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- TC-USBBU-3.0
- CAB-AQ (2C18G) Aquaseal Cable
- TC-BC-2.x/C
- TC-BC-2.x/RCP
- TC-IOPS-1.4/RCP
- TTN-AD-2000
- TTN-ISODN
- Kele LDIM2 Control
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- TTN-D2-1.0/C
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- TTN-D4-1.0/C
- TTN-D8-1.0/C
- TTN-P1A-1.3/C
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- TC-LCMI
- SEN-OSM/C and CO2 4.0
- SEN-OSM/RHT 4.0
- SEN-RHT-1.0/C
- SEN-TN2, SEN-TN21, SEN-TN66, SEN-TN100
- SEN-TN2DW/C
- SEN-TN21/HM2
- SEN-T21/S
- RM-1CG-OL
- RM-2CGR
- RM-2CGR-OL-1PH
- RM-2CGR-OL-3PH
- RM-2DP-4
- RM-2TX75

## Notes

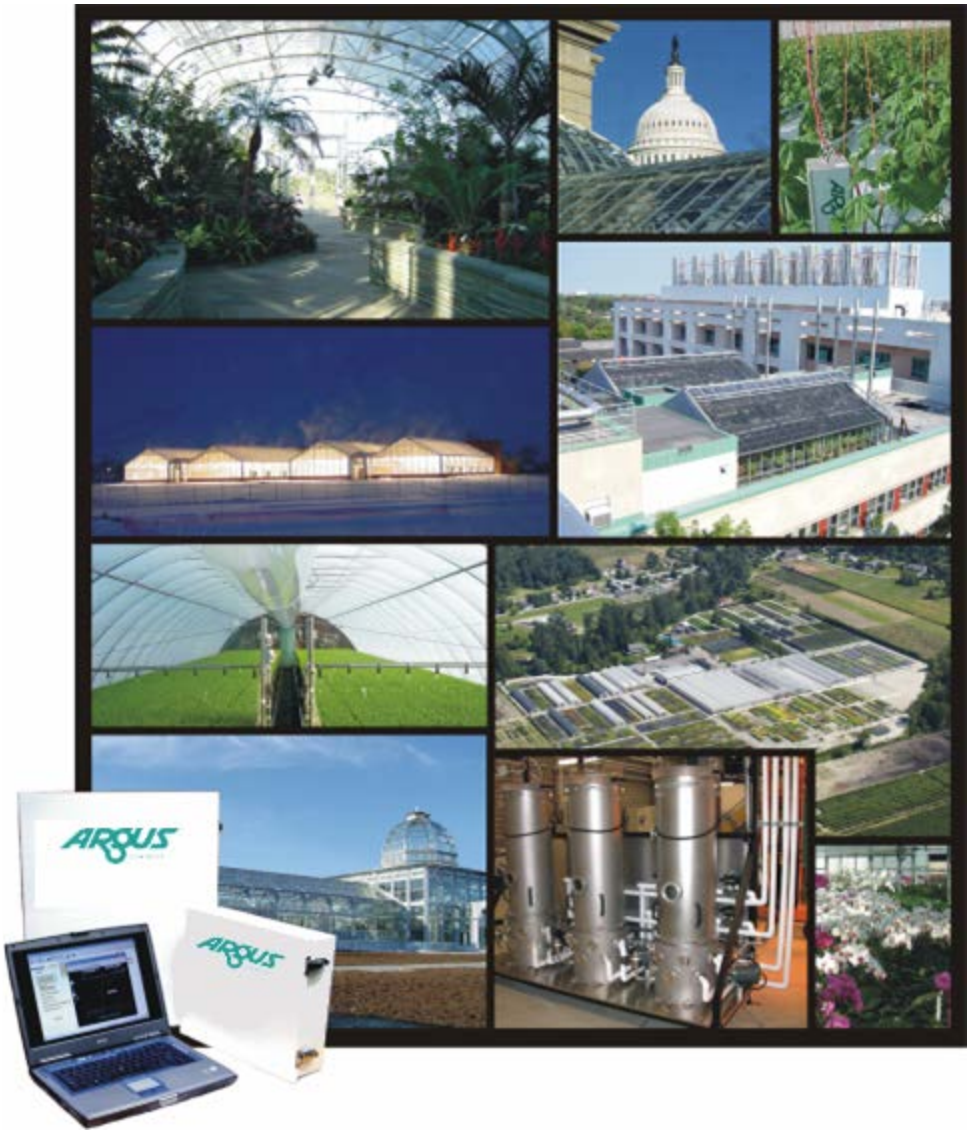
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## Additional Product Brochures

- Argus API
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- Argus DLI

# Managing Risks with Greenhouse Production Systems

## Application Note




*July 2017*

## Managing Risks with Greenhouse Production Systems

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# About this Document

This document is intended to help greenhouse growers and managers to identify and understand the risks involved in mechanical crop production systems and to suggest some strategies for managing those risks.

These same points can also be applied to a broader range of monitoring and control applications.


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# Fail-Safe and Fail-Soft Greenhouse Operation

Greenhouses are complex systems composed of many interactive components which can malfunction or fail. Most greenhouse crops can accommodate a wide range of deviation from optimal growing conditions for short periods of time, but will eventually suffer damage or even death if these deviations are not rectified. It is the job of the greenhouse manager or grower to anticipate, detect, and correct deviations or failures before economic loss occurs. This is not an easy task.

## *The 'Good old Days'*

In the 'good old days', people directly controlled the environment by opening windows, hand watering, and shoveling coal into hand-fired boilers. The result was often inaccurate control and inefficient operation by today's standards, but the greenhouse seldom deviated catastrophically, since there were usually people around to notice and correct major problems.

Growers still suffered from the consequences of external system failures. Loss of electrical power, boiler failures, or extreme weather events could still cause economic damage, but again, the relatively simple greenhouse equipment used, and the 24 hour availability of on-site labor, often mitigated consequential damages to acceptable levels.

## *The Brave New World*

Over time growers adopted more complex production technologies and made great advances in production efficiency. However, these technical advances brought new problems of their own:

- Complex equipment is more difficult to repair and may be more prone to failure.
- It is often difficult or impossible to see if complex equipment is working properly by simply looking at it.
- As mechanization and automation replaced workers, these people were no longer around to check on operating conditions. Equipment failure in the middle of the night might now go unnoticed until the morning, with potentially catastrophic consequences.
- Control strategies became more complex and therefore harder to understand.


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In response, many growers installed sophisticated control systems to manage the greenhouse and implemented independent alarm systems to warn of problems and summon help before significant crop or equipment damage occurred.

This technological progression has continued for the better part of a century, culminating in the highly automated computer control systems that most growers use today. When everything is working properly, the results are impressive; when something goes wrong, it can go very, very wrong before you know it.

When it comes to detecting and addressing catastrophic failures, your computer control system can be your friend, but, if not used correctly, can add to your problems or even create problems of its own.

Let's take a look at some of these points:

## *The Control System as Your Friend*

- Data recording can be used to provide detailed records of operation, helping you to diagnose problems that would otherwise go undetected or be very difficult to resolve.
- Control system alarms can alert you to a wide range of deviations from normal operation and quickly summon help.
- Control systems are reliable, with considerable self-diagnostic capabilities to ensure proper operation.
- Remote technical support is practical and effective.

## *Control System Limitations*

- Control systems, sensors and wiring can fail which, if not detected, may result in poor control or even alarm system failures.
- Operators can and do make errors when entering settings. The control system has little way of knowing whether a setting value is safe or dangerous. While some incorrect settings will cause climate deviations that will be detected through alarms, others may go unnoticed for days or weeks with consequent damage before detection.


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- A fully automated greenhouse may be capable of running for days or weeks with no operator intervention at all. This can lull the operators into a false sense of security, so that they fail to conduct the routine checks necessary to catch production problems early.
- Sounds a bit like “one step forward, two steps back”, but it doesn’t have to be. How can we take advantage of the huge benefits of modern efficient greenhouses and control systems while protecting against some of these introduced weaknesses?

## *A Few Key Points to Consider*

- Growing a good crop involves far more than simply producing an optimal climate for it to grow in. Diseases, insect infestations, and crop timing for market are examples of production factors that are not addressed by automation alone. Someone needs to inspect the crop regularly (at least daily) to detect and deal with problems in a timely fashion. Good growers will not be looking for new jobs any time soon – they will not be replaced by computers!
- Greenhouses are complex systems with many interrelated components. Changes in the weather or a failure of one piece of equipment may have a disruptive effect on many other parts of the production system. It is not economically feasible to install a control system capable of handling every conceivable problem, and in some cases it is simply impossible.
- Murphy’s law – things **will** go wrong.


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# Developing a Strategy to Improve Management of Your Production System

Design your operation with as much production equipment redundancy as possible. Look at each production component and consider how it might fail and what the consequences of that failure might be. Wherever practical, install redundant or complimentary equipment to limit these consequences and develop strategies to detect these failures early, giving you sufficient time to rectify them before damage occurs.

For example:

- Dual heating systems such as gas fired unit heaters for top heat and hot water for bottom heat. A failure in one will not disrupt the other, allowing it to continue functioning. Where on-line redundancy is not possible, carry spare parts in inventory and have staff available to change-out failed equipment on short notice.
- Consider installing equipment that can help mitigate problems. For example, thermal curtains can delay and reduce the consequences of heating or cooling system failures.
- Install back-up fuel systems and stand-by electric generators to provide redundant supplies of these critical resources.
- Consider installing ‘day tanks’ for water supply, or at least have alternate water sources available (multiple wells, ponds, etc.).

Consider all external conditions that could disrupt your production system and install monitoring and alarming to alert to you to failures. Electrical power failures will affect many other production processes if not corrected.

You should respond immediately to the loss of power (or failure of your back up generator system) rather than waiting until a production variable reaches critical conditions.

Identify all critical production conditions, along with the shortest required response time.

For example:

1) Low temperature limit; 30 minutes.
2) High temperature limit; 30 minutes.
3) Low RH limit; 2 hours.
4) High RH limit; 5 hours.
5) Photoperiod; 3 days.
6) Irrigation; 4 hours.


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7) Nutrient injection; 4 hours.

8) Mist propagation: sometimes you only have minutes.

   Each crop and production system will have a different set of critical conditions that may change from season to season. For example, a plug production system will have far tighter response times for irrigation and humidity deviations as compared to a crop grown in 25 gallon tubs. Equally, a greenhouse operating in a very cold climate may have much shorter low temperature response requirements than one in a warm climate.

9) Identify ways to detect and annunciate each of these failures and consider all the ways the detection system can be defeated. Consider independent parallel alarm systems where needed and design a scheduled testing procedure to confirm proper operation of the entire detection and alarming system.

   ***Remember, a chain is only as strong as its weakest link.*** The entire cycle of detection, annunciation, and human response must be shorter than the required response time.

   There is little point to an alarm system that is unable to alert you in time for you to correct the problem!

10) Where possible, don't just test the alarm bell on your system; actually force the sensor to the alarm condition. For example, warm a temperature sensor to trigger a high temperature alarm and have that alarm pass all the way through your alarm system, including phone dialers or other external annunciation systems.

    Changing alarm setting thresholds may have a similar effect, but you run the risk of errors when putting the settings back to correct values after the test.

11) Use several independent measurement systems to confirm operation, either through redundancy (multiple sensors measuring the same thing), or even better, several different types of sensors measuring different aspects of the same problem:

    a) A moisture probe directly measures soil water content.

    b) A weight scale measures the weight of the pot, indirectly measuring water content.


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12) Install sensors to directly detect equipment failures that might lead to critical conditions:
    a) A temperature sensor measuring the heat blowing out of a unit heater (installed several feet in front of the unit) will confirm proper operation of the heater and blower system.
    b) Flow, pressure or sail switches installed to confirm operation of pumps and fans. Confirm both “off” and “on” conditions to also detect failures of the switch itself.
    c) Light sensors installed to confirm proper operation of photoperiod shading and lighting systems.

Assume that all of the precautionary steps described in points 1- 4 will fail.

1) Routinely check your operation through reviews of recorded control system data. Look for the harbingers of possible catastrophic failures such as small, unexplained deviations that may show up under less critical conditions.

   For example, a greenhouse might respond to a partial failure of the heating system with a higher than expected heat demand in mild weather. If you notice this before the weather turns cold, you can fix the problem without crop disruption.

2) Be aware that only some of your critical conditions may be in play at any one time and focus on those:
    a) Frost protection or heating failures may only be critical when it is cold outside.
    b) Irrigation or misting failures may only be a problem during sunlight, not at night time.
    c) Cooling failures may only be critical on warm sunny days
    d) Snow melt heating and curtain overrides will only be critical during snow storms.
3) You have to walk your crop anyway to check for disease and insect pests, plugged irrigation or misting nozzles and other production problems, so schedule these walks to coincide with the timing and frequency of most of your critical conditions. For example:
    a) Walk around in the morning before the heat of the day to confirm watering and cooling.
    b) Walk around in the evening to confirm heater operation and that vents are properly closed, etc.
    c) Walk around at night to confirm photoperiod lights and curtain systems are working properly.


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4) Station a properly trained employee in your greenhouse during particularly critical times. These conditions may only happen on a few days a year and they may be very difficult to manage through automation alone, so it is often easier to address them the old fashioned way. Consider having a knowledgeable person on site for:

   a) Major snow storms or wind storms

   b) Extreme hot or cold weather

   c) Critical cropping stages such as:

      - Frost protection on outdoor crops.
      - Mist propagation of sensitive plants such as poinsettia cuttings.
      - Photoperiod lighting in young plants.


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# CONCLUSION

Use your automated control system to do as much controlling, monitoring, and alarming as is economically feasible. In particular, use the advanced logic in your control system to alert you to a wide range of critical and non-critical management conditions. Every problem identified by the control system is one less problem for your crop.

Make sure your production equipment and control and monitoring systems are in good operating condition.

Where practical, install sensors to confirm proper equipment operation.

This could include:

- Frost sensors above curtain systems.
- Temperature sensors on irrigation pump impeller housings measuring the heat build-up caused by suction loss.
- Moisture sensors to confirm irrigation activity.
- Position sensors on vents.
- Flow sensors in water lines.
- Light sensors under curtains and lighting systems.

You can often use roughly mounted, inexpensive, and un-calibrated sensors since their job is to confirm equipment response, not to accurately measure or control it.

Check and re-check your control system settings at frequent intervals and **particularly after making settings changes** to make sure that they are correct and producing the intended effect.

Don't assume your control, monitoring and alarming systems are working properly – assume they are not! Implement a schedule of manual inspection and review that fits your diverse management objectives and level of risk aversion.

Design your production systems to have critical system redundancy, good alternative strategies to cope with the inevitable failures, and keep a supply of critical spare parts in stock.

If you are not sure which parts of your system are critical, just apply Murphy's Law and decide if the outcome is acceptable.


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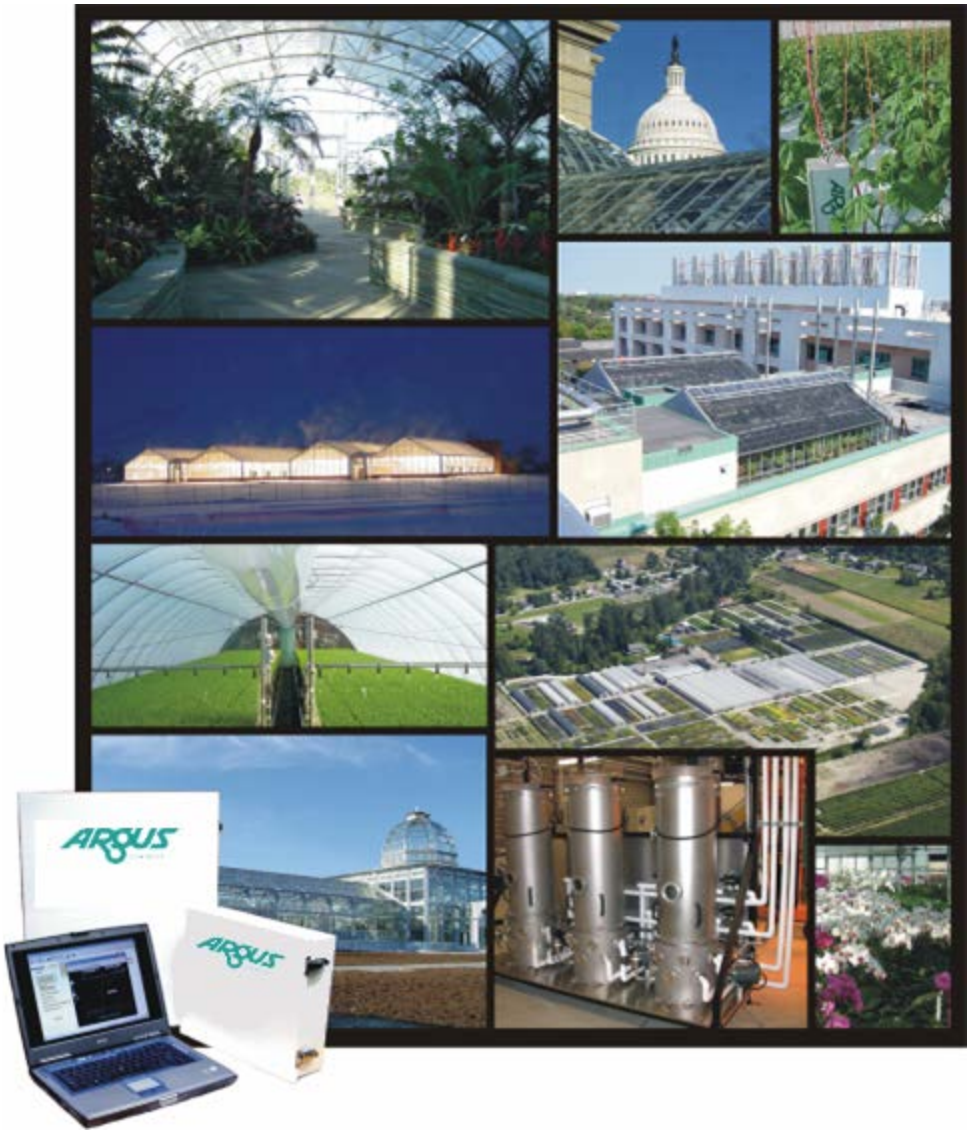
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# Session Manager

## Operator's Guide




*July 2016*

# Session Manager Operator's Guide

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# About This Manual

This guide is intended as a training and reference manual for the Argus Titan operator program. It contains information describing the configuration and connections for the Argus Session Manager software.

Once you have learned the basics, the Argus system can be easy and enjoyable to use. You'll understand the power and flexibility of our user interface and how, with just a few simple tools, you can create a custom user interface that maximizes efficient use and management of your control system.

## *Where to Find Additional Information*

This guide covers the basic components and configuration of the Session Manager.

Detailed data sheets, and other documents are also supplied, along with Help files within the Argus Operator program. Please refer to them for installation.

Help documentation is an ongoing process. While we make every effort to document the features and functions of our systems, it is impossible to fully document the myriad of applications that Argus systems are used for.

For additional assistance please contact **Argus Support**.

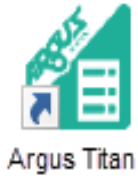

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# INTRODUCTION

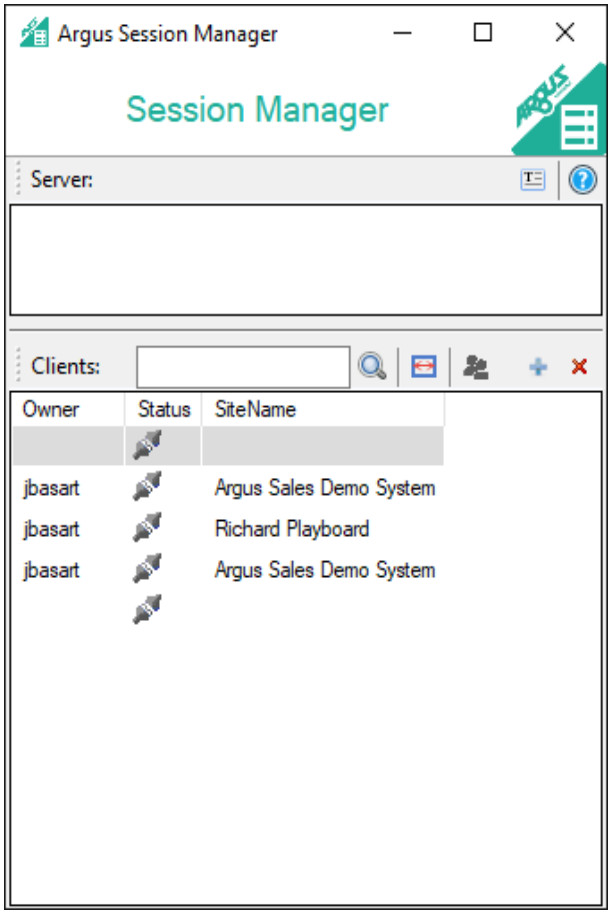
The Argus Session Manager saves the connection details on each PC used to access Argus systems so that a connection can be quickly reestablished at any time.

From a single PC location it is possible to access several Argus **Sites** simultaneously, or one at a time.

The Session Manager remembers all of the connection details for later use.




When you select this Argus icon on your desktop the **Session Manager** application launches:

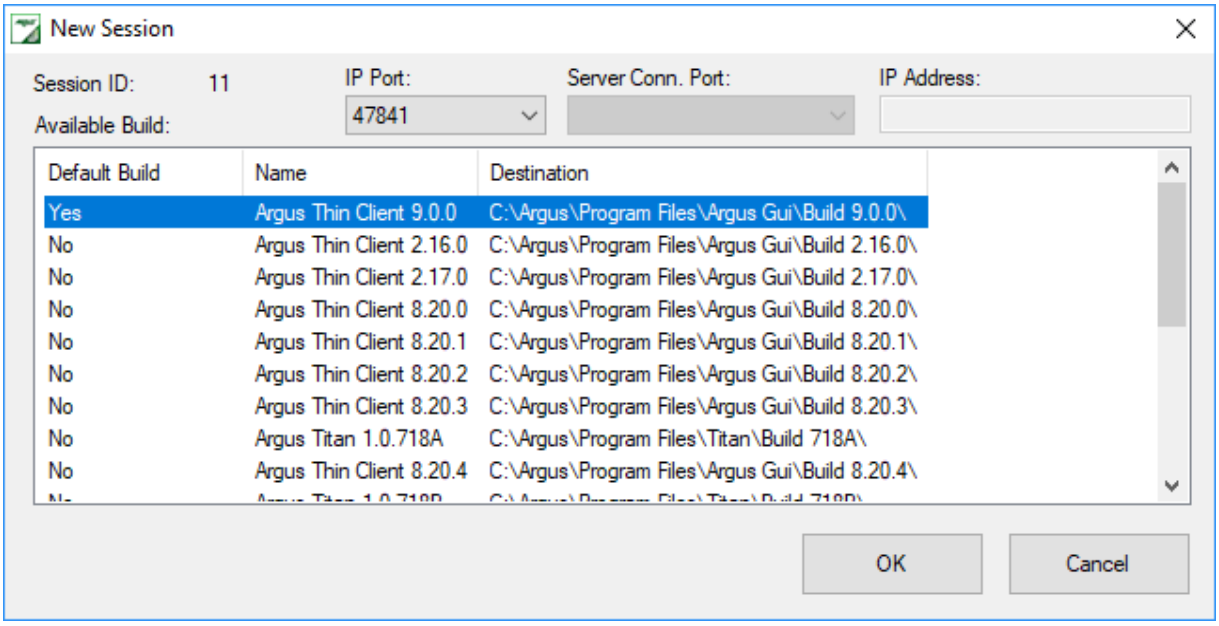




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If the **Session Manager** is currently empty (that is, there are no running sessions or saved sessions) selecting the Argus icon on your desktop launches this dialog instead:



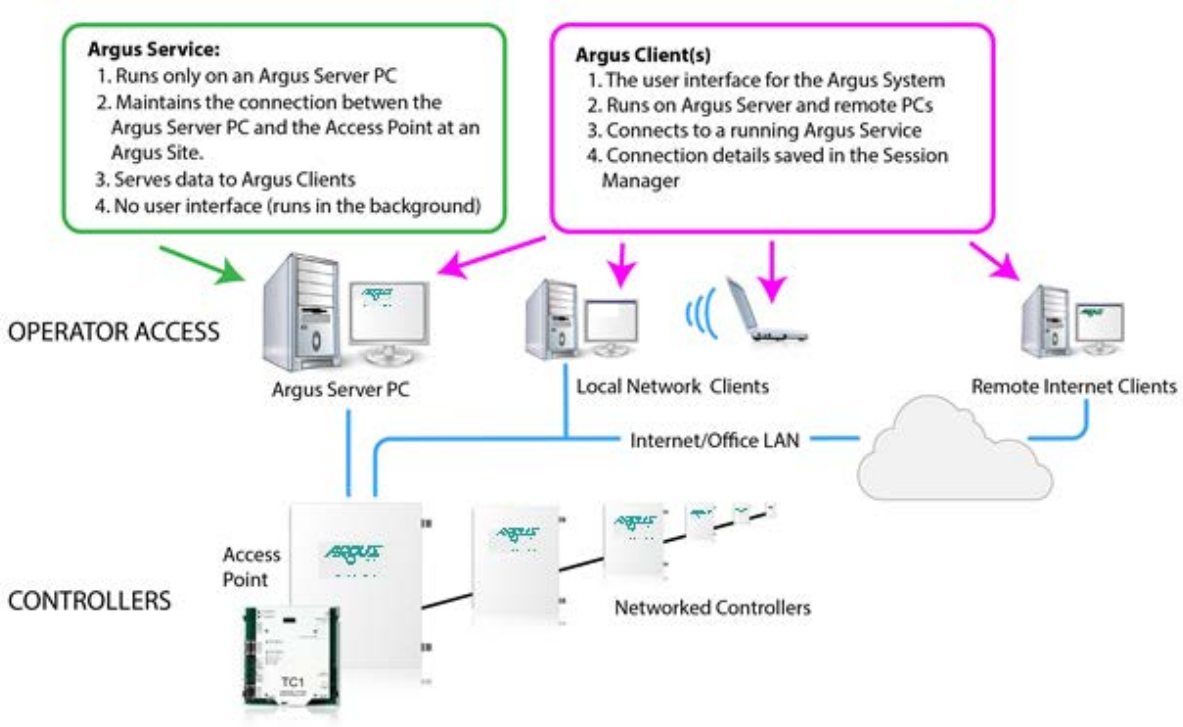

This enables you to create an initial connection to an Argus Site.


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# Understanding Connection Types

There are two types of connection:

- Argus **Server** Connection
- Argus **Client** Connections




## *Server Connections*

An Argus **Server Connection** is made only at the physical Argus site between the designated **Access Point Controller** and the **Argus Server PC** (see the illustration above).

The server connection runs continuously in the background on the Argus Server PC and it maintains a connection to the controllers for user access.

It also provides several important functions including backing up data from the controllers.

Only one Server Connection can run at a time on the Local Argus Server PC.

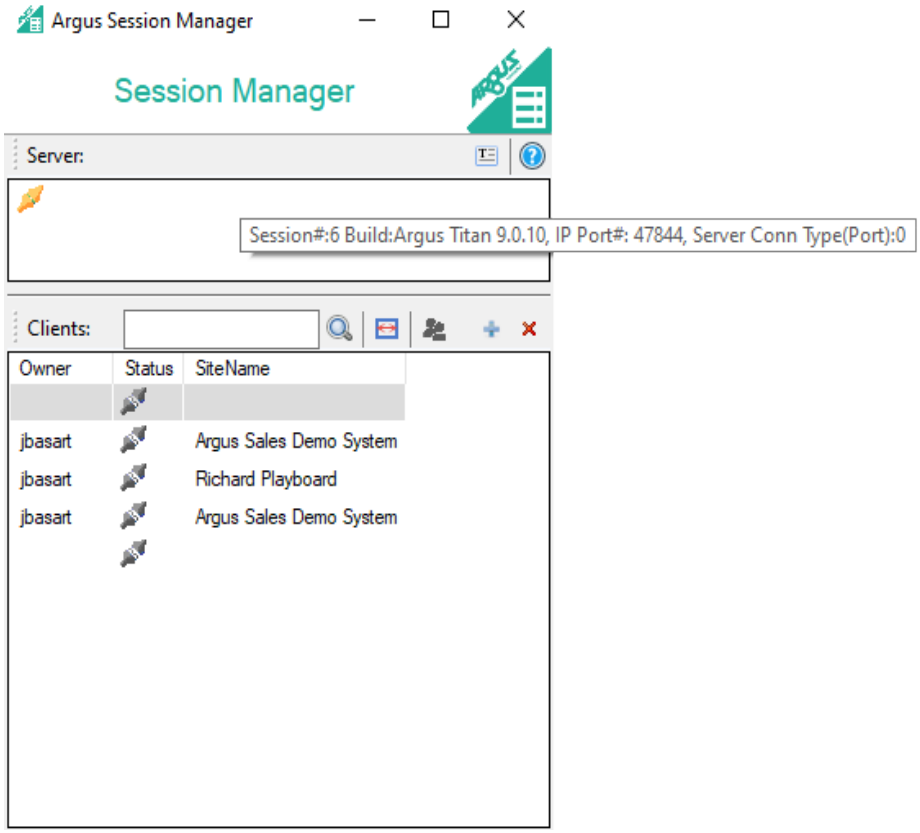
The Argus Service has no user interface. All user access is accomplished using the Argus **Client software** including local access at the Argus Server PC.


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The Argus Service only runs on PCs designated as Argus Server PCs. It does not need to be running on a client PC, but it must be running somewhere and be accessible using the Internet in order for a remote Client to connect to an Argus system.



You can hover over the **Server Connection** as displayed below to detailed information for your currently selected server connection.




Server information includes:

- Session Number
- Build Name and Number
- IP Port Number
- Server Connection Type (Port)


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## Color Descriptions

The Status Icon has three possible colors denoting current status:

1) Green - Connected.
2) Yellow - Running but not connected.
3) Grey - Not running at all.




Older builds do not support many of these colors, so can only display Grey or Yellow. You cannot distinguish between connected and not connected with an old build.

- Black - Thin Client Connections or Service connections.
- Grey - Thick Client or Server connections (Server for older builds).

## *Client Connections*

Client connections are made between the 'Argus Service' running on the Argus Server PC and other PCs running the Client software. The client software is also used at the Argus Server PC for local user access to the connected control system, as well as remote access to other systems as required.

You can connect many Argus Sites to a single PC, either simultaneously or one at a time.

A client can only connect to a running Argus Service

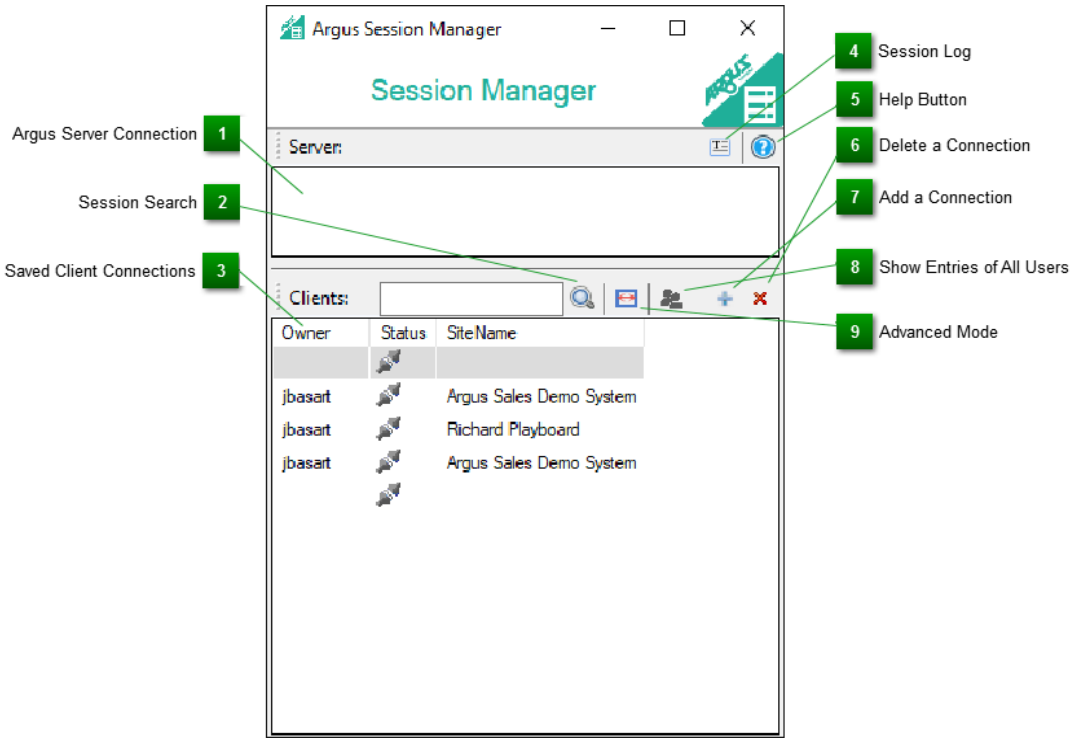
Details of client connections (addresses, system types, software versions, etc. are stored in the Argus Session Manager for later use.


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# CREATING CONNECTIONS

There are various parameters to help you create a connection to the Server and to the Client.

## *Server Connection*




From the **Session Manager** screen:

1) Argus Server Connection
2) Session Search
3) Saved Client Connections
4) Session Log
5) Help Button
6) Delete a Connection
7) Add a Connection
8) Show Entries of All Users
9) Advanced Mode


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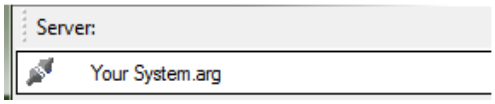
## 1 Argus Server Connection

This section shows the current Argus Server connection, if any, that is running on this PC:




When the connection icon is green this indicates that the Server is currently running.

When it is gray, the Server is **not** running:



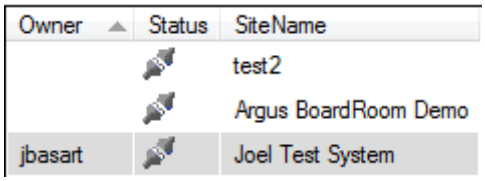

See "Connecting and Disconnecting an Existing Server" on page 21 for more connection information.

## 2 Session Search




This filters saved client sessions by site name. It is useful mainly for connections used by service teams where large numbers of sessions to different systems are stored.

## 3 Saved Client Connections




This lists saved client sessions.

## 4 Session Log

Selecting this icon displays a log of the current session manager activity.


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## 5 Help Button

Select this button to view the help documentation for the session manager.

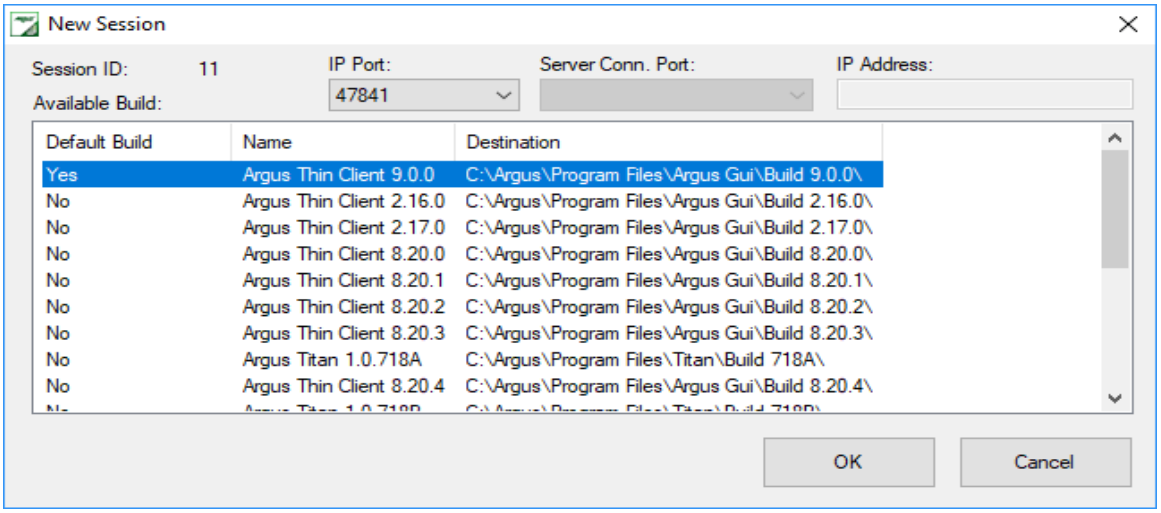
## 6 Delete a Connection

Selecting this deletes a highlighted client session.

## 7 Add a Connection

Select to add a new **Client** or **Server** session:

To add a new client session, select the default build of the **Argus Thin Client,** or a build that matches the software running on the target Argus site.




This dialog is used to make connections between the **Argus Client** software and the **Argus Server** at an Argus Site.

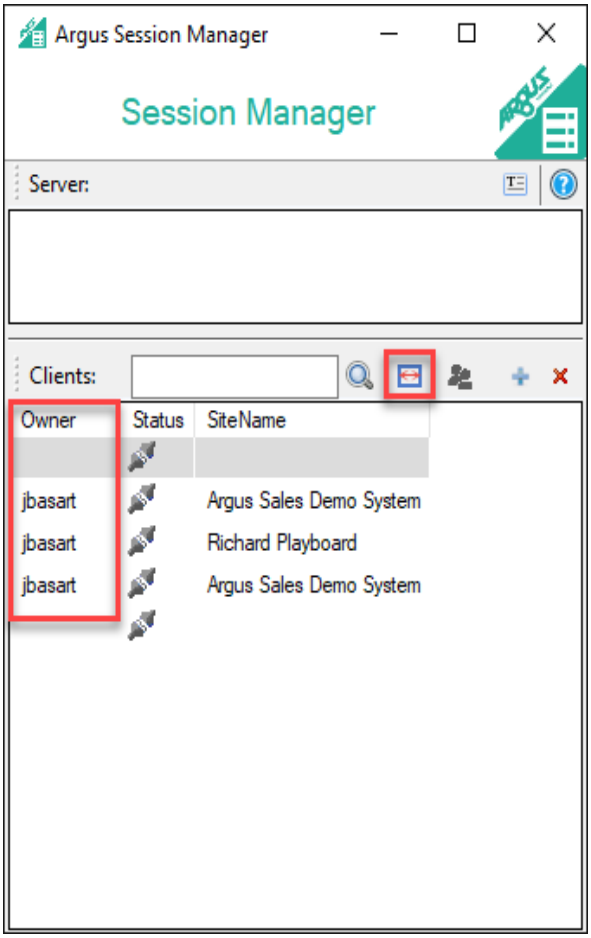
The Argus Server PC must be running at the Argus Site and connected to the control system before you can make a client connection.


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The **Gateway** dialog is displayed whenever you are using the Session Manager to make a new connection, or whenever a previous connection is unavailable. The Session Manager is used to save connection details and the gateway dialog is used to make the initial connections.

## 8 Show Entries of All Users

Clicking the **Show Entries** icon allows you to see all users on your system, rather than just your own user name.



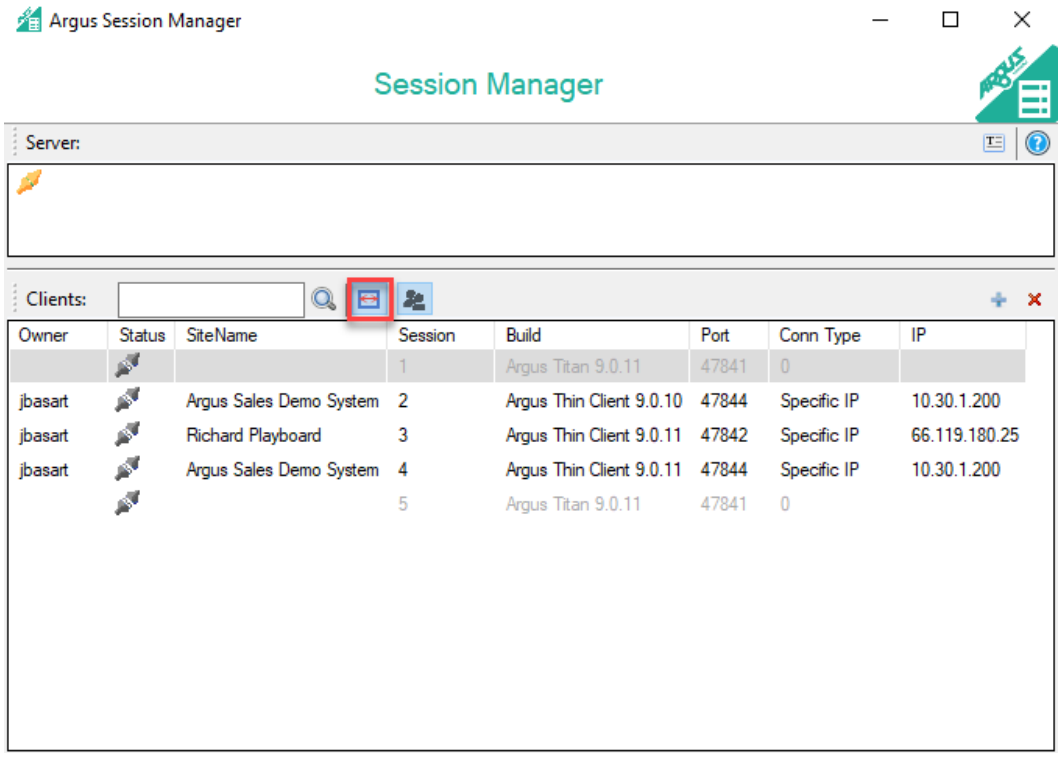

A new **Users** column is displayed, with the specific users logged into each of the sites as displayed above.


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# 9 Advanced Mode

Clicking the **Advanced Mode** icon opens up a larger Session Manager that includes more information.

Included is the **Session**, **Client Build**, **Port** and **Connection Type**.

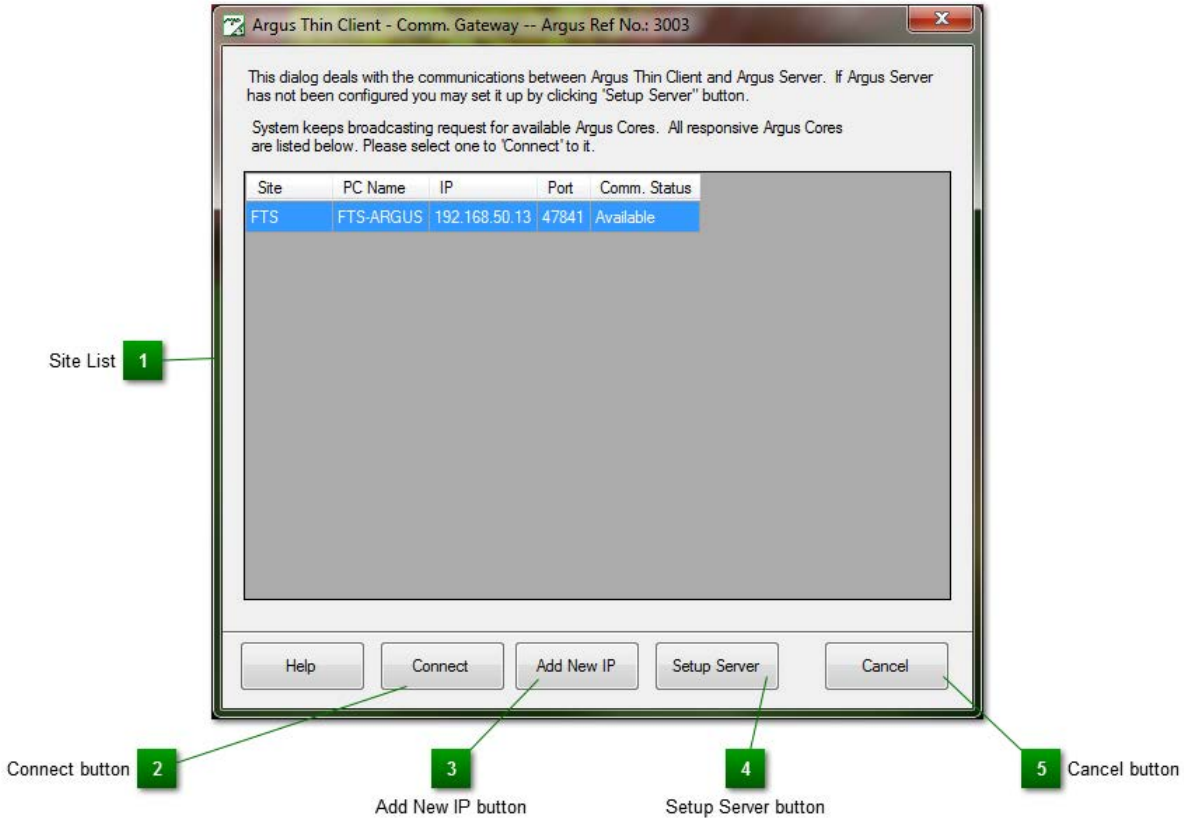



- **Session** – A unique session number, assigned by the first open spot. For example, if 10 sessions are in use and #5 is removed, then the next new session would be #5.
- **Client Build** – The Argus Client Build for that session


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- **Port** – The port number for that session.
- **Connection Type** – The type of connection for each session. Can be Broadcast or Specific IP. Any other available options are used by the Service (Ethernet, COM Port #, etc.)

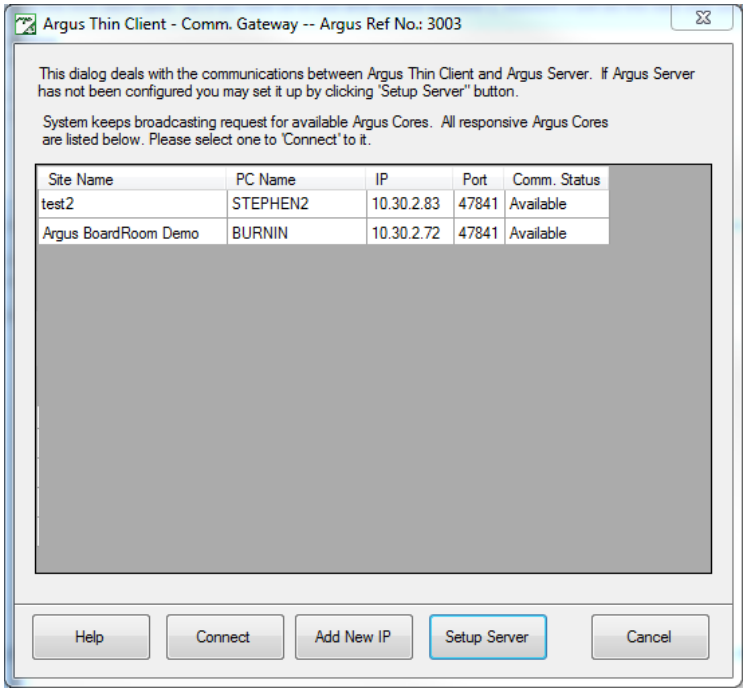
## *Client Connection*




1) Site List
2) Connect Button
3) Add New IP Button
4) Setup Server Button
5) Cancel Button

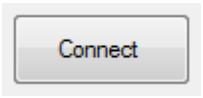

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## 1 Site List



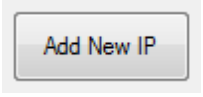

The gateway automatically checks to see if any Argus sites are available on the local network and displays then in the above list.

## 2 Connect button




Select a site from the list and click the **Connect** button to make the connection. The Argus Thin Client login screen launches once the connection is established.

## 3 Add New IP button

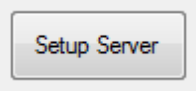




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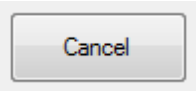
Use this to enter the IP address of the Argus Server PC you are trying to connect to. This can be a local IP or and external IP address. The Gateway then attempts to establish communication with the Argus Server at this address.

### 4 Setup Server Button




If you are trying to set up the Argus Service by connecting the Argus Server PC to an Access point, select this button.

### 5 Cancel Button




Select this button to cancel the current operation and close this dialog.

## *Making a New Server Connection*

This section of the Session Manager window displays the current Argus Server connection (if any), that is running on this PC.

This operation should only be performed on the PC intended as an Argus Server PC.

This operation is for connecting to a Titan Access Point controller and running the Argus Server software on a PC.

This enables the PC to act as the Argus Server PC for other client PCs.

It also enables other housekeeping duties including archival data storage, system heartbeat monitoring, etc.

Each Argus Titan Site requires one Argus Server PC. Only one Argus Service can be run on a PC at a time.

Before you start, ensure that the Access Point controller for the Argus system and the Argus Server PC are both connected using an Ethernet cable on the same subnet.

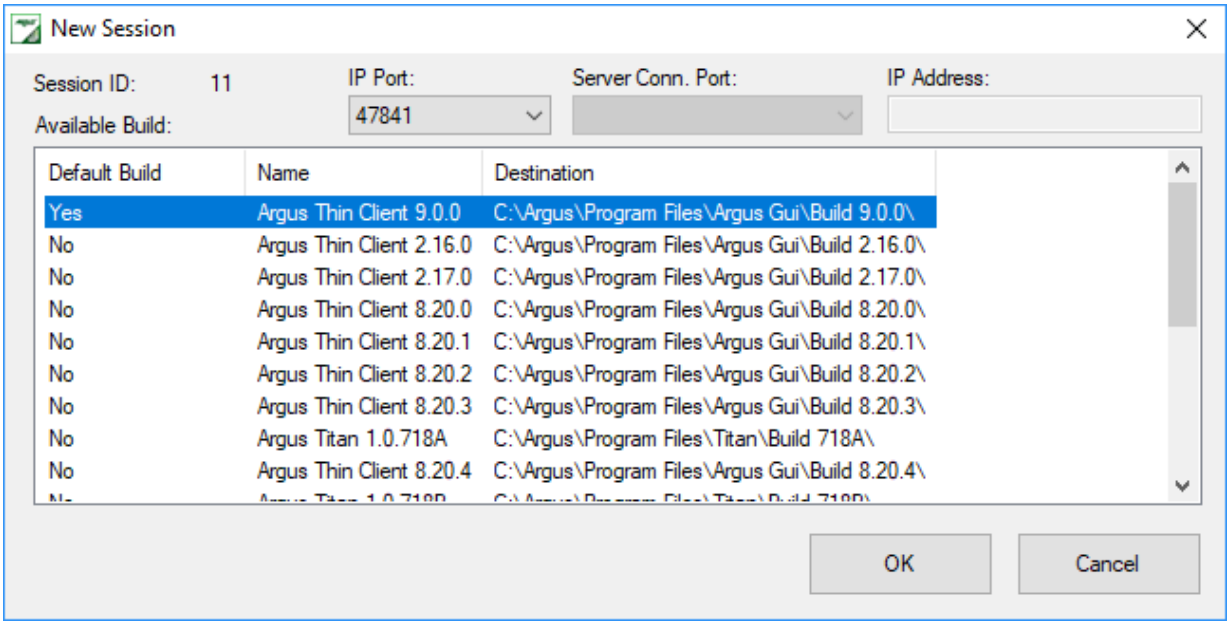

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**Some sites may use a USB to Ethernet connection instead of a direct Ethernet connection using a common Ethernet switch.**

See the Argus **Titan System installation guide** or call Argus Support for assistance.

1) Select the **Add New Session** icon: on the Session Manager window to establish an initial connection between an Argus Server PC and an Access Point Controller using Ethernet.

   The **New Session** dialog is displayed:

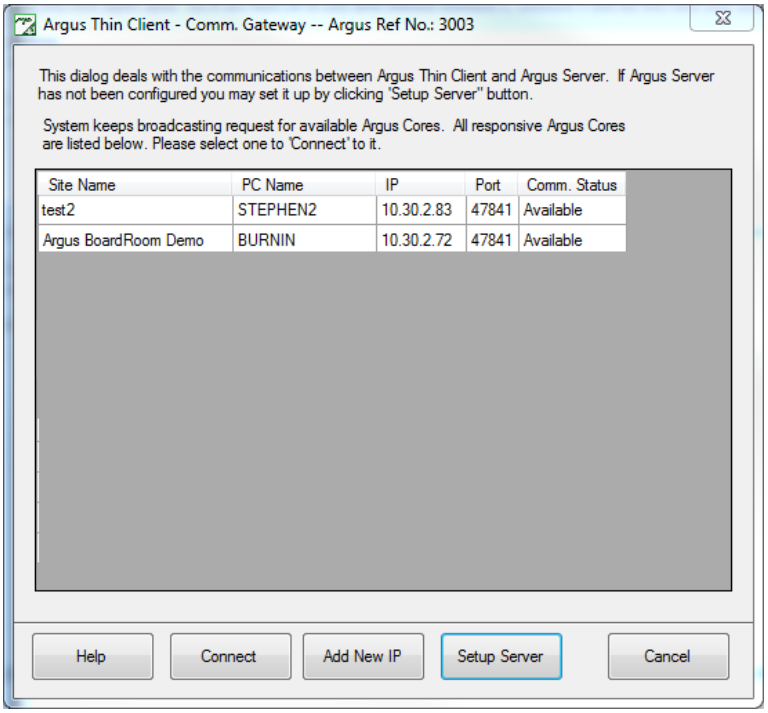



   Normally you should select the **Default Build** of the **Argus Thin Client** program as displayed above.

   This launches the **Argus Communications Gateway** dialog.


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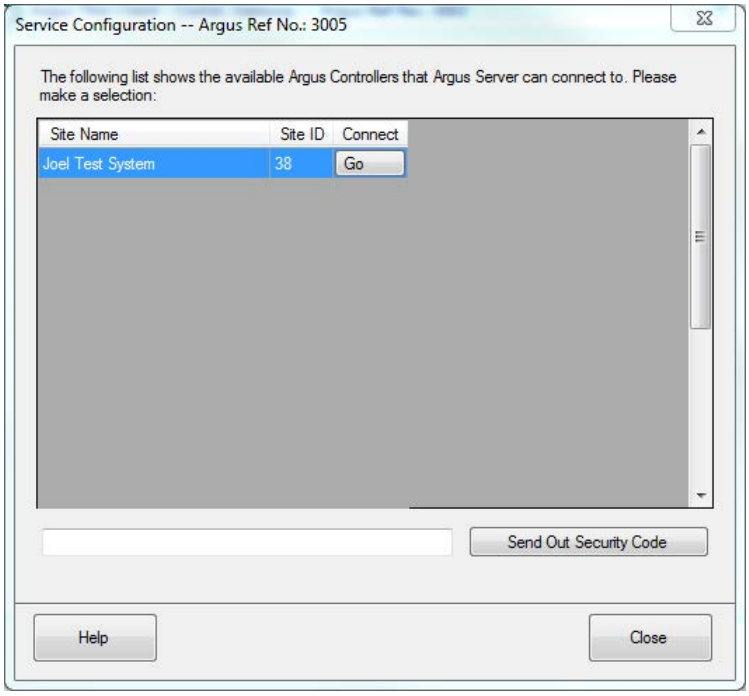
2) Select the **Setup Server** button:



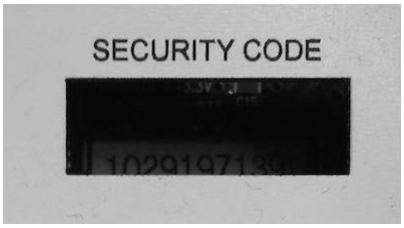

A list of available Argus Sites is displayed. Under most circumstances, you only see one site name.


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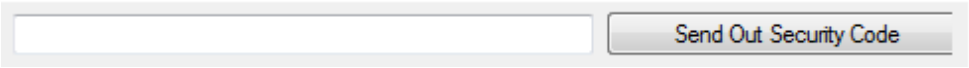
3) Select **Go** to connect.




If your site is not automatically displayed in the list you can try entering the **Security Code** number on the **Access Point Controller**




4) Select the **Send Out Security Code** button:





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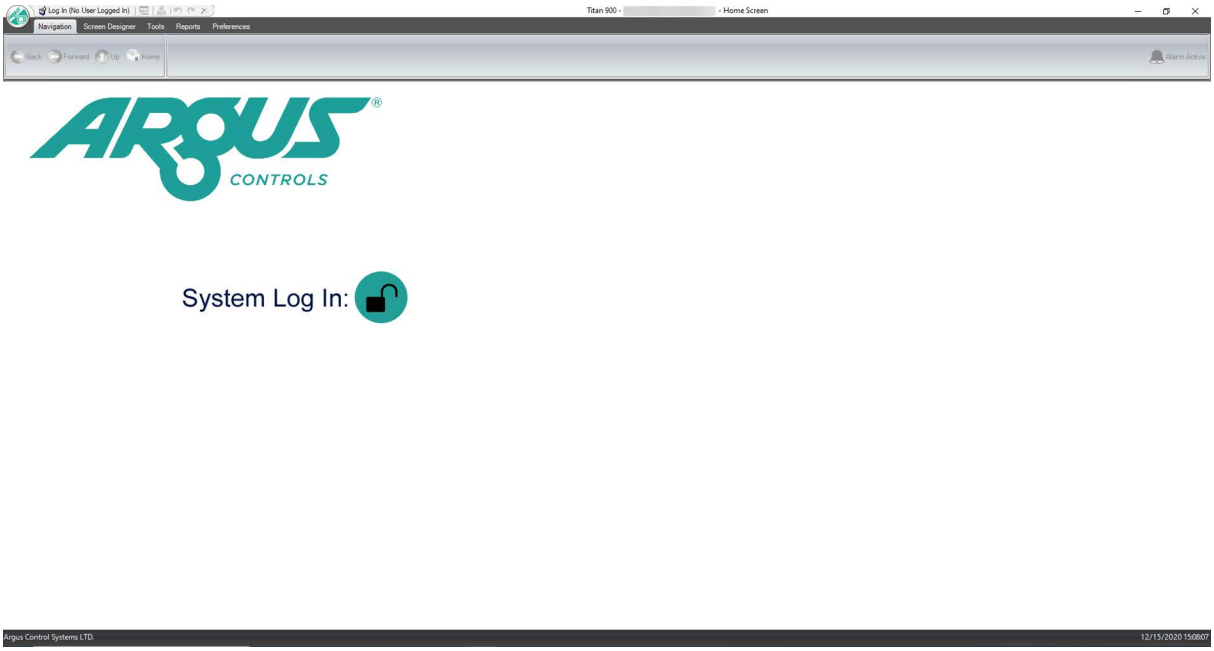
The following dialogs are displayed:







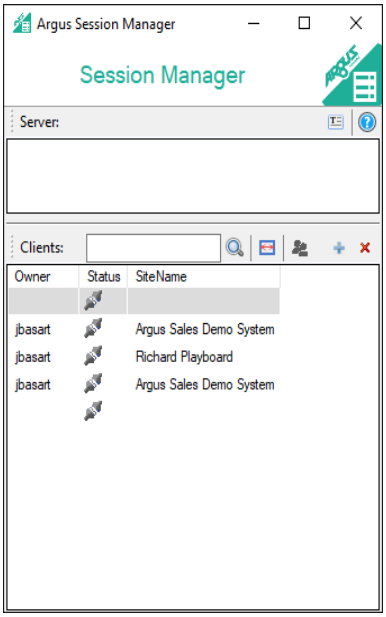
The expected service is found and then the login screen for the site is displayed:





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If you select the **Argus Session Manager** icon from the taskbar, the server connection has been created as well as a matching client session so you can have access to the system:

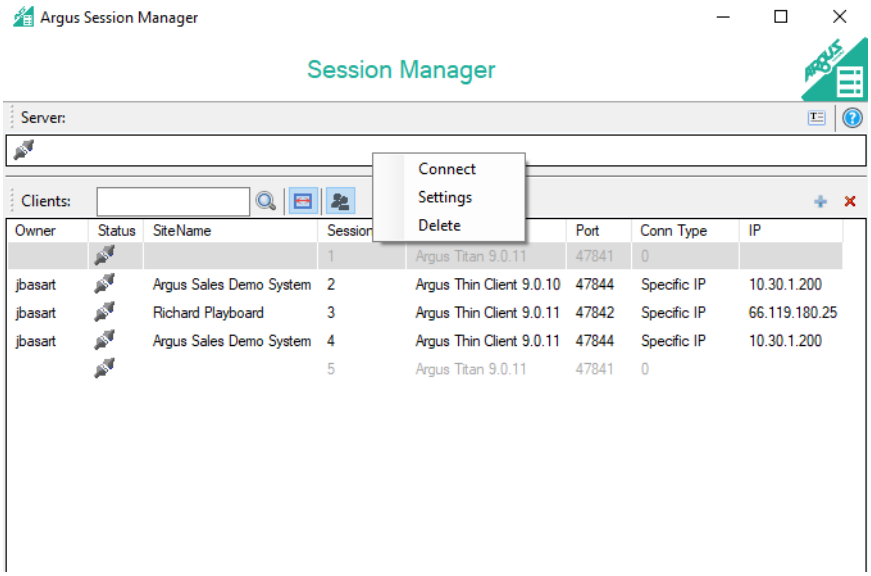




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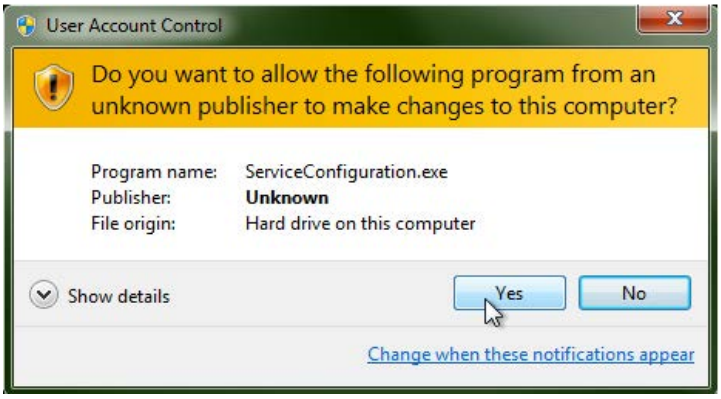
# *Connecting and Disconnecting an Existing Server*

1) To connect (start) the server, right-click in the server field and select '**Connect**':




A user account control warning may be displayed.

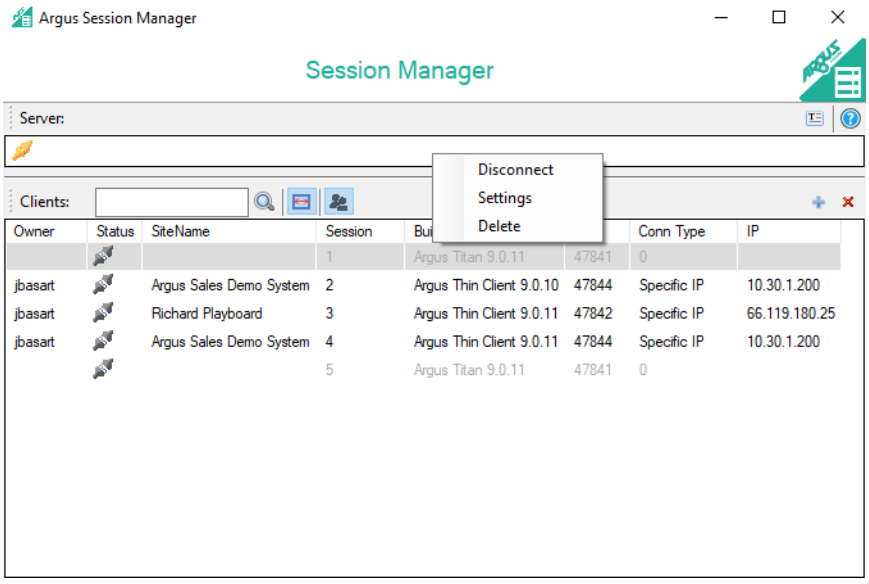
2) Click **Yes**.





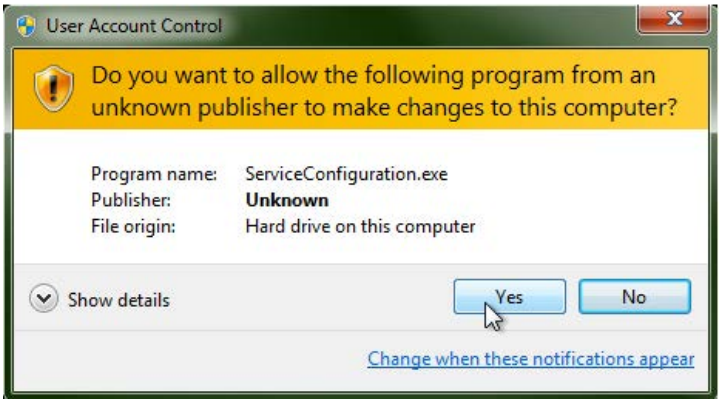
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3) To disconnect a running service right-click in the server field and select '**Disconnect**':




A user account control warning may be displayed.

4) Select **Yes.**





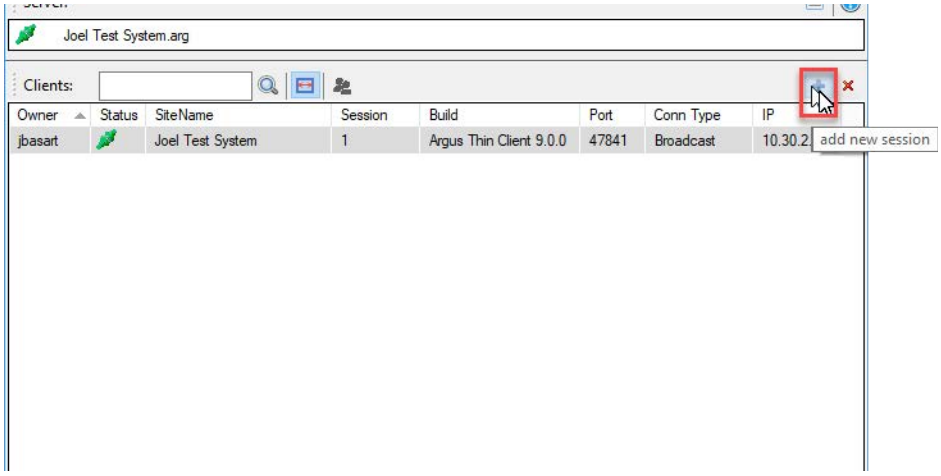
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## *If You are Unable to Make a Server Connection*

1) Make sure the Access Point is not powered down.
2) Ensure that there are no hardware devices powered down between the Server PC and the Access Point, such as the LAN Switch.
3) The Access Point needs to be connected to the same LAN as the Argus Server PC. (see your installation documents and drawings)
4) Ensure there is no Internet Security software on the Argus Server PC blocking the connection, such as Symantec Endpoint Protection.
5) Make sure that the cable between the Server PC and the Access Point is not broken.
6) Check the PC software for any issues, and contact Argus Support as the software requires Argus assistance.
7) Check that you have entered the correct Security Code for the Access Point.
8) Call Argus Support if you require further assistance.

## *Making a new Client Connection*

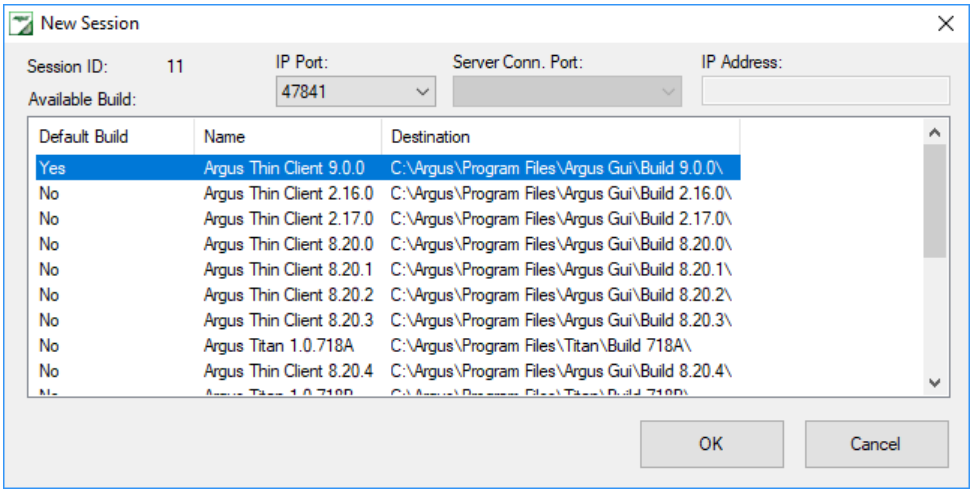
1) Select the **Add new session** icon:  on the **Session Manager** window.





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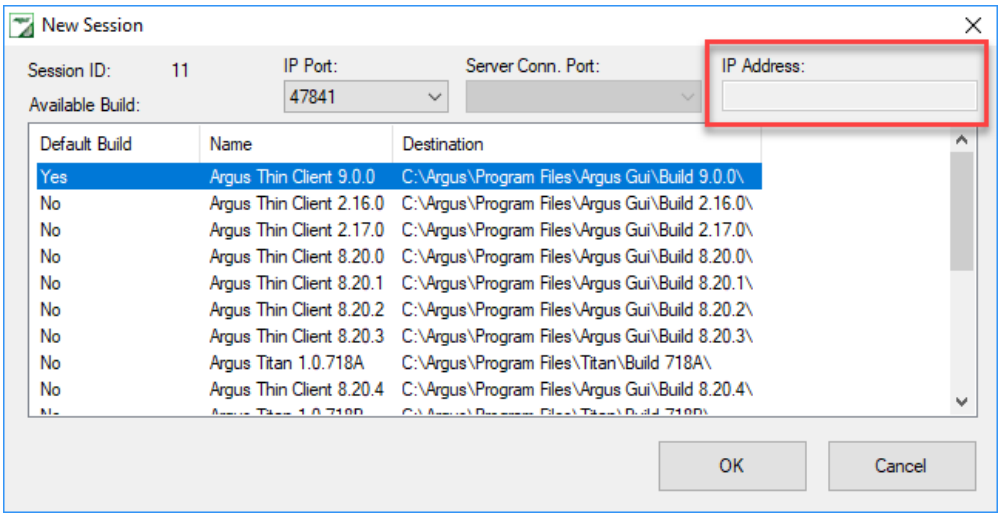
The following dialog is displayed:




2) Select the **Thin Client** build that matches the build running on the site you wish to connect to ('**Argus Titan**' builds that are displayed are for connecting as a server or for connecting to sites running software prior to build 800x).


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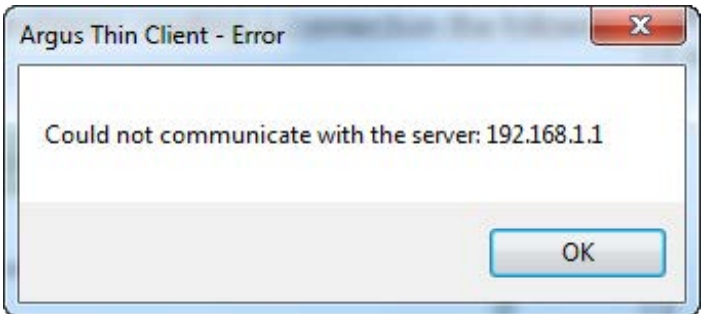
3) Enter the **IP Address** (local or external) of the Argus Server PC that you wish to connect to.




4) Click the **OK** button.

A connection is then established and the Argus Thin Client software launches.

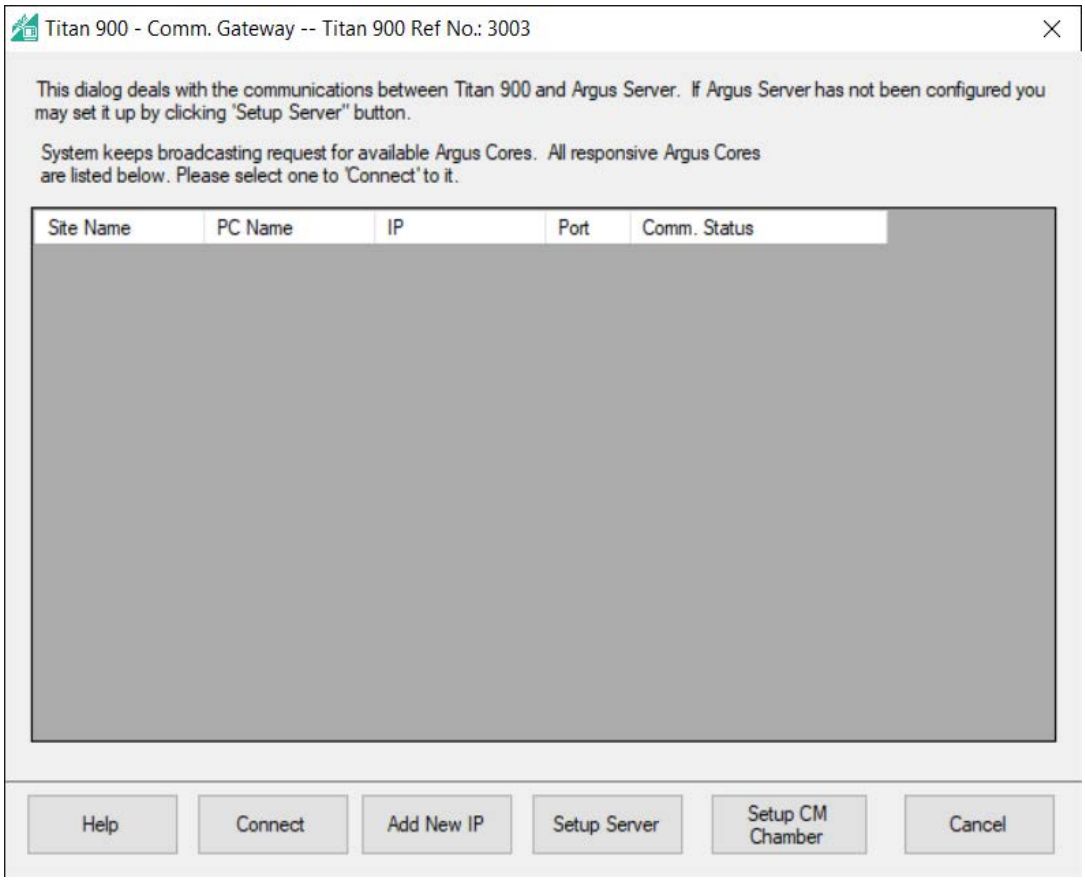
If there are any problems creating a connection the following dialog may be displayed:





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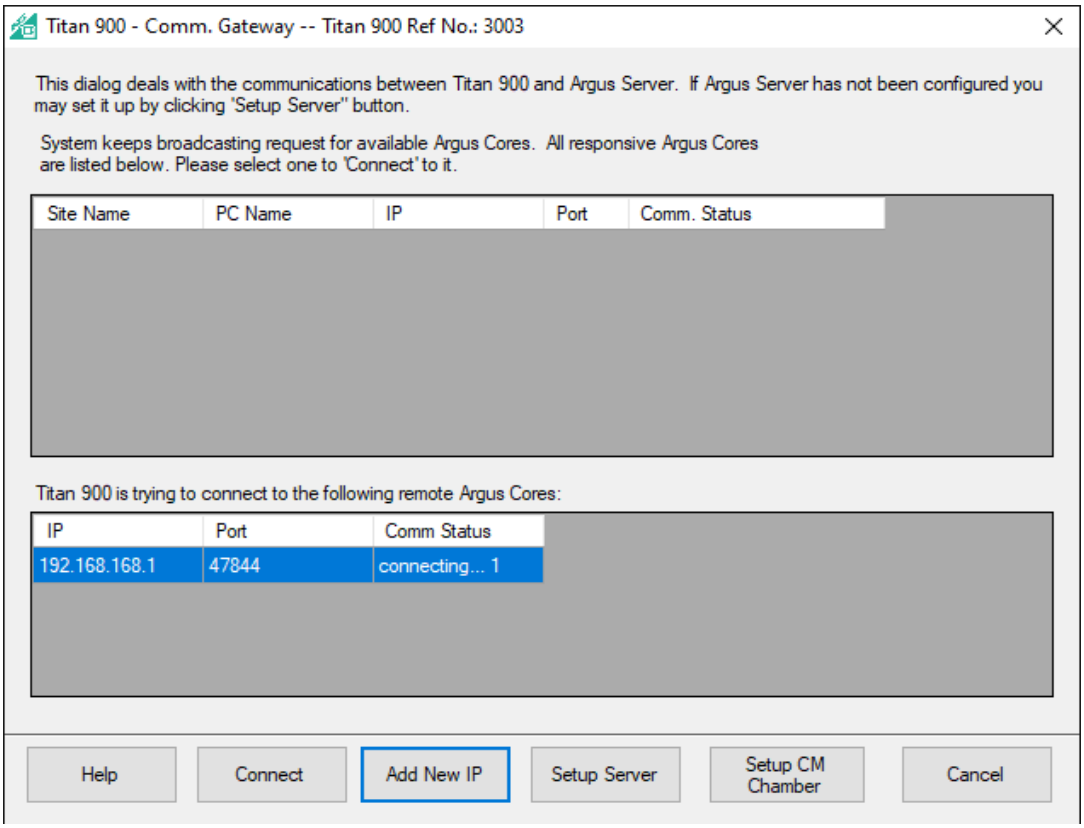
5) If you see this select **OK** and the Argus Communications **Gateway** is displayed:



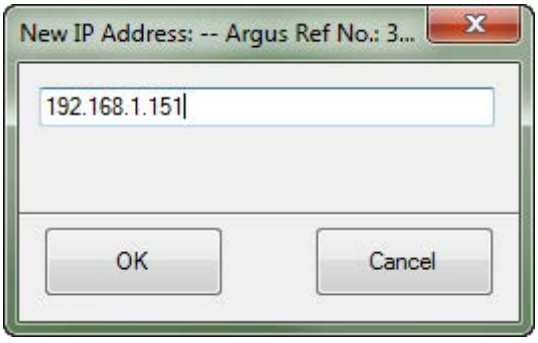


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6) If you do not see your target site listed, click **Add New IP:**




7) Re-enter the IP address:

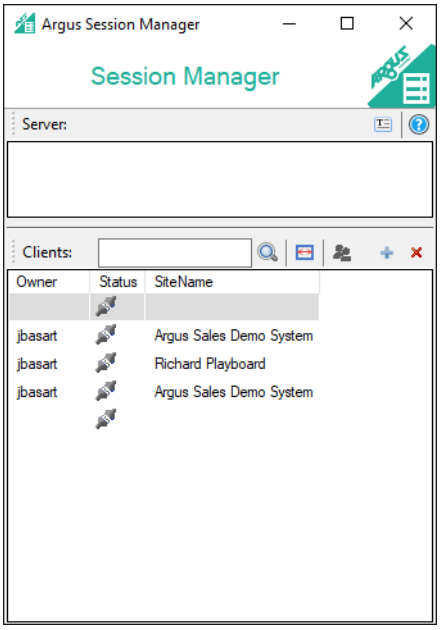




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The Argus Gateway tries connecting to this site for several seconds. If the site responds the gateway dialog closes and the Thin Client program launches the login screen for the site.

The connection details information is saved in the Session Manager for a one-click connection from then on.




## *If You are Unable to Make a Client Connection*

1. Make sure the Argus Server PC at the target location is connected to the Internet and that the Argus server software is running (see “Argus Server Connection” on page 9 above).
2) Ensure that ports **47825** and **47841** are open on the firewall protecting the Argus Server PC to allow communication with an Argus Client.
3) Ensure that there is no Internet Security software on the Argus Server PC blocking the connection.

Call Argus Support if you require further assistance.


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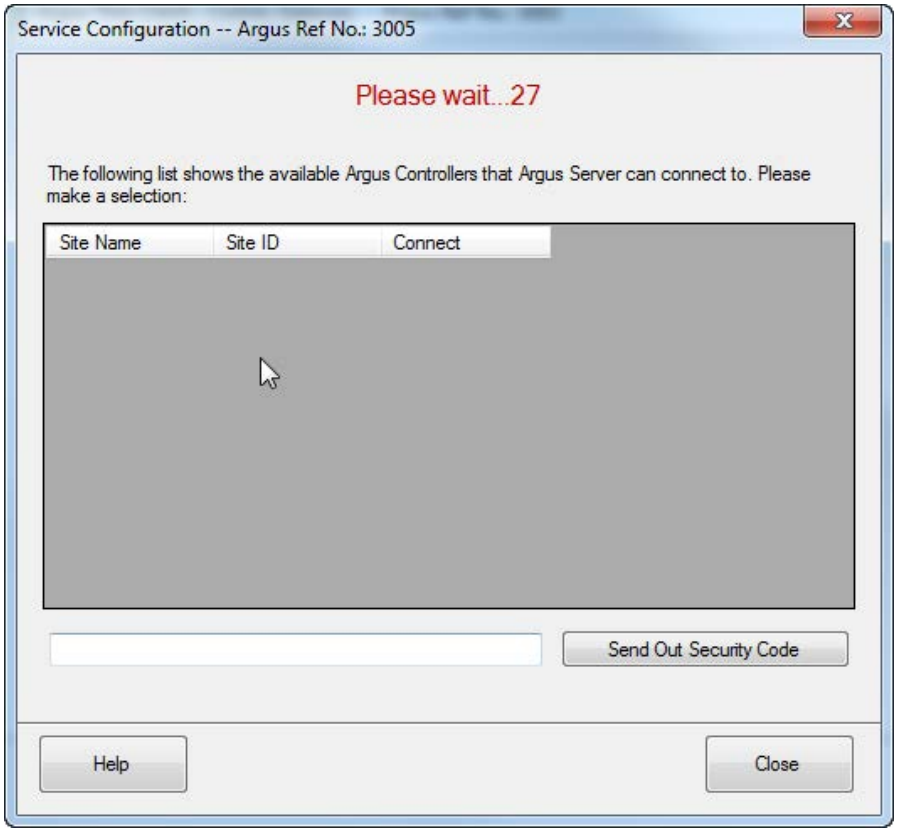
## Launching a Session

Double-click on a session to run it. This launches the Argus client software and a connection is made to the target Argus Service.

Running sessions display a Green 'connected' icon. Idle sessions show a gray 'disconnected' icon.

To disconnect a running session - right click it and select **Disconnect**.

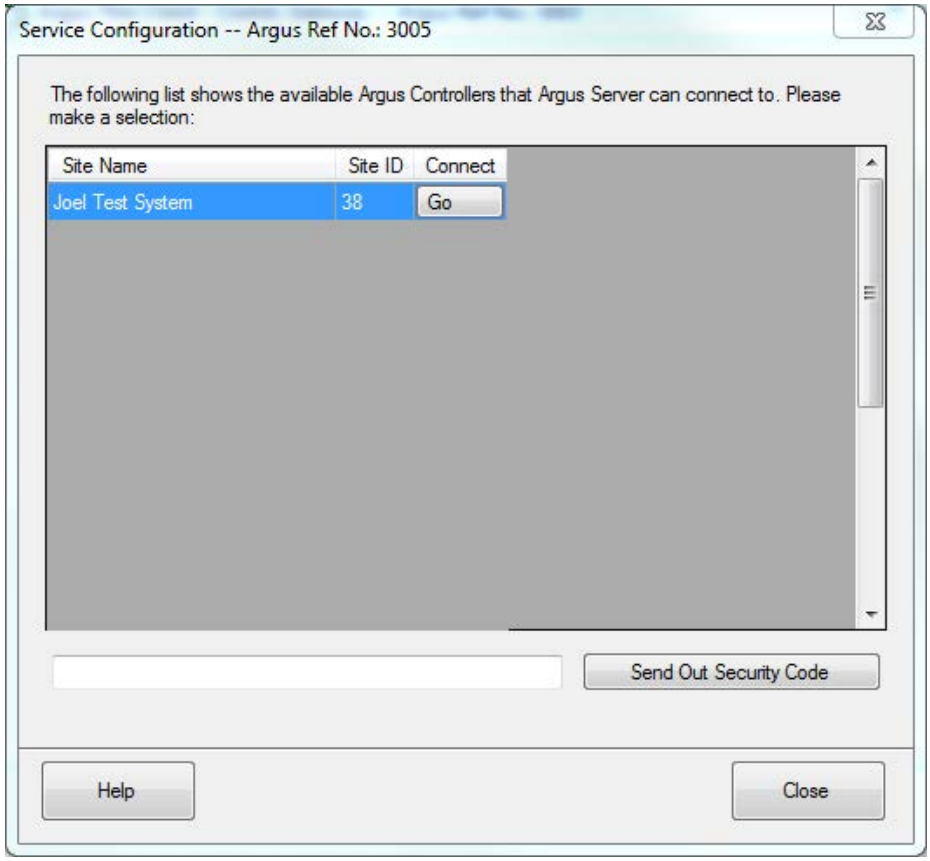
## Service Configuration




This dialog is displayed when the **Setup Server** button is selected on the **Communications Gateway** dialog (3003).


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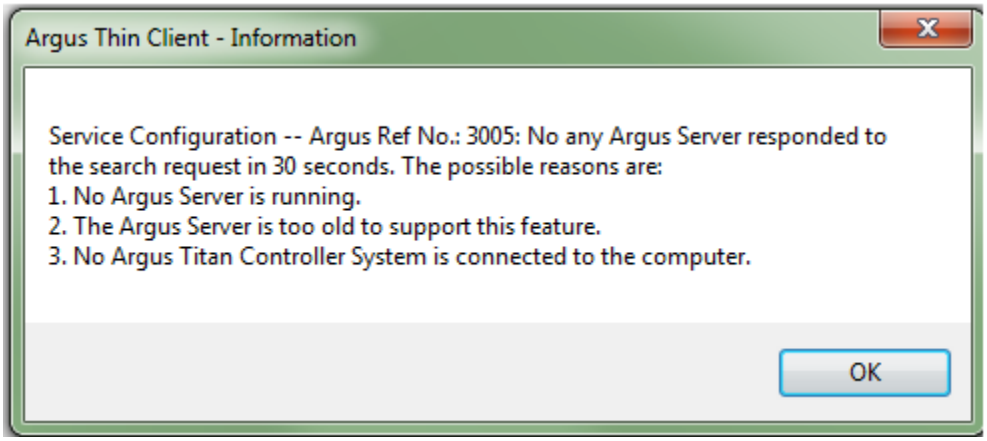
After a few seconds a list of available systems is displayed:




To be available, for connection as a server, the system must not already be connected to another PC as a service.


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If the program cannot find any available systems it displays this message:




Check that the Titan Access point controller is running and is connected to the LAN.

If another PC is already connected to the target system as a service you cannot create a second service connection to that system. Connect as a **client** session instead.


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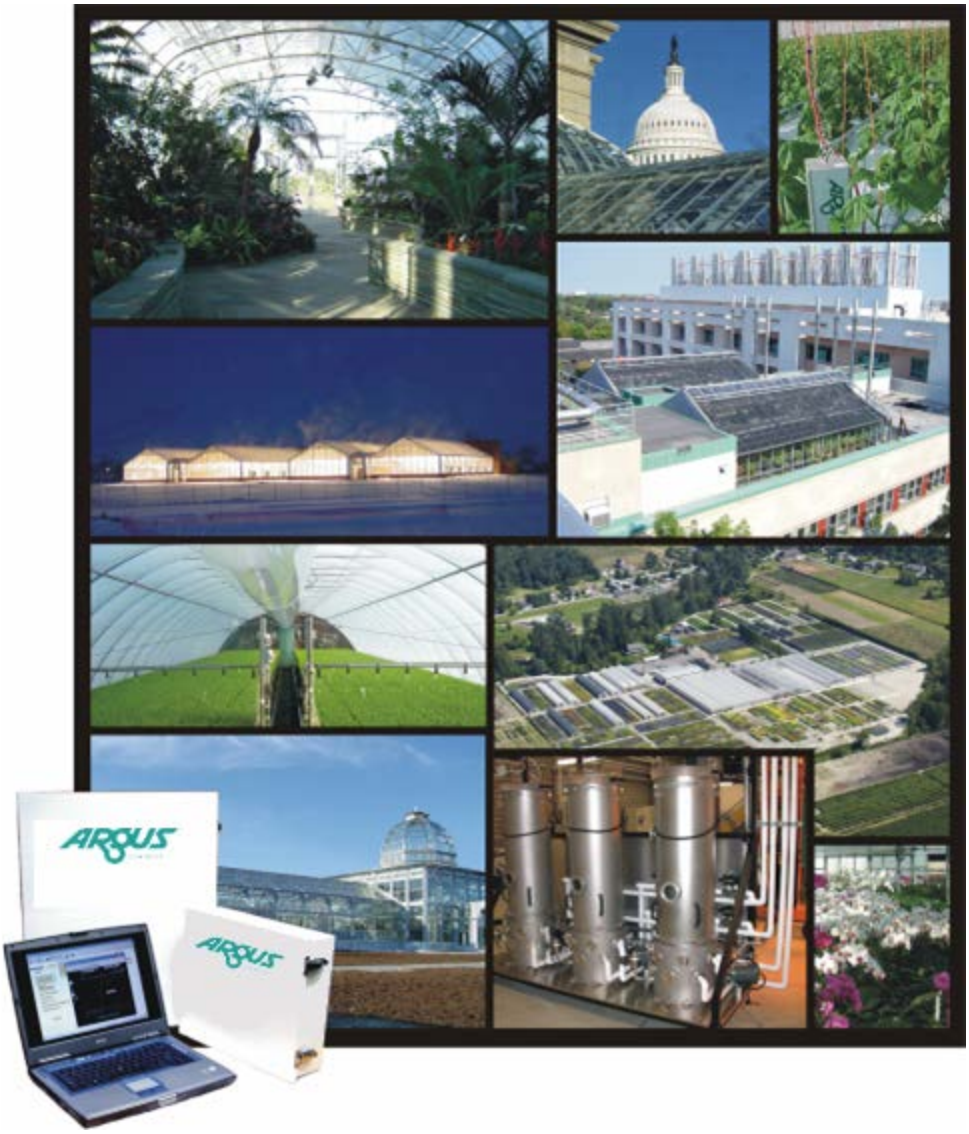
**Telephone:** (604) 538-3531 or (604) 536-9100
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**Toll Free Service:** (888) 667-2091 (North America)
**Fax:** (604) 538-4728
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# Argus Software

# Installation & Reference Guide




*July 2016*

# Argus Software Installation & Reference Guide

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Revised July 2020

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# About this Guide

This guide is intended as a training and reference manual for the Argus software. It contains information describing the main features of the Argus **Operator Program** and how to use it to operate and manage your control system.

Once you have learned the basics, the Argus system can be easy and enjoyable to use. You'll understand the power and flexibility of our user interface and how, with just a few simple tools, you can create a custom user interface.

This manual does not contain information on using specific control programs. You can find context specific control information by navigating to each program screen and selecting the **Help** button on the **Argus Icon Menu**. The Online Help is then launched.

Help documentation is an ongoing process. While we make every effort to document the features and functions of our systems, it is possible for you to come up with new and innovative techniques, making it hard to fully document the myriad of applications that Argus systems are used for.

If you encounter problems at any time, or you cannot find the information you require in the **Online Help,** please contact **Argus Support using the contact information is under "Where to Find More Information" on page 23.**


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# INSTALLING THE ARGUS TITAN OPERATOR PROGRAM

The software installation procedure is the same, regardless of whether you are installing the software on a Local Argus Server PC or a remote Argus Client PC.



**TeamViewer** should first be installed on your PC so you can interact directly with **Argus Support**.

Before you install the program software, make sure that your computer meets the following system requirements.

## *PC System Requirements*

- **Operating System:** Windows 7, 8, or 10 Professional, or Windows Server 2008, 2012, or 2016.
- **Processor:** Intel Core i7 (or AMD equivalent) or better.
- **RAM:** 8GB (16GB or greater recommended)
- **Video:** 1920 x 1080 display. Recommended 24” or larger screen.
- **Hard Drive:** 1TB 7200 RPM (500GB sufficient for systems with less than 10 controllers) 1TB SSD drive recommended
- **Additional Features:** Persistent Internet connection with static IP address required. USB keyboard, mouse, video and sound.
- **Network Card:** A Network or Ethernet Card is required for optional multi-user access over local area networks (LAN) using the TCP/IP protocol. This applies for the local Argus Server PC and any remote Client PC connecting using a LAN. A **second Network or Ethernet card** is required for additional networks/ HVAC networks and for the Field Server.

## *If you have a Previous Version Installed*

Argus software builds are installed in separate directories (by default) and any user files that you created in a previous version of the **Operator Program** is automatically translated and added to the new installation directory.


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# To Install the Program

You will receive an email with specific **Installation/Commissioning** instructions. If you have not been given this Installation/Commissioning package, contact **Argus Support using the contact information is under "Where to Find More Information" on page 23.**

The same software build must be installed on all PCs accessing your system. All Client PCs require the same Build as the Argus Server PC.

This package contains various important documentation including:

- Argus PC Specifications
- Titan Internet Connection Guide
- Argus Titan Port Forwarding Configuration
- Customer Support Policy
- Installation Readiness and Start Up Checklist
- USB Backup (USBBU) Installation Instructions (also included in System Binder)
- Backing Up Your Argus System (also included in System Binder)
- Autodialer User Manual
- Titan Aquaseal Cable (CAB-2C18G) Data Sheet
- Titan Hardware Installation Guide (also included in System Binder)



This list is regularly updated so your list may differ.


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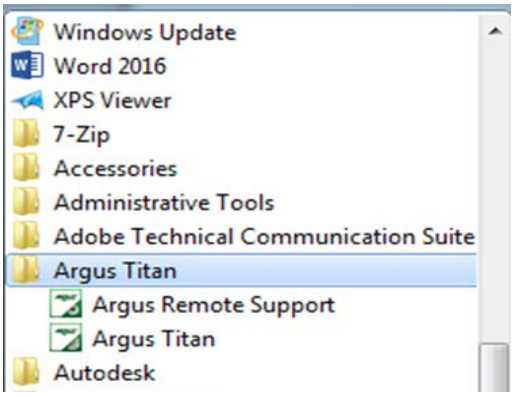
# RUNNING THE OPERATOR PROGRAM FOR THE FIRST TIME

To run the Argus System Software, perform one of the following:

1) Click the **Argus** icon that was placed on your desktop when the program was installed.



2) Using the **Windows Start Menu**, select: **Start/Programs Argus Titan/Argus Titan:**







Always use these pre-configured shortcuts, or a copy of them. Do not attempt to launch the Argus.exe program directly since not all of the required components are loaded.


