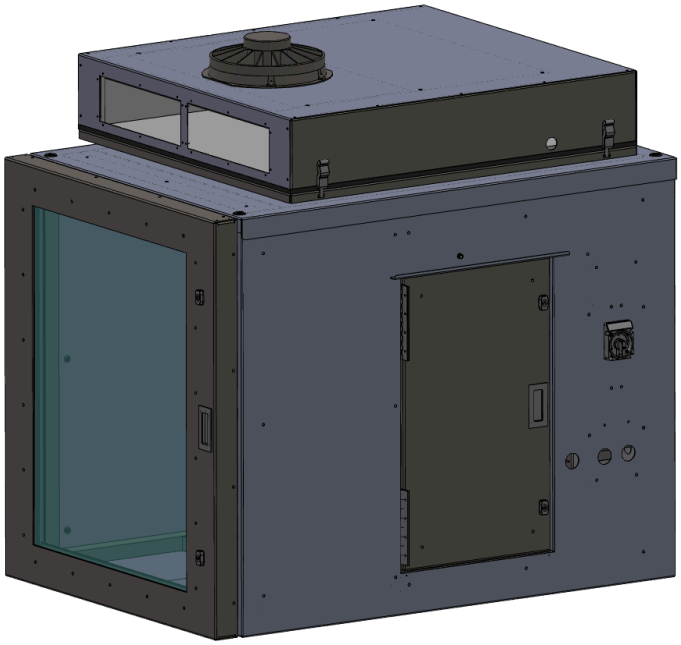
DISPLAY DEVICES
*Design • Engineering • Manufacturing*

# 2050S PROJECTOR ENCLOSURE

*DDI Assembly* #8105-05700



## Installation & Operations Manual

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# Introduction

DDI enclosures are designed and engineered to safeguard digital AV equipment through a variety of environmental conditions. With proper maintenance, your investment will last longer using the custom environmental control system by keeping equipment comfortably within operating conditions even in the harshest environments. This document provides information on how to properly install, operate and maintain your enclosure and effectively protect the equipment inside.

**Key Features:**

- **Custom HVAC:** a custom air conditioning and heating system, ensuring that the internal temperature remains consistent and ideal for your equipment.
- **Environmental Control and Monitoring**: state-of-the-art monitoring systems that allow you to track and adjust the conditions inside. A variety of connectivity methods are available including wireless 4G/5G options.
- **Electrical Distribution Panel**: The built-in electrical distribution panel simplifies power management, making it easy to power all devices within the enclosure.
- **Custom Devices Panel**: The enclosure contains a custom devices panel that accommodates a wide range of devices.
- **Web-Based Environmental Monitoring**: Access real-time environmental data such as temperature, humidity, and other critical parameters, through a dedicated website when connected to the internet.
- **Local Data Connections**: Locally control and access environmental data via RS232 or TCP/IP commands. This feature ensures that you can make instant decisions and adjustments as desired.
- **All-Weather Insulation**: Includes premium insulation to maintain a consistent internal climate, ensuring your equipment is protected in all environments.
- **Double-Paned Windows**: Gas-filled, double-paned window reduces condensation buildup and mitigates image obstruction.
- **Sturdy and Durable Construction**: Our enclosures are built to last and are made from high-quality aluminum that can withstand any outdoor environment.

# Enclosure Installation

**Transportation:**

- Transport the enclosure in its original shipping crate for long distances.
- Position it near its permanent location prior to removing the enclosure from its crate.
- A certified forklift or crane operator should handle all moving tasks.
- Always ensure that qualified personnel perform installation using appropriate equipment.

**Lifting Points:**

- Always use all four lifting points when lifting the enclosure (see Figure 1)
- Keep the sling angle at 45° or greater and avoid lifting in windy conditions.
- Use suitable lifting hardware with a thread depth of at least ⅝”. Refer to enclosure specifications for further details.