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# Uninstalling the Argus Titan Operator Program

You can uninstall the program using the **Add/Remove Programs** option in Windows:

## *Windows 7 or Earlier*

1) On the Windows taskbar, click **Start > Settings > Control Panel.**
2) Click **Add/Remove Programs**.

## *Windows 10 and Beyond*

1) On the Windows taskbar, click **Start > Settings > Control Panel.** For **Windows 10** and beyond, right-click the **Windows (Start)** button  in the lower left corner of the screen and select **Control Panel**.
2) Click **Add/Remove Programs**.

## *Control Panel*

3) Under **Programs,** click **Uninstall a Program**.
4) In the list of installed programs, click the selection: **Argus Titan - Build xxx** that you wish to uninstall.
5) Click **Uninstall**.
6) When prompted to confirm program deletion, click **Yes**.
7) When the program has been removed, select **OK** to exit the wizard.




**Your user data files (and optional archival data) are not deleted when you uninstall the Operator Program. The only files removed during an uninstall are the program files. Never delete the Argus user files folder unless you have a reliable backup of these files!**

Uninstalling the **Operator Program** does not affect your control system since there are no control programs executed from your PC. However, you do need Argus installed and running on a Local Argus Server PC for system access and archival data storage.


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# GETTING STARTED

The Argus System **Operator Program** is your gateway to your Argus control system. This guide is intended to provide an overview of the program and its features.

## *How your Control System Works*

Your Argus Control system is a programmable, distributed control system with dedicated hardware and software specifically designed for use in integrated equipment control and data acquisition.

The Argus system is really three complete systems in one:

### 1. Control System for Equipment Automation

The system gathers continuous input information from sensor devices (temperature, wind speed, tank levels, pH, vent position, humidity, light, CO2, soil moisture etc.). It then uses this information, in conjunction with sophisticated internal programs and user-defined control parameters to automatically operate the equipment under its control.

Integrated control enables the coordination of multiple equipment systems, and the possibility of a variety of control strategies for each device. Systems are engineered to meet the specific requirements of each application In the Argus System, an application is considered to be one or more interlinked programs that work together for a common cause.

For example, a zone heating application might consist of several linked application programs that in turn are linked to the physical inputs (for example, Temperature Sensors) and outputs (for example, Heating Valves) on one or more I/O modules. These linked programs consider the measured input readings in relation to the operator established targets, and produce the calculations that are used to drive the outputs that are connected to the controlled equipment readings.

Measurements made by the Argus computer control system are displayed as numbers on the computer terminal, in relation to the operator established targets, and produce the calculations that are used to drive the outputs that are connected to the controlled equipment. They provide automatic compensation for the effects of weather and other dynamic environmental variables, reducing the need for constants. A constant is a value that remains unchanged.

The settings you make on the system are constants; they remain unchanged until edited by users.


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## 2. Massive Recorder for Data Acquisition

Your system functions as a complete user configurable data recorder for displaying and analyzing real time and historical data in graphical, tabular, and summary formats.

All collected data can be viewed online, as well as exported to other applications for further analysis.

## 3. Monitoring and Alarm System

Your system also functions as a sophisticated and fully user configurable alarm monitoring and annunciation system. Wherever possible, critical control functions are designed to be fail-safe.

However, in cases where the physical design of the equipment being controlled may not allow fail-safe or fail-soft design, an extensive array of user configurable alarms and annunciation logic is provided to aid and guide human intervention.

# *Hardware Features*

Argus has drawn upon its many years of industrial control experience in developing the Argus Titan 2 Control System. We have designed it to provide the highest degree of reliability while still achieving powerful, efficient control with maximum flexibility, scalability, and distributability.

## Dedicated Control

All programs run on dedicated controllers that are networked to form an integrated system.

For maximum safety and redundancy, these controllers can operate independent of one another, and independent of any PCs used for operator access and long-term data storage.




**Your PC does not control the greenhouse. All control programs and settings are located in and run on the Argus controllers.** Your PC, whether it is connected directly or remotely, runs the Operator Program software allowing you to communicate with the controllers. In this way, even if your PC is turned off or breaks down, the controllers continue to do their job.

Each controller has power failure protected memory for settings and data storage, memory data integrity checks, and programs. On the Argus system, a program is a specific set of ordered operations for the controllers to perform. These are grouped into **Application Programs**, each of which can address a particular aspect of control.


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Execution integrity checks (hardware watchdog), hardware memory protection, and protocols are used to prevent inadvertent corruption of critical settings and data. All programs execute from resident non-volatile program memory.

Each Controller contains protection against transient electrical noise and ground potential variations. Power supply fusing and transient clamping devices (varistors) supply further protection.

The system constantly monitors the state of all controllers and peripheral Input/Output modules and automatically warns the operator should any component become erratic or fail. Should this occur, normal operation is quickly restored using plug-and-play component replacement.

## Distributed Control

Controllers and I/O modules are designed to be distributed to where the action is. They can be located close to the equipment they monitor and control under a wide range of environmental conditions.

In many cases this can drastically reduce control and line voltage installation costs when compared to centralized control systems where all wiring must be run to a single location.

### *I/O (Inputs/Outputs)*

Pronounced “eye-oh”, I/O describes the transfer of information between the control system and the external world. The control system gathers external information through its sensor inputs and passes equipment instructions and alarm information through the Access Point, PC, or Email/Phone.

### *Inputs*

The control system receives physical input information from sensor channels located on Argus I/O modules. On the I/O modules, the electronic signals from various sensors are measured and scaled.

Programs on the Argus system then interpret this information for control purposes and monitoring (alarms).


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### *Outputs*

The control system outputs are used to send information from the control system to the equipment that is being controlled. Often this is accomplished through direct control of the power source for an equipment system. For example, to control a simple pump, the control system switches on or off a relay that provides the power to operate the pump. This is done by opening and closing special output relays that are connected to the output channels on Argus I/O modules.

This distributed network of controllers is treated as one effective system. The activities of individual controllers can be coordinated to accomplish cross-module control objectives such as irrigation and the efficient distribution of heat from a central supply.

For more information, please refer to the **Argus Titan 2 System Description** manual.

## *Software Features*

Most control system software is provided in one of two distinct formats:

1) Hard coded program logic
2) User programmable logic

Hard coded systems tend to be easy to use since users are limited to manipulating a few setpoints. Most of the program logic is embedded in the operating code and cannot be altered without rewriting the programs. Although often simpler to operate, these systems are rather inflexible.

User programmable systems offer more flexibility, but are often less user friendly. They may require knowledge of various programming languages and high degree of understanding of process control concepts.

Argus has always endeavored to make its control systems as flexible as possible without requiring users to learn programming languages.

We try to provide the best of both worlds by offering several pre-built control applications that have been customized to control a wide variety of specific equipment types as well as an array of highly configurable generic programs for creating your own custom applications.

As long as you understand your equipment, and your intended application, you can create custom control solutions with our software without needing to learn complex programming methods.

In keeping with the flexibility of our control programs, the **Argus Operator Program** offers complete user customization capabilities. You can design all of your own user screens and a navigation system that best suits your needs.


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Each user of the system can develop his/her own screen system and custom views.

In addition, a pre-built screen menu system is always available to display all programs and parameters currently in use.

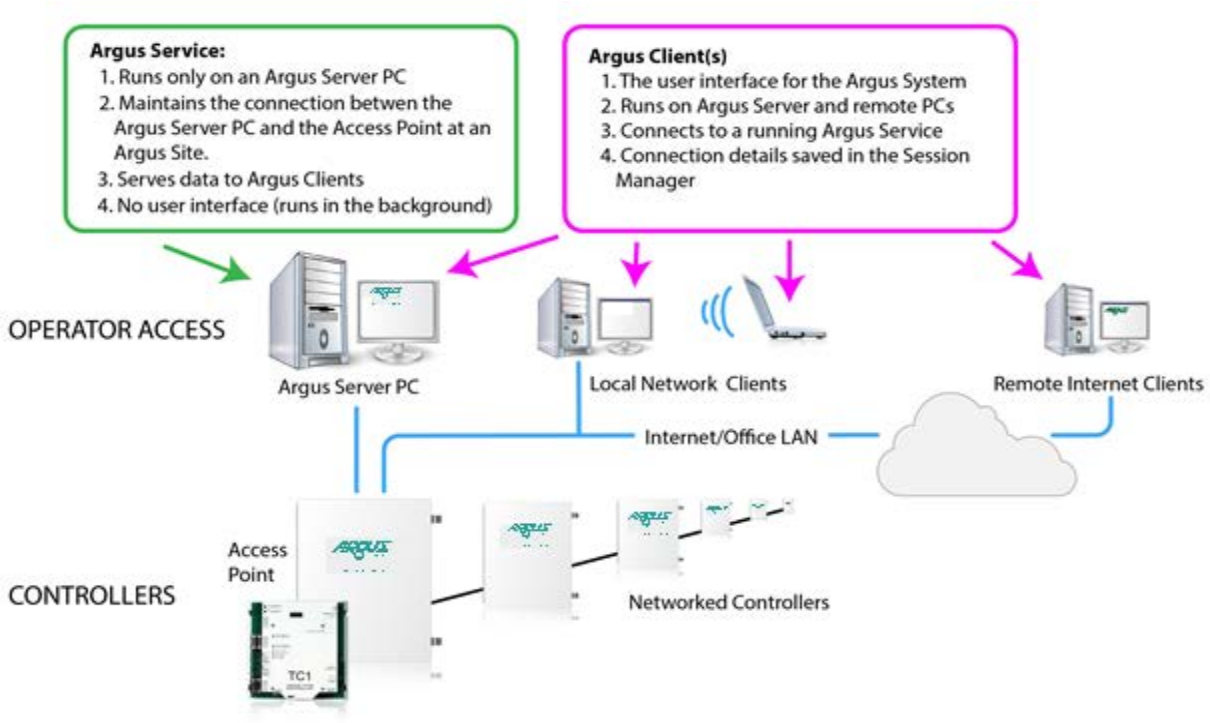



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# Understanding Connection Types

There are two types of connection:

1) Argus Server Connection
2) Argus Client Connections




## *Server Connections*

The only physical connection an **Argus Server Connection** makes is by the cable between the designated **Access Point Controller** and the **Argus Server PC** (see the illustration above).

The server connection runs continuously in the background on the Server PC and it maintains a connection to the controllers for user access.It also provides several important functions including backing up data from the controllers.

Only one Server Connection can run at a time on the Local Argus Server PC. The Argus Service has no user interface. All user access is accomplished using the Argus Client software including local access at the Server PC.


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The Argus Service only runs on PCs designated as Argus Server PCs. It does not need to be running on a client PC, but it must be running somewhere and be accessible using LAN or Internet in order for a remote Client to connect to an Argus system.




You can hover over the Server Connection to reveal detailed information for your currently selected server connection.

## *Client Connections*

Client connections are made between the 'Argus Service' running on the Argus Server PC and other PCs running the Client software. The client software is also used at the Server PC for local user access to the connected control system, as well as remote access to other systems as required.

It is possible to connect to many Argus Sites from a single PC, either simultaneously or one at a time using a purchasable option (**Multi-Session**). A client can only connect to a running Argus Service.

Details of client connections (addresses, system types, software versions, etc. are stored in the **Argus Session Manager** for later use.

The **Online Help** has extensive information on how to **Create a Server and Client Connection** and other connection content in the **Argus Session Manager** section of the help.


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# THE ARGUS OPERATOR PROGRAM

With your Argus Operator Program installed on the Local Argus Server PC, and the PC connected to your control system, you are now ready to ***Take Control with Argus***. This section explains the basics of using the program.

It's important to remember that you only use a PC to access the control system and to store archival data records. All control operations reside on the Titan Controllers, and they operate independent from any connected PCs. This means that if the Local Argus Server PC ever malfunctions or is shut down, control operations are not affected.

## *Understanding Argus Control Programs*

The Argus system is shipped with many control programs that have been designed to address a wide range of control Applications.

The Programs or Firmware on the Argus system can be divided into three types:

1) I/O programs
2) Decision programs
3) Miscellaneous functions (math operations, filters etc)

There are also several utility programs used to run the controller operating systems and network communications. I/O programs control the operation of the physical inputs and outputs on the Argus system. Decision programs make choices regarding the type and degree of control action that is currently required.

Depending on the complexity of each application, it may take one or more programs to define a particular automated control strategy.

An **Application** is just a way of describing some sort of job that the system has to perform, for example, automatically controlling a roof vent. An application may consist of one control program or it may take many.

For some applications, Argus has developed specialized programs suited to particular types of equipment systems. However, if you require more or different strategies, Argus can configure alternate program modules that are highly generic and configurable.

Several programs can also be linked together to produce highly sophisticated custom applications. The installation and setup of these programs is normally done by Argus personnel to your performance specifications.


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Most applications have three common elements:

## 1. Control Parameters (Input Variables and User Settings)

Control programs require a variety of readings and user settings to operate. Sensor information and user supplied settings define the rules and conditions that must be taken into account to achieve the final results.

For example, a climate control program requires a number of reading values from sensors (indoor/outdoor air temperatures, humidity, light levels etc.) and a variety of user settings to establish the heating/cooling/humidity targets.

## 2. Decision Logic (Calculations)

Programs use the defined control parameters to calculate a control decision or result. This is simply the rules or arguments that the program must follow to calculate a decision. Typical equipment control programs are continually evaluating:

- The type of response that is required.
- The degree of response that is required.

For example, a climate control program compares the user supplied control setpoints against the actual climate readings to decide whether active heating, cooling, humidification or dehumidification is currently needed.

## 3. Program Decisions and Results

Program decisions represent the results or 'answers' to the logical arguments that are being addressed in each program module. These results can then be used to drive one or more of the physical outputs used to automatically control your equipment. Often this is accomplished through direct control of the power source for an equipment system.

Program decisions can also be used as a input parameters in other programs. In this way, more complex control strategies can be constructed by linking together simpler program modules.

On the Argus system, program decisions are typically expressed as percentage values between 0% and 100%.

For on/off type equipment control, 0% means 'off' and 100% means 'on'. For modulating control. values between 0 and 100% are produced to position the equipment accordingly.


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# Using Equipment Control Programs

Many different types of programs are likely in concurrent use on your system, and others are available as required. Often there may be several instances of the same type of program running.

For example, you may be using separate instances of the same type of ventilation control program in many separate climates.

As you navigate through the interface, you'll encounter many screens with control information on them. Some of these screens originate in individual control programs and others are amalgamations of parameters extracted from more than one control program for specific applications.

Every reading and setting on the system can be tracked back to a control program running on a controller. Most of the readings and settings on the Argus system are used for application setup and diagnostic purposes and you seldom if ever need to consult them.

As you navigate through the system, the first screens you'll see are intended as 'operator' screens'. These consist of selected readings and settings from the underlying control programs that you need for day to day management of your system.

These screens are organized to represent the logical applications that fit your operation and use. As you drill deeper, the screens become more technical and sometimes less understandable because they originate from the control programs used to build your system.

You do not need to visit these screens to operate your system.

# Decision Programs vs I/O Programs

**Key concept: Decision programs** are used to store and process control information and to make control decisions. **I/O programs** are used to operate the physical inputs and outputs.

On the Argus Titan system, all control programs are run on the Titan controllers. The operator access program that you use on a connected or remote PC does not run any of the real time control programs. It simply provides a viewport for you to visualize what is going on in the controllers.

The programs that operate on the Argus system can be divided into 2 types: **I/O Programs** and **Decision Programs**. (There are also a few utility programs that are used to run the controller operating systems and network communications. These are seldom accessed by operators).


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## I/O Programs

I/O programs control the operation of the physical inputs and outputs on the Argus system. They are always associated with a particular **Input/Output (I/O)** hardware module. Each I/O module on the system has a corresponding I/O program associated with it.

These programs define the input sensor channels that are in use, and the configuration of each sensor channel to match the type of externally connected sensors. They also operate the physical output relays. There are settings to configure each output channel to match the type of equipment being operated (on/off, open/closed/stopped, digital pulse, analog etc.).

The I/O programs do not contain any of the decision logic required to meet the current control objectives. They obtain this information from the Decision programs.

Therefore, in order to operate automatically, each physical output must be driven by a value that originates in a **Decision** program.

## Decision Programs

Decision programs are not directly connected to the physical inputs or outputs on the system. Their job is not to manage the actual inputs or outputs, but to make, or contribute to the making of the higher level decisions regarding the control effects that are currently required. Compared to the I/O programs, they operate in a more abstract fashion.

For example, the **Climate Energy Balance** program makes decisions about the current heating or cooling required, based on analysis of data from a variety of measured physical inputs including light, temperature, humidity sensors, etc. It then compares these values to your setpoints and develops a decision about whether any heating or cooling is currently required, and if so, how much.

This is all it does - it doesn't actually operate any equipment directly.

To get your heating or cooling equipment to operate, a decision program result needs to be linked to one or more physical outputs in an I/O program (see the diagram below). From then on, the physical I/O program responds by operating its output relays in whatever manner the linked decision program decides is required to achieve the desired control effect.

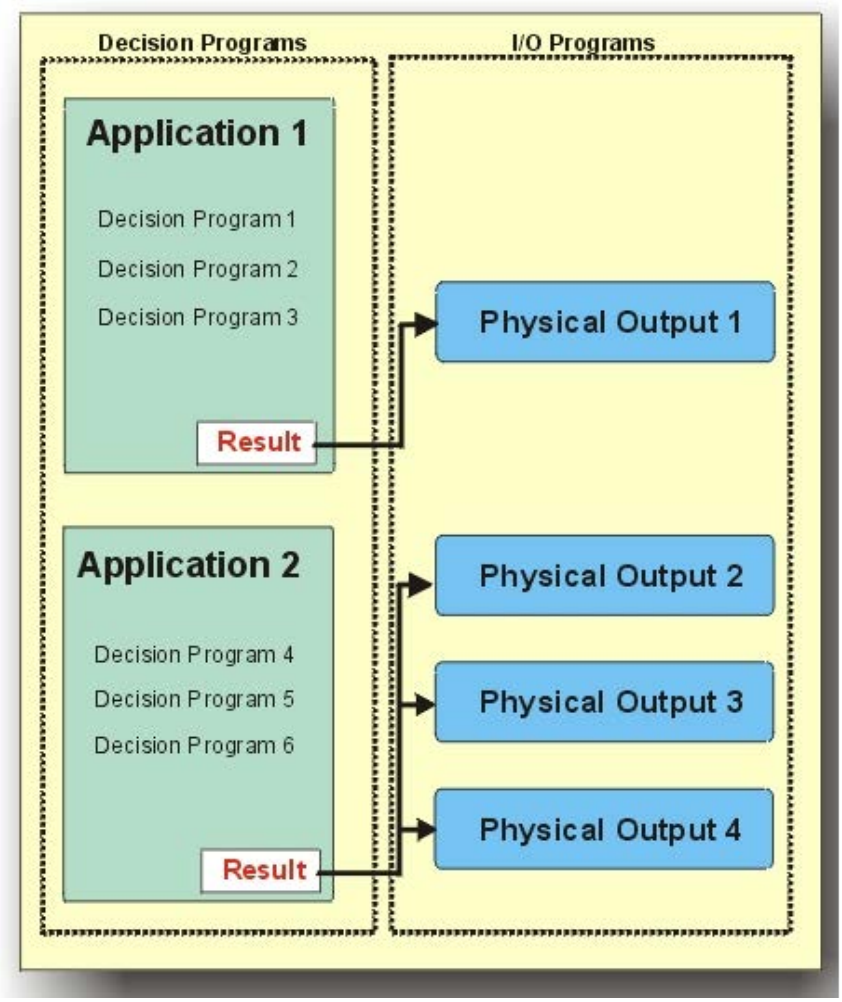
## Why Separate the Two?

By separating the physical outputs from the decision program results, it is possible to economize on the number of decision programs that are required and to provide much greater control flexibility.

For example, you may be able to configure a single application to operate several banks of lights that are all controlled by separate physical outputs. Also, by abstracting the decision


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making part of the process from the actual outputs, it is possible to have the same decision programs drive different types of equipment:

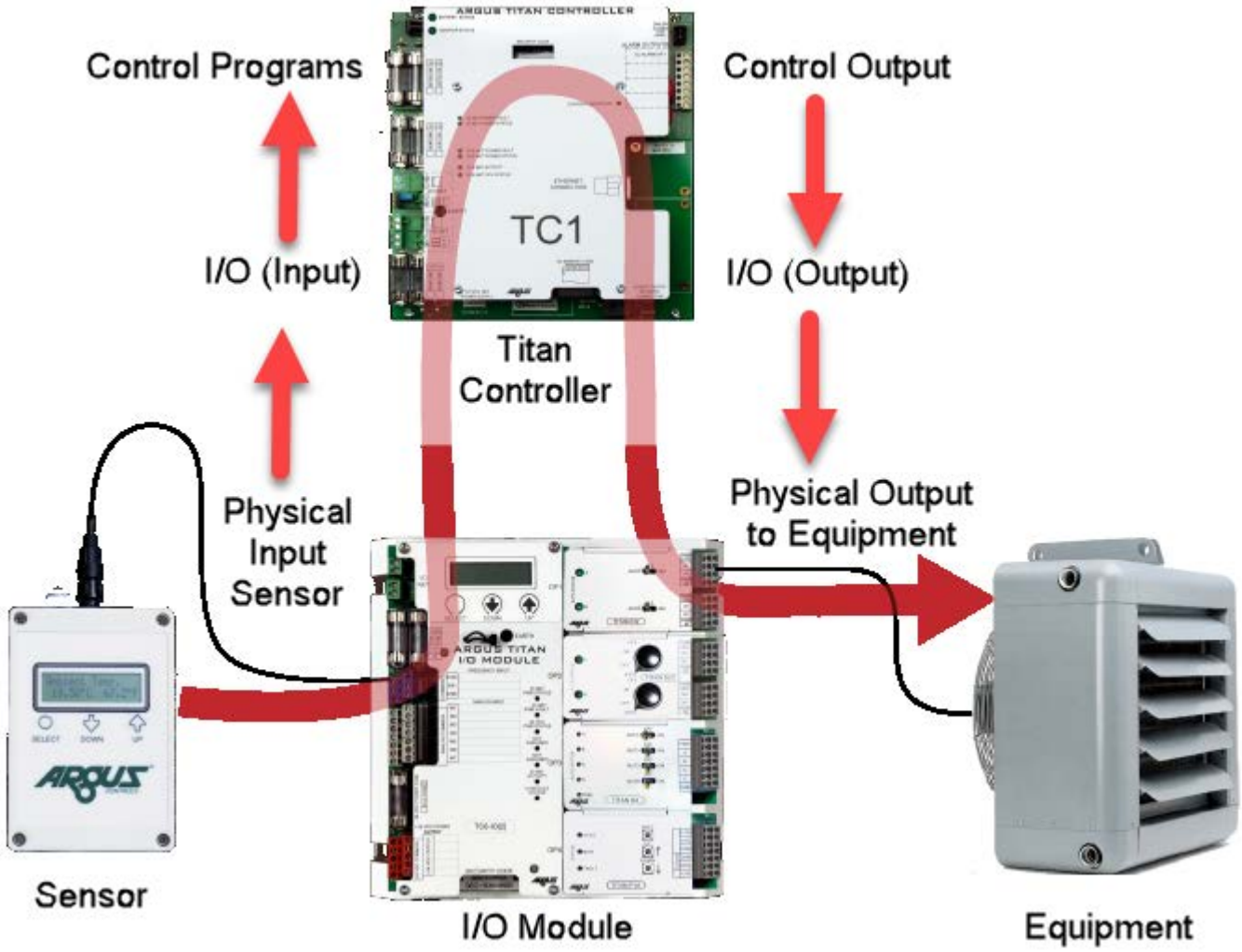



In the above example, application 1 uses several decision programs to calculate a desired control result. This result is then used to drive a single controlled physical output relay in an I/O program. Application 2 also uses several decision programs, but its calculated result is used to operate several physical output relays simultaneously.


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# The Relationship Between I/O Programs and Decision Programs

Each I/O Module is physically wired to an Argus Titan Controller.




For each connected I/O Module, there is a corresponding I/O Module Program running on the Titan Controller.

Sensor information is measured and scaled in the I/O Module program and is made available to Decision Programs on the Argus Controller.

Decision Programs typically use sensor information, operator settings, and embedded logic to create a desired state or position for the controlled equipment.


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Decision Program results are mapped as Reading Source values in I/O Modules programs to drive the output relays accordingly.

Note that in the above example, the same I/O module is being used for inputs and outputs in the controlled process. In practice, the Inputs and Outputs can be located separately on any I/O module on the system.

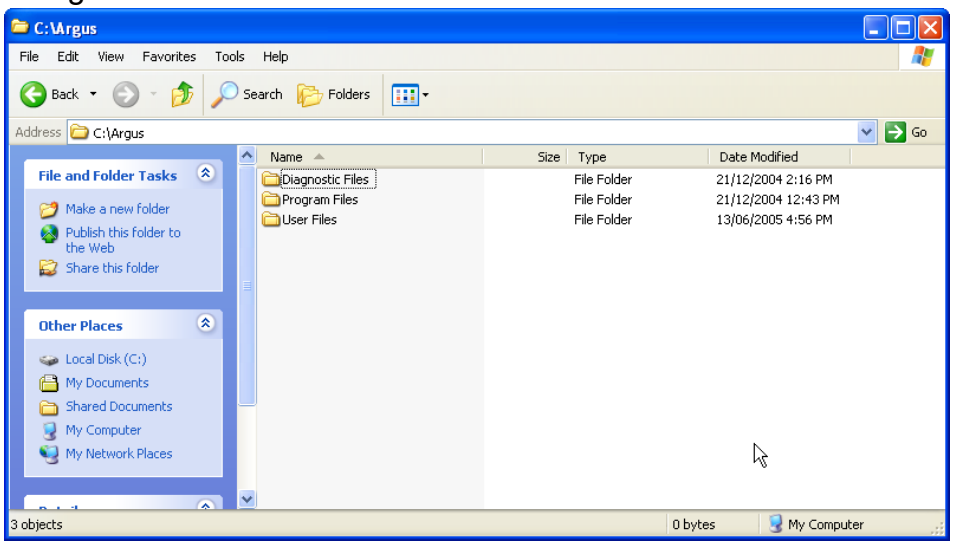
During automatic operation, the Physical Output relays are operated according to the results of the logical decision making programs without the need for any human intervention.


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# BACKING UP YOUR FILES

All Argus files are located in the following directory:

- C:\Argus




This makes your Argus files easy to find.

All program related files are stored in the **Program Files** directory. If required, program files can be restored by reinstalling the latest **Operator Program**.

The **User Files** directory contains information that is specific to each site. This includes custom screens, backups of controller settings, and archived data.



These files **must be backed up periodically** to protect your custom designed screens and to prevent loss of recorded data should anything happen to your PC

The Local Argus Server PC contains the Master copy of all your Argus Data Files. As a precaution, Argus backs up the latest seven copies of the controller checksums (for example, controller settings), and backs up all files required to recreate your user screens (bitmaps).

Backing up your data to other locations at regular intervals is the best safeguard against data loss. You may need to back up other data on your PC(s) besides Argus data. There are many backup software and hardware packages on the market today.

Choose a strategy and backup method that fits your operation and the importance of the data. To protect your data, make back up copies of the contents of the **C:\Argus** directory.


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# Where to Find More Information

For information on how to use specific control programs consult the **Online Help** from the **Argus icon menu**.

Detailed information on using the **Graph** can be found in the **Online Help**.

Should you have any issues regarding the operation of your control system or the Argus **Operator Program** software, contact **Argus Support** at 1-888-667-2091 (toll-free in Canada and the U.S.) or 604-536-9100.

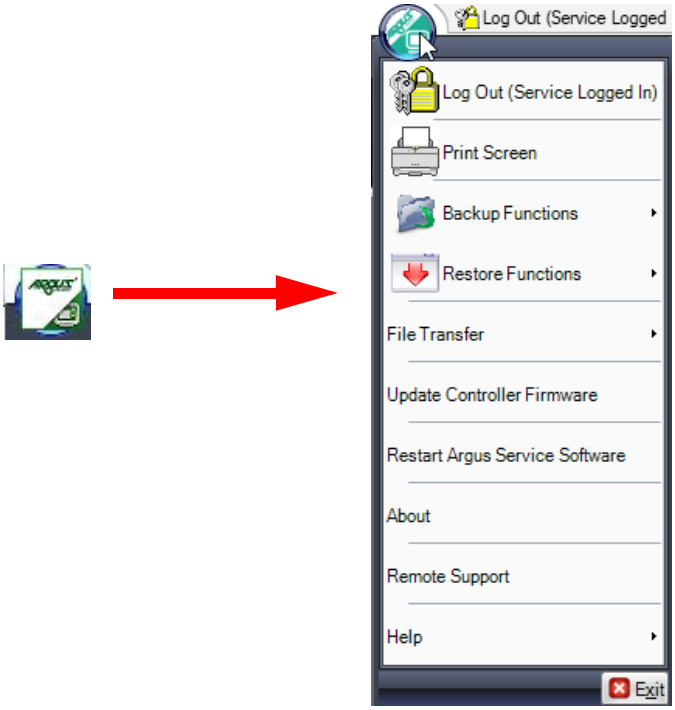
You may also contact us by fax at 604-538-4728 or e-mail us at argus@arguscontrols.com.

You can also check the Argus Web site (www.arguscontrols.com) for answers to frequently asked questions, troubleshooting tips, and the latest product information.

## *Accessing the Online Help*

Should you encounter any problems using the **Operator Program**, or the Argus system in general, all of our software documentation is included in the **Online Help** found within the **Argus Operator Program**.

From any **Operator Program** window, click the **Argus** icon in the top left corner of the screen. A menu opens, click the **Help** option to open the Online Help.





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# *Troubleshooting*

If the **Online Help** or other documentation does not solve your problem, **please call Argus Support**.

**Argus Support** is always ready to help with any difficulties you might encounter.

Contact **Argus Support** at 1-888-667-2091 (toll-free in the U.S. and Canada) or 1-604-536-9100.


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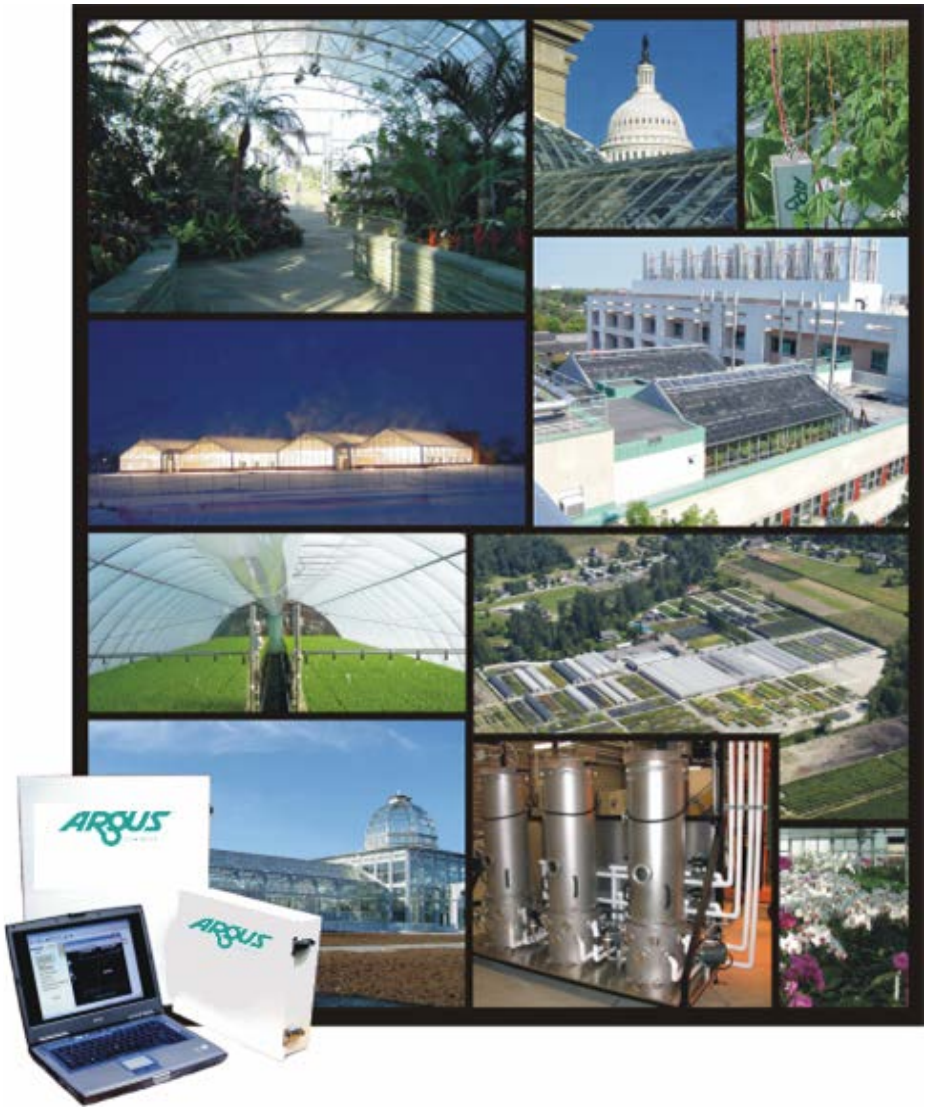
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**Toll Free Service:** (888) 667-2091 (North America)
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# USB Backup Module

## Instructions




*July 2017*

# USB Backup Module Instructions

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# INSTALLATION

The Titan 2 USB Backup Module contains 2 USB Flash drives used for storing Argus system backups and restoring the system files if necessary.

It is designed to work with the Argus **Backup/Restore** utility located in the Argus operator program.


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# INSTRUCTIONS

1) Connect the USB plug end of the USB Backup module into a **spare USB port** on the Argus Server PC.



**Only connect to the PC using the Backside USB Port.**

2) The Windows operating system should automatically detect the device and install the drivers.

   You should see a Windows message when the drivers have been successfully installed.

3) Two flash drives should appear in the Devices and Drives section of Windows Explorer: Argus Backup Drive 01 and Argus Backup Drive 02.




**You may need to restart Windows on your Argus Server PC. Although this step is not always necessary, we have found that it helps to ensure that the drivers are in a state ready for the Argus Operator program to use them.**

4) The **Backup/Restore** utility is integrated into the Argus operator program.

   With the Argus operator program running, select the menu item: **File/Backup Argus System**.

Refer to the Argus document: **Backing Up Your Argus System** for information on setting up automatic backups to the installed drives in the USBBU.

If you encounter any problems please call Argus for assistance.


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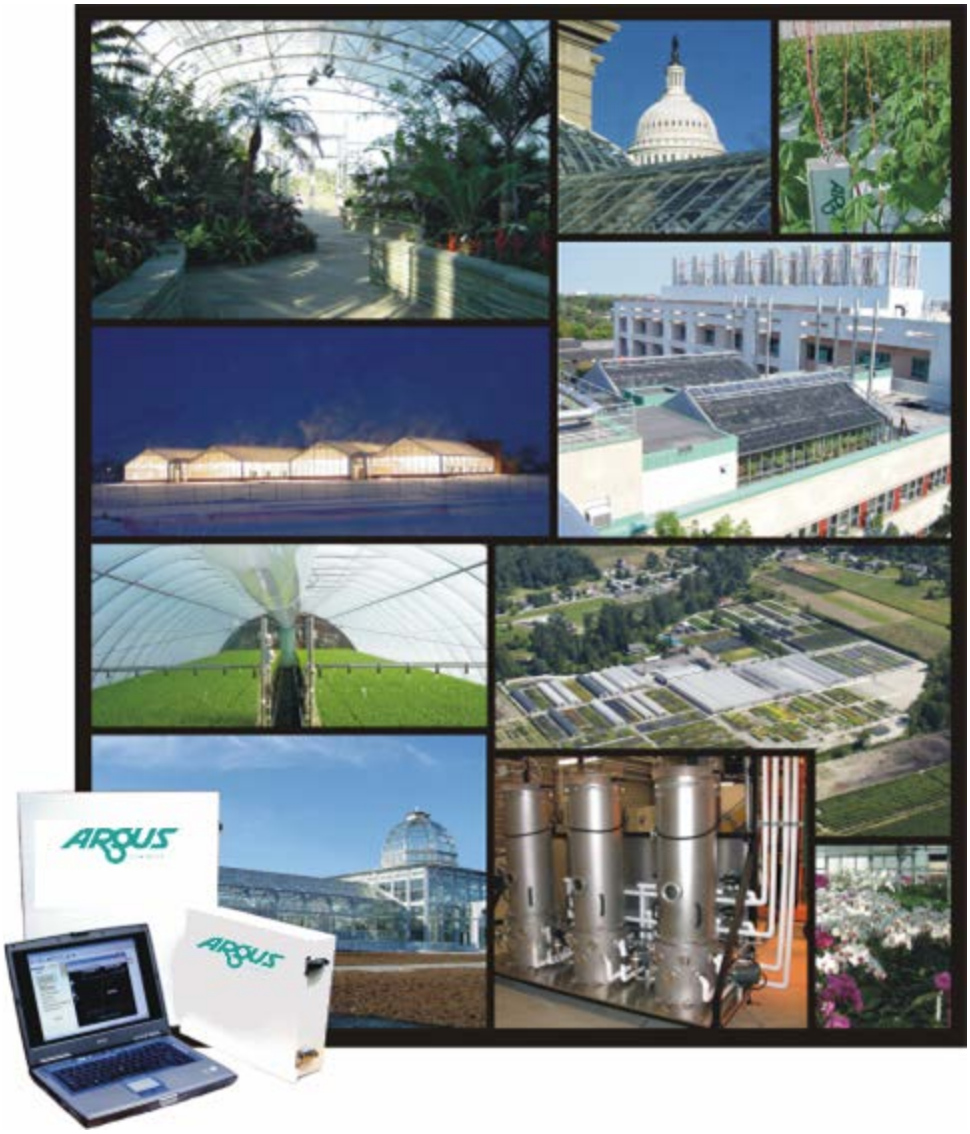
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# Backing Up Your System

## Instructions




*May 2018*

# Backing Up Your System Instructions

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# BACKING UP YOUR SYSTEM

This guide applies to all Argus Titan systems. It describes best practices for backing up your Argus Server PC and in particular the Argus data stored on it.

Unfortunately, many people start backing up their files only after a catastrophic loss of data.

While over 80% of Windows PC owners use some type of virus protection, only about 20% regularly back up the files on their hard drives.

If the hard drive crashes, or the PC is ever lost or stolen your data is lost forever. As with any PC, losing all the data on your Argus Server PC can be expensive and time consuming if you do not have recent backups available. Although the Titan controllers will continue to operate normally

if the Argus Server PC becomes in accessible, it may take considerable time and expense to recreate your user interface in the Argus Operator Program if there are no recent copies available.



**Without a functioning Argus Server PC (or a ready substitute) you cannot access your control system and neither can Argus.**

The **Argus Backup/Restore** utility makes it easy to restore the files needed to access your system. Files can be restored to your existing Argus Server PC or a substitute PC if that is not possible.

Currently we recommend a three level approach to data backup:

1) Backup all of the data on your Argus Server PC regularly using a reliable third-party hardware/software backup solution (for more information see “Third Party Backup Solutions” on page 5).
2) Use the **Argus Backup/Restore** utility in conjunction with an **Argus USB Backup Module** to create scheduled backups of your Argus Server PC files and occasional manual backups to other locations for off-site safekeeping (for more information see “Argus USB Backup Modules ” on page 6).


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3) **Optional:** Use a dedicated external USB hard drive to mirror the contents of your Argus DataStream directory for additional safekeeping of your archival data records (for more information please see page 29).

These files are not needed to operate your system but they do serve as valuable historical records of all recorded information such as weather and climate data.



If you encounter any problems setting up of using the **Argus Backup/Restore** utility, please contact **Argus Support** for assistance.


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# BACKUP OPTIONS

There are several types of backup options you can select.

## *Third Party Backup Solutions*

There are many options available for whole or partial PC data backups.

These include:

1) Folder and file synchronization software
2) Backup Software and backup drives
3) Online Backup Services (cloud-based)

Whichever strategy you select, you should ensure that backups are made frequently and that you can reliably restore your Argus Server PC in the event of a catastrophic failure or loss.

The location where the backups are stored is as important as what is stored. As part of a comprehensive strategy you should make some backups to external drives that can be stored off site or use an online 'cloud-based' backup service.

This will help ensure that you do not lose your files in the event of a fire or theft at your facility.

## Backing up the Argus Directory with Third Party Software



**While it is convenient to create whole drive images for backup purposes, we do not recommend using a global backup utility to back up the Argus directory: (C:/Argus).**

This is because we have seen some instances where backup software can lock an active file while it is copying it, preventing the Argus program from accessing that file.

Remember, the Argus system is a real-time application; there is almost always something going on between the Argus Server PC and the controllers.

In some instances this could cause the Argus Service running on the Argus Server PC to halt and restart. This will not affect the control system but may temporarily interfere with your ability to access the system and the ongoing storage of archival data.

Instead, we recommend that you use the **Argus Backup/Restore** utility to manage the primary backup of your Argus system files and then use your global backup software to perform a secondary backup of these drives. This strategy can provide you with additional and redundant layers of protection for your Argus files.


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## *Argus Backup/Restore*

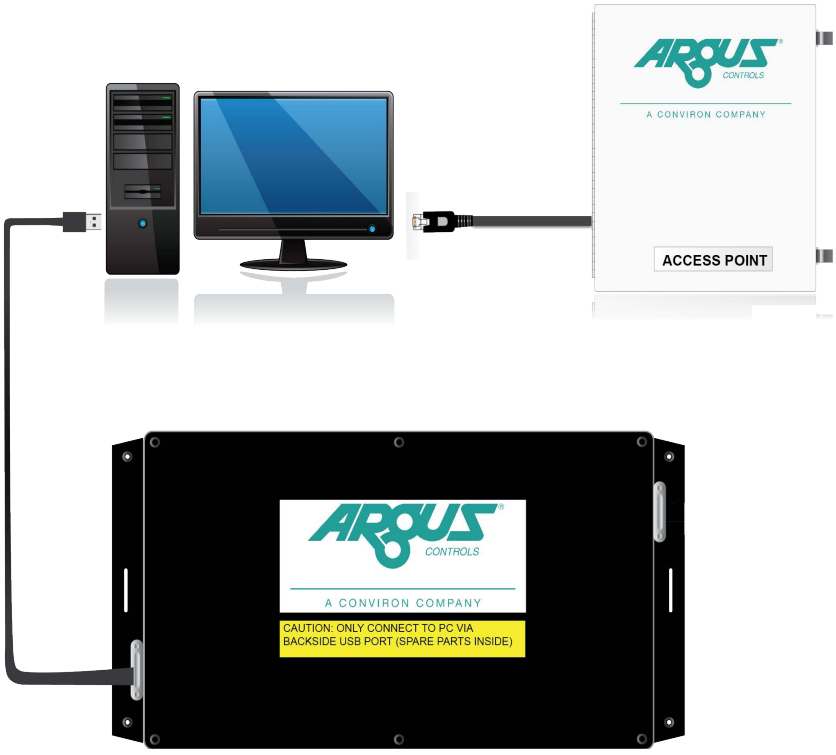
The **Argus Backup Utility** deals with the Argus files needed to operate your system.

It is intended to provide a simple and reliable method for backing up and restoring Argus systems.

Using the dedicated USB drives and cabling solutions provided by Argus can help you avoid many of the pitfalls associated with automatic backups across a network.

This maximizes the probability of having a fresh backup when you most need it, one that can quickly be reloaded onto the Argus Server PC or loaded onto a replacement PC if required.

## Argus USB Backup Modules




The **Argus USB Backup Module** offers a number of advantages over other options:

- The parts are available in a pre-configured kit form from Argus. This saves you the trouble of acquiring the various components and cables to replicate this backup scheme.


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- In the event you ever need to change the Argus Server PC, all you need to do is plug in the **USB Backup Module** cable to a new PC. This provides a connection to the Argus system, and a utility for creating a new Argus Server PC (see "Using a Restore Point to Copy the Argus Files to a Different PC" on page 29).




**Notes:** The **USB Backup Module** is designed and configured to work with the **Backup/Restore** utility in the Argus Operator program.

This utility is standard for new systems and is available as a system add-on option for existing users. If it is not already enabled on your system as described under "Argus Backup" on page 8 of this document please contact Argus for more details.

Although the **Argus Backup/Restore** utility permits backups to any locally available drive location (with the exception of optical drives for scheduled backups), the only scheduled backup configuration that Argus can support is using the drives in the **USB Backup Module** described here.

**This is because the reliability of other methods is beyond our control.**


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# *Using the Backup/Restore Software*

## Argus Backup

This utility creates primary backup sets of Argus system programs, installers, control data and user files held in the working directory.

It creates primary back-ups of the working Argus files on the Argus Server PC (files located in the ***C:\Argus*** directory). This is where the master set of all up-to-date Argus files and programs is located.

The **Argus Backup** utility in the Argus Operator program provides a method for simply and reliably creating scheduled backups of your Argus system files.

The **Argus Restore** utility can then be used to quickly recreate the Argus files on the Argus Server PC in the event of a problem.

The backup utility creates primary backup sets (called **Restore Points**) of Argus system programs, installers, control data and user files held in the working directory with the exception of **DataStream** files which are handled differently (see page 29).

Backups can be performed manually at any time (Immediate backups), or they can be scheduled to run automatically at hourly, daily, weekly, or monthly intervals.

Scheduled backups are the simplest way to ensure your backed up data is up-to-date.

Each backup set is maintained as a dated ‘restore point’ for future restore operations.

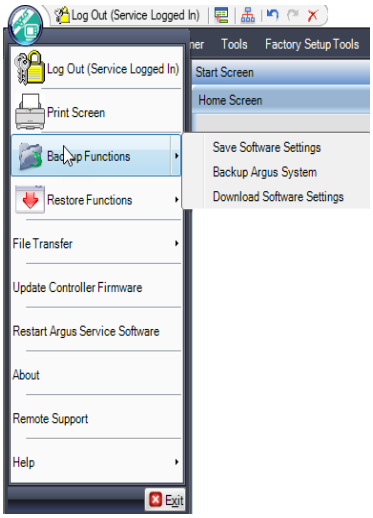
You can offset the backup times so that they are created at different times.

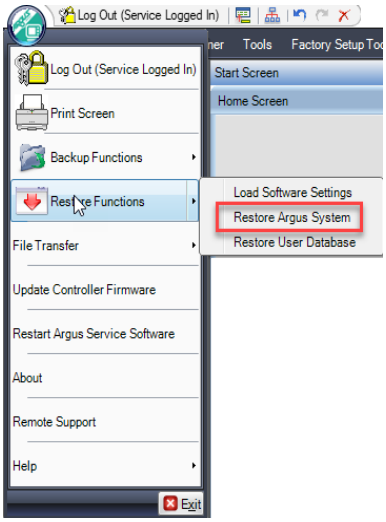

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# Backing Up Your System

## *Before you Begin:*

You can select both the **Backup** and **Restore** functions in the Argus Operator program from the **File** menu:





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# Backing Up Your System

## *Locating the Argus Backup drives in Windows*

Once you have connected the **Argus USB Backup Module** to the PC and the Access Point the two Argus drives should auto-install under Windows. Select **Start/Computer** and you should be able to see the drives:




Once you can see these drives in **Windows Explorer** you are ready to configure the backup and mirror utilities.




**Note:** If for some reason the Backup utility does not configure these scheduled backups automatically, you can create them manually by following the example on the next page.If you need any assistance, please contact **Argus Support**.


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# Backing Up Your System

## *Scheduled Backups*

The easiest way to use the Argus Backup utility is to let it do the work of finding and setting up your backup drive locations and schedules automatically.

1) First, make sure that you have an **Argus USB Backup Module** connected to your system as displayed below:

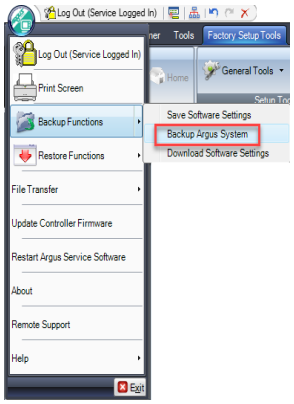




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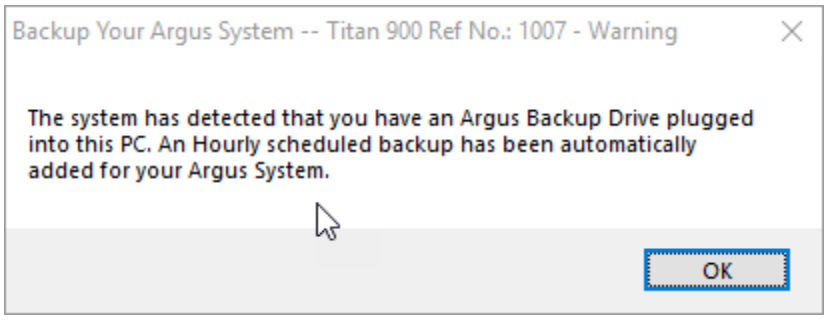
2) The **Argus Backup** utility is pre-programmed to locate and work with the Argus USB Backup Module when one is connected to your Argus Server PC.

Under the **File** menu in the Argus Operator Program, select **Backup Argus System**:




3) The **Backup** utility then performs a scan of your system. The program detects any backup drives that are supplied and configured by Argus.

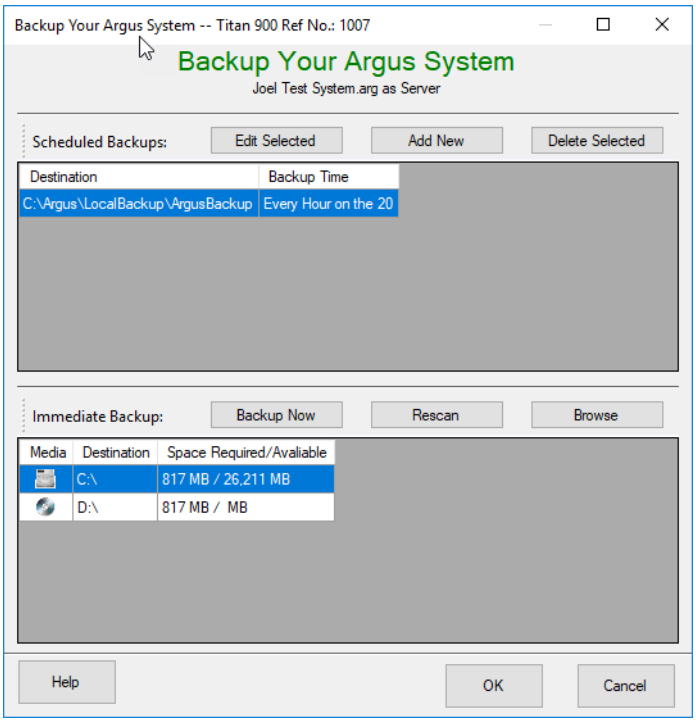
4) Select **Yes** to automatically configure these drives:





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5) The **Backup Your Argus System** dialog opens.

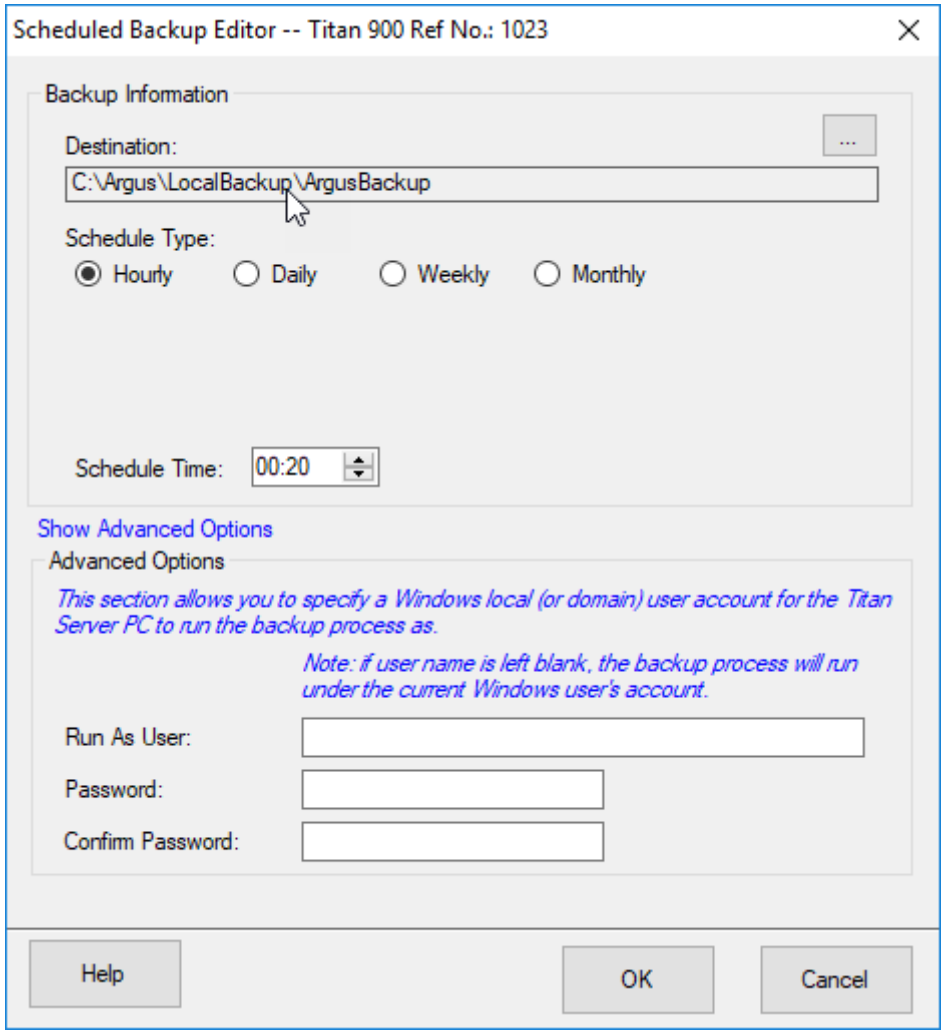



**Important: You cannot schedule a backup for any network drive.**

**Note:** This utility is used to back up files on the Argus Server PC or drives connected to it. No matter where you are connecting from, the drives being referenced are locations on the Argus Server PC.


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6) Select **Edit Selected** to make changes to an existing scheduled backup in the dialog.



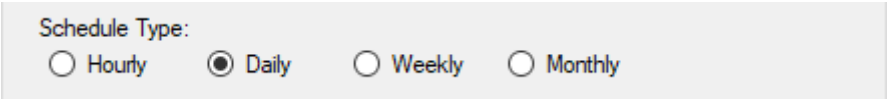

**Browse for Location** - click this button to select a drive and folder location where the scheduled backup files are stored.





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**Schedule Type** - Select how often you want to create scheduled backups.

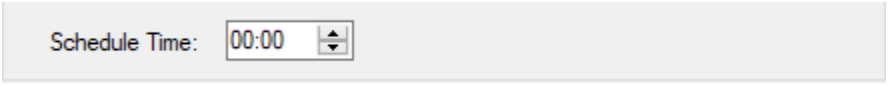



- Hourly
- Daily
- Weekly
- Monthly

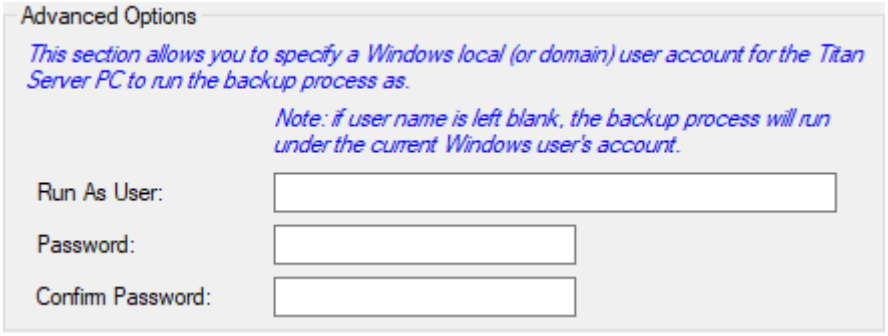
**Schedule Time** - Enter a time of day for the backup to occur.




**Note:** If you are configuring backups to more than one drive location, you can offset the times to reduce system and network loads.



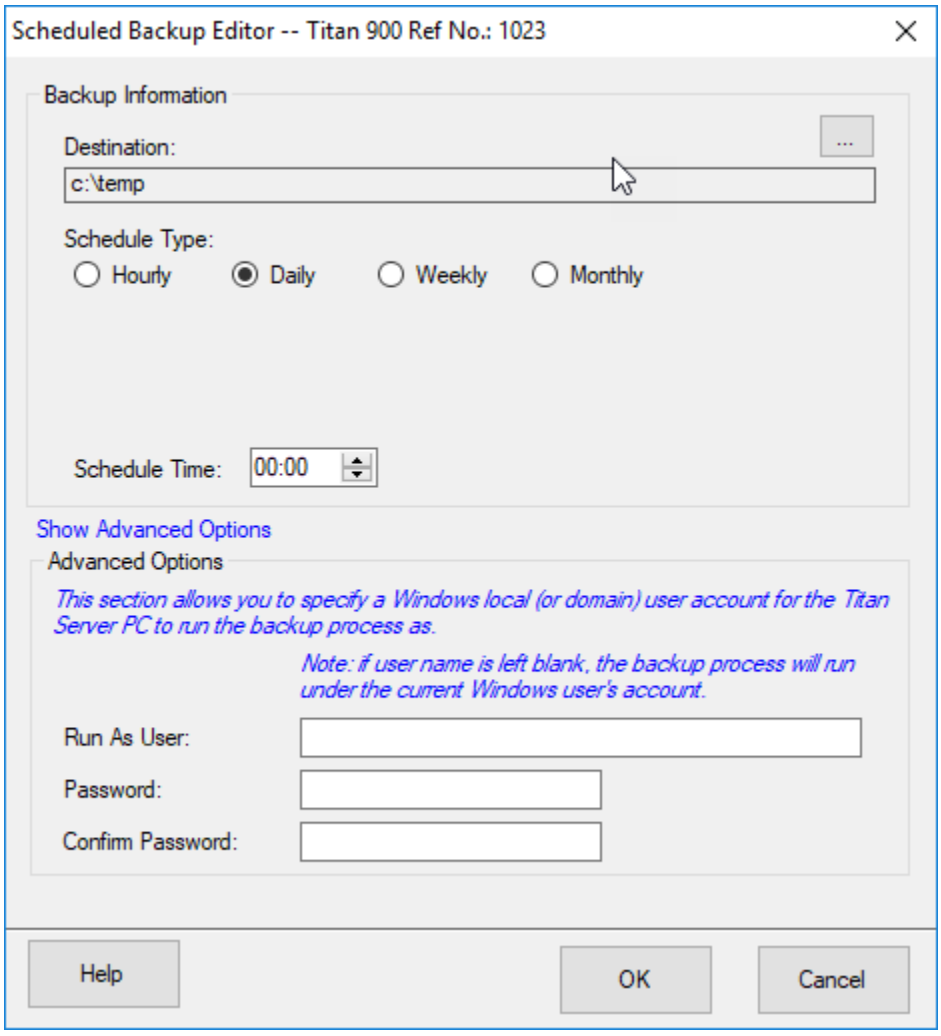

**Advanced Options** - If you require network access to a network drive or any other location requiring you to log in for access, you can enter the **User Name** and **Password** particulars here.





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7) Select **Add New** to add a new scheduled backup to the dialog.




a) Enter the same fields as **Edit Selected** above and click **Ok**.

b) Select **Delete Selected** to remove a highlighted scheduled entry in the dialog.

**There is no warning dialog, and you cannot undo this change.**

8) Click **Ok** to finish.

That's it! Your system now makes hourly backups to each of the **USB Backup Module** drives and to a '**LocalBackups**' folder in the Argus directory.

This scheduled backup ensures you always have at least three recent copies of backups on hand.


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## *Immediate (Manual) Backups*



In most cases you should not have to do this since the **Argus Backup** utility automatically configures backups to the drives in the **USB Backup Module** and a LocalBackups folder in the **Argus Directory** of your Argus Server PC as described in the previous section.

Backups can be performed manually at any time (Immediate backups), or they can be scheduled to run automatically at hourly, daily, weekly, or monthly intervals. Scheduled backups are the simplest way to ensure your backed up data is up-to-date. Each backup set is maintained as a dated restore point for future restore operations.

You can offset the backup times so that they are created at different times.

This utility creates primary backup sets of Argus system programs, installers, control data and user files held in the working directory.

At times you may wish to create an Immediate backup of your settings. This is a one-time, non-scheduled backup.

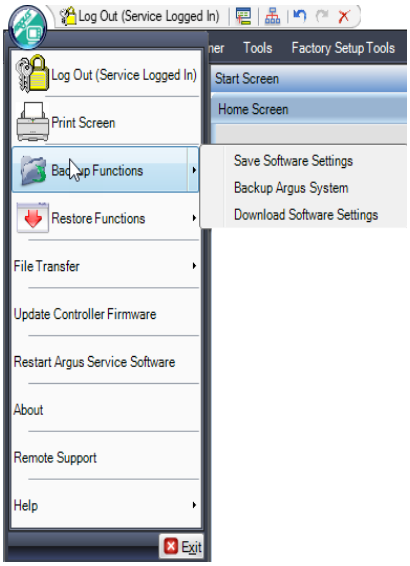
For example, you may occasionally want to backup your settings to a removable drive for off-site storage (we highly recommend this!).



**Named backups are permanent. They are not automatically removed to free up space.**

Here's how to manually configure a scheduled backup:

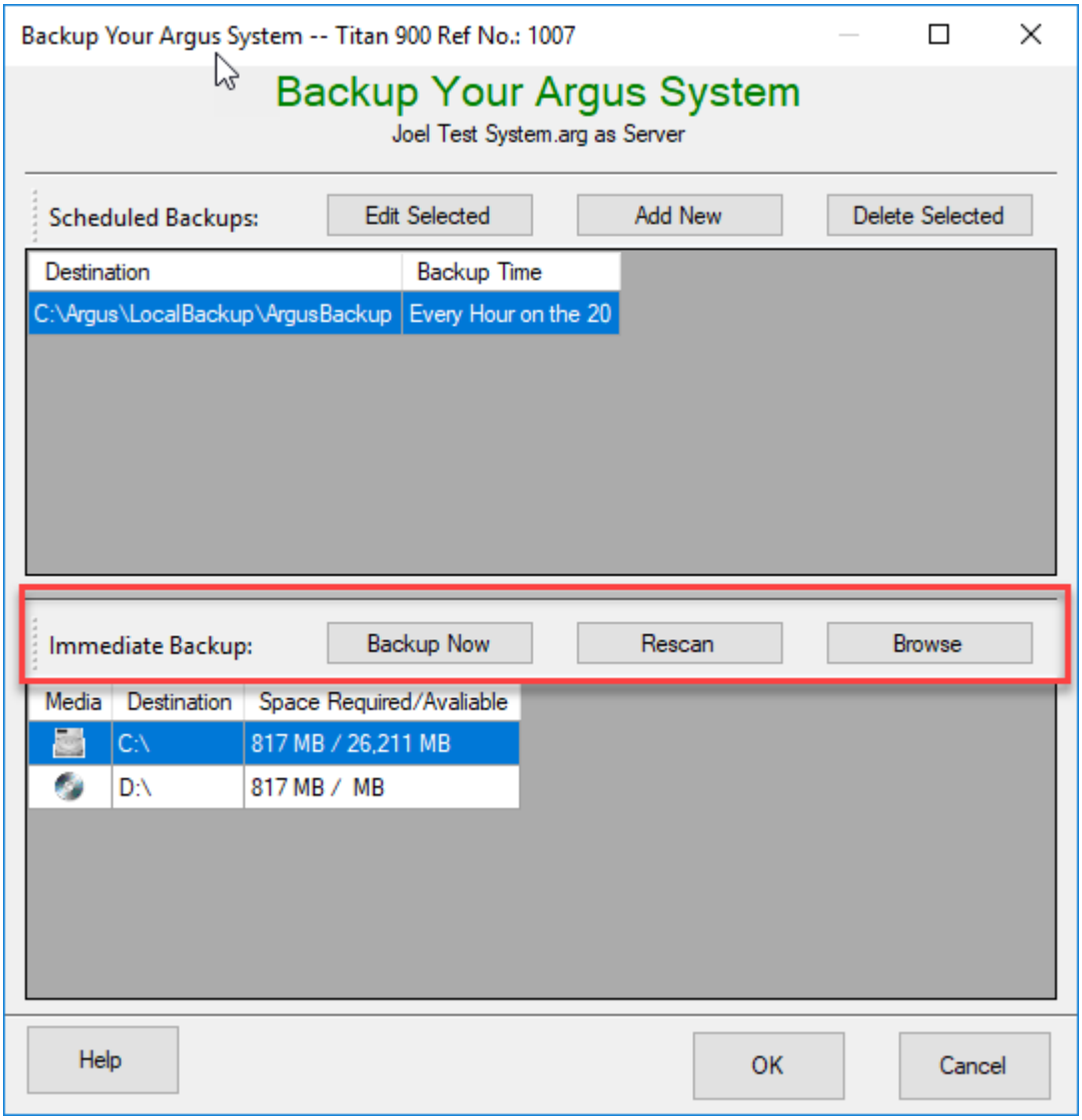
1) Select **Backup Argus System** from the **File** menu:





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2) The following dialog is displayed, and you select an option from the **Immediate Backup** section:




Select **Backup Now** to initiate an immediate backup to all the schedule drive locations.

Select **Re-Scan** to re-scan the Argus Server PC for available drive locations. Use this to refresh the list of available drives if you have just connected a new drive.

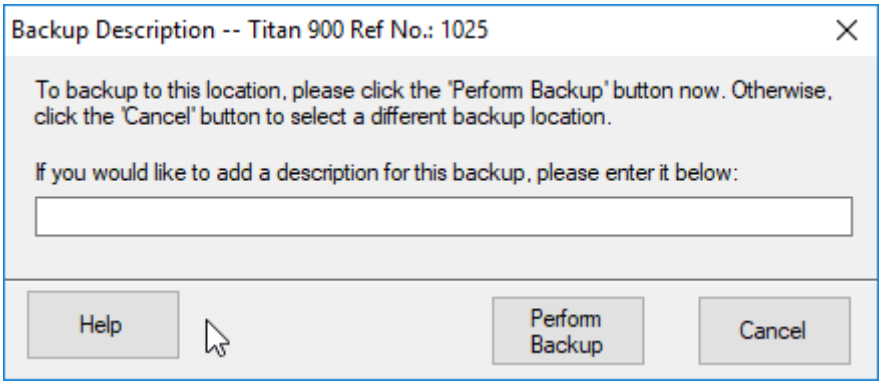
Select **Browse** to browse the computer folder system for a drive location on the Argus Server PC.


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**3) Backup Now:**

a) Click the **Backup Now** button.

b) The B**ackup Description** dialog opens. Enter a description for this backup if desired and then click the **Perform Backup** button.




**4) Re-Scan:**

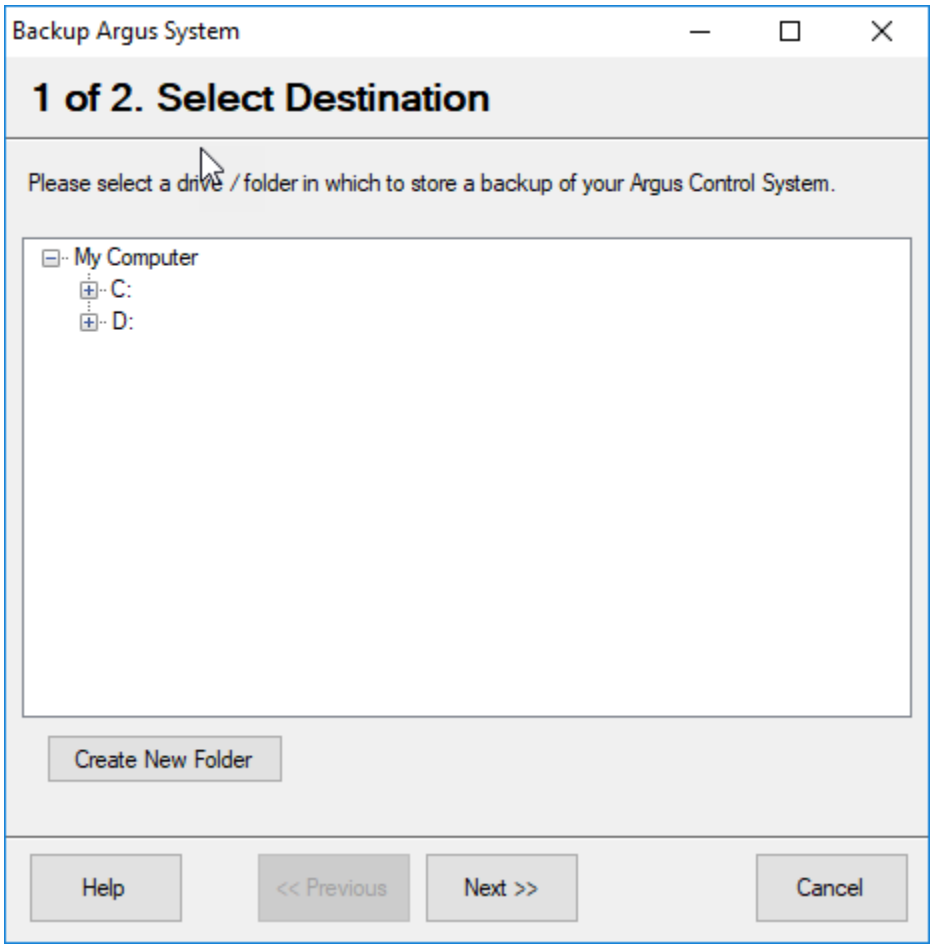
a) Click the **Re-Scan** button and wait a few seconds for the available drive locations to refresh. There is no completion indicator, they are just updated in real time.

**5) Browse:**

a) Click the **Browse** button.


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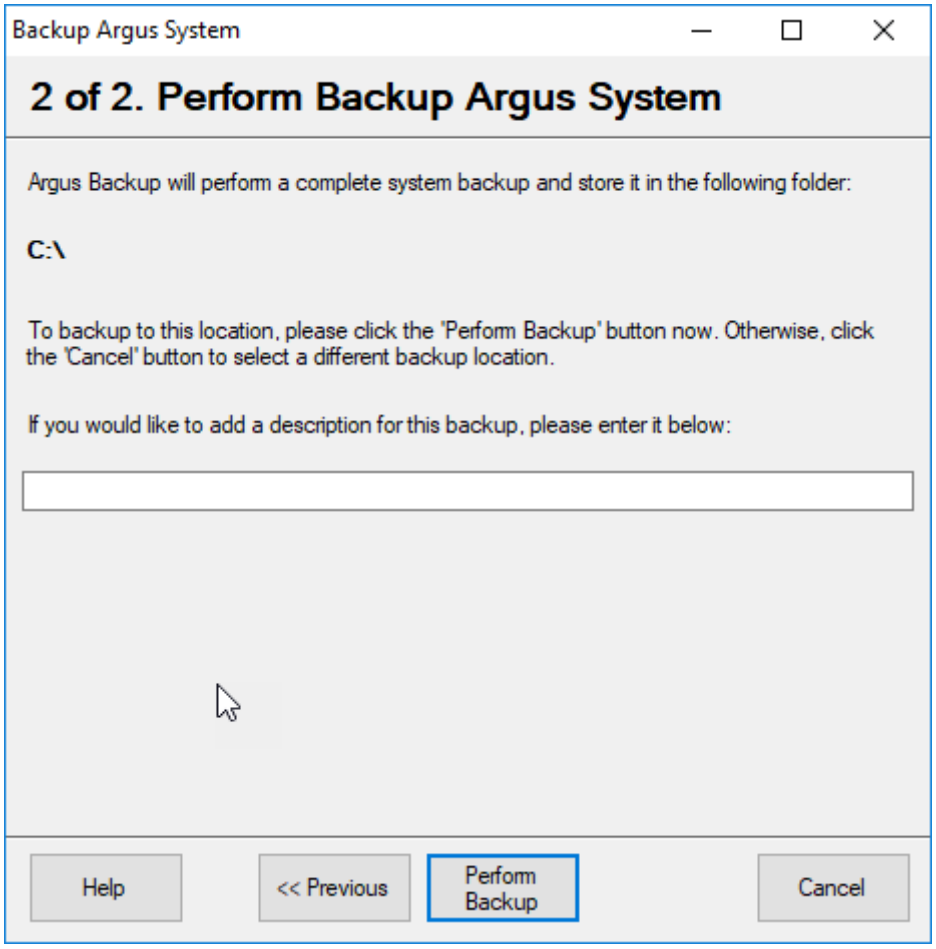
b) **Step 1:** Select your **Destination** using the drop-down menu.



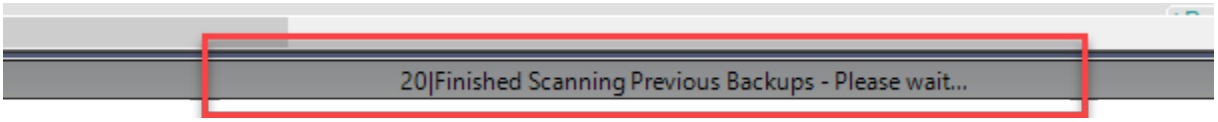


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c) **Step 2**: Perform Backup of your system. Add a description for this backup on the line provided, and then click the **Perform Backup** button.




6) Once the backup is in progress, you have a progress bar at the bottom of your screen:



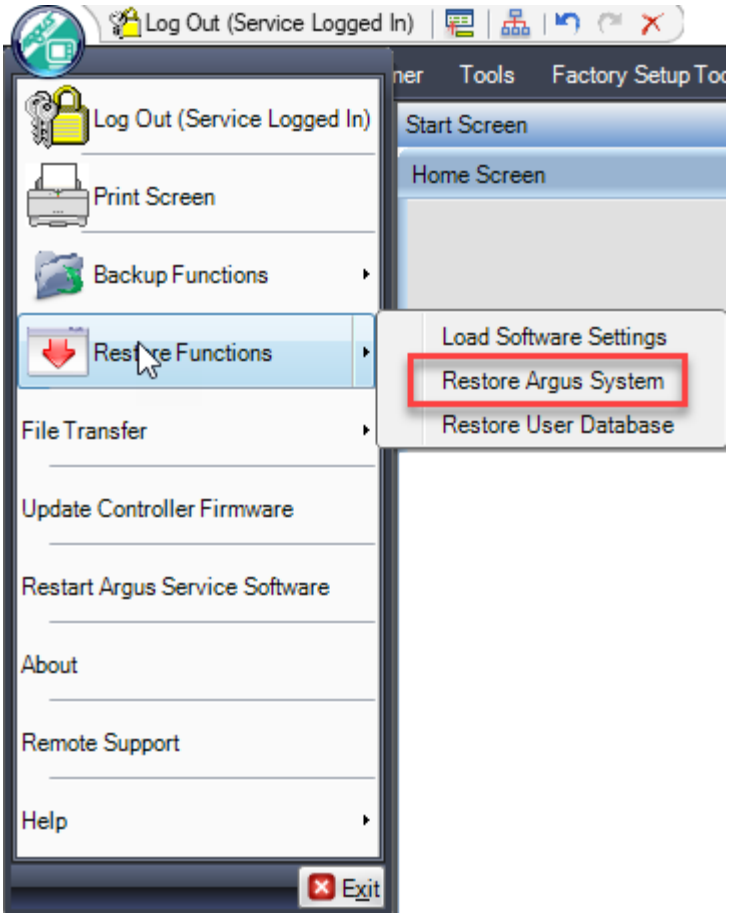

7) Wait until the progress bar completes before removing the drive.


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# Backing Up Your System

## *Checking Your Backups*

Once you have configured your scheduled backups and enough time has elapsed for at least one backup event to occur, you can check it by selecting the **Restore Your Argus System** menu item from the Argus **File** menu:

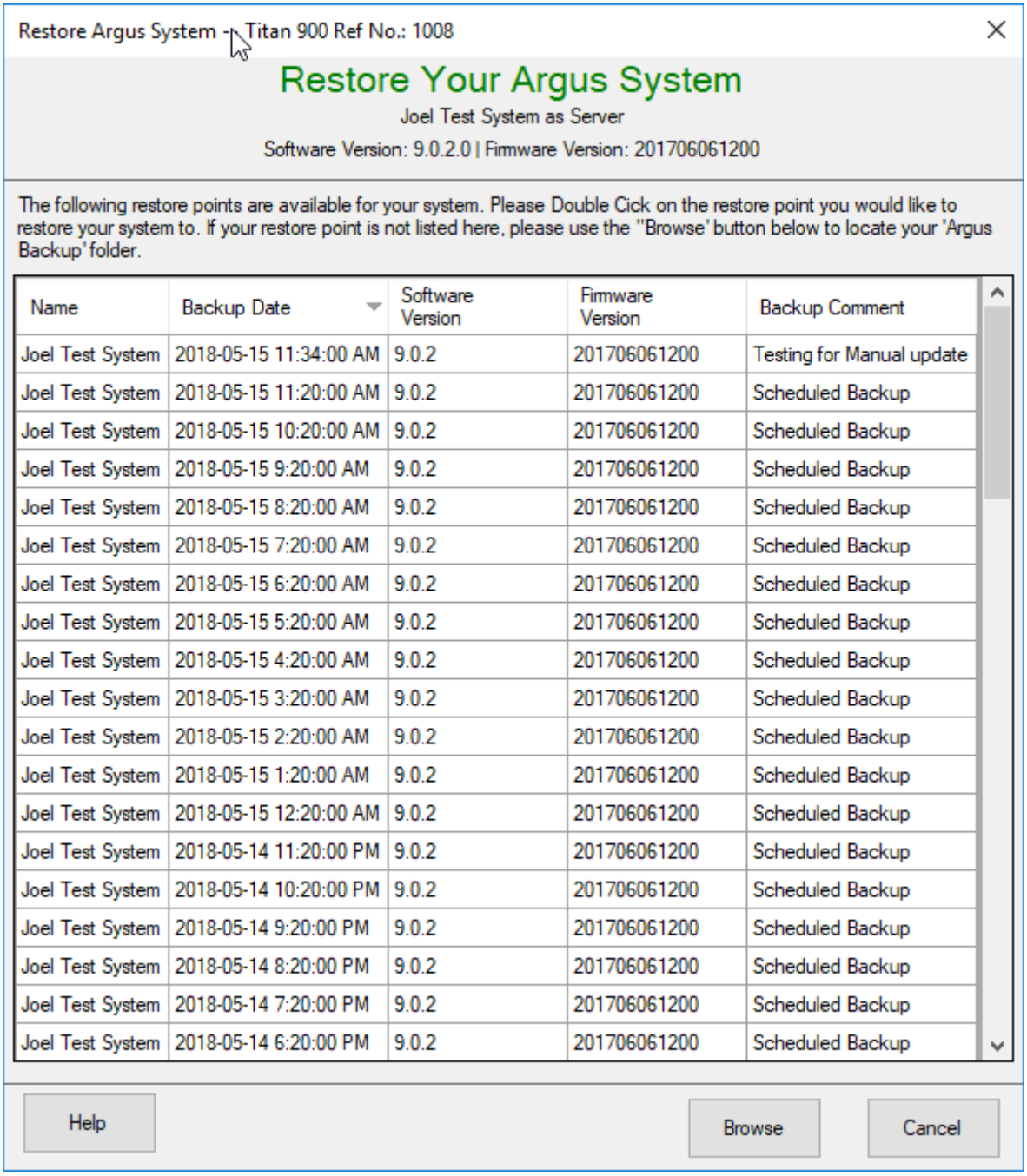




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# Backing Up Your System

After a system scan, the following dialog is displayed showing any restore points that may exist.




Each backup creates a new **Restore Point**. A **Restore Point** resets your Argus files to the way they existed on that date.


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Select **Cancel** to exit this dialog once you have confirmed that your backups are occurring as expected.

The **Backup** utility retains a maximum of about **80** scheduled restore points at each location according to the following file aging structure:

| Backup Frequency | Number of Restore Points Retained |
|---|---|
| Latest Hourly | 24 |
| Latest 6 Hour | 24 |
| Latest Daily | 7 |
| Latest Weekly | 10 |
| Latest Monthly | 12 |

Backups more than 12 months old are not considered useful for an active Argus control System.

If you want to preserve older restore points for any reason, create **Named Immediate** backups. Named backups are permanent.

They are not automatically removed to free up space. See “Immediate (Manual) Backups” on page 17.


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## Restoring Your Argus Files

**Argus Backup** sets contain everything you need to restore or install Argus files and programs onto any PC. These include:

- Control system settings.
- User files, labels, screens on the PC.
- Argus related programs (executable files and associated files such as required drivers and installers.)

Backup sets can be used to restore Argus programs or data in the event of a PC or hard drive failure. They can also be used for transferring files to a new client PC if you do not wish to wait for synchronization (see page 29).

The **Argus Restore** utility makes this easy. You can:

1) Restore your current Argus PC files from a backed up set after a data loss.
2) Quickly transfer and install your Argus program files to a new PC (a replacement Argus Server PC or a remote client PC) without needing the original program installation disk.


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# Backing Up Your System

## *Are all of the Files Generated by the Argus System Backed Up?*

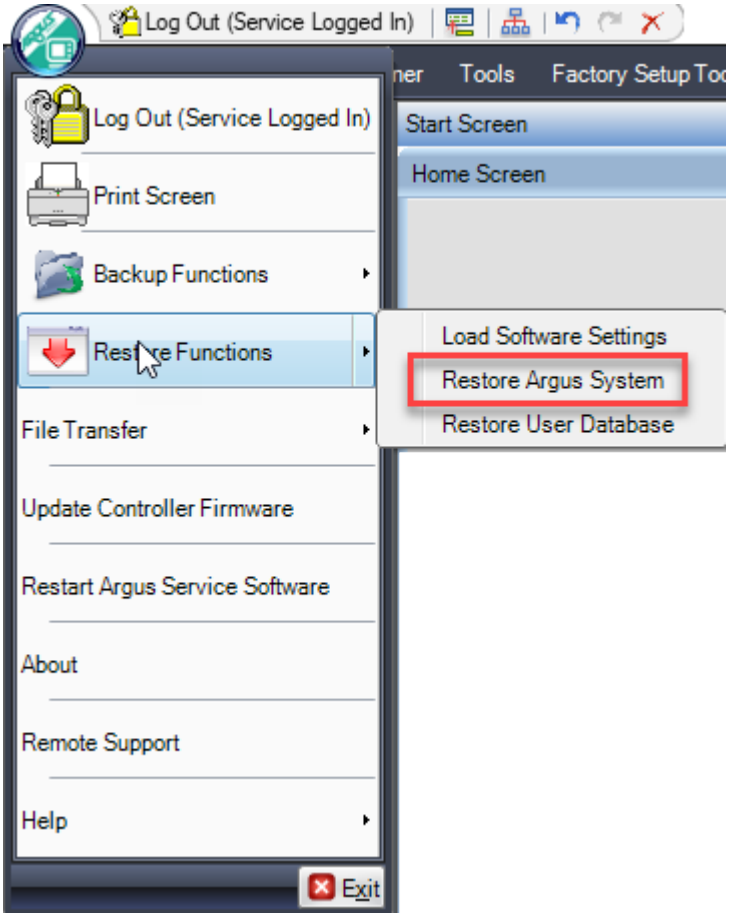
Everything is backed up except for the **Data Stream** directory (data recording) files and a few other service, diagnostic, and history files.

We intentionally bypass these files since they grow over time, and can require large amounts of disk storage space.

They are also not required for operator access. This makes standard backup operations fast and each set is small enough to fit on most removable media such as USB Flash drives.

## *Restoring Your System from a Backup*

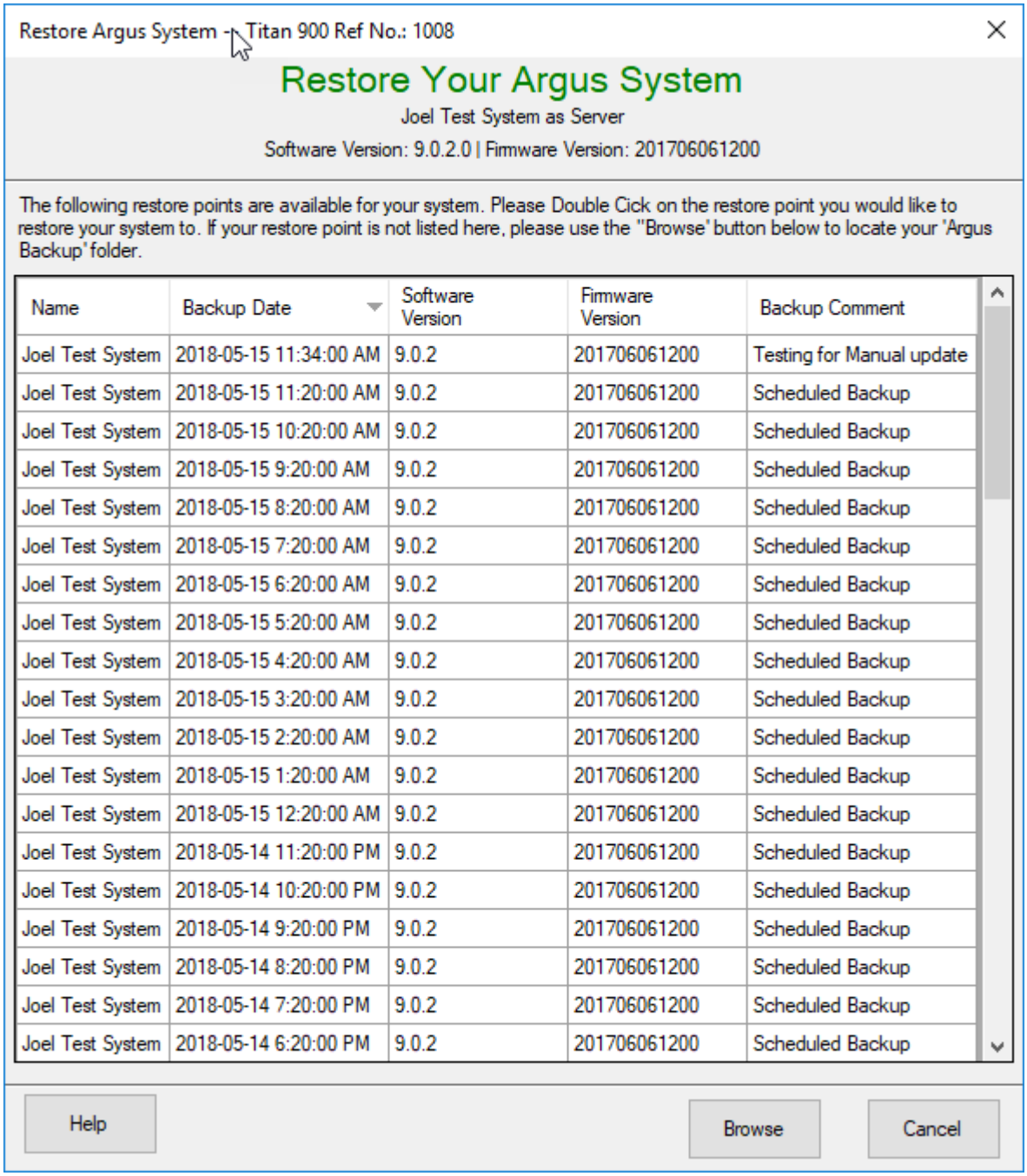
1) To restore the files on your Argus Server PC from inside the Argus Operator program select the **Restore Your Argus System** menu item from the Argus **File** menu:





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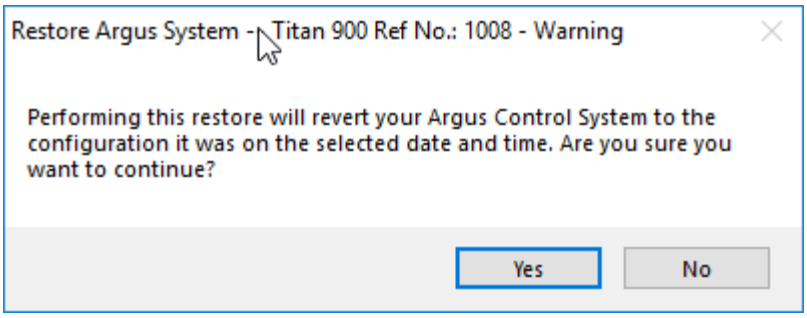
After a system scan, the following dialog is displayed:



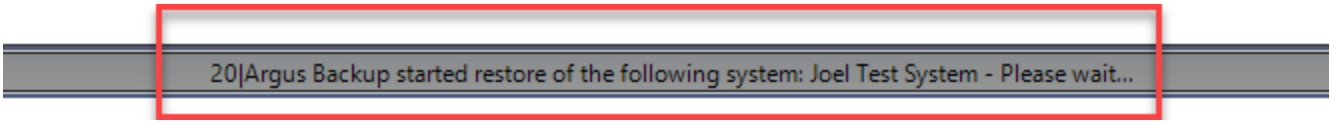

2) The list shows all the **Restore Points** available. You can **double-click** on any of the entries to select them.


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3) The utility confirms that you wish to perform a restore operation. Normally you select a very recent or the most recent **Restore Point**. Click **Yes**.




4) The restore is now in progress.




5) Once complete, you are logged out. Once you log in again, the system has been restored and is ready to use.


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## *Restoring your Files from Outside of the Argus Operator Program*

**What if you can't run the Argus Restore program because the hard drive has crashed or you need to change PCs?**

In the event that you ever need to replace your Argus Server PC or for some reason cannot run the Argus Operator program to restore your files, don't worry:

there is an executable file on each Argus backup drives called:

**ArgusRestoreUtility.exe.**

You'll find it in the directory called ***ArgusBackup*** This can be used to restore a full copy of your Argus files to any PC.

To restore your Argus Server PC, first make sure the **Argus Backup Module** is connected. Then simply locate the ***ArgusRestoreUtility.exe*** file on either of the **USB Backup Module** flash drives using Windows Explorer.

Run it to restore your files to the connected PC. In most cases you should select the most recent **Restore Point** unless for some reason you need to restore from an earlier saved backup (this might be the case if all or part of your system configuration was

corrupted or accidentally altered and the changes were saved in recent backups. In that case you would want to restore from a point before the problem occurred.)

## *Using a Restore Point to Copy the Argus Files to a Different PC*

Assuming the Argus Server PC is available and operational and you need to restore or install Argus files to a different PC:

Insert a removable USB Flash into a spare USB port on the Argus Server PC. (Do not use or remove the **Argus USB Backup Module** drives for this purpose other than in an emergency. They are intended for restoring the Argus Server PC.)

Use the **Backup** utility in the Argus Operator program to create an **Immediate Backup** to the inserted Flash drive.

When the backup has completed, remove the Flash drive and insert it into the destination PC.

Use **Windows Explorer** to find and run the file ***ArgusRestoreUtility.exe*** located in the **ArgusBackup** directory on the flash drive. This installs the Argus program files on the destination PC.


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# *Configuring a Data Stream Mirror Drive*

## Protecting Your Archived Data

The **Argus Backup/Restore** utility does not make backup copies of your Data Stream files.

This archival data can become very large over time, making it impractical and time consuming to keep large numbers of redundant copies as backups.

Instead of scheduled backups, we have implemented a separate option that mirrors your archival data to any of up to three **specifically named** drive locations (for maximum reliability, we highly recommend using a USB connected local drive rather than a network drive location).

This simple mirror feature writes your archived data to another drive or network location at the same time the information is written to your Local Argus Server PC. It's an easy way to maintain a duplicate copy of these larger data sets. You should also include this mirrored file location in your normal back-up procedures for your PC if archival data is very important to you.

### *DataStream Drives provided by Argus*

You can obtain pre-configured **USB DataStream Mirror** drives from Argus. All you have to do is plug them in to an available USB port on your Argus Server PC. The Argus Service automatically recognizes this drive and begins mirroring your DataStream files within 5 minutes.

### *Configuring your own DataStream Drive*

If you are familiar with formatting and renaming drives under Windows, you can use any off-the-shelf external USB Drive that runs under Microsoft Windows as a DataStream mirror drive.

However, **you must give it a specific name** so that the Argus service recognizes it as a mirror drive and begins using it.

The drive names that the program recognizes are:

**ARGUSMIRROR1**

**ARGUSMIRROR2**

**ARGUSMIRROR3**


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To rename a drive:

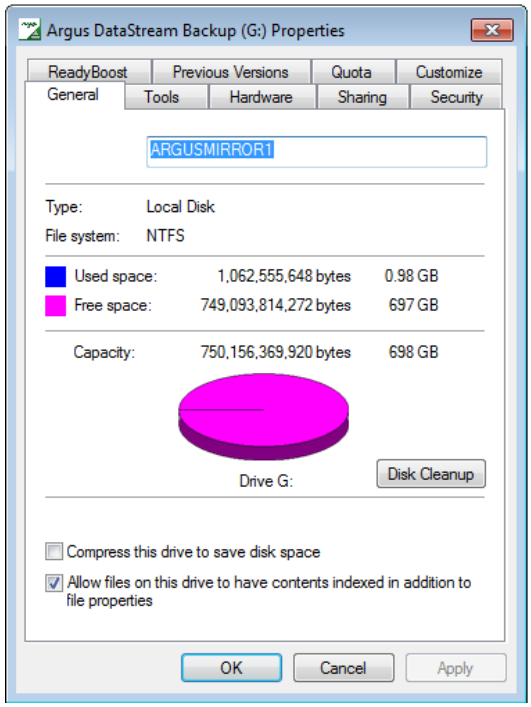
1) Connect an external USB drive to the Argus Server PC
2) Locate the drive using **Windows Explorer**.
3) Make sure the drive is empty. Reformat it or delete all other folders and applications.
4) **Optional:** Obtain the two small DataStream drive configuration files from Argus:

   **ArgusControls-Backup-256px.ico**
   **autorun.inf**

   These consist of an icon and a small autorun.inf file used to help you identify the drive as your DataStream mirror. Copy these files to the root directory of the mirror drive.

5) Right-click the drive and select **Properties**
6) Rename the drive with one of the following names:

   **ARGUSMIRROR1**
   **ARGUSMIRROR2**
   **ARGUSMIRROR3**





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The renamed drive and icon is displayed (you may need to unplug the drive and plug it in again for Windows to refresh the drive information):







Since it mirrors **Archival Data** as it is written the Argus Service is not automatically backing up any data from before the time the mirror was initiated. For a complete mirrored archive you need to manually copy the **DataStream** directory to the backup drive before starting the mirror.

At this time, the data is only mirrored as it is collected.

You must use file manager to delete, copy or replace file inconsistencies that may occur after file corruptions of either the working (master) files or of this primary mirror copy. If the mirror drive is off line for any reason, it will not 'fill in' data recorded during that time.

For more assistance with DataStream mirroring, please contact **Argus Support**.


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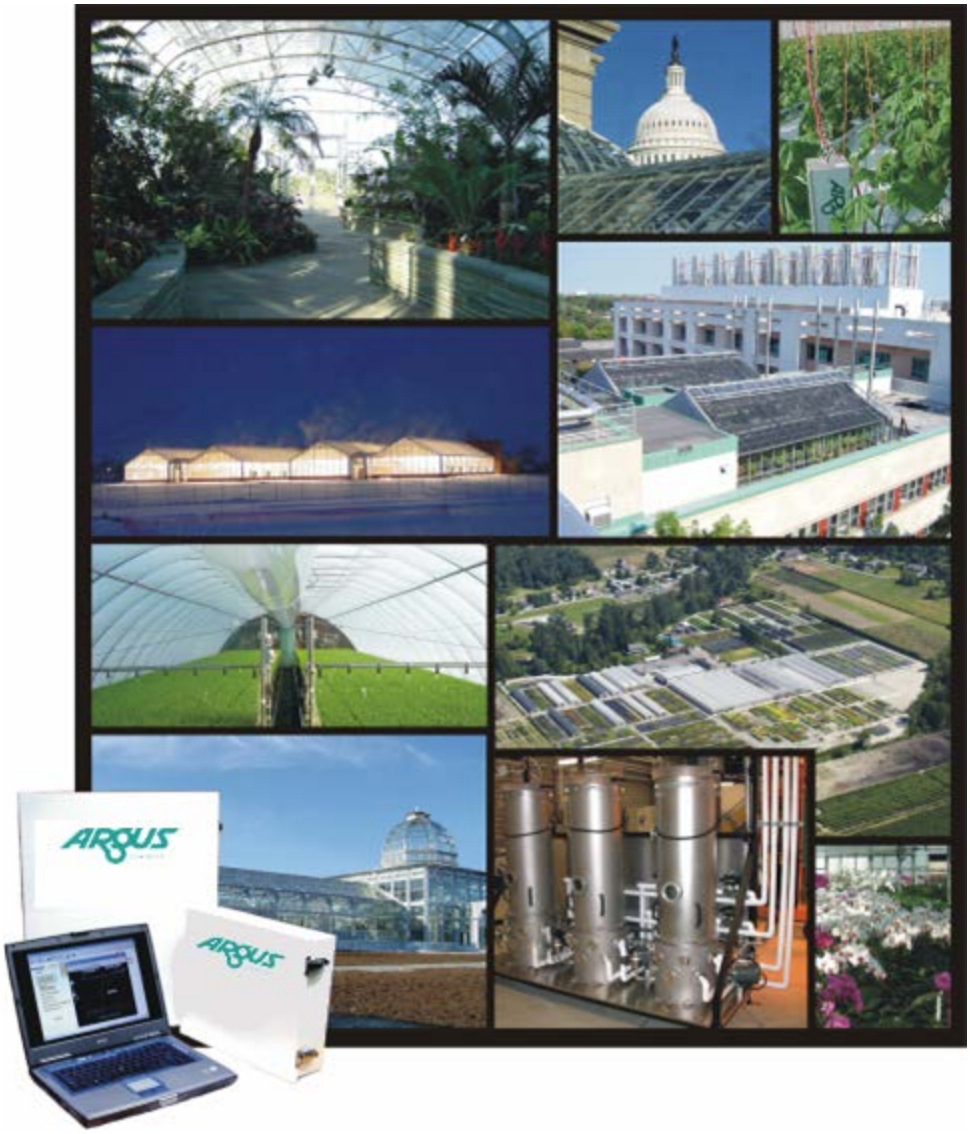
**Telephone:** (604) 538-3531 or (604) 536-9100
**Toll Free Sales:** (800) 667-2090 (North America)
**Toll Free Service:** (888) 667-2091 (North America)
**Fax:** (604) 538-4728
**E-mail:** argus@arguscontrols.com
**Web Site:** www.arguscontrols.com

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# Titan 2 System

## Installation Guide




*July 2017*

# Titan 2 System Installation Guide

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# INTRODUCTION

This manual provides general instructions for installing and putting your new Argus Titan System into service.

Labeled custom wiring diagrams are provided for each system. Please refer to these for the specific installation instructions for your system.

## *What to Expect*

Installing your Argus system should go smoothly if you follow the simple guidelines outlined in this document. Prior to shipping, all of the components within each panel have been pre-wired, so that all that remains are the panel-to-panel connections and connections to equipment outside of the panels such as inputs (sensors) and outputs (controlled equipment).

The entire system was programmed, configured, and end-to-end tested before shipping. Once you finish installing the panels and connecting the wires, all of the control modules should be fully operational and ready for service.

Once all of the inputs and outputs have been connected and manually tested using the override switches, your system is ready for on-line commissioning by Argus factory technicians. This includes general system testing and fine tuning of timing settings for vents, mixing valves, and other modulating equipment.

Finally, we provide on-line and telephone training to familiarize you with your new system.

Call Argus anytime you need help with the installation.

## *Before You Begin*

1) Carefully unpack and inspect the system components when they arrive. Check them against your packing slip and your order confirmations.

   Report and document any missing items or damage due to shipping with the shipping company.

2) Make sure you **call Argus when your system arrives**. Our service technicians guide you through the installation, on-line training, and commissioning process.

   We never expect you to do this on your own, so please call any time you need assistance installing your system.


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3) **Study the wiring diagrams.** Make sure you understand where everything is to be located, and how it is wired.

   These diagrams are custom drawn for your system and your control layout. Please pay particular attention to any wiring and termination specifications.

4) **Naming of Parts** - Argus labels every panel, every sensor input, and every output according to the names you have provided. You'll find these labels affixed to the equipment.

   You'll also see them on your custom wiring diagrams and used inside the Argus Operator program that you'll use to access your system.

   During the installation and commissioning process you may see a need to change the name of something, or to add new names for additional sensors etc.

   To avoid confusion, it is usually best to work with the names provided until everything is installed. If needed, Argus changes the names of items in the software during the commissioning process, and issue new labels and as-built wiring diagrams for your system once it is fully configured and operational.

5) Try to select panel locations that are out of the weather, or protected from direct contact with water. In exposed locations this should include providing rain and drip shields over the panels.

   Even though Argus panels are resistant to water and other contaminants when closed, providing this level of protection makes it safer and more convenient to access them under all conditions.

6) **Plan your wiring runs.** In high lightning areas, try to keep wires as low as possible within the compartments. **No Overhead Wiring runs outside**.

   Try to keep exposed cables (not run in conduit) on the underside or shaded side of support members and beams (even if the cable is rated for use in sunlight). This should greatly extend the life of the cable sheathing.

   **Best Practice**

   ★★ Plan all wiring runs to enter the underside of the panels. Provide drip loops and water-tight connectors as conditions require.


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7) **Cabling and Conduit** – The internal connections **within** each panel are pre-wired at the factory.

You are responsible for all wiring connections ***between*** the panels as well as the wires to the sensors and the controlled equipment. The custom wiring drawings included with your system provide detailed wiring information for all of your Argus equipment.

Please refer to these drawings when undertaking your installation. Installing cable and conduit is, for the most part, a matter of using standard trade practices.

**The type of wire is specified on your drawings**. The actual routing of the cables and conduits must be determined on site.



**All communications cable for the System and I/O Networks should be exactly as specified.** This is to ensure the best possible integrity, system reliability, and longevity of the communications cabling.

For sensors and low voltage outputs, when multiple runs of wire travel between the same devices, the decision of whether to use fewer cables with many conductors each, or more cables with fewer conductors each, affects the cost and serviceability.

Although a larger cable with many conductors is in some cases less expensive than several two and three-conductor cables, the latter system of point-to-point wiring with fewer junction boxes are much easier to troubleshoot in the future.

In addition, cable damage to one small cable affects fewer items than damage to a single cable that houses the control wiring for an entire zone.

**Best Practice:**

★Mark all cables and make as-built cable layout drawings. This makes the control system easier to service and troubleshoot in the future.

★In retrofits, avoid reusing existing cables if they are aged. The potential for problems created by their use far outweighs any savings in the long term.Use LVT or Fire Alarm (FA) Cables for sensor wiring. These are available in multi-conductor versions with an approved outer jacket. Check your local electrical code for the correct sizes and installation methods.


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## Warnings

1) Always be sure that the panels are powered down before making wiring connections.
2) Use a qualified electrician for all line voltage wiring and terminations.
3) Check your local electrical codes.
4) **Lightning Warning** – although lightning is not normally a problem, it is the most common cause of failures in control systems. Repair of lightning damage is usually fairly easy and not in itself expensive.

   On rare occasions, direct lightning strikes have occurred, causing extensive damage by physically destroying sections of the control system. In either case, loss of all or part of the control system for one or more days can be very inconvenient, so reasonable precautions should be taken to reduce the chances of lightning damage.

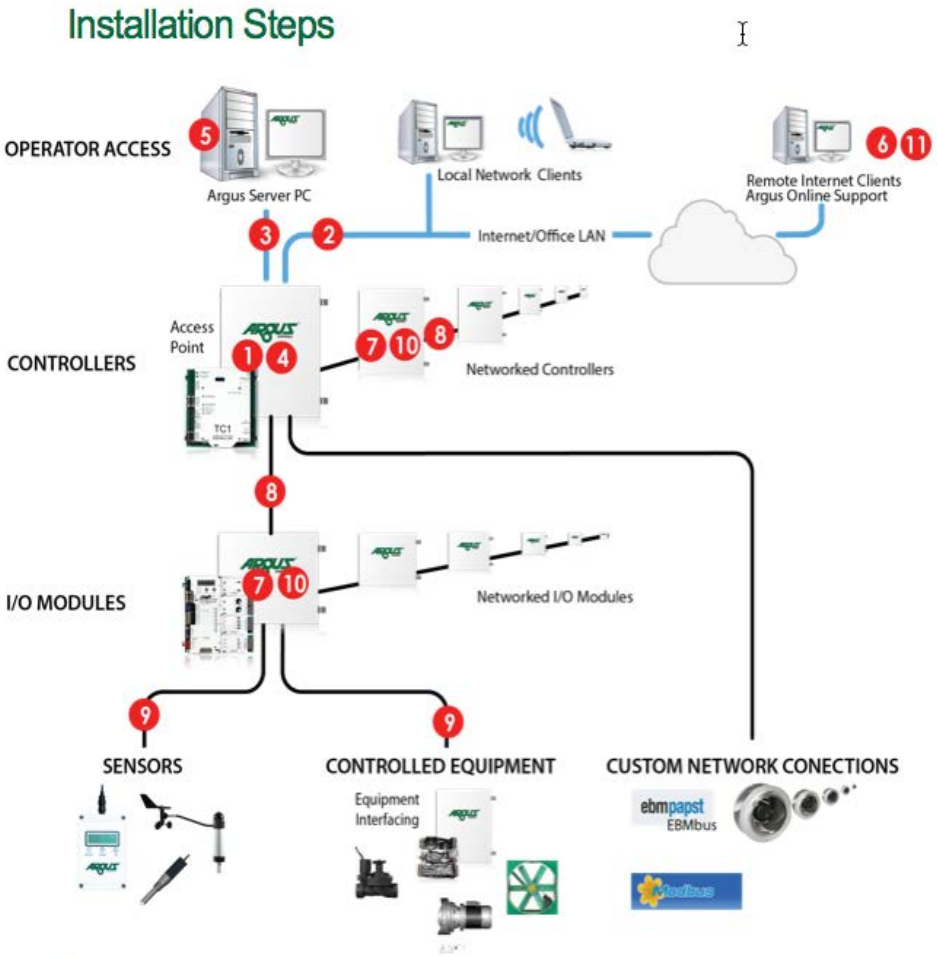
   All Communications Networks wiring should be installed as low as practical in the compartment.

   All outside wiring must be done underground. Under no circumstances should outside wiring be run overhead (for example, between two buildings).

   If network wiring is run in metal conduit, the conduit should be grounded. These precautions are necessary to reduce the chance of lightning damage spreading throughout the control system.


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# INSTALLATION STEPS




1. Install the Access Point controller
2. Connect Ethernet cable between the Surge Arrestor in the Access Point Controller and your Lan/Internet source
3. Connect Ethernet cable between the Argus Server PC and the Ethernet switch in the Access Point controller
4. Power up the Access Point controller
5. Install the Argus Operator Software on the Argus Server PC
6. Call Argus for assistance with first time connection to your system
7. Install all remaining Argus panels as per your wiring diagrams (controllers, I/O modules, relay panels etc.)
8. Connect the System Communications and I/O Network wiring per your wiring diagrams
9. Connect all sensors and controlled equipment per your wiring diagrams
10. Power up all controllers and I/O power supplies and check the communications status of all controllers and I/O modules in the Argus Operator program
11. Call Argus for further assistance with system commisioning


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The diagram on the previous page illustrates the suggested steps for installing your Titan System. This is a generalized overview diagram and you should refer to the supplied wiring diagrams for full wiring details.

In some instances, multiple devices may be housed in the same panel. For these, all of the wiring interconnections between hardware modules that start and end within the same cabinet is pre-wired by Argus. All you need to do is make the connections from panel to panel, and the connections to power sources, sensors, and controlled equipment.

Although you do not need to follow these steps in strict order, there are at least two advantages to performing them in this sequence:

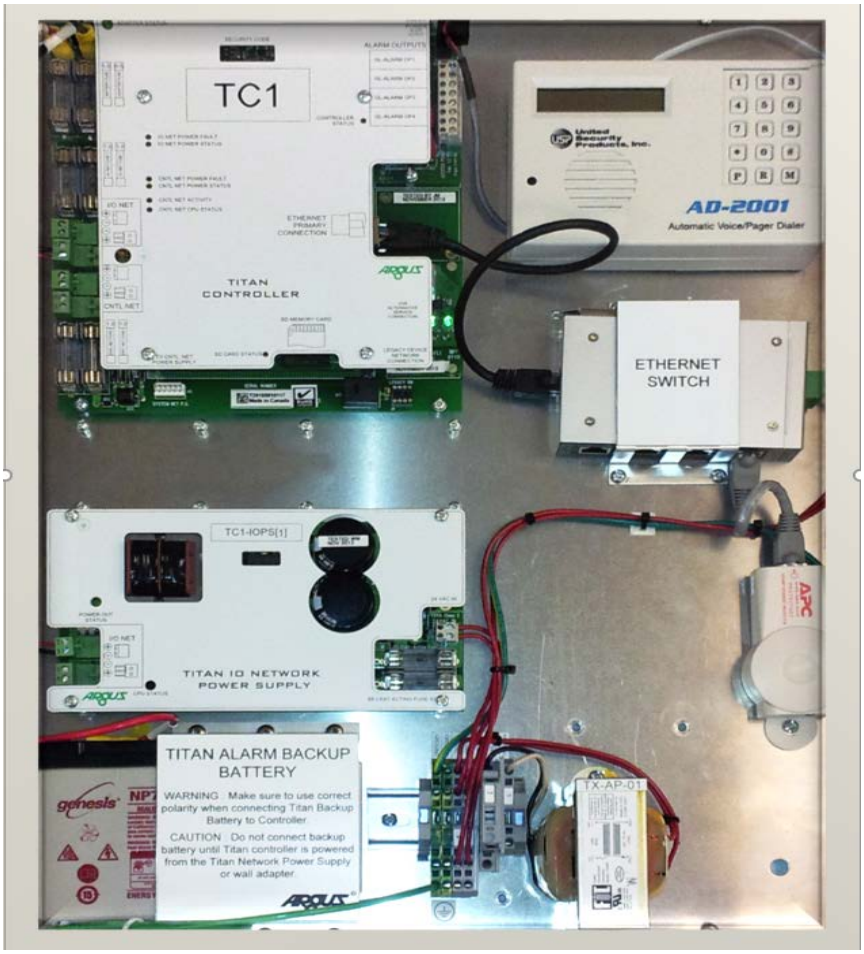
1) After **Step 6** your system is 'Live'. You can then use the Titan Operator program to systematically verify each subsequent phase of the installation, particularly when hooking up the controllers, I/O modules, and sensors.

2) Any time after **Step 5**, Argus Support personnel are able to go on-line with your system to assist you with the rest of the installation.

**Let's get started!**


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# *Step 1 - Install the Access Point Controller*




The best place to mount the **Access Point** panel is usually at or near the **Argus Server PC** location so that you can easily connect the alarm dialer to your telephone line as well as other local alarm lights or audible devices as required.

If this is a single controller system, this is the only Titan controller used. On multi-controller systems it is the controller designated as the **Access Point**.

The Access Point controller is mounted on a special backplane containing alarm outputs and charging circuitry for an optional backup battery.

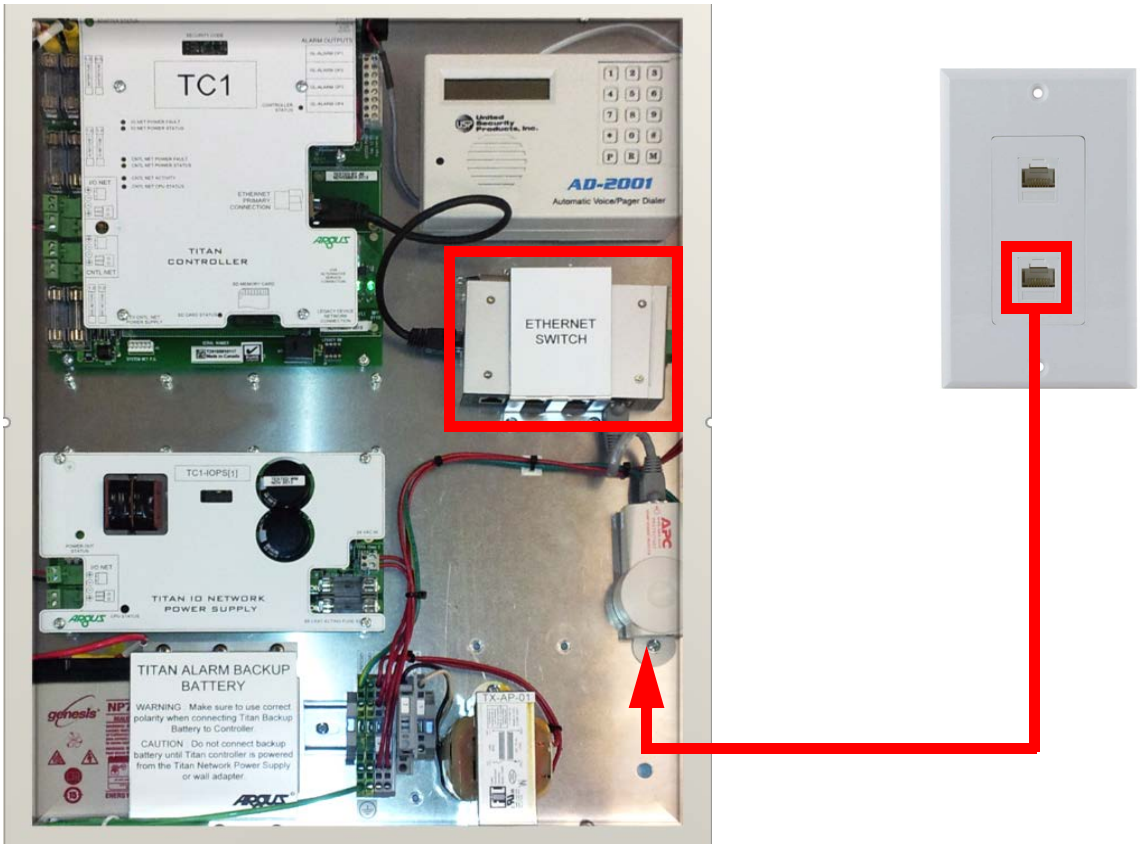
The battery can maintain power to the controller and the connected alarm equipment during power outages.

Provide **110 VAC** power to the Access Point as indicated on your wiring diagrams.


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## *Step 2 - Connecting your Office LAN/Internet*

The industrial **Ethernet** switch in the Access Point panel is used to connect the Access Point controller to the Argus Server PC, and the Argus Server PC to your Internet/LAN.

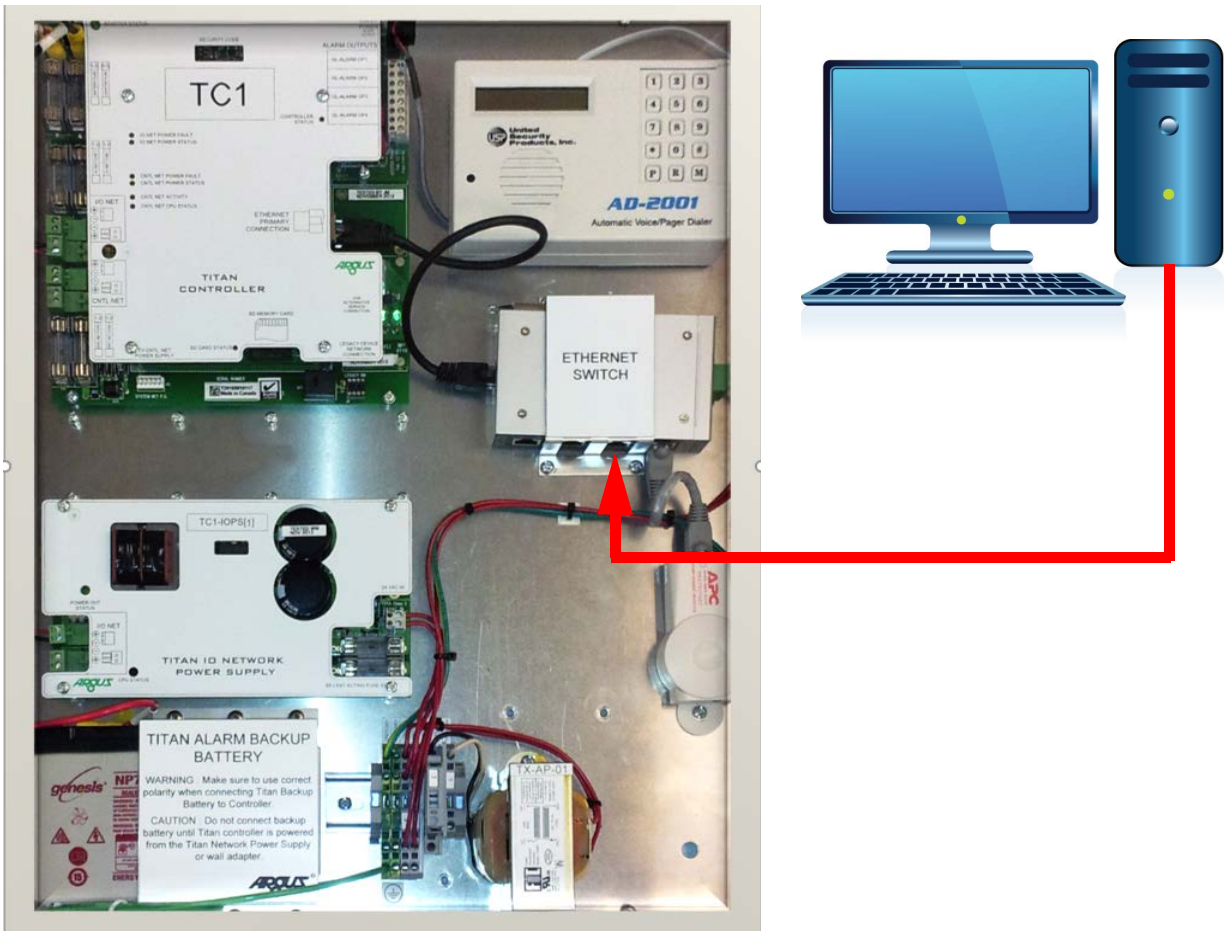



The Titan Access Point controller should already be connected to the **Ethernet Switch** as displayed above. Connect the Ethernet cable between your Office LAN/Ethernet port and the surge arrestor protector.


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## *Step 3 - Connect the Argus Server PC*

Connect an Ethernet cable between the Ethernet switch in the Access Point panel and the Argus Server PC.

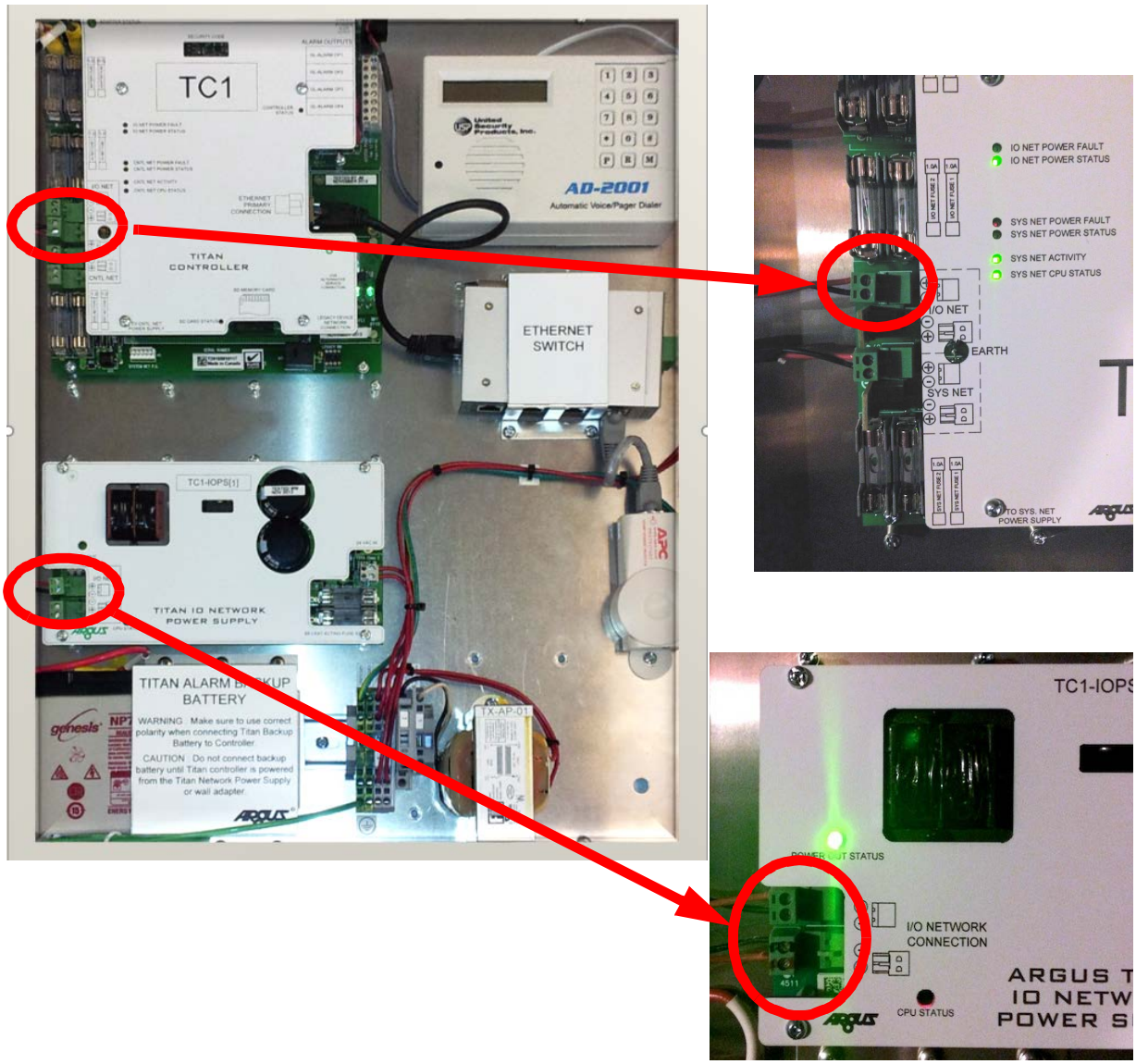




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## *Step 4 – Power up the Access Point Controller*

The controller is powered from the IOPS (I/O Power Supply) using the I/O NET connector/ The IOPS is powered by a 24 VAC transformer in the Access Point panel.




Connect the line voltage supply to the transformer as displayed in the wiring diagrams included with your system.


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## *Step 5 – Install the Argus Software*



Install the provided Argus Software on the Argus Server PC.

Once the installation is complete you'll be ready to run the Argus operator software to link the Argus Server software to the control system.


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## *Step 6 – Call Argus*



Before an Argus service technician can go on-line to assist you further with system installation and commissioning, you need to configure your PC for remote access using the Internet.

If the Argus Server PC is part of a large internal network of computers, you may require assistance from your network systems administrator to configure the appropriate ports and firewall settings.

Please refer to the **Titan System – Internet Connection Guide** for details on configuring your system for Internet access.


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# *Step 7 - Install the Argus Panels*



## Panel Mounting

Your Argus system consists of at least one controller panel, a weather station, I/O modules, and various sensor enclosures.

Depending on the size of your system, there may also be a number of other panels including line voltage interfacing relays.

Complete wiring diagrams are supplied with your system showing the designation, location, and wiring details for each component.

Review and understand these drawings before undertaking installation.

Mount each panel onto a rigid plywood backing or a channel bar mounting system. Mounting holes are provided in the back of each panel.

In greenhouses, try to mount the panel so that it faces North, with an overhanging shelf providing protection overhead.

Alternatively, mount in a protected location in the boiler room or a packing shed.

Even though they are water resistant (Nema-12 or Nema-4 rated as per you requirements), as a best practice, you should try to mount your Argus panels in locations that are protected from water, mechanical damage, and bright sunlight.

This makes it easier and safer to access the control hardware under all conditions. Remember to leave room for the door latches to operate and for the doors to swing fully open.



**All greenhouse electrical wiring should enter through the bottom of panels to prevent water damage**.

**Controller boards showing obvious water damage is not covered under your warranty!**


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Generally, control panels should be mounted near the zones they are controlling.

This practice:

- Helps keeps control wiring runs short.
- Makes the manual overrides (inside the control panels) useful for visual operation and testing of the zone equipment.
- Takes advantage of the distributed design of the Argus system where a single communication cable links the controllers.
- Reduces wiring costs in most cases.

An exception to this general rule is when the line voltage relays for the zone equipment are all located in a remote electrical room and the cost to run control wiring from the zone to the electrical room is prohibitive.




Argus ships each panel pre-configured and labeled for a particular location in your system. Make sure to install the appropriate panel for each location.


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# *Step 8 – Wire the Communications Networks*

## Wiring the System Network

If your system uses more than one controller you need to wire a **System Network**.

The System Network connects all Titan controllers on a multi-controller Argus installation so that they can communicate with each other, and so that all controllers can be accessed using PC through the **Access Point** controller. Details are found on your custom wiring diagrams.

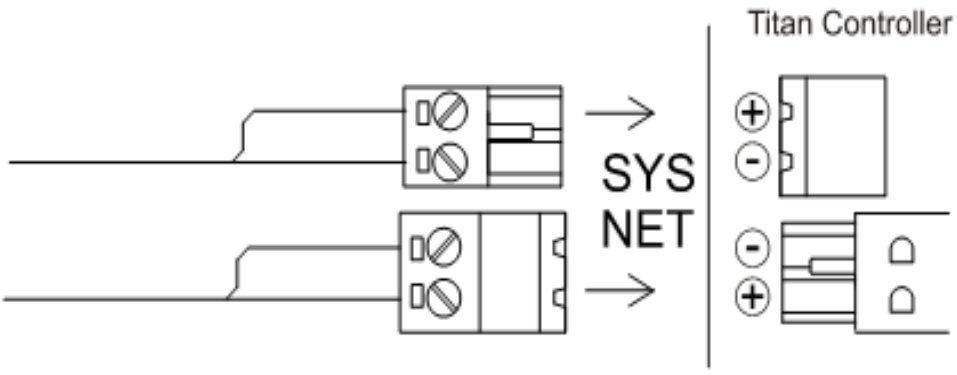
The System Network uses a twisted pair cable (Aquaseal AQ224) that connects to each Titan controller, enabling them to share information (for example, weather station readings) as well as providing centralized PC access for settings, current status, and recorded data.

Network Terminators are supplied for the end of each wiring run. The location for each of these terminators is displayed on your wiring diagrams. **Make sure you use the specified wire and install the network terminators as noted on your diagrams**.



***Aquaseal AQ224 Communications Wire***

An 'In' and 'Out' System Network terminal connector is supplied with each controller to be used when connecting the network cable. These connectors can also be joined together should you ever need to temporarily bypass a controller module.




***System Network Terminal Connectors***

If you have a system with a large number of controllers, your system may be divided into Domains using Ethernet domain bridging.

Follow the wiring diagrams provided with your system for connecting the controllers.


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# Wiring the Titan I/O Network

The Titan I/O network connects Titan I/O modules to each controller on your system.

It also connects **I/O Power Supply** (IOPS) units that provide the power and communications for the I/O network and the controller they are connected to.

Because of this, it is often necessary to connect the I/O network before the controllers can be powered up.

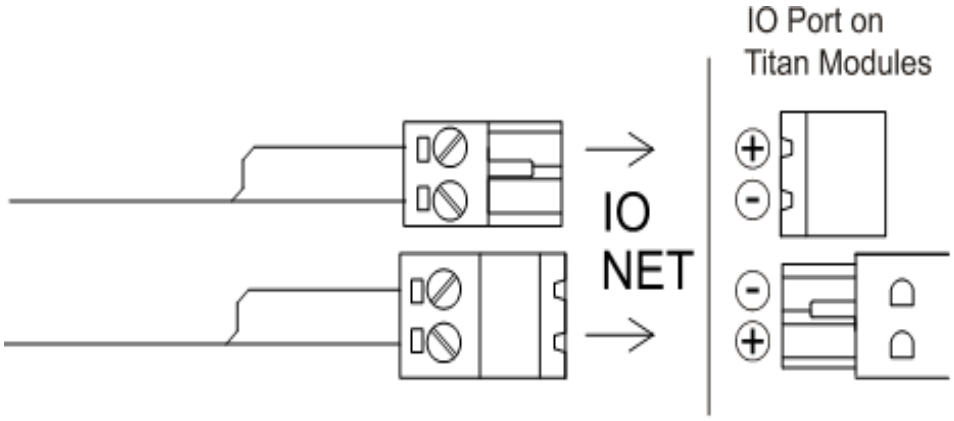
Make sure you use the specified wire and install the network terminators as noted on your diagrams.



***Aquaseal AQ224 Communications Wire***

An 'In' and 'Out' I/O Network terminal connector is supplied with each controller.

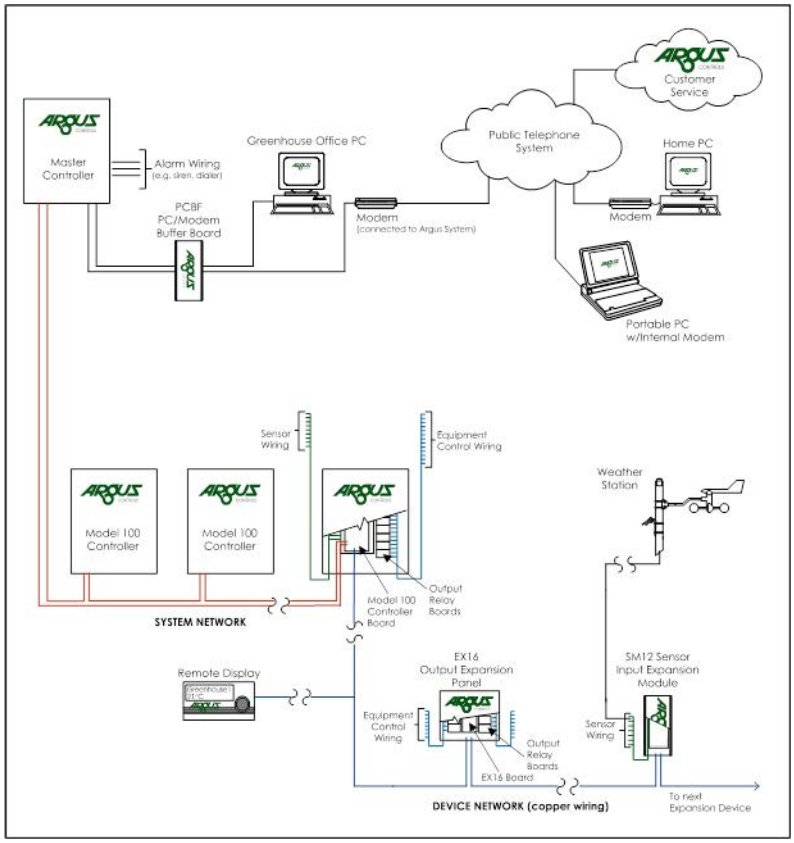
These connectors can also be joined together should you ever need to temporarily bypass an I/O module.




***I/O Network Terminal Connectors***


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# Wiring Classic I/O Network or Other Serial Communications Equipment




This step is only required for situations where you are upgrading or expanding an existing Classic CL100 system with Titan controllers or if you connecting non-Argus serial communications devices such as Modbus RTUs or ebmBUS fans.

If you are not connecting any of this equipment you can skip this step.

An Argus ISODN (Isolated Optical Device Network) card is required for interfacing with Argus Classic hardware and other serial communications devices.

**Argus Classic hardware** consists of **CL100, X100, EX16**, and **SM12** hardware modules.

All CL100 controllers are converted to X100 I/O modules as part of the Titan conversion process.


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Unlike the Titan System Network and Titan I/O communications networks, the Classic communication network uses a **twisted pair shielded** cable, and module power is supplied by external 24 VAC adapters.




Only one type of communications protocol can be supported on the serial interface (Argus Classic, Modbus, ebmBUS, etc.)

**Your wiring diagrams provide details of how to re-connect your existing equipment.**

You need to make some changes to your existing wiring since the old system network loop between CL100 controllers are no longer used, and each CL100 is converted into an X100 expansion module and wired into the Classic I/O network.

Follow the instructions on your wiring diagrams to complete this step.


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# *Step 9 – Connecting Sensors and Controlled Equipment*

## Connecting Sensors



Once each I/O network is operational, you can proceed with wiring the sensors as per your wiring diagrams.

Be sure to connect each sensor to the correct input terminals, since they have already been pre-assigned and configured for these inputs in the controller software.

Once connected, you can verify operation in the operator program by navigating to the screens that display sensor readings. Any sensors that are not yet connected, or are incorrectly connected, display as **FAILED**.

When all of the sensors have been connected they are checked by your Argus service technician as part of the on-line commissioning process.




If you are connecting sensors that have not been supplied by Argus, please contact Argus Support to confirm they are compatible with your system.


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# Installing Aspirated Sensor Enclosures




Sensor aspirators must be hung in representative locations in the environment, where they can measure the average conditions. For greenhouses, this location is usually close to the growing part of the crop.

Avoid placing them too close to heating or cooling sources (For example, not directly under the opening of a vent), but they should still be able to experience and measure changes to the environment caused by these devices.

Aspirated sensor modules should be located so that the air inlets and air outlets on the bottom are unobstructed and the unit draws air from the location you wish to measure. Avoid extremely wet locations.

Fans fail prematurely if exposed to free water for prolonged periods of time. Use a chain to suspend the aspirator from a structural member using the eyebolt on the top of the aspirator. You may tie-wrap the low voltage cable to this chain. Do not hang the aspirator from the control wiring.

The enclosure housing is designed to reflect most solar energy and reduce internal temperature gain. For aspirated enclosures, the fan cools the sensor compartment further by carrying away residual solar heat gain and introducing a fresh stream of sample air.


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The sensors are located in the air inlet stream and measure actual air and wet-bulb temperatures.Depending on the type of sensors you are using, guard sensors may be located near the top of the housing where they can measure higher temperatures caused by solar heat gain should the fan fail.

An alarm can be set to alert the operator of fan failure if the temperature difference between the guard and air temperature sensors is greater than approximately 3 - 4 °C. This does not detect all failure conditions, so fan operation should be checked monthly.

We recommend you use a single, multi-conductor cable with an outer jacket to ensure a waterproof connection to the aluminum housing through the supplied compression strain-relief clamp. See your wiring diagrams for full details.

## Weather Station




***Typical Weather Station (Yours may vary)***

The Weather Station mast (containing a light sensor and optionally, wind speed, direction, and rain detection sensors) should be mounted in a location that is not shaded by anything (For example, the south peak of the boiler room roof).

Ideally it should be located in a position where a nearby taller structure, such as a power pole, providing some indirect protection by acting as a preferred ground for lightning strikes. We recommend that lightning rods (or some other form of protection) be installed if a protected location cannot be found.

Although it is usually convenient to mount the weather station mast on the greenhouse roof or a pole nearby, keep in mind that the proximity of the greenhouse tends to produce outdoor readings that are not the same as readings at local airports or other meteorological stations.


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This small divergence is fine for control purposes provided you avoid mounting the station near exhaust vents and chimney stacks, and make sure it is mounted high enough above the roof peaks for accurate wind speed and wind direction sensing.

As an added consideration, locate the weather station in the opposite direction from the prevailing winds if it has to be mounted on a boiler room rooftop. This helps prevent contamination from products of combustion from boiler stacks from reducing the life of wind direction and rain detection sensors.

Outdoor temperature sensors should be mounted 4 feet above the ground in a location that is shielded from direct sunlight and any other heat sources (for example, the north side of the boiler room). This temperature information is used extensively for climate control, so it is important that it measure outdoor conditions as accurately as possible.

For a more formal weather station application, comparable with national standards, temperature and optional humidity sensors can be mounted in a Stevenson screen.

The Wind Direction arm must point **north** as indicated by the label on the arm.

The light sensor is at the top of the weather station. The mast must be mounted vertically for maximum accuracy of light readings.

Use a level to ensure proper orientation.

## Pipe Temperature Sensors



Pipe Temperature sensors (required for hot water heating systems) should be mounted at the appropriate positions on the heating pipes.

Argus offers a variety of pipe sensors including surface mounted and wet-well types. Any of these can be used at any location.

The illustration below shows wet well, dry well, and surface-mount strap-on sensor options.


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As an alternative to wet or dry sensor wells, which must be welded or tapped into the pipes, temperature sensors can be surface-mounted by tie-wrapping the final 1.5 inches of the sensor (use at least 2 ties) to the side of a horizontal section of the pipe, or anywhere on a vertical section of the pipe.

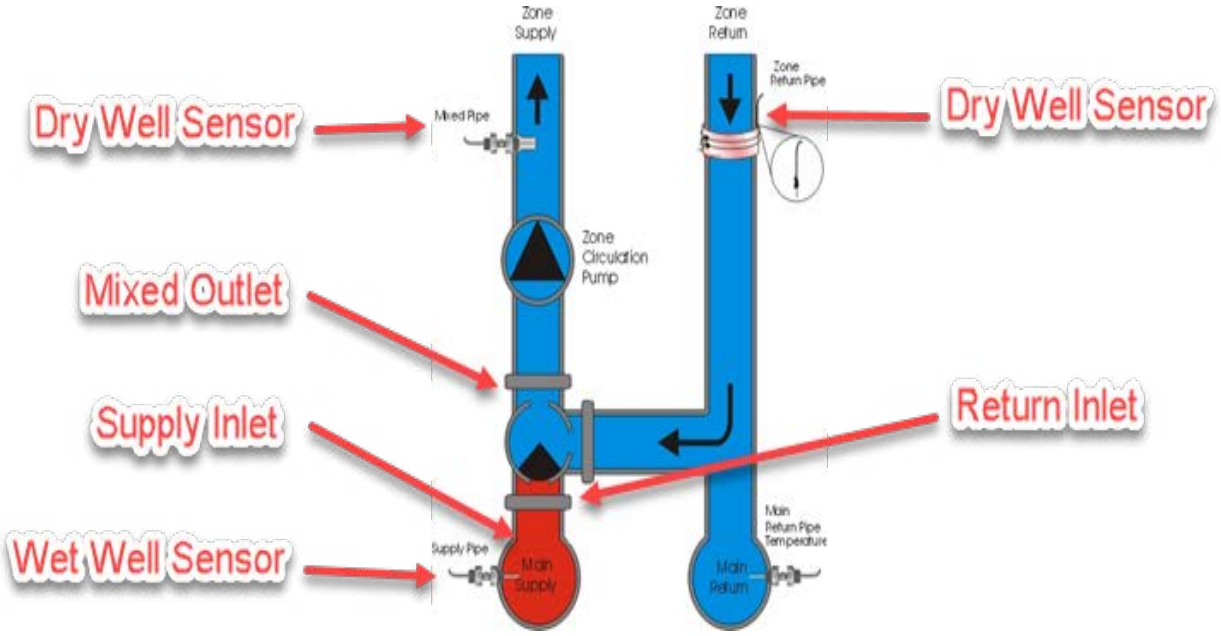
A section of pipe insulation (extending at least 1 foot in each direction) should cover the sensor.

This section should be easy to remove to simplify troubleshooting and sensor replacement. This mounting system may result in temperature readings that are slightly below the actual water temperature, but the quality of control is not affected.

Although dry-wells are not required for most installations, pipe temperature sensors can also be mounted in them at the appropriate locations in the heating system. For the best performance, thermal grease should be used to improve thermal bonding to the heating pipe.

**For mixing valves**, the **Mixed Pipe Temperature** sensor should be placed no more than 10 feet and not less than four feet from the outlet of the mixing valve.

An optional **Zone Return Pipe** sensor is useful for monitoring the zone loop temperature drop. This can be helpful in diagnosing heating system flow problems.




***Pipe Temperature Sensor Locations and Temperature Sensor Options***

**Supply pipe temperature sensors** should be mounted on the pipe supplying the hot water to the mixing valves, normally near the boiler before any distribution headers. If the supply water is from a transport loop, the mixed pipe temperature sensor for the transport loop mixing valve should be used as the supply pipe sensor for the zone mixing valves.


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If the Argus system is directly controlling the boilers, there should be a boiler temperature sensor located as close to the boiler outlet fitting as possible.

**Main return pipe temperature sensors** should be mounted on the pipe returning cold water to the boiler(s) between the return header and the boiler after the last tee in the return line.

This placement ensures that the sensor is exposed to the same water temperature that is returning into the boiler. This is important because the sensor is used to protect non-condensing boilers from thermal shock. In particular, if there is a shunt pump on the boiler, put the sensor on the boiler side of the shunt tee into the return line.

## Connecting Controlled Equipment

Your custom wiring diagrams contain detailed information for wiring each of the controlled outputs. Argus has pre-wired all connections that start and end within a single panel. All connections to destinations outside the panels must be performed on site. **Use a qualified electrician for all line voltage loads and equipment.**

The Titan control system uses **dry contact relay outputs** to switch **low voltage loads only**. To energize these low voltage loads, an external load power supply must be provided to switch through the Argus outputs. For example, when switching low voltage irrigation valves, an external transformer is required to power the valves. For this type of application, the Argus relays on the I/O module can be used to directly open and close the circuits.



**For line voltage applications, (120 VAC and above) all devices must use a low voltage relay circuit between them and the Argus output module.**

**Check local electrical codes when installing wiring between the Argus controllers and field equipment. Check for minimum wire sizes and proper insulation types suitable for greenhouse (damp) conditions.**

Connecting anything other than an Argus load module to the controller could damage the main board and voids your warranty.

Argus relay modules are used for operation of control circuits and loads of 24 Volts at 4 Amps maximum. **Do not use these outputs to directly control 120 or 220 VAC power circuits or they will be damaged!**


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# Physical Wiring & Output Testing

This step involves wiring and testing the output control circuitry independent of the control system before placing them under automatic control. This is done by operating the physical overrides on the output relays connected to each I/O module.




Some output relays such as the D8 may not have physical overrides. These wiring connections must be tested using a meter, an independent ON/OFF switch, or by using the control system software. Contact Argus for details.

1) Set all physical override switches to **Manual Off** or **Manual Closed** etc. for each output module. This is to ensure that the equipment does not operate accidentally when the circuit is energized.

2) Connect the loads (for example, lights, fans, relays, contactors, motor starters, irrigation valves, or mixing valve motors) to the destinations as displayed on the supplied wiring diagrams.



**The equipment to be controlled may come with its own wiring information, and wiring options (for example, separate wires for single phase or 3-phase etc.).**

Call Argus if you need assistance connecting the equipment to your control system.

Wiring errors, torque overloads, “single-phasing”, and other problems frequently result in motor damage, particularly during installation. For these reasons, it is important that all line-voltage motors have overload protection. Many single-phase motors have internal overload protection and do not require additional protection, but three-phase motors require an external overload device.

**Install and adjust the overload protection before you operate the motor!**

Under no circumstances should you bypass or modify any of the limits, time delays, or other safety devices in your controlled equipment. Severe mechanical damage or personal injury could result.

3) Turn the power on at the circuit breakers for each equipment device being controlled by the system. (No equipment should operate at this time since the manual control switches have been set to “Manual Off” in Step 1).


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4) Verify that each piece of equipment operates correctly by using the manual override switches mounted on the I/O module output relays.



**Make sure that you can safely operate the equipment (for example, pumps should not be run while dry, nothing should be blocking the full travel of a vent or shade system, etc.). Also make sure all personnel are aware that equipment is starting and stopping without warning!**

Refer to the system drawings when you do the manual switch test to verify that the correct equipment is connected to each output. Your system has been pre-configured based on these drawings. **Hazardous operation of equipment may result if devices are connected to outputs other than those indicated on the drawings.**

5) If the equipment is a vent, mixing valve, shade system, or other proportional device controlled by time, write down the length of time it takes to move from fully closed to fully open. This time is entered as the Full Movement Time in the installation screen for each equipment program.




The travel limit switches for vents and shades may need to be set by the equipment installer. In some cases, you are not able to properly complete the manual switch test until this is done.

If the installation includes a mixing valve, do not trust the open and close markings on the valve since some piping arrangements may reverse these functions.

At the I/O module, set the mixing valve's relay to Manual OPEN and set the pump relay's D2 switch to manual ON. Verify that hot water is being supplied to the compartment. Next, Set the mixing valve's P1T relay to Manual CLOSE and leave the pump ON. Verify that hot water is no longer being supplied to the compartment.

After each piece of equipment has been checked, set all manual override switches back to OFF, or Manual Closed.


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# *Step 10 – Powering Up the System*

We highly recommend you contact Argus to assist you with any initial communication issues. Our technicians can assist you in systematic troubleshooting during this start-up phase.

Once the panels are in place and the System and Network Communication wires have been connected it's time to power up your entire system. This can be done by connecting the 24 volt power supply wires to the I/O Module Power Supplies. They in turn supply the power for the controllers and I/O Modules, as well as communications on each I/O network.

## Verifying Controller operation from the PC

From the home screen on the Argus Server PC, there should be a link to a **Communications** screen. You should see a list of all of Titan controllers and I/O modules that are connected and powered up.

### *About Board ID Codes*

Each module has a unique ID code to identify it on its respective communications network.

For new systems, these ID codes are pre-entered during factory setup and commissioning so you can just wire up your system and turn on the power. For Titan Controllers and IO modules, the Board ID chips are located on the **Back Planes**. This enables you to replace the top boards without needing to change the ID code.

For Classic hardware such as the **X100**, **SM12**, and **Ex16** modules, the board ID chip is located on the modules themselves and must be entered whenever a module is replaced.

If any modules are not communicating you may need to check the wiring or the power status. In the example below, the Access Point is communicating fine, but the other controllers are not, indicating possible wiring problems on the System Network.

Since the **System Network** is needed to communicate with the controllers, you need to make sure it is working properly first, before you can verify proper operation of the I/O networks.

The status LED lights on each module are also useful for diagnosing wiring and communications faults. These are described next.

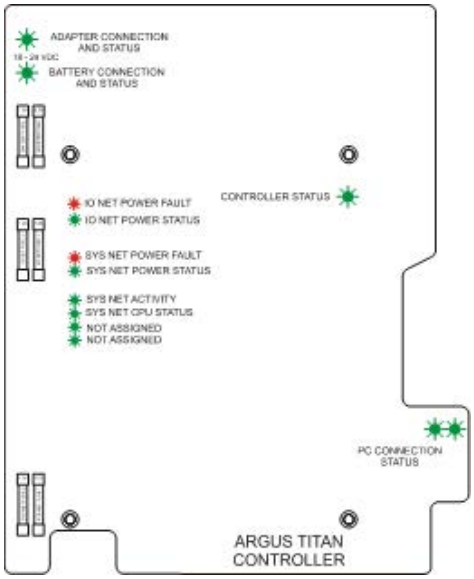
### *Verifying Module Operation at the Panels*

Titan Controllers, Titan I/O Modules, and Classic hardware modules have a number of status LEDs to indicate various operating conditions. See the following pages for an explanation of the LED status lights for each module type.

If the problem appears to be more than a wiring error, you should call Argus for further assistance.


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# Controller Status Lights



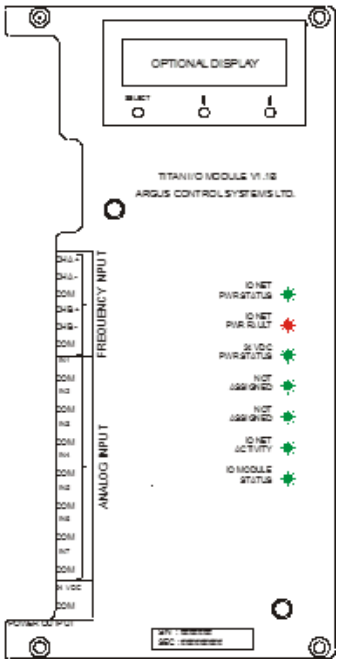

| | |
|---|---|
| ADAPTER CONNECTION STATUS:<br>(Access Point Only) | Green light ON indicates there is power to the backplane from an external adapter.<br>**Note:** Controllers other than the Access Point are normally powered by an **I/O Network Power Supply**. The Access Point controller may be powered by either means. |
| BATTERY CONNECTION STATUS:<br>(Access Point Only) | Green light ON indicates that a battery is connected to the charging circuit on the controller backplane. |
| I/O NET POWER FAULT: | Red light ON indicates that the I/O network is currently powered and the wires are reversed. |
| I/O NET POWER STATUS: | Green light ON indicates, the I/O network is currently powered and the wires are connected correctly. |
| SYS NET POWER FAULT: | Red light ON bright indicates the system network is currently powered by a system network power supply, and the wires are reversed. Note: If the red light is on dim or flickering, it indicates that there is no power supply on the system network. This is not a problem. |
| SYS NET POWER STATUS: | Green light ON, the System Network is currently powered by a System Network Power Supply, and the wires are connected correctly. |
| SYS NET ACTIVITY: | Multi-Controller systems only. Flashing and flickering indicates communications activity between controllers. |
| SYS NET CPU STATUS: | Green Light on indicates the controller is receiving token passes. |


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| | |
|---|---|
| ADAPTER CONNECTION STATUS:<br>(Access Point Only) | Green light ON indicates there is power to the backplane from an external adapter.<br>**Note:** Controllers other than the Access Point are normally powered by an **I/O Network Power Supply**. The Access Point controller may be powered by either means. |
| CONTROLLER STATUS: | Flashing once per second indicates power to the controller and normal operation. |
| PC CONNECTION STATUS: | Lights flash when the PC link port is actively communicating with the PC. |


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# I/O module Status Lights




| | |
|---|---|
| IO NET PWR STATUS: | Green LED is ON indicates that the I/O network has power and the wiring is correct. |
| IO NET PWR FAULT: | Red LED ON indicates that the I/O network has power and the wiring is reversed. |
| 24 V DC POWER STATUS: | Green LED is on steady indicates the +24V Power fuse and +24V are OK. Green LED blinking indicates the fuse is blown or the power supply voltage is low. |
| I/O NET ACTIVITY: | Green LED ON indicates that the controller is receiving messages from the I/O Network. |
| IO MODULE STATUS: | Green LED blinking approximately once per second indicates that the I/O module is operating properly. |
| SECURITY CODE ERROR | If the security code in the software doesn't match the backplane security code, all the LED's go out except for **IO Net Power Status** (ON steady) and **IO Module Status** (blinking once per second). |
| INCORRECT FLASH VERSION | If the flash version in the I/O Module doesn't match the flash version in the controller, all the LED's go out except for **IO Net Power Status** (ON steady), while the 24V POWER STATUS, and both the NOT ASSIGNED LED's blink ON and OFF together.<br>This situation is usually corrected automatically within a few minutes after a new IO Module is installed, or after a Load Flash update to the controller. |


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# Step 11 – Preparing for Commissioning



Before placing your equipment in **automatic** control, you should have your system commissioned by an Argus service technician. Argus then goes on line to confirm all settings and readings and make timing adjustments for calibrating proportional equipment.

At this time:

- All of the sensors and output equipment should be connected and operational.
- All timed mixing valves, vents, and shades are set with factory default “Full Movement Time”. Time your equipment individually using the physical switches on the relay modules, and note the full movement time for each device.
- All vents are capable of windward/leeward limiting to protect your vents and crops against physical damage. This option is available to you but is presently set up for leeward control. Note the directions of each vent system so that they can be properly commissioned.
- All mixing valves have the ability to limit the amount of return water to the boiler during certain circumstances. This option is available to you but is presently not enabled by default. Review this option with your Argus service technician during online commissioning.
- If your system included position sensors, they need to be calibrated once they have been installed. Consult the position sensor operator manual that was supplied with your system.


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You should then call the Argus Service department for help in start-up commissioning and preliminary training on:

- Navigating and using the Argus operator program.
- Reviewing and changing setpoints.
- Proportional device timing.
- Using the alarms, and Data Recording functions to verify that the system is operating correctly.

Before commissioning:

1) Make sure all of the output relay control settings in the I/O modules are set to **Manual OFF** or **Manual Closed**.
2) **When instructed by Argus**, set the physical output switches on the Argus output modules to “auto”.

After commissioning, keep a close watch on the control system for the first few days to make sure operation is correct.

**Contact Argus immediately if you have any problems or questions**.

Always make sure that you have a properly functioning alarm system to alert you to any critical problems.


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# Titan 2 System

## Description Guide




*February 28, 2022*

# Titan 2 System Description Guide

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# TITAN 2 SYSTEM DESCRIPTION

## *Introduction*

The Argus Titan Control System™ is a user-programmable, distributable, real-time control system with dedicated hardware and software. It has been specifically designed for automated equipment control, monitoring, and data acquisition in commercial and institutional protected horticulture production settings. It also has many applications in general climate control, irrigation management, and nutrient control situations.

The system gathers input information from sensor devices such as temperature, wind speed, tank levels, pH, vent position, humidity, light, $CO_2$ etc. It then uses this information, in conjunction with sophisticated internal algorithms and user-defined parameters to control target processes such as air temperatures, $CO_2$ concentrations, humidity, soil moisture, and nutrient levels supplied by irrigation.

The system is highly modular and expandable, so you only purchase the components you need when you need them. Since the hardware components can be located nearly anywhere in your operation, you can substantially reduce the total length and cost of low and line-voltage wiring runs (when compared to more centralized control systems) for your sensors and controlled equipment.

The Argus Titan Control system is designed to provide the highest degree of durability, reliability, and flexibility in both hardware and software for achieving powerful control objectives. Wherever possible, critical control functions are designed to be failsafe.

In cases where the physical design of the controlled equipment does not allow failsafe or fail-soft design, we provide appropriate user configurable alarms combined with a fallback to manual override control for additional safety.

Titan systems are custom configured by Argus to your exact requirements, with a custom set of software navigation screens that match the names and layout of your controlled equipment and locations.

One of the strengths of the Titan system is the modular building block approach that we use to configure our control applications. With it, we can construct increasingly sophisticated applications by combining simpler generic control modules. The end result is shaped into the custom applications that you use for day-to-day control.

If at any time your requirements change, we can usually adapt the control logic by simply reconfiguring the underlying control programs to suit your new requirements. In most cases there is no need to revise or recompile the underlying program code to accomplish this.


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This ability to rapidly and economically adapt our software to your changing requirements helps set the Argus Titan system apart from our competition.

## *The Argus Advantage*

The Argus Titan Control System™ is designed to provide the following benefits:

- Powerful and flexible control capabilities.
- Maximum system reliability and stability.
- Full-featured equipment automation complete with safety limits and overrides tailored to each application and the capabilities of the equipment under control.
- Distributed processing hardware for improved on-line redundancy and deployment flexibility.
- Modular ‘plug-and-run’ hardware design.
- Easy ‘no wire’ module replacement courtesy of the included backplane design.
- Self-diagnostics and simplified troubleshooting.
- Fully integrated monitoring and alarms.
- Flexible, high-end data filtering and data logging capabilities.
- Full-featured graphical trend analysis tools.
- Minimal on-site wiring costs.
- Superior electrical isolation and lightning protection.
- A variety of integrated panel and line voltage interfacing options.
- High-resolution sensor measurement and accuracy.
- Simplified, economical sensor interfacing.
- Full remote operation capabilities and support using on-line system access.
- Minimal requirement for on-site service.
- A fully customizable user interface.
- Extensive password protection and configurable user permissions.
- Cloud based email notifications and reports.
- Comprehensive service and support direct from Argus.


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# *Three Complete Systems in One*

The Argus Titan system provides the capabilities of three full featured management systems in a single platform:

## A Real-Time Equipment Control System

The system gathers continuous input information from sensor devices (temperature, wind speed, tank levels, pH, vent position, humidity, light, $CO_2$, soil moisture etc.).

It then uses this information, in conjunction with sophisticated internal programs and user-defined control parameters to automatically operate the equipment under its control.

Integrated control enables the coordination of multiple equipment systems, and the possibility of a variety of control strategies for each device.

Systems are engineered to meet the specific requirements of each *application* while providing automatic compensation for the effects of weather and other dynamic environmental variables.

This reduces the need for *constant* human monitoring and adjustment.

## A Data Recorder

Whether you need data recording for general management purposes or as an integral component for research, the Argus Titan system provides extensive data collection capabilities.

Each system functions as a complete user-configurable recorder that can be used for collecting, displaying, and analyzing real-time and historical data in graphical, tabular, and summary formats.

All collected data can be viewed online, from any location as well as exported to other applications for further analysis.

The Titan system's unique data filtering and compression methods make it possible to record thousands of items at selectable sampling frequencies, including all sensor readings and equipment positions.


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## An Early Warning Alarm System

The word Argus is synonymous with watchfulness. It comes from the many-eyed creature of Greek mythology who, even as he slept, could always keep at least one eye open. Accordingly, we have always included monitoring and alarm features as an integral part of our systems.

You can monitor virtually any measured and controlled condition and configure the appropriate alarm logic, thresholds, and annunciation methods.

Not only can you use the system to watch over its own controlled processes, but any measurable conditions within your operation.

Your system arrives with many pre-configured alarms. You can also configure as many additional alarms as you need. Selectable alarm priorities and annunciation methods enable you to set some alarms to warn you immediately of critical conditions such as low or high temperatures, and other non-critical alarms for management purposes, such as tracking the operational hours of controlled equipment for preventative maintenance purposes.

You can even configure ‘smart’ alarms that warn you only when a combination of events occurs.

For example, if you lose heating ***and*** there are low temperatures outside you can set a critical alarm to alert someone immediately. On the other hand, if there is a heating system problem while the temperatures are warm outside, you might want to set this as a non-critical alarm (so no need to get someone out of bed!).


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## *Integrated Control Benefits*

Argus Titan systems are specifically designed to provide facility-wide equipment control and monitoring. This offers the convenience of managing all your major climates and equipment systems from a single, unified program interface.

It enables you to provide the most uniform and precise control for your situation. Central management is not only much more convenient, but it can be more accurate and safer due to the many built-in self-diagnostic and alarm monitoring features of the system.

With integrated control, you can coordinate the operation of all equipment and zones. You can even use single equipment systems for more than one purpose.

For example, ventilation systems can be used to control both humidity and climate temperature. Integrated systems are engineered to meet the specific requirements of each zone while providing full compensation for external events such as outdoor weather conditions. This substantially reduces the need for constant human monitoring and adjustment.

Integrated control also ensures that all your greenhouse equipment operates effectively, efficiently, and in harmony with other control processes. By using advanced control strategies such as energy balance and “feed-forward” control intelligence, Argus Titan systems anticipate and respond to rapidly changing climate conditions ***before*** negative deviations occur.

When all of the major equipment systems are controlled from the same platform, equipment conflicts are prevented and you can easily combine the effects of multiple systems to accomplish common control objectives.

You can specify the exact operational parameters that ensures all your equipment systems operate in a coordinated manner, and you can observe the results with our built-in data recording and analysis tools.

The major advantages of integrated control include:

- Increased precision in monitoring and equipment control.
- Smoother, more uniform growing conditions.
- Better crop quality and uniformity.
- Maximum energy and irrigation efficiency.
- Reduced equipment operation and wear.


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## *Argus Customers*

Our major customer groups include:

- Professional greenhouse and nursery growers.
- Researchers
- Facility managers.

Our systems are ideally suited to:

- Commercial greenhouses and nurseries.
- Biotechnology research facilities.
- Aquaculture facilities
- Aquaponics Facilities
- Conservatories
- Teaching institutions
- Any situation where precision climate and water management are required.

All Argus systems feature quick and easy configuration to match your requirements.

They are designed to maximize the performance of all types of properly engineered and installed equipment, enabling you to select the equipment that is best for your existing situation and your future needs.

Whatever your control needs, our flexible programs can be adapted to your situation. In addition to standard greenhouse automation, the Argus Titan system is used in many special applications for research, educational, and commercial purposes.


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Examples include:

- Building HVAC equipment operation.
- Butterfly conservatories and insectaries.
- Tanks, reservoirs, and recirculation ponds.
- Bulb curing rooms.
- Amphibian enclosures
- Mushroom barns
- Vegetable storage
- Cogeneration systems.
- Geothermal heat recovery.
- Temperature controlled rail cars.
- Cold rooms and freezers.
- Bulb and seed curing rooms.


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# FULL SYSTEM CONFIGURATION

**Argus systems are fully configured by Argus for your applications.** We typically provide systems for commercial and institutional applications where a specific set of control requirements has been specified. We engineer each systems to provide an exact fit for your needs.

We supply everything required to automate your operation. This includes all:

- Control hardware, power supplies and communications equipment.
- Sensors
- Line Voltage interfacing panels and equipment (optional).
- Nutrient injection equipment (optional).

Line voltage interfacing is also available in separate or integrated panels. Typically, the only items you need to supply are a PC for operator access, and the interconnecting wiring between the control panels, equipment, and sensors.

Once your system is configured and operational we back it up with our legendary on-line service and support.

We provide complete instructions and detailed wiring diagrams for easy installation. Since your system is custom configured to match your operation, you can begin using it immediately after commissioning.

All control information and settings are presented in plain language and there is no programming required and no computer languages to learn.

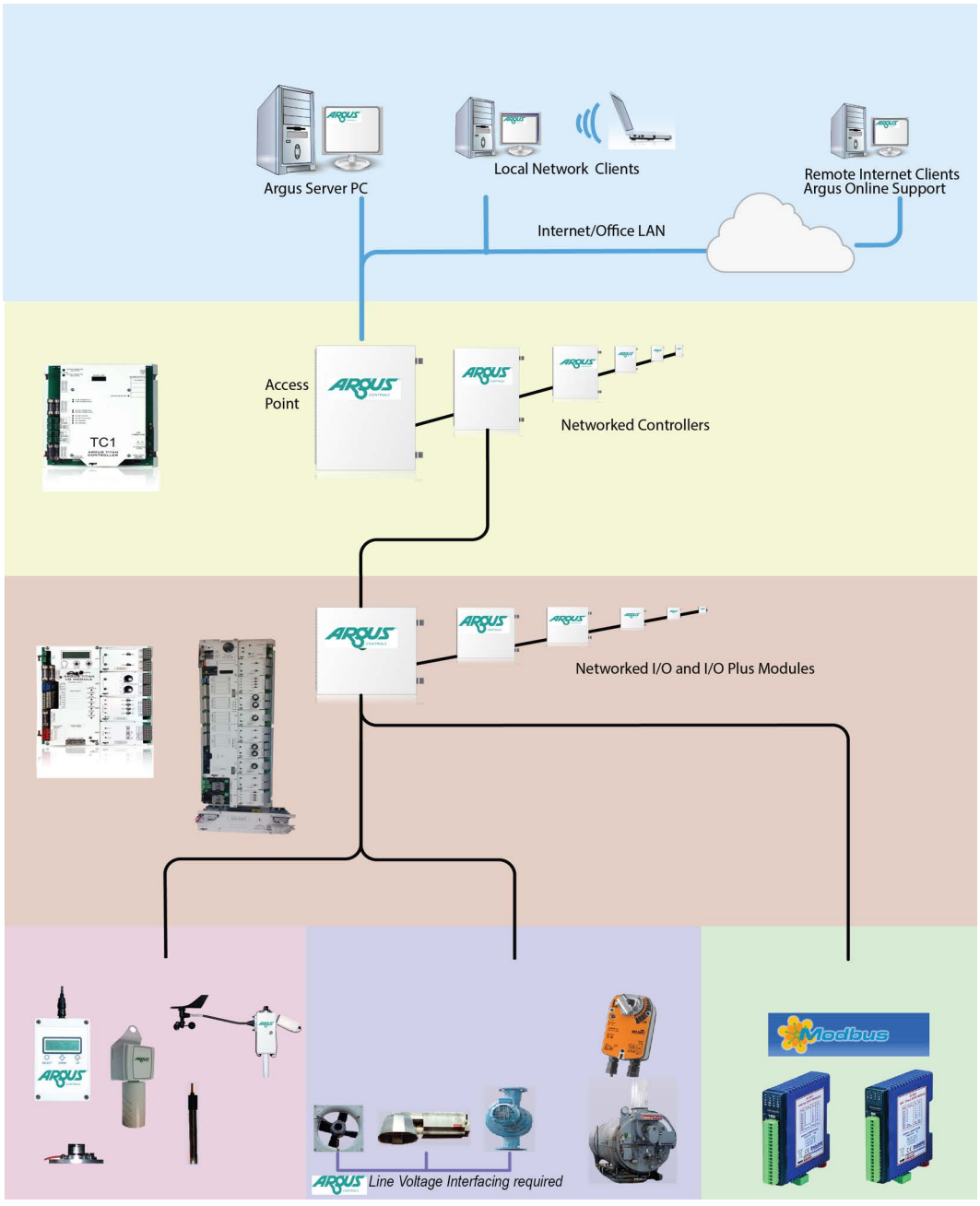
Although, your system may arrive fully configured, that doesn't mean that it's frozen in time. As your requirements change, your system can be modified or expanded as needed.

Our highly flexible modular design makes it easy to add new capabilities in small economical increments.


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# ARGUS TITAN SYSTEM HARDWARE

This section describes the main components of your control system. Although each control system is configured to your specific needs, certain components are common to most Argus Titan systems.





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Typical hardware components include:

- Argus Server PC (often sourced locally).
- Argus Titan controller(s).
- Titan I/O modules.
- Sensors
- Output control relays.
- Line voltage interfacing equipment (can be provided by Argus or locally sourced).
- Power supplies
- Lightning ESD Protective Equipment




With the exception of Argus Multi-Feed nutrient injection systems, we generally do not provide controlled equipment such as vent motors, pumps, irrigation valves, etc.

Controllers and I/O modules are designed to be distributed to where the action is. They can be located very close to the equipment they monitor and control, and are designed for a wide range of environmental conditions.

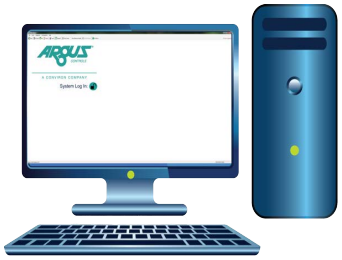
In many cases this can substantially reduce low and line voltage installation costs when compared to centralized control systems where all wiring must be run to a single location.

System network wiring consists of inexpensive, easy to install twisted pair communications wire, and system installation is simple and straightforward.

This distributed network of controllers is treated as a single system. The activities of individual controllers can be coordinated to accomplish cross-module control objectives such as irrigation and the efficient distribution of heat from a central supply.


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## *Argus Server PC*



Titan systems require a PC to be used as the **Argus Server PC** at the **Access Point** controller location. Other remote PCs can also connect to the control system *through* the Argus Server PC using an Internet connection.

Argus provides the software for these operator access options. This PC should be left running continuously for the best operating performance, uninterrupted remote system access, and to facilitate the automatic transfer of recorded data from the controllers.

It should also be used primarily for accessing and managing your Argus system.

A PC is connected to the Titan Access Point Controller and designated as the **Argus Server PC**. Argus provides proprietary software for using this PC to:

- Provide Operator Access to the connected control system.
- Save archival data and back up control system settings to the PC hard drive.
- Serve Argus data to other PCs connected as Argus clients using an internet connection.


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# Argus Server PC Specifications

For any Server that is going to be used by a large customer as an Argus Host, the following minimum requirements should be met:

| | |
|---|---|
| **Ram** | <20 controllers - 8GB is sufficient for systems with less than 10 controllers.<br>21+ controllers - 16GB |
| **Processor** | Intel Core i7 (or AMD equivalent) or better. |
| **Hard Drive** | <20 controllers - 500GB SSD* drive<br>21 - 49 controllers - 1TB SSD* drive<br>50+ controllers - 2TB SSD* drive<br>* **SSD** stands for **Solid State Drive**, PC storage that is much faster than a regular hard drive. An SSD is able to read and write data much faster than a mechanical hard drive, at least 3 times as fast as conventional hard drives. |
| **OS** | Windows Professional 7, 8 or 10, or Windows Server 2008, 2012, or 2016. |
| **Additional Features** | Persistent internet connection with static IP address required. USB, keyboard, mouse, video, and sound. |
| **Monitor** | 24" HD (1920 x 1080). |
| **Other** | Internet connection is required.<br>A Network card (NIC) or Ethernet card is required for any Argus system.<br>A second Network or Ethernet card is required for additional networks/HVAC networks and for the Field Server. |




**Notes:**

Performance may suffer on machines with slower processors and **less than 8GB of RAM**.

While the Argus software is generally very efficient in terms of bandwidth, it may be affected by very slow internet connections.

PCs that are connected as remote clients can generally provide satisfactory performance with lesser performance specifications than the Argus Server PC.

Running the Server on a **Virtual Machine (VM)** is possible, but realize that a VM can be sharing physical hardware with other VMs and can cause it to slow down. It is not recommended to run large systems on a VM.

**At least one user on the Argus Server PC needs administrator privileges to start and stop the Argus software.**


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## *Support*

Argus provides support for the Argus software as originally purchased.

Argus does not provide support for the **configuration**, **maintenance**, or **backup** of the Host PC.

Ensure that your Server PC is adequately supported by a **local certified supplier** and follow their configuration, maintenance, and network installation instructions.

In general, the Argus Server PC specifications listed above for an Argus system with less than 10 controllers provides good performance as a Client PC.




While the Argus Client/Server software is generally very efficient in terms of bandwidth, it may be affected by very slow Internet connections.

Windows RT is not supported.


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# *Argus Thin Client*



The Argus Client is only used with **Versions 800 and 8.20** or above.

The Argus Client is used to connect the Argus Client software to the Argus Server at an Argus site.

An Argus Server PC must already be running at the site and connected to the control system before making a Client connection.

## Argus Client Specifications

For any PC that is going to be used as a Client for connecting to the Argus software, the following minimum requirements should be met:

| | |
|---|---|
| **Ram** | <10 controllers - Minimum of 4GB.<br>11+ controllers - Minimum of 8GB |
| **Processor** | <10 controllers - **Intel Core i5** (or AMD equivalent) or better.<br>10-30 controllers - **Intel Core i7** (or AMD equivalent) or better.<br>30+ controllers - **High End Intel Core i7** (or AMD equivalent) or better. |
| **Hard Drive** | <10 controllers - 200GB<br>10-30 controllers - 200GB SSD drive<br>30+ controllers - 200GB SSD drive |
| **OS** | Windows Professional 7, 8 or 10 or Windows Server 2008, 2012 or 2016. |
| **Additional Features** | Persistent internet connection with static IP address required. USB, keyboard, mouse, video, and sound. |
| **Monitor** | 24" HD (1920 x 1080). |

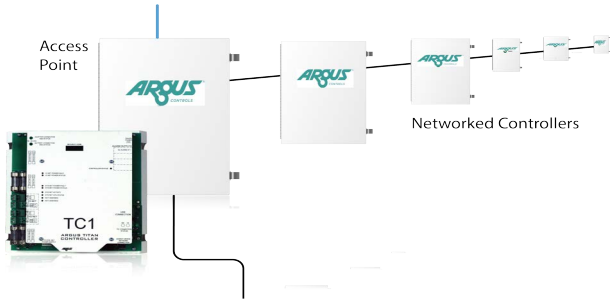
Performance may suffer on machines with slower processors and less than 4GB of RAM.

While the Argus software is generally very efficient in terms of bandwidth, it may be affected by very slow internet connections.


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## *Access Point Controller*




Each Titan system starts with an Access Point module, usually located near and connected to the Argus Server PC used for operator access.

The Access Point is equipped with a Titan controller and components to facilitate Ethernet connection to the Operator PC, external alarm output relays, an automatic alarm dialer, a battery for emergency backup power, and power supply circuitry for operating the controller and the first segment of the connected I/O Communications Network.

The Access Point features all the control capabilities of a standard Titan controller, and on smaller installations, may be the only controller required. Additional controllers are added using Argus System Network communications cabling or Ethernet connection.


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# Access Point Features

| |
|---|
| **Easy Connection to the PC** – Access Point controller includes a fast Ethernet connection to the Argus Server PC. |
| **Battery Backup and Smart Charging circuitry** – A 12-volt battery provides emergency power for alarm annunciation and external communications with the access point during power outages. |
| **Alarm Outputs** – Controller back plane is equipped with four alarm outputs used to provide alarm signals to external annunciation devices such as sirens, lights, or alarm dialers. |
| **Industrial Ethernet -** A Phoenix Contact switch is mounted inside the enclosure to connect to the Argus Server PC |
| An Ethernet **surge protection** device is included to protect the Access Point. Space is also provided for additional surge protection devices if required. |

# Access Point Specifications

| | |
|---|---|
| **Enclosure** | Argus part: **SUB-CL100/NBP**<br>UL type 12, white powder coated aluminum |
| **Enclosure Dimensions** | 22.5” x 18” x 4” (H x W x D) |
| **Titan Controller** | Argus part: **TTN-CONT-2.0** (includes Ethernet adapter daughter board) See Controller Specifications below. |
| **Controller Back Plane** | Argus part: **TTN-CMBP-1.8** |
| **Power Supply** | Argus part: **TC-IOPS-1.4** (Titan I/O Network Power supply) |
| **Battery** | Argus part: **TTN-CONT/BBU**<br>12 Volt, 7 Amp-Hour sealed lead-acid. |
| **Line Voltage Transformer and Fused Terminal Block** | Argus part: **RCC-TX75/TITAN**<br>Input voltage: 120 VAC (line voltage wiring must be supplied to the panel)<br>Output Voltage: 24 VAC, 75 VA |


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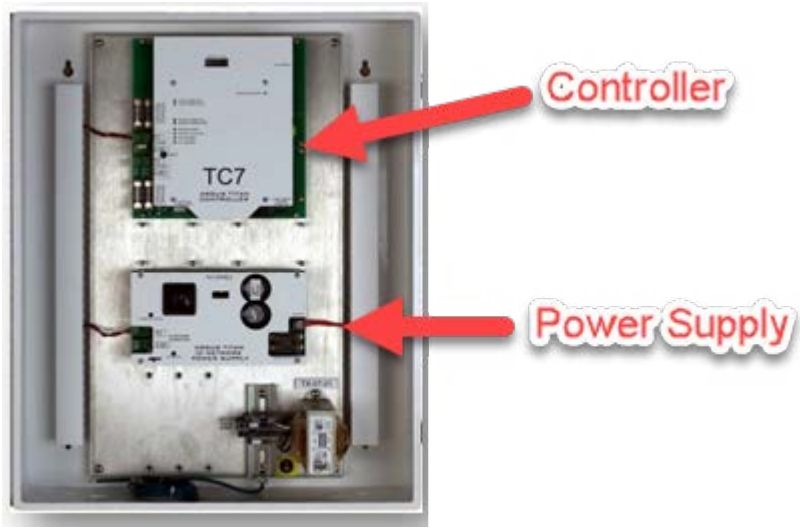
| | |
|---|---|
| **Alarm Auto-dialer** | Argus part: **TTN-AVD45-c** automatic voice pager/dialer |
| **Controller System Network and I/O Network Cable** | Argus part number **CAB- 2C18G/TITAN** (West Penn Wire - AQ224): a 2-conductor 18AWG (18-gauge) UV UTP (Unshielded Twisted Pair) and moisture resistant cable suitable for indoor/outdoor use and is direct burial and wire tray-rated. **NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION.**<br>**Note:** Controllers can also be connected using **CAT5 Ethernet** pathways. The **I/O Device Network** must use the Aquaseal AQ224 Cable. |

## *Titan 2 Controllers*

Additional controllers on the Titan system use a **Basic Controller** configuration. This consists of a Titan Controller on a standard Back Plane with a plate to facilitate mounting into Argus panels




A complete controller assembly mounted in a separate enclosure is also available. Basic Controllers do not have alarm contacts, or battery charging circuitry.




Each Titan controller consists of a powerful 32-bit RISC processor with a nonvolatile memory area for program storage. The extensive program features provide the most advanced flexibility and control capability in its class.


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The job of each controller is to:

1) Process information from the sensor inputs located on various connected I/O modules.
2) Execute the on-board control programs according to your current settings.
3) Make equipment control decisions for operating the physical outputs located on various connected I/O modules.

There are no on-board sensor inputs or equipment control outputs on the Titan controllers. All connections to the physical world are performed on one or more slaved I/O modules that perform the input sensing and output signal operations for each controller.

This provides the highest degree of control safety, isolation, flexibility, and economy.

Almost any type of equipment can be controlled, including hot water mixing valves and pumps, gas-fired unit heaters, exhaust fans, air circulation fans, modulating vents, thermal and photo period shading systems, HID lighting, CO2 enrichment, crop irrigation, nutrient mixing systems, HVAC equipment, etc.

Titan controllers are typically housed in powder-coated, white, heat reflecting aluminum enclosures, with a hinged, gasketed door that provides a dust and drip-proof seal. They may be mounted alone, or in combination panels along with input/output hardware such as Titan I/O and modules, line voltage interfacing, and power distribution. The enclosures are suitable for mounting in almost any location, but should be protected from extreme heat and weather.

In areas subject to frequent dripping, we recommend the installation of a protective drip shield above the enclosures.

Titan controllers perform all of the control processing functions for the system. Depending on your needs, your Argus system uses at least one, and perhaps dozens of Titan controllers. These dedicated, interconnected, supervisory control computers can be distributed about your operation as the need requires.

The system network is self-configuring and self-monitoring.

All control programs are stored in and executed from the controllers. When you use the Argus Operator program to access your system, you are communicating with the controllers. When you are not on line, the Titan controllers automatically operate your controlled equipment in accordance with your settings.

For maximum safety and redundancy, Titan controllers can operate independently from one another, and independent from the Argus Server PC.


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Each controller is equipped with power failure protected memory for settings and data storage, memory data integrity checks, program execution integrity checks (hardware watchdog), hardware memory protection, an on-board alarm beeper, and protocols to prevent inadvertent corruption of critical settings and data. All programs execute from resident non-volatile program memory.

In addition, each controller contains protection against transient electrical noise and ground potential variations. Power supply fusing and transient clamping devices (varistors) provide further protection.

The system constantly monitors the state of all controllers and peripheral Input/Output modules and automatically warns you should any component become erratic or fail. Should this occur, you can quickly restore normal operation without any rewiring using our plug-and-run replacement components.

All systems are designed with temporary manual operation overrides in the event of an emergency.


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# Titan 2 Controller Features

| | |
|---|---|
| **High Capacity** | Each controller can manage dozens of independent control processes and a large number of connected I/O devices. |
| **Ethernet Port** | Controllers can be connected using standard Argus network wiring or CAT5 Ethernet. Mixed Argus System Network/Ethernet environments are supported to accommodate more flexible wiring topologies.<br>Wired and wireless Domain Bridging can be configured for connecting controllers and groups of controllers in situations where physical or logistical impediments prevent the use standard Argus network wiring. In such cases, new or existing Ethernet pathways can be substituted.<br>The Ethernet port also provides a high-speed connection from the Access Point controller to the Argus Server PC. |
| **SD Card Slot** | A removable high capacity SD card slot (4-32 GB) with an included 4 GB SD card is provided for additional on-board buffering of recorded data. This helps prevent loss of recorded data during network interruptions and whenever the Argus Server PC is off-line. Plug-in memory also enables easy firmware updates and board replacements. |
| **Flash Memory** | Controllers can receive firmware revisions or updates from any local or remote operator workstation. |
| **Fully Programmable** | An extensive depth of control settings and options is provided. |
| **Distributable** | Controllers can be distributed throughout the operation for ease of peripheral wiring. |
| **Diagnostics** | Continuous self-diagnostics, communication diagnosis, and monitoring of all slaved components for maximum safety and reliability. |
| **Easy Installation** | No-wire 'Plug & Run' module replacement courtesy of the included backplane that accommodates all external connections. |
| **Independent operation** | Peer-to-peer communications between controllers ensures independent operation. |
| **Backwards compatible** | Earlier Argus control system hardware is supported using a legacy communications port. |
| **LED Status Indicators** | Used to indicate proper wiring and network operation |

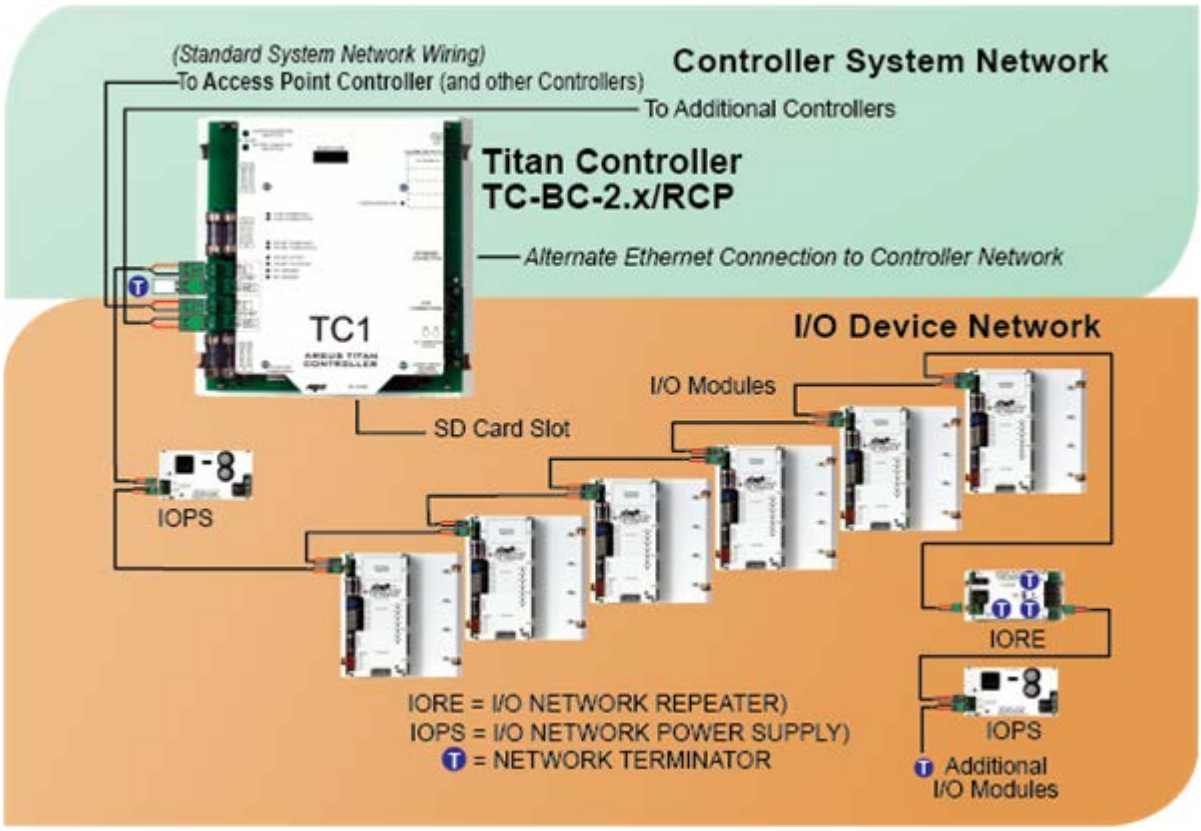

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# Titan 2 Controller Specifications

| | |
|---|---|
| **Panel Dimensions** | 22” x 18” x 4” (height x width x depth) |
| **Power Consumption** | 3.75 Watts @ 24VDC (using a Titan I/O Power Supply) |
| **Data Storage Memory Backup Power** | Lithium battery maintains memory for approximately 2 years without power (settings are automatically reloaded on power-up) |
| **Program Execution** | All programs are executed once each second |
| **Maximum linked controllers per system** | 64 (more if domain bridging is used) |
| **Program Capacity** | Up to 255 |
| **Program Storage Memory** | 4MB (Flash) + 1MB (Fast RAM) |
| **Data Storage Memory** | 1MB (RAM) |
| **Removable Memory** | SD Card Slot (a 4GB SD card is included) |
| **Power and Data Connections** | All connections except Ethernet are provided using the included backplane. |
| **Controller System Network and I/O Device Network Wiring** | Argus part number CAB- 2C18G/TITAN (West Penn Wire - AQ224): a 2-conductor 18AWG (18-gauge) UV UTP (unshielded Twisted Pair) and moisture resistant cable suitable for indoor/outdoor use and is direct burial and wire tray-rated. **NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION.**<br>**Note:** Controllers can also be connected using CAT5 Ethernet pathways. The I/O Device Network must use the Aquaseal AQ224 Cable. |


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## Titan 2 Connection Details




## Controller Backplanes

Each Titan controller fits onto a specially designed Backplane. There are different Backplane receptacles for different applications.

For example, the controller that is connected to the Local Argus Server PC is provided with a backplane containing dedicated alarm outputs.

All wires for connecting the controller to the power supply, and various communications pathways are connected to the Backplane.

Should a controller ever need replacing, it can be removed without undoing any wires other than unplugging the power connector.


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# *Titan I/O Modules*




Titan I/O modules are used to gather sensor information and to provide the physical outputs for equipment control. They can be located remotely, close to the connected sensors and controlled equipment. They are connected to Titan controllers and powered using a 2-wire I/O Communications Network.

With more than a million parts of resolution over a 0-5 volt span, Titan I/O modules can be directly interfaced to many sensors that produce signals of only a few millivolts.

Nearly any industrial sensor can be connected, although a few special types may require external signal conditioning.

Direct connection helps to reduce instrumentation costs and wiring complexity.

Each output channel is addressable, and can be extensively configured for most types of output signals including digital (including on/off, pulse width modulation, pulse period modulation, frequency), analog, and tri-state floating control.

Any combination of Titan Output Relay Boards can be connected to the supplied backplane to provide the appropriate output signals.


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An optional on-board display unit with operator entry keys is available to monitor readings and change setting values at the control locations.