**Note:** It is highly recommended to avoid lifting with the projector inside the enclosure, as the movement of the enclosure during lifting may cause damage to the projector and projector components.

**Installation and Mounting:**

The enclosed information and engineering drawing(s) offer a general overview of the enclosure. For specific mounting details, refer to the engineering drawing(s) provided with the purchased enclosure. Mount the enclosure to a structure approved for the rated loads of the enclosure and its associated equipment. Further information can be found in the top-level drawings provided with the purchased enclosure.

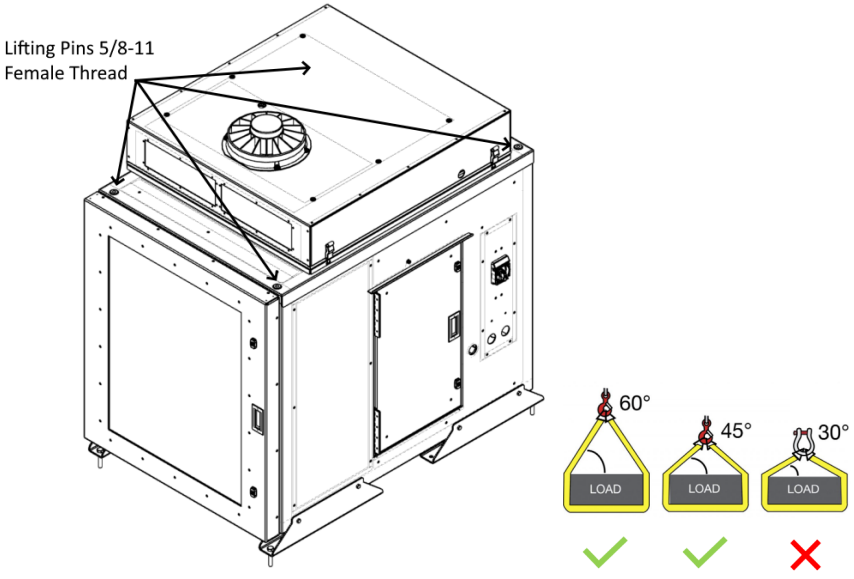


**Figure 1 Enclosure Exterior**

# Enclosure Access

The enclosure has two access points: front door and the side auxiliary door.

## Front Door Access

The front door provides access to the front of the projector and projector mount adjustments. It is also used for accessing the projector lens and window. The front of the enclosure features a low iron double-pane window and two compression latches (see Figure 2).

Opening the front door:

1. Insert an 8mm (5/16in) Allen wrench into each cam lock located on the front surface of the door
2. Rotate counterclockwise a half-turn for each lock.
3. Carefully open the door.

When closing the door, ensure that both latches are securely locked and that the door is firmly fastened.  Verify there are no visible gaps or inconsistencies between the door and the enclosure.