## I/O Module Features

| | |
|---|---|
| **'Plug and Run'** | No-wire module replacement courtesy of the included backplane that accommodates all external connections |
| **Input Switching** | Analog sensor channels can be switched in the software between AC Voltage, DC Voltage, or DC Resistance |
| **High Resolution** | Digital frequency measurements up to 20 kHz |
| **LED Status Indicators** | Indicate proper wiring and network operation |
| **Expansion Capacity** | Up to 32 I/O modules can be operated from a single Titan Controller |
| **Flash Memory** | Firmware updates can be performed from any operator workstation |
| **Isolation** | Built-in cross-channel interference protection |
| **Consistent Performance** | Scan rate does not degrade as a function of system size or load |
| **Low installation and wiring costs** | Modules can be located hundreds of meters apart, close to the connected sensors and the equipment they control |
| **Error Detection** | Extensive self-diagnostics, error detection, and fault diagnosis for wiring and connected equipment |
| **EMI Choke** | Reduces interference generated by devices emitting high frequency 'noise' |

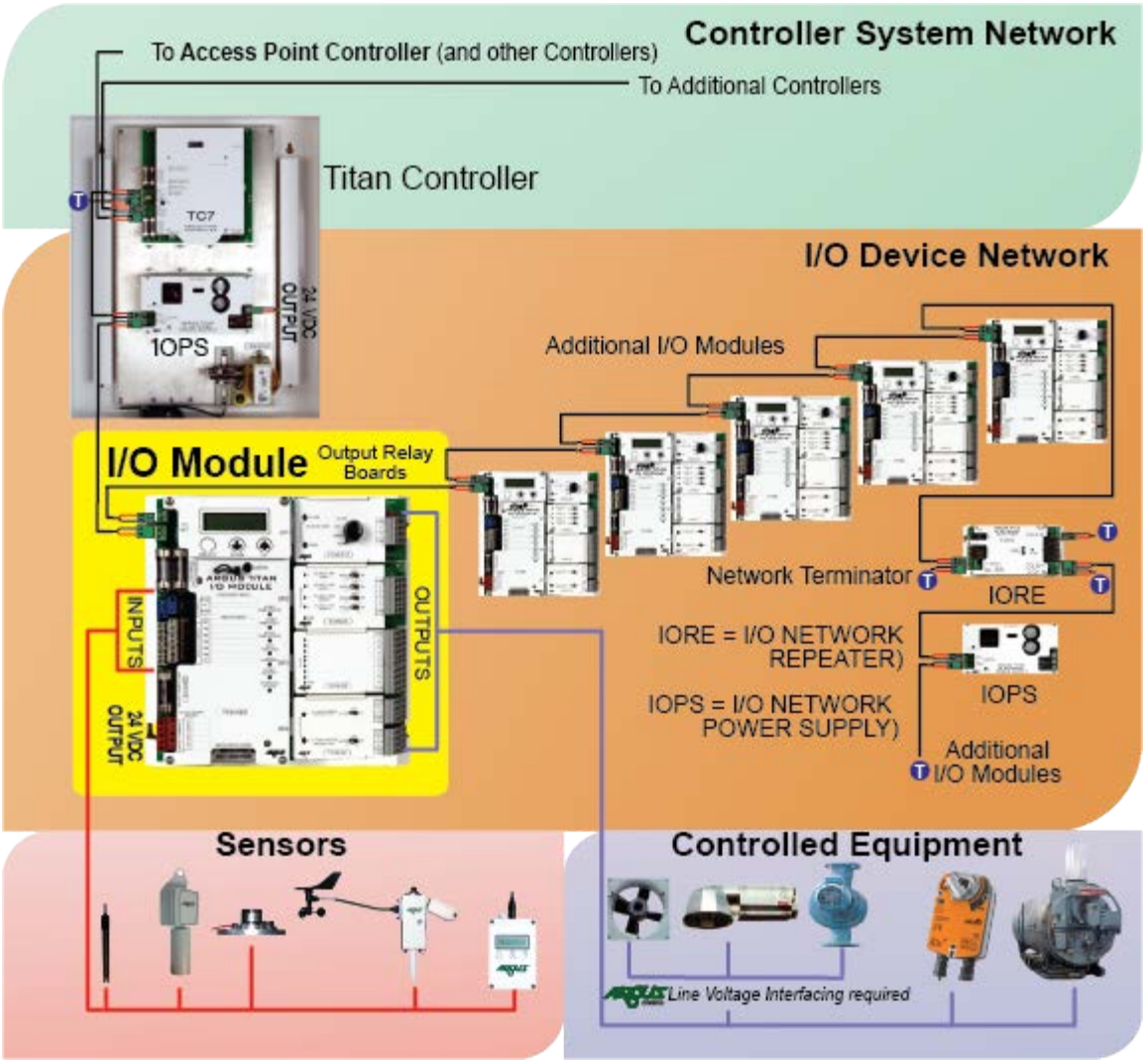

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# I/O Specifications

| | |
|---|---|
| **Dimensions** | 9" x 9" x 3" (length x width x depth) |
| **Power Consumption** | 1.5 Watts @ 24VDC (using the Titan IO Power Supply module) |
| **Sample Conversion** | 24-bit A/D, 12 bit D/A |
| **Analog Input Raw Resolution** | One million parts over 0-5 volts in 5 microvolt steps. |
| **Output Channels** | 4 Output Relay Board connectors (OP1-OP4) provide:<br>up to 8 - 32 discreet digital outputs (depending on the choice of output relay boards to suit each application)<br>*or* up to 4 tri-state floating (open/close/stop) for reversing motor control<br>*or* up to 4 analog signal (voltage, frequency or current modes)<br>*or* combinations of the above |
| **Analog Input Channels** | 7 universal analog channels, each 0-5 volts. Software-configurable for direct connection of DC resistance, DC voltage, or AC signal devices. |
| **Digital Frequency Inputs** | 2 channels at up to 20 kHz. |
| **I/O Device Network Cable** | Argus part number CAB- 2C18G/TITAN: West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |


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# I/O Module Connection Details




When connecting multiple I/O modules, there is a maximum of 8 before needing a repeater, and a power supply for the repeater. The diagram above outlines how to connect more than 8 I/O modules correctly.

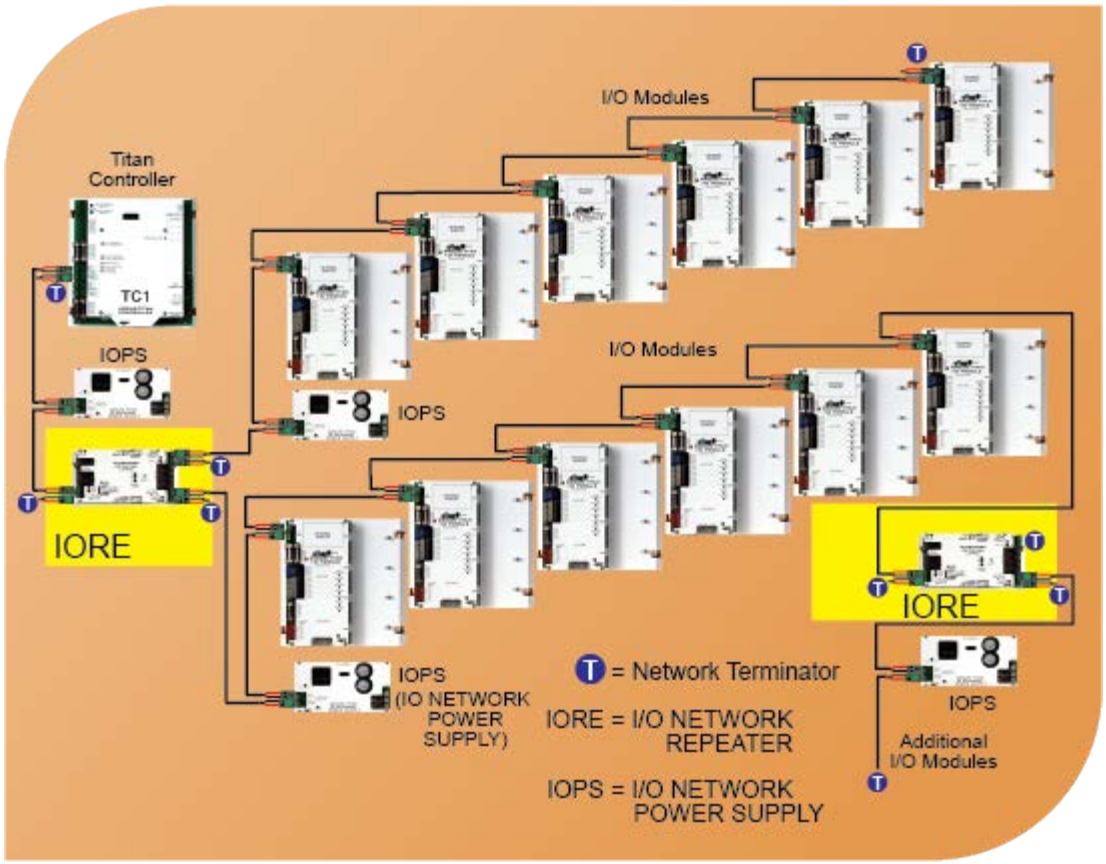



The I/O module does not come with its own power supply, which is why no more than 8 can be connected without a repeater. Both a repeater and power supply are required at that point to connect additional I/O modules.

A repeater (IORE) also draws a small amount of power which must come from a point on the network.


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# I/O Device Network




When using an I/O module Repeater (IORE), it can come with a power supply (IOPS) in a panel, or separately.


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## *Sensors*



Each Titan I/O has 7 high-resolution analog inputs and 2 high-speed frequency inputs for connecting sensors and other input signals.

Virtually any industrial sensor can be connected, although a few special t external signal conditioning.

With more than a million parts of resolution over a 0-5 volt span, the Titan I/O module can even accommodate direct connection of sensors that produce signals of only a few millivolts. This can help you save money on expensive signal conditioning circuitry as well as reduced wiring complexity.

The Argus Titan system provides on-board gain, offset, temperature compensation, linearization, display scaling, and other sensor specific calibrations to simplify sensor connections and allow the use of lower cost sensors.

Many standard sensors used for control applications are available directly from Argus for measuring:

- Air, soil, water, and pipe temperature.
- Relative humidity and vapor-pressure deficit (VPD) - wet bulb and solid state.
- CO2 – multiplexers and stand alone.
- pH
- Electrical conductivity (EC).
- Wind speed and direction.
- Rain/snow detection and measurement.
- Equipment position (potentiometer).
- Flow meters (liquid & gas).
- Light sensors (including photometric, radiometric, PAR, infra-red, UV).
- Soil moisture.
- Weight scales, strain gauges.


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Sensor input features Include:

- On-board 125 mA, 24-volt DC power supply can be used to drive 4-20 mA loop-powered sensors such as pressure transducers, soil moisture tensiometers, $CO_2$ Sensors, and remote infrared temperature sensors.
- Direct connection of isolated voltage source sensors in the 0 - 5 volts range without external signal conditioning. This includes sensors such as PAR (Photosynthetically Active Radiation) and Pyranometers that produce full-scale output signals in the 10 – 20 mV range.
- The control software supports configuration of a wide range of custom sensor types and brands through generic linearization routines, slope, temperature, and other offset compensation routines.
- Thermocouple support - direct connection and configuration of thermocouple types: B, E, J, K, N, R, S, & P, resolvable to 0.1 degree C and +/- 0.1 degree 'noise' with short term filtering. Thermocouples can be referenced to an on-board temperature sensor or an optional high precision cold junction temperature reference installed on one input channel. Measurement accuracies are constrained by thermocouple limits and cold junction compensation temperature errors.
- Dedicated digital frequency inputs – two per I/O module. These can be used for on/off pulse counting applications.

## Omni Sensors




Omni-Sensors were developed to resolve many issues relating to the measurement of the most common climate parameters used in horticultural production.

In particular, the Omni-Sensor applies our very successful strategy of heating the RH sensor in high humidity environments to protect it from condensation induced errors and damage.

Compared to unheated solid-state RH sensors, this technique offers extraordinary accuracy and sensor life over the range of humidifies common in horticultural environments.


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Omni Sensors are available in a range of models and features:

| Model: | Temperature | Relative Humidity | Light | On-Board Display |
|---|---|---|---|---|
| **SEN-OSM/C** | Yes | Yes | Yes | Yes |
| **SEN-OSM/RHT** | Yes | Yes | | |
| **SEN-OSM/T** | Yes | | | |

**SEN-OSM/C** **SEN-OSM/RHT & SEN-OSM/T**




Omni Sensors are compact and easily interchangeable measuring stations for indoor applications including greenhouses and growth chambers.

A simple 2-wire cable is used to connect them to any available Titan I/O module, and since the communications cable also supplies the power, there is no need for an additional power source.


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Up to **2 Omni Sensors** can be connected to the multi-purpose digital/frequency inputs on a Titan I/O module.

| | |
|---|---|
| **Dimensions (all models)** | 4.9" x 3.3" x 2.1" (H x W x D) |
| **Power Requirements (all models)** | Power is provided by the connected **I/O module** using the 2-wire connection. |
| **Cabling (all models)** | Factory cable is provided with an easy-to-use Micro-Con-X connector When ordering, specify the length required.<br>Cable can be extended using 2-conductor 18-24 AWG approved sun/ UV-resistant cable.<br>A blue **Omni-Sensor Input Protection Board** (part #: **TTN-IPB/OMNI**) is provided with each sensor and must be installed on the I/O module input. Wiring details are provided with each unit. |
| **Display**<br>**(SEN-OSM/C only)** | 2 line, 16 characters reflective. 0 – 50 ºC operating range |
| **Temperature Sensors** | Solid-state digital sensors. Factory calibration accuracy of better than 0.2 ºC over the working range of 0 to +50 ºC. |
| **Humidity Sensor**<br>**(all models except SEN-OSM/T)** | Range: 10-100% non-condensing<br>Accuracy: 10-20%RH: +/- 4%; 20-80%RH = +/- 1.8%; >90%RH: +/- 4% |
| **Light Sensor**<br>**SEN-OSM/C only** | **Note:** This is an uncalibrated light sensor intended as a general sensor for light/dark differentiation (lights on/off, shade pulled, etc.)<br>For accurate light measurement and quantification Argus can provide separate PAR and Pyranometer sensors. |
| **Operating Temperature** | 0-50 ºC (Tested and calibrated to work from -20 to +40 ºC)<br>Not suitable for use in extremely cold environments. |


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## *Control Outputs*




The Argus Titan system provides specialized output signals tailored to the equipment being controlled. Output relay boards are selected and configured according to the application

Output relay boards connect directly to the Titan I/O module. Each I/O module can accommodate up to 4 interchangeable relay boards providing simple and efficient configuration of the output signals required by different types of equipment.

These boards include the appropriate field wire terminations, status indicators lights, and most include manual overrides for testing and emergency operation.

All output control on the Titan system is designed to operate as Class-2 low-voltage equipment. This maximizes safety, reduces wiring costs, and is compatible with most greenhouse control equipment.

Separate line voltage interfacing equipment is also available to convert low voltage control signals into line voltage power (for more information please see the Argus Line Voltage Interface Equipment Data Sheet).

Each I/O module contains 4 output connectors. Each of these connectors is addressable, and can be extensively configured for any type of output signal. Special output relay modules are connected to the outputs to provide the appropriate signal for the type of equipment being controlled.

Depending on the application, each I/O module can operate between 4 and 32 discrete output. The I/O module software provides for precision calibration of each output.

Once connected to the I/O Network, each I/O module is operated by a corresponding I/O module Program running on the Controller to which it is connected.


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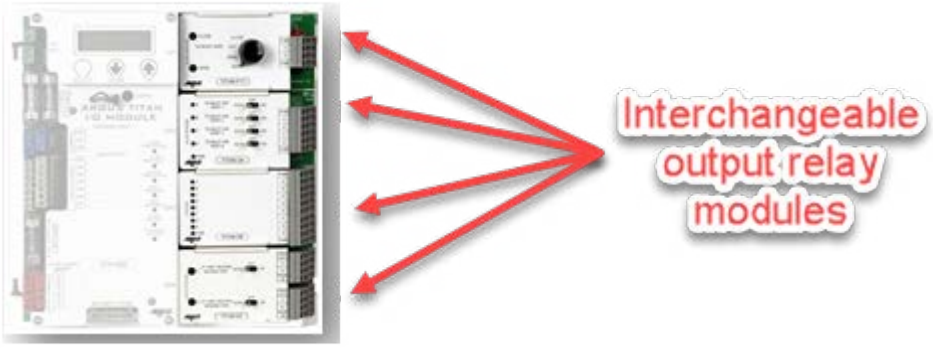
## Output Relay Modules

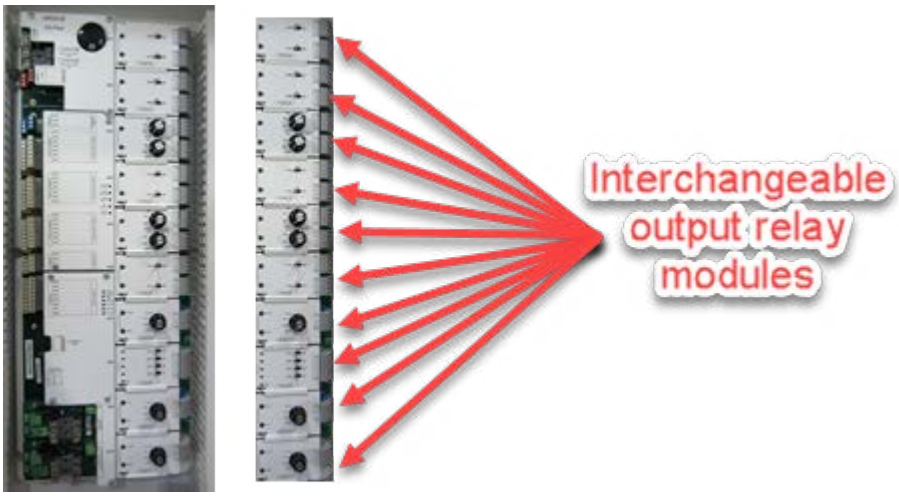
The Argus Titan system uses specialized output signals tailored to the equipment being controlled. Output relay types are selected and configured according to your particular equipment configuration.

All output control is designed to operate as Class-2 low-voltage equipment. This reduces wiring costs (and you can do it yourself) and is compatible with most greenhouse control equipment.

Low-voltage wiring (24V, AC) is also safe, allowing you to safely open the enclosure and use the manual overrides in an emergency. Connectors on the I/O module Backplane provide for simple configuration of output signals by using different types of plug-in Output Signal Boards.

These boards include the appropriate field wire terminations, status indicators lights, and manual overrides.




*Output Signal Types:*


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**Digital Control** - This includes standard ON/OFF control and equipment that is operated by low frequency digital pulsing strategies such as pulse width modulation and pulse period modulation. Form 'A' and Form 'C' contact configurations are available. For simple digital applications such as irrigation valves, special relay boards are available to increase the number of addressable On/Off outputs to up to 32 per I/O module.

**2-speed** – A special output relay board is available to provide mechanically interlocked low and high-speed control signals for 2-speed fans and motors.

**Tri-State Floating Control** - These relays provide safe, proportional, reversing motor control for equipment such as motorized roof vents, louvers, and shade curtains.

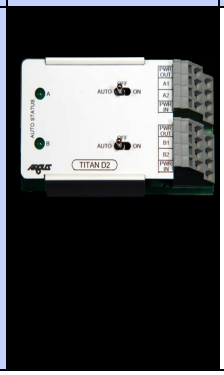
**Analog Control** - Argus provides an extremely versatile high resolution analog output module for equipment that requires variable current, voltage, or frequency signals to control proportional equipment such as analog valves, speed controllers (VFD), etc.

**Special Applications** – Other output boards are available for specialized control applications such as sensor multiplexing.




Titan controllers also support serial communications including **Modbus**.

## Titan Output Relay Selection Table

| Part Number | Dimensions for all Modules: 4" x 2" x 1 ½" (L x W x H) | Description | Control Signal Type | Manual Override Positions | Contact Ratings | Shared Common Bus | Field Isolation | Typical Applications |
|---|---|---|---|---|---|---|---|---|
| TTN-D2-1.0/C |  | Digital (2 x Form A) Dry contacts | ON/OFF; PWM+/-; PPM+/- (1 second Pulse Resolution) | ON OFF AUTO | 3.2 A @24V AC/DC 5 A @12V AC/DC | X | 5000V | Independent control of up to 2 ON/OFF devices. Control of equipment that can be digitally modulated using Pulse Width Modulation, Pulse Period Modulation, or Soft Start Pulsing |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TTN-D2C-1.0/C |  | Digital<br>(2 x Form C)<br>Dry contacts | ON/OFF<br>(Open/ Close) | ON<br>OFF<br>AUTO | 3.2 A @24V AC/DC<br>5 A @12V AC/DC | X | 5000V | NC or NO signals for control of up to 2 ON/OFF Devices.<br>Interlocked signals for up to 2 Power Open/ Power Close valves or drive motors. |
| TTN-D4-1.0/C |  | Digital<br>(4 x Form A)<br>Normally Open/Closed | ON/OFF | ON<br>OFF<br>AUTO | 3A Max @ 24V AC/DC<br>(max 4.2 amps per board) | Y | 5000V | Independent control of up to 4 ON/OFF devices i.e. lights, Irrigation valves. (From one common power source) |
| TTN-D8-1.0/C |  | Digital<br>(8 x Form A)<br>Normally Open/Closed | ON/OFF | No | 3A Max @ 24V AC/DC<br>(max 4.2 amps per board) | Y | 5000V | Independent control of up to 8 ON/OFF devices i.e. lights, Irrigation valves (no on-board manual overrides). (From 1 power source) |
| TTN-D1S-1.0/C |  | Digital<br>2 Speed<br>Electrically Interlocked | ON/OFF | HIGH<br>LOW<br>OFF<br>AUTO | 3.2 amps @ 24V<br>5 amps @ 12V AC/DC | Y | 5000V | Control of one 2-speed fan or motor |
| TTN-P1T/IC |  | Digital<br>2x Form A<br>Isolated Common | Tri-State Floating | CLOSE<br>OFF<br>OPEN<br>AUTO | 3.2 amps @ 24V<br>5 amps @ 12V AC/DC | Y | 5000V | Control of one Tri-State Floating (OPEN/CLOSE/ STOP) reversing motor (i.e. vents, shade curtains, mixing valves) |


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| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| TTN-P1T-1.0/C |  | Digital<br>2x Form A<br>Electrically Interlocked | Tri-State Floating | CLOSE<br>OFF<br>OPEN<br>AUTO | 3.2 amps @ 24V<br>5 amps @ 12V AC/DC | X | 5000V | Control of one Tri-State Floating (OPEN/CLOSE/STOP) reversing motor (i.e. vents, shade curtains, mixing valves) |
| TTN-P1A-1.2/C |  | Analog 1x | 0-20 ma current<br>0-10V<br>0-5V<br>Frequency<br>PWM<br>(0.001s<br>Pulse Resolution) | Manual (0-100%)<br>AUTO | Sinking:<br>External 24 VDC (isolated)<br>Sourcing:<br>On-board 24 VDC (isolated) | Y | 1500V | Modulating Analog control of proportional output equipment |


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# *Power Supply Modules*

All I/O modules include an on-board power supply.

Specially designed Titan power supply modules are used to provide combined module power and I/O network communications over a two-conductor twisted pair wire.

These regulated power supplies feature intelligent fault detection and automatic reset capabilities. They automatically protect the controllers, I/O modules from short-circuits, faulty wiring, lightning, utility power surges, and brown-outs. This significantly enhances the overall robustness and reliability of your control system.

## I/O Module

Each I/O module power supply can power up to eight control modules (up to eight I/O modules, or one Titan Controller and 7 I/O modules).

Since they also provide the power to slaved I/O modules over the same communications wire, it is possible to locate I/O modules at a significant distance from line power sources.

This can greatly simplify and reduce the installation costs for managing outdoor irrigation valves and locating remote sensor arrays such as weather stations.

### *Features*

| | |
|---|---|
| **Over Voltage Protection** | Power supply switches off and visibly indicate when input voltage is greater than 32VAC. |
| **Zero-voltage turn-on** | Reduces inrush current that may cause interference to the environment and the microprocessor. |
| **Short-Circuit Protection** | The IOPS switches off when the output is shorted to prevent the fuse from blowing. |
| **Over-current Protection** | Intelligent programming detects an accumulated over-current condition and switches off supply to protect components from overheating. |
| **Zero-current turn-off** | Reduces inrush current that may cause interference to the environment and the microprocessor. |
| **Automatic recovery** | The IOPS attempts to resume power delivery after an error condition is detected and continue to repeatedly test for removal of the error before switching on. |

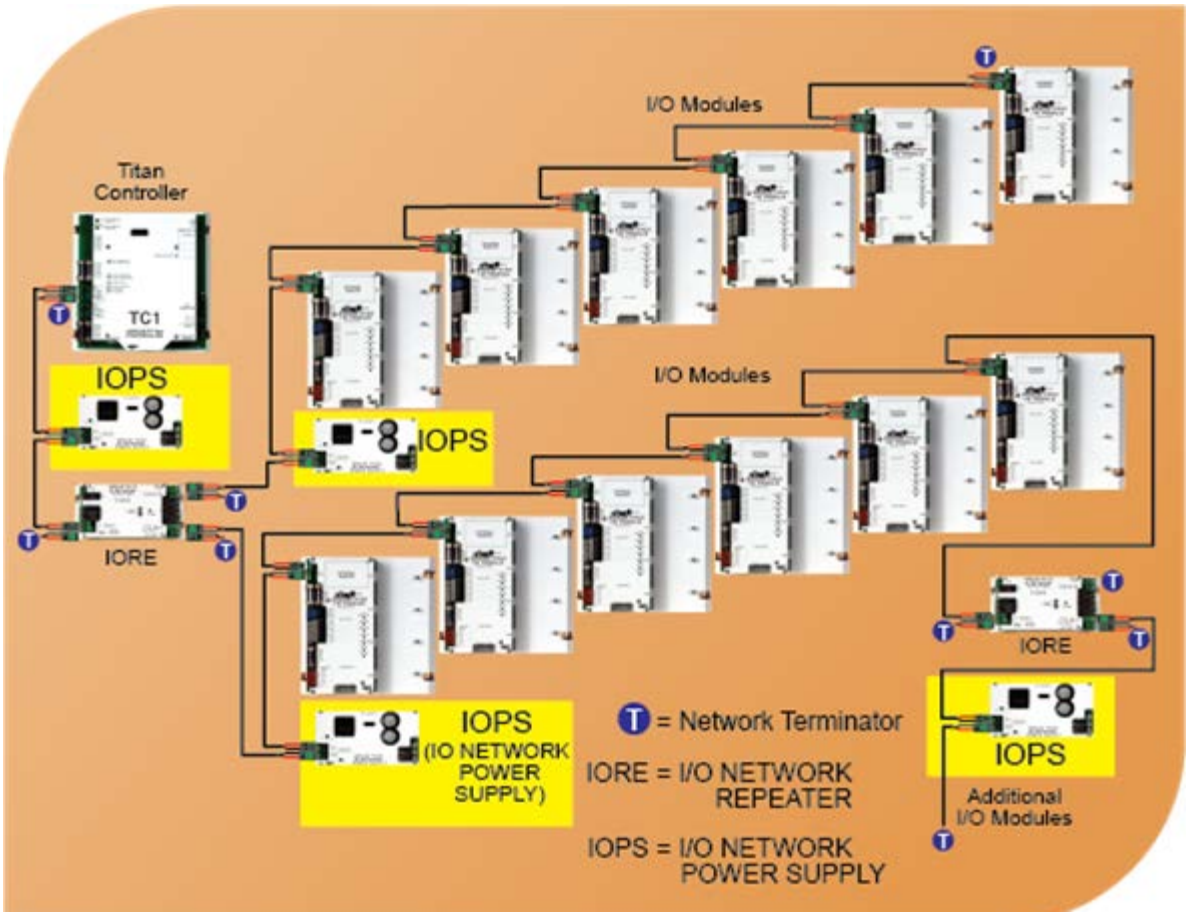

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## *Specifications*

| | |
|---|---|
| **Dimensions** | 8" x 4 1/2" x 1 1/2" (length x width x height) |
| **Power Requirements** | 24VAC 75VA transformer (Class II) - i.e. Argus Part # RM-2TX75 |
| **Max. Operating Power Output** | 50W (29VDC @ 1.7A) |
| **Max. Peak Power Output** | 60W (27VDC @ 2.2A) |
| **Min. Input Voltage** | 24VAC |
| **Max. Input Voltage** | 32VAC |
| **Max. Current Load** | 2.2A (@ 27VDC) |
| **Power Output Type** | Current-limited switching power supply |
| **Temperature Range** | 0 – 50°C |


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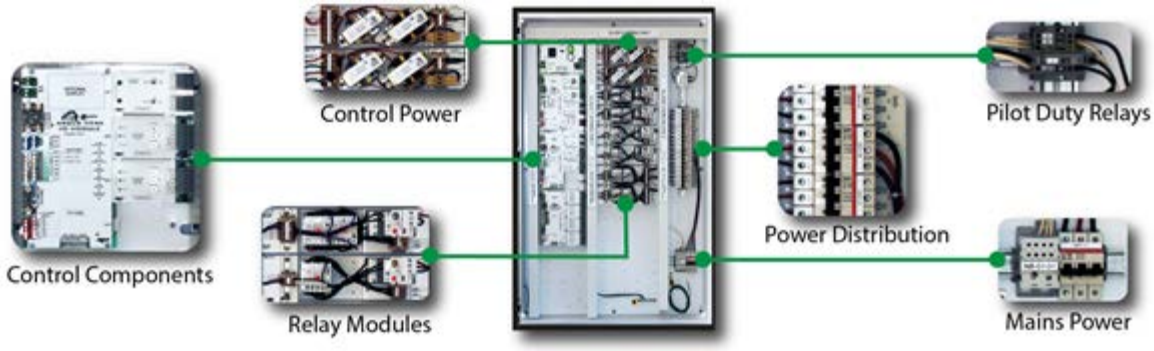
*Connection Details*





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## *Line Voltage Interfacing*







Argus can provide custom engineered combination panels containing the Argus Titan control hardware along with pre-wired power distribution and line voltage relays matched to the controlled loads.

Combination panels are well suited to new construction and major retrofits.

They can be situated in centralized power rooms or distributed throughout your facility in close proximity to the controlled equipment.

A selection of standard relay interfacing modules is available to suit most applications.

For special applications, custom relays and motor starters can also be provided.


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## Features

- Space saving ‘all-in-one’ design.
- White, powder-coated NEMA 4 enclosures are heat reflective, and water resistant. NEMA 4x panels are also available where enhanced corrosion resistance is required.
- Panels are engineered to maintain proper separation between Class 1 and Class 2 low voltage equipment and wiring:
    - Class I and Class 2 components and wire-ways are clearly marked, color coded, and segregated within the panels for maximum safety and isolation of sensor and communications cabling from potential sources of electrical interference.
    - A segregated Class 2 ↔ Class 1 Translation Area facilitates the field installation of power transformers, isolating relays, contactors, and motor overloads where required.
    - A Class 1 power distribution section accommodates the fuses and breakers required to distribute power and protect all wiring.
- Meets NEC, CEC & UL standards
- Line voltage relay modules are factory matched to each load.
- Panels are carefully engineered to ensure proper grounding and protection of all internal components when connected to a good earth ground.


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# SOFTWARE FEATURES

Our design goal is to provide control systems that are as powerful and flexible as possible that can be successfully used by operators without any advanced skills in computing or industrial control.

For the most part, system users are shielded from the complexity of equipment automation, and daily activities are abstracted to the setting of control targets and reviewing control performance.

Extensive monitoring, self-diagnostics and redundant alarms enable true ‘management by exception’ where the control system watches over all processes including its own, and only alerts operators when a problem occurs.

Titan systems are configured using a proprietary suite of pre-built control applications that have been designed for specific equipment types such as mixing valves, shade curtains, and ventilation systems.

These applications contain a large number of options for tuning the control responsiveness to the capabilities of your equipment. They also contain many safety limits and overrides to protect your facilities from improper operation. In addition, we provide an array of highly configurable generic program modules for developing custom applications.

Whenever you have special control requirements beyond the scope of our standard modules, we create custom applications from these generic programs.

One advantage to using the Argus Titan system for custom control applications is that all program setup and configuration is performed at run-time using our pre-built, pre-tested logic modules. There is no need for off-line compilation and debugging.

In keeping with the flexibility of the Titan Control System™, the Argus Operator software offers substantial user customization capabilities.

You can design and customize your own overview screens and create a navigation system that best suits your needs. Each user of the system can develop a personal screen system for managing the entire control system or their own sections of the controlled operation.

In addition, a factory built screen system is always available to display all programs and parameters that are currently in use.


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# *Firmware (Controller Programming)*

Titan firmware is software responsible for real-time control residing in the Titan controllers. It includes standard, comprehensive modules for managing environments, irrigation systems, and nutrient control applications, as well as a powerful suite of generic programs for configuring custom equipment control.

All Titan systems feature quick and easy configuration to match your requirements.

The system is self-monitoring with an extensive array of fail-safe and fail-soft features for maximum safety and reliability.

Most equipment control applications feature alarms and conditional safety limits and overrides to suit your situation. All programs are managed and continuously monitored by their respective controllers for the highest reliability and safety.

Program execution does not degrade as a function of system load. This ensures that all time-critical sensor readings and output responses are performed instantly.

In most cases your system arrives with the control programs already fully configured for your applications. Your system ships with a full set of control programs, including many that you may not currently need.

Should your needs change, we can usually adjust your program configuration on-line using the program set already provided with your controller.

## Open-Ended Applications

The unique architecture of the Argus Titan hardware and software provides unparalleled flexibility in configuring custom control applications.

Aside from the standard equipment control capabilities available in many competing systems, the Argus Titan system contains a suite of generic control modules that make it easy to provide custom control logic and custom sequences of operations.

Unlike other systems, this can usually be accomplished on-line and at runtime without the need to recompile any program code or understand arcane programming languages. This also avoids syntax errors and other program coding problems.

With this ‘second tier’ programming architecture, real-time configuration and testing is possible, greatly speeding up application development, all in a plain language format.


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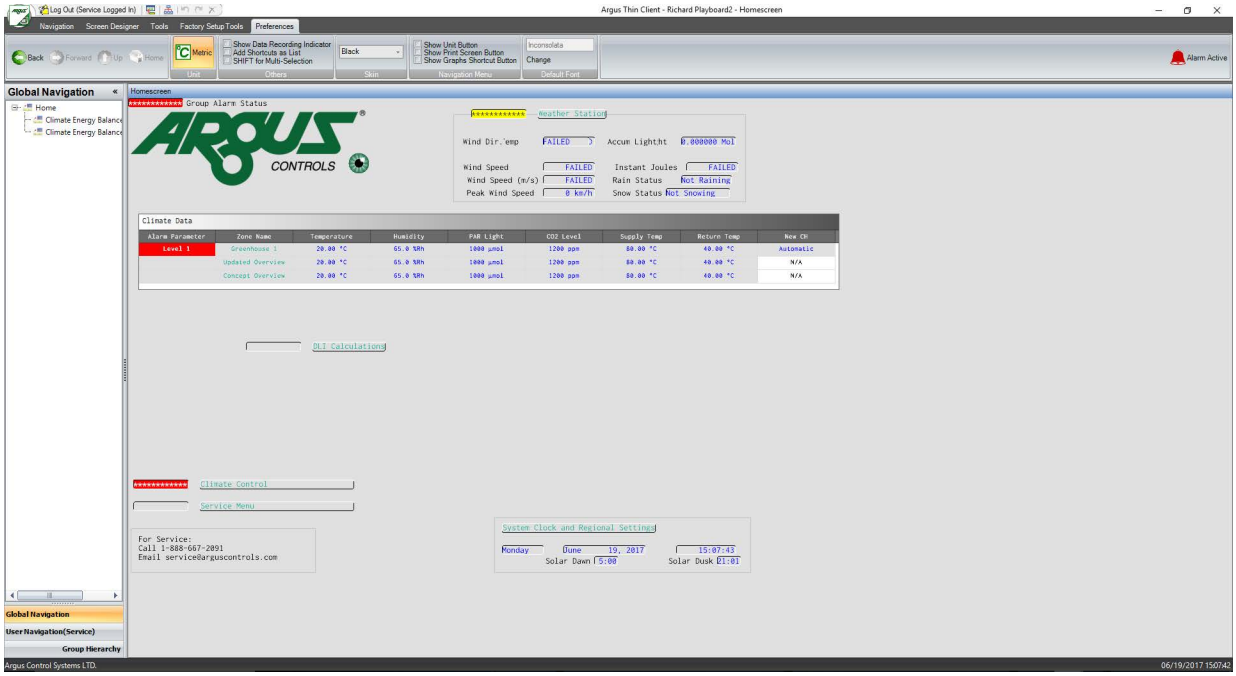
## Updates and Revisions

Minor revisions and bug fixes are always provided for free. Occasionally, Argus releases a major revision to our control program set.

These upgrades are reasonably priced, and are always optional. We then update your entire control system using our on-line flash update procedures.

This completely eliminates the need for changing out EPROMs and other hardware memory components.

## *Argus Operator Program*




The Argus Operator program is used to access the control system from a local or remote PC.

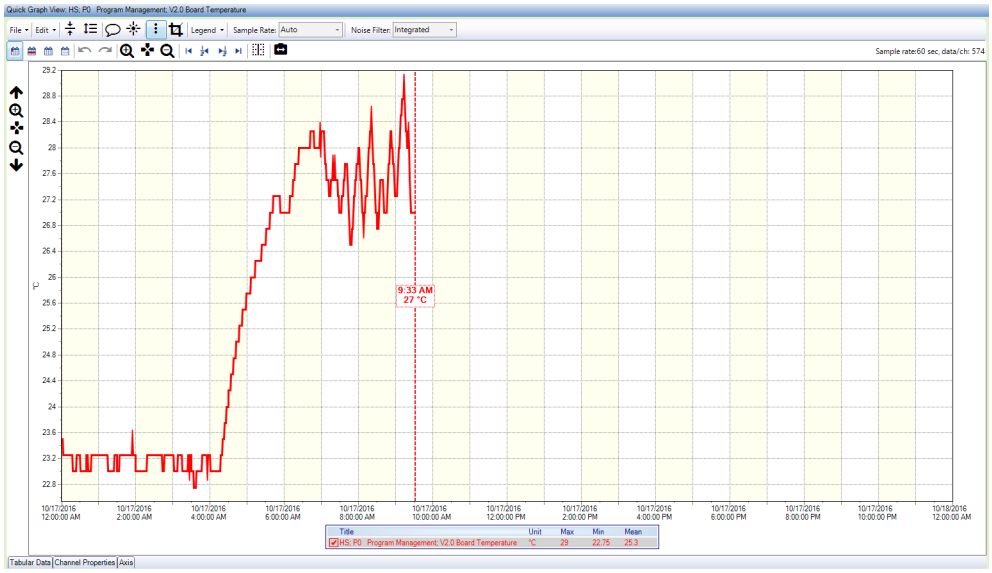
The program contains a wealth of features for managing and monitoring equipment, controlled processes and environmental conditions.

Each site is custom configured to match the physical layout of your facility, your equipment systems, and your control and monitoring applications.


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# *Argus Graph*

The Argus Graph is a full featured graphing utility for viewing and comparing recorded data from your control system.




The Argus Graph enables you to get the most from your recorded data.

Featuring graphical and tabular views, not only can you visualize the effects of present readings and settings on your system, but you can see how these values change over time.

You can track the cause and effect relationships between such environmental parameters as light, heat, and humidity, and the effects of the equipment control actions that your system is taking to achieve your targets.

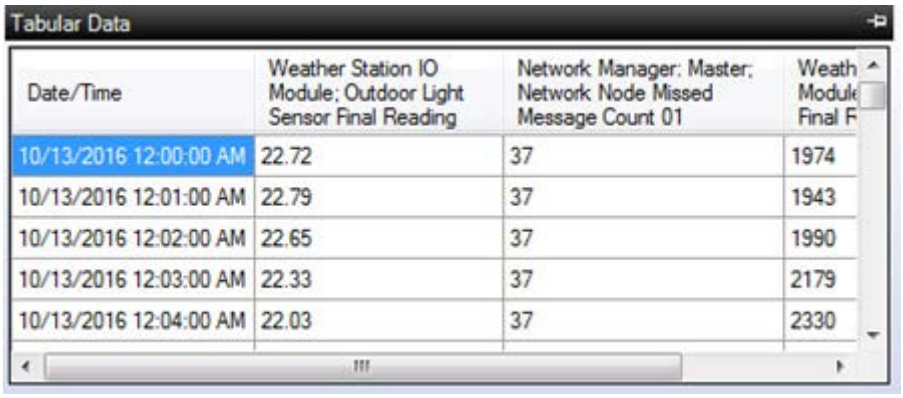

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# Features of the Argus Graph

| | |
|---|---|
| **View Recorded Data** | You can view any recorded data anytime, by simply starting the graph and selecting recorded parameters directly from your screens. |
| **Dates** | Jump to any date by using the **Time buttons** and the **Data Cursor**. The **Daily**, **Weekly**, **Monthly**, and **Yearly** preset time scales have been retained. |
| **History Buttons** | Arrow 'history' buttons take you back to previous views and forward again. |
| **Zoom and Pan Timescale** | You can zoom and pan the timescale directly. |
| **Custom Data Recording Reports** | You can make and save any number of custom **Data Recording Reports.** These are fully pre-configured graphs that you can recall at any time. |
| **Shortcuts** | Create **Shortcuts** to individual Data Recording Reports and place them anywhere on your system screens. |
| **Parameters** | Up to 64 parameters can be viewed and saved in each **Report**. The display of individual parameters in graph reports can be toggled 'on' or 'off'. |
| **Graph Data Controls** | There are numerous controls for manipulating graph data channels singly or in groups. |
| **Save Manual Scaling Values** | Manual scaling values can be saved with reports. |
| **Auto-Fit and Zoom** | Auto-fit to data and zoom to fit data display options. |
| **Configurable Lines and Background Colors** | Line and background colors can be configured and saved. |
| **Re-sizable Window** | The graph window is re sizable. When a graph is opened it can float independent from the main Argus window. |
| **Automatic Updates** | Graph values are updated automatically, based on the present zoom level. |
| **Interactive Data Cursor** | Interactive **Data Cursor** displays value and time for selected parameters. |
| **Data Legend** | The optional **Data Legend** can be toggled on and off. |
| **Off-Scale Data Icons** | Help you to find data channels that are not visible in the current **Y-axis** view |
| **Annotations** | Add, Edit, or Delete annotations (similar to channel notes) on your graph. |
| **Multiple Graphs** | You can have as many graphs as you want independently on your screen(s). Another option has a graph embedded in the window, or as a separate graph. |

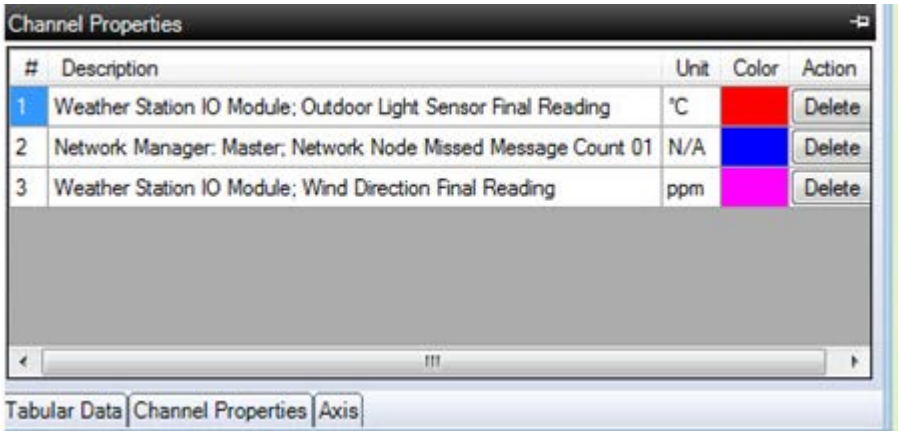

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Graphed information can also be displayed in tabular form:




The **Tabular Data** tab at the bottom of the graph opens when clicked and displays all of the data on the graph in a table format.

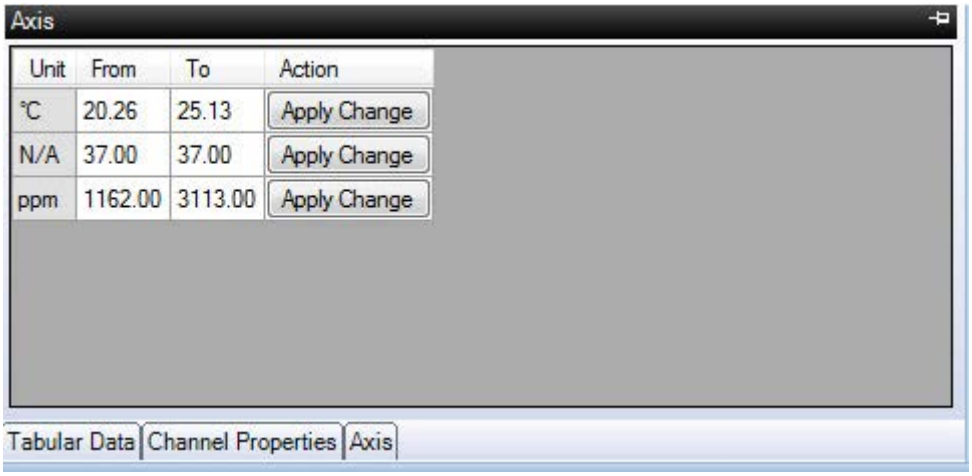
The **Channel Properties** tab allows you to change the Channel colors and delete Channels as required.





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The **Axis** tab allows you to change the **Axis Scale r**ange of Units on the graph.




For more Information on the Argus Graph, please refer to the Argus Operator Online Help.


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# SYSTEM CAPABILITIES

## *What Can an Argus Titan System Do for You?*

An Argus Titan system can manage and monitor every aspect of environmental control. It can co-ordinate and integrate the activities of all controlled equipment ensuring that they operate efficiently and in harmony with your current control objectives.

### Crop and Weather Fluctuations

It accommodates changes in the crop and weather while monitoring, recording, and reporting on current conditions, and raising alarms if things go wrong. When matched with the right structures and equipment, an Argus Titan system can create and maintain a precision growing environment despite constantly changing external conditions such as temperatures, humidity, and light.

### Controls

The Argus Titan system can also meet the needs of the crop by controlling $CO_2$ levels, irrigation, chemical treatments, and nutrient concentrations. It continuously monitors all growing environments and equipment operations and reports on the consumption and supply of resources such as water, electricity, heat, and equipment operation hours.

### Reporting

The system maintains a detailed history of your operation so you can get accurate reports whenever you need them.

### Installation and Servicing

In all cases, the controlled equipment must be properly installed and serviced. In particular, there must be a good match between the capacity and response of the equipment and the tasks they are expected to perform.

The following sections explain some of the control capabilities for protected cropping in greenhouses, conservatories, growth chambers, growth rooms, aquaculture, Aquaponics and any other facilities with similar control requirements. They also illustrate the direct connection between the grower's objectives, the physical equipment design, and the computer control strategies that are required. These examples are by no means complete but should provide some insight into the approaches Argus uses to solve problems in equipment control.


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# *Climate Control*

Argus configures each control system to your specifications and needs.

Each controller is capable of managing several climates. However, the actual number of managed zones per controller depends on:

- Complexity of each climate.
- Physical layout of the operation.
- Number of controlled equipment systems.
- Level of control separation and redundancy required.

Climate control is one of the most common applications, and one of the most complex. The Argus Titan system provides extensive climate control capabilities and features including:

## Scheduling

Argus provides several ways to schedule climate targets in advance.

Diurnal (24 hour repeating) and multi-day strategies can be used individually or in combination to program your growing environment for the changing needs of the crop over time.

Any climate targets can be scheduled including heating, ventilation, and humidity levels. The targets can be fixed settings or they can be dynamically adjusted by other conditional control logic.

For example, heating targets can be automatically adjusted in relation to current or recent light levels.

To control energy costs, you can also define resource rationing limits for activities such as dehumidification.

## Energy Balance Calculations

The Argus Titan control system constantly evaluates greenhouse and outdoor conditions and grower established targets to develop the best possible strategy for control.

It accurately predicts the energy balance for a given heating zone and manipulates the heating and/or cooling equipment to maintain this balance.

The computer system ‘looks ahead’ and reacts to changes in conditions that result in errors and target deviations if not corrected. This is far superior to waiting until a deviation has occurred before making changes.


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## Temperature Management

Climate air and media temperatures must be controlled to produce the correct growing environment. Extensive heating and ventilation equipment control programs are available to manage all types of systems including:

- Central or distributed heating management.
- Water or steam from central heating plants.
- Forced air/Infra-red/Electric.
- CO2 Flue Gas Recovery & Heat exchangers.
- Waste heat and geothermal sources.
- Solar storage and recovery systems.
- Heated/Chilled ground beds.
- Compartmentalized heating zones and beds.
- HVAC systems.

During the configuration process, we work with you and your heating system supplier to make sure that your equipment is operated in the safest, most efficient manner, according to the manufacturer's recommendations.

Even if your heating plant comes with packaged controls, we can provide improved heating system management by efficiently interfacing these stand-alone systems with the heat distribution system.

Our flexible programs can be used for:

- Intelligent staging of boiler firing as a function of return water temperature relative to the design "Delta T".
- Boiler or unit heater rotation for equipment 'wear leveling'.
- Pipe temperature management (mixing valve control).
- Modulating burner systems.
- Return temperature limiting to protect against boiler shock.
- CO2 extraction.
- Heat storage and recovery.
- Cogeneration (combined heat & power applications).
- High temperature cutoff in conjunction with boiler safety limits.
- Control of cycle times to prevent excessive wear on equipment.


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## Argus SmartHeat

You can also use this program when you want to automatically modify the value of a target parameter (such as a Heating or Cooling target) based on an accumulated multi-day average.

A SmartHeat multi-day integration strategy enables you to manage your climates in a manner that can compensate for prior conditions.

For example, a SmartHeat strategy allows you to offset the gains made by crops on warm, sunny days by automatically lowering target temperatures on subsequent days.

This approach is based on the assumption that there is a strong correlation between average daily temperatures (ADT) and net plant growth.

For example, the maximum growth rate (rate of photosynthesis) for many greenhouse plants is often attained at temperatures that are quite a bit warmer than it is economic to maintain with purchased energy.

With a SmartHeat strategy you can take advantage of good weather by allowing the sun to boost temperatures well above your heating setpoints to their optimum level.

A heat 'surplus' is created, as measured against your setpoints and average daily temperature targets.

As a surplus accumulates, the program automatically reduces the heating target by a specified amount in relation to the surplus amount. Whether or not the climate temperature is actually reduced depends on the weather.

For example, on warm sunny days, the climate may continue to accumulate a heat surplus despite a reduced heating target.

However, on cooler, duller days the climate temperature is reduced until the surplus has been exhausted.

There are two potential benefits to this type of strategy:

1) It can help to maintain your target ADT. This in turn helps keep the crop on schedule.
2) It can help maximize the benefits of solar heating while minimizing the use of purchased heat energy.

Although we call it 'SmartHeat' this program can be used with both heating and cooling operations. Other non-heating applications are also possible.

Each equation is designed to average and accumulate a specific value. It maintains running totals and daily averages for each of the last 7 days, as well as multi-day combined averages and totals.

These averages can then be recorded and used as the basis for triggering alarms and other control events.


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# Air Exchange

Greenhouse ventilation must be controlled to remove solar heat, to reduce relative humidity, and to provide additional moisture absorbing capacity for evapotranspiration and evaporative cooling systems.

Ventilation also supplies carbon dioxide for plant growth during daylight hours. All types of ventilation equipment are supported including:

**Passive roof and sidewall vents** – fully modulating, wind direction compensated control with safety limits and overrides for high wind speeds, and rainfall.

To protect your vents, your structure, and your crop from the effects of strong winds, the control system constantly monitors the current outdoor conditions and closes or limits the vent openings in extreme conditions.

To maximize air exchange and cooling precision, the system can compensate for the effects of wind speed and wind direction by managing windward and leeward vents separately.

Features include:

- Full span modulating control (0 -100% opening).
- Reaction tables to accelerate or decelerate vent opening with respect to ventilation required.
- Rain position opening limits.
- Separate cooling and dehumidification settings.
- Evaporative cooling position.
- Wind speed lockout.
- Wind lockout release rates.
- Windward/leeward control.
- Low temperature opening overrides for “winter freeze up” protection.
- Time and position based vent movement.
- Vent compensation settings to compensate for reduced air exchange when energy curtains are deployed.
- Spray program overrides.
- Minimum crack settings.
- Additional overrides, limits, and operating logic as required.


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**Open Roof Structures –** These structures are operated differently from conventional roof vents. In general, they take longer to open and close, and tend to be operated less aggressively.

The Argus Titan system can provide safe, optimum operation for these types of structures while respecting the limitations of the equipment.

**Exhaust Fans** – including sophisticated staging and fan rotation programs for multiple fan applications.

With the Argus Titan system, you can use a variety of control strategies to operate ventilation fans. In climate control situations, the operation of the ventilation fans is coordinated with your heating system to maximize energy efficiency.

For multi-fan applications, the Argus Titan system regulates the operation of fans based on the current calculated ventilating requirement. Fans can be operated individually or in groups to achieve varied ventilation rates.

Each fan can be controlled using a simple ON/OFF strategy, or with pulse width modulation (PWM). With PWM control, the control system regulates the on/off times as well as the number of fans operating to precisely match the current cooling or dehumidification requirements. This results in exceptional temperature control precision. Fan operation can also be coordinated with evaporative cooling pad(s) systems.

Typical features include:

- Fully user customizable multi-fan output grouping and staging.
- On/Off control.
- Multiple speed control.
- Variable speed control.
- Evaporative cooling settings.
- Pulse width modulation (PWM) control.
- Minimum on/off time fan cycling protection.
- Spray program interlock settings.
- Additional overrides, limits, and operating logic as required.

**HVAC systems -** Argus Titan systems are capable of managing all types of heating ventilation and air conditioning systems typically found in commercial buildings, and research facilities.

In situations where other control systems are in place (for example, providing central heating and cooling water resources), our systems are capable of signal interlinking for coordinated operation.


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## Humidity Management

Almost every activity in a greenhouse has an effect on humidity. Some examples are:

- Ventilation rates
- Indoor/outdoor temperature differences.
- Transpiration
- Evaporation
- Short term temperature changes.
- Carbon dioxide burners
- Curtain systems

Control of relative humidity is extremely important in the production of most crops. Greenhouse humidity may need to be controlled by use of heating and ventilation (to reduce humidity) and humidification systems to supplement the evapotranspiration from soil and plants to help meet the climate temperature, vapor-pressure, and relative humidity targets.

The Argus Titan system can operate your heating and ventilating equipment to simultaneously manage temperature and humidity. At the same time, it can manage evaporative pad and fan systems, as well as misting and fogging equipment to achieve your humidification and cooling objectives. The operation of these systems is integrated with your other climate management equipment to ensure fully coordinated operation of all devices.

Typical de-humidification options include:

- Selection of heating, ventilation, or a combination of strategies.
- Heating and ventilation energy resource allocation to limit dehumidification costs.

Typical humidification and cooling control options include:

- Time windowing
- Operator configurable diurnal humidity and fixed VPD (vapor pressure deficit) setpoints.
- Intelligent integration of evaporative cooling with standard ventilation techniques.
- Minimum on and off time matched to your equipment operation specifications.
- Evaporative cooling opening limits on roof vents.
- Integration with other climate control equipment systems


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## Equipment Operation

Each equipment system has operating requirements imposed on it by its design and the way it must interact with other equipment.

Although these requirements often limit the ability of the control system to instantly execute corrective measures they must be recognized and dealt with to protect the equipment.

The Argus Titan system not only addresses direct safety issues with proper equipment installation and wiring, but also includes additional settings to further protect and improve operation. These include:

- **Minimum “on” and “off” times** to prevent short-cycling and premature wear of equipment.
- **Power-up delay times** to delay and stage electrical loading upon return from power failures or drop outs. This feature is much appreciated by either your generator or the electrical company, as the case may be.
- **Event records** and **data recording** provide summaries of equipment operating frequency and duration as well as a continuous operating audit. This information is very important when evaluating performance or maintenance and service requirements.
- **Multiple operating limits**, and **safety overrides** can be configured to ensure the safest operation, and extend the operating life of your equipment.
- **Modulating control** - the Argus Titan control system contains programs to manage modulating equipment such as hot water heating systems and ventilation systems. These systems are capable of delivering a wide range of output levels. The computer can calculate and then directly deliver the correct output, after evaluating a range of operator set limits.


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- **Pulse-width modulation** - most on/off equipment is sized so that it is either too effective when on or not effective enough when off. Most of the time, the correct equipment response needed is somewhere between these two extremes.
  Staging of multi-unit systems like cooling fans can provide some intermediate steps, but these are not always sufficient for full, evenly distributed control.

  The Argus Titan system can cycle an equipment device on and off in proportion to the required response to accurately match the current requirements.

  When properly configured, the inertia of the greenhouse environment absorbs the operating pulses quite effectively resulting in a smooth control response.

  For example, the computer can turn a unit heater “off” after the calculated heat requirement has been delivered, regardless of the current air temperature reading. The longer term air temperature average is monitored, and future heat pulses are adjusted to give a greater or lesser response as required.

  This control strategy greatly reduces temperature overshoot, resulting in lower energy costs and a better growing environment without increasing the total number of equipment operations (cycling). Pulse-width modulation is particularly effective for managing fog and mist systems.


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## Curtain Systems

Thermal curtains can reduce energy loses by up to forty percent while simultaneously providing features that often improve crop quality and production. In addition to energy savings, curtains can be used to control light intensities, humidity, and plant surface temperatures.

Curtains made from black cloth may also be used for photoperiod control.

Greenhouses may require controlled shade (seasonal or light level dependent) to regulate solar energy levels for optimum plant growth, and to provide substantial reductions in the solar heat load.

The Argus Titan system provides several flexible modes of operation for curtain systems including:

- **Thermal Operation**: used to reduce energy requirements by closing during specified times and conditions.
- **Photoperiod Control**: used with blackout systems to regulate the day night periods.
- **Shade Control**: used to reduce the amount of heat gain and light exposure during periods of high solar radiation.

Features include:

- Time of day and/or light based operation.
- Up to 8 time/temperature/position based opening steps to reduce cold spillage.
- Temperature overrides can be tied to current climate and outdoor temperatures.
- Snow load overrides.
- Override positions for spraying.
- User definable light based shading steps.
- Independent delay time setpoints for opening and closing to control excessive curtain moves and protect sensitive crops.
- Timed and position based movements.
- Minimum crack setting.
- Separate dehumidify settings for night and day can be tied to ventilation required.
- Additional overrides, limits, and conditional operating logic as required.


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## Air Circulation

Adequate air circulation must be provided to ensure thorough mixing of the air inside the greenhouse. This avoids thermal stratification, and increases the temperature uniformity throughout the compartment.

Even small changes in temperature for a given air moisture content can result in large differences in relative humidity, or VPD readings.

Dehumidification and humidification strategies also require good mixing of the air mass since even small variations in temperature can result in large differences in relative humidity and vapor pressure deficit.

By maintaining consistent conditions throughout the greenhouse with good air circulation, many plant diseases can be prevented and more uniform crops can be produced.

The Argus Titan system controls the operation of horizontal and vertical airflow (HAF) fans and poly tube air distribution systems to optimize air circulation within the growing environment.

To save on energy costs, internal air circulation fans can be linked to the ventilation rate. In this way, whenever the roof vents or ventilation fans are providing sufficient air movement, the internal air circulation fan system is deactivated.

Fan operation can also be influenced by the time of day, the climate temperature, and many other user selectable parameters and conditions.

## Multi-Fan Operation

This program provides the control logic for staging the operation up to eight separate fans or fan groups, based on the current ventilating requirement as calculated by a **Climate Energy Balance** program or another control program configured to determine the amount of ventilation that is required.

Up to eight ventilating **Stages** can be configured. Each Stage supports up to eight logical fan outputs and up to eight rotation **Steps**.

Alternating fan operation within each ventilating stage can improve the distribution of the air in the compartment as well as balance fan wear. Each fan can be controlled using a simple on/ off strategy, or with Pulse Width Modulation (PWM) to provide more precise control.


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# Lighting

Controlled high-intensity-discharge (HID), LED and fluorescent lighting is beneficial as a supplement for low natural light levels.

Lighting can also be used to extend the natural day length to control the photoperiod response of plants.

All of the electrical energy used to provide lighting becomes part of the heat gain of the structure. This is usually beneficial, as lighting is customarily used during low light periods in the winter months when additional heat is required.

The Argus Titan system provides specialized control programs for operating a lighting system in photoperiod or supplementary regimes.

Photoperiod lighting control is used for day length management. Supplementary lighting control is typically used to turn lighting systems whenever the ambient light levels are insufficient for the desired plant response.

Features include:

- DLI (Daily Light Integral) based operation.
- Photoperiod start/end time can be absolute (time of day) or relative (tied to dawn or dusk).
- Cyclical lighting settings for energy efficient photoperiod control.
- Time windowed supplementary light control.
- Automatic reset of user initiated overrides.
- Light sensor based operation.
- Light level and light duration proving times.
- Light accumulation override features to reduce energy costs and extend lamp life.
- Minimum cycle on times to prevent short cycling of lighting equipment.
- Additional overrides, limits, and operating logic as required.


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## Spray Override Programs

The Argus Titan system enables integrated management of pesticides and other types of spray systems typically used in greenhouse compartments. Whether or not you use automated spray systems, you can still use the power of the control system to automatically manage your other equipment systems while you are spraying.

For example you can automatically manage your vents, irrigation equipment, HAF fans, etc. while you are spraying, and immediately afterwards by simply setting up the proper spray cycle times and triggering a spray cycle before you begin spraying.

Features include:

- Separate override settings for before, during and post spraying events.
- Individual spray override states can be configured for each controlled output.
- Automated management of other equipment systems such as $CO_2$, lighting, vents, mixing valves, shade, fan, and multi-output programs while spray operations are occurring.
- Programmed start or manual initiation.

Several output control programs have built-in override settings for spray program phases. This helps provide zone wide management of other equipment system such as $CO_2$, lighting, vents, mixing valves, shade, fan, and multi-output programs while spray operations are occurring. These settings allow the normal functions of these programs to be automatically overridden during the spray operations, and resumed once they are completed.

## Carbon Dioxide Enrichment

The Argus Titan $CO_2$ enrichment control program is used to manage the operation of $CO_2$ burners and liquid $CO_2$ valves. For applications where carbon dioxide gas is generated from combustion, the Argus Titan system can also be used in conjunction with heat storage and recovery equipment.

A control strategy of maintaining a $CO_2$ enrichment rate during daylight hours can be very successful when used with crops that derive a significant benefit from $CO_2$ such as tomatoes, cucumbers, and roses.

To save on $CO_2$ costs, the system can automatically reduce or suspend $CO_2$ enrichment when the compartment is at higher ventilation rates.

For $CO_2$ monitoring and control applications, Argus can provide timed or sensor based dosing and a range of $CO_2$ sensors to match your applications


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Features include:

- Enrichment control based on user definable time or light levels.
- Settings for using $CO_2$ burners as an emergency heat source.
- Ventilation based dosing overrides.
- Dosing overrides for spraying operations.
- Separate dosing targets for closed and venting modes.
- Minimum on/off interval settings for time-based dosing.
- Emergency shutdown source.
- Additional overrides, limits, and operating logic as required.


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# *Irrigation Management*

An irrigation system is defined as an integrated system that includes one or more sources of water or fertilizer solution, pressurization pump(s), distribution piping around the nursery, irrigation valves, and final irrigation water delivery systems.

Along with complete climate control, Argus Titan systems have fully integrated irrigation and nutrient management capabilities. Our irrigation and nutrient management programs are the most complete and sophisticated in the industry.

Flexibility and an “open” system approach are two of the key factors that set Argus apart. Argus can control virtually any type of pump, valve, or other equipment. We can assist in the design of virtually any irrigation and nutrient system, including all types of “site-built” systems.

The Argus Titan system has also been used to provide all measurement and control functions for many different commercially available nutrient injection and mixing systems.

Features Include:

- System wide capacity management.
- Management of multiple irrigation feed sources.
- Coordination with nutrient control equipment.
- Feed/Water rotation cycles.
- Control of base watering times at the individual valve level.
- Recirculation, water level, and volume management in tanks, ponds, and ebb and flood systems.
- Dynamic control of irrigation event duration and/or frequency.
- Output source and irrigation valve coordination.
- Manual and automatic operation.
- Sensor-based watering decisions including soil tensiometers, weight scales, start-trays, tipping. buckets, as well as heat and frost protection sensors.
- The Argus Titan system can accommodate:


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## Irrigation Decision Making

There are many different reasons for delivering water or feed to a crop. These include:

- Meeting the water demand.
- Delivering fertilizers to the crop.
- Flushing salt build-up from the soil.
- Cooling the soil surface to prevent high temperature damage to tender crops (seedlings).
- Humidifying the air and reduce crop wilting and stress.
- Providing some frost protection on outdoor crops in spring and fall.
- Bringing the crop to a uniform moisture level before packing and shipping.

Transpiration and evapotranspiration computer models, soil-moisture probes (tensiometers and conductivity sensors), and other systems that measure or predict crop water-usage are of no use for most of these other tasks.

For this reason, Argus has many different water management approaches that can be used separately or together to meet the specific requirements of your crop. Each of the following decision programs can also select its own specific fertilizer source:

- Manual operation.
- Time schedules.
  - Time of day.
  - Two-week calendar.
- Sensor accumulation values.
- Light sensor input.
- Other sensor input.
- Combination time-sensor values.
- Water starts based on an accumulation of sensor measurements or time-interval values.
  Watering response can vary with time of day and can automatically track a user-defined schedule as the crop grows from seedling to market.


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- Control equations using measurements from:
  - Soil tensiometers.
  - Weight scales.
  - Start-tray irrigation sensors.
  - Thermometers (typically for frost and heat protection).
  - Others.
- **Specific crop models** – As an example, evapotranspiration models that use temperature, light, relative humidity, vapor-pressure deficit (VPD), and other sensor and sensor-derived measurements as inputs.

  Once a model is developed for a particular crop and greenhouse, control settings are automatically adjusted to match the changing water requirements over the lifetime of a crop.

## Water Scheduling and Capacity Management

Argus separates water decision making (when to water) from the actual delivery of water to the crop (irrigation system capacity management). This frees the grower from having to worry about capacity and feed management limitations of the irrigation system when making watering decisions.

The Argus Titan Control system automatically manages the irrigation-system resources to best meet the requirements of any irrigation zones that need water.

The control system maximizes efficient use of the irrigation system while protecting against overloading. If too many zones request water at the same time, the system schedules them and service them as soon as water supply is available.

Separating the water delivery from the decision-making has another advantage. The grower is only concerned with meeting the needs of the crop. How the water is delivered can vary greatly, depending on the type of irrigation equipment used.

Argus allows the mixing of very different irrigation system components on one system, for example, irrigation booms, sprinklers, and drip systems. These systems are transparent to the grower once they are set up on the control system.

A single crop can then be managed from one decision-making program, even if it is physically located across several different types of irrigation systems. The control system automatically manages each irrigation valve in the correct way to meet the crop's requirements.


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## Irrigation Pulsing

Many watering systems deliver water at a rate that is faster than the growing media is capable of absorbing. This can be more of a problem when the growing media is dry.

Normal watering results in excessive waste and run-off. Pulse watering can be used to divide the required watering into a number of shorter pulses with a delay time between each pulse to allow water absorption to occur.

- Recirculating systems:
  - Ebb & flood systems.
    - Table & bench systems.
    - Floor systems.
    - Separate and variable fill, drain, and hold times for each zone.
  - Trough & nutrient-film-technique (NFT) systems.
  - Hydroponic media (rock wool, clay pellets, cocoa peat, etc.).
- Non-recirculating systems:
  - Sprinklers
  - Drip tubes
  - Misting
  - Hydroponic media (rock wool, clay pellets, cocoa peat, etc.)
  - Container crops
  - Field Crops


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## Evapotranspiration Modeling

For outdoor nurseries, silviculture, and other outdoor irrigation applications, the Argus Titan system contains built-in evapotranspiration modeling software for calculating water loss.

This advanced program can be used alone or in conjunction with other irrigation decisions for scheduling irrigation events.

This program is based on the Penman-Monteith equations, the FAO (UN Food and Agriculture Organization) standard for evapotranspiration calculations.

It combines solar, wind, temperature, and other outdoor atmospheric effects to calculate probable water loss.




This model is suited to predicting evapotranspiration water loss from outdoor crops. For indoor crops, where wind is not a factor and the evapotranspiration losses are different due to a protected environment, it is generally easier to simply use accumulated light as a means of predicting irrigation demand.

## Feed Selection

The irrigation system can also provide feed delivery management. The feeds can come from almost any source - injectors, pump sets, tanks, etc. - and do not have to be controlled by Argus.

The capacity management system selects the feed source that the irrigation zone requires and delivers it to the zone valve. This is done using a selector valve or pump.

Multiple feed sources plus clear water are supported on each irrigation system.

Feeds and clear water can be alternated to provide a range of nutrient levels for a variety of crops while using only one fertilizer source - a great way to keep fertilizer systems simple.


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# *Nutrient Monitoring and Control*



Argus Titan nutrient injection programs and injection equipment offer sophisticated nutrient for a variety of applications.

Nutrient control is fully integrated with irrigation management.

You can manage anything from the simple injection of pre-blended fertilizer concentrates to full single element dosing where the target recipes are blended on-the-fly from available stock tanks.

You can create and save multiple recipes by simply entering the desired parts per million for the required elements.


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The system automatically creates a blending solution from the available stock tanks (or reports back if a recipe cannot be created). When a recipe is called by the irrigation system, the nutrient injection program automatically produces it for the current flow rate.

Nutrient injection systems can be used to produce a single feed or many different feeds in multiplexing applications where a single injection system services several crops.

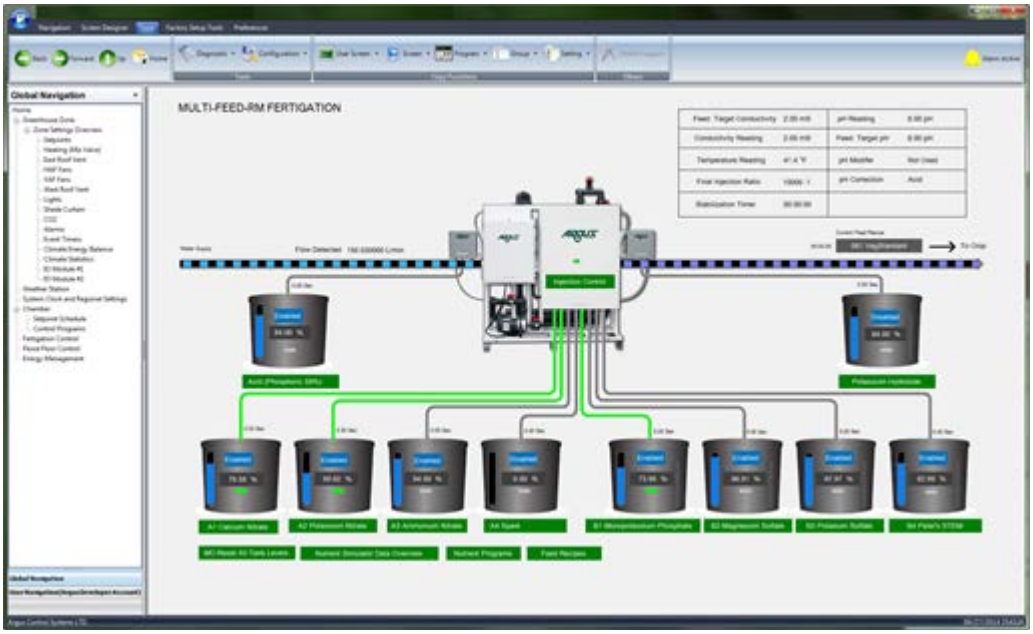
Feed chemistry and overall concentration can also be varied dynamically in relation to light levels or the need for substrate salts management.

## Nutrient Injection Features

- The **Argus Injection Program** can handle up to **14** stock solutions, while the **RM Nutrient Program** is designed with **8** stock solution injectors.
- Full fertilizer analysis entry for each stock tank.
- Concentration factor settings.
- Compensation for preexisting fertilizer elements in the water supply.
- Output styles to accommodate a wide variety of injector types.
- Complete integration with Argus **Irrigation** programs.
- This program can be used with **Argus Multi-Feed** injector systems or other injection equipment.
- Full support for single-tank, A/B ratio feeding and single element dosing systems.
- Can be used for in-line injection or dilute stock tank management.


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- Can produce up to 64 distinct user specified **Feed Recipes**.




## Feed Recipes Program Features

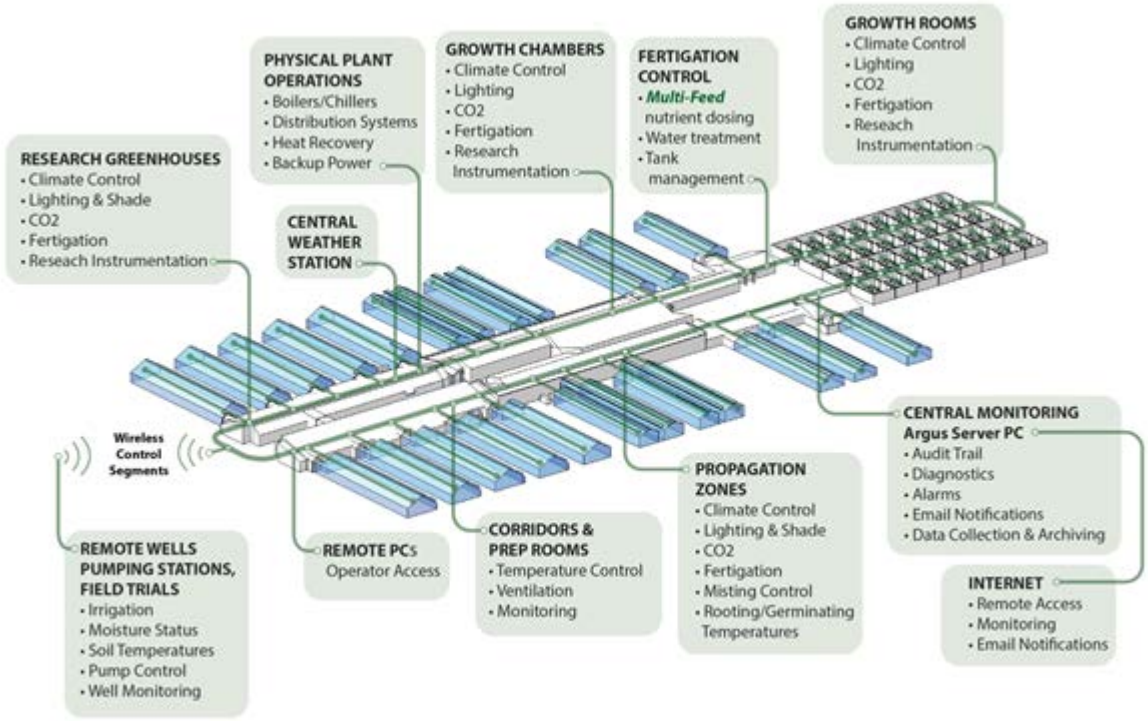
- Enter recipe element targets in parts per million – the program automatically determines how to create the recipe from the available stock concentrates.
- Up to 8 distinct feed recipes per program.
- Automatic, semi-automatic, or manual feed recipe creation.
- Rules-based feed recipe creation.
- Automatic parts per million tabulation for each element.
- Full integration with the
- **Nutrient Injection** program and **Irrigation** programs.

## Additional Features

- Full set-point control for EC (electrical conductivity) and pH.
- Feedback based recipe compensation for recirculating systems.
- Alarming and safety shutdown.
- Recirculation management
- Light-level or accumulated-light compensation of EC


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# *Facility and Physical Plant Management*




Argus Titan systems are designed for central monitoring and management of engineered climate zones throughout a facility. There are control features and options throughout the system to manage each equipment item as efficiently as possible while respecting the limitations and safe operating parameters of each controlled device.

## Integrated Control of Multiple Heat Source Systems

The Argus Titan system can be used to manage, stage, and integrate the use of alternative and supplementary heat sources.

Natural gas is a clean, economical, reliable, and easily managed energy source, but there are other energy sources that can be used to improve the performance and economics of the greenhouse operation. Some sources such as solar energy are “free” to the extent that greenhouses naturally trap and use it.

Others such as waste cooling water or alternate fuels (sawdust, waste oil, etc.) may be relatively inexpensive but not continuously available or in sufficient supply for all conditions.

Control strategies can be optimized for energy conservation by using less expensive energy when it is available.


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## Boiler Limiting

The Argus Titan control system arbitrates between the heat requirements of the greenhouse and the ability of a boiler system to reliably and safely deliver this heat.

The program eliminates thermal shock and condensation problems when used with properly designed equipment.

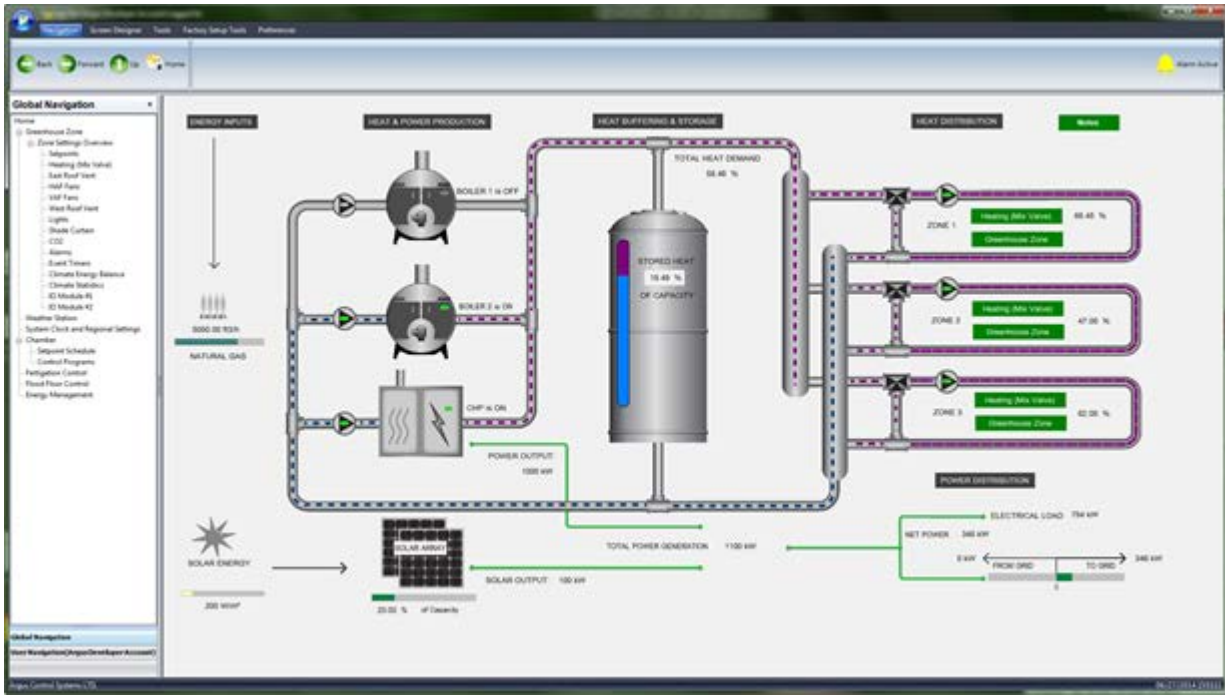
A direct benefit of this type of program is the need to only size the boiler system for average heating requirements rather than short term peak requirements.

## Co-generation (Combined Heat and Power)

The Argus Titan system, coupled with properly designed physical systems, can handle the arbitration required to make the highest and best use of each component in a co-generation application.

The computer system can select the best use for the recovered heat and schedule operating periods for maximum benefit.

## Power Management, Thermal Storage and Heat Buffering




Argus has sophisticated control programs for operations that need to recover stored heat energy produced by activities such as $CO_2$ generation from natural gas.


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Surplus heat energy can be automatically stored and recovered seamlessly, in harmony with the primary heating source.

Heat storage systems are used in situations where the heat energy produced by a heating plant is in excess of the current heating demand.

For greenhouse operations, heat storage is often used for daytime CO2 generation from natural gas or propane, and in other situations such as combined heat and power generation (Co-gen) where the heat energy created to produce electricity occurs at a time when it is not needed.

The reservoir of hot water that accumulates is typically used at night when the greenhouse requires heat.

The Argus Titan system can manage the complex equipment required to store and recover surplus heat efficiently. This includes precision management of zone heating, heat storage, and heat recovery, as well as intelligent transitioning between these operational phases.

Argus can configure a control design to match your specifications including:

- CO2 extraction and optional condenser heat recovery
- Cogeneration heat extraction
- Boiler operation (storage & heating modes)
- Heating system supply and return valves
- Hot water storage mixing control
- Hot water storage pump control
- Hot water recovery mixing valve control
- Monitoring and data recording of all storage system sensors and relays
- Hot water storage tank status and stratification monitoring.


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## *Custom Equipment Control*

In situations where specialized equipment systems require additional or non-standard features, Argus has a powerful suite of generic control programs that can be configured to meet the control objectives of the most demanding applications.

These powerful and flexible programs are adaptable to almost any situation and unlike many alternative systems, they are user-configurable without the need to learn a complex computer programming language.

In situations where other stand-alone equipment controllers are in place, such as boiler control packages, PLCs, and nutrient controllers, the Argus Titan system can often provide an interface to coordinate and integrate the operation of these devices with the rest of your facility.

This not only helps you to better manage these systems, it also ensures maximum operating efficiency and effectiveness while avoiding potential equipment conflicts.

Whenever you are selecting new equipment that is available with custom control options, you should check with Argus first.

We can often manage your new equipment directly, providing convenient and coordinated central control and monitoring, while saving you money on redundant control hardware.

## Supervisory Control

The Titan system is designed for custom interoperability with external decision support products such as plant growth models and other expert systems.

The **Supervisory Control Guardian** program acts as a safe portal for accepting the results of these external applications as control inputs and targets.

The **Supervisory Control Guardian** program provides a safe means of receiving information and control instructions from outside sources into the Argus Titan system.

For example, if you wish to use an external crop modeling program to set targets for climate temperatures and other parameters, the **Supervisory Control Guardian** safely imports the results of your model into the Titan system. It enables an external program to automatically ‘direct’ or influence the activities of the Titan system.

The program is called the **Supervisory Control Guardian** because it watches over the incoming data to make sure that it is safely within the tolerances and limits that you define. It also requires the incoming data to be refreshed at regular intervals to make sure that the communications link is sound.

If problems occur, there are configurable failure mode contingencies and alarms to alert you.


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The **Supervisory Control Guardian** program is intended primarily for researchers involved in the development of predictive and feedback supported growth modeling systems. It enables them to use the features of the Titan control system to safely accept the results of the modeling programs as control targets.

The advantage of this strategy is that it allows researchers to focus their efforts on plant growth modeling without needing to worry about the complexities of equipment control.

Two-way communications are also possible with the use of a **UDP RealTime** window that acts as a host for inter system communications. In this way the Titan system can also provide feedback information to the model such as sensor readings and equipment states.

## Modbus, BACnet and ebmBUS support

There are a number of situations where it is useful to pass data into and out of the Titan system.

In some instances there may be a need to coordinate the activities of the Titan system with standalone or ‘package’ equipment systems that are supplied with their own control processors.

There may also be other control systems in place such as a building control system that regulates the availability of hot water from a central heating plant.

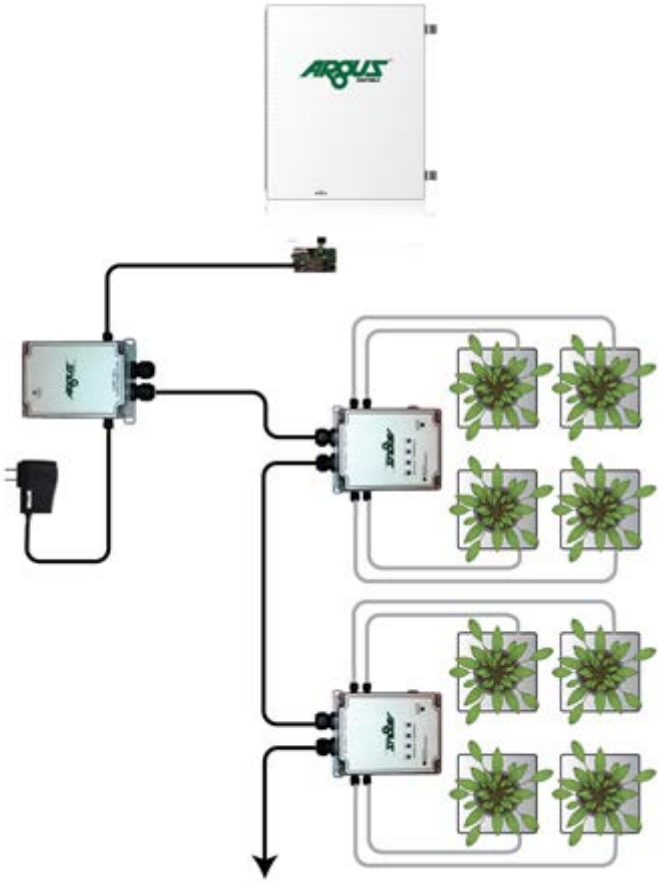
To coordinate control activities, the Argus Titan system often needs to know the status of these systems and they may also need to receive and process data from the Argus Titan system.

Depending on the type of equipment and the specific application, this can often be accomplished through physical signal wiring between the systems.

Titan systems also support **Modbus RTU** and **ASCII** and **BACnet** protocols. Titan systems also have direct support for the ebmBUS protocol used for operating arrays of **ebm-Pabst** fans.


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In addition to third-party Modbus support Argus provides a custom designed Modbus interface for **monitoring arrays of load cells** used for plant moisture studies,




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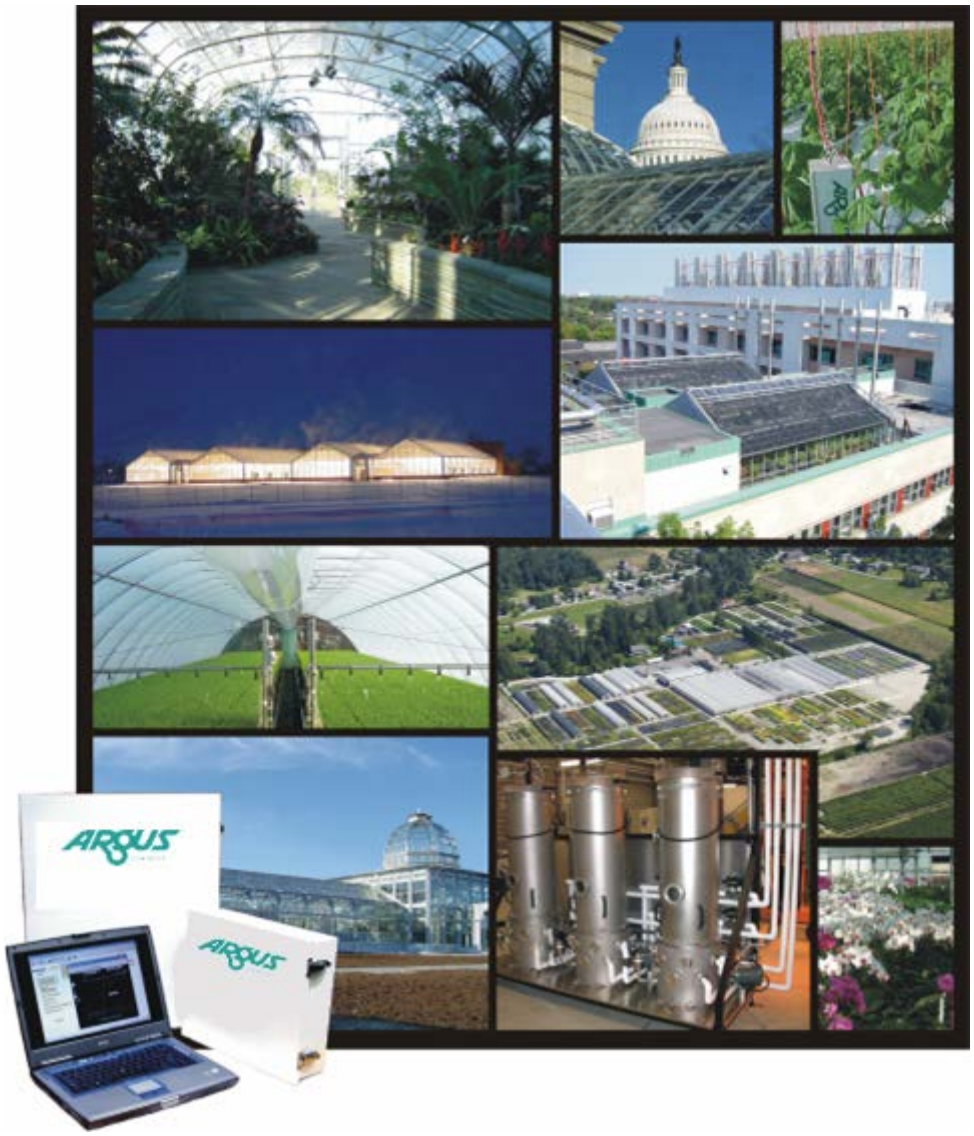
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# Omni Sensor

## Operator's Guide




*December 2022*

# Omni Sensor Operator's Guide

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# About this Manual

This manual describes the features, installation, and operation of **Argus Omni** sensors.

## *Where to Find Additional Information*

This guide covers the basic components and configuration of the **Argus Omni** sensors.

Detailed wiring diagrams, data sheets, and other documents are supplied with the equipment. Please refer to them for installation.

For additional assistance please contact **Argus Support** at 1-888-667-2091 (toll-free in Canada and the U.S.) or 604-536-9100.

You may also contact us by fax at 604-538-4728 or e-mail us at argus@arguscontrols.com.

You can also check the **Argus Web site** (www.arguscontrols.com) for answers to frequently asked questions, troubleshooting tips, and the latest product information.


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# INTRODUCTION

Omni sensors were developed to resolve many issues relating to the measurement of the most common climate parameters used in horticultural production.

In particular, the Omni sensor applies our very successful strategy of heating the RH sensor in high humidity environments to protect it from condensation induced errors and damage.

Compared to unheated solid-state RH sensors, this technique offers **extraordinary accuracy and sensor life** over the range of humidity common in horticultural environments.

Omni sensors are available in a range of models and features:

| Model: | Temperature | Relative Humidity | PAR Light | $CO_2$ | On-Board Display |
|---|---|---|---|---|---|
| SEN-OSM/CO2 | Yes | Yes | Yes | Yes | Yes |
| SEN-OSM/C | Yes | Yes | Yes | | Yes |
| SEN-OSM/RHT | Yes | Yes | No | No | No |




OMNI RHT (no display)




OMNI C/CO2 (LED Display)

Omni sensors are compact and easily interchangeable measuring stations for indoor applications including greenhouses and growth chambers.


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A simple 2-wire cable is used to connect them to any available Titan I/O module, and since the communications cable also supplies the power, there is no need for an additional power source.

The Omni sensor uses a single digital channel on a Titan I/O module ***leaving all the analog inputs available for other uses.***

By comparison, an equivalent number of analog sensors for the ***SEN-OSM/CO2*** model would require 6 analog inputs!

Until now, PAR light and $CO_2$ measurement were often left out of standard horticultural zone monitoring solutions because of the cost and the difficulty of providing these measurements.

Along with state-of-the-art high accuracy temperature and humidity measurement systems, the Omni sensor is the first of its kind to include models that incorporate PAR light readings and $CO_2$ measurement.


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# Features of the Omni Sensor

## *All Models*

### Compact Size

The Omni sensor is small and lightweight making it suitable for installation in almost any horticultural application, including most growth chambers.

### Easy and Inexpensive to Install

Wiring can span quite long distances of up to 1000 feet and consists of simple two conductor cable. This is very easy to install, and much less expensive than the 8 – 12 conductor cabling required for conventional sensor systems with the same functionality.

No external power source is required.

### Plug-in Connection

A simple “plug and twist lock” waterproof connection system (IP-67) makes installation and service or calibration swaps very easy.

### Simplified Troubleshooting

Most problems are limited to the 2-conductor cable, which is relatively easy to test, troubleshoot, or replace, or to the Omni sensor itself, which can simply be replaced if any part of its functionality or calibration accuracy is suspect.

Omni sensors can be tested elsewhere on-site or returned to the factory for automated calibration checks, re-calibration, or repair as needed.


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## Precision Temperature Measurement

**Operating Range:**

- **SEN-OSM/C (v 4.1):** 0°C to 50°C
- **SEN-OSM/CO2 (v 4.1):** 0°C to 50°C
- **SEN-OSM/RHT (v4.1):** 0°C to 50°C

**Typical Accuracy:**

- -10°C to +85°C: +/-0.4°C.
- -10°C to -40°C: from +/-0.4°C (at -10°C) to +/-0.7°C (at -40°C).

**Temperature** and **RH** sensors are designed to work acceptably even if the built-in fan has failed, reducing the need for immediate fan replacement.

## Precision Humidity Measurement

**Operating Range:** 20 - 80% RH, non-condensing.

The Omni sensor provides relative humidity measurements with typical accuracies of:

- 20 - 80% RH: +/- 3% RH

Recommended humidity operating range is **20% to 80% RH** (non-condensing) over **–10 °C to 60 °C**. Prolonged operation beyond these ranges may result in a shift of sensor reading, with slow recovery time.

**For any high humidity applications, it is recommended to use the SEN-RHT sensor instead of the Omni.**

## Aspirated Sensing Enclosure

A low-powered DC fan provides sensor aspiration to offset any solar heating of the sensor enclosure.

For all models with humidity sensors, **the blower is programmed to automatically shut down in very high humidity(>98%) to reduce the risk of aspirating fog or mist that could damage or contaminate the sensors or blower fan.**

In most situations very high humidity only occurs under low (solar) radiation conditions when aspiration is of little benefit.


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## Enhanced Lightning Protection

Enhanced lightning protection is provided built-in transient voltage suppression at both the Omni sensor and the I/O Module. A supplied **Input Protection Board** (IPB/OMNI) mounts onto the I/O module providing current-to-frequency conversion and built-in transient voltage protection.

## Redundancy Options

Up to **two Omni sensors** can be connected to a Titan I/O module. This provides an option for a backup sensor in applications demanding high reliability and availability as well as the option for sampling from more than one location in a monitored zone. Since the Omni sensor does not use any of the analog inputs on a Titan I/O module, it is also possible to add analog instrumentation including backup temperature and humidity sensors.

If required, redundant I/O Modules and Titan Controllers can also be employed in keeping with the mission critical nature of each application.

# *SEN-OSM/C & SEN-OSM/CO2 Models*

## Reasonable Cost (for a High End Sensor Package)

These models are priced competitively with high end aspirated measuring systems but with the added benefits a user interface and display, a PAR light sensor, an integrated $CO_2$ sensor option.

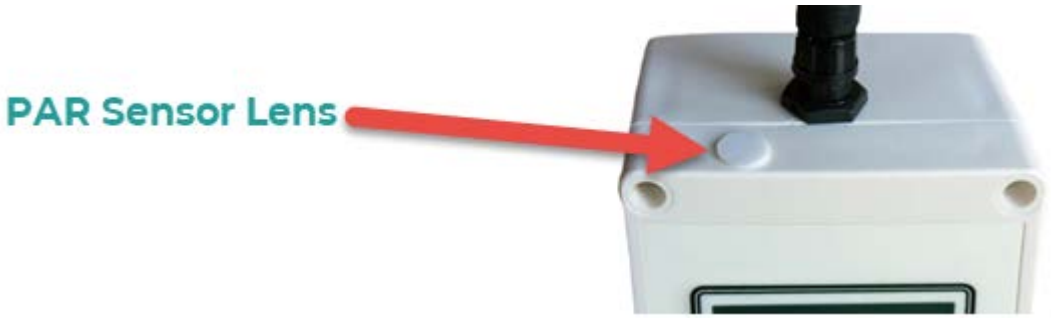
## On-Board Display

The Omni sensor features a 2 line x 16 character reflective LCD display to provide an accurate readout of the measured values at the mounting location.

The keypad interface also provides a calibration pathway for field or site calibration of $CO_2$ measurements. **It is recommended all RH calibrations be completed at Argus.**


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# PAR Light Measurement




Many growers depend on the proper management of light to regulate growth (photoperiod) and to drive growth.

We incorporated a PAR (photosynthetic active radiation) measurement system into the Omni sensor because of the importance of light measurement and the relatively low cost for Argus to include this feature in an already installed and powered, 'smart' sensor system.

***It is not intended to replace a high cost, high accuracy scientific instrument such as the LiCOR Quantum sensor***, but it is capable of providing quite accurate information, if properly mounted in the greenhouse or growth chamber.

It is particularly well suited for managing photoperiod, calculating **Daily Light Integrals (DLI)**, and is capable of confirming proper performance of lighting systems and blackout curtain systems at the Omni sensor mounting location (remember, the Omni sensor cannot 'see' the entire greenhouse).

**Omni sensor PAR measurements are calibrated to be the most accurate for direct sunlight or sunlight through transparent glazing**.

Man-made light sources, overhead infra-red heaters, non-transparent (colored) glazing materials, and diffused light through leaf canopies affects PAR accuracy.

The PAR readings from the Omni sensor are sufficiently accurate for most crop growth management requirements but, as stated earlier, care must be taken with the sensor location, plant canopy shading, and mounting orientation for the best results.

Since the Omni sensor is primarily an aspirated temperature/RH system it must be placed at the most optimal location for these measurements.

For many crops including potted plants and bedding plants the sensor can usually be positioned for optimum performance of all sensor readings.

The light sensor should be exposed and level, just above the plant canopy, and the temperature and humidity measurements taken from the air intake at the bottom of the Omni sensor should be just at the top of the crop.


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However, for true in-canopy mounting locations such as tall vegetable crops, the readings from the light sensor may be less useful.

Therefore, if accurate light measurement is important in these situations, a second Omni sensor (perhaps a 'T' model) or a dedicated PAR light sensor mounted at the best location for light measurements may be required.

## *SEN-OSM/CO2*

## $CO_2$ Measurement Option

$CO_2$ measurement is an easily added plug-in upgrade for the SEN-OSM/C, greatly reducing the cost as compared to previous technologies (much less than half the cost).

$CO_2$ sensor checking and reading calibration procedures are also much easier than previously possible.

Advancements in long term stability and reading calibration have made it practical for much wider application of $CO_2$ measurement and $CO_2$ enrichment for all plant production systems.

The Argus $CO_2$ sensor has excellent environmental protection to minimize the risk of sensor contamination. This protection slows the response time of the $CO_2$ sensor which is both a blessing and a curse. The sensor does not respond to short exposure to $CO_2$ sources (like operators breathing $CO_2$ all over the sensor while they look at the LCD readings).

The sensor has a T63 (response time constant) of 180 seconds meaning it takes 180 seconds to produce a value that is 63.2% of a step-wise change in the $CO_2$.

Greenhouses and growth chambers do not normally experience large 'step-wise' changes in $CO_2$ levels.

Since they typically move up and down gradually over many minutes or hours in response to ventilation and enrichment strategies (and to a lesser extent assimilation and respiration), the $CO_2$ sensor accurately tracks these changes.


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# Maximizing Omni Lifespan

The Omni sensor is a highly accurate measurement system with sensitive electronics. To protect your instrument and ensure the longest, most trouble-free service:

- Do not drill into the Omni enclosure.
- Do not spray directly with water.
- Remove and store in a safe place (or bag securely) when spraying pesticides/ fertilizers/chemicals.
- Not recommended for environments with propagation mist systems (call Argus for alternatives).
- **Not recommended for any environments above 80% RH.**


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# Design Considerations: Recommended Applications

Omni sensors are suitable for a wide a range of monitoring and climate control applications and they are fully integrated with the Argus Titan Control system.

They can be used in place of stand-alone sensors and other types of aspirated sensing units.

Although there are some situations where they can't match the required accuracy or sampling speeds of specialized instrumentation, they are more than capable of serving the general monitoring and control needs for typical:

- Coolers.
- Corridors.
- Dry Rooms
- Greenhouses.
- Growth chambers.
- Mechanical rooms.
- Storage rooms.
- Tank rooms.
- Warehouses.
- Work spaces.


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# DESIGN CONSIDERATIONS: NOT RECOMMENDED

**Any humidity environments greater than 80% RH, for example:**

- Propagation Zones
- Germination Chambers

## *Unprotected Outdoor and Extremely Wet Locations*

While Omni sensors are designed to withstand the occasional dousing from hoses etc. they are mainly intended for indoor use.

## *Locations Containing Large Amounts of Free Water Droplets*

Omni sensors perform very well in high humidity environments. However, like all aspirated sensors they must not be positioned where they are continually exposed to air containing large quantities of suspended moisture droplets from fogs or mists. There are two reasons for this:

1) Free water droplets can damage the fan electronics and other electronic components in the aspirated air path.
2) Free water droplets wet the filter and the walls of the aspirated chamber. This results in inaccurate temperature and humidity readings due to evaporation and evaporative cooling until this water has evaporated.

## *Locations Subject to Freezing Temperatures (Omni/C and /CO2 models)*

Any location subject to freezing temperatures for both the Omni C and the $CO_2$ Models.


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# INSTALLATION

We recommend you first mount and connect your Omni sensor(s) to the Argus Titan system before setting up the software in the Argus Operator program.

By performing the wiring part first you can ensure the sensor is operating (since the fan should start running and the display readings are viewable on /C and /CO2 models as soon as it is powered up. This also gives the Omni sensor some time to warm-up and stabilize while you set up the software on the PC.

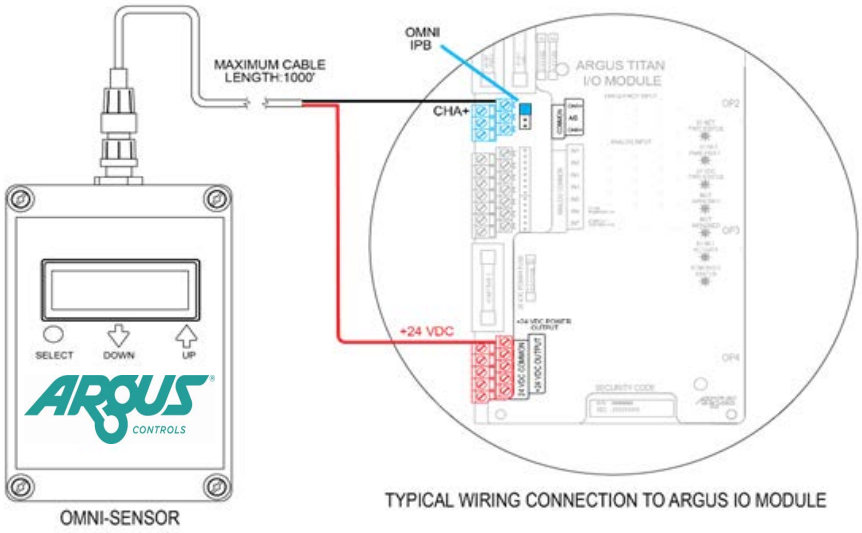
## *Hardware Installation*

**Important: Do not open the OMNI sensor for any reason. Opening the OMNI may result in putting the $CO_2$ sensor out of calibration.**

**Opening the OMNI sensor will void any warranty.**

The Omni sensor must be connected to a **Titan I/O module**. Up to **two Omni sensors** can be connected to a single I/O module, using the digital input channels built into each module.

These inputs are also used for other measurement purposes such as water flow-meters, so they may not always be available. Usually there is at least one I/O module in or near the target zone so all you have to do is locate it and run the supplied cabling to it from the Omni sensor mounting location.




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions supplied with the sensor.


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# Omni Sensor Mounting and Cable Run

## *Locating the Omni Sensor*

You first need to decide on a good representative location to mount the sensor.

The best mounting location depends to some extent on your objectives and often involves some compromises since a single location must 'speak' for the entire monitored area.

Also, the best place to monitor temperature and humidity may not be the best place to measure light.

The reverse is also true. $CO_2$ measurements are generally less affected by mounting location, so long as you avoid placing the sensor directly in the path of any supplemental $CO_2$ discharge points.

For aspirated temperature or humidity measurements of bench and floor grown crops, we normally recommend mounting the sensor at or just above the crop height.

This also gives good light sensor performance since the crop cannot shade the light sensor.

For taller crops such as tomatoes and cucumbers we usually recommend you place the sensor in the canopy. Unfortunately this causes some light sensor shading, reducing the accuracy of the light measurements.

Avoid locations where drafts, fog nozzles, sprinklers, nearby heat pipes, unit heaters, or the shadows cast from posts or overhead obstructions causes non-representative sampling errors.

In greenhouses, it is impossible to completely avoid structural shading, but the sensor can usually be located where this is minimized, while still providing representative readings for temperature, humidity and optional $CO_2$.


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## Running the Cable



We recommend that the installer neatly coil and **leave all spare cable at the sensor end,** facilitating future sensor relocation within the immediate area.

This allows the grower to optimize sensor location as crops or conditions change.

The supplied communications cable is strong and well protected with a UL-approved Sun/UV-resistant jacket.

Even so, it is always a good practice to keep it protected from mechanical damage by running it along the underside of structural members or attaching it with black (UV resistant) tie wraps to existing conduit runs.

Better still, pull the cable into conduit if the mounting location is permanent. Try to make sure it won't get snagged or tripped over.

**Make sure it enters the underside of the I/O Module enclosure using a suitable drip loop.** If the distance involved requires more cable you can splice an additional length of the same type of cable* **to the I/O Module end of the run**.

Consult Argus if the cable run is more than 1000 feet.

* Cable can be ordered in custom lengths or you can extend it yourself using 2-conductor, twisted pair, 18-22 gauge, UL-approved cable. Use Sun/UV-resistant cable if it is exposed to light.


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## Hanging the Omni Sensor

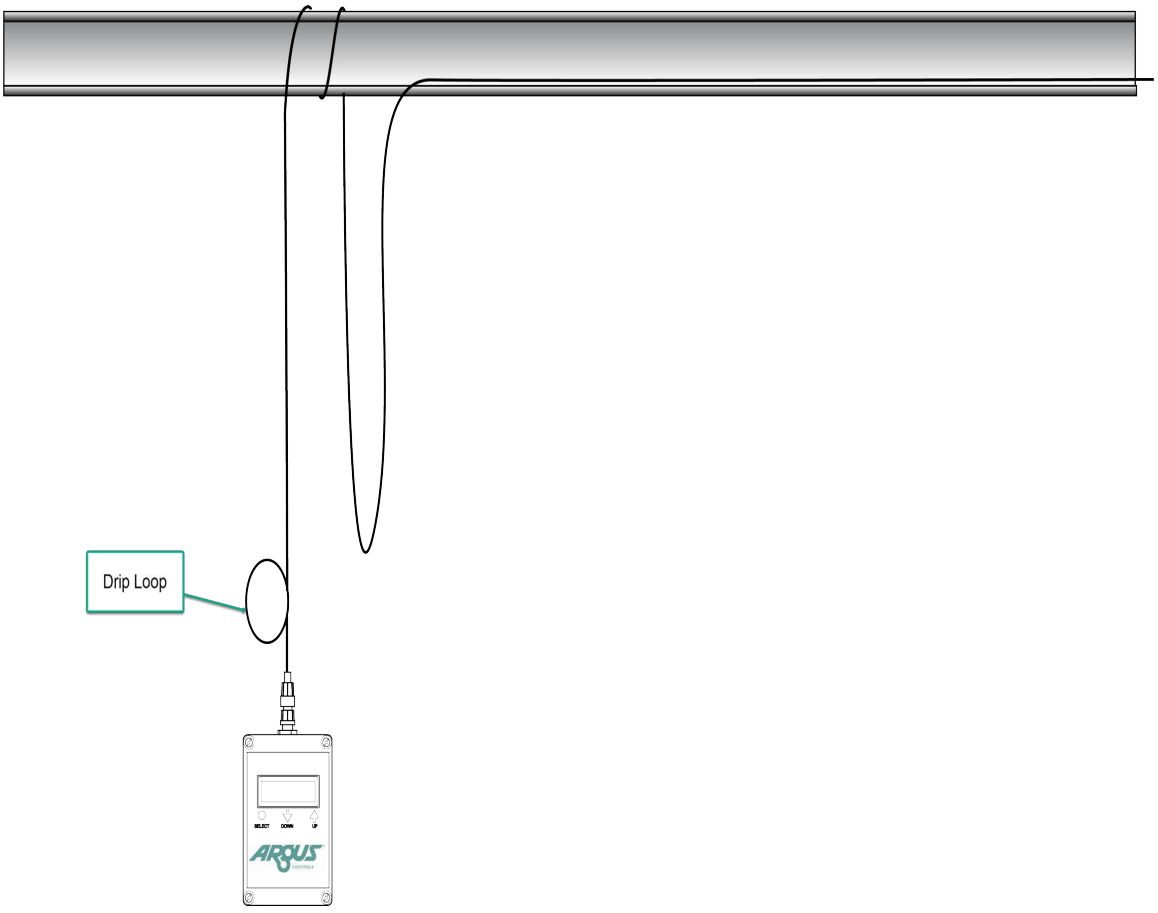
The sensor is designed to be suspended from its own communications cable. Simply find something overhead to hang the wire from at your desired location.

We recommend looping it over a horizontal beam if one is available, so that it can be easily repositioned as required.

Leave some slack so that the sensor can be raised and lowered as appropriate.

There is also a drip loop placed near the sensor so any moisture does not run into the sensor housing.

If hanging the cable is not practical you can use the included mounting tabs to attach the sensor to a pole, post, or wall (see the next page).



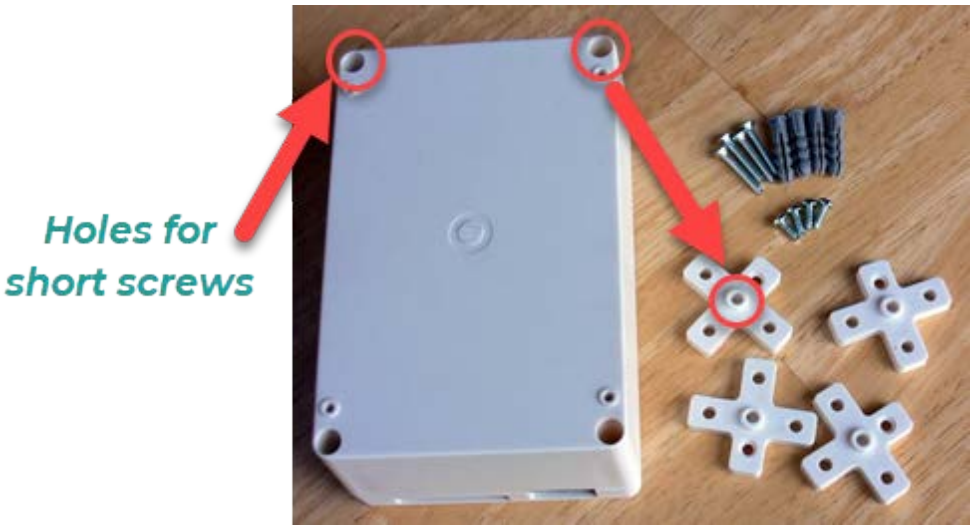


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## Pole, Post, and Wall Mounting

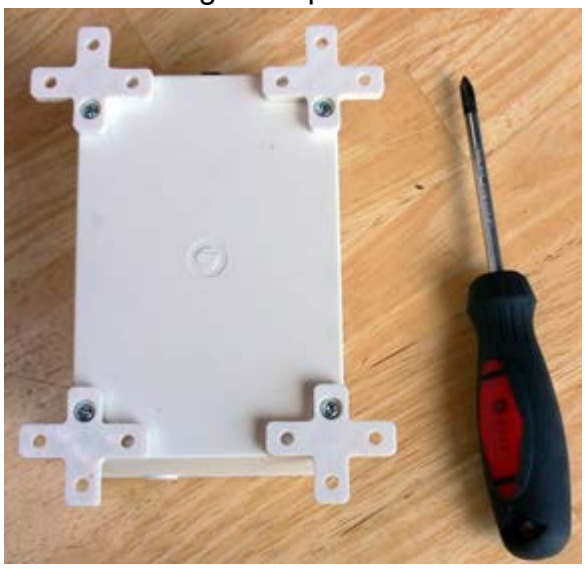
A set of four mounting tabs is included with each sensor module for mounting the module to a flat surface. This makes it possible to mount the sensor onto walls, poles, or posts that have a suitable flat surface or a mounting plate attached.

The raised dimple on each tab fits into the hole on the back of the module like a Lego piece, and the short leg of the tab is aligned over the pre-drilled screw hole:




**Above:** Mounting tab kit

**Below:** Tabs installed. **Make sure to use the short screws for fastening the tabs to the module!** The long ones are for mounting to the post or wall.




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## Connecting the Cable to the Omni Sensor

The supplied cable has a push in, quarter-turn, water resistant connector.The connector uses an internal key slot to ensure proper seating and wiring polarity. Make sure the key and the slot are lined up and insert the connector cap into the receptacle on the Omni sensor housing.

Push the slip connector fully down and turn one quarter turn clockwise to lock.





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# REPLACING EXISTING OLDER OMNI SENSORS (V1-V4)

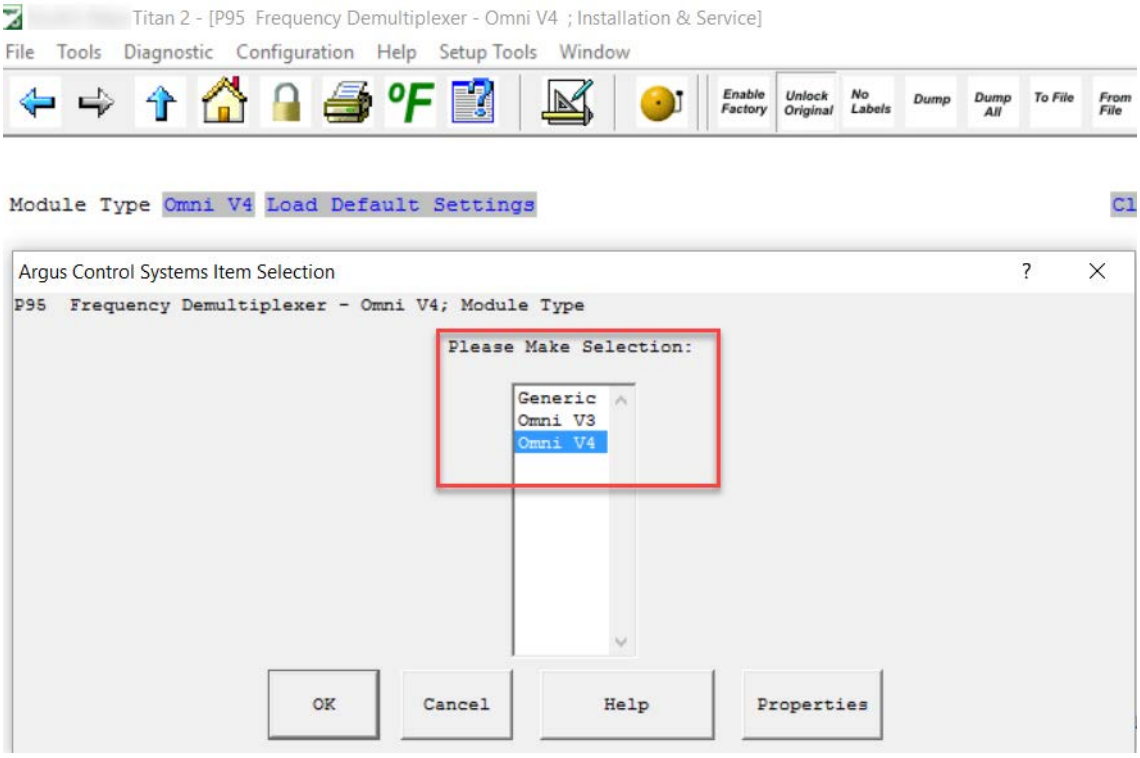
**Important: for upgrading Omni V1 models, please contact Argus customer support when wanting to upgrade from V1 to V4. Additional configuration is required and is done by Argus.**

Version 4 Omni sensors require new firmware that includes features to enable re-configuring the Controller settings with minimal effort.

There is a new Module Type setting at the top of the **Frequency Demultiplexer's Installation and Service** screen.

**The firmware builds available to the Omni Version 4 are Firmware Build 201612061200 and above ONLY.**

To update the firmware, select **Omni V4** and **Load Default Settings** when you are installing the Omni sensor:





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# I/O Module Connections

If the Omni sensor is part of a custom installation, consult the wiring diagrams for the project. If you are adding an Omni sensor on your own, select an unused counter/timer channel on an existing I/O module and follow the instructions below.

The instructions below provide some general points for connecting the wires and the supplied **Input Protection** board. However, you should always refer to your custom wiring diagrams for additional information and warnings. Check with Argus if you are not sure.

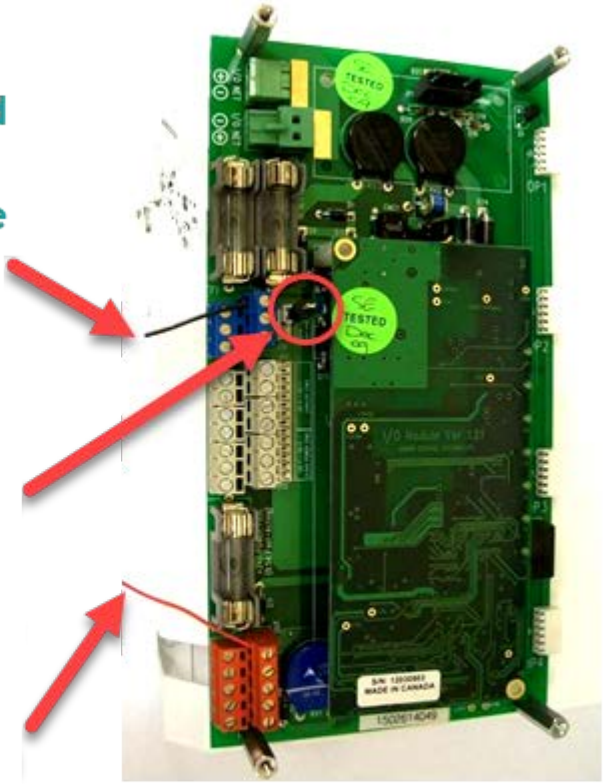
Once you have led the cable into the I/O module enclosure you need to do the following:

**I/O Module**

Connect the black wire to your selected counter-timer channel (CHA+ or CHB+) on the Blue Terminal Block (refer to the drawings for the OMNI Sensor

Plug in the input protection board (IPB/OMNI). It has a blue mark on the end (refer to your drawings for the OMNI Sensor for the correct channel and see the notes on the next page

Connect the red wire from the OMNI Sensor to the 24VDC+ Output on the red Terminal Block



*Wiring Connections for a Version 1.3 I/O Module*

Once you have led the cable into the I/O module enclosure you need to do the following:



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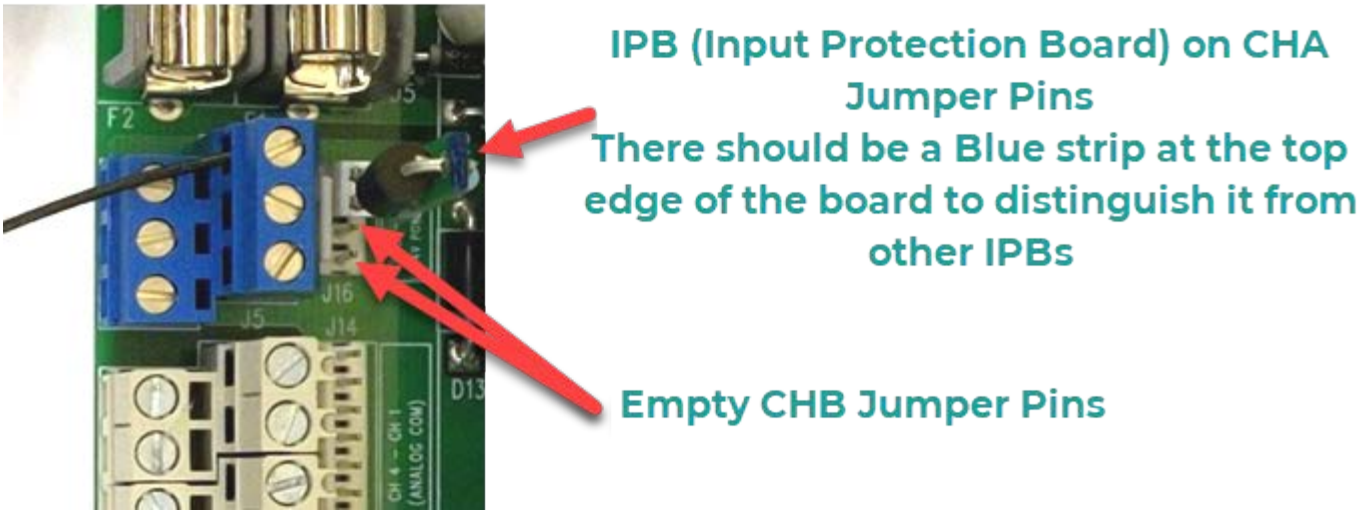
# *I/O Module Installation Notes*

## Installing the Input Protection Board (IPB)

The **IPB** provides current-to-voltage conversion and built-in transient voltage protection. The current is pulsed at varying frequencies indicating the sensor values. There are 4 jumper pins located behind the blue digital counter/timer inputs terminal block

The top pair are for CHA and the bottom pair are for CHB. Plug the IPB onto the appropriate pair of jumpers as per your supplied wiring diagrams or the digital input channel that you have selected for the Omni sensor.

The photo below shows an **Input Protection Board** installed on CHA and the black wire from the Omni sensor terminated to the CHA+ terminal block:





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# SOFTWARE INSTALLATION

Let Argus know ahead of time when you are installing the Omni sensor. We can then schedule a time for setting up the sensor in the software once the installation is completed.

When your Omni sensor is connected to the I/O module and running, please call us for assistance.




If your Omni sensor was shipped as part of a new control system the software may already be fully configured. If you are adding on an Omni sensor to an existing system, the software needs to be set up accordingly. If the Omni sensor is replacing existing sensors, the new readings need to be appropriately mapped in the software to the control applications that use them.

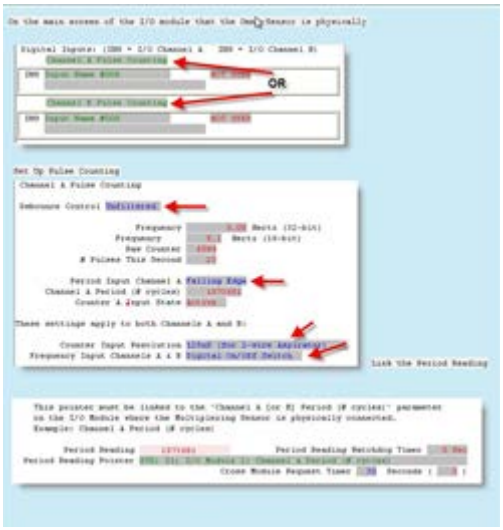
Once the software is set up it does not require any day to day operator changes. Briefly, here's how it works:

A special program on the Argus Titan system called the **Frequency Demultiplexer** program is used to obtain readings from the Omni sensor. This program is normally embedded into an **Omni sensor Group** that is added from the **Argus Operator** program.

Once it is set up, you'll find it associated with the zone you are monitoring and other I/O Module readings.

The group screens also contain basic instructions for setting up the input channel on the I/O Module and linking it to the **Frequency Demultiplexer** program (again, all the set-up is normally performed by Argus).

Basic instructions included in the software for Omni sensor setup:





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All readings from the Omni sensor are sent in a sequential stream of digital data along the 2-wire cable to the I/O module.

The **Frequency Demultiplexer** program (running on the Titan Controller that manages the I/O Module where the Omni sensor is connected) interprets and filters this data and produces separate reading values that are them mapped to the program used for monitoring and control.


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# OPERATING THE OMNI SENSOR

**The following information applies to the SEN-OSM/C and SEN-OSM/CO2 models.**

## *Display Readout*

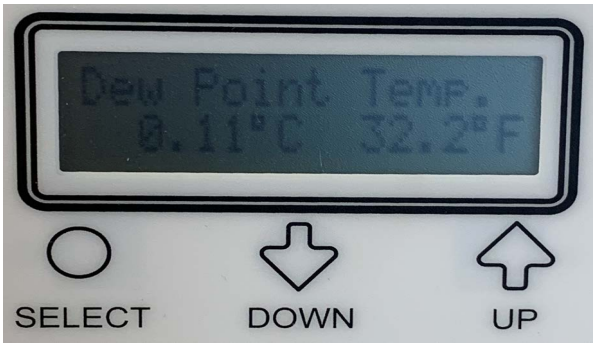
In its normal display mode, the Omni sensor sequentially displays the:

- Ambient Temperature.
- Ambient Humidity.
- Visible Light.
- PAR light.
- Light Energy.
- Dew Point Temperature.
- Absolute Humidity.
- Mixing Ratio.
- $CO_2$ (if equipped with an optional $CO_2$ sensor).

These readings scroll continuously until any one of the keys is selected.


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## *Using the Keys*




There are three keys on the keypad:

- **Select** – Selects a displayed value, and confirms a setting change.
- **Down** – Scroll down through the list or numerically down when setting a calibration value or password.
- **Up** - Scroll up through the list or numerically up when setting a calibration value or password.

Pressing any of these keys halts scrolling of the readings, freezing the display on a single value until the up or down arrows are pressed to manually scroll through the list of parameters. In this manual display mode, there are several additional parameters that can be viewed.

Starting from the top of the list (press the up arrow until the display reads **Beginning of Menu List**.




There is no tactile or audible feedback on these keys. Pay close attention to the LCD display; the parameter displayed changes with every press of a key.

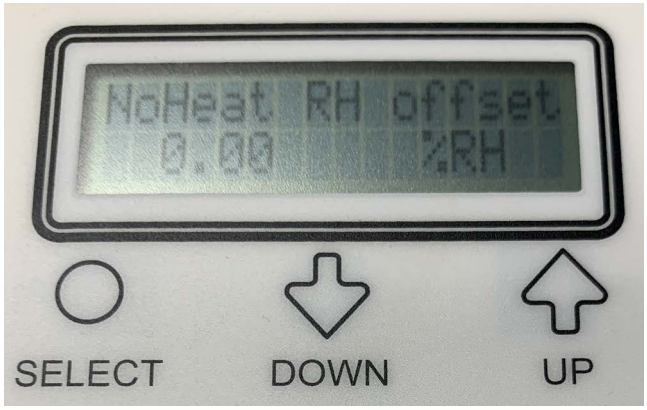

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The editable parameters are displayed in **blue** **below**:

- **Humidity #1 -** Value for sensor #1 (used by Argus technicians).
- **Humidity #2 -** Value for sensor #2 (used by Argus technicians).
- **Temperature #1 -** Value for sensor #1 (used by Argus technicians).
- **Temperature #2 -** Value for sensor #2 (used by Argus technicians).
- **20°C Calibration -** Select to perform a single point calibration of the two temperature sensors.

  This setting is normally used by Argus technicians for factory calibration. Do not use this feature without consulting with Argus about the environmental requirements and constraints.

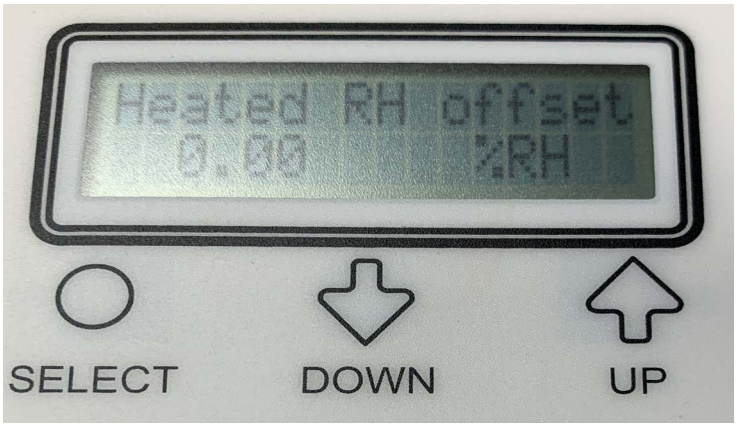
- **Ambient Temperature** – Air temperature measured at the bottom of the air inlet on the Omni sensor.
- **Ambient Humidity** – Calculated ambient humidity.
- **NoHeated RH Offset** – Used for calibrating the RH sensor against a reference source. As a general rule do not change this offset unless you are very sure your calibration RH values are accurate. This setting is normally used by Argus technicians for factory calibration. Only calibrate to humidities when below 60% RH.





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- **Heated RH Offset** –Used for calibrating the RH sensor against a reference source. As a general rule, do not change this offset unless you are very sure your calibration RH values are accurate. This setting is normally used by Argus technicians for factory calibration. Only calibrate to humidities when above 75% RH.




- **Carbon Dioxide** – Value is only displayed if a $CO_2$ sensor is installed. It is the current $CO_2$ reading after any $CO_2$ offset adjustments.
- **$CO_2$ Multiplier -** Value is only displayed if a $CO_2$ sensor is installed. You can use it for calibrating the CO2 sensor against a reference source. As a general rule, do not change this setting unless you are very sure your calibration $CO_2$ values are accurate. This setting is normally used by Argus technicians for factory calibration.
- **$CO_2$ Offset** – Value is only displayed if a $CO_2$ sensor is installed. You can use it for calibrating the $CO_2$ sensor against a reference source. As a general rule, don't change this offset unless you are very sure your calibration $CO_2$ values are accurate. This setting is normally used by Argus technicians for factory calibration
- **Visible Raw -** Value from the visible light sensor. It is lower than the actual light levels due to the lens attenuation.
- **Lux Multiplier -** Value is used it for calibrating the light sensor against a reference source. It compensates for the lens attenuation. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus Technicians for factory calibration. **Default is 6.95.**
- **Visible Light -** The visible light after applying the **Lux Multiplier**.


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- **PAR Multiplier -** Value is used it for converting the light sensor's lux reading to PAR. Normally it uses sunlight as a reference. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus technicians for factory calibration. **Default is 0.0105.**

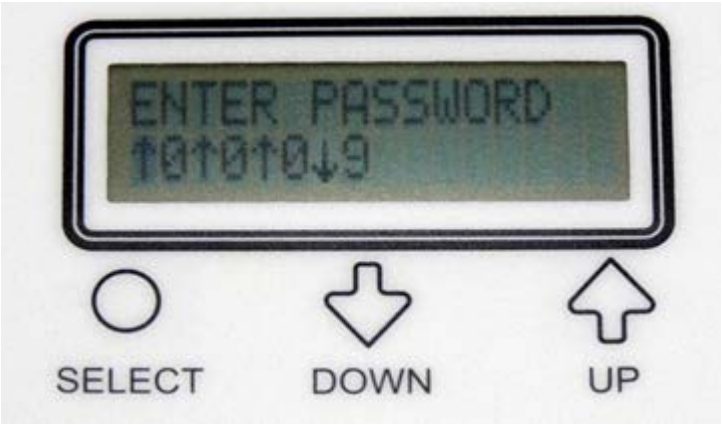
  There is a 10 second delay once you change the PAR multiplier in order to keep the value before it is powered off.
- **PAR Light** – The calculated **PAR Light** value.
- **W/m² Multiplier -** Value is used it for converting the light sensor's lux reading to Light Energy. Normally it uses sunlight as a reference. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus technicians for factory calibration. **Default is 0.0100.**
- **Light Energy -** The calculated **Light** value.
- **Dew Point Temperature -** Calculated temperature below which moisture condenses out of the air, it is based on the current humidity and temperature.
- **Absolute Humidity -** Amount of moisture in grams per cubic meter of air.
- **Mixing Ratio** - In grams per kilogram.
- **Change Password** – Protects the Omni sensor from unauthorized settings changes. Select this to change the password (you must first enter the existing password and then your new password). If you forget the password, you can read it on the operator settings screen for this Omni sensor (where only authorized users may access this information)
- **Fan Turned Off, Humidity over 98%** – Value displays only when the fan has been shut down to protect the Omni sensor from the risk of damage by fog or mist particles that are often present in high humidity conditions. The fan shuts off when the measured humidity is greater than **98.0%** or below **-10°C**. The fan automatically turns on again when the humidity falls below **98%** or is above **-10°C**.
- **Voltage Reading** – Diagnostic value reads **Normal** above 3.3 Volts and **Bad** below 2.47 V. **Contact Argus Support** if this reads **BAD**. This is a measurement of an internal voltage, not the supply voltage.
- **Memory Debug** – Diagnostic value for service and troubleshooting


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- **Sign Off (Exit)** – Cancels password access and returns the unit to normal scrolling mode.

If left alone the Omni sensor automatically cancels password access and return to the normal scrolling mode after 510 seconds.

## *Entering a Password*




Each Omni sensor has a password to prevent unauthorized changes to the calibration settings. You can access the readings on the unit without a password, but to make any changes such as performing a humidity sensor test, or entering a $CO_2$ offset value you need to enter the password.

The **default** Factory password is: ↑**0**↑**0**↑**0**↓**9**

Change this password to one of your own to protect against unauthorized access. See “Changing the Password” on page 32.

There are four registers to the password. Each register is adjusted by using the **UP** or **Down** arrows to select a value between ↑**9 (UP 9)** and ↓**9 (DOWN 9)**. Use the **SELECT** key to move to the next register. The blinking cursor indicates which register you are currently on.

Once a password has been entered it remains in effect until eight minutes of keypad inactivity has been registered. This enables you to make multiple changes without needing to constantly reenter the password.

Unless a password has been entered within the past eight minutes, you are challenged to enter the password before you can make any changes on the unit. Once a password has


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been correctly entered, a blinking cursor indicates that you can now make changes to a selected parameter.

If the password is incorrect, the password entry screen is displayed again. After a change has been made to the password, of any other parameter you must confirm it with the **Select** key or cancel it with an **Arrow** key.

There are seven parameters that can be adjusted:

1) **20°C Calibration -** Select to perform a single point calibration of the two temperature sensors.

   Always consult **Argus Support** before using this setting, as it is an Argus factory item.



**This calibration must be performed in steady state conditions.**

   To use, enter the current ambient temperature from your precision meter reading and press **Select**, then confirm the setting to initiate calibration.

   Calibration will not occur if:

   - The Humidity is > 75% (the heaters may have been on)
   - The entered reference Temperature is not in the range of 18 to 26C
   - The difference between the reference temperature and the raw temperature is more than +- 1.00C (manufacturer's specification states it should not be more than +- 0.40C)

2) **$CO_2$ Multiplier -** Value is only displayed if a $CO_2$ sensor is installed. You can use it for calibrating the CO2 sensor against a reference source. As a general rule, do not change this setting unless you are very sure your calibration $CO_2$ values are accurate. This setting is normally used by Argus technicians for factory calibration.

3) **$CO_2$ Offset** – Value is only displayed if a $CO_2$ sensor is installed. You can use it for calibrating the $CO_2$ sensor against a reference source.

   **As a general rule, do not change this offset unless you are very sure your calibration CO2 values are accurate.** This is normally used by Argus technicians for factory calibration.

   Omni sensors factory-supplied with $CO_2$ may already have a value entered.


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4) **Lux Multiplier -** Value is used it for calibrating the light sensor against a reference source. It compensates for the lens attenuation. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus Technicians for factory calibration. **Default is 6.95.**

5) **PAR Multiplier -** Value is used it for converting the light sensor's lux reading to PAR. Normally it uses sunlight as a reference. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus technicians for factory calibration. **Default is 0.0105.**

   There is a 10 second delay once you change the PAR multiplier in order to keep the value before it is powered off.

6) **W/m² Multiplier -** Value is used it for converting the light sensor's lux reading to Light Energy. Normally it uses sunlight as a reference. As a general rule, do not change this setting unless you are very sure your calibration light values are accurate. This setting is normally used by Argus technicians for factory calibration. **Default is 0.0100.**

7) **Change Password** – Select to change the password (you must first enter the existing password and then your new password). If you forget the password, you can read it on the operator settings screen for this Omni sensor (where only authorized users may access this information)

## Changing the Password

You must be signed in with the existing password before you can change it to a new password.

**The password can only be changed from the Omni sensor keypad although it can be viewed** from the Argus Operator program once the Omni sensor has been configured in the software.

On the Omni sensor (assuming you are currently signed out):

1) Use the **UP/DOWN** keys to stop auto-scrolling and locate the **Change Password** parameter.

2) First you must enter the current password:

   - Press the **SELECT** key once. The cursor blinks on the arrow symbol for the first of the four registers.
   - Use the **UP or DOWN** keys to set the first register to the desired numeric value *and* arrow direction.


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- Press the **SELECT** key once to complete the first register setting and move to the next register. The cursor should now be blinking on the arrow symbol for the second register
- Continue setting the rest of the registers in the same fashion until they match the existing password.

3) If the password is entered correctly, the screen displays **Change Password** with a blinking cursor on the first **UP/Down** arrow. **You are now changing the password**.

   Use the same steps as the password entry above to set your new password.

4) Once entered, you must **Confirm** the new password by pressing the **SELECT** key or **Cancel** the operation by pressing an **Up** or **Down** Key.

   If you ever forget the current password you can read it from **Argus Operator Program** (once the Omni sensor is configured in the program). The password is located on the Factory screen of the Omni sensor application: **Installation and Setup / Frequency Demultiplexer (Beta) / Password**:




If you have more than one Omni sensor connected, ensure you select the correct one. Each can have its own unique password for added security.


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## *Setting the $CO_2$ Offset*

1) Use the **UP/DOWN** keys to scroll to the $CO_2$ Offset parameter.
2) Press the **SELECT** key.
3) Enter your password for this Omni sensor when prompted.
4) Once you are 'signed on', the $CO_2$ Offset parameter displays a blinking cursor to the left of the display. If your password entry was ***incorrect***, the $CO_2$ Offset parameter is displayed without a blinking cursor and you need to repeat step 2 or check back on your PC to view the correct password for this Omni sensor
5) Use the **UP** or **DOWN** arrows to enter a negative or positive offset value. Each time you press an arrow key it increments the offset by 10 ppm. (finer offset resolution is of no use, given the size of the stated measurement errors)
6) Press the **SELECT** key when you are done.
7) Press the **SELECT** once again to **Confirm** the setting change, or press an **UP/ DOWN** key to **Cancel**.

As long as you remain signed on you can make additional adjustments to this or other editable parameters by simply selecting the parameter.

Selecting the **SIGN OFF** parameter exits password mode. You need to enter the password once again if you wish to make any further setting adjustments.


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# CALIBRATION

The only sensor that can be field calibrated is the $CO_2$ sensor. Although this should seldom be necessary, it is possible to perform an offset calibration against a reference source if one is available.

For example, if you know for certain that the air being sampled is exactly 410 ppm and the unit is reading 440 ppm then you could enter an offset of -30 ppm. In practice this is very difficult to accomplish with any degree of accuracy in the field.

Even if you have a superior $CO_2$ sensor to use as a reference, you must ensure that they are both sampling a uniform air mass with an absolutely stable $CO_2$ concentration for at least a few minutes.

The only way to accomplish this with any certainty is in a sealed chamber.

The manufacturer's specifications for the $CO_2$ sensor are +/- 50ppm plus 2% of the reading value. This makes even an uncalibrated sensor good enough for most horticultural applications.

## *RH Calibration*

For Heated RH Offset and Non-Heated Offset:

This setting is normally used by Argus technicians for factory calibration. Do not use this feature without consulting with Argus about the environmental requirements and constraints.

## *Evaluating the Need for Calibration*

The Omni sensor contains several high accuracy sensing systems. These sensors are difficult to field calibrate for the following reasons:

1) The Omni sensor is located in a constantly changing environment. Accurate calibration requires extreme stability during the calibration test, and this is just not possible in most field installations.
2) Omni sensors are, for the most part, calibrated to a very high standard of accuracy using reference sensors that cost hundreds or thousands of dollars. Few Argus users have access to reference sensors of comparable accuracy
3) Omni sensors have good long term stability, so they are less likely to drift out of calibration (with the possible exception of the optional $CO_2$ sensor).

For these reasons, **you should not attempt to field calibrate these sensors**.


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Although the sensors can fail or become contaminated, resulting in incorrect readings, typically these errors cannot be 'calibrated out' and sensor replacement is required.

Correct Omni sensor operation can be confirmed by:

1) First, review the historical and current readings for each sensor. Compare these values to your expectations based on other sensors in similar situations or on your understanding of the environment you are measuring.

   a) Do the recent sensor measurement values agree with historical measurements taken by the same sensor in the same location and operating conditions?

   b) How do sensor measurements compare to other sensors located in similar situations and conditions?

   If you are not satisfied with the results of these comparisons, you can use the following procedure to quickly test all sensors:

2) Conduct this test under steady state conditions when the measured values are in the area of most interest to you (conduct this test at different times for different sensor systems in the Omni sensor).

   a) **Temperature**: Close to the normal operating temperature.

   b) **Humidity**: Close to your normal dehumidification setting (for example, 80%).

   c) **PAR light**: Near solar noon on a bright day, or under your standard, warmed-up HID lights.




Light output degrades as lamps age, so take that into account when comparing to historical data.

   d) **$CO_2$**: Check calibration when exposed to outdoor ambient $CO_2$ levels or at night when readings are most stable.

3) Quickly remove the power/communications cable from your Omni sensor and re-connect it to a spare, factory calibrated, 'known-to-be-good' Omni sensor and mount this sensor in the same location as the suspect Omni sensor.

   This quick sensor transfer should cause little or no disruption to your control system behavior. (You might lose $CO_2$ sensor readings for a couple of minutes as the new unit warms up).


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4) Allow readings to stabilize for a minute or two (longer for the $CO_2$ sensor to warm-up and stabilize), and then compare the readings from the new Omni sensor to the original sensor readings.

See if the differences are explainable. If not, or if the differences are large, swap the original Omni sensor back in and see if it returns to pre-test values.

If it does, (thus confirming a significant difference between the original sensor and the reference sensor) consider returning the original Omni sensor for factory calibration or sensor replacement, as needed.

If, however, the differences are small, it is likely that the sensors are reading correctly and you may continue using the original Omni sensor.

Keep your 'reference' sensor in a clean dry place for future use and as an emergency backup to your operational Omni sensors.




Small differences are explained by claimed calibration accuracies (errors) plus your inability to accurately control ambient conditions during this type of field testing.

Temperature readings within a few 10ths of a degree, RH readings within a few percent, light readings within 10% of reading, and $CO_2$ readings within ~100 PPM are all within the normal range for this type of quick check and are not an indication that the sensor needs replacement.


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# MAINTENANCE

Omni sensors require a small amount of regular maintenance to ensure that the sensor keeps functioning correctly for the lifespan until it needs to be replaced.

**Filters** need to be inspected and cleaned regularly, and eventually replaced to help extend the life of the filter and sensor and avoid getting clogged and affecting performance.

We recommend that the filter be replaced **every 2 months** under normal conditions, and **monthly** for environments where the humidity is above 70% or there is periodic dust intake.

Argus has a replacement pack of 5 filters, just ask for part number ***SUB-OMNI/FLTR-5PK*** to have us send you replacements regularly.

## *Replacing Filters*

A **replaceable filter** is included with all Omni sensors. This sensor should be inspected regularly. The inspection interval depends on the amount of dust and other particles in the sampled environment.

When you first install the sensor you should check it every few weeks to determine an appropriate inspection and replacement interval.




You should temporarily disconnect the power to the Omni sensor when changing the filter to avoid aspirating any dust accumulated in the filter material back into the unit as it is removed.

1) The filter replacement port is located on the side of the unit. It is covered with an adhesive label:





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2) Remove the label to access the filter:




3) Use a pair of needle nose pliers or tweezers to remove the filter:



4) Wipe or blow away any accumulated dust visible in the filter port.

5) Clean the existing filter or insert a new one:




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6) Replace the adhesive cover:




7) Reconnect the sensor cable.


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# TROUBLESHOOTING

Here are some general troubleshooting suggestions. Contact **Argus Support** if you are unable to resolve a problem with your Omni sensor.

## *All Models*

| | |
|---|---|
| **Issue:** | **Readings are showing 'FAILED' in the Argus Operator program.** |
| **Cause:** | There may be a loose or broken wiring connection or a configuration problem with the unit. Check to see if the fan is running on the Omni sensor.<br>There may also be a more general problem with the Titan System or the I/O Communications Networks, in which case there should be communications alarms active on your system. In this case the readings probably display as: **********<br>The Omni sensor may not be set up correctly in the **Argus Operator** program software. In particular, it may not be linked to the correct I/O module digital channel, or the settings for that channel may be incorrect. Contact **Argus Support** for assistance. |
| **Issue:** | **Reading performance seems to be sluggish.** |
| **Cause:** | Can you hear the fan operating fan operating? If the fan has stopped, the temperature, humidity and $CO_2$ sensor response performance is slower. Contact **Argus Support** for assistance.<br>Note that the fan stops automatically or go into intermittent operation if very high humidity is detected, This is to minimize the chance of aspirating free water into the unit.<br>Is the filter plugged? When was the last time you cleaned it? If you can hear the fan running but cannot feel much air blowing from the unit the filter may be plugged. Clean or replace as necessary. |


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# *SEN-OSM/C & SEM-OSM/CO2 Models*

| | |
|---|---|
| **Issue:** | **I can see good readings on the Omni sensor display but they are showing 'FAILED' in the Argus Operator program.** |
| **Cause:** | There may be a more general problem with the Titan Control System or the **I/O Communications Networks**, in which case there should be communications alarms active on your system. In this case the readings probably display as: **********<br>The Omni sensor may not be set up correctly in the **Argus Operator Program** software. In particular, it may not be linked to the correct I/O module digital channel, or the settings for that channel may be incorrect. Contact **Argus Support** for assistance. |
| **Issue:** | **So I breathed into the unit and the $CO_2$ reading didn't change.** |
| **Solution:** | Stop breathing into the unit! It's not a good way to test the $CO_2$ sensor.<br>The $CO_2$ sensor samples only once every 15 seconds and the sensing element is very heavily filtered from direct air flow to reduce contamination. Therefore the unit can take several minutes to adjust to a change in $CO_2$ levels. This is normally a good thing because it lets you examine the current readings without affecting them much as you breathe 50,000 ppm of $CO_2$ all around the Omni sensor. It may be a problem if you expect to use the $CO_2$ readings in a tight feedback control loop (all Argus $CO_2$ dosing control applications take this into account.<br>Regardless of the responsiveness of the sensor, we administer $CO_2$ on a pulse-width-modulated basis that is adjusted for the process lags in the both the dispersal of the $CO_2$ itself and the sensor responsiveness). |
| **Issue:** | **No readings at all on the Omni sensor display.** |
| **Cause:** | There is likely a problem with the wiring. Check all connections and check that the Input Protection Board is installed on the correct jumper as in the photo under "I/O Module Connections" on page 21.<br>Check if the fan is operating on the unit. Check for the correct wiring polarity. |


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| | |
|---|---|
| **Issue:** | **The Omni sensor is displaying readings but the fan has stopped.** |
| **Cause** | The humidity might be too high. The Omni sensor automatically shuts down the fan if the relative humidity exceeds 98% RH to protect the internal components from water or mist damage.<br>The fan shuts off if the temperature is below -10°C and remains off until above -7.5°C or if above 98% RH.<br>The readings are still quite accurate without the fan running. Try scrolling through the list of readings with the UP/Down keys. If you see a message that says 'Fan Turned Off' then Omni sensor has intentionally shut down the fan and there is no problem at all (you may however, have a high humidity problem unless this is a propagation zone!).<br>If the fan stops and the locally displayed humidity is well below 98% RH, then the fan has likely failed. Contact Argus Support for additional help. |
| **Issue:** | **Readings aren't the same on the Omni sensor and the PC** |
| **Cause:** | If the readings are wildly different and you have more than one Omni sensor then perhaps you are not looking at the correct unit or there has been a mix-up during the software configuration (you might be seeing readings from a different zone).<br>One way to sort this out is to unplug the sensor and see if the readings fail after a few seconds. If they don't then you are likely looking at the wrong Omni sensor's readings. Contact **Argus Support** for assistance to sort out your wiring or configuration problems.<br>If the readings are only a bit different this is because the readings are more heavily integrated on the PC and may have had some additional filtering applied (such as a light offset to 'zero-out' very low light levels).<br>Because all sensor measurements are multiplexed on the same digital wire, the readings arrive sequentially, one at a time. Each sample is then averaged with a few of the previous samples to calculate a current value. This effectively tunes out any noise or lost samples, producing much more stable results for monitoring and control purposes. |
| **Issue:** | **Whoops! I accidentally changed the Lux Multiplier, PAR Multiplier, or W/m² Multiplier.** |
| **Solution:** | If you cannot find the original calibration values with your paperwork for the Omni sensor, please contact **Argus Support** for them. |
| **Issue:** | **I can't see any readings for $CO_2$** |
| **Solution:** | The $CO_2$ reading and $CO_2$ offset calibration value is only displayed if your Omni sensor is equipped with an on-board $CO_2$ sensor. If you think it is supposed to be there then there could be a problem with the $CO_2$ sensor, the connection to the main Omni sensor processor, or the Omni sensor processor itself. Please contact **Argus Support** for assistance. |


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# OMNI SENSOR SPECIFICATIONS

## *SEN-OSM/C & SEN-OSM/CO2*

| | |
|---|---|
| **Dimensions** | 4.9” x 3.3” x 2.1” (HxWxD) |
| **Power Requirements** | Power is provided by the connected I/O Module using the 2-wire connection. |
| **Cabling** | Factory cable is provided separately. Standard lengths are 15’, 30’, and 60’. Custom lengths are also available.<br>Cables can also be extended using 2-conductor non-shielded 18-24 AWG UV-resistant cable.<br>A blue Omni sensor Input Protection Board is provided with each sensor and must be installed on the I/O Module input as shown.<br>Wiring details are provided with each unit. |
| **Display** | 2 line, 16 characters reflective. 0 – 50 ºC operating range |
| **Temperature Sensors** | 2 solid-state digital sensors.<br>**Typical Accuracy:** +/-0.4°C Range: -10ºC to +85ºC. |
| **Humidity Sensor** | **Range:** 20-80% non-condensing<br>**Typical Accuracy at 30ºC:** 20-80%RH: +/- 3%<br>**It is not recommended to exceed 80% RH and to use the SEN-RHT sensor for >80%** |
| **Light Sensor** | PAR (Photosynthetically Active Radiation). Readings are in µmols.<br>The sensor is calibrated to outdoor sunlight as a quantum light sensor. This sensor is intended for general use only.<br>There is a 10 second delay once you change the PAR multiplier in order to keep the value before it is powered off. |
| **$CO_2$**<br>**(SEN-OMNI/CO2 only)** | 0-2000 ppm dual element NDIR (Non Dispersive Infra-Red) sensor with an accuracy of +/- 100 ppm + 2% of measuring value.<br>Sensor is self-calibrating to compensate for aging of the sensor elements. |
| **Max Operating Range** | 0 ºC to +50 ºC **Note:** Aspiration Fan turns off below -10ºC or >98%RH. |


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# SEN-OSM/RH

| | |
|---|---|
| **Dimensions** | 4.9” x 3.3” x 2.1” (HxWxD) |
| **Power Requirements** | Power is provided by the connected I/O Module using the 2-wire connection. |
| **Cabling** | Factory cable is provided separately. Standard lengths are 15’, 30’, and 60’. Custom lengths are also available.<br>Cables can also be extended using 2-conductor non-shielded 18-24 AWG UV-resistant cable.<br>A blue Omni sensor Input Protection Board is provided with each sensor and must be installed on the I/O Module input as shown.<br>Wiring details are provided with each unit. |
| **Display** | None |
| **Temperature Sensors** | 2 solid-state digital sensors.<br>**Typical Accuracy:** +/-0.4°C Range: -10ºC to +85ºC. |
| **Humidity Sensor** | **Range:** 20-80% non-condensing<br>**Typical Accuracy at 30ºC:** 20-80%RH: +/- 3%<br>**It is not recommended to exceed 80% RH and to use the SEN-RHT sensor for >80%** |
| **Max Operating Range** | 0 ºC to +50 ºC **Note:** Aspiration Fan turns off below -10ºC or >98%RH. |


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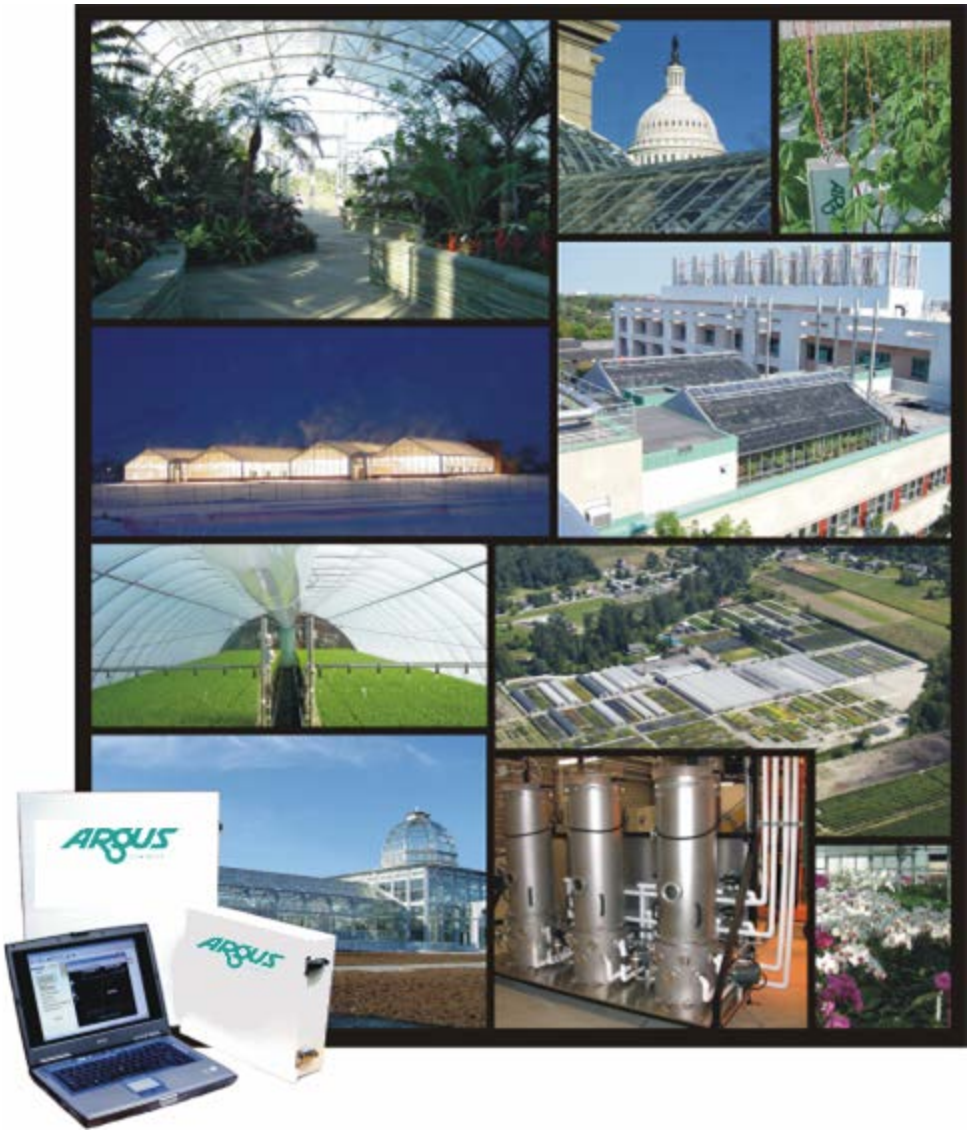
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# Relative Humidity and Temperature (RHT) Non-Aspirated Sensor

## Installation Guide




*January 2018*

# Relative Humidity and Temperature (RHT) Non-Aspirated Sensor

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# INTRODUCTION

The Relative Humidity and Temperature (RHT) sensor is a non-aspirated Temperature and humidity sensor.

It is used when a non-aspirated sensor is used for indoor/outdoor use and highly recommended for any outdoor use that needs to provide an accurate RH and Temperature measurement.

This RHT sensor is easy to maintain and has a replaceable sensor tip allowing for quick replacement of just the tip instead of the whole sensor.

It is a good replacement for either the **Aspirated Temperature/Humidity (AMHB)** or **Aspirated Wet Bulb/Dry Bulb Humidity (AMWBDB)** sensors.

## *Features*

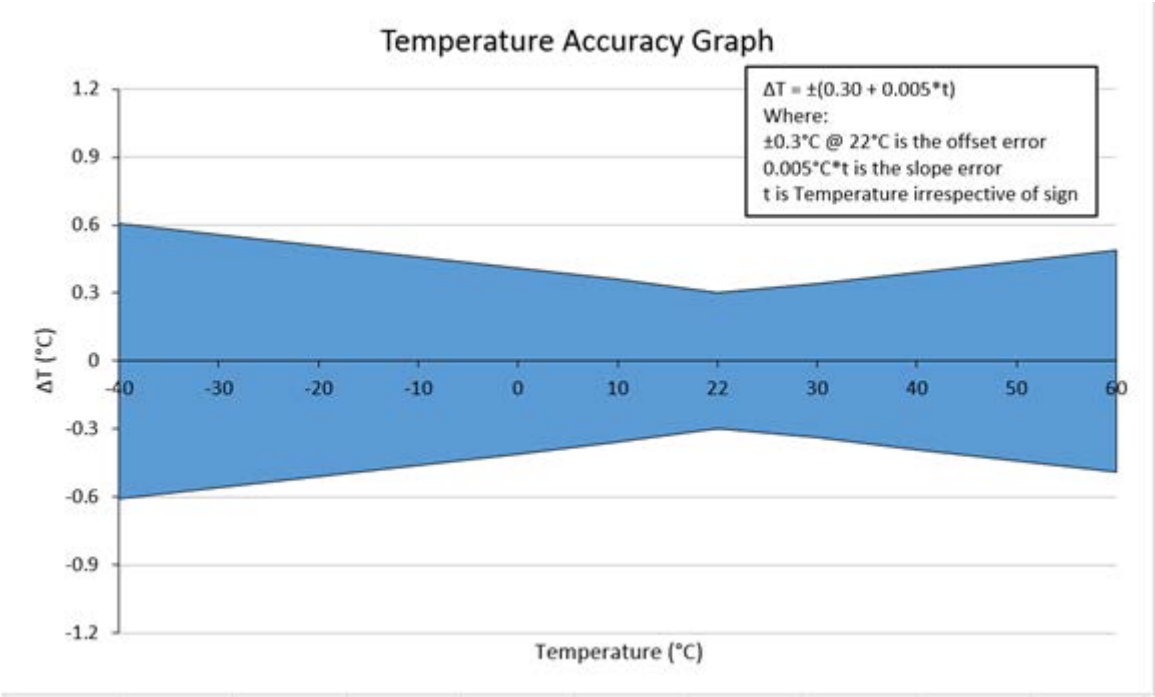
| | |
|---|---|
| **Quality Construction** | Interface electronics sealed from environment to ensure a long life. |
| **Easy Replacement** | Field-replaceable sensor tip allows you to swap the sensor on-site while maintaining ±2% RH accuracy and NIST traceability.<br><br>Instead of replacing the whole assembly as usual, you can replace just the sensor tip for an easy solution.<br><br>It is very easy to remove and replace with a new sensor tip, reducing any downtime for service. |
| **Reliable Operation** | Long Term reliability with a weather resistant casing allowing enhanced airflow through a side vent and a rugged capacitive sensor that is both responsive and stable. |
| **Cost Effective** | Replacing just the sensor tip makes this sensor a good value, where normally you would have to pay for a whole new sensor if it stopped working. |
| **Solar Shield** | The sensor includes a solar shield to protect the sensor from the rays of the sun, aiding in accuracy and response time. |
| **RH Accuracy** | Microprocessor-based signal processing allows for specified RH accuracy across the full operating range of -40ºC to 60ºC. |
| **Mounting Bracket** | The mounting bracket that is included allows you to hang the sensor in the best possible spot for accurate readings. |


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# SPECIFICATIONS

| | |
|---|---|
| **Power Requirements** | 12 to 30 VDC power supply. |
| **Environmental Conditions** | **Operating Range:** –40°C to 60°C<br>0 - 99% RH non-condensing.<br>**Storage Temperature:** 55°C to +85°C |
| **Humidity** | **Sensing Element:** Capacitive Sensor<br>**Accuracy (at 22°C):**<br>2% Version:<br>±2% 10-90% RH and<br>±5% 0-10% & 90-99% RH<br>Accuracy includes hysteresis, linearity and repeatability.<br>**Long Term Stability:** Less than 1% drift per year, typical.<br>**Temperature Effect:** Delta %RH =<br>(0.0014 x %RH + 0.1325) x T°C –<br>(0.0317 x %RH + 3.0876)<br>Temperature Effect not required for Signal-Conditioned Temperature units.<br>**Repeatability:** See Accuracy.<br>**Linearity:** See Accuracy.<br>**Hysteresis:** < ±1.5% RH (30%RH 1h –>70%RH 1h<br>–>90%RH 1h –>30%RH, Vair = 2m/sec)<br>**Signal Outputs:** 4-20 mA<br>**Supply Voltage:** 12 to 30 VDC<br>**Maximum Load:** (Current Output Only)<br>$\Omega = \frac{\text{Supply Voltage} - 10}{0.02}$ |
| **Temperature - RTD** | **Signal Conditioning**<br>**Sensing Element:** 1000Ω thin film platinum RTD with signal conditioning.<br>**Calibration Accuracy** at 22°C is ±0.3°C<br>*****See Temperature Accuracy graph on next page.**<br>**Long Term Stability:** Less than 0.2°F drift per year.<br>**Sensor Interchangeability:** ±0.3°C<br>**Signal Inputs:** 4 to 20mA<br>**Supply Voltage:** 12 to 30 VDC<br>**Maximum Load:** (Current Output Only) |
| **Certification** | CE Marked<br>Complies with EMC Directive 89/336/EEC and LVD 73/23/EEC.<br>IP 42 rating for Outside Air Transmitters. |


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# INSTALLATION

Refer to the wiring diagram in this section.

The base is used as a mounting unit for easy installation.

## *Installing the Sensor*

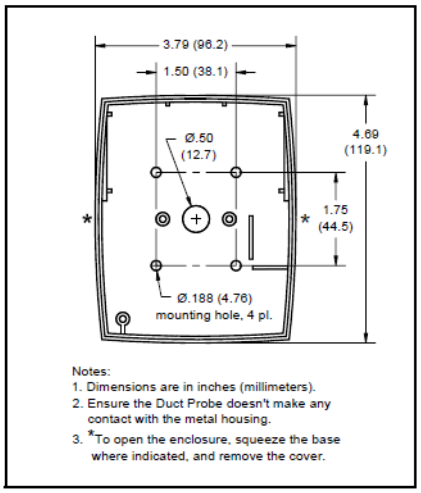



A **Parts Kit** (primarily for wall mounting) is included that contains:

- A larger cable gland to replace the current small cable gland.
- A plug for replacing the small cable gland hole.
- A nut to attach the plug.
- Four screws to screw the enclosure onto a wall or surface.

## *Mounting Bracket*

The included attached mounting bracket allows you to hang the sensor in the best possible spot for accurate readings. See "Positioning the Case" on page 7 for details.







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## *Case*

The case should be mounted with the sensor pointing down (solar shield downward) to prevent water collection in the sensor cavity.




The case and solar shield comes fully installed, so there is no need for any configuration or setup.

## *Positioning the Case*

The sensor should be mounted ideally in a sheltered area that is protected from rain, and if possible, away from heating or cooling sources that might affect the readings.

A good location has the sensor experience the average conditions for the environment.


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## Hanging Mount




It is highly recommended that the sensor is suspended by a chain or cable.

- Hang the mounting bracket with a chain or steel cable.
- Level out the sensor at the height of the crop.

Leave a sufficient cable and support chain for any height adjustments due to growing crops.

## Wall, Post, or Pole Mounting

- A parts kit (described earlier) is included for wall, post or pole mounting.
- When mounting on a wall, post, or pole there must be a suitable amount of flat surface available.

**To setup the RHT sensor for a wall mount:**

1) Carefully open the case.
2) Remove the cable gland from the back of the case.
3) Unscrew the mounting bracket off the RHT sensor.



4) Plug the hole on the back of the case.
5) Using a hammer and screwdriver, knock out a hole on either side of the enclosure, which one depends on the location of the wire.
6) Mount the RHT sensor onto a post or the wall.


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7) Using the four screws from the kit, insert the screws into the wall.
8) Place the new cable gland from the parts kit into the side of the case with the hole from step 5.
9) Close the case.

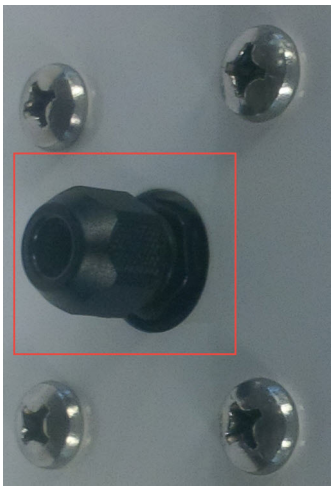
## *Wiring*

### Inside the Case

For optimal communication, use 2-Pair 22AWG shielded instrumentation cable with a maximum length of 1000 feet. Contact Argus Support if the length is greater than 1000 feet.

One end of the shielded wire must be connected to the power supply/controller earth ground ONLY. The other end of the shield wire cannot be connected to anything.

Wiring should enter through the cable gland on the back of the sensor. This cable gland is then tightened once the cable is installed.



Match your sensor wiring with the corresponding diagram on the next page.



Ensure that the **Probe Earth ground wire** (for Duct and Outside Air units only), the **Shield wire**, and the **PCB Earth ground wire** are connected to the mounting screw or the **nearest** (within 1.5m) **Earth ground**.


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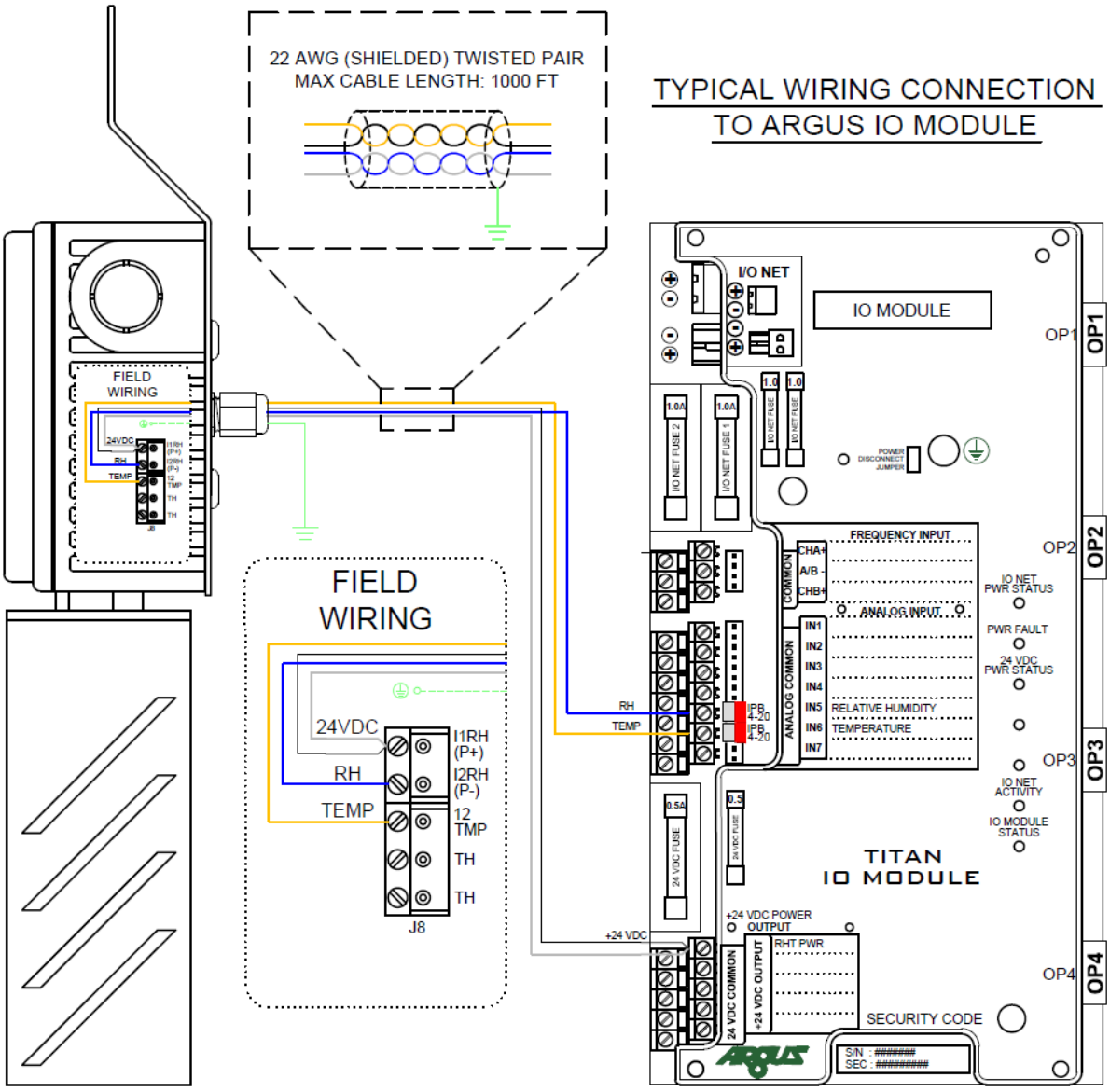
## Ground Wiring Recommendation

Using a wire splice connector (wire nut connector), connect the ground wire found inside the RHT sensor to an extended ground wire outside the sensor.

Then connect the extended ground wire to the nearest earth ground.


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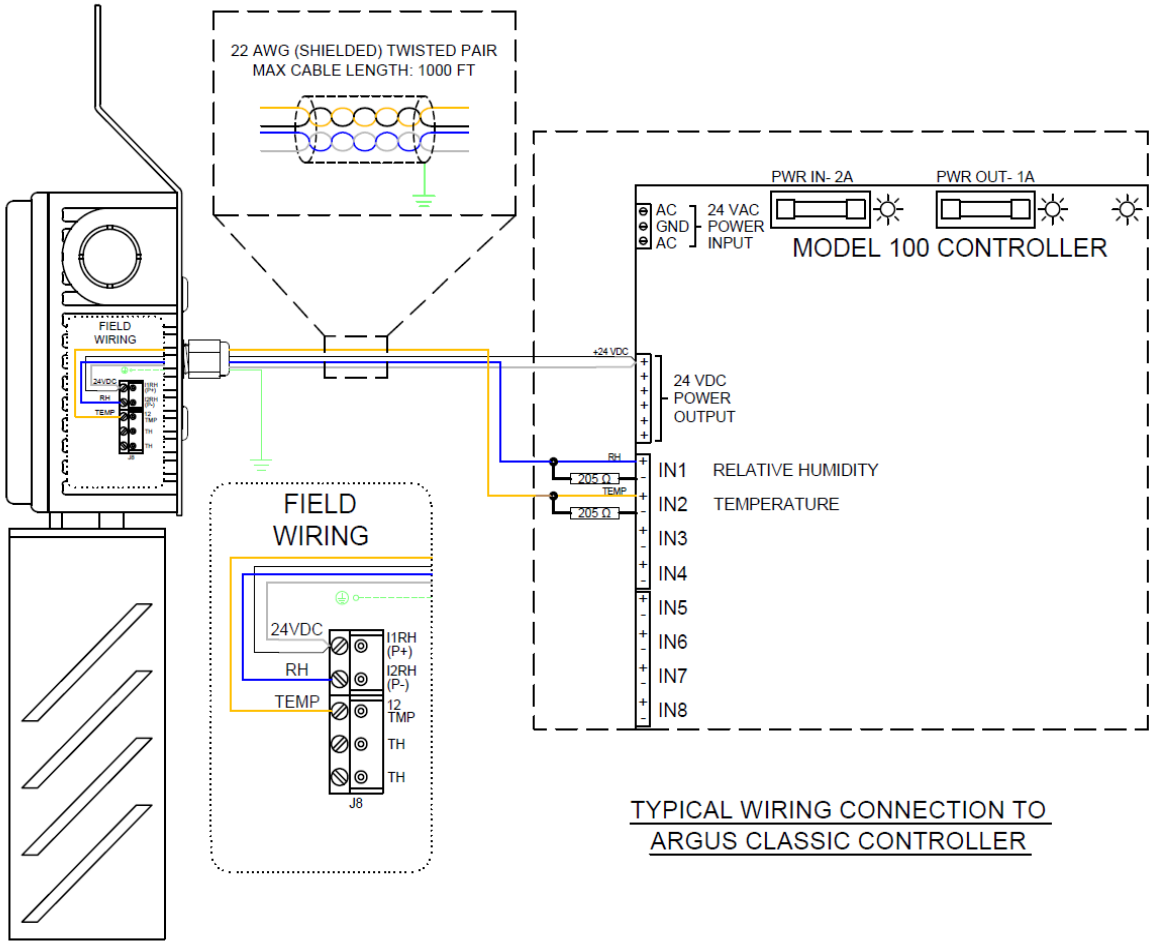
## Wiring for Titan Systems





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## Wiring for Classic Systems




TYPICAL WIRING CONNECTION TO ARGUS CLASSIC CONTROLLER

*All Voltage Outputs are measured with respect to the* POWER SUPPLY / CONTROLLER GROUND.

Do not run sensor wires and AC power wires together in the same conduit or wire bundle.

Running sensor wires and AC power wires, including earth ground, in the same conduit or wire bundle may cause malfunction due to electrical noise.


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# CONFIGURING THE SENSOR

Make sure the sensor is physically wired to a Titan I/O module or an MD100 Classic system.

Once the wiring connections are completed, call Argus Support for assistance configuring this sensor in your control software.

## *Calibration*

The RHT sensor is shipped calibrated and cannot be calibrated in the field.

If the unit appears to be producing incorrect readings, please contact Argus Support.

If required, this sensor can be provided with a **National Institute of Science and Technology (N.I.S.T.) calibration certificate**, meaning the sensor has been tested and certified within the stated tolerance of accuracy compared to the standard.



A NIST certified sensor does not allow for a sensor tip replacement, the entire sensor needs to be replaced with another NIST certified sensor.

If necessary, you can verify calibration to within 10% using an accurate hand-held humidity meter. **See "Troubleshooting" on page 21.**

## *Cleaning*

To clean the metal shield or cover, wipe with a damp cloth, and the same goes for any metal parts surrounding the sensor tip.

Ensure that you do not get any electrical part or the sensor tip itself wet, as that can affect sensor function.


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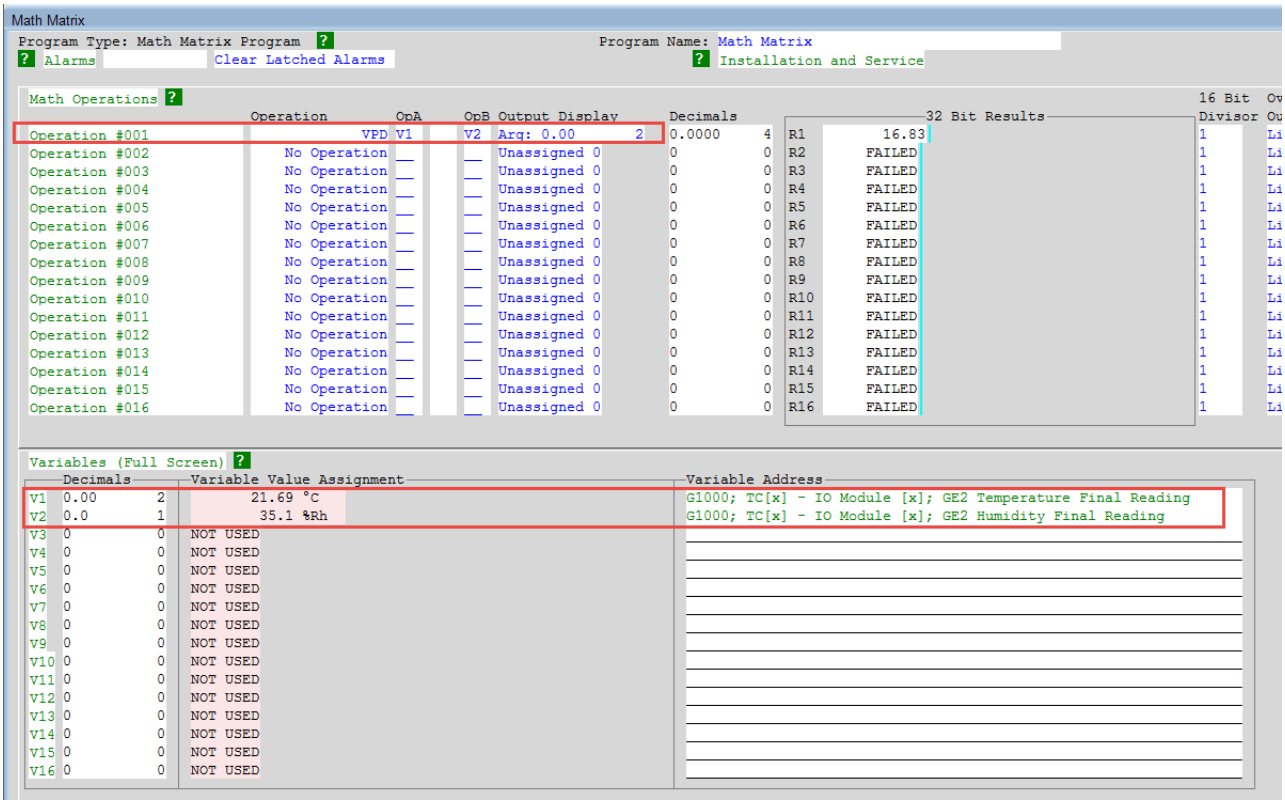
# *Vapor Pressure Deficit (VPD) Configuration*

## *Titan Systems*

Using the **Math Matrix** program, place the location of temperature and relative humidity readings into the variable address.

Under **Operation**, change **No Operation** to **VPD**, then place variables for the temperature (Celsius) reading to **OPA** and Relative Humidity to **OPB**.

The following result can be in either millibar or kilopascal pressure units.



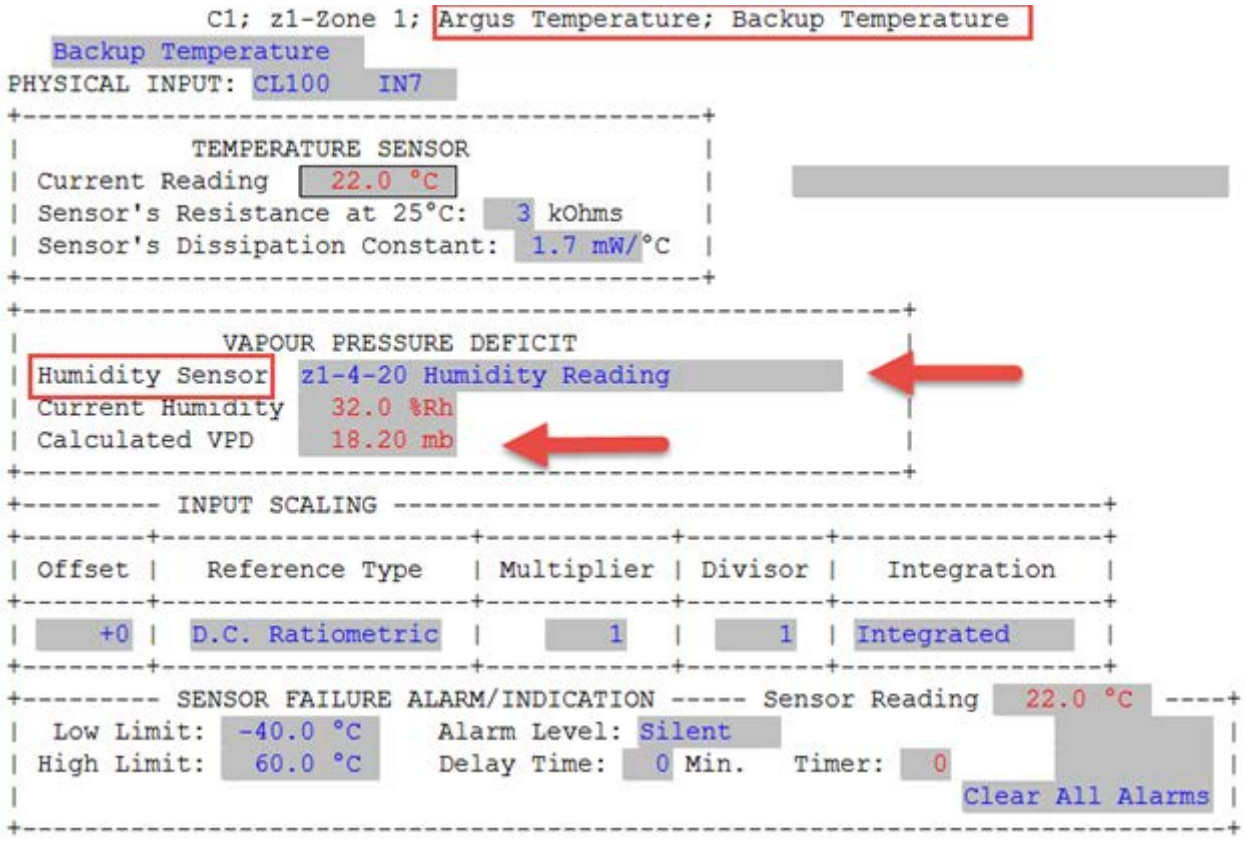


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## *Classic Systems*

On the Argus Temperature; Backup Temperature screen, navigate to the Vapor Pressure Deficit (VPD) section and assign the **Humidity Sensor** to the RHT sensor humidity reading.

The following screen highlights the correct section:





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# SERVICE AND MAINTENANCE

## *Replacement*

Large removable, pluggable terminal blocks eliminating the need to wire in an enclosed space and allow the unit to be pre-wired separate from the electronics.

For optimal communication, use 2-Pair 22AWG shielded instrumentation cable with a maximum length of 1000 feet. This wire can be supplied by Argus.

## *Replacing the Sensor Tip*



Remove from power before replacing the sensor tip.

**Replacement Sensor Tip Part Number:** SUB-RHT/RST

1) Remove the solar shield by unscrewing it from the case.





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2) Hold the metal sensor wand with two fingers over the bumps and gently twist and pull the metal cap off the end of the wand to expose the sensor tip.



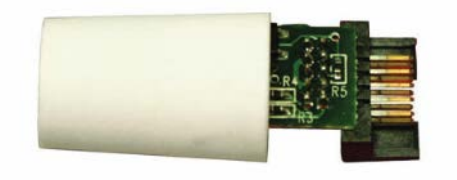
3) Hold the sides of the sensor tip near the white base and pull to remove.

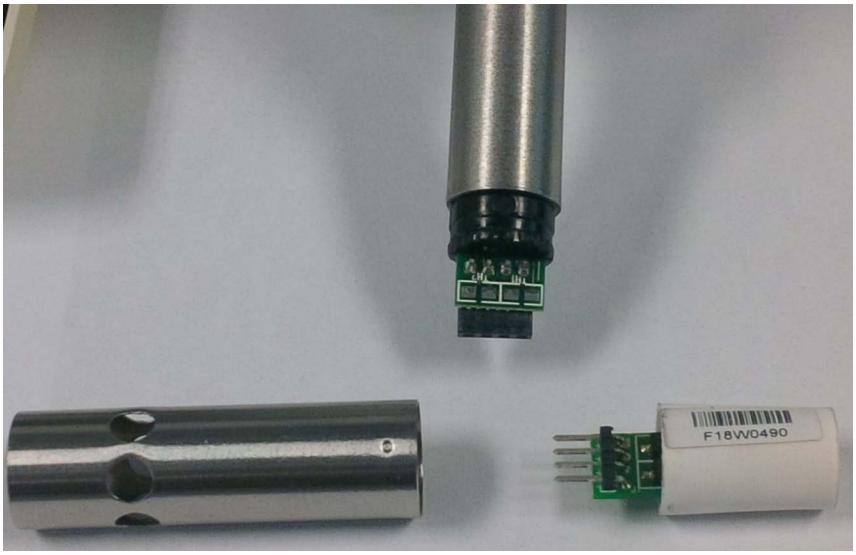




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4) Discard the old sensor.






5) Push the new sensor tip into place until it clicks.
6) Replace the metal cap over the sensor tip and push it completely closed.
7) Screw the solar shield back on so that it is secure.

The new sensor is now ready to use. As you can see below, it fits comfortably into the solar shield.




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## *Replacing the AMHB or AMWBDB Sensor*

To replace an existing Argus **AMHB** or **AMWBDB** sensor:

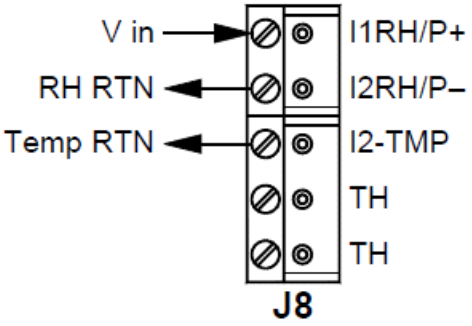
1) Remove power from the input board (Titan I/O module or MD100 Classic).
2) Disconnect the wiring from both ends of the existing sensor.
3) Remove and discard the existing sensor.

**If you are replacing an AMHB or AMWBDB sensor and re-using the cable:**

4) Mount the new RHT sensor.
    a) Open the case.
    b) Remove the small cable gland by loosening the nut inside the case.
    c) Use the plug from the parts kit to cover up the hole where the small cable gland was placed.
    d) Using a hammer and screwdriver, knock out a hole on either side of the enclosure, which one depends on the location of the wire.
    e) Take the larger cable gland from the parts kit and place through the hole you just made. Tighten the nut for the cable gland inside the case.
    f) Close the case.
5) Select three of the existing conductors. Try to select the three best looking conductors.
6) Connect the new RHT sensor with the selected wires. Tie the rest of the wires out of the way.
7) Re-connect the three conductors at the input (Argus board) side while adding resistors for Classic systems, and IPB's for Titan systems. Tie the rest of the wires out of the way.


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8) Re-apply the power.




**V *in* =** *Voltage from I/O module (24VDC)*
***RH RTN* =** *Humidity to I/O module input (RH IN)*
***Temp RTN* =** *Temperature to I/O module input (TEMP IN)*

**If you are replacing an AMHB or AMWBDB sensor and using a recommended cable:**

4) Mount the new RHT sensor.
5) Connect the wire according to the wiring diagram. Wiring details can be found in the "Wiring" on page 9 of this document.
6) Re-apply the power.

## Sensor Connected to an SM12

If you want to replace an AMHB or AMWBDB that is connected to an SM12, you require 12 to 30 VDC to power up the sensor.

## Backup Temperature Sensor

It is recommended to have a backup sensor installed near the original sensor to represent ambient conditions and is unobstructed by any heating or cooling elements.

If the original sensor fails you can revert to the backup to continue monitoring temperature until the broken sensor is functioning again.


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# TROUBLESHOOTING

The RHT sensor should provide many years of trouble free service. Most problems occur during installation resulting from improper setup or wiring faults. Occasionally, one of the sensors may need to be replaced.

Here are some troubleshooting tips to help you diagnose and correct problems.

**All or some of the sensors on the I/O module or MD100 read FAILED:**

This could be a problem with the I/O module/MD100, RHT sensor, or another sensor on the board.

- If there are other sensors connected to the **I/O module** in addition to the **RHT** sensors, and they all read failed, then the problem is likely with the I/O module/ MD100.

  Refer to the troubleshooting documentation for the I/O module/MD100 or call Argus for assistance.
- If only the RHT sensors have failed then the problem is likely with the RHT unit or the wiring. Does the sensor have power?
- If only one sensor reads failed, check for wiring problems or try a replacement sensor.
- Does the sensor have power? Check the power wiring from the I/O module/ MD100 (or alternate power source) the +24 VDC and matching common wire must not be crossed.

  To check for power, disconnect the power wires at the terminal block and using a portable volt meter or multimeter, check for DC power and correct polarity.
- Is there a break in the wire to the I/O module? Check the other sensor wires and connections. Are the wires properly connected to the wiring block as in the wiring diagram?

**RH voltage is stuck at 100% and the raw voltage is less than 0.8 volts:**

- The connector wires from the RH sensor to the I/O module may be reversed.

**Sluggish readings:**

- If it is taking more than more than 5 minutes for the RH sensor to respond you may need to replace the sensor tip.


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**Readings seem to be slightly 'off' when compared to hand held sensors:**

- This can be very difficult to accurately diagnose in the field due to large variations and fluctuations in temperature and relative humidity from one location to another. In general, when the RHT sensor is properly installed, it is very accurate and reliable.
- If the unit appears to be producing incorrect humidity readings, please contact Argus.

  Be aware that even your breath and body heat can affect readings when you are close to the measuring instruments and sensors.

**Humidity reading is far too high, or stuck at 100%:**

- The sensor may have become contaminated, or the sensor tip is incorrectly placed in the sensor.
- Check the switches on the inside cover (see diagram on the next page).

  Clean the sensor at least once per year. Try rotating the sensor tip. See "Cleaning" on page 13 for more information.

**Humidity reading is too low, or stuck around 0-30%:**

- Check that the RH sensor is well seated in its socket, and the sensor tip is correctly placed in the sensor. Try rotating the sensor tip.
- Check the switches on the inside cover (see diagram below).


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**To check the switches on the inside cover:**

Ensure that both switches, pictured below, are set to **Current** mode.



There is a third switch near the voltage terminal block, this switch state is not relevant because **Voltage** mode is not used.


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# Argus Weather Station 3.1

## Operator's Guide




*June 2020*

# Argus Weather Station 3.1 Operator's Guide

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# About This Manual

This manual describes the features, specifications, installation, maintenance, and operating procedures for the TC-WS-3.1/C Weather Station (WS3.1).

## *Where to Find Additional Information*

This guide covers the basic components and configuration of the weather station.

Detailed wiring diagrams, data sheets, and other documents are supplied with the equipment. Please refer to them for installation.

For additional assistance please contact **Argus Support** at 1-888-667-2091 (toll-free in Canada and the U.S.) or 604-536-9100.

You may also contact us by fax at 604-538-4728 or e-mail us at argus@arguscontrols.com.

You can also check the Argus Web site (www.arguscontrols.com) for answers to frequently asked questions, troubleshooting tips, and the latest product information.


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# INTRODUCTION

A weather station is required to take advantage of the advanced climate and equipment control features of the Argus software. It is used in situations where accurate weather information is required to coordinate automated control applications such as heating, ventilation, and crop irrigation.

Continuous weather recording is also useful for correlating the performance of controlled climates and crop performance with weather events and trends.The Argus Titan weather station integrates temperature, light, wind speed, wind direction, and rain sensing in a simple compact design.