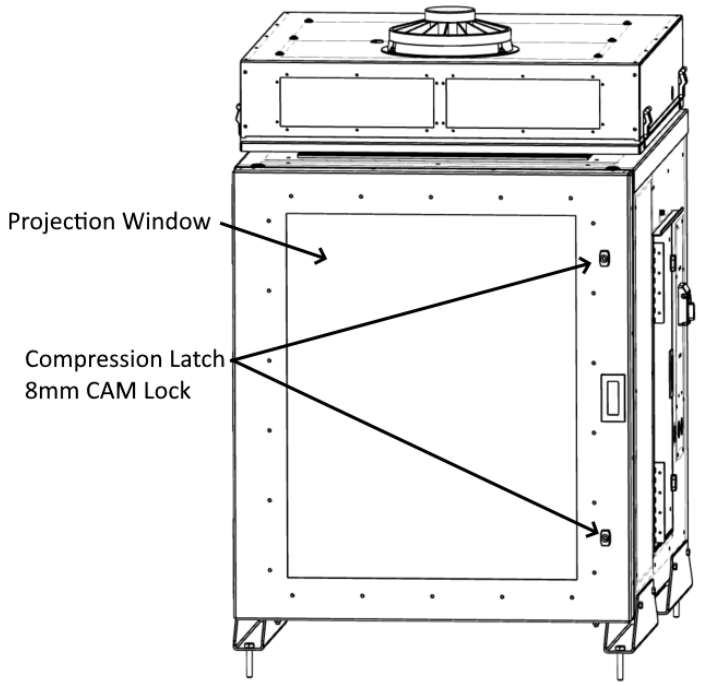


**Figure 2: Enclosure Exterior**

## Auxiliary Access Door

The auxiliary door uses the same locking mechanism as the front door (see Figure 3).

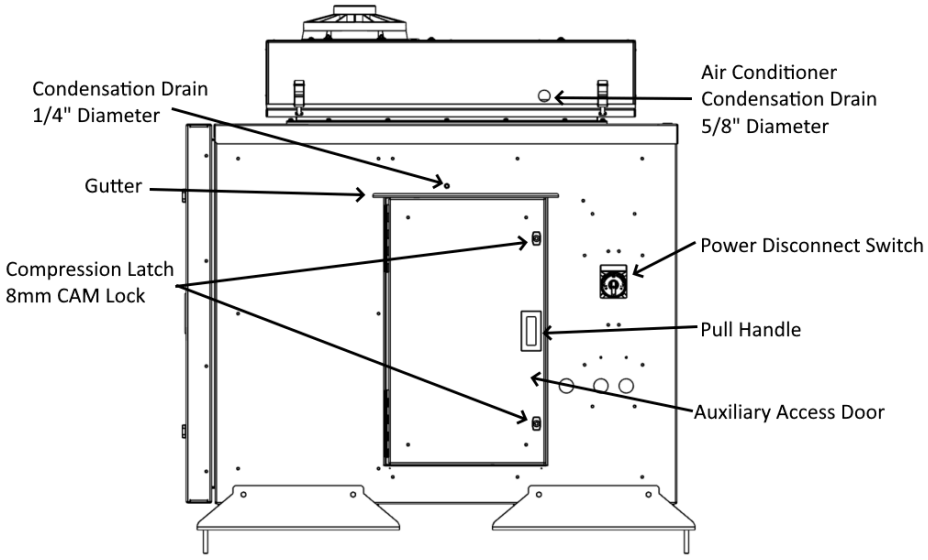


**Figure 3: Enclosure Exterior**

To open the auxiliary door, insert a 8mm (5/16in) allen wrench into each cam lock and rotate counterclockwise a half-turn, then carefully open the door. When closing the door, ensure that both latches are locked and that the door is securely fastened. Check for inconsistent gaps between the door and enclosure.

When the door is closed, both latches must be fully engaged, pulling the door inward. Give the pull handle a gentle but firm pull to ensure that neither the upper or lower latches are loose.

There are two 5/8” inside diameter holes for condensation drains from the air conditioner (see Figure 3). A flexible pipe runs from the air conditioner and exits this hole. The customer can choose to leave it as-is or connect their pipe to route the water away from the enclosure.

- There is no access to the enclosure from the rear or left side of the enclosure.

# Incoming Connections

This section provides detailed information about the external power and data connections located on the right-hand side of the enclosure.

## Data Connection Penetration

The enclosure features one penetration point for accommodating data lines.

## Power Sources Penetration

Above the incoming power source, there is a power cutoff switch for maintenance purposes. Please note that power will still be present at the switch unless the feeding breaker is open. Ensure to follow all lockout-tagout procedures when performing maintenance on the enclosure.

The enclosure relies on two separate incoming power sources:

- 20A Service for Environmental Control System (ECS) and User Devices
- 30A Service for projector
- Voltage: This service requires two power sources each at 208 or 240 VAC.

For visual representations and the exact placement of these components, please refer to Figure 4 in this manual. Always prioritize safety precautions and guidelines during the connection process. For more in-depth information on specific components or procedures, consult the corresponding sections within this manual.

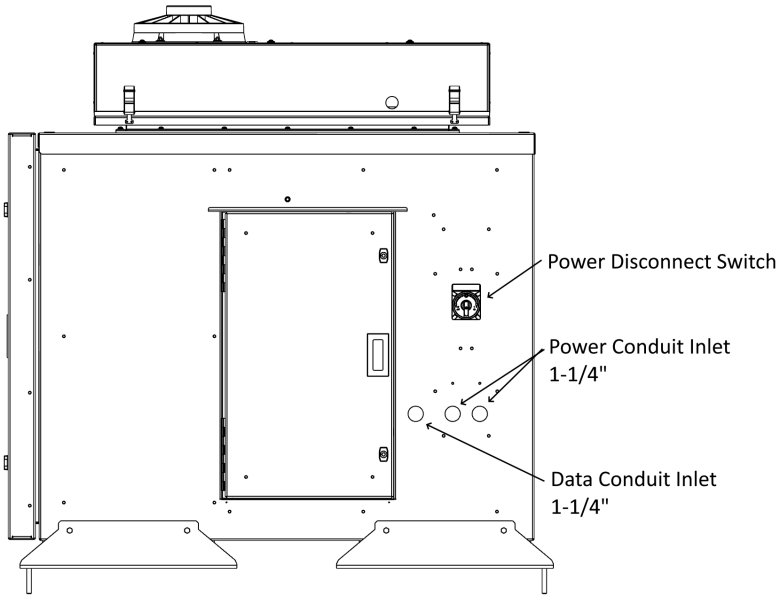


**Figure 4: Enclosure Exterior**

# Enclosure Interior

## Interior Components

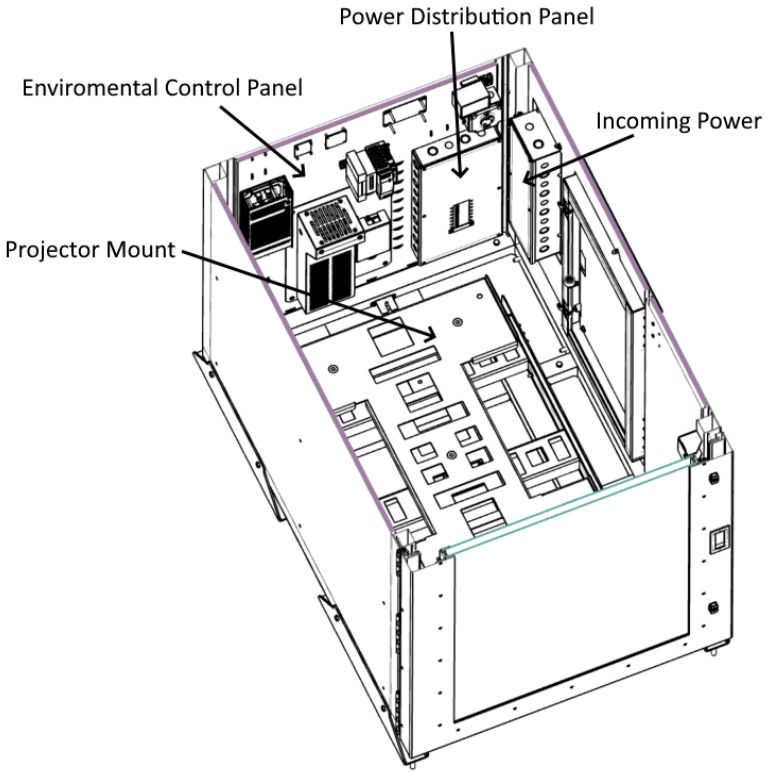


**Figure 5: Enclosure Interior**

The interior of the enclosure hosts several essential components to ensure optimal functionality. These components include:

1. **Projector Mount Assembly:** This component is responsible for securely holding and positioning the projector within the enclosure. The mount is on sliders and can be moved through the front of the enclosure. Use the slide latches to make sure it is securely retracted after maintenance. Alignment of the projector may be necessary after adjustments have been made.