Additional sensors including humidity and rain/snow accumulation can also be added to provide complete weather monitoring with your Argus Titan control system.Outdoor light and temperature and wind measurements are essential to the Argus system. They are employed in heating and cooling calculations and for predictive evapotranspiration calculations.

For example:

- For structures using roof vents, rain detection is used to limit the maximum opening of the vents during rain events.
- Some roof and sidewall vents are also susceptible to damage when high wind speeds are detected.
- Some equipment systems including exterior fan louvers and passive vents are subject to freezing in cold weather and possible damage if they are operated under these conditions.

The weather station includes the following sensors:

- Light (pyranometer)
- Air temperature
- Wind speed
- Wind direction
- Rain/snow detection
- For special situations, other types or brands of sensors can be added or substituted. Contact Argus for further details.
- The sensors are mounted on a non-aspirated, highly reflective enclosure to minimize heating from direct sunlight.

Internal interface electronics are isolated in a separate compartment to keep the electronic components clean, dry, and free of contaminants.


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All sensor wires are terminated inside the electronics enclosure for easy replacement and servicing.

The enclosure features a sturdy door that provides easy access and secure weather-proof protection. The communications wiring is run through the inside of the mast for protection from the elements.

In addition, since the only moving parts are the wind speed cups and weather vane, there is little ongoing maintenance required other than occasional inspection and cleaning of the light and rain sensors.

The weather station is easy to install. It plugs directly into the Titan I/O network using a 2-wire Aquaseal cable (AQ224) that supplies all required power and communications. The standard sensors are all internally pre-wired and ready to operate.

## *Important Notes about Snow Detection*



Due to the extreme danger posed by snow loading on some structures, many users do not trust automatic snow detection devices, preferring to staff their operations during periods of high snowfall probability, and to manually set the Snowing/Not Snowing system flag on the Argus Control System as appropriate.

In some instances, a control strategy must be initiated well before it begins to snow so that the necessary snow melting equipment is already engaged and up to temperature before it begins to snow.

Instantaneous snow detection may be of little value for these situations since it is necessary to activate snow load control strategies well before the snowfall starts.

If snow detection and snow melting contingencies are critical to the safety of your operation discuss this with Argus.

There are several methods for automatically detecting snowfall, ranging from simple and relatively inexpensive, to very sophisticated and expensive. None of these methods are fail-safe.

**In situations where a critical failure could result as a consequence of snow loading, you need to develop management contingencies in addition to an automatic detection and control response.**

The heated rain grid on the Argus weather station can be configured in the software for both rain and snow detection. Since the sensor is heated, it melts any snow falling on its surface and the sensor detects this as moisture.


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Although the sensor cannot actually distinguish between snow or rain, it is reasonable under most circumstances to assume that any moisture detected at or below a declared outdoor air temperature near freezing point may well be snow.

Due to the variable nature of snow and the manner that it falls there are instances where the heated rain grid and the associated control logic may fail to accurately detect snow events.

Other snow detection methods include heated tipping buckets, interrupted optical beams, weight scales, and other devices.

The problem with all of these methods is in accurately distinguishing between rainfall and snowfall under **all** circumstances.

Snow is also much more subject to blowing and drifting making it harder to detect accurately.

Sensors that must melt the snow before it can be detected may not always be capable of melting sufficient snow under extreme cold conditions. If the snow is blowing sideways it may not even contact the sensor.

Consequently, **rain grids and heated tipping bucket sensors may not collect sufficient snow during windy conditions, and they may react too slowly for certain applications.**

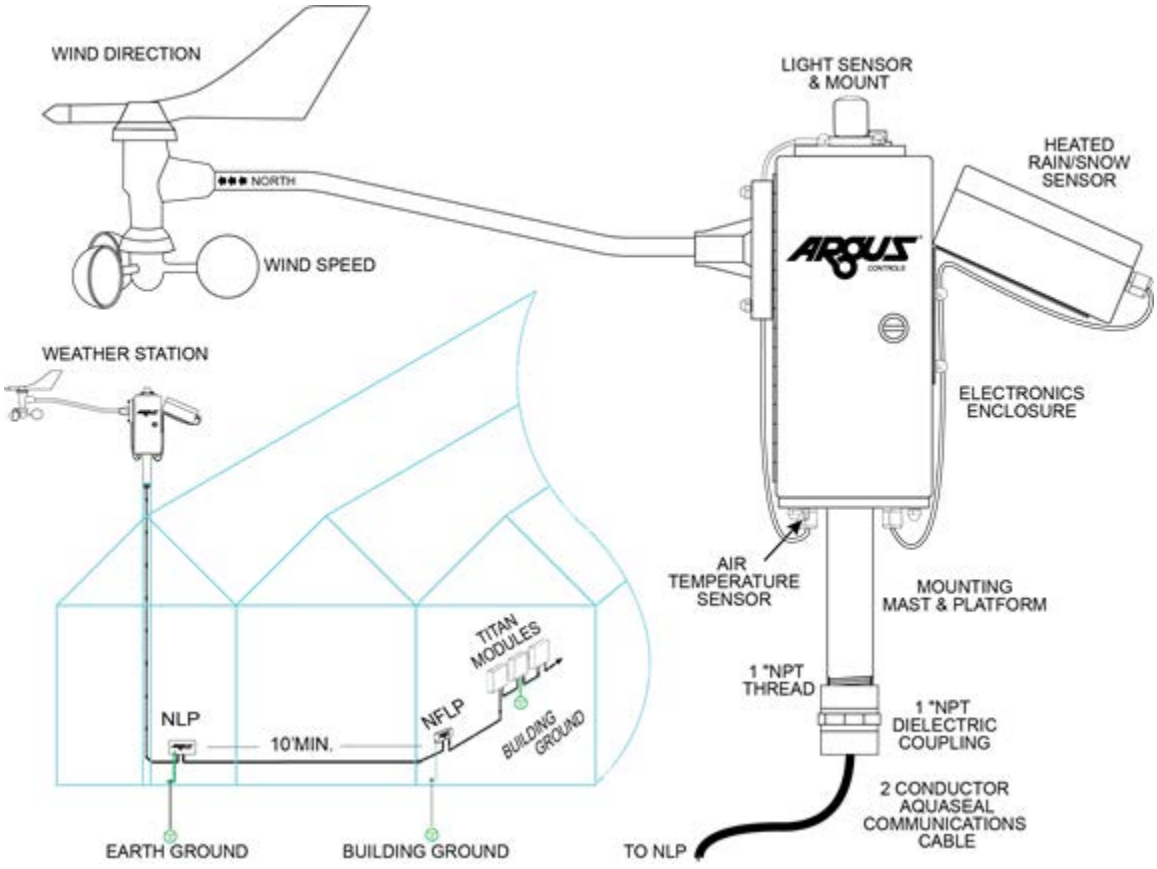
An outdoor air temperature threshold value must be used in conjunction with a precipitation detector to determine the **likelihood** that any measured precipitation is actually snow.

However, **sometimes the wettest, heaviest snow can fall when it is well above freezing.**


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# Weather Station Installation

The illustration below displays a typical rooftop installation of the Argus weather station and the **NLP** (Network Lightning Protection) and **NFLP** (Network Fused Lightning Protection) devices included with it.




## *Location*

The weather station is designed for rooftop mounting on buildings, greenhouses, and packing sheds. It can also be mounted on the top of a pole or onto a ground station mast provided the area is protected from damage.

Locate the weather station in a representative location where it does not encounter shadows from taller buildings and trees (unless the controlled areas are similarly shaded).

It should be mounted 4-6 feet above the roof or ground surface to minimize the effects of surface heating, and for good exposure to winds.


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Try not to locate the weather station close to heat or exhaust vents as this affects measurement accuracy.

Select a mounting location where the weather station is relatively easy to access for service and periodic cleaning of the light and rain sensor elements.

The 1” diameter mast of the weather station is made of powder coated aluminum. It has a standard male pipe threaded end for joining it to a pipe or conduit section (supplied by you) that supports the weather station assembly and guide the wires into the building. A 1” female NPT dielectric coupler is supplied with the station for joining it to a 1” male threaded pipe end.

For rooftop applications, the pipe can travel through the roof or through the side of the building so that the communications wires can be fed through the inside of the mounting pipe or conduit. This provides maximum wiring safety and protection from the elements.


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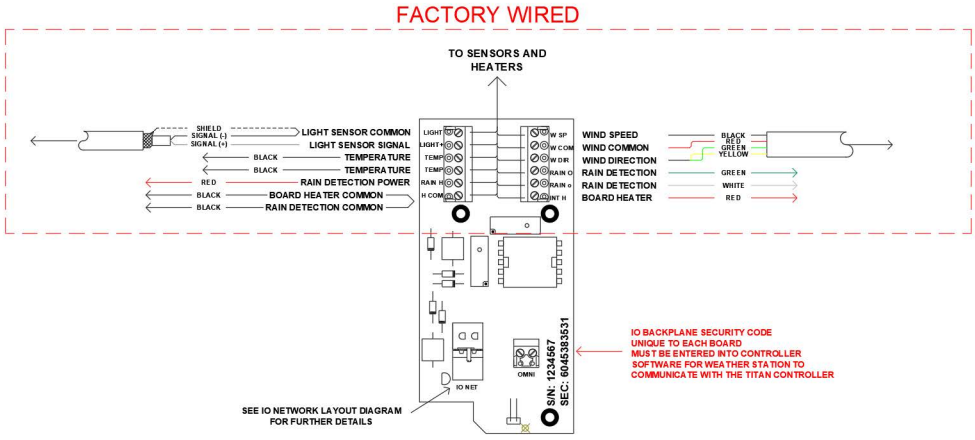
# Wiring

Refer to the wiring diagrams accompanying your weather station for installation details. All sensors in it are internally pre-wired and ready for operation.

You only need to feed the communications cable through the mast assembly and into the building.




The communication cable can also be run outside the mast using the spare cable gland mounted on the underside of the assembly.




The weather station is supplied with 50’ of communications wire, connecting it to the control system using an **NLP** device (**Network Lightning Protection**) supplied with your weather station.

The NLP is then connected to an **NFLP** device (**Network Fused Lightning Protection**) that is also provided (see “Weather Station Installation” on page 7).



If you require additional communications cabling use only Argus Titan communications cable: Argus part number: **CAB- 2C18G/TITAN**, West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant.

**NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATIONS**


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# LIGHTNING PROTECTION

Roof mounted weather stations can be easy targets for lightning strikes and lightning induced damage.

The wires that connect the station to the control system can also act as an electrical pathway conducting damaging voltages to other control system components.

Argus provides two devices designed to protect your control system from lightning induced voltages traveling through the communications wires connected to the weather station.

The **NLP** and **NFLP** devices provide an easy indoor means of connecting the weather station to an I/O Communications Network. Since it is mounted in the open air and it's often the tallest thing on your building, it is a prime target for lightning strikes (by direct hit or indirect conduction).

Fast blow fuses are provided in the **NFLP** to quickly isolate and contain a lightning induced electrical pulse. Along with the supplied grounding wire, these fuses help prevent lightning damage from spreading to other system components.

The **NLP** is meant for outdoor installation or installation where an outdoor communications wire enters a building.

The **NFLP** is meant for indoor mounting. It joins the weather station to the I/O communications network (other **Titan I/O Modules** and the **Titan Controllers**).




Where the wires exit the conduit into the building, the pipe requires sealing with a mastic putty.

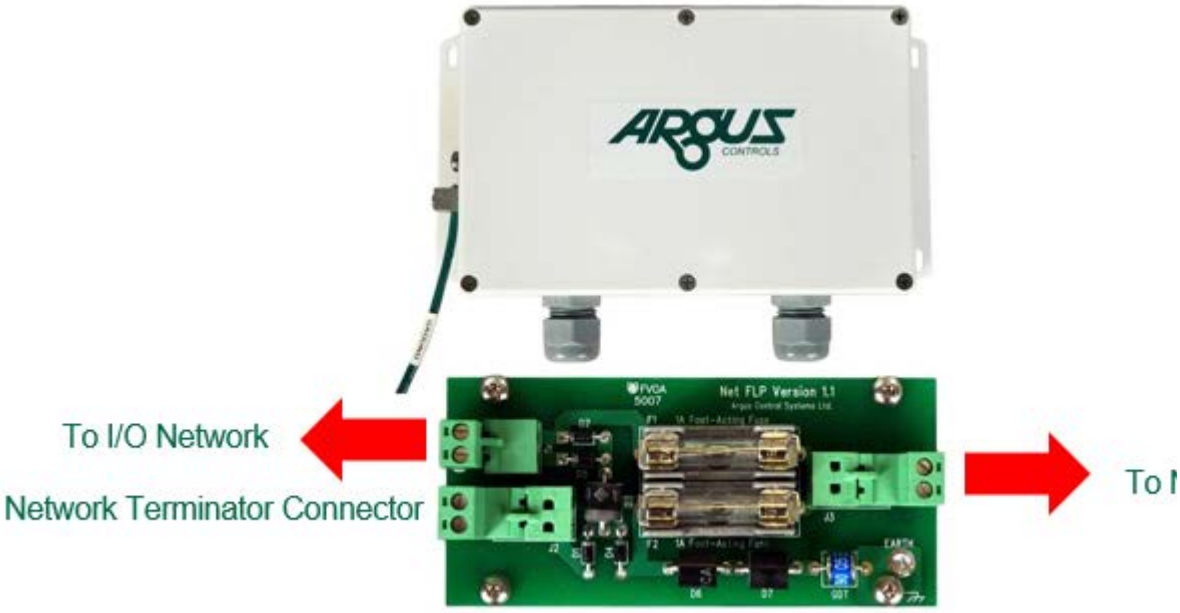
A standard drip loop should be provided before the entry connection is made to the **NLP** box, protecting against water ingress into the **NLP** and condensation from moist air traveling up the pipe from the building into the weather station enclosure.


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# NLP INSTALLATION

Refer to the drawings and documents supplied with your weather station for mounting and wiring instructions specific to your installation.

**Mount the NLP** at the network cable entrance to a building where the network is significantly exposed to the outdoors (tens of meters of outside cabling).




It needs to be mounted close to its own grounding connection point and be easily accessible for inspection or replacement.

The **NLP** device is designed to intercept all lightning-induced current in the communications cable, diverting (shunting) it safely to a ground point, away from the other control system components.

This primary protection component is capable of shunting thousands of amps of transient energy into the ground.

**Connect the NLP** to a local earth point (Low impedance ground rod or a low impedance ground rod bonded to nearby electrical system ground or directly bonded to the electrical system ground if within a few meters), using an insulated 12-gauge green/yellow bonding/ grounding wire to the grounding/bonding point with the ground rod/bonding system sized according to the electrical code.


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The connection to the ground rod or electrical system grounding system must be made according to local electrical code. A connection with less than 10 Ohms of impedance to earth is strongly desirable.

To keep the total impedance low, use a short (for example, one meter or less) cable connection to a ground rod or directly to the building system ground point (not an electrical ground!)

**Bond the ground rod** to the building grounding system if possible. This bond connection has to be a short distance (6 meters or less), since it becomes ineffective if run a very long distance due to the impedance of the bonding wire.

Alternately connect directly to a ring grounding system if one is installed around the building.

The objective is to use bonding to create an equipotential voltage grounding system to minimize voltage differences at different points on the grounding system, and thus limit current flow and consequent damage to equipment.

While capable of diverting all current into a good grounding system, there may be situations where the NLP ground connection impedance is too high, limiting current and allowing network voltages to rise to unsafe levels.

Eventually these high voltages find an alternate path to earth, usually (according to Murphy's famous law) through the most expensive and critical component in the Titan control system.

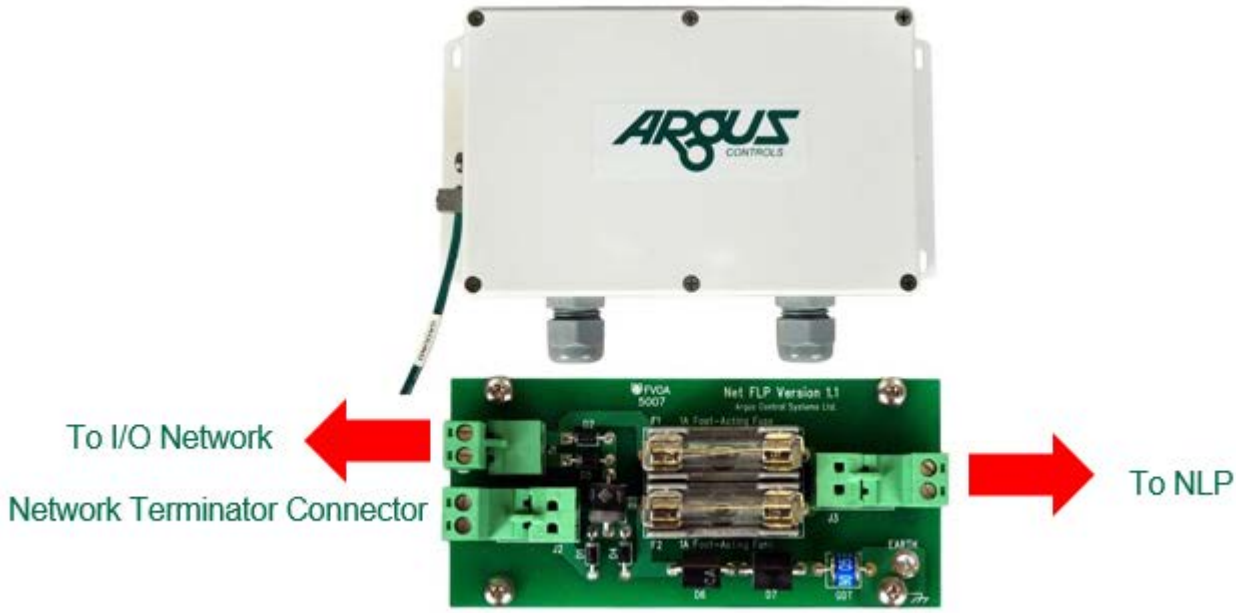
To reduce this possibility we use a **NFLP (Network Fused Lightning Protection)** device in the network line between the **NLP** and the rest of the Titan system.


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# NFLP INSTALLATION

Refer to the drawings and documents supplied with your weather station for mounting and wiring instructions specific to your installation.

The **NFLP** is not a primary protection component. Think of it as added insurance. Its installation is optional but recommended if your electrical grounding system is sub-standard and you are experiencing blown fuses or Titan module damage.




It disconnects the inside portions of your Titan system from damaging transients entering from the outside portions of your network.

This secondary lightning protection system requires mounting between the **NLP** and the first Titan module inside the building and requires connecting to the same electrical ground as that Titan module.

The **NFLP** fuses can only blow if the **NLP** protection system fails to do its job, usually because of inadequate grounding and bonding.

This in-line fusing system is designed to allow communications signals and modest amounts of control power to pass under normal conditions, but disconnect the control system from dangerous high voltages coming in from exposed outside lines if the primary **NLP** system fails to divert sufficient energy.


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With an **NLP** device installed at the building entrance and connected to a low impedance grounding point that is also directly bonded to the building electrical grounding system, the down-stream **NFLP** should never see sufficient current to blow its fuses.

If the primary **NLP** grounding system is less than perfect, the **NFLP** may see more current, causing it to blow its fuses during severe transient events.

This is still preferable to blowing many fuses at individual Titan modules and/or risking the possibility of overwhelming the local electrical grounding system and causing other equipment damage.

In the event fuses do blow, service is restored to the outdoor sections of the Titan system by simply replacing the line fuses in the **NFLP** after the risk of transients has passed.


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# IMPORTANCE OF GROUNDING

The weather station is not grounded and the supplied **dielectric mast coupler** is intended to help make it a poor primary target for lightning strikes.

To discharge potential lightning induced voltages traveling along the communications cable Argus recommends a dedicated earth ground rod be placed as close to the **NLP** as practical to drain any potential lightning energy.

Alternatively, you may be able to use a metal building structural member or a nearby metal plumbing pipe provided it is well grounded.

Check with your local building and electrical approving authority for further advice.

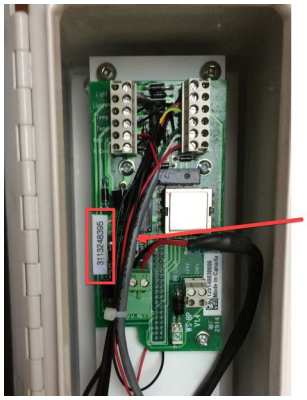


***Dielectric coupler for mast mounting***


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# MOUNTING THE WEATHER STATION

Before installation, record the **Board ID Number** onto a slip of paper or your wiring drawings. The board ID is printed on the weather station backplane inside the electronics enclosure. This is needed later for configuring the weather station software.







The weather station must be mounted so that the anemometer and wind vane assembly are level with and perpendicular to the horizon. **The arm must point to NORTH**.


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This also helps ensure that the light sensor element is parallel to the horizon.




1) The pole or mast used to mount the weather station must be perpendicular (check with a spirit level and adjust as necessary).

   Once it is attached to the mast and the wind arm is pointing north, use a spirit level to check that both the back and sides of the weather station electronics enclosure are perfectly perpendicular.

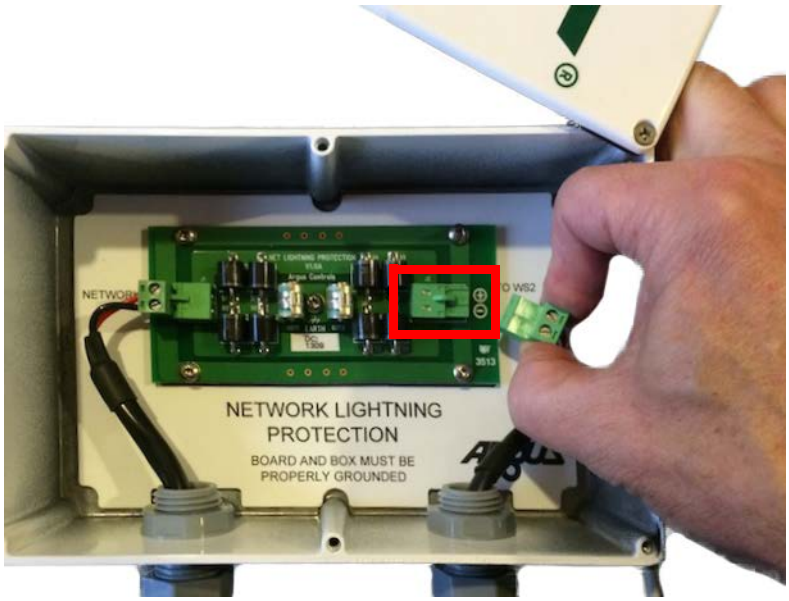
2) Adjust the mast if necessary. This is the easiest way to ensure that the wind arm and the light sensor are 'plumb'.


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# Connecting the Weather Station to the Titan Control System

Once you have installed the weather station, NLP and NFLP devices and connected the communications wiring as per your wiring diagrams, it can be powered up and operated.

Connect the weather station communications cable to the 'WS' input on the NLP. This provides power to it and enable communications and software configuration.




If your weather station is shipped as part of a new system, the software may already have been configured for it.

All that may be required is ensuring that the correct Board ID is entered in the I/O module program that has been configured to communicate with the weather station.

Argus assists with this process as part of regular system commissioning.


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# WEATHER STATION SOFTWARE CONFIGURATION

The weather station must be configured in the Argus software before it can be used.



Once the station is installed and powered up using the NLP connection, **it is time to contact Argus for assistance with software configuration**.

If the weather station is supplied with a new system, the software is configured and tested as part of the full system commissioning.

If you are replacing an existing weather station, an Argus service technician needs to go on line with your system as soon as it is powered up to configure the software and make any adjustments to your existing weather monitoring applications.


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# WEATHER STATION SERVICE AND MAINTENANCE

## *General Maintenance*

All sensors are factory calibrated and need to remain within specifications for several years.

However, accumulations of dirt, bird droppings, cobwebs, and other materials may affect the operation or accuracy of the solar radiation sensor, and the rain detection sensor.

## *Sensors*



The TC-WS-3.1/C requires a TTN-WSBP-1.4A RoHS Weather Station Backplate.

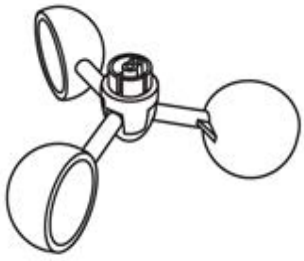
The Apogee sensor is not compatible with the TC-WS-3.0/C or TTN-WSBP-1.4OHS Weather Station Backplane.

If you need to replace a sensor, please refer to the wiring diagram under “Wiring” on page 9.

### Temperature Sensor

The temperature sensor should provide years of trouble-free service. It requires no ongoing maintenance.

### Anemometer Wind Cups



#### *Troubleshooting*

Wind speed reads 0 all the time or intermittently or wind direction reading is failed.


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Check that the weather station I/O module is communicating normally in the operator software (other weather readings are unaffected).

Make sure the anemometer wires are connected to the correct I/O backplane terminals inside the electronics enclosure. Refer to your wiring diagrams.

Check for broken wire along length of anemometer cable. Carefully check any areas where the cable has been secured.

Try dropping the wind cups approximately 1/16" to 1/8" (1.5 to 3 mm) lower on the mounting shaft. Use the supplied Allen wrench to loosen and re-tighten the wind cup assembly.

If you still do not get a reading, the problem is likely with the anemometer or the software configuration.

Contact **Argus Support** for assistance, contact information is found under.“Introduction” on page 4

## *Wind Reading Seems Too Low*

Use the supplied small Allen key to loosen the setscrew on the side of the wind cups.

Remove the wind cups, and clean the exposed portion of the shaft with a damp cloth or cotton swab.



Clean the wind cups with water and a mild liquid detergent. Rinse thoroughly before replacing.

Do not use grease, oil, or lubricants of any kind.

Replace the wind cups and re-tighten the setscrew. If the wind cups do not spin freely, then the bearings may be worn. Please contact Argus for a replacement anemometer.

## *Wind Speed Reading Seems Too High or Too Low*

Check installation by spinning wind cups. If the wind cups spin freely and the weather station displays a wind speed, the wind cups are installed correctly.

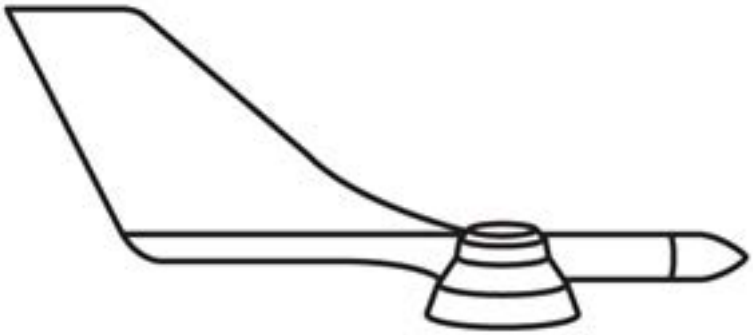
If the wind cups don’t spin freely, then try dropping the wind cups approximately 1/16" to 1/8" (1.5 to 3 mm).

Check for any obstructions blocking the wind near the anemometer.

Call Argus to check the software configuration for the anemometer interface.


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*Wind Vane*



To ensure accurate wind direction readings check the orientation of the wind vane annually.

Set the wind vane to point to the North.

The raw sensor value sensor on the weather station I/O module reads somewhere between **355º to 5º** (for example, very close to zero degrees).

The wind direction reading in the **Weather Monitoring** program should read 'North'.

## Solar Radiation Sensor




Dust the solar radiation sensor with a soft dry brush as often as is practical. When necessary, use a damp cloth or cotton swab to clean the top of the sensor.

If you notice a sudden decrease in observed light reading values it is likely due to debris on the sensing element (bird droppings etc.).

Please refer to the light sensor documentation that accompanied your weather station.

The following is a quick method for calibrating the sensor so that it is accurate to within a few percentage points each year.


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1) During the first year of operation, observe the recorded maximum light reading on the most intense sunny day of the year, typically this occurs around noon on or near the Summer Solstice.

   Make sure that the white sensor element is clean and the sensor is level.

   The reading should be approximately 1000 $Wm^{-2}$.

2. In subsequent years, observe this reading again.

   If you note a significant reduction in the reading, it is possible to adjust the gain settings using the multiplier and divisor settings in the software. Please contact Argus for assistance when doing this.

### *Zero Calibration (Perform this check annually)*

Cover the sensor so that it is in complete darkness.

If the reading is not zero, enter a **Light Sensor Offset** value on the weather station **I/O Module** sensor installation screen to achieve a zero value.

All readings are reduced by this offset value.

## Rain/Snow Detection Sensor



If the rain detection sensor is falsely triggering the “Raining” or “Snowing” reading:

1) Make sure the rain sensor element is clean and free of debris. Use a damp cloth to remove any debris from the gold-plated grid surface area.

2) Make sure the rain heater is working. This prevents fog, mist, and condensation from triggering rain.



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It also prevents ice accumulation and makes it possible to use the sensor for snow detection.

3) To test the sensor, use a water filled spray bottle to wet the grid until a few drops run down the surface.

4) If needed, you can also adjust the

**Rain Threshold Setting** on the **Weather Inputs and Setup Values** screen of the **Weather Monitoring** program.

Call **Argus Support** for assistance, contact information is found under “About This Manual” on page 3.

## I/O Module Removal and Replacement

The I/O module processor board is located on the reverse side of the mounting plate for the I/O backplane.

The board that you see when you open the enclosure in the I/O backplane. It contains all of the wiring terminals for the sensors and communications.

It is possible to replace the I/O module with the weather station in place, without removing any wires. Instructions for this are provided below.

If it is not safe or practical to service it while in place, the only wired you need to undo are the two communications wires.

After that the weather station can be unscrewed from its mounting coupling and removed in one piece for servicing on the ground.


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# I/O Module Replacement Steps

1) Power down the weather station by unplugging the communications terminal at the NLP (Network Lightning Protection Device).

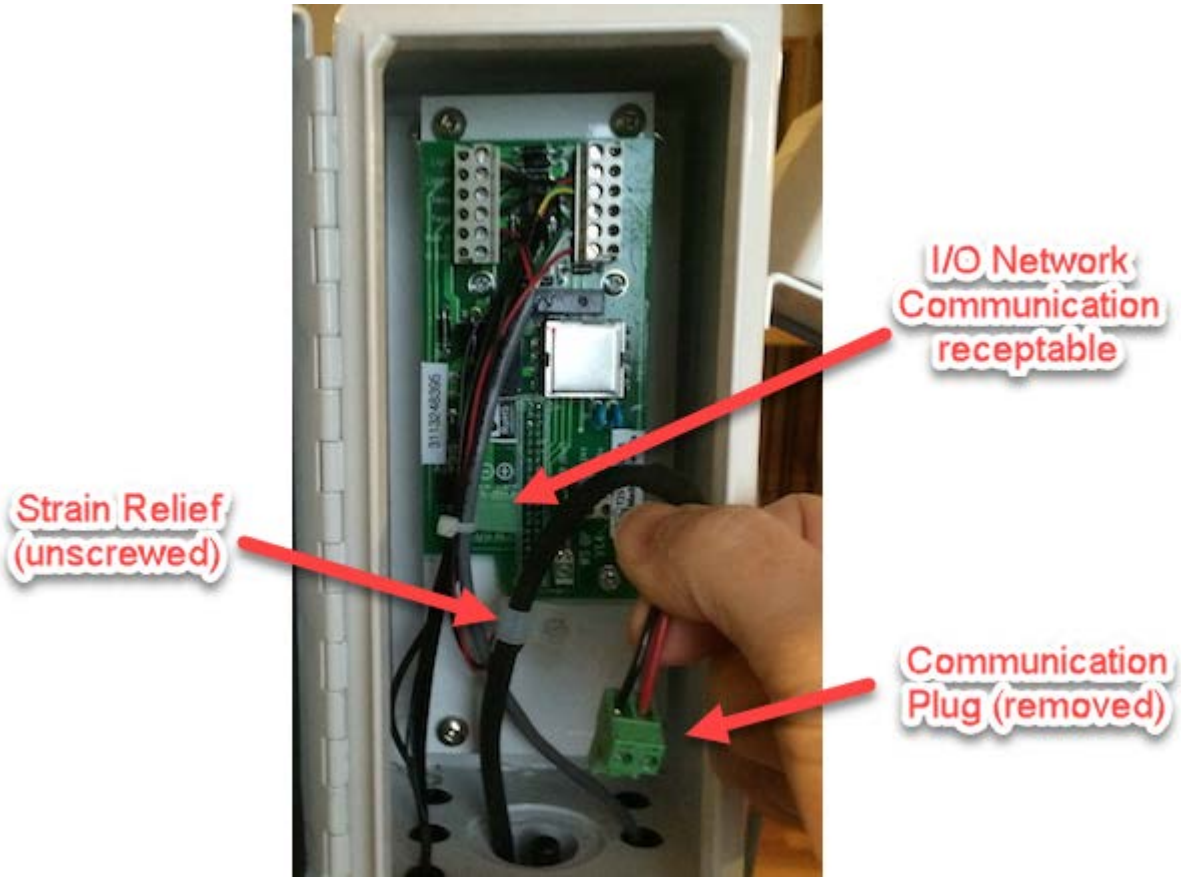




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2) If you are removing the weather station, disconnect the plug for the communications cable plug and the screw that secures the strain relief clamp for the cable.

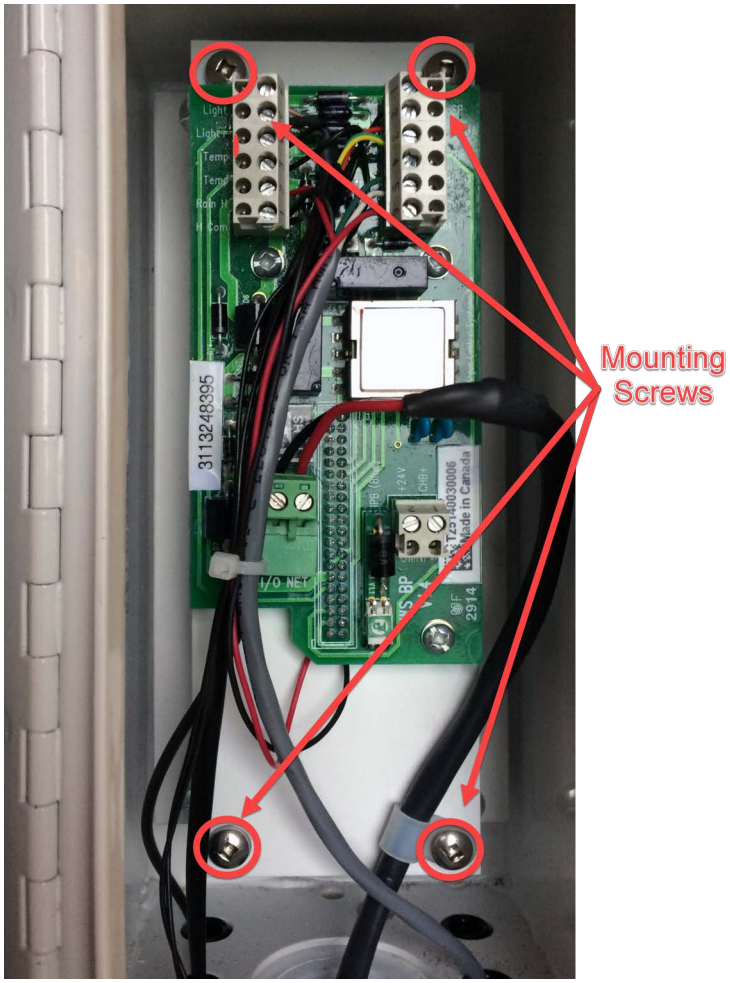
This enables you to remove the entire weather station to service it elsewhere.





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3) Remove the four screws that fasten the mounting plate to the electronics enclosure.

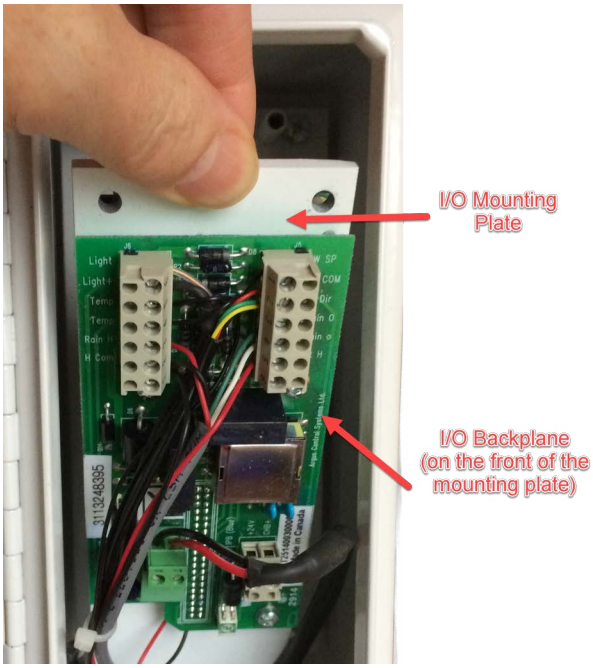




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4) Carefully remove the mounting plate from the enclosure and flip it upside down exposing the back of the mounting plate.

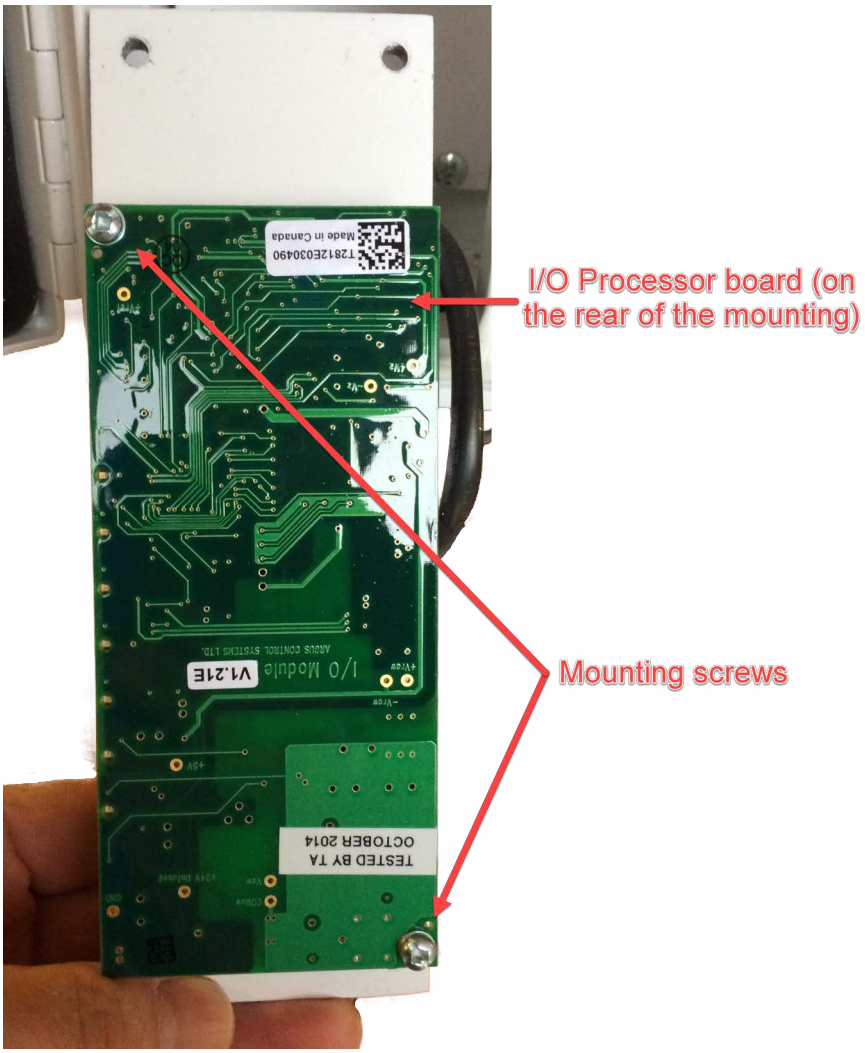
There needs to be enough slack in the sensor wires to accommodate this.





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5) The I/O module is located on the back side of the mounting plate. Remove the two screws securing the I/O Module processor.

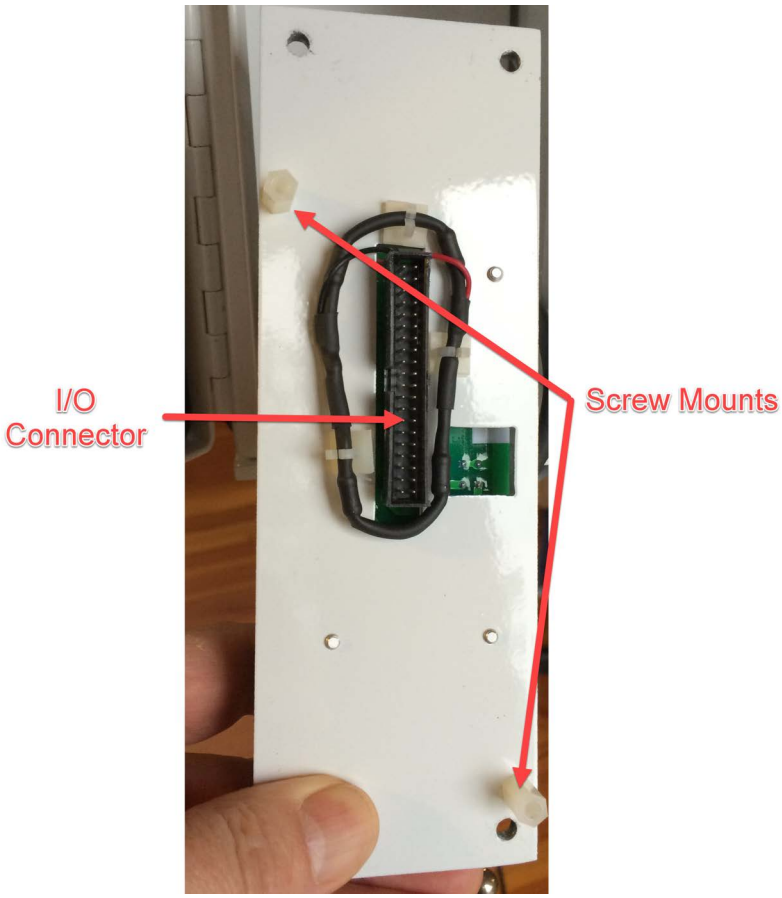




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6) The I/O Processor board is connected to the I/O backplane by a large connector located underneath the board.

   Hold the white mounting plate and gently pull the I/O processor board toward you (away from the mounting plate) while wiggling it slightly to unseat it from the main connector shown below.




7) Replace the I/O module by aligning the two screw holes on the board with the screw mounts on the mounting plate and gently pressing the board down to fully seat it on the connector block.

8) Replace the I/O board mounting screws.

9) Replace the mounting plate in the electronics enclosure taking care not to pinch or strain any sensor or communications wires.

10) If you removed the weather station, replace it and reconnect the communications plug and the strain relief clamp that you detached in **Step 2**.


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11) Power up by reconnecting the WS communications cable that you disconnected in **Step 1** in the **NLP** module.

12) Check for communications in the I/O module control program that operates the weather station.




If you are also replacing the I/O backplane you need to enter the new Board ID number printed on the backplane before the Argus system can communicate with the weather station. Call Argus for assistance.


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# Weather Station Specifications

| | |
|---|---|
| **Mast Mount** | **Dimensions**: 6" length x 1.35" diameter.<br>**Construction**: threaded 1" NPT, Schedule 40 aluminum. A 4 x 4" mounting flange connects the mounting mast to the base of the enclosure. A 1" NPT reinforced dielectric coupler is supplied for connecting to a male end pipe mast. |
| **Enclosure** | **Material**: UL/CSA Type 3R outdoor-rated, corrosion resistant aluminum, white powered-coated with a quarter turn latched weather-sealed door.<br>**Enclosure Dimensions**: 9" Tall x 4" Wide x 4.5" Deep |
| **Apogee Pyranometer**  | **Type:** Silicon-cell<br>**Sensor Housing:** Anodized Aluminum Housing<br>**Size**: (diameter x height) 0.95" x 1.1" (2.40 cm x 2.75 cm)<br>**Weight**: 3.17 oz. (90g)<br>**Radiometric Range**: 360 to 1120 nm<br>**Calibration**: Factory-calibrated<br>**Error**: Typically ± 5%<br>**Sensitivity**: Typically 0.20 mV per $Wm^{-2}$<br>**Linearity**: < 1% (up to 1750 $Wm^{-2}$)<br>**Stability**: < ± 2% change over a 1 year period<br>**Response Time**: < 1 ms<br>**Temperature Dependence**: -0.04 ± 0.04% per ºC (maximum)<br>**Cosine Correction**: ±5% at 75º zenith angle<br>**Field of View:** 180º<br>**Operating Temperature**: -40ºC to 70ºC<br>**Relative Humidity**: 0 to 100%<br>**Mount**: Supplied with an AL-100 mount<br>The TC-WS-3.1/C requires a TTN-WSBP-1.4A ROHS Weather Station Backplate.<br>***Important:***<br>The Apogee sensor is not compatible with the TC-WS-3.0/C or TTN-WSBP-1.4OHS Weather Station Backplane. |
| **Rain Detection** | **Sensor materials**: Gold-plated nickel over copper with a silk-screened, white, weather resistant paint mask on the exposed PCB surface<br>**Housing**: ASA plastic, IP65 UV-resistant enclosure<br>**Mounting Bracket**: Powder coated aluminum<br>For additional information please refer to the Argus data sheet for part number **SEN-RGRD-X.X/WS** |


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# *Weather Station Specifications Continued*

| | |
|---|---|
| **Anemometer** | **Construction**: black anodized aluminum mounting arm<br>**Wind Direction**:<br>**Construction**: UV resistant ABS plastic<br>**Range**: 0 to 360º<br>**Accuracy**: ± 7º<br>**Resolution**: 1º (0º to 355º), 22.5º between compass points<br>**Wind Speed**:<br>**Type**: cup<br>**Construction**: polycarbonate<br>**Range:** 2 to 175 mph<br>**Accuracy:** ± 2 mph (3kph) or ± 5%<br>**Resolution**: 1 mph |
| **Argus TN Temperature Sensor** | **Thermistor Type**: NTC (negative temperature coefficient)<br>**Resistance**: 3000 Ohms @ 25°C Fenwal Unicurve (UUA Series)<br>**Sensor Accuracy**: ± 0.2°C (0°C to 70°C range)<br>± 0.5°C (-50°C to 150°C)<br>**Range**: - 50°C to 150°C<br>**Thermistor Housing**: 0.575" x 0.157" (length x diameter) of 304 stainless steel |
| **Lightning Protection** | A Network Lightning Protection Module (TC-NFLP-X.X/C) and a Network Fused Lightning Protection Module (TC-NLP-X.X/C) are included with the weather station.<br>For more information, refer to the product data sheets for these devices. |
| **Network Cable** | Supplied with a 50' cable: Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant.<br>**NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATIONS** |
| **Electronics** | The enclosure houses a Titan I/O Module mounted on a Titan weather station backplane.<br>All sensors are pre-connected. Power is provided using the I/O device cabling. |


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## NLP Specifications

| | |
|---|---|
| **Dimensions** | 7” x 4.5” x 1.2” (L x W x T) |
| **Enclosure** | White powder coated aluminum |
| **Discharge Capacity** | ~12,000 Amps (8/20 µsec pulse) |
| **Ground Wire** | 10AWG TEW copper stranded wire – 2m length connected to an external grounding lug. Trim the wire as short as possible to the grounding point. A separate ground rod is recommended. |

## NFLP Specifications

| | |
|---|---|
| **Enclosure Dimensions** | 7” x 4.5” x 1.2” (L x W x D) |
| **Fuse Capacity** | 1 Amp fast blow |
| **Ground Wire** | 10 AWG TEW copper stranded wire – 2m length connected to an external grounding lug. Trim the wire as short as possible to the grounding point. |


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**Web Site:** www.arguscontrols.com

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# Titan 2 Access Point Module

This assembly consists of a Titan 2 controller mounted in a white powder-coated aluminum enclosure. An I/O power supply, power transformer, Ethernet switch & surge protector, back-up 12V battery, and auto-dialer are also included.

## Applications




Each Titan system starts with an Access Point module, usually located near and connected to the Argus Server PC used for operator access. The Access Point is equipped with a Titan controller and components to facilitate Ethernet connection to the Operator PC, external alarm output relays, an included automatic alarm dialer, a battery for emergency backup power, and power supply circuitry for operating the controller and the first segment of the connected **I/O Communications Network** (see the control system illustration on the back page).

The Access Point features all the control capabilities of a standard Titan controller, and on smaller installations, may be the only controller required. Additional controllers are added via Argus System Network Communications cabling or Ethernet connection.

## Alternatives

Additional controllers on the Titan system use a **Basic Controller** configuration. This consists of a Titan Controller on a standard Back Plane with a plate to facilitate mounting into Argus panels (part number: **TC-BC/RCP**). A complete controller assembly mounted in a separate enclosure (part number **TC-BC/C**) is also available. Basic Controllers do not have alarm contacts, or battery charging circuitry.

## Features

- **Easy Connection to the PC** – the Access Point controller includes a fast Ethernet connection to the Argus Server PC.
- **Battery Backup and Smart Charging circuitry** – a 12-volt battery provides emergency power for alarm annunciation and external communications with the access point during power outages.
- **Alarm Outputs** – the controller back plane is equipped with four alarm outputs used to provide alarm signals to external annunciation devices such as sirens, lights, or alarm dialers.
- **Industrial Ethernet** - a Phoenix Contact switch is mounted inside the enclosure to connect to the Argus Server PC
- An APC **Ethernet surge protection** device is included to protect the Access Point. There is also space provided for additional surge protection devices if required.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

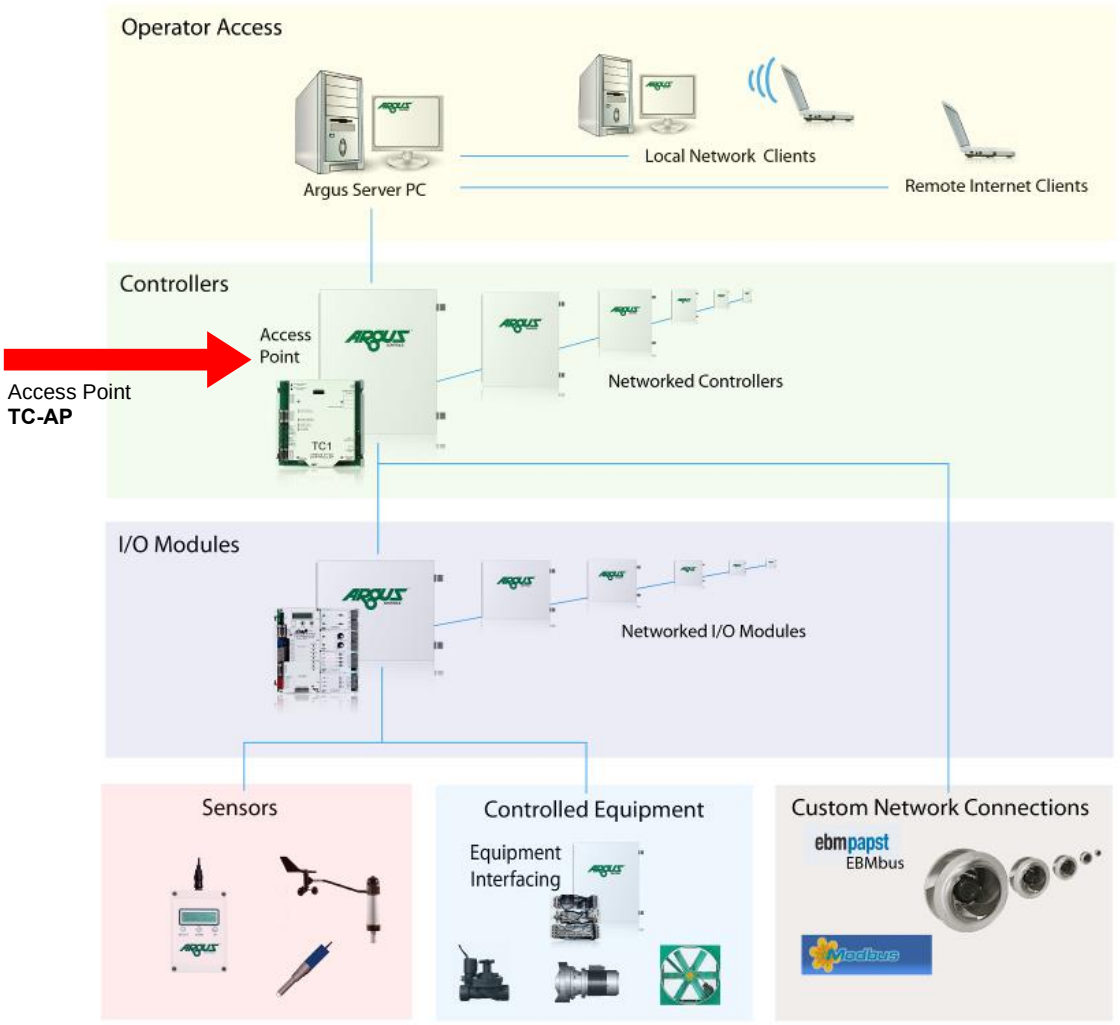
# Access Point Specifications

| | |
|---|---|
| **Enclosure** | Dimensions: 23” x 18.25” x 4.5” NEMA Type 4X and UL/CSA Type 12.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Titan Controller** | Argus part: **TTN-CONT** (includes Ethernet adapter daughter board) See Controller Specifications below. |
| **Controller Back Plane** | Argus part: **TTN-CMBP** |
| **Power Supply** | Argus part: **TC-IOPS** (Titan I/O Network Power supply) |
| **Battery** | Argus part: **TTN-CONT/BBU**<br>12 Volt, 7.2 Amp-Hour sealed lead-acid. |
| **Line Voltage Transformer and Fused Terminal Block** | Argus part: **RCC-TX75/TITAN**<br>Input voltage: 120 VAC (line voltage wiring must be supplied to the panel)<br>Output Voltage: 24 VAC, 75 VA |
| **Alarm Auto-dialer** | Argus part: **TTN-AD2001** automatic voice pager/dialer |
| **Controller System Network and I/O Network Cable** | Argus part number **CAB- 2C18G/TITAN** (West Penn Wire - AQ224): a 2-conductor 18AWG UV and moisture resistant cable suitable for indoor/outdoor use and is direct burial and wire tray-rated. **NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION**<br>**Note:** Controllers can also be connected via **CAT5 Ethernet** pathways. The **I/O Device Network** must use the Aquaseal AQ224 Cable. |

# Controller Specifications

| | |
|---|---|
| **Dimensions** | 8.5" x 8.5" x 1" (length x width x height) |
| **Power Consumption** | 3.75 Watts @ 24VDC (via Titan I/O Power Supply) |
| **Data Storage Memory Backup Power** | Lithium battery will hold up memory for approximately 2 years without power (settings are automatically reloaded on power-up) |
| **Program Execution** | All programs are executed once each second |
| **Maximum linked controllers per system** | 64 (more if domain bridging is used) |
| **Program Capacity** | Up to 255 |
| **Program Storage Memory**<br>**Data Storage Memory**<br>**Removable Memory**<br>**Power and Data Connections** | 4 MB (Flash) + 1 MB (Fast RAM)<br>1 MB (RAM)<br>SD Card Slot (a 4 GB SD card is included)<br>All connections except Ethernet are provided via the included backplane |

# Titan System Schematic




**Notes:**

Additional controllers and I/O equipment are provided in either separate enclosures or they may be ganged together in panels. Argus UL certified panels are built to order, and can also include line voltage interfacing and power distribution as required.

## Additional Information

Additional information is available on the data sheets for the component parts. For more information, please contact Argus.

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# USB Backup Module (Titan 2)

The Titan 2 USB Backup Module provides dual removable flash drives for storing control system backup data.

## Applications



The USB Backup Module is designed to work automatically with the Argus Backup/Restore Utility.

## Alternatives

This device is only used for backing up controller settings and other files needed for emergency restoration of an Argus system. Third party backup software can be used to back up all programs and files on the Argus Server PC.

## Features

- **Ease of Installation** – connects to the Argus Server PC using a standard USB cable.
- **Automatic Backups** – With the Backup/Restore option, automatic backups are performed at operator-defined frequencies.
- **Neat Drive and Cabling Configuration** – Storage drives and cabling connections are protected in a wall-mountable plastic enclosure with a removable lid. The enclosure is used to deter people from removing the USB drives for non-Argus use and ensure the device remains connected to the Argus Server PC at all times.

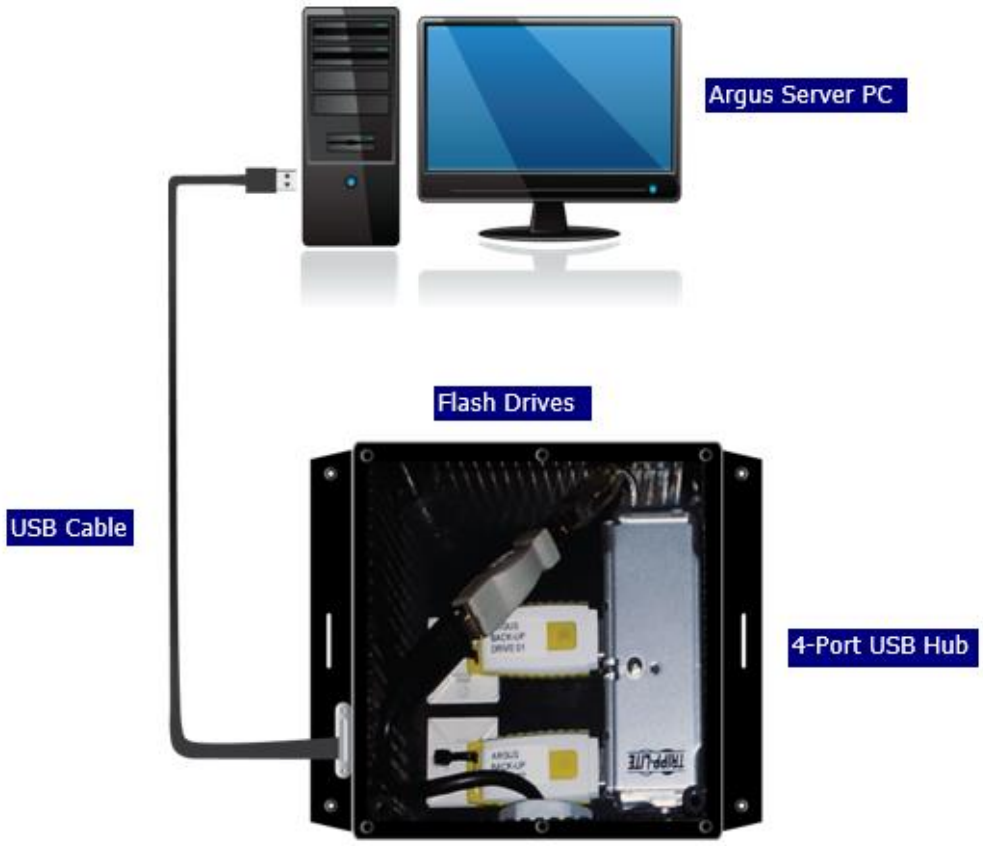
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## Specifications

| | |
|---|---|
| **Dimensions (Case)** | 4.75" x 4.75" x 2½" (length x width x depth) |
| **Internal USB Hubs** | 1 4-port bus-powered Hub. |
| **Removable Flash Memory** | 2-8GB USB Flash drives are included. |
| **USB Cable Length** | 5 Feet |

**Caution:** Only connect to the PC using the **Backside USB Port**.

## Product Details




## Additional Information

For more information, please refer to the Omni-Sensor Operator Manual or contact Argus.

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# 2-Conductor Aquaseal Cable

Network communication cable for Argus Titan Systems.

## Applications

This unshielded, water resistant communications cable is used to interconnect Titan Controllers and I/O Modules. The unique moisture sealing capabilities of this product provide stable and predictable reflectance characteristics for the matching of network termination devices on Titan communications wiring runs.



## Alternatives

**This is the only cable approved by Argus for use on System and I/O communications networks.**
There are currently no other Argus approved alternatives for this cable specification. **CONTACT ARGUS BEFORE MAKING ANY SUBSTITUTIONS.**
*This cable may also be ordered direct from West Penn Wire: www.westpenn-cdt.com/*

## Features

- Water resistant, water blocking cable for both indoor and outdoor (direct burial) applications.
- 2-Conductor 18-gauge low voltage unshielded cable.

## Specifications

| | |
|---|---|
| **Make** | Aquaseal 224 |
| **Manufacturer** | West Penn Wire |
| **AWG Size** | 18 |
| **Conductor Material** | Bare Copper |
| **Twisted Pairs** | Stranded |
| **Conductors** | 1 |
| **Moisture Resistance** | 2 |
| **Outer Jacket** | Self-sealing 2-ply water blocking tape. |
| **DC Resistance** | Sunlight and moisture resistant PVC |
| **Nominal Capacitance** | 6.2 Ohms/1000 feet |
| **Nominal Impedance** | 25pF/foot |
| **Maximum Operating Voltage** | 300 Volts |

## Important Notice

In Canada, the Aquaseal AQ224 cable can be used in a fire rated conduit to conform with CSA (Canadian Electrical Code, CEC) rules without having CSA approval. As stated in the CEC.

Canadian customers can use AQ224 in a building with a totally enclosed non-combustible raceway meeting the fire-resistant requirement. installers need to refer to the building code and select the correct raceway with related fire code (depends on the location installed). The marking on completely enclosed non-metallic raceways indicating compliance with the Flame Test is **FT4**.

## Additional Information

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Titan 2 Basic Controller in Enclosure

This assembly consists of a Titan 2 Controller Board connected to a Controller Backplane mounted in a white powder-coated aluminum enclosure. An I/O Power Supply and power transformer are also included.

## Applications




Titan controllers are specially designed processor units for data acquisition and automated control of bio-production environments including greenhouses, conservatories, nurseries Growth chambers and recirculating aquaculture systems.

Custom applications are configured for sustaining complex life support environments including the management of air, soil, nutrient, and aquatic conditions.

## Alternatives

An **Access Point** controller assembly (Argus part number **TC-AP/C**) is always the first controller used on the system. Basic controllers can also be mounted in larger panels along with other Argus components (see Argus Part Number **TC-BC/RCP**).

## Features

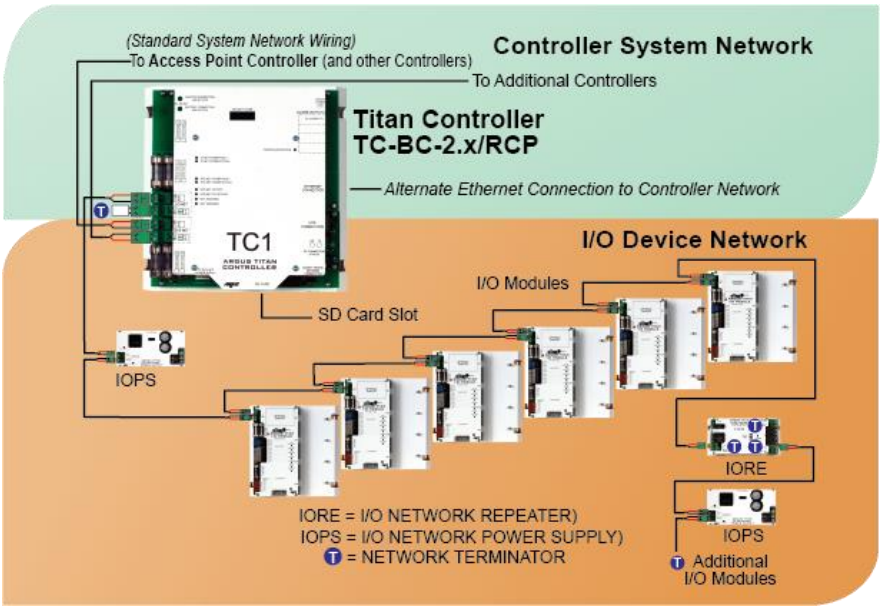
- **High Capacity** - Each controller can manage dozens of independent control processes and a large number of connected I/O devices.
- **Ethernet Port –** Controllers can be connected using standard Argus network wiring or CAT5 Ethernet. Mixed Argus System Network/Ethernet environments are supported to accommodate more flexible wiring topologies. Wired and wireless Domain Bridging can be configured for connecting controllers and groups of controllers in situations where physical or logistical impediments prevent the use standard Argus network wiring. In such cases, new or existing Ethernet pathways can be substituted. The Ethernet port also provides a high-speed connection from the Access Point controller to the Argus Server PC.
- **SD Card Slot –** A removable high capacity SD card slot (4-32 GB) with an included 4 GB SD card is provided for additional on-board buffering of recorded data. This helps prevent loss of recorded data during network interruptions and whenever the Argus Server PC is off-line. Plug-in memory also enables easy firmware updates and board replacements.
- **Flash Memory –** Controllers can receive firmware revisions or updates from any local or remote operator workstation.
- **Fully Programmable –** An extensive depth of control settings and options is provided.
- **Distributable –** Controllers can be distributed throughout the operation for ease of peripheral wiring.
- **Diagnostics –** Continuous self-diagnostics, communication diagnosis, and monitoring of all slaved components for maximum safety and reliability.
- **Easy Installation –** No-wire 'Plug & Run' module replacement courtesy of the included backplane that accommodates all external connections.
- **Independent Operation –** Peer-to-peer communications between controllers ensures independent operation.
- **Backwards Compatible –** Earlier Argus control system hardware is supported via a legacy communications port.
- **LED Status Indicators –** Used to indicate proper wiring and network operation.

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## Specifications

| | |
|---|---|
| **Panel Dimensions** | Dimensions: 23” x 18.25” x 4.5” NEMA Type 4X and UL/CSA Type 12.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Consumption** | 3.75 Watts @ 24VDC (via Titan I/O Power Supply) |
| **Data Storage Memory Backup Power** | Lithium battery will hold up memory for approximately 2 years without power (settings are automatically reloaded on power-up) |
| **Program Execution** | All programs are executed once each second |
| **Maximum linked controllers per system** | 64 (more if domain bridging is used) |
| **Program Capacity** | Up to 255 |
| **Program Storage Memory** | 4 MB (Flash) + 1 MB (Fast RAM) |
| **Data Storage Memory** | 1 MB (RAM) |
| **Removable Memory** | SD Card Slot (a 4 GB SD card is included) |
| **Power and Data Connections** | All connections except Ethernet are provided via the included backplane. |
| **Controller System Network and I/O Device Network Wiring** | Argus part number CAB- 2C18G/TITAN (West Penn Wire - AQ224): a 2-conductor 18AWG UV and moisture resistant cable suitable for indoor/outdoor use and is direct burial and wire tray-rated. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION<br>Note: Controllers can also be connected via CAT5 Ethernet pathways. The I/O Device Network must use the Aquaseal AQ224 Cable. |

## Wiring Details




**Example Configuration** - for installation, always refer to the custom wiring diagrams supplied with each system.

## Additional Information

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Titan 2 Basic Controller Module RCP

This assembly consists of a Titan 2 Controller Board connected to a Controller Backplane and a relay control panel (RCP) mounting plate for Argus enclosures. Basic controller assemblies are used in multi-controller Titan applications where the controllers are installed in panels with other control equipment.




## Applications

Titan controllers are specially designed processor units for data acquisition and automated control of bio-production environments including greenhouses, conservatories, nurseries Growth chambers and recirculating aquaculture systems.

Custom applications are configured for sustaining complex life support environments including the management of air, soil, nutrient, and aquatic conditions.

## Alternatives

An **Access Point** controller (Argus part **TC-AP**) is always the first controller used on the system. Networked basic controllers are also available as complete assemblies in separate enclosures (Argus part number **TC-BC)**.

## Features

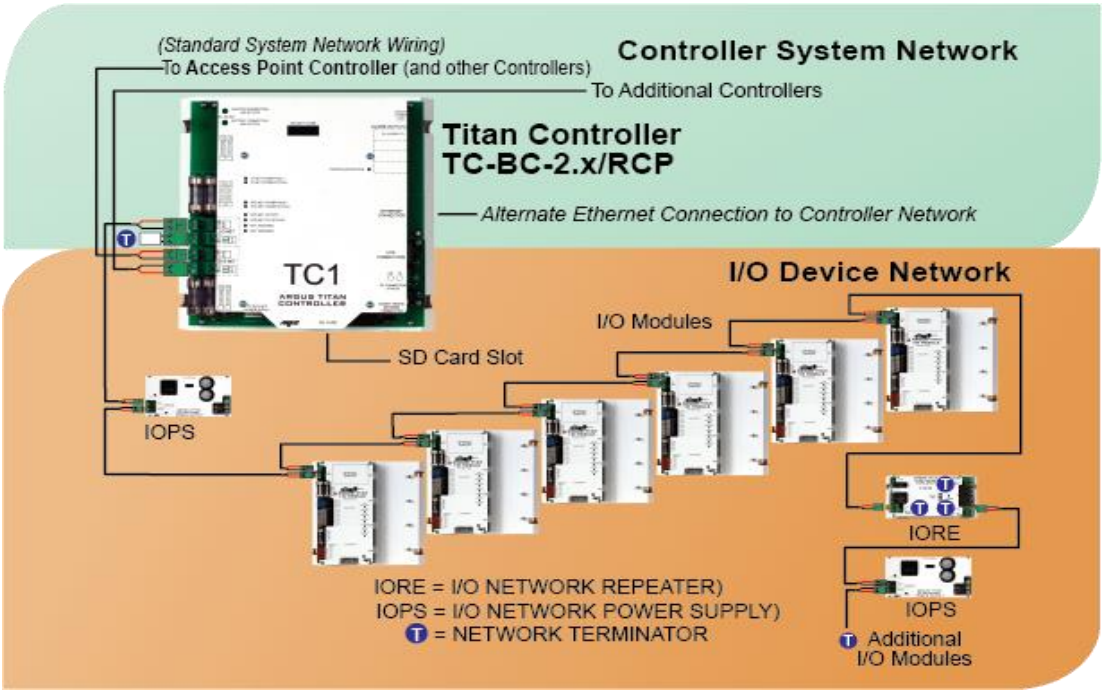
- **High Capacity** - Each controller can manage dozens of independent control processes and a large number of connected I/O devices.
- **Ethernet Port –** Controllers can be connected using standard Argus network wiring or CAT5 Ethernet. Mixed Argus System Network/Ethernet environments are supported to accommodate more flexible wiring topologies. Wired and wireless Domain Bridging can be configured for connecting controllers and groups of controllers in situations where physical or logistical impediments prevent the use standard Argus network wiring. In such cases, new or existing Ethernet pathways can be substituted. The Ethernet port also provides a high-speed connection from the Access Point controller to the Argus Server PC.
- **SD Card Slot –** A removable high capacity SD card slot (4-32 GB) with an included 4 GB SD card is provided for additional on-board buffering of recorded data. This helps prevent loss of recorded data during network interruptions and whenever the Argus Server PC is off-line. Plug-in memory also enables easy firmware updates and board replacements.
- **Flash Memory –** Controllers can receive firmware revisions or updates from any local or remote operator workstation.
- **Fully Programmable –** An extensive depth of control settings and options is provided.
- **Distributable –** Controllers can be distributed throughout the operation for ease of peripheral wiring.
- **Diagnostics –** Continuous self-diagnostics, communication diagnosis, and monitoring of all slaved components for maximum safety and reliability.
- **Easy Installation –** No-wire ‘Plug & Run’ module replacement courtesy of the included backplane that accommodates all external connections.
- **Independent Operation –** Peer-to-peer communications between controllers ensures independent operation.
- **Backwards Compatible –** Earlier Argus control system hardware is supported via a legacy communications port.
- **LED Status Indicators –** Used to indicate proper wiring and network operation.

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## Specifications

| | |
|---|---|
| **Dimensions** | 8.5" x 8.5" x 1" (length x width x height) |
| **Power Consumption** | 3.75 Watts @ 24VDC (using Titan I/O Power Supply) |
| **Data Storage Memory Backup Power** | Lithium battery will hold up memory for approximately 2 years without power (settings are automatically reloaded on power-up) |
| **Program Execution** | All programs are executed once each second |
| **Maximum linked controllers per system** | 64 (more if domain bridging is used) |
| **Program Capacity** | Up to 255 |
| **Program Storage Memory** | 4 MB (Flash) + 1 MB (Fast RAM) |
| **Data Storage Memory** | 1 MB (RAM) |
| **Removable Memory** | SD Card Slot (a 4 GB SD card is included) |
| **Power and Data Connections** | All connections except Ethernet are provided via the included backplane |
| **Controller System Network and I/O Device Network Wiring** | Argus part number CAB- 2C18G/TITAN (West Penn Wire - AQ224): a 2-conductor 18AWG UV and moisture resistant cable suitable for indoor/outdoor use and is direct burial and wire tray-rated. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION.<br>Note: Controllers can also be connected via CAT5 Ethernet pathways. The I/O Device Network must use the Aquaseal AQ224 Cable. |

## Wiring Details




**Example Configuration** - for installation, always refer to the custom wiring diagrams supplied with each system.

## Additional Information

For more information, please contact Argus.

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# Titan I/O Network Power Supply for RCP

The Titan I/O Network Power Supply (IOPS) provides reliable regulated control power and I/O communications for the Titan system.

This model is supplied on an Argus RCP (relay control panel) mount for installation in Argus combination panels.

## Applications




I/O Power Supplies (IOPS) are used on the Titan system to provide power and pass-through communications for the connected devices in an I/O network segment.

They are equipped with intelligent input/output signal fault detection, each power supply monitors for under/over-current conditions to protect the other devices on the network.

The managed power design enables superimposition of the communication signals using a two-wire connection to each node on the network. Each IOPS module powers one network segment. The number of powered segments required on each I/O network is determined by the calculated load of the hardware to be powered.

## Alternatives

IOPS modules are required on all Titan I/O networks.

## Features

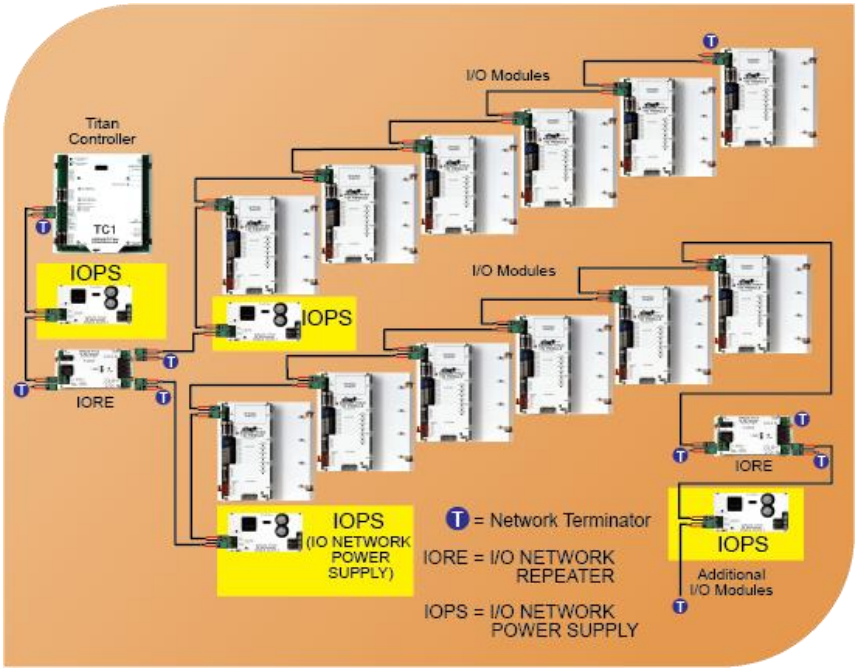
- **Over Voltage Protection –** Power supply switches off and visibly indicate when input voltage is greater than 32VAC.
- **Zero Voltage Turn On –** Reduces inrush current that may cause interference to the environment and the microprocessor.
- **Short Circuit Protection –** The IOPS switches off when the output is shorted to prevent the fuse from blowing.
- **Over Current Protection –** Intelligent programming detects an accumulated over-current condition and will switch off supply to protect components from overheating.
- **Zero Current Turn Off –** Reduces inrush current that may cause interference to the environment and the microprocessor.
- **Automatic Recovery** - The IOPS attempts to resume power delivery after an error condition is detected and continue to repeatedly test for removal of the error before switching on.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

## Specifications

| | |
|---|---|
| **Dimensions** | 8" x 4 1/2" x 1 1/2" (length x width x height) |
| **Power Requirements** | 24VAC 75VA transformer (Class II) - i.e. Argus Part # RM-2TX75 |
| **Max. Operating Power Output** | 50W (29VDC @ 1.7A) |
| **Max. Peak Power Output** | 60W (27VDC @ 2.2A) |
| **Min. Input Voltage** | 24VAC |
| **Max. Input Voltage** | 32VAC |
| **Max. Current Load** | 2.2A (@ 27VDC) |
| **Power Output Type** | Current-limited switching power supply |
| **Temperature Range** | 0 – 50°C |

## Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

**Example I/O Network Configuration**: The wiring for each I/O Network is custom engineered to match the physical layout, the controlled applications, and the distances spanned. For installation, refer to the custom drawings supplied with the control system.

## Additional Information

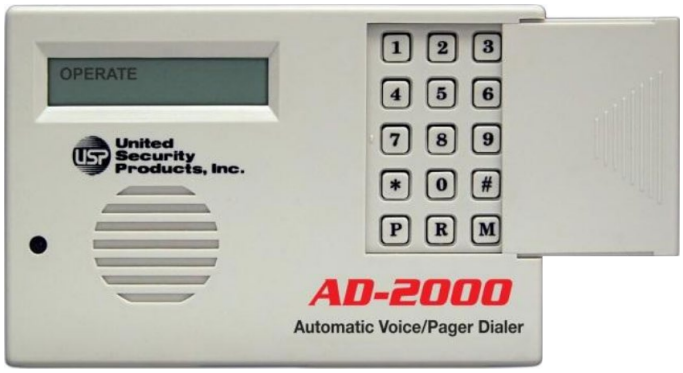
For more information, please contact Argus.

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# Automatic Voice/Pager Dialer System

*The AD-2000 Dialer is used to transmit alarm signals via telephone from the Titan Control system. It is normally supplied as part of the Access Point controller assembly.*

## Applications




Within the control system software, you can configure a variety of alarm priorities and annunciation methods, including alarms where remote individuals must be alerted through an emergency telephone dialer.

The AD-2000 can connect to up to four alarm contacts on the Titan Access Point controller for this purpose. Pre-recorded messages alert the recipient to the Alarm condition.

## Alternatives

Up to four alarm contacts are provided on the Access Point controller to support a variety of alarm annunciation methods including audible alarms, sirens, lights etc. Other alarm dialers can also be accommodated with the Argus Titan Control system.

## Features

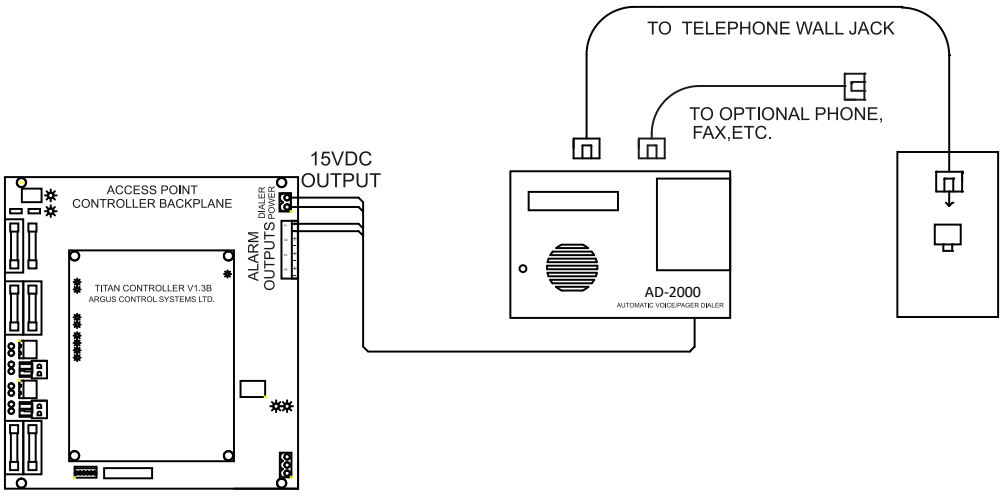
- **Alarm Contact List** – Stores up to 8 telephone/pager numbers.
- **Retries** - Select 1- 9 calling efforts for the numbers dialed.
- **Message Repeats** – Select 1-3 message repeats.
- **Recordable Messages** – Record a variable combination (maximum of 4) of instructional outgoing messages.
- **Alarm Channels –** Up to 4 separate input channels with individually enable/disable, entry/exit delay and activation options.
- **Channel Differentiation –** Each channel has selectable delay times, telephone/pager numbers to be dialed and outgoing messages to be played.
- **Power Supply –** Normal and emergency power is supplied via the Access Point controller backplane and connected backup battery.

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# Technical Specifications

| | |
|---|---|
| **Parts Included** | • 1 Model AD-2000<br>• 1 Phone cable<br>• 1 Instruction manual<br>• 1 Access Point connector harness |
| **Power Supply** | • Via direct connection to Access Point controller<br>• 9-18 VDC<br>• 28 mA standby<br>• 100 mA dialing |
| **Channel Activation** | Normally Open, Normally Closed, or 5-28 VDC |
| **Outgoing Numbers** | 50 Digits maximum |
| **Case Material** | ABS |
| **Dimensions** | 6” x 4” x 1.5” |
| **Mounting** | Wall or Flat surface |

# Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

# Additional Information

For more information, please contact Argus.

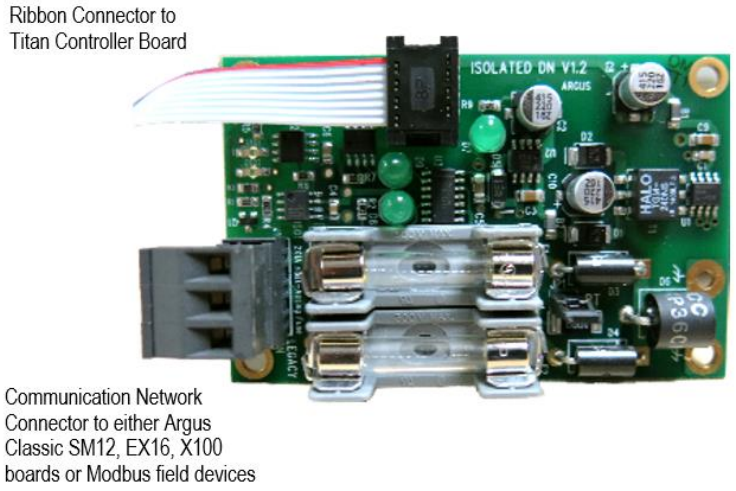
**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Isolated Device Network Board

The ISODN is an optically isolated RS-485 communications interface with integrated heavy-duty transient voltage protection (lightning protection).

It is used for interfacing an Argus Legacy device network or slaved Modbus devices to a Titan Controller Basic or Access Point (TC-BC-1.0 C or TC-AP-1.0C).

## Applications




1. **Argus Classic to Titan upgrades**: Supports the connection of Argus Classic Device networks to Argus Titan controllers, enabling the continued use of existing I/O hardware.
2. **Modbus Interface**: Supports the connection of other RS-485 based networks (i.e. Modbus RTU, ebmBUS, etc.) to the Titan system.

## Features

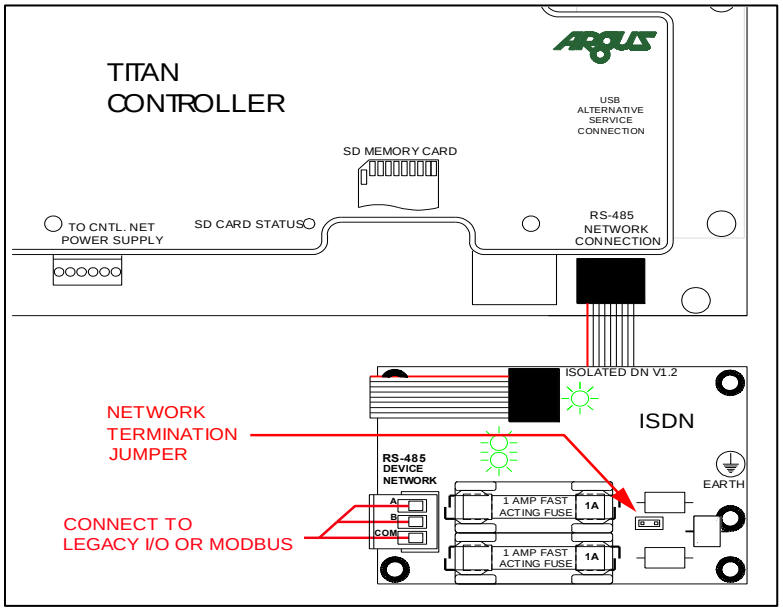
- Compatible with Argus Titan Controllers in 23" x 20" Standard Enclosures
- LED status lights indicate transmit/receive activity
- Easy to install in the field with DIP connector – controller mounting plates have a designated mounting location for this board
- Easy to replace, fast acting, heavy duty, fused lightning protection
- Powered through the controller connection
- An on-board jumper can be removed to disable the built-in 100 Ohm cable termination resistor. The 100 Ohm termination resistance was selected to match the typical impedance of the communications cables specified by Argus.
- Connector provides RS-485 A, B (signal) and COM (common) terminations.

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## Specifications

| | |
|---|---|
| **Dimensions** | 2” H x 3.25" W |
| **Lightning Protection Fuse** | 1A fast-acting |
| **Hardware Mounting** | Mounting holes are predrilled on the back plate and machine screws are provided |
| **Ground Connections** | via the supplied mounting screws |
| **Power Requirement** | Power is provided via the ribbon cable from the connected Titan controller |

## Wiring Details




ISODN Application for Titan Systems

Example Wiring: For installation, always refer to the custom drawings supplied with the part.

## Additional Information

For more information, please contact Argus.

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# KELE FLUORESCENT/LED DIMMING CONTROL MODULE

## *LDIM2*

## DESCRIPTION

The **Kele Model LDIM2** is a fluorescent/LED dimming control for dimmable electronic fluorescent ballasts/LED driver module. It is designed for single 0-10V dimming output with a 0-10V input or a PWM input from BAS controllers. Feedback is provided for light level setpoint and light level output. The **LDIM2** output interfaces with electronic fluorescent ballasts/LED driver modules designed for an analog 0-10V sinking input.



## FEATURES

- ***Control output 0-10 VDC dimmable fluorescent ballasts or LED driver modules***
- ***BAS Setpoint (0, 2-10V or PWM)***
- ***4-20 mA feedback for light level setpoint and output monitoring***
- ***Output is electrically isolated from input***
- ***Fail-safe, output to full-bright on lost signal***
- ***Manual override of setpoint input***
- ***3.25" x 5.00" snap-track mount***

## SPECIFICATIONS

| | |
|---|---|
| **Supply Voltage** | 24VDC ±5% @ 75 mA<br>24VAC ±10% @ 150 mA |
| **Signal Input** | 0-10 VDC, 2-10 VDC @ 50KΩ, or<br>PWM contact(Adj. Timebase)<br>0.1 to 25.6 seconds |
| **Signal Output** | Light dimming, 0-10 VDC, sinking, 0.5A Max |
| **Fuse** | 1A fast blow (20 x 5 mm Fuse. **K235-1**) |
| **Isolation** | Output signal Isolated from Input signal |
| **Fail Safe** | Max 10V out on input signal loss |
| **Manual Override** | 40% to 100% (DIP switch adjustable) |
| **Feed Back** | Using both requires 24VDC @<br>"LOOP IN" terminal |
| **Setpoint** | 4-20 mA (Sourcing), @650Ω |
| **Output Signal** | 4-20 mA (Sourcing), @650Ω |
| **Set-Up** | 8 DIP switches (Adj. on the fly) |
| **Visual Indication** | Three Status LED's |
| **LED 1 (RED)** | Output feedback loop (dim to bright) |
| **LED 2 (RED)** | Setpoint feedback loop (dim to bright) |
| **LED 3 (GRN)** | Off = No PWR, Solid On = normal,<br>Blinking = See below |
| **Operating Temperature** | 14° to 122°F (-10° to 50°C) |
| **Operating Humidity** | 5 to 95% RH non-condensing |
| **Wiring Terminations** | 8-Terminals, 22 to 14 AWG wire<br>2 Ballast Signal Terminals, 22 AWG<br>to 10 AWG |
| **Mounting** | Snap Track, (3.25" x 5.00") Included |
| **Dimensions** | 3.25"W x 5"L x 1.8"H<br>(8.25 x 12.7 x 4.57 cm) |
| **Weight** | 0.75 lb (0.34 Kg) |
| **Warranty** | 2 years |

## DIP SWITCH SETTINGS (0 = OFF, 1 = ON)

| "LDIM" Light Dimmer | DIP Switch Assignments | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 |
| **Analog Input Range (SW1 = On)** | | | | | | | | |
| 0-10V, Lost Input Detected Enabled | 1 | | | | | 0 | 0 | 0 |
| 0-10V, Lost Input Detected Disabled | 1 | | | | | 0 | 1 | 0 |
| 2-10V, Lost Input Detected Enabled | 1 | | | | | 0 | 0 | 1 |
| 2-10V, Lost Input Detected Disabled | 1 | | | | | 0 | 1 | 1 |
| **PWM Timebase Input 0.59-2.93 sec (SW1 = Off)** | 0 | | | | | 0 | 0 | 0 |
| **0.1-2.65 sec Timebase** | 0 | | | | | 0 | 0 | 1 |
| **0.1-5.2 sec Timebase** | 0 | | | | | 0 | 1 | 0 |
| **0.1-12.85 sec Timebase** | 0 | | | | | 0 | 1 | 1 |
| **0.1-25.6 sec Timebase** | 0 | | | | | 1 | 0 | 0 |
| **Go 100% Bright On Signal Loss** | | 0 | | | | | | |
| **Maintain Current Brightness On Signal Loss** | | 1 | | | | | | |
| **Normal CTRL. (No OVD.)** | | | 0 | 0 | 0 | | | |
| **Manual Override 40%*** | | | 0 | 0 | 1 | | | |
| **Manual Override 50%*** | | | 0 | 1 | 0 | | | |
| **Manual Override 60%*** | | | 0 | 1 | 1 | | | |
| **Manual Override 70%*** | | | 1 | 0 | 0 | | | |
| **Manual Override 80%*** | | | 1 | 0 | 1 | | | |
| **Manual Override 90%*** | | | 1 | 1 | 0 | | | |
| **Manual Override 100%*** | | | 1 | 1 | 1 | | | |

*** Stops input control when activated**

## GREEN STATUS LED OPERATION

**Solid Off (No Power)**
Indicates that 24 power is missing. Any time power is applied, the LED should not be solid off.

**Solid On (Normal)**
The LED is solid on for:
Analog input, no override, no PWM pulse present, not in Lost Analog Input state.
PWM input, no override, no PWM pulse present, not in Lost PWM state.

**Blink-Blink-Pause (Override)**
This occurs when the board is in Override state and no PWM pulse is present.

**Blink-Blink-Blink-Pause (Lost PWM or Lost Analog Input)**
This occurs in the PWM state, no override, when a pulse has not been received for 10 seconds (i.e.,Lost PWM state). This occurs in the analog input state, no override, no PWM pulse present, when the input value drops below 0.3 volts (i.e., Lost Analog Input state). The input value must rise above 0.5V to return to normal operation. In Analog Input mode, dipswitch 7 can be used to disable Lost Analog Input detect, allowing the output to track the input all the way to zero volts.

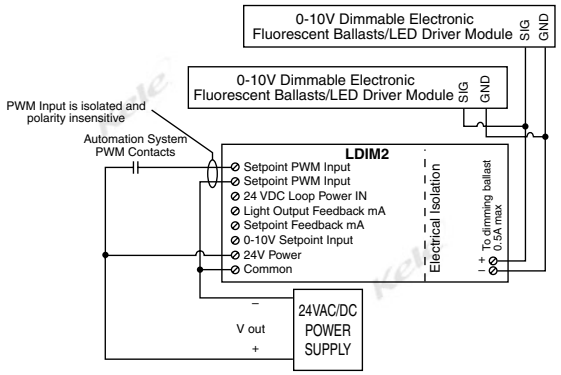
**Rapid Blink (PWM Pulse Active)**
Any time a PWM pulse is active, the Status LED will blink rapidly. This is true even in the analog input and override modes. The rationale for this is that you may have the board in the analog input or override mode because there is a problem with the pulses coming from the controller, and this way you can visually tell when the pulses have been restored. The PWM pulse does not affect the output in the analog input and override modes, just the Status LED.