2. **Environmental Control Panel:** The environmental control panel is designed to regulate and monitor environmental conditions within the enclosure. It allows users to adjust settings to maintain the ideal temperature, humidity, and other environmental factors required for the reliable operation of sensitive equipment.

3. **Power Distribution Panel:** The power distribution panel serves as the central hub for distributing electrical power to various devices within the enclosure. It facilitates the safe and efficient distribution of power to all connected components.

*Continued on the next page.*

4. **Incoming Power:** The incoming power connection provides the primary electrical supply to the enclosure. Proper attention to this connection ensures that all components within the enclosure receive the necessary power to function correctly.

## Accessing Interior Components

To access these interior components, utilize the side access door, which provides a convenient entry point. Ensure that you follow proper safety protocols when accessing and working on these components to maintain the safety and functionality of the enclosure.

Regular inspection, maintenance, and, if necessary, troubleshooting of these interior components are crucial for the continued performance and longevity of the enclosure and its associated equipment. Refer to the respective sections of this manual for detailed instructions on servicing and maintaining each component.

## Condensation Pan

The condensation pan protects the equipment by directing the accumulated condensation and giving it a path outside of the kiosk.

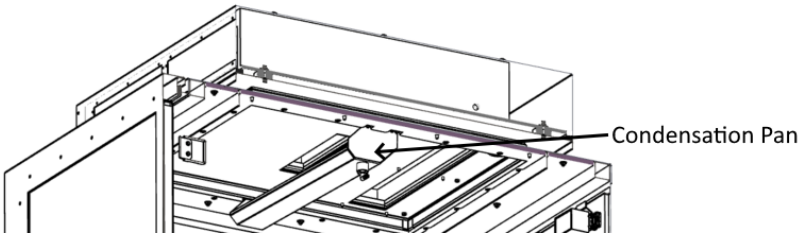


**Figure 6: Enclosure Interior**

A condensation pan is located within the enclosure that connects to the condensation drain, by a 1/4” inside diameter tube (see Figure 6). It is important that the drain and the gutter remain free of debris or obstructions.