# KELE FLUORESCENT/LED DIMMING CONTROL MODULE

## *LDIM2*

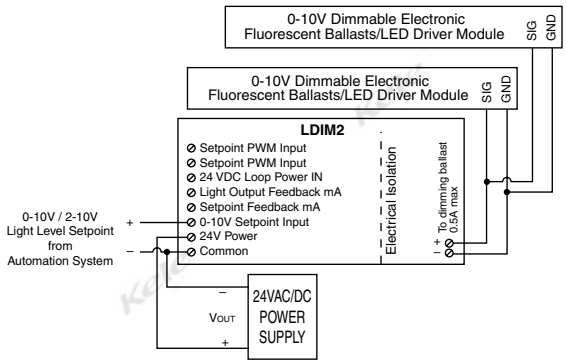
## WIRING

### Control Wiring (PWM)

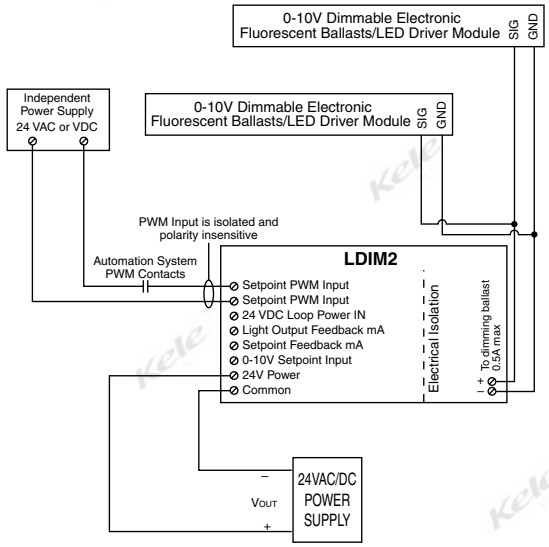



**Pulse-Width Setpoint Input Using the LDIM Power Supply**
(Feedback circuits not shown)

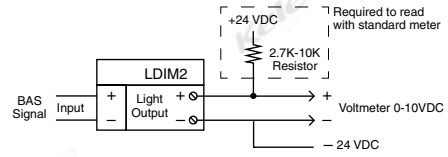
### Control Wiring (Analog)



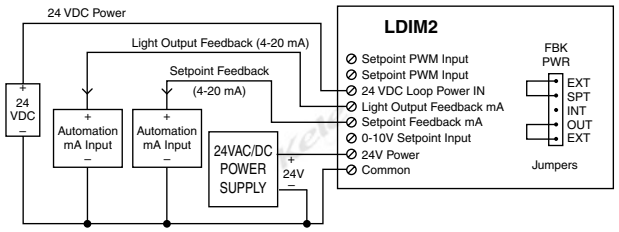

**0-10V / 2-10V Analog Setpoint Signal from Automation System**
(Feedback circuits not shown)



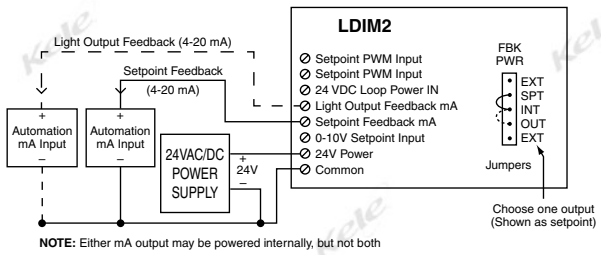

**Pulse-Width Setpoint Input Using Independent Power Supply**
(Feedback circuits not shown)




**Testing LDIM2 Output Without Lighting Ballast(s) Attached**

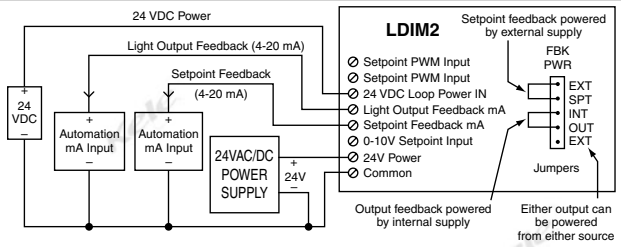



**Powering Both mA Feedback Signals with External 24 VDC Loop Supply**




**NOTE:** Either mA output may be powered internally, but not both

**Powering Single mA Feedback Signal Internally from LDIM2**




**Powering One mA Feedback Signal with External 24 VDC Loop Supply and One mA Feedback Signal Internally from LDIM2**

## ORDERING INFORMATION

| MODEL | DESCRIPTION |
|---|---|
| LDIM2 | Analog input fluorescent ballast & LED dimming control interface module |

# Titan I/O Module in Aluminum Enclosure

The **Titan I/O** (Input/Output) **Module** consists of a **Titan I/O Board** (**TTN-IO**) connected to a standard **I/O Backplane** (**TTN-IOBP**) in a white Argus powder-coated aluminum enclosure (**SUB-EX16/NBP**). Titan I/O Modules are used to connect sensor instrumentation to the Argus control system and for producing the output control signals to operate controlled equipment.

## Applications



Titan I/O modules can be located remotely, close to the connected sensors and controlled equipment. They are connected to Titan controllers and powered via a 2-wire I/O Communications Network. With more than a million parts of resolution over a 0-5 volt span, Titan I/O modules can be directly interfaced to many sensors that produce signals of only a few millivolts. Nearly any industrial sensor can be connected, although a few special types may require external signal conditioning. This helps reduce instrumentation costs and wiring complexity.

Each output channel is addressable, and can be extensively configured for most types of output signals including digital (including on/off, pulse width modulation, pulse period modulation, frequency), analog, and tri-state floating control. Any combination of Titan Output Relay Boards can be connected to the supplied backplane to provide the appropriate output signals.

An optional on-board display unit with operator entry keys is available to monitor readings and change setting values at the control locations.

## Alternatives

I/O Modules are also available on a metal mounting plate (**TC-IO/RCP**) for installation in Argus Combination Panels with other Argus components. A dual I/O Module enclosure is also available (**TC-IO/DUAL**).

## Features

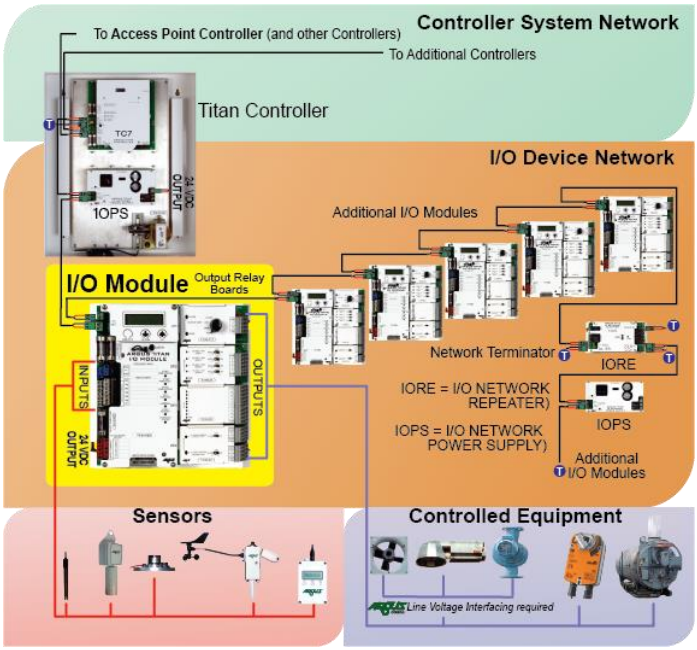
- **Plug and Run –** No-wire module replacement courtesy of the included backplane that accommodates all external connections.
- **Input Switching –** Analog sensor channels can be switched in the software between AC impedance, DC voltage, or DC resistance.
- **High Resolution –** Digital frequency measurement up to 20 kHz.
- **LED Status Indicators –** Indicate proper wiring and network operation.
- **Expansion Capacity –** Up to 32 I/O Modules can be operated from a single Titan Controller.
- **Flash Memory –** Firmware updates can be performed from any operator workstation.
- **Isolation –** Built-in cross-channel interference protection.
- **Consistent Performance –** Scan rate does not degrade as a function of system size or load.
- **Low Installation and Wiring Costs –** Modules can be located hundreds of meters apart, close to the connected sensors and the equipment they control.
- **Error Detection –** Extensive self-diagnostics, error detection, and fault diagnosis for wiring and connected equipment.
- **EMI Choke – Reduces interference generated by devices emitting high frequency 'noise'.**

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## *Specifications*

| | |
|---|---|
| **Enclosure** | Dimensions: 12.75" x 14.25" x 4.5" NEMA/UL/CSA Type 4X.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Consumption** | 1.5 Watts @ 24VDC via Titan IO Power Supply module (IOPS) |
| **Sample Conversion** | 24-bit A/D, 12 bit D/A |
| **nalog Input Raw Resolution** | One million parts over 0-5 volts in 5-microvolt steps. |
| **Output Channels** | 4 Output Relay Board connectors (OP1-OP4) provide:<br>• Up to 8 - 32 discreet digital outputs (depending on the choice of output relay boards to suit each application)<br>• *or* up to 4 tri-state floating (open/close/stop) for reversing motor control<br>• *or* up to 4 analog signal (voltage, frequency or current modes)<br>• *or* combinations of the above |
| **Analog Input Channels** | 7 universal analog channels, each 0-5 volts. Software-configurable for direct connection of DC resistance, DC voltage, or AC impedance at 1 kHz. |
| **Digital Frequency Inputs** | 2 channels: up to 20 kHz single channel, or up to 10 kHz each for dual channel measurement |
| **I/O Device Network Cable** | Argus part number CAB- 2C18G/TITAN: West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## *Wiring Details*




I/O Modules are used for Input and Output connections on the Titan system. The illustration shows an I/O module (yellow background) operating as part of a typical I/O Device Network for a Titan Controller.

For installation, please refer to the custom drawings and wiring diagrams provided with your system parts.

## *Additional Information*

For more information, please contact Argus.

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# XL/Dual Titan I/O Module in Aluminum Enclosure

The **Titan I/O** (Input/Output) **XL/DUAL Module** consists of one or two **Titan I/O Boards** (**TTN-IO**) connected to standard **I/O Backplane(s)** (**TTN-IOBP**) in a white Argus powder-coated aluminum enclosure (**SUB-CL100/NBP**).

Titan I/O Modules are used to connect sensor instrumentation to the Argus control system and for producing the output control signals to operate controlled equipment. If one Titan I/O module is used, the extra enclosure space is for future expansion. The XL version contains one Titan I/O module, while DUAL contains two modules.

## Applications



Titan I/O modules can be located remotely, close to the connected sensors and controlled equipment. They are connected to Titan controllers and powered via a 2-wire I/O Communications Network. With more than a million parts of resolution over a 0-5 volt span, Titan I/O modules can be directly interfaced to many sensors that produce signals of only a few millivolts. Nearly any industrial sensor can be connected, although a few special types may require external signal conditioning. This helps reduce instrumentation costs and wiring complexity.

Each output channel is addressable, and can be extensively configured for most types of output signals including digital (including on/off, pulse width modulation, pulse period modulation, frequency), analog, and tri-state floating control. Any combination of Titan Output Relay Boards can be connected to the supplied backplane to provide the appropriate output signals.

An optional on-board display unit with operator entry keys is available to monitor readings and change setting values at the control locations.

## Alternatives

I/O Modules are also available on a metal mounting plate (**TC-IO/RCP**) for installation in Argus Combination Panels with other Argus components. A single module enclosure is also available (**TC-IO/C**).

## Features

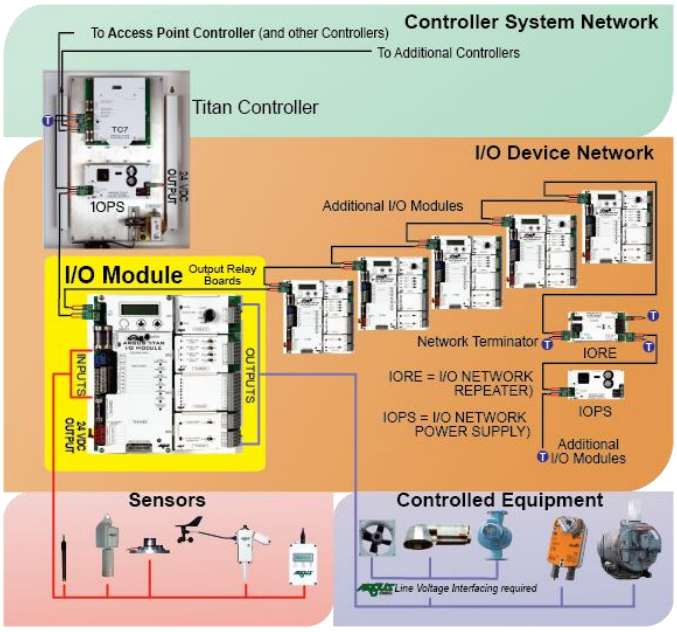
- **Plug and Run –** No-wire module replacement courtesy of the included backplane that accommodates all external connections.
- **Input Switching –** Analog sensor channels can be switched in the software between AC impedance, DC voltage, or DC resistance.
- **High Resolution –** Digital frequency measurement up to 20 kHz.
- **LED Status Indicators –** Indicate proper wiring and network operation.
- **Expansion Capacity –** Up to 32 I/O Modules can be operated from a single Titan Controller.
- **Flash Memory –** Firmware updates can be performed from any operator workstation.
- **Isolation –** Built-in cross-channel interference protection.
- **Consistent Performance –** Scan rate does not degrade as a function of system size or load.
- **Low Installation and Wiring Costs –** Modules can be located hundreds of meters apart, close to the connected sensors and the equipment they control.
- **Error Detection –** Extensive self-diagnostics, error detection, and fault diagnosis for wiring and connected equipment.
- **EMI Choke –** Reduces interference generated by devices emitting high frequency ‘noise’.
- **Safe** - mechanically interlocked to prevent the OPEN and CLOSE contacts from being energized at the same time

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## Specifications

| | |
|---|---|
| **Enclosure** | Dimensions: 23” x 18.25” x 4.5” NEMA Type 4X and UL/CSA Type 12.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Consumption** | Each module: 1.5 Watts @ 24VDC (via Titan IO Power Supply) |
| **Sample Conversion** | 24-bit A/D, 12 bit D/A |
| **Analog Input Raw Resolution** | One million parts over 0-5 volts in 5 microvolt steps. |
| **Output Channels (each module)** | 4 Output Relay Board connectors (OP1-OP4) provide:<br>• up to 8 - 32 discreet digital outputs (depending on the choice of output relay boards to suit each application)<br>• *or* up to 4 tri-state floating (open/close/stop) for reversing motor control<br>• *or* up to 4 analog signal (voltage, frequency or current modes)<br>• *or* combinations of the above |
| **Analog Input Channels (each module)** | 7 universal analog channels, each 0-5 volts. Software-configurable for direct connection of DC resistance, DC voltage, or AC impedance at 1 kHz. |
| **Digital Frequency Inputs** | 2 channels: up to 20 kHz single channel, or up to 10 kHz each for dual channel measurement |
| **I/O Device Network Cable** | Argus part number CAB- 2C18G/TITAN: West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## Wiring Details




I/O Modules are used for Input and Output connections on the Titan system. The illustration shows an I/O module (yellow background) operating as part of a typical I/O Device Network for a Titan Controller.

For installation, please refer to the custom drawings and wiring diagrams provided with your system parts.

## Additional Information

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Titan I/O Module for RCP

The **Titan I/O** (Input/Output) **Module for RCP** (Relay Control Panels) consists of a Titan I/O Board (**TTN-IO**) connected to a standard I/O Backplane (**TTN-IOBP**) and a mounting plate (**TTN-IOMOD/MP-3**) to support connected Output Relay Boards and for mounting into Argus panel enclosures.

Titan I/O Modules are used to connect sensor instrumentation to the Argus control system and for producing the output control signals to operate controlled equipment.

## Applications




Titan I/O modules can be located remotely, close to the connected sensors and controlled equipment. They are connected to Titan controllers and powered via a 2-wire I/O Communications Network. With more than a million parts of resolution over a 0-5 volt span, Titan I/O modules can be directly interfaced to many sensors that produce signals of only a few millivolts. Nearly any industrial sensor can be connected, although a few special types may require external signal conditioning. This helps reduce instrumentation costs and wiring complexity.

Each output channel is addressable, and can be extensively configured for most types of output signals including digital (including on/off, pulse width modulation, pulse period modulation, frequency), analog, and tri-state floating control. Any combination of Titan Output Relay Boards can be connected to the supplied backplane to provide the appropriate output signals.

An optional on-board display unit with operator entry keys is available to monitor readings and change setting values at the control locations.

## Alternatives

I/O Modules are also available in a separate enclosure (**TC-IO**. A dual I/O Module enclosure is also available (**TC-IO/DUAL**).

## Features

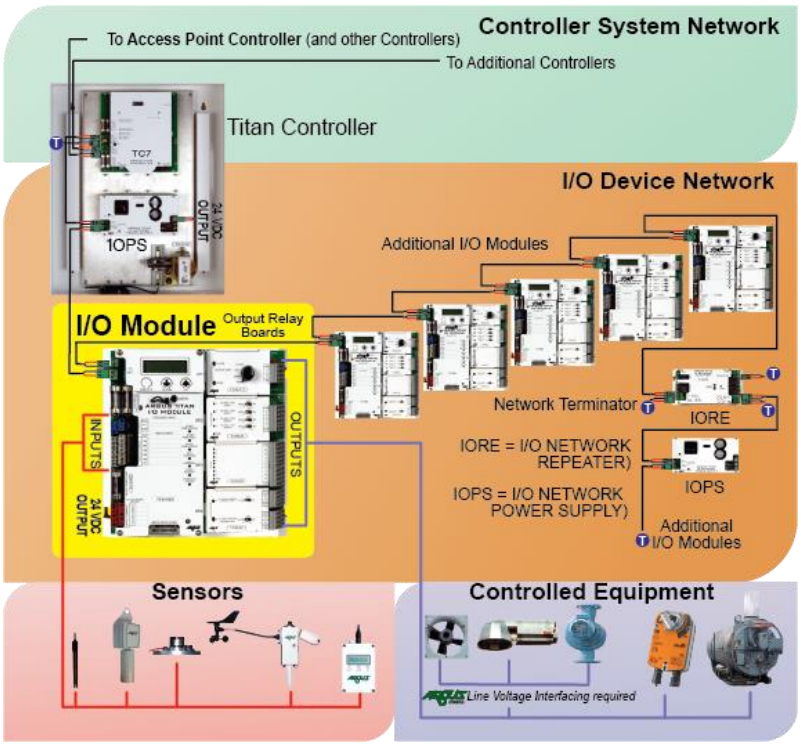
- **Plug and Run –** No-wire module replacement courtesy of the included backplane that accommodates all external connections.
- **Input Switching –** Analog sensor channels can be switched in the software between AC impedance, DC voltage, or DC resistance.
- **High Resolution –** Digital frequency measurement up to 20 kHz.
- **LED Status Indicators –** Indicate proper wiring and network operation.
- **Expansion Capacity –** Up to 32 I/O Modules can be operated from a single Titan Controller.
- **Flash Memory –** Firmware updates can be performed from any operator workstation.
- **Isolation –** Built-in cross-channel interference protection.
- **Consistent Performance –** Scan rate does not degrade as a function of system size or load.
- **Low Installation and Wiring Costs –** Modules can be located hundreds of meters apart, close to the connected sensors and the equipment they control.
- **Error Detection –** Extensive self-diagnostics, error detection, and fault diagnosis for wiring and connected equipment.
- **EMI Choke – Reduces interference generated by devices emitting high frequency 'noise'.**

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## *S p e c i f i c a t i o n s*

| | |
|---|---|
| **Dimensions** | 9" x 9" x 3" (length x width x depth) |
| **Power Consumption** | 1.5 Watts @ 24VDC (via Titan IO Power Supply module) |
| **Sample Conversion** | 24-bit A/D, 12-bit D/A |
| **Analog Input Raw Resolution** | One million parts over 0-5 volts in 5 microvolt steps. |
| **Output Channels** | 4 Output Relay Board connectors (OP1-OP4) provide:<br>• Up to 8 - 32 discreet digital outputs (depending on the choice of output relay boards to suit each application)<br>• *or* up to 4 tri-state floating (open/close/stop) for reversing motor control<br>• *or* up to 4 analog signal (voltage, frequency or current modes)<br>• *or* combinations of the above |
| **Analog Input Channels** | 7 universal analog channels, each 0-5 volts. Software-configurable for direct connection of DC resistance, DC voltage, or AC impedance at 1 kHz. |
| **Digital Frequency Inputs** | 2 channels: up to 20 kHz single channel, or up to 10 kHz each for dual channel measurement |
| **I/O Device Network Cable** | Argus part number CAB- 2C18G/TITAN: West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## *W i r i n g D e t a i l s*




I/O Modules are used for Input and Output connections on the Titan system. The illustration shows an I/O module (yellow background) operating as part of a typical I/O Device Network for a Titan Controller.

For installation, please refer to the custom drawings and wiring diagrams provided with your system parts.

## *A d d i t i o n a l I n f o r m a t i o n*

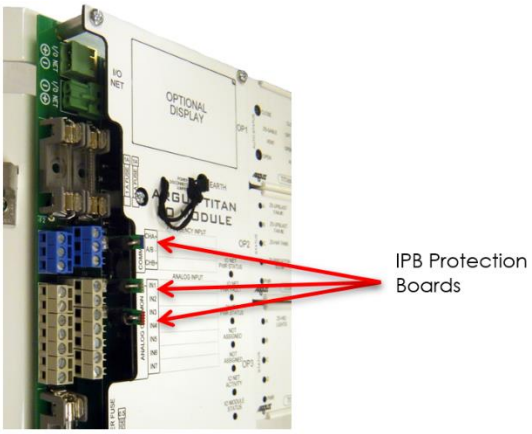
For more information, please contact Argus.

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# Titan Input Protection Boards

*These small input protection devices plug onto the Titan I/O Backplane just behind the connection point for each input. Each one is color coded to indicate its application* (see the application chart on the next page).

## Applications




Input Protection Boards can be used for two purposes:

1. To provide protection against transient voltage conditions such as lightning strikes.
2. To provide specialized signal conversion for specific input sources (except for the TTN-IPB/TVS which is used only for overvoltage protection).

## Alternatives

There are no alternatives to this product at this time.

## Features

- Compatible with I/O module and Backbone Versions 1.3 and higher.
- Protects electronic equipment from overvoltage conditions.
- Easy to replace after a significant overvoltage event.
- Color coded for easy identification (see application chart on next page).
- Converts signals from a variety of input sources (see application chart on next page).
- Spare IPB's are provided with every I/O module to be used when additional inputs are added or when replacement is required after a significant overvoltage event.

  **Warning:** Input Protection Boards (IPBs) cannot be used for any sensors/buffers/converters/transmitters not able to have **a capacitive load of 0.1µF** (for example, PHBF), or any digital and analog channel using **AC Impedance measurement configuration**.

## Specifications

| | |
|---|---|
| **Connection Type** | 2-pin IDC Connector |
| **Maximum Input Voltage** | Plus 12V to Minus 0.6V |
| **Maximum Surge Current** | 550A @ 8/20µS, 200A @ 8.3mS. |
| **ESD Protection** | 16KV |
| **Leakage** | <1µA (tested value: 0.1~0.15nA) |

## Application Chart

| Color Code | Part Number | Application |
|---|---|---|
| | TTN-IPB/TVS-3 | Overvoltage protection only. Does not perform signal conversion and is to be used only for standard 0-5 volt or dry contact inputs. (Note: older versions are green or unpainted) |
| | TTN-IPB/4-20mA V1.1<br>TTN-IPB/4-20mA V1.2 | Used with 4-20mA signal inputs<br>V1.1 – Resistance: 249 Ohm resistor, +/-1% ¼ W accuracy<br>V1.2 - Resistance: 249 Ohm resistor, +/-0.1% ¼ W accuracy |
| | TTN-IPB/OMNI | Used with Titan Omni Sensors<br>**Resistance:** 44 Ohm resistor, +/-5% accuracy |
| | TTN-IPB/LI-190 | Used with LI-COR LI-190 Quantum Light Sensors<br>**Resistance:** 604 Ohm resistor, +/-1% accuracy |
| | TTN-IPB/LI-200 | Used with LI-COR LI-200 Pyranometer Light Sensors<br>**Resistance:** 147 Ohm resistor, +/-1% accuracy |

## Additional Information

For more information, please contact Argus.

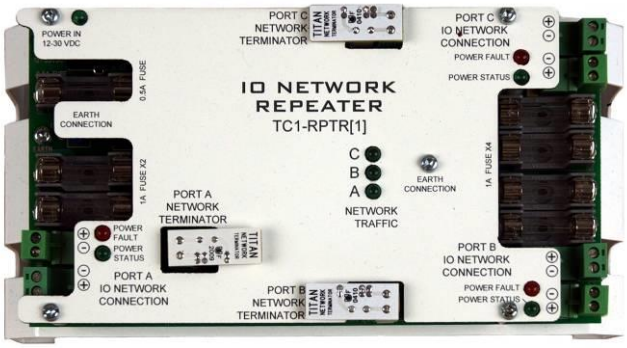
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# I/O Network Repeater Board RCP

The I/O Network Repeater provides power and signal regeneration for I/O network communications. It also facilitates network branching and provides isolation for each independently powered segment of the I/O network.

The I/O Network Repeater for RCP consists of an I/O Network Repeater board on a relay control panel mount for installation in Titan combination panels.

## Applications




The I/O Network Repeater is used to regenerate the digital communications signal on I/O Network wire runs more than 300 meters and whenever a branch in the network wiring is required.

I/O Network Repeaters are also used to segregate the I/O Network into powered segments, with the devices in each segment powered by a separate Titan I/O Network Power Supply. The I/O Network Repeater provides power isolation between the powered segments (see the illustration on the next page).

The I/O Network Repeater is also available in a complete module (TC-IORE/C) consisting of an I/O Network Power Supply board, an I/O Network Repeater board, and a 24-volt AC power transformer mounted in a white powder-coated aluminum enclosure.

## Alternatives

Passive Couplers (**TC-PASC**) may be used where branching is not required and total I/O network lengths are short (less than 300 meters).

## Features

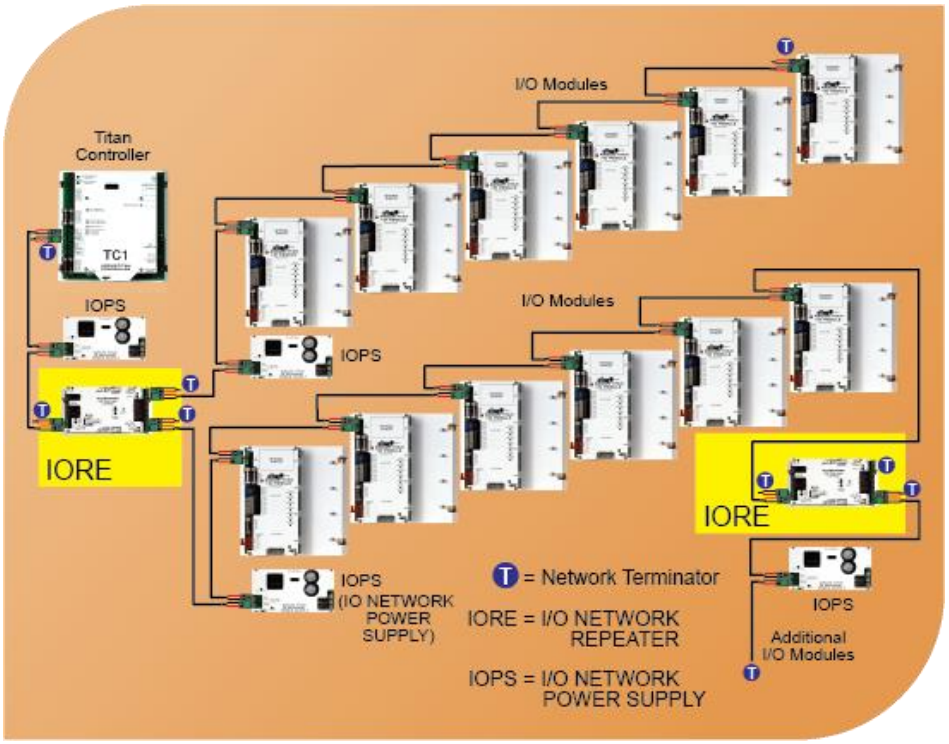
- 3-Port design accommodates free topology network branching for ease of wiring.
- Modules are powered by Network power on Port A. No requirement for supplementary power.
- EMI Choke – reduces interference generated by devices emitting high frequency ‘noise’.
- Led Status lights indicate proper wiring and network operation.
- Complete digital re-construction of degraded signals, allowing very long networks with many in-line repeaters with no loss of performance.
- Up to nine repeaters may be connected in series, creating I/O network lengths of many kilometers.

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## Specifications

| | |
|---|---|
| **Dimensions** | 4.5”H x 9”W x 3”D |
| **Power Requirement** | Power is normally provided via an I/O Network Power Supply on the powered segment that is connected to Port A. An alternative local power source (12-30 VDC >100mA) must be supplied if Port A is not used. |
| **Maximum Network Segment Distance** | Limited by I²R power losses (voltage drop) and signal degradation (up to 1500 meters per segment). |
| **I/O Device Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## Wiring Details




IOREs are highlighted in yellow.

In the example, one IORE is being used as an I/O Network Branch point and the other is used to extend the network length.

**Example I/O Network Configuration**: Each I/O Network is custom engineered to suit the physical layout of the controlled applications and the distances spanned.

For installation, refer to the custom drawings supplied with the control system.

## Additional Information

For more information, please contact Argus.

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# I/O Network Repeater Module

The I/O Network Repeater Module provides power and signal regeneration for I/O network communications. It also facilitates network branching and provides isolation for each independently powered segment of the I/O network.

The module consists of an I/O Network Repeater board, an I/O Network Power Supply board and a 24-volt AC power transformer mounted in a white powder-coated aluminum enclosure.

## Applications




The I/O Network Repeater is used to regenerate the digital communications signal on I/O network wire runs more than 300 meters and whenever a branch in the network wiring is required.

I/O Network Repeaters are also used to segregate the I/O network into powered segments, with the devices in each segment powered by a separate I/O Network Power Supply. The I/O Network Repeater provides power isolation between the powered segments (see the illustration on the next page).

The I/O Network Repeater board (part number TC-IORE-1.x/RCP) is also available separately on a relay control panel mount for installation in Titan combination panels.

## Alternatives

Passive Couplers (TC-PASC…) can be substituted on short wiring runs to isolate powered segments. Passive Couplers do not offer network branching.

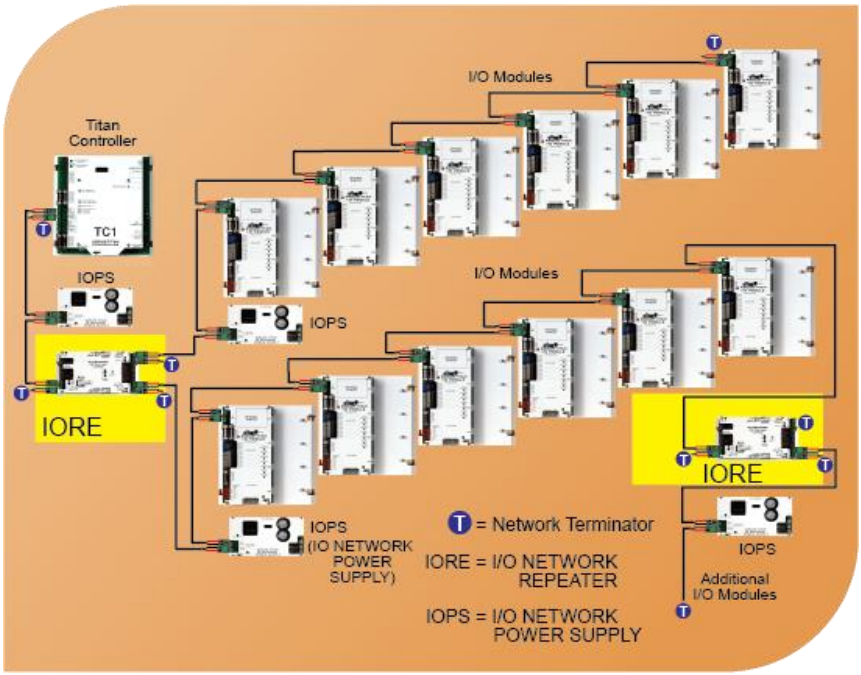
## Features

- 3-Port design accommodates free topology network branching for ease of wiring.
- Modules are powered by Network power on Port A. No requirement for supplementary power.
- EMI Choke – reduces interference generated by devices emitting high frequency ‘noise’
- LED status lights indicate proper wiring and network operation.
- Complete digital re-construction of degraded signals, allowing very long networks with many in-line repeaters with no loss of performance.
- Up to nine repeaters may be connected in series, creating I/O network lengths of many kilometers.
- Network terminator connections for installation at the ends of network segments
- Built to UL 508A electrical standards.
- NEMA rated enclosure, suitable for indoor mounting, providing protection against moisture, dust & dripping liquids.

## *S p e c i f i c a t i o n s*

| | |
|---|---|
| **Enclosure** | Dimensions: 12.75" x 14.25" x 4.5" NEMA/UL/CSA Type 4X.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Requirement** | Power for the module is normally provided via the I/O Network Power Supply on the powered segment that is connected to **Port A**. An alternative local power source (12-30 VDC >100mA) must be supplied if Port A is not used. |
| **Maximum Network Segment Distance** | Limited by I²R power losses (voltage drop) and signal degradation (up to 1500 meters per segment). |
| **I/O Device Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## *W i r i n g  D e t a i l s*




IORE panels are highlighted in yellow.

In the example, one IORE is being used as an I/O Network branch point and the other is used to extend the network length.

***Example I/O Network Configuration**: Each I/O Network is custom engineered to suit the physical layout of the controlled applications and the distances spanned. For installation, refer to the custom drawings supplied with the control system.*

## *A d d i t i o n a l  I n f o r m a t i o n*

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Passive Coupler Module

*The Passive Coupler isolates powered segments of I/O device communication networks. The Passive Coupler Module consists of a Passive Coupler board, an I/O Network Power Supply, and a 24-volt transformer mounted in a white powdered-coated aluminum enclosure.*

## Applications




Passive Couplers are conveniently configured to power one I/O network segment and provide power and lightning transient isolation in one easy to install package. Only the I/O network communications signal passes through the Passive Coupler device unchanged.

Total segment length is limited by signal degradation and power losses in the communications cable. Argus engineers normally evaluate these limitations during the system design process.

The Passive Coupler board (TC-PASC-1.3/RCP) is also available separately on a relay control panel mount for installation in Titan combination panels.

## Alternatives

An I/O Repeater (TC-IORE…) should be used in place of Passive Couplers if I/O network branching is required or to regenerate communications signals in applications with long wiring runs or high electrical noise. The I/O Repeater is a drop-in replacement of the Passive Coupler to extend the device communications wiring length beyond 300 meters.

## Features

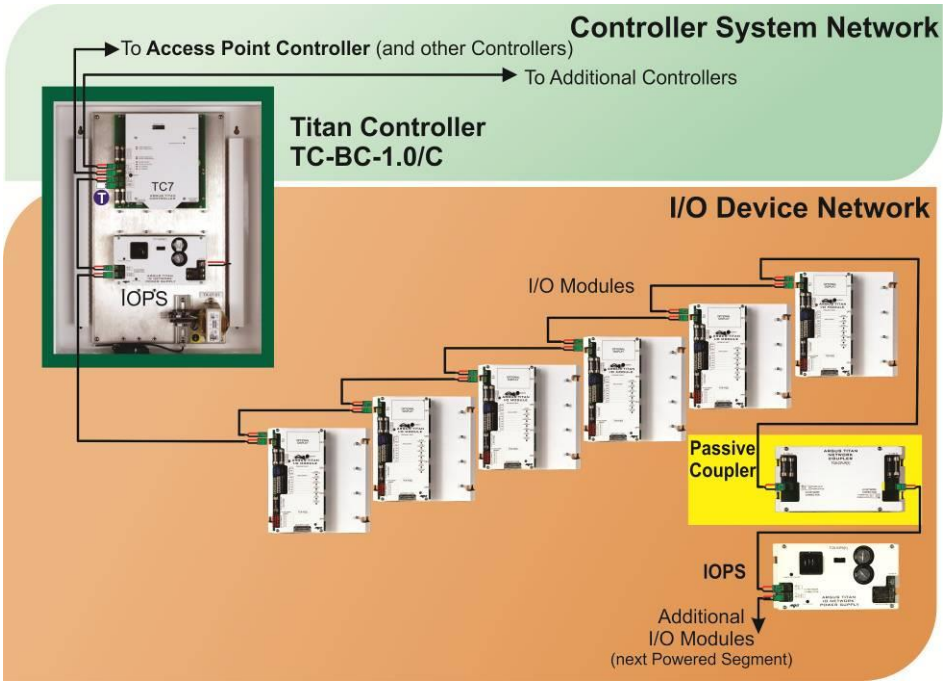
- Fused Lightning protection circuits on each side of the Passive Coupler.
- Single 120 VAC power connection.
- Class II 24 VAC transformer with current limiting and output power fusing.
- I/O Network Power Supply with gas discharge tube lightning protection.
- Factory pre-wired, requiring only 120 VAC power and I/O network wiring connections.
- NEMA/UL 12 rated enclosure, suitable for indoor mounting, providing protection against moisture, dust, and dripping liquids.
- Built to UL 508A electrical standards.

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# *S p e c i f i c a t i o n s*

| | |
|---|---|
| **Enclosure Material and Dimensions** | Dimensions: 12.75" x 14.25" x 4.5" NEMA/UL/CSA Type 4X.<br>*We recommend following local electrical codes as applicable.<br>Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Requirement** | 120 VAC, Maximum 75VA. Must be connected to a good electrical ground. |
| **Maximum Network Segment Distance** | Limited by network wire ($I^2R$ power losses); usually 100-300 meters Subject to some signal degradation. Substitute with I/O Repeater (TC-IORE-1.4/C) in case of a problem. |
| **I/O Device Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

# *W i r i n g D e t a i l s*




***Typical placement of a Passive Coupler on an I/O Communications Network***

*The **I/O Modules** in the illustration form an isolated **Powered Segment**. They are being powered by the **IOPS** (I/O Power Supply) located with the **Titan Controller**. The **Passive Coupler** (shown on the yellow background) is used to isolate the power between each IOPS.*

***Example I/O Network Configuration**: Each I/O Network is custom engineered to suit the physical layout of the controlled applications and the distances spanned. For installation, refer to the custom drawings supplied with the control system.*

# *A d d i t i o n a l I n f o r m a t i o n*

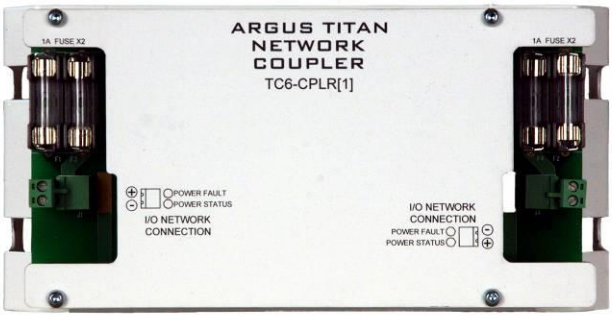
For more information, please contact Argus.

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# Passive Coupler for RCP

*The Passive Coupler isolates powered segments of I/O device communication networks. The Passive Coupler for RCP consists of a Passive Coupler board on a relay control panel mount for installation in Titan combination panels.*

## Applications




Passive Couplers are conveniently configured to power one I/O network segment and provide power and lightning transient isolation in one easy to install package. Only the I/O network communications signal passes through the Passive Coupler device unchanged.

Total segment length is limited by signal degradation and power losses in the communications cable. Argus engineers normally evaluate these limitations during the system design process.

A Passive Coupler Module (TC-PASC-1.3/C) is also available. It consists of a Passive Network Coupler Board, an Argus Titan I/O Network Power supply, and a 24-volt transformer in a white aluminum powered-coated enclosure.

## Alternatives

An I/O Repeater (**TC-IORE**) should be used in place of Passive Couplers if I/O network branching is required, or to regenerate communications signals in applications with long wiring runs or high electrical noise. The I/O Repeater is a drop-in replacement of the Passive Coupler to extend the device communications wiring length beyond 300 meters.

## Features

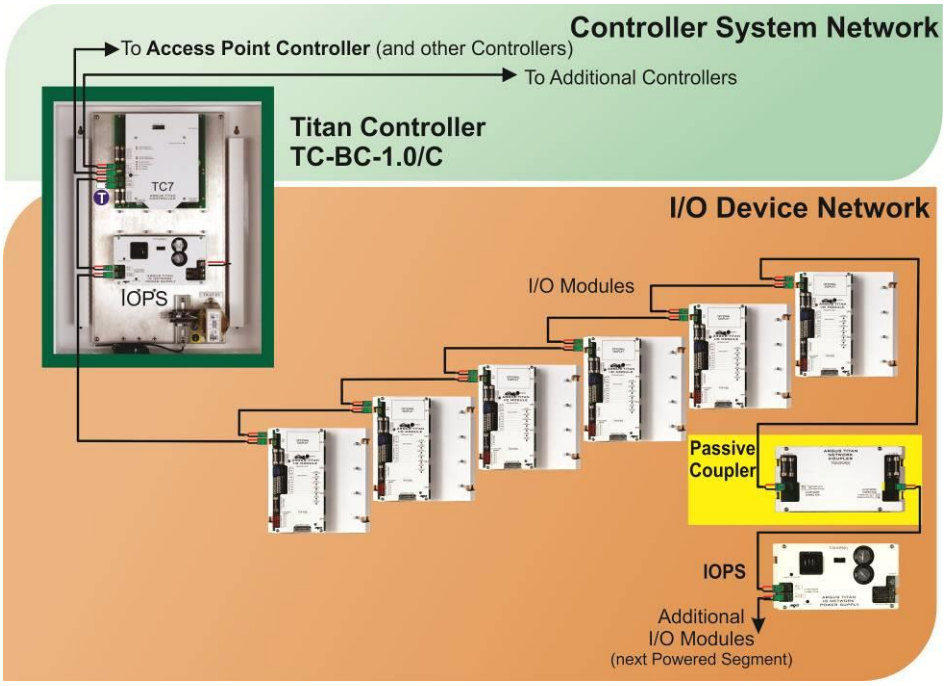
- Fused Lightning protection circuits on each side of the Passive Coupler.
- Completely passive: no power supply required.

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# Specifications

| | |
|---|---|
| **Dimensions** | 4.5” x 9” x 3” (L x W x T) |
| **Power Requirement** | Not powered. |
| **Maximum Network Segment Distance** | Typically less than 300 meters. Subject to some signal degradation. Substitute with active repeater if a problem. |
| **I/O Device Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

# Wiring Details




***Typical placement of a Passive Coupler on an I/O Communications Network***

*The **I/O Modules** in the illustration form an isolated **Powered Segment**. They are being powered by the **IOPS** (I/O Power Supply) located with the **Titan Controller**. The **Passive Coupler** (shown on the yellow background) is used to isolate the power between each IOPS.*

***Example I/O Network Configuration**: Each I/O Network is custom engineered to suit the physical layout of the controlled applications and the distances spanned. For installation, refer to the custom drawings supplied with the control system.*

# Additional Information

For more information, please contact Argus.

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# System Network Repeater Module

*The System Network Repeater provides power and signal regeneration for system network communications. It also facilitates network branching and provides isolation for each independently powered segment of the system network. This module consists of a System Network Repeater board mounted in a white aluminum enclosure and a System Network Power Supply that is to be connected to an adjacent Controller.*

## Applications




The System Network Repeater is used to regenerate the digital communications signal on system network wire runs more than 300 meters and whenever a branch in the network wiring is required.

System Network Repeaters are also used to segregate the System Network into powered segments, with the repeaters in each segment powered by a separate System Network Power Supply. The System Network Repeater provides power isolation between the powered segments (see the illustration on the next page).

The System Network Repeater for RCP (part number TC-SNRE-RCP) is also available, consisting of an SNRE board on a mounting plate and a System Network Power Supply (SNPS) that connects to an adjacent Controller.

## Alternatives

None Available.

## Features

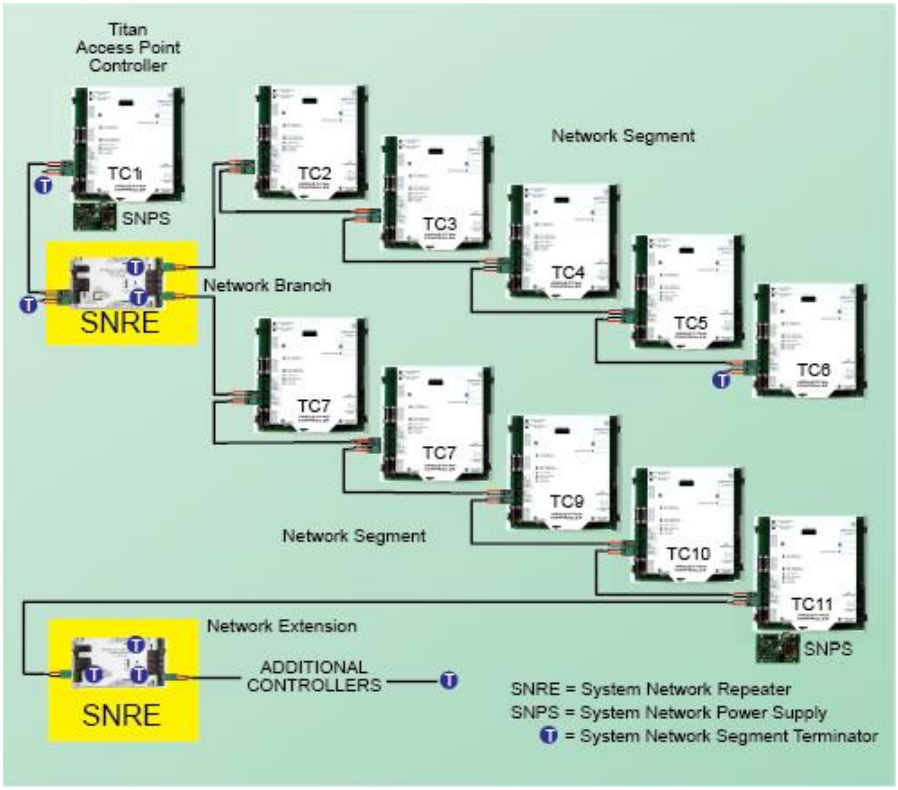
- 3-Port design accommodates free topology network branching for ease of wiring.
- Modules are powered by Network power on Port A. No requirement for supplementary power.
- EMI Choke – reduces interference generated by devices emitting high frequency ‘noise’
- LED status lights - indicate proper wiring and network operation.
- Complete digital re-construction of degraded signals, allowing very long networks with many in-line repeaters with no loss of performance.
- Up to nine repeaters may be connected in series, creating network lengths of many kilometers.
- Network terminator connections for installation at the ends of network segments
- Built to UL 508A electrical standards.
- NEMA/UL rated enclosure, suitable for indoor mounting, providing protection against moisture, dust & dripping liquids

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## Specifications

| | |
|---|---|
| **Enclosure** | Dimensions: 12.75" x 14.25" x 4.5" NEMA4/4X, CSA, CUL3R/4/4X/12 approved. *We recommend following local electrical codes as applicable. Modular quarter-turn latches are included with an option to swap these out for key lock and non-key lock handles. |
| **Power Requirement** | Power for the module is normally provided via the System Network Power Supply on the powered segment that is connected to **Port A**. An alternative local power source (12-30 VDC >100mA) must be supplied if Port A is not used. |
| **Maximum Network Segment Distance** | Limited by $I^2R$ power losses (voltage drop) and signal degradation (up to 1500 meters per segment). |
| **System Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18 gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## Wiring Details




**Typical placement of System Network Repeaters on a Multi-Controller Titan System.**

The illustration shows one repeater used to create a network branch and another used to extend a portion of the network beyond 300 meters. Power for repeaters is supplied by connection of a System Network Power Supply to a controller connected to the 'A' port on the repeater.

Network wiring layouts are custom engineered to accommodate the physical location, the control applications, and the distances spanned. For installation, always refer to the custom wiring diagrams supplied with each system.

## Additional Information

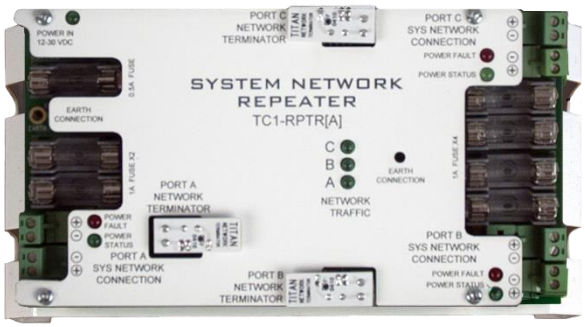
For more information, please contact Argus.

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# System Network Repeater for RCP

The System Network Repeater provides power and signal regeneration for system network communications. It also facilitates network branching and provides isolation for each independently powered segment of the system network. This module consists of a System Network Repeater board on mounting plate and a System Network Power Supply that is to be connected to an adjacent Controller.

## Applications




The System Network Repeater is used to regenerate the digital communications signal on system network wire runs in excess of 300 meters and whenever a branch in the network wiring is required. System Network Repeaters are also used to segregate the System Network into powered segments, with the repeaters in each segment powered by a separate System Network Power Supply. The SNRE also provides power isolation between the powered segments (see the illustration on the next page).

The System Network Repeater Module (part number TC-SNRE/C) is also available, consisting of an SNRE Board, mounted in a white aluminum enclosure and a System Network Power Supply that is to be connected to an adjacent Controller.

## Alternatives

None Available.

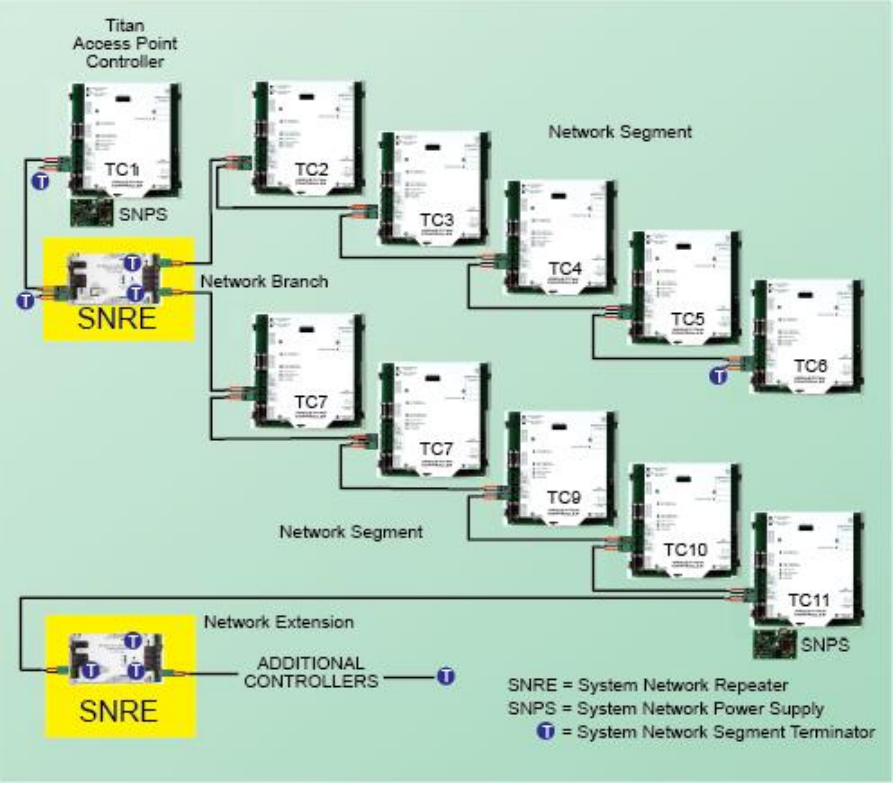
## Features

- 3-Port design accommodates free topology network branching for ease of wiring.
- Modules are powered by Network power on Port A. No requirement for supplementary power.
- EMI Choke – reduces interference generated by devices emitting high frequency ‘noise’
- LED status lights - indicate proper wiring and network operation.
- Complete digital re-construction of degraded signals, allowing very long networks with many in-line repeaters with no loss of performance.
- Up to nine repeaters may be connected in series, creating network lengths of many kilometers.
- Network terminator connections for installation at the ends of network segments
- Built to UL 508A electrical standards.
- NEMA/UL 12 rated enclosure, suitable for indoor mounting, providing protection against moisture, dust & dripping liquids

## Specifications

| | |
|---|---|
| **Enclosure Material and Dimensions** | Aluminum, white powder-coated (12"H x 14"W x 4"D) |
| **Power Requirement** | Power for the module is normally provided via the System Network Power Supply on the powered segment that is connected to **Port A**. An alternative local power source (12-30 VDC >100mA) must be supplied if Port A is not used. |
| **Maximum Network Segment Distance** | Limited by I²R power losses (voltage drop) and signal degradation (up to 1500 meters per segment). |
| **System Network Cable** | Argus part number: CAB- 2C18G/TITAN, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATION |

## Wiring Details




**Typical placement of System Network Repeaters on a Multi-Controller Titan System.**

The illustration shows one repeater used to create a network branch and another used to extend a portion of the network beyond 300 meters. Power for repeaters is supplied by connection of a System Network Power Supply to a controller connected to the 'A' port on the repeater.

Network wiring layouts are custom engineered to accommodate the physical location, the control applications, and the distances spanned. For installation, always refer to the custom wiring diagrams supplied with each system.

## Additional Information

For more information, please contact Argus.

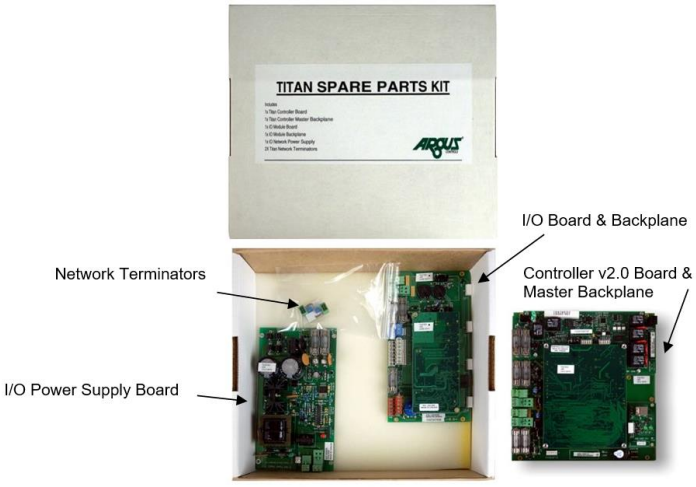
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# Titan Spare Parts Kit (for V2.0)

The standard spare parts kit consists of:

- 1 - Controller v2.0 Board and Controller Master Backplane
- 1 - I/O Board and I/O Backplane
- 1 - I/O Power Supply Board
- 2 - Network Terminators

## Applications




The Titan spare parts kit is used for fast on-site replacement of key Titan system components. These parts can be replenished individually as needed.

## Alternatives

Argus maintains a warehoused stock of replacement components that can be rush shipped as needed. Repair exchange & extra spare parts are also available.

## Additional Information

For individual component specifications please refer to the data sheets for the following modules:

**TC-AP-2.0/C** - Access Point Module

**TC-IO-1.21/RCP** - I/O Module

**TC-IOPS-1.3/RCP** - I/O Power Supply Module

For more information, please contact Argus.

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# Titan Weather Station

*The Weather Station integrates temperature, light, wind speed, wind direction, and rain/snow sensing in a single compact design. The weather station assembly includes the outdoor sensor mast, as well as a **Network Fused Lightning Protection (NFLP)** module, and a **Network Lightning Protection (NLP)** module. These devices provide enhanced lightning protection and accommodate connection to the Titan I/O Device network.*

## Applications



The weather station is used in situations where accurate weather information is required to coordinate automated control applications such as heating, ventilation, and crop irrigation.

High quality internal components and powder-coated external components ensure long life and minimal service requirements. The weather station features heated rain detection circuitry to melt snow and frost and evaporate dew for increased rain detection accuracy.

## Alternatives

The weather station is compatible with Argus Titan control systems only. For special situations, other types of weather instruments can be used in addition to, or in place of the Argus Weather Station.

## Features

- The weather station features the following weather sensors selected for quality, reliability, and accuracy: Light (Pyranometer), air temperature, wind speed, wind direction, rain/snow detection.
- For maximum lightning protection, the weather station connects to the Titan I/O network via a supplied **Network Lightning Protection Module** (NLP) mounted on the outside of the building which is in turn connected to a **Network Fused Lightning Protection** (NFLP) module mounted just inside the building (see the example wiring diagram on page 4 of this document).
- All power and communications are supplied using a 2-wire connection (see Network Cable on page 3).
- All sensors are internally pre-wired and ready to operate. They are mounted in a non-aspirated, highly reflective, white powder-coated aluminum housing to minimize heating from direct sunlight. Internal interface electronics are isolated in a weather-tight enclosure to keep the electronic components clean, dry, and free of contaminants.
- Sensor wires are terminated inside the housing for quick replacement and servicing. Field wiring is run through the inside of the mast for protection from the elements. Since the only moving parts are the wind speed cups and weather vane, little ongoing maintenance is required other than occasional cleaning of the light and rain sensors.

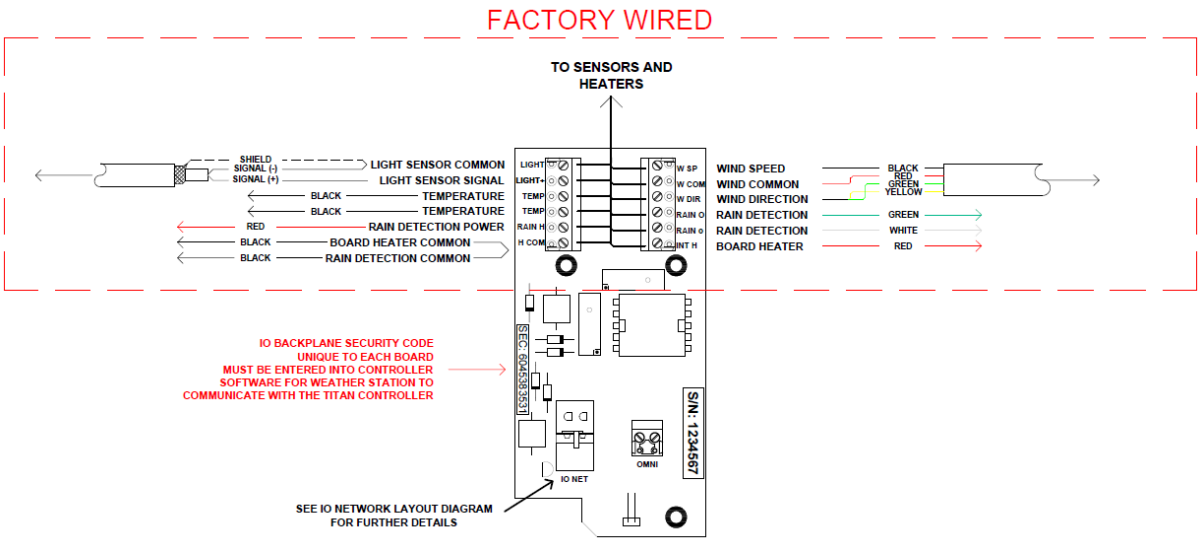
** Optional outdoor humidity, rain accumulation, and other meteorological sensors can be connected to the Argus Titan control system.*

# *S p e c i f i c a t i o n s*

| | |
|---|---|
| **Mast Mount** | **Dimensions**: 6" length x 1.35" diameter.<br>**Construction**: threaded 1" NPT, Schedule 40 aluminum. A 4 x 4" mounting flange connects the mounting mast to the base of the enclosure. A 1" NPT reinforced dielectric coupler is supplied for connecting to a male end pipe mast. |
| **Enclosure** | **Material:** UL/CSA Type 3R outdoor-rated, corrosion resistant aluminum, white powered-coated with a quarter turn latched weather-sealed door.<br>**Enclosure Dimensions:** 9" Tall x 4" Wide x 4.5" Deep |
| **Apogee Pyranometer** | **Type:** Silicon-cell<br>**Sensor Housing:** Anodized Aluminum Housing<br>**Size**: (diameter x height) 0.95" x 1.1" (2.40 cm x 2.75 cm)<br>**Weight**: 3.17 oz. (90g)<br>**Radiometric Range**: 360 to 1120 nm<br>**Calibration**: Factory-calibrated<br>**Error**: Typically ± 5%<br>**Sensitivity**: Typically 0.20 mV per W $m^{-2}$<br>**Linearity**: < 1% (up to 1750 W $m^{-2}$)<br>**Stability**: < + 2% change over a 1-year period<br>**Response Time**: < 1 ms<br>**Temperature Dependence**: -0.04 ± 0.04% per ºC (maximum)<br>**Cosine Correction**: ± 5% at 75º zenith angle<br>**Field of View:** 180º<br>**Operating Temperature**: -40ºC to 70ºC<br>**Relative Humidity**: 0 to 100%<br>**Mount**: Supplied with an AL-100 mount |
| **Rain Detection** | **Sensor materials:** Gold-plated nickel over copper with a silk-screened, white, weather resistant paint mask on the exposed PCB surface<br>**Housing:** ASA plastic, IP65 UV-resistant enclosure<br>**Mounting Bracket:** Powder coated aluminum<br>For additional information please refer to the Argus data sheet for part number **SEN-RGRD-X.X/WS** |
| **Anemometer** | **Construction:** black anodized aluminum mounting arm<br><br>**Wind Direction:**<br>**Construction**: UV resistant ABS plastic<br>**Range**: 0 to 360º<br>**Accuracy**: ± 7º<br>**Resolution**: 1º (0º to 355º), 22.5º between compass points<br><br>**Wind Speed:**<br>**Type**: cup<br>**Construction**: polycarbonate<br>**Range**: 2 to 175 mph<br>**Accuracy**: ± 5%<br>**Resolution**: 1 mph |
| **Argus TN Temperature Sensor** | **Thermistor Type**: NTC (negative temperature coefficient)<br>**Resistance**: 3000 Ohms @ 25°C Fenwal Unicurve (UUA Series)<br>**Sensor Accuracy**: ± 0.2°C (0°C to 70°C range)<br>± 0.5°C (-50°C to 150°C)<br>**Range**: - 50°C to 150°C<br>**Thermistor Housing**: 0.575" x 0.157" (length x diameter) of 304 stainless steel |

# *S p e c i f i c a t i o n s C o n t i n u e d*

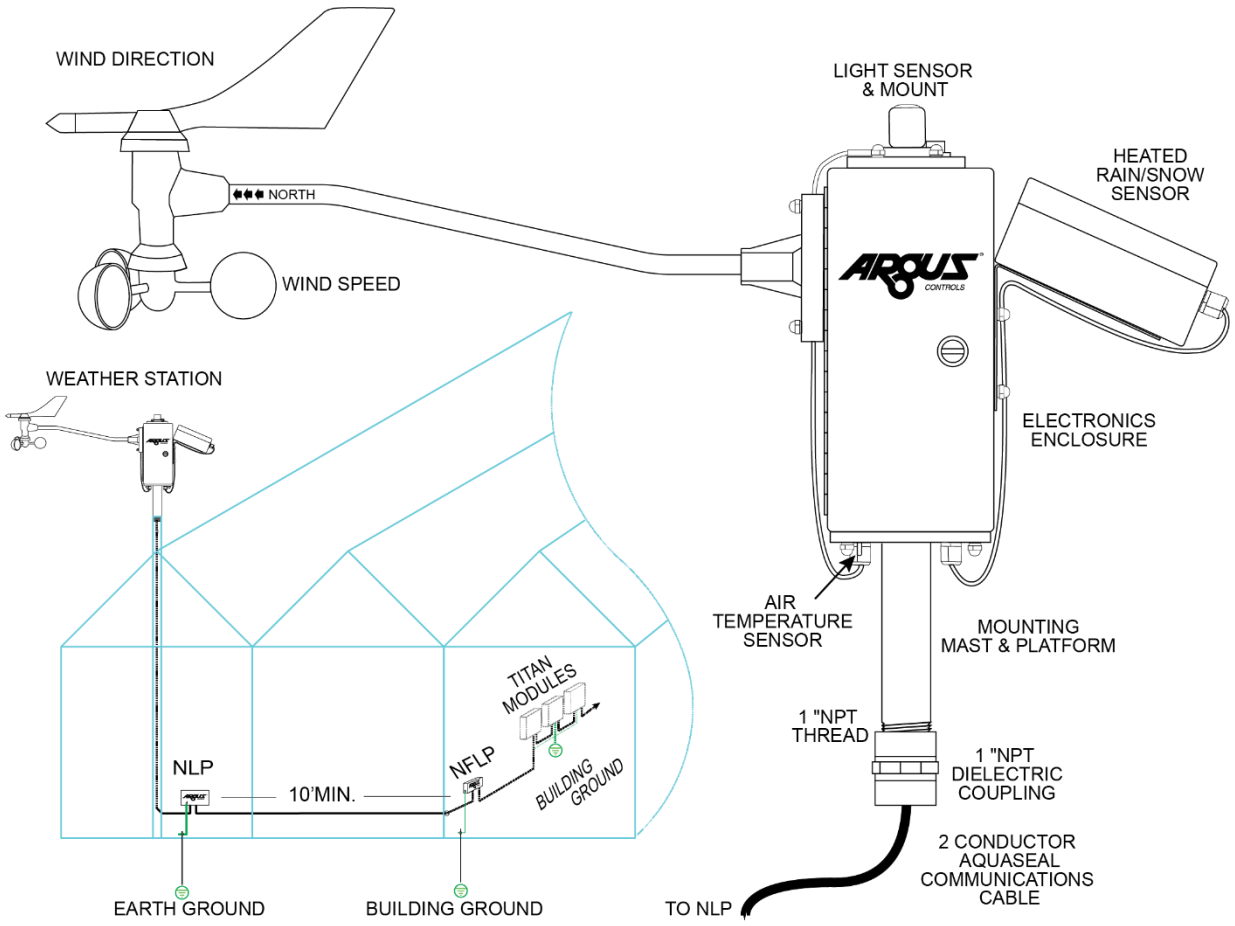
| | |
|---|---|
| **Lightning Protection** | A **Network Lightning Protection Module** (**TC-NFLP-X.X/C**) and a **Network Fused Lightning Protection Module** (**TC-NLP-X.X/C**) are included with the weather station. For more information, refer to the product data sheets for these devices. |
| Network Cable | Supplied with a 50' cable: Argus part number: **CAB- 2C18G/TITAN**, West Penn Wire - Aquaseal AQ224, 2-conductor, 18-gauge cable, suitable for outdoor use (direct burial), indoor trays, moisture & UV resistant. **NO SUBSTITUTIONS – USE OF THIS EXACT WIRE IS CRITICAL FOR PROPER NETWORK COMMUNICATIONS** |
| Electronics | The enclosure houses a **Titan I/O Module** mounted on a Titan Weather Station backplane. All sensors are pre-connected. Power is provided using the I/O network cable. |




For maximum lightning protection the WS3 connects to the Titan I/O network via the supplied Network Lightning Protection Module (NLP) mounted on the outside of the building which is in turn connected to a Network Fused Lightning Protection (NFLP) module mounted just inside the building.

# *Wiring Details*

**Typical Installation Example**




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

# *Additional Information*

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Network Fused Lightning Protection Module

The NFLP provides safety isolation protection from large lightning and power surges on Titan communications networks installed in the 'outdoor' zone (exposed to high lightning risk).

## Applications




A separate NFLP module is installed at each end of exposed Argus Titan network sections. In the event of excessive lightning energy coupling into the exposed network section, the fuses on the NFLP are designed to blow, isolating the rest of the network from the surge and safely discharging the lightning energy to ground.

The NFLP works in conjunction with the standard Argus **NLP** (Network Lightning Protection) module in situations where very high energy lightning events are expected. Please refer to the Argus Data sheet: TC-NFLP-1.0_C for more information.

Separate NFLP and NLP modules are included with all Titan Weather Stations.

## Alternatives

Argus Titan network couplers and repeaters provide the same fused safety isolation when mounted at the boundary between indoor and outdoor (exposed) network segments. They are more expensive and should only be used if they are already supplied for network extension. Note: third party protection systems cannot be used with Titan networks.

## Features

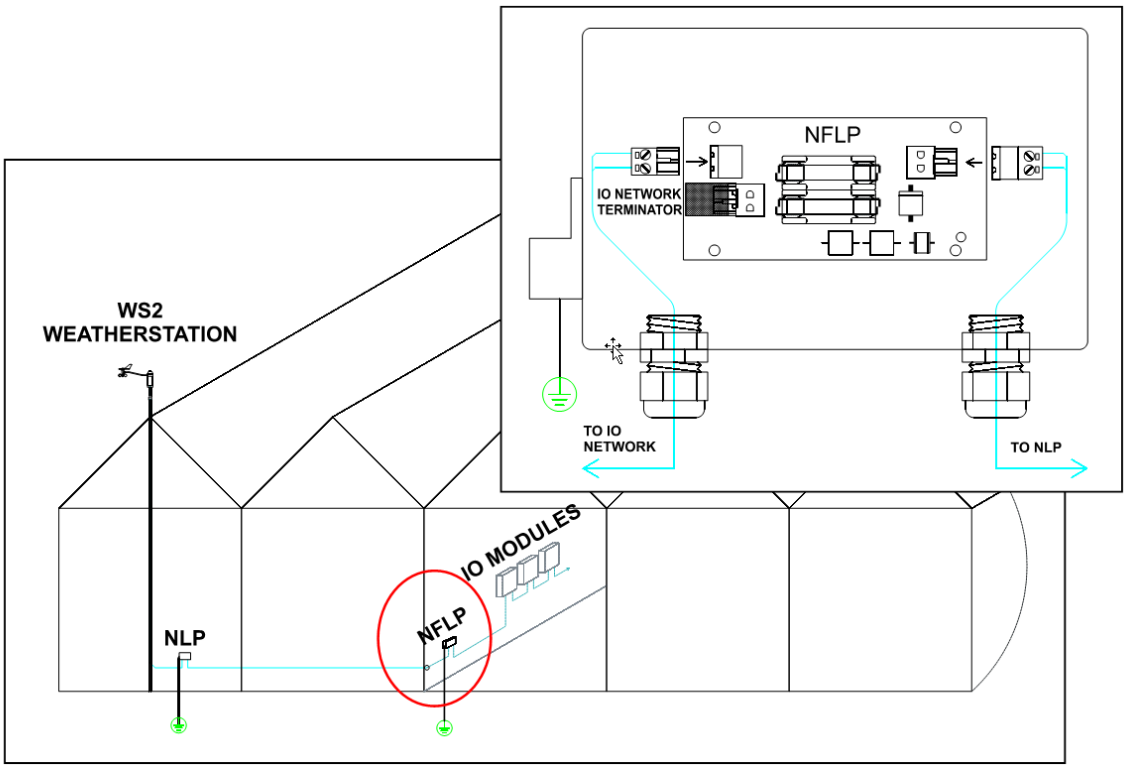
- Water resistance aluminum enclosure.
- Replaceable fuses.
- Spare fuses and grounding wire are included.

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# Specifications

| | |
|---|---|
| **Enclosure Dimensions** | 7” x 4.5” x 1.2” (L x W x D) |
| **Fuse Capacity** | 1 amp fast blow |
| **Ground Wire** | 10 AWG TEW copper stranded wire - 2M length connected to an external grounding lug. Trim the wire as short as possible to the grounding point. |

# Wiring Details




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

# Additional Information

For more information, please contact Argus.

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# Network Lightning Protection

*The NLP provides direct protection from lightning and power surges on Titan communications networks. This product* ***supplements*** *the built-in fused protection at each Argus Titan module, reducing the chance of blown fuses during moderate lightning events.*

## Applications




The NLP (Network Lightning Protection) module provides additional protection from substantial lightning surges while allowing power & communication signals to pass under normal conditions. It is typically installed on the I/O communications network between the highly exposed weather station (TC-WS2) and the **NFLP** (Network Fused Lightning Protection) module used to protect the rest of the I/O hardware on the network (refer to the Argus Data Sheet **TC-NFLP-1.0/C** for additional details).

In high lightning areas, the NLP is also used on long communications cables that run outside the greenhouse structure. It is normally mounted on the exterior of the greenhouse using the shortest wiring lengths possible between the NLP and a direct earth connection.

Separate NLP and NFLP modules are included with all Titan Weather Stations.

## Alternatives

An NLP is always supplied with Argus weather stations. Other Titan network applications are optional. Short networks with low exposure do not need this additional protection. Note: Third party lightning protection systems are not compatible with Titan networks and cannot be used.

## Features

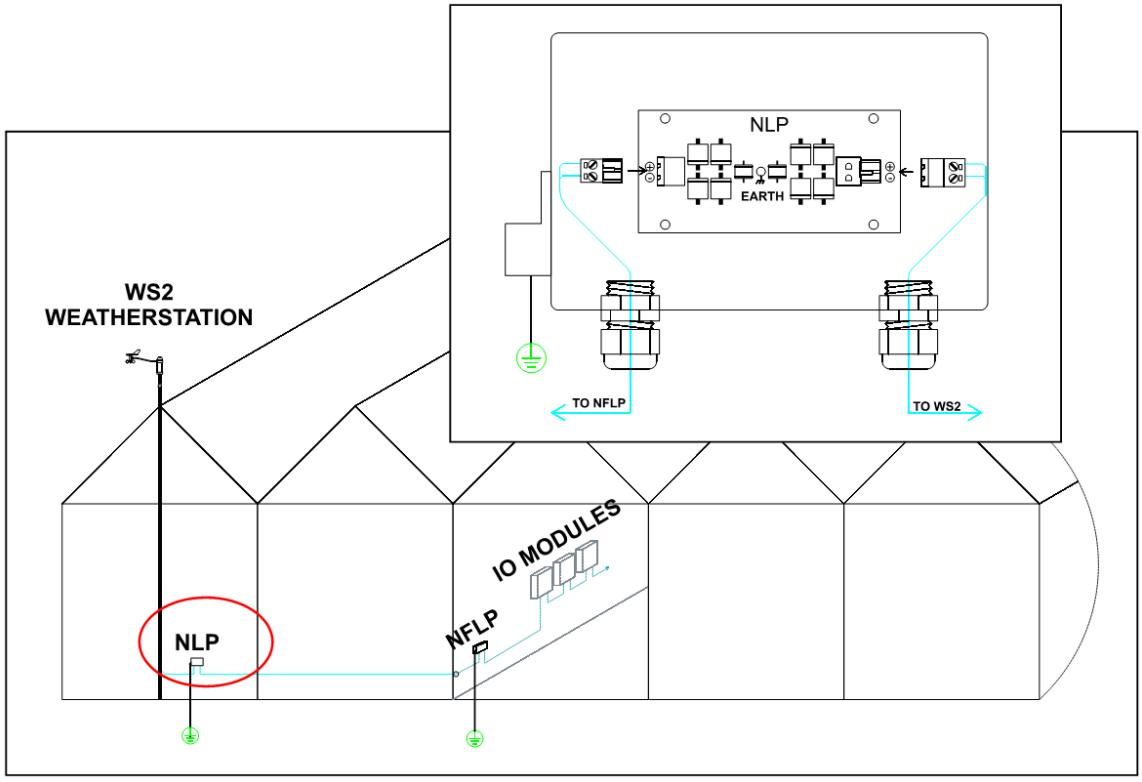
- Watertight aluminum enclosure.
- Grounding cable is included (path to ground should be as short as possible.
- Diode and gas discharge tube circuitry withstands substantial nearby lightning events. Protection capacity approaches the maximum capacity of an 18 gauge cable. Please note that, as with all electrical circuitry and wiring, this unit may be damaged beyond repair by a direct lightning strike.

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## Specifications

| | |
|---|---|
| **Dimensions** | 7” x 4.5” x 1.2” (L x W x T) |
| **Enclosure** | White powder coated aluminum |
| **Discharge Capacity** | ~12,000 Amps (8/20 microsecond pulse) |
| **Ground Wire** | 10AWG TEW copper stranded wire - 2M length connected to an external grounding lug. Trim the wire as short as possible to the grounding point. A separate ground rod is recommended. |

## Wiring Details




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

## Additional Information

For more information, please contact Argus.

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# D1S 2-Speed Output Relay Board

The Argus **D1S Output Relay Module** uses two **Form A** (normally Open) relays for digital control of a single two-speed device connected to a **Titan IO Module**.

## Applications




The Argus D1S Output Relay Module provides separate interlocked HIGH and LOW signals for control of a two-speed fan. It provides dry contact switching only, or Class 2 low voltage signals through an external power supply (see the wiring diagrams on the next page).

## Alternatives

Argus provides a full range of output relay modules for controlling analog and digital equipment including Form A and Form C switching, tri-State floating, and analog current, voltage, and frequency output. Contact Argus for further details.

## Features

- **Safe –** Low voltage control circuits pose no shock hazard.
- **Status Indicators –** LEDs indicate controller signal status.
- **Manual Override Capability –** Built-in manual overrides for testing or emergency operation.
- **Easy to Install** – Simple plug-in connection to IO Module and secured by a single screw.
- **Built-In Board Protection –** Varistors across the output contacts reduce arcing, thereby extending contact life.
- **Equipment Protection –** Relays are electrically interlocked to prevent activation of both high and low contacts at the same time.

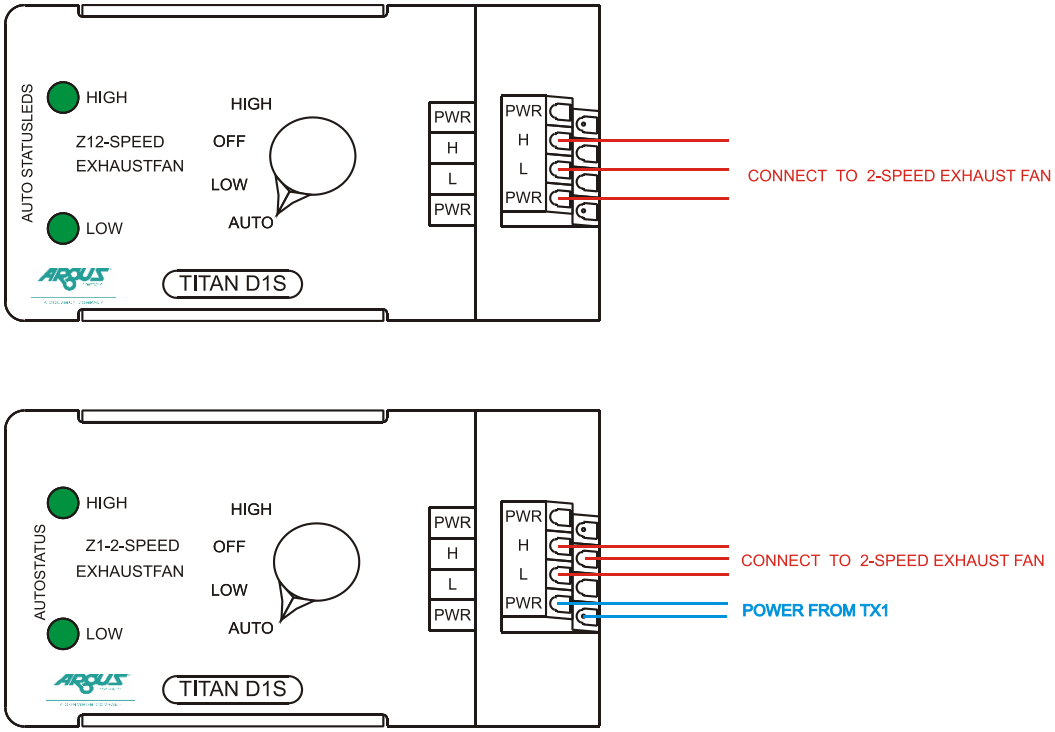
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## Specifications

| | |
|---|---|
| **Dimensions** | 4" x 2" x 1 ½" (length x width x height) |
| **Ampere Rating** | 3.2 amps @ 24V or 5 amps at 12V (AC or DC) (Class 2) |
| **Devices controlled** | 2-speed devices compatible with High/Low signals |
| **Isolation** | 5000 volts between field wiring and central computer |
| **Line voltage loads** | Use external relays or contactors with 24V coils |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

## Wiring Details

Customer must provide an independent control power supply, sized and fused for the applicable loads (within Class 2 electrical ratings).




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

## Additional Information

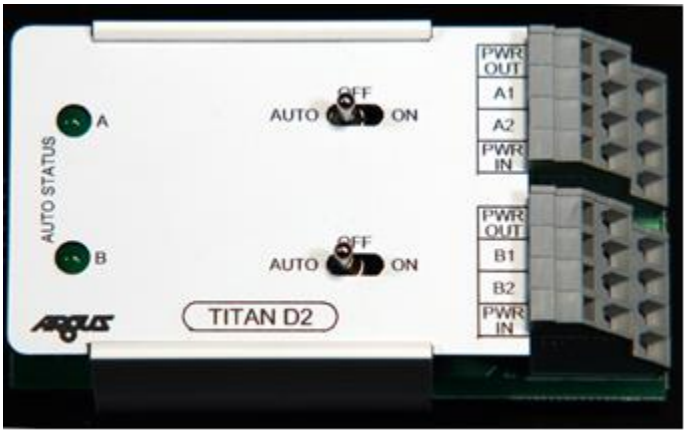
For more information, please contact Argus.

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# Titan D2 Form A Output Digital Relay Board

The Titan D2 Output Relay Module uses two Form A (normally open) relays for digital control of 2 output devices connected to a Titan I/O module.

## Applications




The D2 can control up to 2 ON/OFF digital devices.

Examples include: single speed fan motors, pumps, and solenoid valves. It provides Class 2 low voltage, or dry contact switching for relay coils or actuators.

There is independent power on each output for isolation purposes.

## Alternatives

The **Titan D4** digital relay board provides 4 on/off outputs on a common bus, with on-board manual override switches. The **Titan D8** digital relay board provides 8 on/off outputs on a common bus, but without manual override switches. For other applications, Argus provides a full range of relay boards for modulating and digital equipment control. Contact Argus for details.

## Features

- **Manual Override Capability –** Used for field testing or emergency operation.
- **Bussed Power Distribution –** Minimizes wiring time and costs.
- **Safe –** Low voltage control circuits reduce electrical shock hazards.
- **Status Indicator LEDs –** Indicate control signal status for each output.
- **Built-In Board Protection –** Varistors across output contacts reduce arcing, thereby extending contact life.
- **Easy to Install –** Simple plug-in connection to I/O Module and secured by single screw.

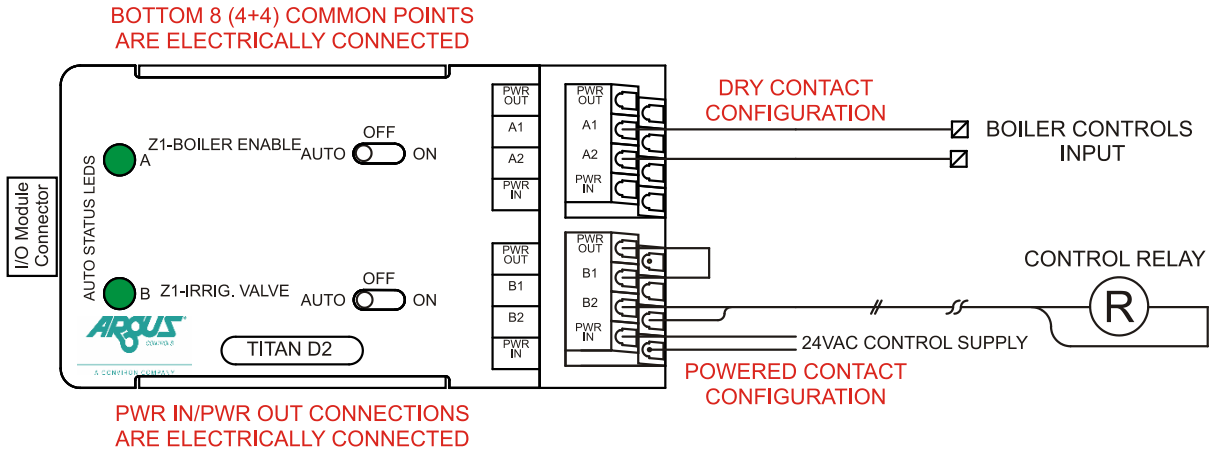
**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

## Specifications

| | |
|---|---|
| **Dimensions** | 4" x 2" x 1 ½" (length x width x height) |
| **Power Consumption** | 1.0W @ 24VDC (supplied via Titan I/O module connection) |
| **Ampere Rating** | 3.2 amps @ 24V or 5 amps @ 12V (AC or DC) (Class 2) |
| **Isolation** | 5000 volts between field wiring and central computer |
| **Line Voltage Loads** | use external relays or contactors with 24V coils |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

Customer must provide an independent control power supply, sized and fused for the applicable loads (within Class 2 electrical ratings).

## Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

## Additional Information

For more information, please contact Argus.

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# Form C Digital Output Relay Board

The Argus Titan **TTN-D2C-1.0/C** Output Relay Board connects to a **Titan I/O Module** providing two Form C relays for digital control of two independent output devices.

## Applications




The **TTN-D2C-1.0/C** Output Relay board can control up to 2 digital devices.

Example applications include powered open/close valve actuators, as well as normally open and normally closed circuits.

Contacts are dry with provision for external Class II power input for switching and delivery to the load(s).

## Alternatives

Use the **TTN-D2-1.0/C** for 'Form A' normally open contact applications and to operate external 'Form C' relays in situations where full isolation is required or the application requires larger loads than the TTN-D2C ratings. Argus provides a full range of output relay boards for digital and analog equipment control. Contact Argus for details.

## Features

- **Dual Relays –** Two independent relays per module.
- **Safe –** Low voltage control circuits pose no shock hazard.
- **Status Indicators –** LEDs indicate controller signal status.
- **Manual Overrides –** Built-in manual overrides for testing or emergency operation.
- **Built-In Board Protection –** Varistors across output contacts reduce arcing, thereby extending contact life.
- **Easy to Install** – Simple plug-in connection to I/O modules and secured by a single screw.

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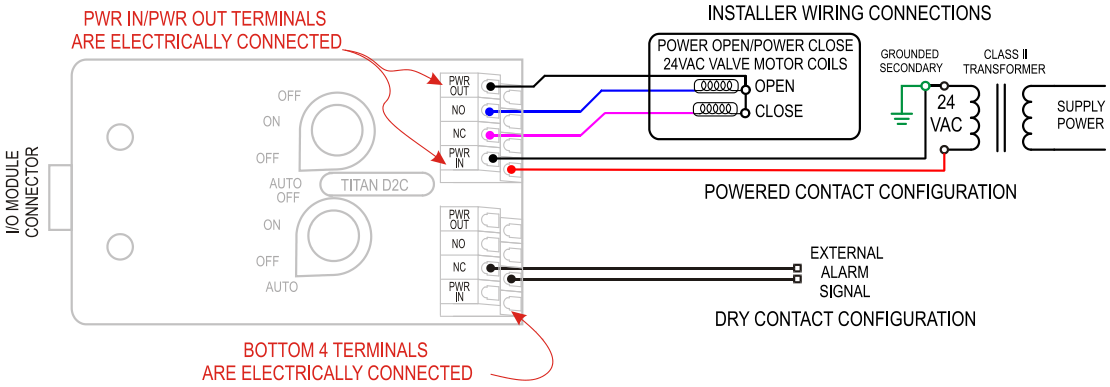
## Specifications

| | |
|---|---|
| **Dimensions** | 3" x 2" x 1.5 " (length x width x height) |
| **Maximum Contact Rating** | 3 amps @ 24V (AC or DC) (Class II) |
| **Power Supply** | Power for board operation is supplied by the connected Titan I/O Module. Power for field loads must be provided externally* |
| **Devices Controlled** | up to 2 independent devices |
| **Isolation** | 5000 volts between field wiring and central computer |
| **Terminal Blocks** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

**Output Relay Board has **dry contacts only**. For powered contact configurations, an independent control power supply (such as the Argus RM-2TX75) must be provided, sized and fused for the applicable loads.*

CONTACTS ARE NOT RATED FOR LINE VOLTAGE LOADS. USE EXTERNAL RELAYS OR CONTACTORS WITH 24V COILS

## Wiring Details




Typical wiring example. For installation, refer to the wiring diagrams, examples, and instructions supplied with each part.

## Additional Information

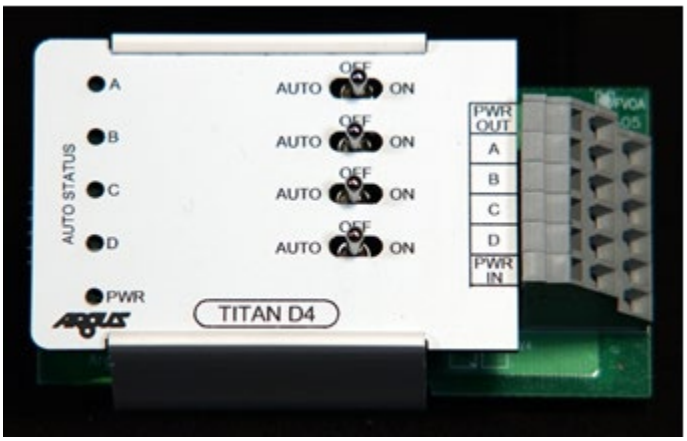
For more information, please contact Argus.

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# Titan D4 Output Digital Relay Board

The Titan D4 uses four, Form-A (normally open) relays for digital control of 4 independent devices. All four devices share a common control power source.

## Applications




The D4 is intended for Class II low voltage electrical loads such as 24 VAC relays or solenoid valves that share a common power source. Typical uses include irrigation valves and other low voltage On/Off applications.

This module cannot be used for dry contact applications since the outputs share the same common power buss (see the wiring diagram).

## Alternatives

The **Titan D2** digital relay board provides isolated control for two on/off devices. Each can be powered from a separate power supply. Dry contact use is also possible. The **Titan D8** digital relay board provides 8 on/off outputs on a common power buss, but without manual override switches. For other applications, Argus provides a full range of relay boards for modulating and digital equipment control. Contact Argus for details.

## Features

- **Manual Override Capability -** Used for field testing or emergency operation.
- **Microprocessor Based Output Control –** Provides the ability to use high-frequency output pulsing for power savings
- **Safe –** Low voltage control circuits reduce electrical shock hazards.
- **Status Indicator LEDs –** Indicate control signal status for each output.
- **Built-In Board Protection –** Varistors across output contacts reduce arcing, thereby extending contact life.
- **Easy to Install –** Simple plug-in connection to I/O Module and secured by single screw.
- **Economical –** Up to 32 outputs can be controlled by a single Titan I/O Module.

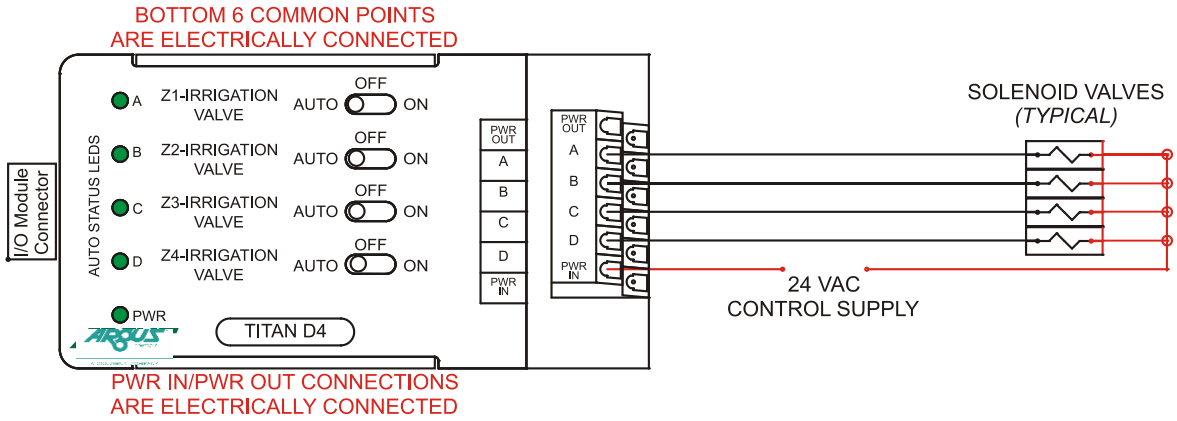
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# Specifications

| | |
|---|---|
| **Dimensions** | 4" x 2" x 1 ½" (length x width x height) |
| **Power Consumption** | 1.2W @ 24VDC (supplied via Titan I/O module connection) |
| **Ampere Rating** | 3A Max @ 24V AC or DC |
| **Isolation** | 5000 volts between field wiring and central computer |
| **Line Voltage Loads** | use external relays or contactors with 24V coils |
| **Power Light Operation** | • 0.5s on, 0.5s off: normal operation with good messaging<br>• 0.5s on, 3.5s off: powered on but not assigned as a D8 or no message from I/O Module.<br>• All other states indicate a failure |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

Customer must provide an independent control power supply, sized and fused for the applicable loads (within Class 2 electrical ratings).

# Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

# Additional Information

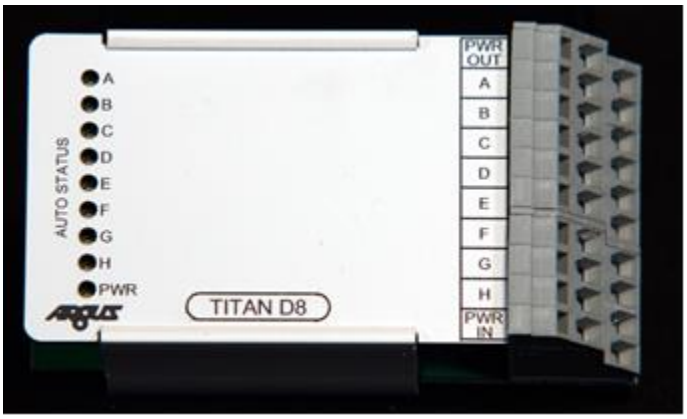
For more information, please contact Argus.

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# Titan D8 Output Digital Relay Module

The Titan D8 uses eight, Form-A (normally open) relays for digital control of 8 independent devices. All eight devices share a common control power source.

## Applications




The D8 is intended for Class II low voltage electrical loads such as 24 VAC relays or solenoid valves that share a common power source.

Typical uses include irrigation valves and other simple On/Off low voltage applications.

This module cannot be used for dry contact applications since the outputs share a common power buss (see the wiring diagram).

## Alternatives

The **Titan D2** digital relay board provides isolated control for two on/off devices. Each can be powered from a separate power supply. Dry contact use is also possible. The **Titan D4** digital relay board provides 4 on/off outputs, with on-board manual override switches. For other applications, Argus provides a full range of relay boards for modulating and digital equipment control. Contact Argus for details.

## Features

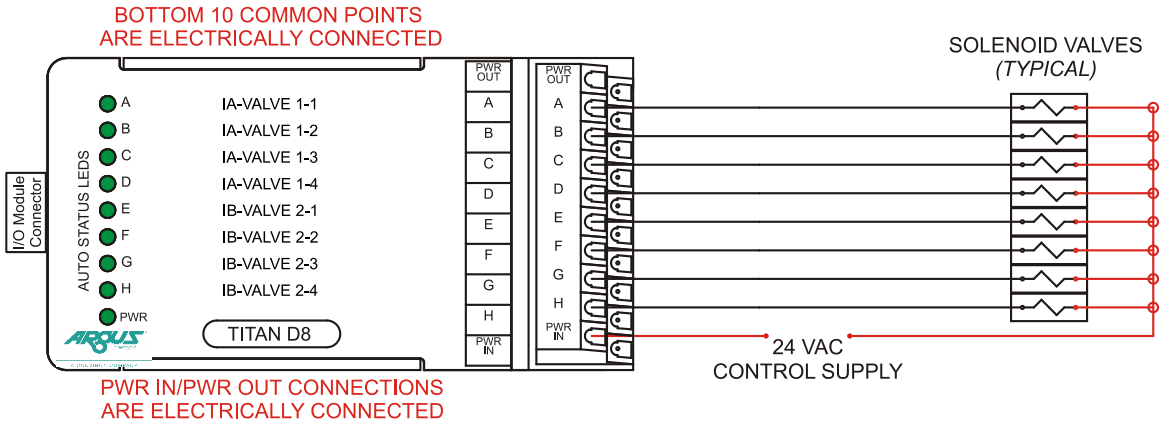
- **Manual Override Capability -** No manual overrides are available on this output card.
- **Microprocessor Based Output Control –** Provides the ability to use high-frequency output pulsing for power savings
- **Safe –** Low voltage control circuits reduce electrical shock hazards.
- **Status Indicator LEDs –** Indicate control signal status for each output.
- **Built-In Board Protection –** Varistors across output contacts reduce arcing, thereby extending contact life.
- **Easy to Install –** Simple plug-in connection to I/O Module and secured by single screw.
- **Economical –** Up to 32 outputs can be controlled by a single Titan I/O Module.

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## Specifications

| | |
|---|---|
| **Dimensions** | 4" x 2" x 1½" (length x width x height) |
| **Power Consumption** | 2.5W @ 24VDC (supplied via Titan I/O module connection) |
| **Ampere Rating** | 3A Max @ 24V AC or DC |
| **Isolation** | 5000 volts between field wiring and central computer |
| **Line Voltage Loads** | Use external relays or contactors with 24V coils |
| **Power Light Operation** | • 0.5s on, 0.5s off: normal operation with good messaging<br>• 0.5s on, 3.5s off: powered on but not assigned as a D8 or no message from I/O Module.<br>• All other states indicate a failure |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

## Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

## Additional Information

For more information, please contact Argus.

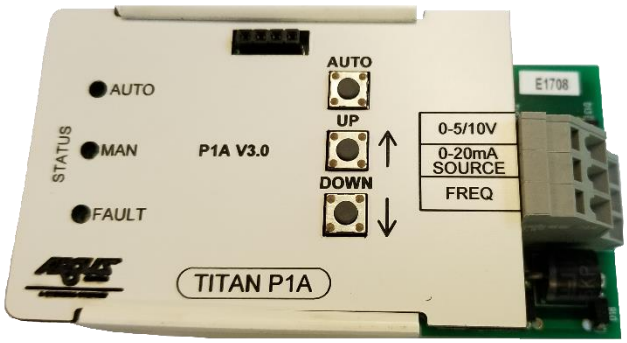
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# P1A Proportional Output Module

*The P1A Proportional Output module produces a single proportional output signal that is selectable between:*

- *Current*
- *Voltage*
- *Frequency*
- *PWM (pulse-width-modulation)*

## Applications




The P1A can be used to provide high-resolution modulating control for a wide variety of equipment including variable speed pumps and fans, as well as analog current controlled valves and damper actuators.

Up to four P1A modules can be operated from a single Titan I/O module. The style of output is configured through the Titan System software and the selection of output terminals used to connect the field wiring.

## Alternatives

Argus provides a range of relay boards for modulating and digital equipment control. Contact Argus for details.

## Features

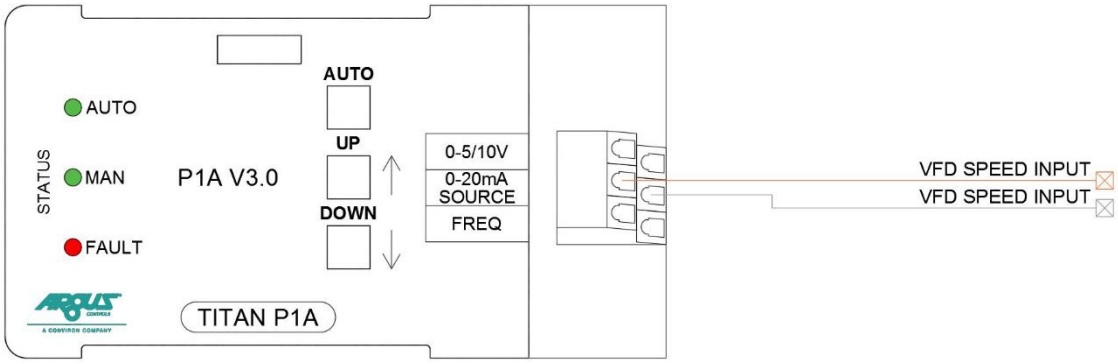
- **Automatic Button -** Switches the P1A to Automatic operation and uses the value sent from the Titan Controller through the I/O Module to generate the output signal.
- **Automatic LED -** Blinks when the P1A module is being controlled by the Titan control system.
- **Up/Down Buttons -** Switches to manual operation. Desired amount can be increased or decreased in by depressing the buttons: < 0.5 seconds (=1%) or > 0.5 seconds (=10%) increments.
- **Manual LED -** If manual control is locked out by settings in the Titan Controller, the Manual LED will flash rapidly 6 times whenever the Up or Down buttons are pressed.
- **Output Fault Detection LED -** The P1A module performs an independent measurement of the generated output signal to verify proper operation. The red colored Output Fault LED blinks when there are problems with the setup or operation of the P1A module.

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## Specifications

| | |
|---|---|
| **Dimensions** | 4”X2”X1.5” (Length x Width x Height) |
| **Current Mode** | The current output produces values from 0 to 20mA with 12-bit (1 part in 4096, which is approximately 5uA) resolution. Typically, the output start will be set to 4mA to produce the industry standard 4 to 20mA range.<br>Output terminals are provided to allow sourcing of the current. When sourcing current, the P1A provides internally 24 Volts of isolated DC power to the current loop. |
| **Voltage Outputs** | 0 - 5V: 12-bit resolution: 1.22mV; 6mA current output<br>0 - 10V: 12-bit resolution: 2.44mV; 10mA current (source) output; 20mA current (sink for controlling IEC standard dimmable lamp ballasts and LED lamp drivers) output.<br>Caution: *Applying external voltages to these outputs may permanently blow the 500mA fuse.* |
| **Frequency** | The Frequency Output generates a 50% duty cycle signal using one of four selectable ranges: (0 to 65535 Hz), (0.0 to 6553.5Hz), (0.00 to 655.35Hz), (0.000 to 65.535Hz) |
| **PWM** | Pulse Voltage: Shorted: 0 VDC; Open: 5 VDC The Pulse Width Modulation Output generates pulses to 0.001 second resolution using modulation periods from 0.01 to 655.35 Seconds with 0.01 second resolution.<br>There are two polarities of PWM; positive and negative. When positive is selected for 25% PWM, the output will be active (shorted) for 25% of the modulation period and inactive (open) for the remaining 75%. When negative is selected the output will be inactive (open) for 25% of the modulation period and active (shorted) for the remaining 75%. |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

## Wiring Details




Typical Wiring Example
For installation, refer to the custom wiring diagrams supplied with each part.

## Additional Information

For more information, please contact Argus.

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# P1T Tri-State Floating Output Relay Board

The Titan P1T Output Relay Board connects to a Titan I/O module. It uses two Form A (normally open) relays for tri-state floating control of a single device such as a reversing motor.

## Applications




The Argus P1T Output Relay Module controls a tri-state (OPEN/CLOSE/OFF) device; for example, opening and closing of a modulating valve or a roof vent motor. It provides Class 2 low voltage and dry-contact switching only.

## Alternatives

For other applications, Argus provides a full range of relay boards for modulating and digital equipment control. Contact Argus for details.

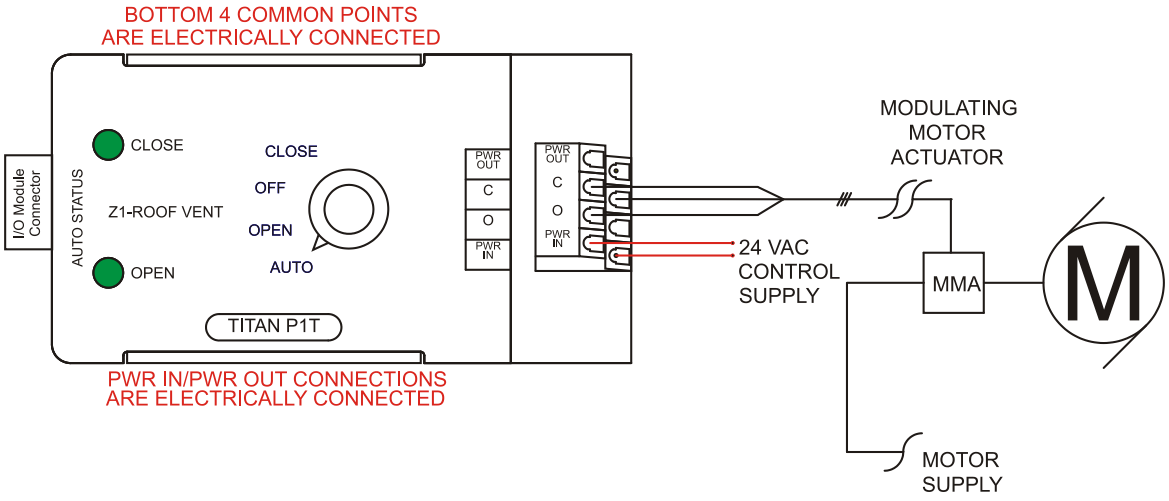
## Features

- **Manual Override Capability -** Used for field testing or emergency operation.
- **Safe –** Low voltage control circuits reduce electrical shock hazards.
- **Status Indicator LEDs –** Indicate control signal status for each output.
- **Built-In Board Protection –** Varistors across output contacts reduce arcing, thereby extending contact life.
- **Easy to Install –** Simple plug-in connection to the I/O Module and secured by a single screw.

## Specifications

| | |
|---|---|
| **Dimensions** | 4" x 2" x 1.5" (length x width x height) |
| **Power Consumption** | 0.5W @ 24VDC (supplied using Titan I/O Module connection) |
| **Ampere Rating** | 3.2A @ 24V and 5A @ 12V) |
| **Isolation** | 5000 volts between field wiring control system components |
| **Line Voltage Loads** | use external relays or contactors with 24V coils |
| **Terminal Block** | Double-deck PCB terminal block; 2.5 mm²; CAGE CLAMP® |
| **Wiring** | Fine-stranded conductor 0.08 … 2.5 mm² / 28 … 12 AWG |

## Wiring Details




Typical Wiring Configuration
For installation, refer to the custom wiring diagrams supplied with each part.

## Additional Information

For more information, please contact Argus.

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# Load Cell Modbus Interface

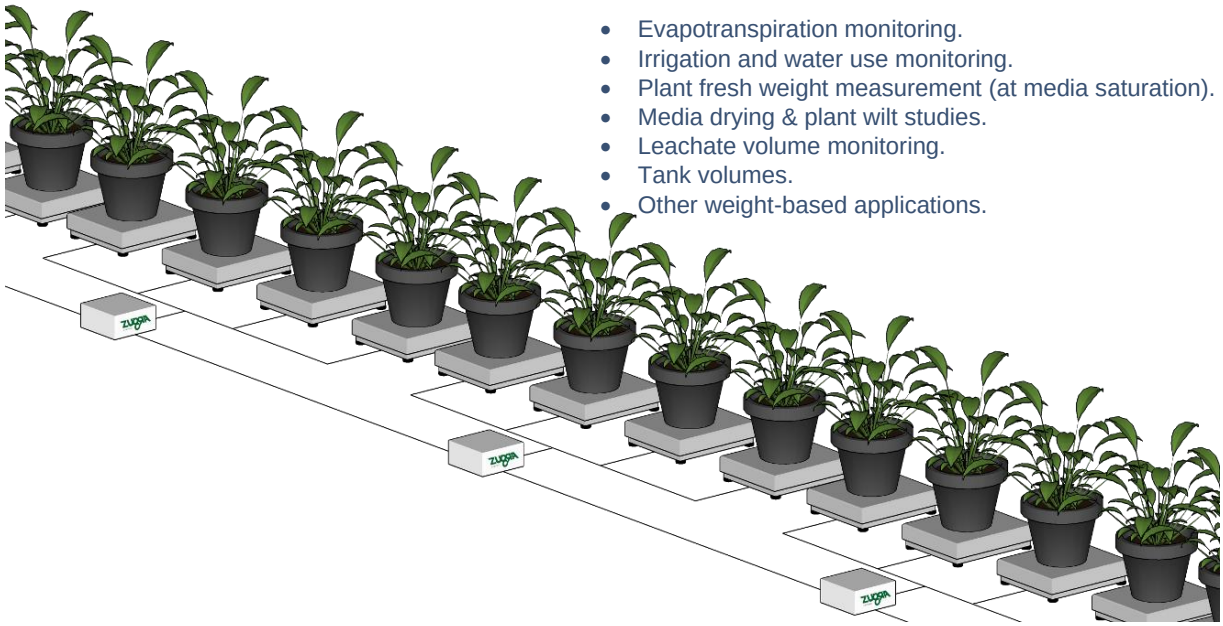
The Argus Load Cell Modbus Interface is a Modbus RS-485 RTU product for connecting load cell measurement arrays to Argus Titan systems.

## Applications

The Argus load cell interface system is designed for measuring, monitoring, and recording the data from load cells and weigh scales. Each interface module can connect up to four load cells or scales. Arrays of up to 16 load cell modules are supported on each Titan controller, connecting up to 64 discrete scales or load cells. Larger numbers of scales can be accommodated by using additional controllers. The typical time between samples is 5 seconds.

Typical applications include:

- Evapotranspiration monitoring.
- Irrigation and water use monitoring.
- Plant fresh weight measurement (at media saturation).
- Media drying & plant wilt studies.
- Leachate volume monitoring.
- Tank volumes.
- Other weight-based applications.



## Features

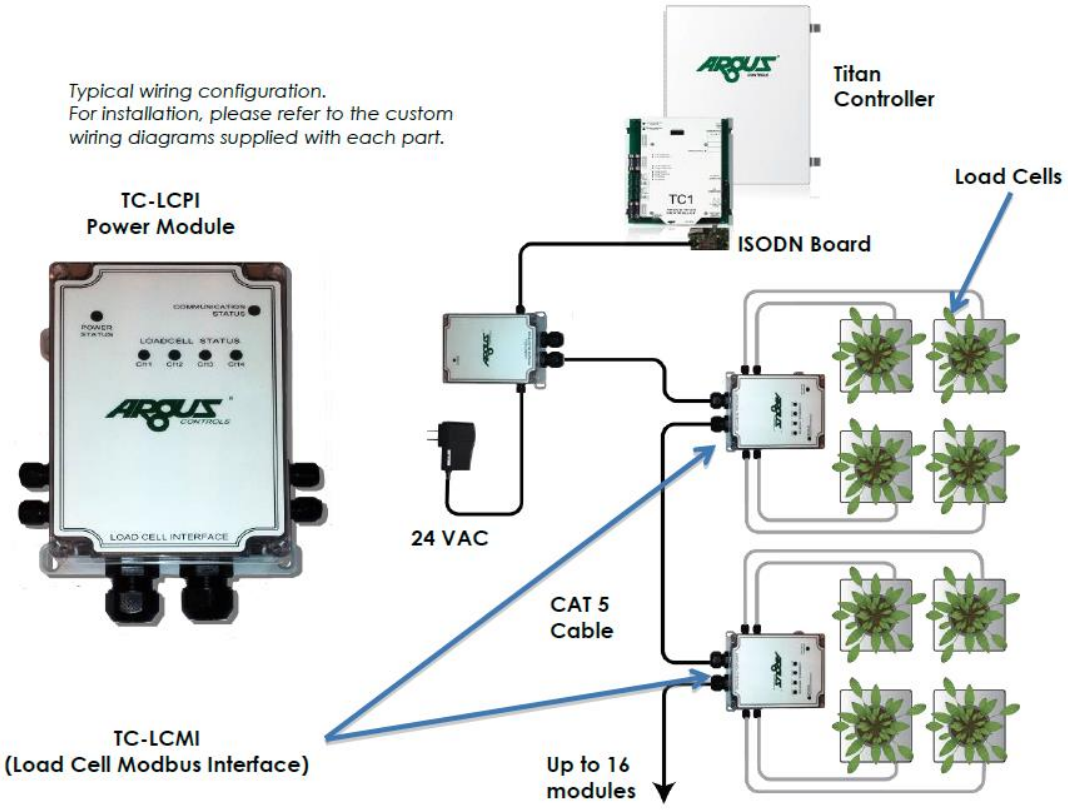
- **Economical** – Up to 64 load cells can be connected using a single wiring path and controller connection.
- **Power Injection** – A single power supply unit (TC-LCPI) is used to power up to 16 LCMI units.
- **Easy to Install** – Standard Ethernet cables with RJ45 connectors are used for network connections and power supply to the LCMI modules and load cells.
- **Status Indicators** – Separate status LEDs are provided for communications, power, and each connected load cell.
- **Durable Enclosure** – NEMA 4X Indoor/Outdoor-rated enclosure with mounting feet and watertight cable glands.
- **Precision** – Calibration functions for each load cell are provided in the software. Temperature compensation is possible, but each scale needs testing to determine its unique correction values.

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## Specifications

| | |
|---|---|
| **Dimensions** | 7" x 4.5" x 2.5" (height x width x depth) |
| **Protection** | 1A internal fuse |
| **Load Cell Connections** | Up to 4 Load cells can be connected to each TC-LCMI |
| **Network Connections** | 2 CAT5 (In/Out) with RJ45 male connectors |
| **Network Termination** | Integrated - (activated by a jumper) |
| **Power** | 24 VAC provided by the TC-LCPI (See the diagram below) |
| **Excitation Voltage** | 5 VDC |

## Wiring Details




## Additional Information

For more information, please contact Argus.

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# Titan Omni-Sensor

The Titan Omni-Sensor is an aspirated module for in-zone climate monitoring. It combines temperature, humidity, PAR light, and optional $CO_2$ monitoring (SEN-OSM/CO2) in a compact unit that can be suspended anywhere within a monitored or controlled zone.

## Applications




The advanced electronics and instrumentation on board the Omni-Sensor make it suitable for a wide range of applications, including greenhouses, growth chambers, produce coolers, and other clean ambient air sampling environments.

Use wherever combined temperature and humidity measurements are required. The integrated light sensor is suitable for confirmation of lighting and shade system operations as well as quantitative light measurement. The SEN-OSM/CO2 includes an on-board $CO_2$ sensor that can be used for both $CO_2$ monitoring and control applications.

**Aspirated sensors are not suitable for environments containing a lot of fog or very fine mist.** Fans and other electronic parts will be damaged from prolonged exposure to free water. In addition, moisture will accumulate in the air path affecting both humidity and temperature readings through local evaporation and evaporative cooling until the unit is completely dry again. Use non-aspirated versions of this sensor or other sensors for these special applications. For all other applications, aspiration improves response.

## Alternatives

Argus provides a wide selection of application-specific sensors and sensor enclosures for use with the Titan system. Individual sensor options are also available for $CO_2$, PAR light measurement, and many other environmental parameters.

**For any high humidity applications, it is recommended to use the SEN-RHT sensor instead of the OMNI.**

For special applications, customer specified sensors can also be connected. Please contact Argus for additional details.

## Features

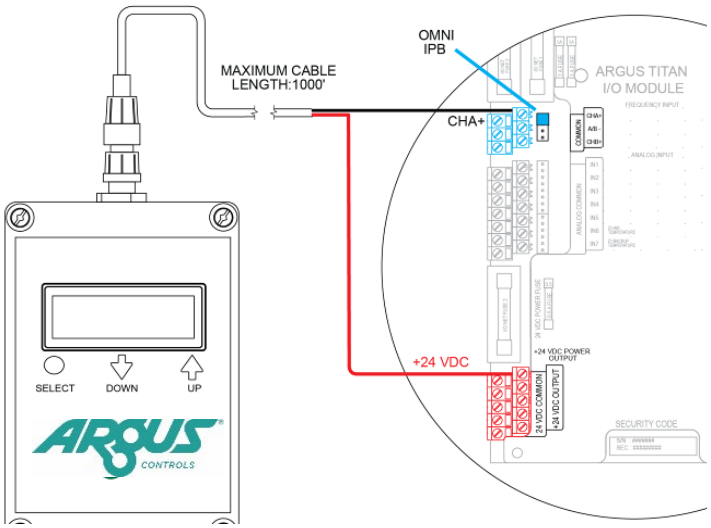
- A convenient on-board display shows the current values for all readings and accepts operator entered field calibration adjustments for the optional $CO_2$ sensor (SEN-OSM/CO2 model).
- Connects to a Titan I/O Module using **simple, two-conductor shielded or unshielded cable**. This also provides an easy means of suspension for the sensor. Digital communications enable **long wiring runs up to 4000 feet**. Custom cable lengths can be specified.
- Requires only a single digital input on the I/O Module leaving all analog inputs free for other uses. Up to two Omni-Sensors can be connected to one I/O Module.
- High accuracy temperature and humidity measurements.
- A high-resolution integrated light sensor is included for measurement of the local light conditions at the sensor location. This is useful for confirming the operation of shade and blackout curtains as well as supplemental lighting equipment. Readings are provided for lux, energy and PAR.

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## Specifications

| | |
|---|---|
| **Dimensions** | 4.9” x 3.3” x 2.1” (H x W x D) |
| **Power Requirements** | Power is provided by the connected I/O Module using the 2-wire connection. |
| **Cabling** | Factory cable is provided separately. Standard lengths are 15’, 30’, and 60’. Custom lengths are also available. Cables can also be extended using 2-conductor non-shielded 18-24 AWG UV-resistant cable. A blue Omni-Sensor Input Protection Board is provided with each sensor and must be installed on the I/O Module input as shown. Wiring details are provided with each unit. |
| **Display** | 2-line, 16 characters reflective. 0 – 50 ºC operating range |
| **Temperature Sensors** | 2 solid-state digital sensors. **Typical Accuracy:** +/-0.4°C Range: -10ºC to +85ºC. |
| **Humidity Sensor** | **Range:** 20 -80% non-condensing<br>**Typical Accuracy at 30ºC:** 20 - 80%RH: +/-3%<br>**Environments exceeding 80% RH may damage the sensor. Inquire about alternatives for environments greater than 80%** |
| **Light Sensor** | Lux illumination with conversions to generate PAR (Photosynthetically Active Radiation) in µmols and light energy in W/m$^3$. This sensor is intended for general use only.<br>There is a 1**0 second delay** once you change the PAR multiplier in order to keep the value before it is powered off. |
| **CO2 (SEN-OMNI/CO2 only)** | 0-2000 ppm dual element NDIR (Non-Dispersive Infra-Red) sensor with an accuracy of +/- 100 ppm + 2 % of measuring value. Sensor is self-calibrating to compensate for aging of the sensor elements. |
| **Max Operating Range** | 0 ºC to +50 ºC Note: Aspiration Fan turns off below -10ºC or >98%RH. |

## Wiring Details




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

The supplied Input Protection Board (Omni IPB) provides power for the Omni-Sensor and protection for the I/O Module.

## Additional Information

For more information, please refer to the Omni-Sensor Operator Manual or contact Argus.

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# Relative Humidity and Temperature Sensor Module

The **Relative Humidity and Temperature Sensor Module** is a non-aspirated temperature and humidity sensor.

## Applications



The **Relative Humidity and Temperature Sensor Module** is used when a non-aspirated sensor is required for indoor/outdoor use and highly recommended for all outdoor RH applications.

The RHT Sensor Module is easy to maintain and has a replaceable sensor allowing for quick replacement of just the sensor instead of the whole module.

It is a good replacement for either the **Aspirated Temperature/Humidity (AMHB)** module or **Aspirated Wet Bulb/Dry Bulb Humidity (AMWBDB)** module sensors.

## Alternatives

For Argus Titan systems, the **Omni-Sensor** (**SEN-OMNI**) combines temperature, full range humidity, light, and optional CO2 measurement in a compact aspirated module complete with an on-board display.

## Features

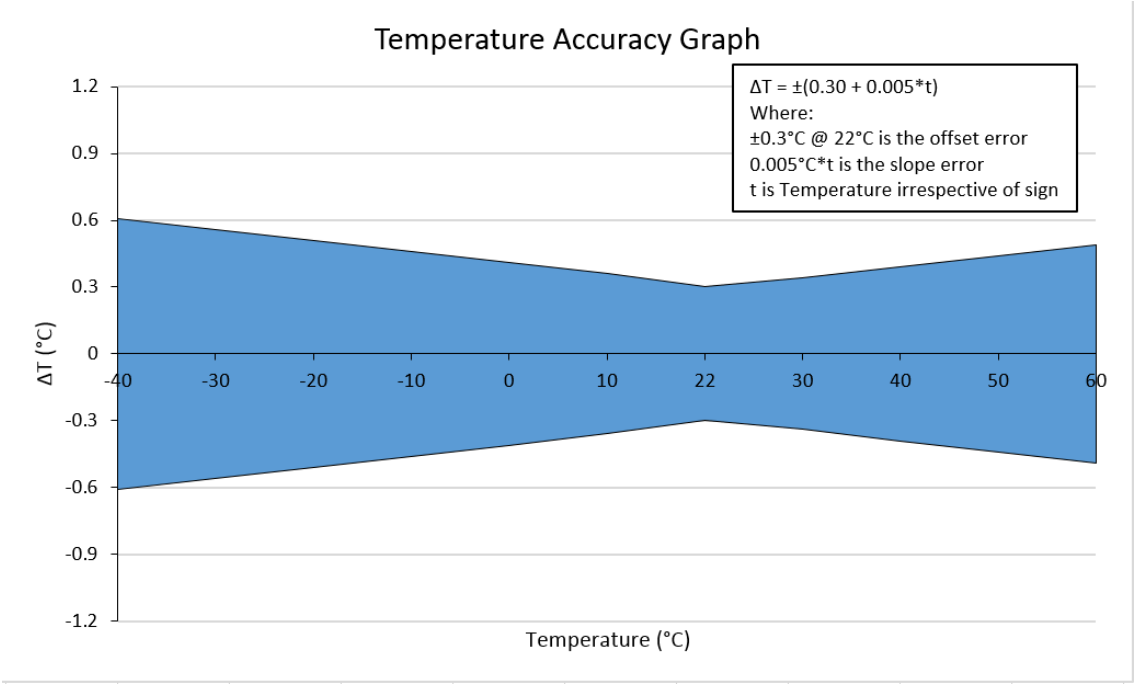
- **High Quality Construction** - Interface electronics sealed from environment to ensure a long life.
- **Easy Replacement** – Field-replaceable sensor tip allows you to swap the sensor on-site while maintaining ±2% RH accuracy and NIST traceability. Instead of replacing the whole sensor as usual, you can replace just the tip for an easy solution. It is very easy to remove and replace with a new tip, reducing any downtime for service.
- **Reliable Operation** - Long Term reliability with a weather resistant casing allowing enhanced airflow through a side vent and a rugged capacitive sensor that is responsive and stable.
- **Cost Effective** – Replacing just the sensor tip makes this sensor a good value, where normally you would have to pay for a whole new sensor if it stopped working.
- **Solar Shield** – The sensor includes a solar shield to protect the module from the rays of the sun, aiding in accuracy and response time.
- **RH Accuracy** - Microprocessor-based signal processing allows for specified RH accuracy across the full operating range of -40ºC to 60ºC.

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## Specifications

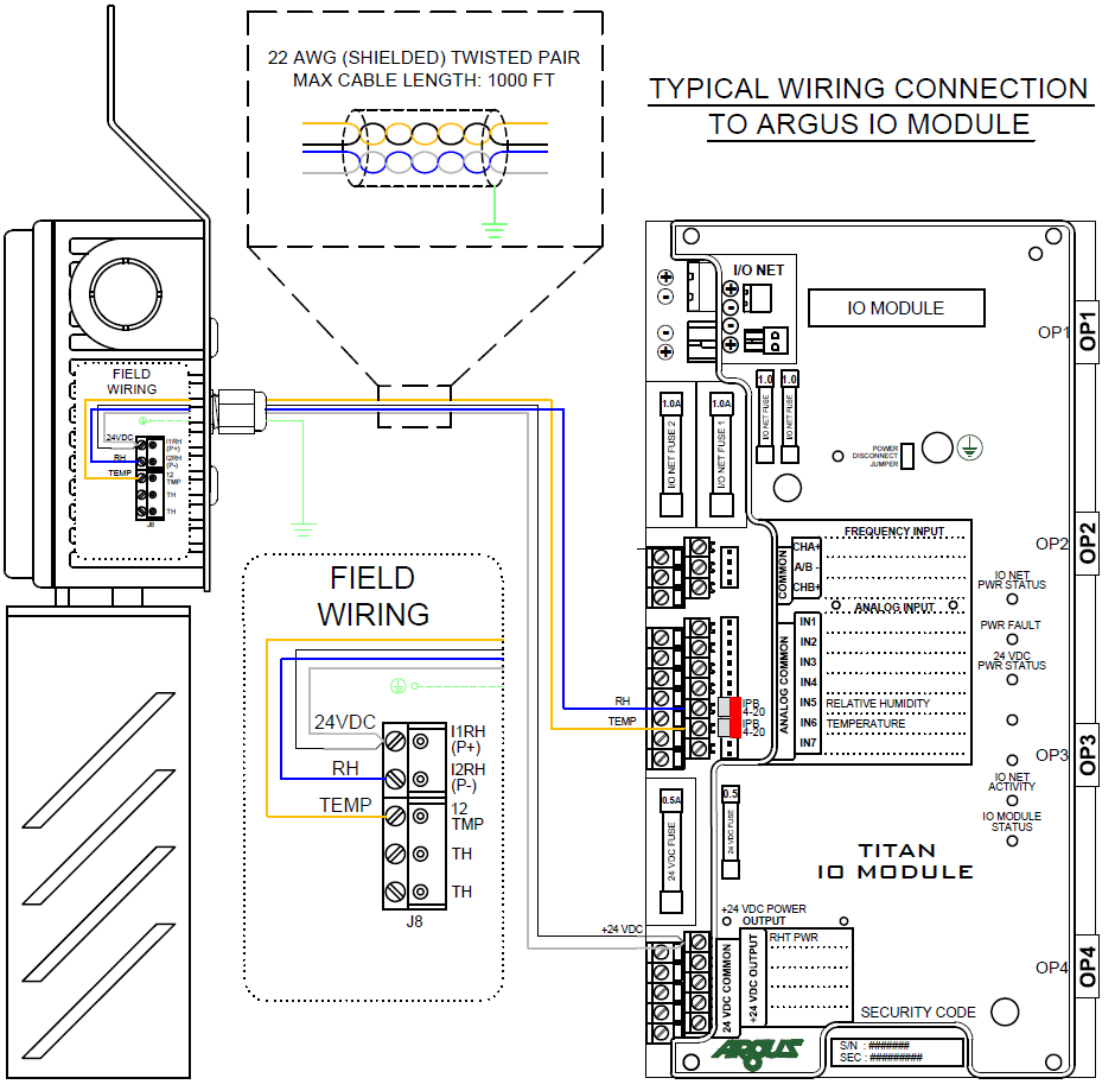
| | |
|---|---|
| **Dimensions** | *11.08" x 3.8" x 2.75" (includes sensor length)* |
| **Power Requirements** | *12 to 30VDC* |
| **Operating Range** | 0 – 99% RH non-condensing, -40ºC to 60ºC |
| **Humidity Sensor** | ±2% 10-90% RH and<br>±5% 0-10% & 90-99% RH |
| **Temperature Sensor** | Calibration Accuracy at 22ºC is ±0.3ºC<br>*****See Temperature Accuracy Graph below.*** |
| **Cabling** | *For optimal communication, use 2-Pair 22AWG, shielded instrumentation cable with a maximum length of 1000 feet.* |
| **Signal Output** | *4 to 20mA* |
| **NIST Certification Version Available** | *Part Number: SEN-RHT-1.0/C-NIST* |
| **Replacement Sensor Tip** | *Part Number: SUB-RHT-RST* |
| **Backup Temperature Sensor** | It is recommended to have a backup temperature sensor. |
| **Vapor Pressure Deficit (VPD)** | Additional steps are required to monitor VPD:<br>• For **Titan** systems, a math matrix program must be set up for calculations.<br>• For **Classic** systems, it is recommended to use a TN21/S as a backup temperature sensor. In the Argus Operator program there is a VPD calculation that must be performed.<br>For more information, see the **RHT Installation guide**. |

## Wiring Details



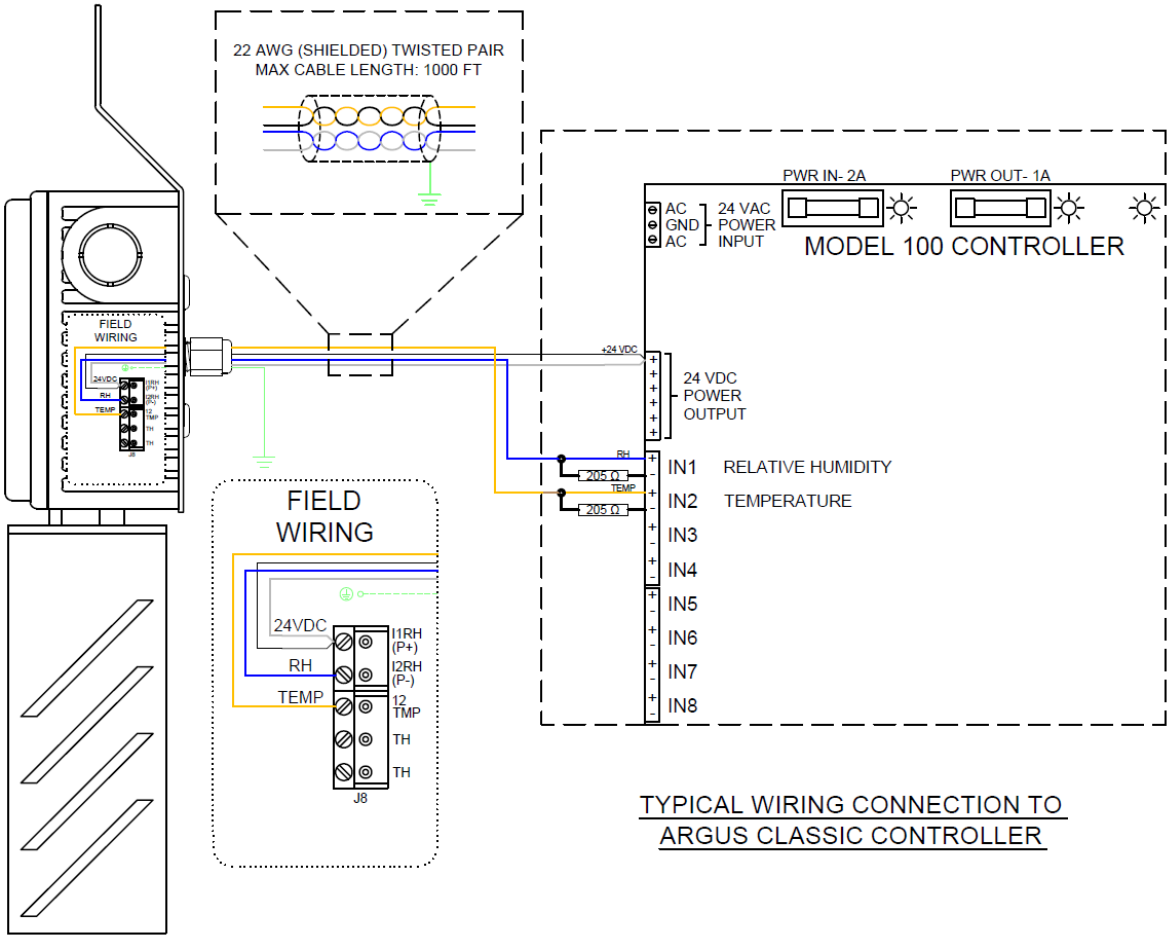

Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

# Wiring Details Titan




Typical wiring example for Titan Systems. For installation, refer to the supplied wiring diagrams and instructions.

## Wiring Details Classic




TYPICAL WIRING CONNECTION TO
ARGUS CLASSIC CONTROLLER

Typical wiring example for Classic Systems. For installation, refer to the supplied wiring diagrams and instructions.

## Additional Information

For more information, please contact Argus.

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# Thermistor Temperature Sensors

Argus TN series Thermistor temperatures sensors offer high stability, accuracy, and resolution for a variety of temperature sensing applications.

## Applications



TN sensors are used alone and in Argus Temperature sensor modules and assemblies. They are suitable for use in climate control, heating systems, nutrient control, irrigation, and direct temperature sensing in a variety of media.

The numbers in the part names indicate the wire lengths in feet.

## Alternatives

**SEN-TN21/HM2**: Recommended for direct soil, liquid immersion, and other high moisture applications.
**SEN-TN21/S**: Includes a heat reflective suspended enclosure for passive air temp measurement.
**SEN-TNDW/C**: Includes a dry well and thermo grease fitting for pipe temperature measurement.

A wide range of other application-specific temperature sensors including thermocouples and RTDs can also be connected to the Argus system.

## Features

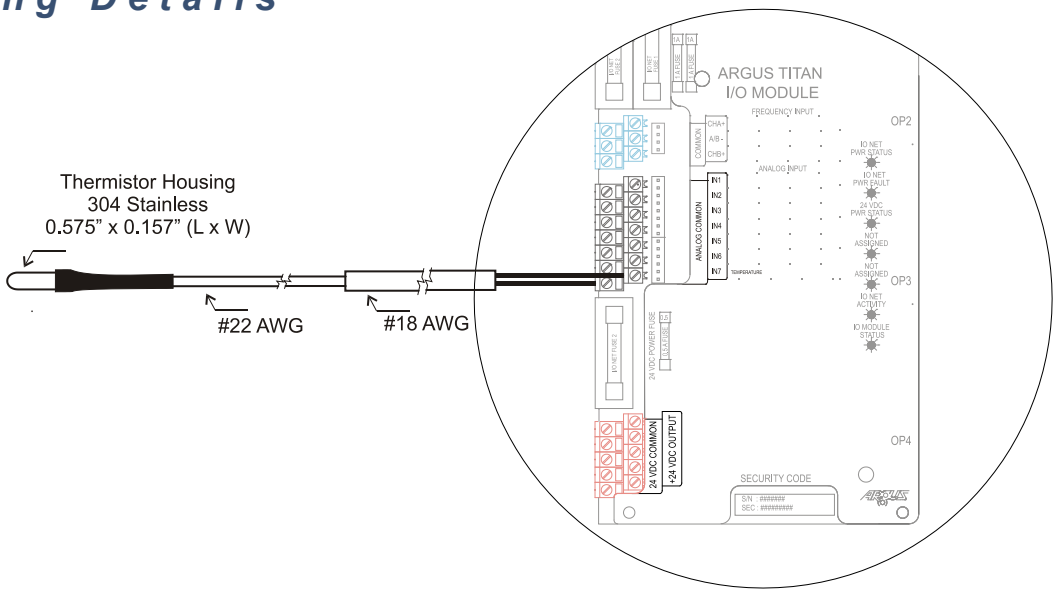
- **Accuracy –** Temperature measurement over an extensive range.
- **Interchangeability –** Thermistors are matched to a standardized resistance/temperature curve to permit interchangeability without requiring calibration.
- **Multi-Purpose –** TN Temperature sensors are used for a variety of temperature sensing applications, including pipe, soil, and air temperature.
- **Minimal Signal Degradation –** TN Sensors are minimally affected by wire resistance. Consequently, accurate measurements can be obtained from sensors located relatively long distances from the input module.

## Specifications

| | |
|---|---|
| **Thermistor Type** | NTC (Negative Temperature Coefficient) |
| **Resistance** | 3,000 Ohms @ 25ºC Fenwal Unicurve (UUA Series) |
| **Accuracy** | +/-0.2ºC over the range 0ºC to 70ºC<br>+/-0.5ºC over the range -50ºC to 150ºC<br>(Accuracy degrades by 0.1ºC for every 1000ft of 18 AWG field wire used) |
| **Range Supported in Software** | -50ºC to 150ºC |
| **Dissipation Constant** | **Still Air:** 1.0mW/ºC<br>**Moving Air Stream:** 1.7mW/ºC (for example in aspirated housing)<br>**Immersed in Liquid:** 8.0mW/ºC |
| **Thermistor Housing** | **Construction:** 304 stainless steel<br>**Dimensions:** 0.575” x 0.157” (length x diameter) |
| **Conductors** | **TN2:** 2 ft. of 22 AWG leads (heat shrink tubing included for splicing to field wiring)<br>**TN21/66/100**: pre-spliced to 22 AWG stranded sensor wire<br>(21’, 66’, 100’, respectively) |
| **Recommended Field Wire** | 2-conductor, 18 AWG UTP |
| **Sensor Compensation** | Type A (3K) is used for Argus, while Type G (10K) is used for Conviron. |
| **Maximum Temperature Rating** | +80ºC |

* Dissipation constants are usually not required when connected to Titan I/O Modules due to short excitation times.

## Wiring Details




Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

TYPICAL WIRING CONNECTION TO AN ARGUS I/O MODULE

## Additional Information

For more information, please contact Argus.

# High Moisture Thermistor Temperature Sensor

*Argus SEN-TN21-HM2 thermistor offers high stability, accuracy, and resolution for a variety of temperature sensing applications in wet or direct immersion applications.*

## Applications



The SEN-TN21-HM2 temperature sensor is designed for use in high moisture applications in place of standard TN sensors.

Typical applications include direct insertion into liquids as well as wet soils and substrates. The sensor is encased in a stainless-steel housing using a water proof potting compound designed to resist water and dissolved salts.

The sensor is supplied 21-foot leads.

## Alternatives

For dry or moderately moist applications, use Argus **SEN-TN** series thermistors. Please refer to the Argus Data Sheet **SEN-TN** for details). A wide variety of other application-specific temperature sensors including thermocouples can also be connected to the Argus system.

## Features

- **Wet Applications –** Water and salt resistant sensor enclosure.
- **Interchangeability –** Thermistors are matched to a standardized resistance/temperature curve to permit interchangeability with other thermistors using this curve without requiring calibration.
- **Accuracy –** Temperature measurement over an extensive range.
- **Minimal Signal Degradation -** TN thermistor sensors are minimally affected by wire resistance. Consequently, accurate measurements can be obtained from sensors located in satellite zones, far from the connected input module.

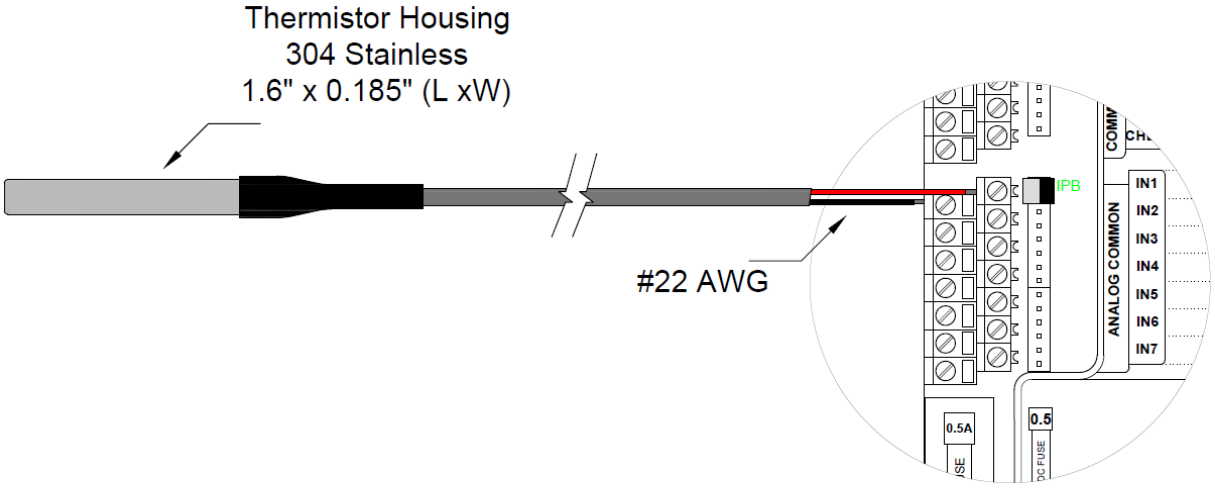
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## Specifications

| | |
|---|---|
| **Thermistor Type** | NTC (Negative Temperature Coefficient) |
| **Resistance** | 3,000 Ohms @ 25 °C Fenwal Unicurve (UUA Series) |
| **Accuracy** | ± 0.2 °C over the range 0 °C to 70 °C<br>± 0.5 °C over the range -50 °C to 150 °C<br>*(accuracy degrades by 0.1°C for every 1000 ft. of 18 AWG field wire used)* |
| **Range Supported in Software** | - 50 °C to 150 °C |
| **Dissipation Constant** | **Still Air:** 1.0 mW/°C<br>**Moving Air Stream:** 1.7 mW/°C (for example, in aspirated housing)<br>**Immersed in Liquid:** 8.0 mW/°C |
| **Thermistor Housing** | **Construction:** 304 stainless steel<br>**Dimensions:** 1.6” x 0.185” (length x diameter) |
| **Conductors** | 21 ft. of 22 AWG leads (heat shrink tubing included for splicing to field wiring) |
| **Recommended Field Wire** | 2-conductor, 18 AWG UTP |

* Due to short excitation times, dissipation constants not normally required when connected to Titan I/O Modules.

## Wiring Details




Connection to I/O Module

## Additional Information

For more information, please contact Argus.

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# Solar Shielded Temperature Sensor

*The SEN-TN21/S consists of an Argus thermistor type temperature sensor mounted in a heat reflective, passively ventilated solar shield.*

## Applications



The module consists of a SEN-TN21 temperature sensor, housed inside a cylindrical, powder coated aluminum housing. Solar-shielding enables the use of a reliable, accurate, and inexpensive Argus TN series sensor in areas where an exposed sensor would provide inaccurate readings due to solar heat gain.

Typical applications include greenhouses, crop shelters, and other sunny locations.

## Alternatives

For general temperature measurement applications that do not require solar shielding, **TN2**, **TN21** and **TN100** sensors are available (the numbers indicate the lengths of the leads). Several aspirated modules are available for air temperature monitoring either alone or in combination with humidity, light, and $CO_2$ measurement. A variety of other application-specific sensors are also available for measuring temperatures in soils, pipes, tanks, liquids, etc.

## Features

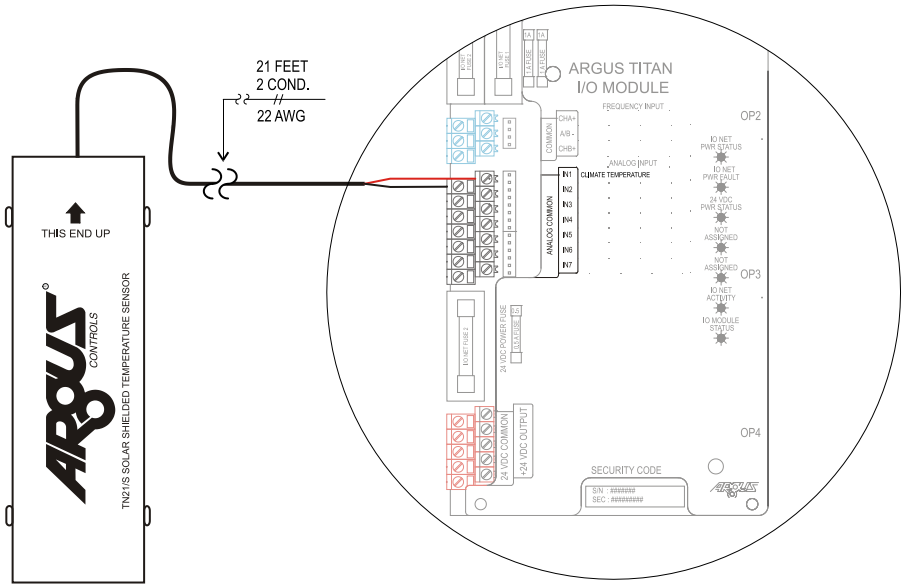
- **Quality Construction** - The durable aluminum housing is designed to provide convective airflow past the temperature sensor while shading it from solar heat gain. The sensor is securely fixed in place to ensure reliable, repeatable readings.
- **Ease of Installation** - The lightweight housing hangs from its own electrical lead.
- **Field Replaceable** - Sensor can be easily removed and replaced in the field.
- **Maintenance free** - Compared to aspirated sensors there are no moving parts or filters.
- **Repositionable** - The suspended unit is easily repositioned to accommodate different crops and crop heights.

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## Specifications

| | |
|---|---|
| **Dimensions** | 7” x 2.25” (length x diameter) |
| **Construction** | White powder coated extruded aluminum, plastic stand-offs, stainless steel screws |
| **Conductors** | 21 ft. of 22 AWG UV resistant wire leads (can be field extended: 2-conductor, 18 AWG UTP recommended) |
| **Sensor Type** | Argus TN Thermistor (refer to the Argus Data Sheet **SEN-TN** for complete thermistor specifications) |
| **Measurement Range Supported in Software** | - 50 °C to 150 °C |
| **Accuracy** | ± 0.2 °C over the range 0 °C to 70 °C<br>± 0.5 °C over the range -50 °C to 150 °C<br>*(accuracy degrades by 0.1°C for every 1000 ft. of 18 AWG field wire used)* |

## Wiring Details




TYPICAL WIRING CONNECTIONS TO ARGUS I/O MODULE

NOTE: For representative temperature readings in greenhouse compartments, suspend the module at or near the top of the crop, near the center of the measured area.

Typical wiring example. For installation, refer to the supplied wiring diagrams and instructions.

## Additional Information

For more information, please contact Argus.

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# Dry Well Sensor Housing

The SEN-TN-DW_C is a hollow stainless-steel housing intended for threaded insertion into water pipes and liquid vessels. A temperature sensor is then inserted into the dry cavity to measure the temperature of the pipe or tank contents.

## Applications




The SEN-TN-DW_C can be used in place of wet well temperature sensors.

Once fitted, a temperature sensor can be inserted and removed without the need for draining the contents of the pipe or tank.

The dry well is designed to fit Argus TN series sensors (please refer to the Data Sheet: SEN-TN)

## Alternatives

This part is intended as a replacement for wet well sensors. It is also available as part of a complete assembly that includes a temperature sensor, a junction box, and stainless fittings, and a packet of heat transfer compound. Please refer to the data sheet for part number SEN-TN2-DW.

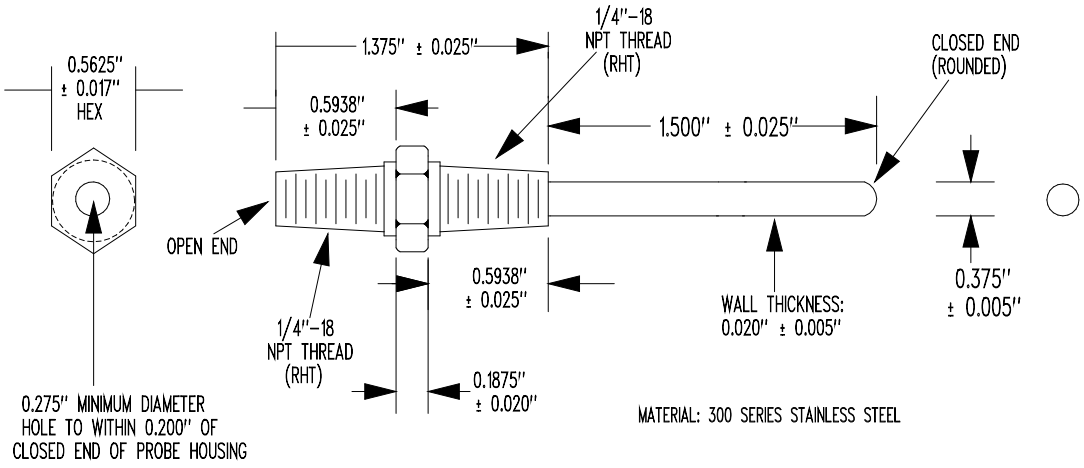
## Features

- Type 300 Stainless Steel construction.
- Dry well permits replacement of sensors without the need for draining the system.
- Threaded for easy placement in existing threaded wet well locations.

## Specifications

| | |
|---|---|
| **Materials** | Type 300 Stainless, PVC |
| **Coupler** | ¼" PVC |
| **Connector** | ¼" water tight PVC |
| **Heating Conducting Compound** | Silicone Heat Transfer Compound |
| **Dry Well Thread** | ¼" Male NPT |

## Construction Details




## Additional Information

For more information, please contact Argus.

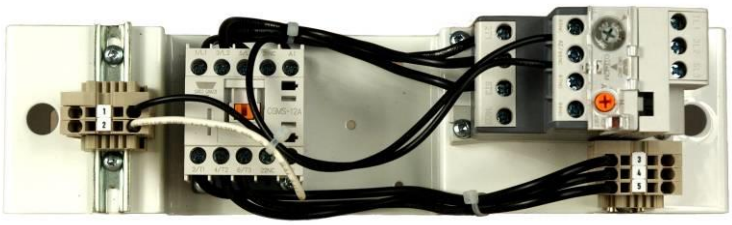
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# Line Voltage Interface Module

*The RM-1CG-OL is used for switching a single-phase or three phase motor load up to 7.5 HP @ 600V maximum. Motor overload protection is provided via an integrated overload relay.*

## Applications

The RM-1CG-OL provides a line voltage interface with thermal overload protection between a low voltage output on the Argus control system and a motor load. Typical applications include single speed fans, motors, and pumps.



## Alternatives

Use the **RM-2DP** for larger motor and lighting loads of up to 15hp. For non-reversing motor loads that do not require overload protection, use the **RM-2CG**. Pilot duty contactors and mechanically interlocked reversing motor relays are also available. Argus supplies a full range of standard and custom-built relay interfacing products to suit your applications. Packaged motor starters are also available from electrical suppliers. Contact Argus for additional details.

## Features

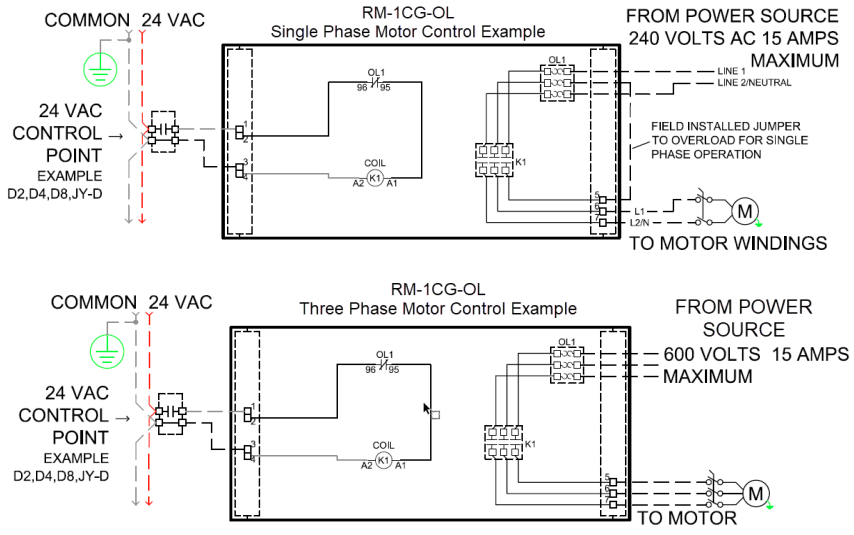
- **Versatile** - Can be used for single phase and three phase applications.
- **Reliable** - Contacts have a long service life
- **Modular** - Each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Standardized** - Modules are designed to handle typical greenhouse loads.
- **Cost Effective** - Argus selects reliable, compact, cost-effective CSA/UL approved components from manufacturers who are industry leaders in both technology and service.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring tension terminals ensure uniform contact pressure with wire ends.
- **Protection** - The integrated overload relay provides protection against overload, phase loss, or phase unbalanced load conditions.

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## *Specifications*

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Relay** | Single IEC-style 3-pole mini contactor (20 Amp rated) |
| **Maximum Load Ratings (see NOTE)** | 120 VAC 1Φ: 1 HP<br>240 VAC 1Φ: 2 HP<br>208/240 VAC 3Φ: 3 HP<br>480 VAC 3Φ: 7.5 HP<br>600 VAC 3Φ: 7.5 HP |
| **Overload Relay** | Class 10A, Bimetallic CGT-12M - specify overload range (Amps) when ordering:<br>[0.10 to 0.16] [0.63 to 1.0] [4 to 6] [9 to 13],<br>[0.16 to 0.25] [1.0 to 1.6] [5 to 8] [12 to 16]<br>[0.25 to 0.40] [1.6 to 2.5] [6 to 9]<br>[0.40 to 0.63] [2.5 to 4] [7 to 10] |
| **Coil Rating** | 24 VAC 50/60Hz (6 VA draw - 32 VA inrush) (Maximum 6 Modules Per 75VA TX) |
| **Maximum Switching Voltage** | 600 VAC |
| **Maximum General Purpose Switching Current** | 15 A |
| **Terminal Block** | Spring tension, accommodating 12 - 22 AWG field wiring |
| **Factory Wiring** | Low voltage: 18 AWG, TEW 600 V 105°C equipment wire<br>Line Voltage: 14 AWG, TEW 600 V 105°C equipment wire |

## *Wiring Details*




**Notes:**
These are typical wiring examples. Refer to the custom wiring diagrams supplied with each part for full installation details.

Use copper conductors only.

**Wire Connection Sizes:**
Class II Control Wiring: 18-14 AWG
Power Wiring: 14-12 AWG

## *Additional Information*

For more information, please contact Argus.

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# Line Voltage Interface Module

The RM-2CGR is a mechanically interlocked dual, 3-pole mini contactor used for switching a single-phase or a three-phase instant-reversing motor load in applications where thermal overload protection is not required or is provided with the motor package.

## Applications



This module is used for **three-wire, shared common control signals** to provide line voltage interfacing between the Class 2 outputs on the Argus control system and an instant reversing motor with built-in or line voltage limit switches.

Typical examples include motors used for operating roof vents and shade curtains. Terminals are provided for connection to external motor travel limits.

## Alternatives

For reversing motor applications where overload protection is required, use the single-phase **RM-2CGR-OL-1PH** or the three-phase **RM-2CGR-OL-3PH**. Argus supplies a full range of standard and custom-built relay interfacing products to suit your applications. Packaged motor starters are also available from electrical suppliers. Contact Argus for additional details.

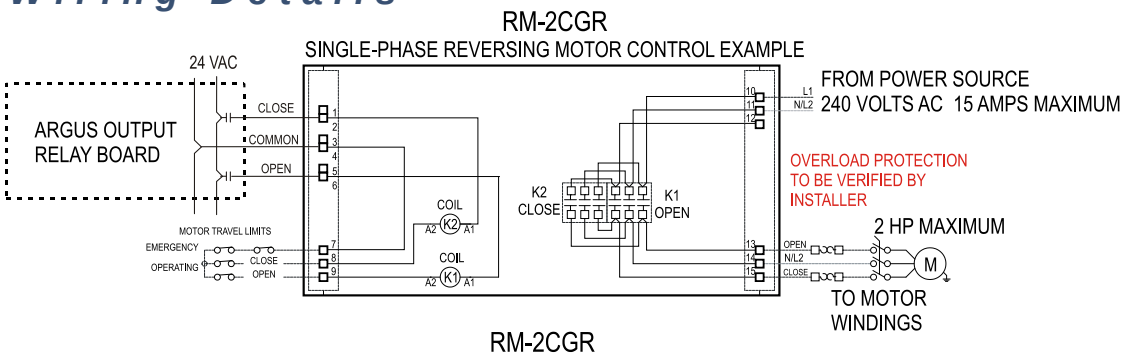
## Features

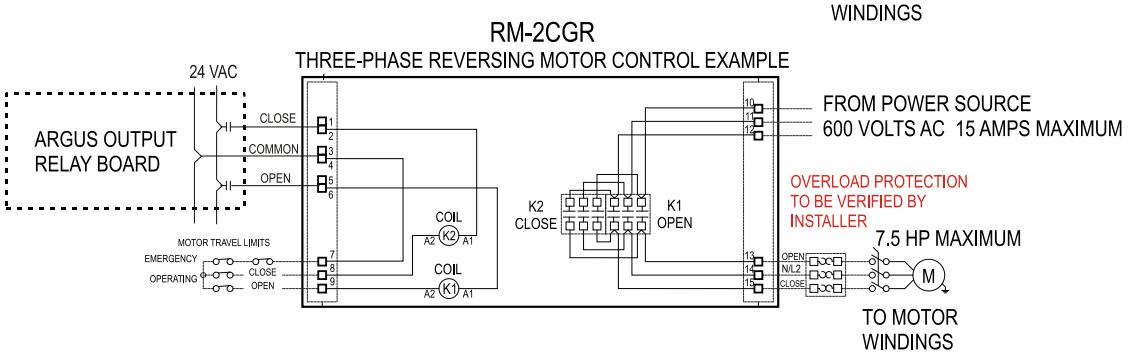
- **Reliable** - Contacts have a long service life.
- **Quality Components** - Argus selects reliable, compact, cost-effective, CSA/UL approved components from industry leading manufacturers
- **Modular** - Each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring terminals assure uniform contact with field wiring terminations.
- **External Travel Limits** - landed on the module
- **Safe** - mechanically interlocked to prevent the OPEN and CLOSE contacts from being energized at the same time.

## Specifications

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Relay** | Dual IEC-style 3-pole mini contactors (20 Amp Rated) |
| **Maximum Load Ratings (see NOTE)** | 115VAC - 1Φ: 1 HP<br>208/240VAC - 1Φ: 2 HP<br>208/240 VAC 3Φ: 3 HP<br>460 VAC 3Φ: 7.5 HP<br>575 VAC 3Φ: 7.5 HP |
| **Coil Rating** | 24 VAC 50/60Hz (1 x 6 VA draw - 32 VA inrush) (Maximum 6 Modules Per 75VA TX) |
| **Maximum Switching Voltage** | 600 VAC |
| **Maximum General Purpose Switching Current** | 15 A |
| **Terminal Block** | Spring tension, accommodating 12 - 22 AWG field wiring |
| **Factory Wiring** | Low voltage: 18 AWG, TEW 600 V 105°C equipment wire<br>Line voltage: 14 AWG, TEW 600 V 105°C equipment wire |

## Wiring Details




Notes: Typical wiring example. Refer to the custom wiring diagrams supplied with each part for full installation details.
Wire Sizes: Class II Control Wiring: 18-14 AWG Power Wiring: 14-12 AWG Use copper conductors only

## Additional Information

For more information, please contact Argus.

**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Line Voltage Interface Module

The RM-2CGR-OL-1PH is a dual, mechanically interlocked 3-pole mini contactor with thermal overload protection used for switching a single-phase, instant-reversing motor load.

## Applications



This module is used for **three-wire, shared common control signals** to provide line voltage interfacing between the Class 2 outputs on the Argus control system and an instant reversing motor. Motor overload protection is provided by integrated thermal overload circuitry.

Typical applications include motors used for operating roof vents and shade curtains in greenhouses.

## Alternatives

For three-phase instant-reversing applications with overload protection, use the **RM-2CGR-OL-3PH**. For single or three-phase reversing motor applications where overload protection is not required, use the **RM-2CGR**. Argus supplies a full range of standard and custom-built relay interfacing products to suit your applications. Packaged motor starters are also available from electrical suppliers. Contact Argus for additional details.

## Features

- **Reliable** - Contacts have a long service life.
- **Quality Components** - Argus selects reliable, compact, cost-effective, CSA/UL approved components from industry leading manufacturers
- **Modular** - Each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring terminals assure uniform contact with field wiring terminations.
- **External Travel Limits** - landed on the module
- **Safe** - mechanically interlocked to prevent the OPEN and CLOSE contacts from being energized at the same time.

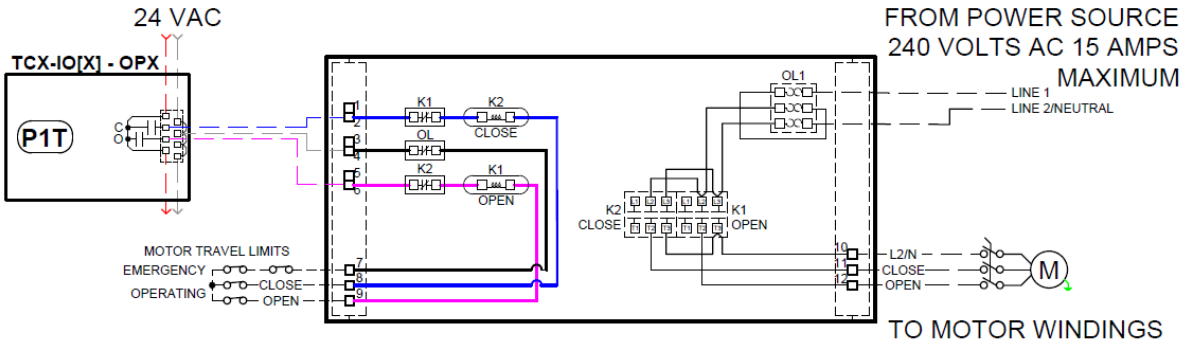
**PHONE:** 604-538-3531 or 1-888-667-2091 (Canada and the US) - **FAX:** 604-538-4728 - **EMAIL:** argus@arguscontrols.com

# Specifications

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Relay** | Dual IEC-style 3-pole mini contactor (20 Amp rated) |
| **Maximum Load Ratings (see NOTE)** | 120 VAC 1Φ: 1 HP<br>240 VAC 1Φ: 2 HP |
| **Overload Relay** | Class 10A, Bimetallic CGT-12M - specify overload range (Amps) when ordering: [0.10 to 0.16] [0.63 to 1.0] [4 to 6] [9 to 13],<br>[0.16 to 0.25] [1.0 to 1.6] [5 to 8] [12 to 16]<br>[0.25 to 0.40] [1.6 to 2.5] [6 to 9]<br>[0.40 to 0.63] [2.5 to 4] [7 to 10] |
| **Coil Rating** | 24 VAC 50/60Hz (6 VA draw - 32 VA inrush) (Maximum 6 Modules Per 75VA TX) |
| **Maximum Switching Voltage** | 600 VAC |
| **Maximum General Purpose Switching Current** | 15 Amps |
| **Terminal Block** | Spring tension, accommodating 12 - 22 AWG field wiring |
| **Factory Wiring** | Low voltage: 18 AWG, TEW 600 V 105°C equipment wire<br>Line Voltage: 14 AWG, TEW 600 V 105°C equipment wire |

# Wiring Details

Wiring Connections with Titan Control




Notes: This is a typical wiring example. Refer to the custom wiring diagrams supplied with each part for full installation details.

Wire Sizes: Class II Control Wiring - 18-14 AWG; Power Wiring - 14-12 AWG. Use copper conductors only.

# Additional Information

For more information, please contact Argus.

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# Line Voltage Interface Module

The RM-2CGR-OL-3PH is a dual, mechanically interlocked 3-pole mini contactor with thermal overload protection used for switching a three-phase, instant-reversing motor load.

## Applications



This module is used for **three-wire, shared common control signals** to provide line voltage interfacing between the Class 2 outputs on the Argus control system and a three-phase instant reversing motor.

Motor overload protection is provided by integrated thermal overload circuitry.

Typical applications include motors used for operating roof vents and shade curtains in greenhouses.

## Alternatives

For single-phase instant-reversing applications with overload protection, use the **RM-2CGR-OL-1PH**. For single or three-phase reversing motor applications where overload protection is not required, use the **RM-2CGR**. Argus supplies a full range of standard and custom-built relay interfacing products to suit your applications. Packaged motor starters are also available from electrical suppliers. Contact Argus for additional details.

## Features

- **Reliable** - Contacts have a long service life.
- **Quality Components** - Argus selects reliable, compact, cost-effective, CSA/UL approved components from industry leading manufacturers.
- **Modular** - Each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring terminals assure uniform contact with field wiring terminations.
- **External Travel Limits** - landed on the module.
- **Safe** - mechanically interlocked to prevent the OPEN and CLOSE contacts from being energized at the same time.

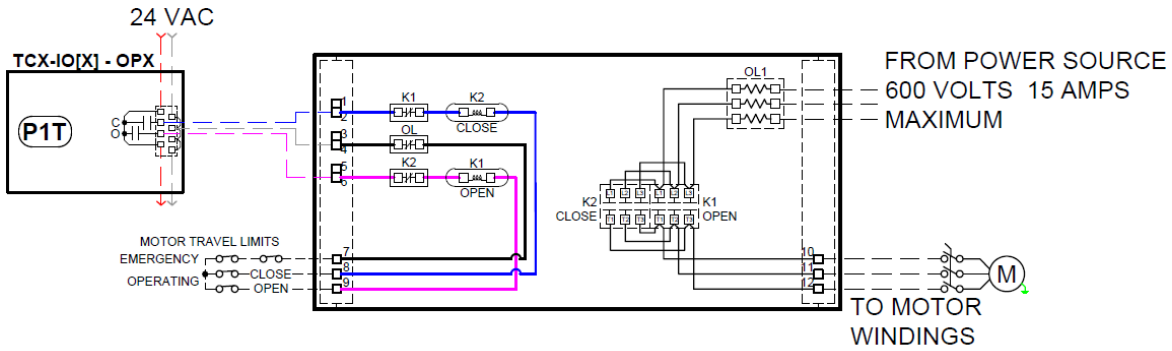
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# Specifications

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Relay** | Dual IEC-style 3-pole mini contactor (20 Amp rated) |
| **Maximum Load Ratings (see NOTE)** | 208/240 VAC 3Φ: 3 HP<br>480 VAC 3Φ: 7.5 HP<br>600 VAC 3Φ: 7.5 HP |
| **Overload Relay** | Class 10A, Bimetallic CGT-12M - specify overload range (Amps) when ordering: [0.10 to 0.16] [0.63 to 1.0] [4 to 6] [9 to 13],<br>[0.16 to 0.25] [1.0 to 1.6] [5 to 8] [12 to 16]<br>[0.25 to 0.40] [1.6 to 2.5] [6 to 9]<br>[0.40 to 0.63] [2.5 to 4] [7 to 10] |
| **Coil Rating** | 24 VAC 50/60Hz (6 VA draw - 32 VA inrush) (Maximum 6 Modules Per 75VA TX) |
| **Maximum Switching Voltage** | 600 VAC |
| **Maximum General Purpose Switching Current** | 15 Amps |
| **Terminal Block** | Spring tension, accommodating 12 - 22 AWG field wiring |
| **Factory Wiring** | Low voltage: 18 AWG, TEW 600 V 105°C equipment wire<br>Line Voltage: 14 AWG, TEW 600 V 105°C equipment wire |

# Wiring Details

Wiring Connections with Titan Control




Notes: This is a typical wiring example. Refer to the custom wiring diagrams supplied with each part for full installation details.
Wire Sizes: Class II Control Wiring - 18-14 AWG; Power Wiring - 14-12 AWG. Use copper conductors only.

# Additional Information

For more information, please contact Argus.

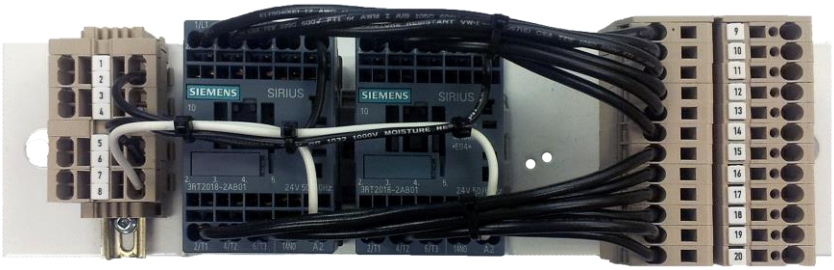
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# Line Voltage Interface Module

The RM-2DP-4 is a dual, 3-pole contactor module for switching up to two motor or lighting loads up to 10 HP each.

## Applications

The RM-2DP-4 is typically used to provide line voltage interfacing for motors, pumps, and ballasted lighting loads (for example, fluorescent and HID lighting).




## Alternatives

Use the **RM-2CG** for smaller motor loads of up to 7.5 hp at 600VAC. For non-reversing motor loads requiring overload protection, use the **RM-1CG-OL**. Pilot duty contactors and mechanically interlocked reversing motor relays are also available. Argus supplies a full range of standard and custom-built relay interfacing products to suit your applications. Packaged motor starters are also available from electrical suppliers. Contact Argus for additional details.

## Features

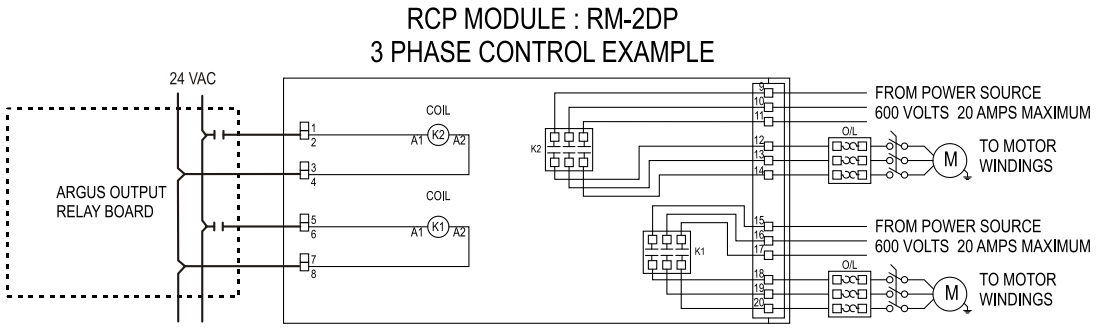
- **Reliable** - Contacts have a long service life.
- **Cost Effective** - Argus selects reliable, compact, cost-effective CSA/UL approved components from manufacturers who are industry leaders in both technology and service.
- **Modular** - Each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring terminals assure uniform contact with field wiring terminations.

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## Specifications

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Relay** | Dual 3-pole contactor (30 Amp rated) |
| **Maximum Load Ratings (see NOTE)** | 120 VAC, 1Φ: 1 HP<br>240 VAC, 1Φ: 2 HP<br>208/240 VAC, 3 Φ: 3 HP<br>480 VAC, 3Φ: 10HP<br>600 VAC, 3Φ: 10 HP |
| **Coil Rating** | 24 VAC 50/60Hz |
| **Maximum Switching Voltage** | 600V |
| **Maximum General-Purpose Switching Current** | 20A |
| **Terminal Block** | Spring tension, accommodating 10 - 22 AWG field wiring |
| **Factory Wiring** | Low voltage: 18 AWG, TEW 600 V 105°C equipment wire<br>Line Voltage: 12 AWG, TEW 600 V 105°C equipment wire |

## Wiring Details




Notes: This is a typical wiring example. Refer to the custom wiring diagrams supplied with each part for full installation details.
Wire Sizes:
Class II Control Wiring: 18-14 AWG; Power Wiring: 10 AWG. Use copper conductors only.

## Additional Information

For more information, please contact Argus.

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# Line Voltage Interface Module

The RM-2TX75 module provides 24 VAC power for Argus line voltage module relays.

## Applications

The RM-2TX75 consists of two120V/60Hz, energy limiting transformers. It provides control power for Argus Line voltage interfacing modules and can also be used to power Class 2 equipment and Argus system boards.



## Alternatives

Argus can provide specialty transformers for applications requiring other voltages, load requirements, or DC output. Contact Argus for additional details.

## Features

- **Quality Components** – Steel transformers are used for excellent heat dissipation, electromagnetic shielding, and trouble-free operation.

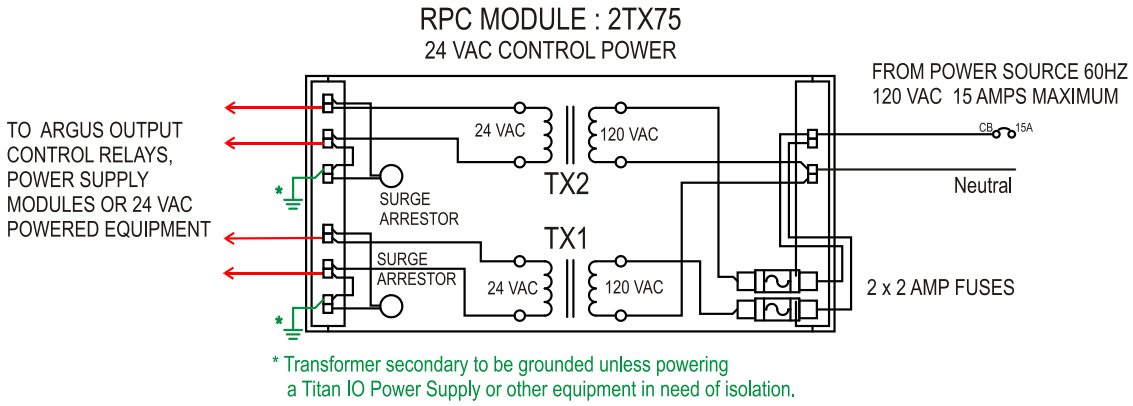
  * Some transformers have a second circuit breaker built in.
- **Surge Protection** – Load protected by 390V varistors. Line protected by replaceable 5 x 20 mm 2A fuses.
- **Cost Effective** - Argus selects reliable, compact, cost-effective CSA/UL approved components from manufacturers who are industry leaders in both technology and service.
- **Modular** - each module is factory assembled, prewired, labeled, and preapproved for field use. All components are mounted on a pre-drilled back plate assembly for mounting into standard Argus panels. Detailed, custom drawings are provided.
- **Ease of Wiring** - Each module is prewired according to equipment load ratings. Spring terminals assure uniform contact with wire ends.

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## Specifications

| | |
|---|---|
| **Dimensions (mounting bracket)** | 11” x 3” (length x width); mounting centers at 10.5” |
| **Transformer** | 2 x 75VA Class 2 |
| **Input Voltage** | 120 VAC 60Hz |
| **Output Voltage** | 24 VAC 60 Hz |
| **Power Rating** | 150 VA Total (75 VA per transformer) |
| **Fuses** | 2 - 5 x 20 mm 2A replaceable |
| **Varistors** | 2 - 390 V rating |

## Wiring Details




Notes: Typical wiring example. Refer to the custom wiring diagrams supplied with each part for full installation details.
Wire Sizes:
Class 2 Control Wiring: 18-14 AWG; Power Wiring: 14-12 AWG. Use copper conductors only.

## Additional Information

For more information, please contact Argus.

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# Practicing Safe $CO_2$

Carbon Dioxide ($CO_2$) is a colorless, odorless gas. At low concentrations, it has been used to safely enrich the greenhouse atmosphere to accelerate the growth of crops. However, at high concentrations it can damage crops and is potentially lethal to humans. This note is intended to provide advice for the safe use of supplementary $CO_2$.

Although $CO_2$ supplementation has been safely and routinely used for many years in commercial horticulture, the potential for mishap should be recognized and guarded against. Both manual and automated $CO_2$ monitoring and delivery systems can be safely and accurately employed if regular maintenance and safety inspections are employed, and the potential dangers are understood.

## *Plant Safety*

Plants are generally much more sensitive than humans to sustained exposure to high levels of $CO_2$. At levels exceeding 1000 ppm, young tomato plants may exhibit foliar inrolling and increased purple pigmentation, and cucumber leaves may be burned or bleached. In general, supplementation beyond 800-1000 ppm has not been shown to be beneficial or cost effective for most greenhouse grown crops.

## *Human Safety*

Human breath contains about 40,000 ppm $CO_2$, or about 40 times the maximum sustained exposure level recommended for plants, so humans have a far greater tolerance to $CO_2$ concentrations. However, acute human toxicity occurs at about 100,000 ppm, and above 50,000 ppm, people may experience dizziness and loss of consciousness.

Prolonged exposures above 20,000 ppm should be avoided.

## *Sources of Supplementary*

There are two principal sources of $CO_2$ supplementation in commercial greenhouses: combustion of natural gas or propane, or the dosing of liquid $CO_2$. Each have their own safety considerations.


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## $CO_2$ from Combustion

When burned efficiently, low sulfur propane and natural gas produce water vapor and $CO_2$ as their combustion byproducts. If for some reason the combustion is incomplete, a host of other undesirable materials may be produced. These include carbon monoxide, nitrous oxides, ethylene and ethylene- like compounds, and other hydrocarbons. High levels of carbon monoxide are hazardous to humans, and ethylene can be damaging to crops at very low levels. The best way to avoid all of these problems is to ensure the proper operation of $CO_2$ burners and generators at all times. Make sure you have regular inspections of your burners by a qualified technician, particularly before starting them up for a new growing season. Corroded components, cracks, and spider nests in the gas/air mixing ports are common causes of equipment malfunctions.

An adequate oxygen supply is required for all combustion devices. Whenever the supply of oxygen is restricted or depleted, incomplete combustion can result.

For example, stand-alone $CO_2$ generators are commonly used as a backup source of heating. Under cold, tightly sealed conditions, when they are being used primarily for heating, burners may produce excessive levels of $CO_2$ and deplete the $O_2$ levels in the compartment unless they are provided with a fresh air supply.

Be very careful when using non-vented $CO_2$ generators under these conditions.

Whenever flue gases are extracted from boilers, the boiler must be in excellent operating condition. One way to ensure this, is to use a CO (carbon monoxide) detector in the flue gas stream. Significant levels of carbon monoxide are an indication of incomplete combustion, and there is a high likelihood that other incomplete combustion products such as ethylene may be present as well.

Therefore, when operating properly, an atmospheric or fan powered boiler should produce very low levels of carbon monoxide (< 50 ppm in the exhaust stream). In addition, a $CO_2$ sensor in the growing environment(s) should be used for alarm purposes, and optionally for control.

## Liquid $CO_2$

Liquid $CO_2$ is usually stored in large pressure vessels and introduced as a gas into the greenhouse environment by electronically operated valves. A potential overdose could occur if a valve malfunctions, is accidentally left in the manual on position, or if there is a break in the line. To minimize the potentially dangerous effects of such a malfunction, a mechanical restrictor or pressure safety valve must be used at the tank outlet to ensure that the maximum possible flow rate from the $CO_2$ system is no greater than the maximum required flow rate under normal dosing conditions.


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A pressure safety valve will also reduce or cut off the flow if a drop in line pressure indicates a line break. Physical restrictors should also be used in the branch lines for each enclosed compartment. In addition, a $CO_2$ sensor in the growing environment(s) should be used for alarm and shutdown purposes, and optionally for control.

For maximum human safety, you may wish to use one sensor system for dosing control, and another, independent sensor unit for alarm and shutdown purposes.

If you're currently using $CO_2$ supplementation or planning to use it, take some time to consider these safety issues.

## *Safety Checklist*

- Does your CO burner have adequate air for combustion?
- Do you service your equipment each year prior to operation?
- Do you regularly inspect your CO distribution system and valves?
- Is your system physically designed (for example, flow restrictors) to prevent overdose?
- Do you have a contingency for system failures?
- Do you perform regular safety inspections on your dosing equipment?
- Do you have alarm sensors to warn you of possible problems?
- Are the alarm sensors in good working order?
- Do your workers understand what these alarms mean?


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# Practicing Safe CO2


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# A Note About Your CO2 Sensor

Most growers experience very few problems with their $CO_2$ sensors under a wide range of operating conditions. However, we do see occasional problems with premature sensor failure.

While Argus will replace any sensors during the one-year warranty period due to manufacturing defects, we cannot be responsible for sensor failures or any subsequent losses caused by contaminated or improperly installed and maintained sensors.

Please read the following to make sure you get the maximum benefit and safety from your sensor.

## *Sensor Selection*

Argus supplies carbon dioxide sensors that are selected to provide optimum, durability, longevity, and accuracy with a minimum of maintenance. In general, $CO_2$ sensors are expensive and are not easily repaired. Since a $CO_2$ sensor must be exposed to the air in the target environment, it is susceptible to any impurities that may affect its accuracy and life.

Although the sensor may employ various filtering elements, certain gases, fumes, or micro-fine materials such as dusts or smoke particles may penetrate, depositing or precipitating on the sensing elements. This may result in a loss of accuracy and/or eventual sensor failure. In addition, corrosive gases in the air, such as sulfur, chlorine, or bromine may corrode the sensor components reducing the life and accuracy of the sensor.

To obtain the maximum performance from your sensor we recommend that when you are performing activities such as pesticide spraying, dusting, fumigating, or wash down, you either temporarily remove it from the environment, or seal the enclosure tightly against moisture and air penetration.

Even with the best of care, **all $CO_2$ sensors are subject to eventual drift and failure**. They should be periodically checked against a known standard, re-calibrated if applicable, and replaced when recalibration is no longer possible.


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# Note About Your CO2 Sensor


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# API

## Extract data and information from your Argus system to ease analysis and decision making.

This Application Program Interface (API) works as a conduit that enables programmers and expert users to capture information from the Argus system to help them build and manage their own tools for analysis and decision making.



### Advantages of the API

Data Management - Efficiently manage your system's data for analysis, and access real-time information about your system.

API Out Only - Users can retrieve information (GET only) from their own system to use for data analysis. Users determine the elements they want to display, and data is returned in a string (date/time, parameter, data)

Secure Authentication - The information on your Argus system is secure while using the interface. An Argus username and password are required to use the API, and only users with the correct privileges will be authorized to use it.

HOW DO I SUBSCRIBE?

1. Upgrade to Titan 900 (V 9.0.8 or newer).

Not on Titan 900? Don't worry! Go to argus-hub.com to begin the subscription process, and our service team will guide you step by step on how to upgrade your system.

2. Go to argus-hub.com and create a username and password.

3. Select API and follow the instructions to link your site and complete the sign-up process.

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# Email Out

## Receive notifications, reports and alarms from your Argus system anywhere, anytime.

Email Out is an optional feature that sends real-time updates and regularly scheduled summary reports of conditions within your controlled environment.

### What information will I receive with Email Out?

- Regular summaries of important system data including alarm logs, sensor data and audit trails.
- Event-driven notifications configured for alarm conditions detected by the Argus system.
- Additional reports, such as climate conditions, weather readings and equipment status.
- Alarm notifications when the Argus email server stops receiving communications from your Argus system.

### Configure Email Out to your needs

- Cloud-Based Email Notifications - Easy and simple to configure Email Out a cloud server.
- SMTP–Based Email Notifications - You can also use your own email server if you already have one in place, or if you prefer an alternative to a cloud server.
- Heartbeat Monitoring – Configure your control system to send a heartbeat message to the Argus cloud or SMTP server at specified intervals. Heartbeat monitoring provides constant evaluation of the health of the cloud link and current availability of the Argus system to generate alarms



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2. Go to argus-hub.com and create a username and password.

3. Select Email Out and follow the instructions to link your site and complete the sign-up process. Setup fees will apply.

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# ARGUS LIVE




**With a live view of your operation, you can monitor, analyze, and run your facility in real time, giving you full control whether you're at your desk or on the move.**

**Argus Live™ is a safe, secure and powerful enhancement to one of the most advanced environmental control systems on the market.**

### Manage your operation on the go

- Use your computer or mobile device to connect remotely to your facility
- Quickly access your settings and controls
- Easily equip your entire team with access to Argus Live

### Real Time Data for Faster Decision Making

- See your entire operation in real time
- Receive and respond to alarms immediately
- Change operating parameters to optimize production

### Cut Through the Clutter

- Personalize your dashboard for a focused view of critical information
- Customize the way you see data with versatile screens and intuitive graphics

## FEATURES

### Smart and Interactive Dashboard

Customize your Argus Live dashboard to ensure you can access the most essential information of your operation, including:

- Environmental conditions in every controlled zone
- System status, including HVAC, lighting, shades, vents and more
- Alarm notifications and status
- Irrigation and fertigation schedules
- Outside weather information

### Personalized Settings

Completely customize Argus Live to suit the needs of your operation, from personalizing the interface to controlling your facility's settings to keep your operation running smoothly.

### Intuitive and Informative Graphing

Create graphs based on multiple inputs with Argus Live's user-friendly interface, which adapts to your mobile device for easy viewing and adjustment. You can also define and implement the type and number of graphs you wish to see.

### Customizable Display

Configure each section to prioritize the information you want to see and select how you want your data to be displayed through visual tools like graphs, tables, dials and gauges.

ARGUS HUB

### Manage Your Account with Argus Hub™

Argus Hub is an easy-to-use online tool that lets you monitor user activity, manage payments and sign up for all Argus Controls' subscription-based products and services.

**Sign up at argus-hub.com**

**To learn more, visit argus-live.com**

# Report Generator

## Analyze your data and quickly create reports for easy decision making.

Report Generator is a tool that allows you to easily select data from your Argus system, manipulate that data and display the information in an easy to use report format. With the Report Generator it is easy to detect areas of improvement and define strategies for your operation as well as sharing relevant reports with different agencies or governmental offices.

### Reduce time to analyze information

With the Report Generator you can easily select the information you want to include in your report. Once the report is generated, you will have the exact information you need with precise and concise information.

### Generate relevant information for decision making

Accesible and clear information from your system is key for decision making. With the Report Generator, you will be able to evaluate your equipment's performance, usage, and efficiency in different timestamps/situations in the process. Also, you will be able to extract information from the data (mathematics statistics average, highest, lowest, sum) per different date periods and understand what is happening with the process.

### Some of the reports you can generate include:

- Hydro & Electric Monitoring
  - Lights: Daily & Weekly Sums of kW/hr
  - Pump: Daily & Weekly Sums of kW/hr
  - Irrigation: Water usage
- Light sums per zone
- Equipment usage/efficiencies/costs
- See the operating costs of your organization



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Report Generator, Nov2019, MK0122, rev 00 I © 2019 Argus Control Systems Ltd. Argus is a registered trademark of Controled Environments Limited. I www.arguscontrols.com

# Daily Light Integral Control Program

This control application is used specifically for managing and standardizing the total daily light delivered to greenhouse crops.

It measures and calculates the Daily Light Integral (DLI) at the crop level, using a new algorithm to predict the available natural light as the basis for supplementary lighting control.

This program delivers standard DLI despite daily and seasonal weather variations and ensuring optimal use of electrical energy and lamp resources.

## Applications

Despite many advances in greenhouse designs and equipment, light is at best a partially controlled variable for most greenhouse horticulture applications.

Although photons provide the basic energy units that drive all plant growth processes, we are still at the mercy of the sun and seasonal weather patterns.

Even with the addition of supplementary lighting and shading systems, it is difficult to provide an exact amount of daily light given the unpredictability of weather and the seasonal fluxes in solar radiation reaching the crop.

Traditional supplementary lighting strategies have focused on photoperiod extension and maintaining minimum light intensities. While these types of lighting strategies are useful, they are not an effective way to provide a uniform amount of daily light.




## Features

- **Reducing Energy Costs-** Reducing your energy costs depends on whether you were previously under or over lighting with respect to the DLI target for your crop. DLI control is a different way of measuring and proportioning the amount of light that plants receive.
- **Improving Crop Yields** – Control over the growth cycle can lead to larger crop yields and better results.
- **Predictable Results** – Researchers have established minimum DLI levels for several commercial crops. If light levels fall below these amounts, sub-optimal growth and production can occur. DLI allows you very predictable crop results.
- **Better Quality** – Using DLI improves consistency with better control over greenhouse light and manages the daily amount of light leading to a stable quality in your plants.
- **Improved Timing** – Controlling DLI can lead to faster, better results to help reduce your research or growth cycle.

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# Operation

The **DLI** control program is used to regulate the **Photosynthetically Active Radiation** (PAR) spectral range of solar radiation. It predicts exact amounts of daily light required to enhance growth rates and save energy for systems using supplementary lights.

The **Argus DLI Control Program** begins with a target DLI and a predicted maximum DLI from sunlight based on the time of year, the location, and the light transmission efficiency of the greenhouse.

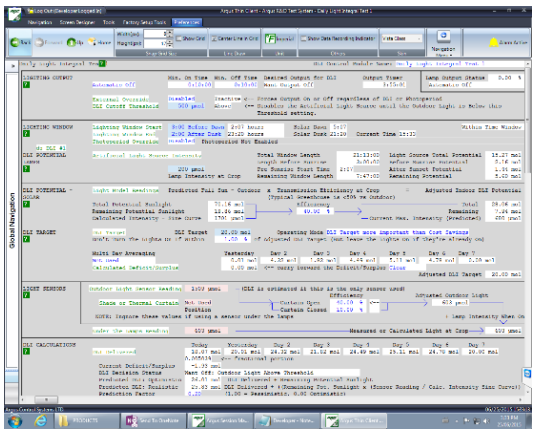
Rather than rely on weather forecasts or external connections to forecast data, the program is fully self-contained. It calculates the potential available DLI from a **Seasonal Light Intensity Model** running natively on the Argus system.

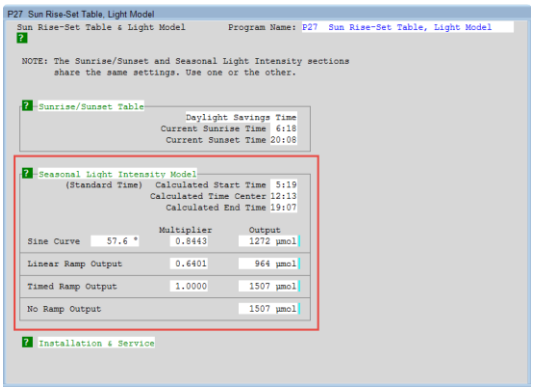
This model calculates the dawn to dusk solar intensities for each day based on the predicted weekly maximum PAR intensity values at midday for your location and time of year.

The DLI program updates its predictive calculations throughout the day by comparing the actual light received by the crop to the potential light (the amount of sunlight potentially available on a clear sunny day).

Surplus light can be forwarded into the next day's calculations to produce an accurate multi-day average DLI even when there are some variations between days.

Supplementary lights are only operated when the program determines there is a high probability that the DLI Target cannot be achieved using the remaining sunlight potential.






In this way, it is possible to deliver an accurate, repeatable DLI while using as little purchased energy and lamp operating hours as possible.

To further increase overall accuracy and reduce energy use, the program can optionally compensate for any daily deviations between the actual DLI delivered and the DLI Target by carrying forward a rolling average for up to 7 days.

# Additional Information

For more information, please contact Argus Support.

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