# Projector Mount

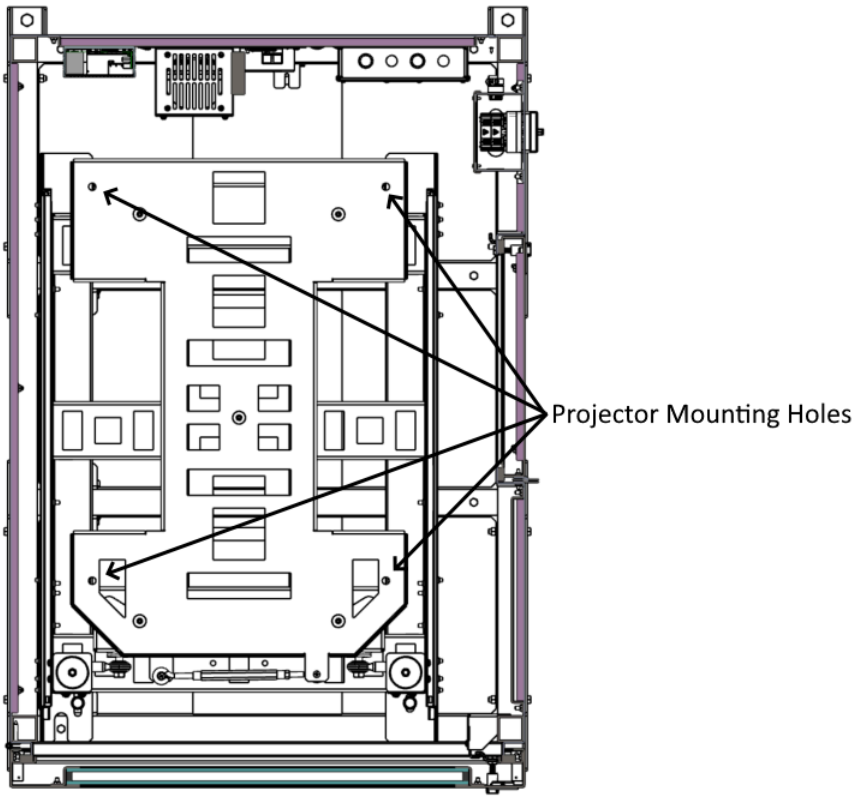


**Figure 7: Enclosure Interior**

## Installing and Uninstalling Projector

Installation:

1. Once the front access door has been opened, locate the slide lock release on the front of the drawer slides (see Figure 7).
2. Extend the projector mount slides from the front of the enclosure by pressing the slide lock release and gently pulling the projector mount out (see Figure 7).
3. Once the projector mount has been extended, align the projector and projector mount holes.
4. Once the projector is aligned to the mounting holes, use the bolts recommended by the projector manufacturer to secure it to the mount, inserting bolts from below.
    a. Do not fully tighten any screws before aligning all mounting holes.
5. Once the projector has been securely fastened, it can be repositioned into the enclosure. Verify that the sliding mechanism is securely locked in place prior to closing the door.
6. The process of uninstalling the projector is analogous to the process of installing a projector, but in reverse order.

## Projector Alignment

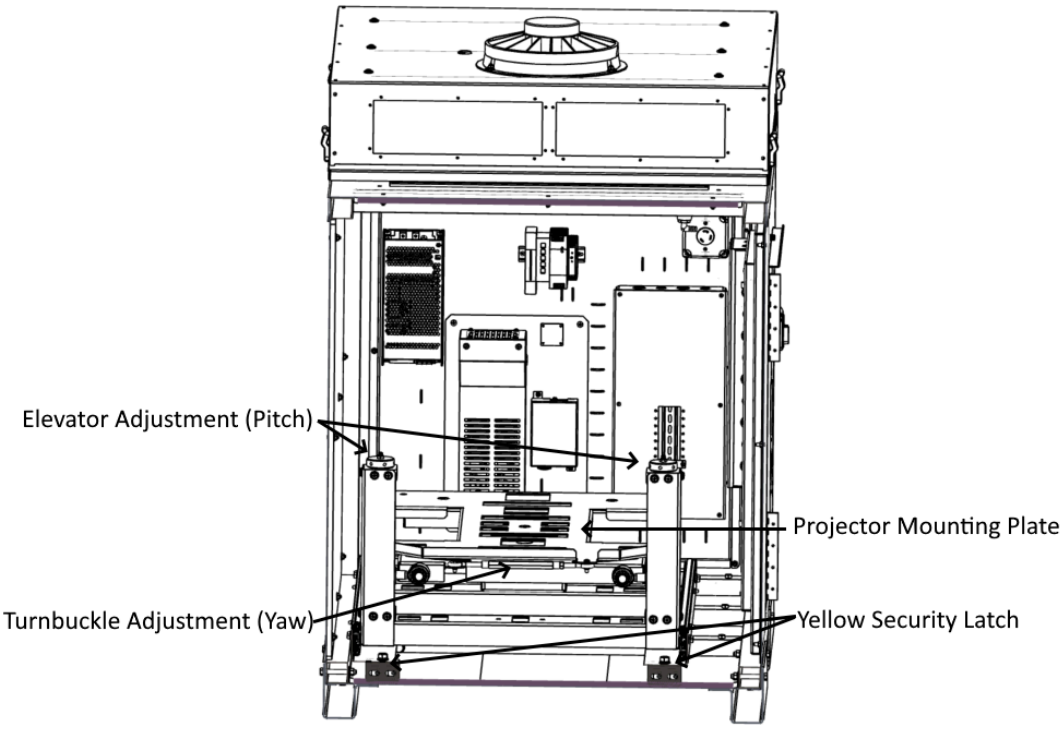


**Figure 8: Enclosure Exterior (Front Door Open)**

## Projector Mount Adjustments

- The turnbuckle and lift adjustment handles are designed for adjusting the projectors' position and aim.
- Pitch Adjustment: You can adjust the pitch by rotating the right and left elevator adjustment knobs either clockwise or counterclockwise. It's crucial to adjust both elevator adjustments simultaneously to maintain a level position. If you encounter resistance when turning the knobs, ensure that the adjustments are at an equal level to avoid straining the mechanism.

Note: Severe height differences could potentially damage the projector platform.

- Yaw Adjustment: Rotate the pan turnbuckle to change the yaw position to either the left or right.

# AC Monitoring System

## Functional Description of 3P A/C Controller

This controller essentially functions as an internet-connected thermostat, providing a relay output similar to most standard thermostats. When the relay is closed, it activates the AC unit. The communication protocol is compatible with our other units and can be connected to our utility program and cloud server.

The controller consists of three components: The RPI touchscreen, the master board, and the slave board.

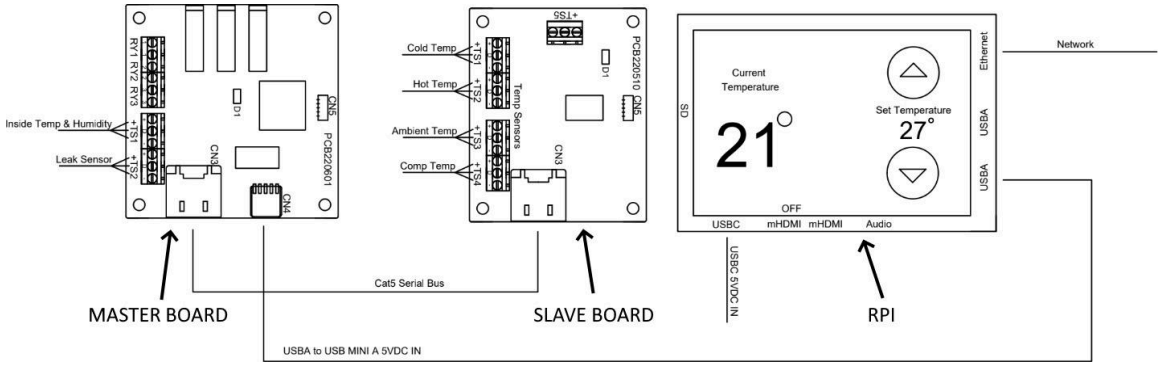


**Figure 7: 3P A/C Controller (Front Vlew)**

**RPI:** This component connects to the internet through either an Ethernet cable or WiFi, and the IP address can be set to the user's network. A USB cable runs from the RPI to the master board. The touchscreen serves as a basic operator interface, displaying feedback such as temperature or errors. It also includes buttons for changing the AC on/off setpoint. Any other settings, such as heat on/off or hysteresis, can be adjusted using the utility program.

**Master Board:** The master board connects to the RPI using a USB cable and to the slave board using a standard Ethernet cable. It features three relays that, when closed, activate the AC unit, heater, and fans. The fans automatically turn on when either the AC or heater is engaged or when circulation is needed but not warm enough to trigger the AC unit. These relays are 1 amp normally open and are designed for control signals, capable of handling both DC and AC voltages. The board has two connectors for sensors: one for the main enclosure internal temperature sensor and the other as a spare. The main sensor serves as both a temperature and humidity sensor, while the second connector is for a water leak sensor.

**Slave Board:** The slave board connects to the master board using a standard Ethernet cable. It can accept up to five temperature sensors, including ambient, compressor, hot gas, and cold gas sensors. There is a fifth sensor input that is currently unused. While ambient should always be used, the others are optional. Even if no sensors are utilized, this board must be part of the system and connected to the master board.

## DDI Environmental 3P Operator Panel

There are three ways in which data can be accessed and processed by the DDI environmental control system:

1) External telemetry systems can be connected to a TCP port and utilize a protocol to configure and receive data. The protocol is contained later in this document.
2) The operator interface of the environmental unit can be accessed locally. Additionally, the interface can be controlled via a touch screen.
3) A standard browser can be used to log in from any location, performing the same functions as the operator screen.

### Operator Panel Explanation

The following images and descriptions are intended for local control.


**Figure 8: 3P DISPLAY**

The LED on the controller indicates the presence of an active TCP connection between the remote system and the controller. The air conditioner's cooling turn on set point can be adjusted by using the up and down button on the display. The display shows the current internal temperature of the PJE, and it also displays the current internal humidity (RH).The bottom center location indicates the current state of operation of the unit. The temperature at which Air Conditioning (A/C) is activated is referred to as the set point temperature.



**Figure 9 & 10: 3P DISPLAY**

The *"Water Leak"* status indicates the presence of water at the base of the enclosure. The *"Inside Bad"*status signifies that the primary internal temperature sensor is malfunctioning, resulting in inaccurate readings. Conversely, if the top LED is illuminated red and the *"Inside Bad"* status does not appear, then other internal sensors, such as the ambient or compressor, may be malfunctioning. The *"Comm Bad"* status signifies that the display is unable to communicate with the Main or Slave board.

## System Modes of Operation

The subsequent chart provides a visual representation of the diverse operational modes available within the environmental control system. It is important to note that the values displayed within parentheses on the chart indicate the default settings, which may be modified to suit specific requirements or conditions.

Before initiating any tests or operations, it is highly recommended to thoroughly review the configuration data to confirm the current settings and ensure they align with the intended objectives. This proactive step helps prevent unexpected outcomes and ensures that the system operates in desired manner.

If there is no integrated heater within the enclosure, the *"Heater On"* mode serves as a valuable indicator that the enclosure's internal temperature has fallen below the predefined heater activation threshold. This serves as an early warning of temperatures that may be unsuitable for the projector, allowing users to take appropriate actions to prevent any adverse effects on the installed equipment.

The *"Cut-off"* mode should be understood as a crucial aspect of the system. It is important to note that this mode does not interrupt power to the projector. Instead, it serves as a signal for a critical situation that requires immediate intervention. When the system enters *"Cut-off"* mode, it indicates the presence of an issue that demands prompt attention and resolution to ensure the system's continued operation and the preservation of the equipment it supports.

| ENVIRONMENTAL CHARACTERISTICS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mode | Function | Sensor | Operation | Levels | Fans | A/C | Alarm Level | Cut-Off Level |
| 1 | Normal | Internal Temp | <= | A/C Turn On Level (25C) +- Hysteresis | OFF | OFF | OFF | OFF |
| 2 | Heater Turn On | Internal Temp | <= | Heater Turn On Level (10C) +- Hysteresis | ON | OFF | OFF | OFF |
| 3 | A/C Turn On | Internal Temp | >= | A/C Turn On Level (25C) +- Hysteresis | ON | ON | OFF | OFF |
| 4 | Alarm Level | Internal Temp | >= | Alarm Level (40C) +- Hysteresis | ON | ON | ON | OFF |
| 5 | Cut-Off | Internal Temp | >= | Cut-Off Level (45C) +- Hysteresis | ON | ON | OFF | ON |

Note: There is no power cut-off on this unit, but if temperatures go above cut-off level (Critical Alert) it will report the error and mode 5.

## Environmental Test Recommendations

The system maintains the projector inlet air temperature <31C (87.8F) when outdoor temperatures were raised up to 47C (116.6F) outside ambient air temperature.

## DDI Environmental Communications Protocol 3P

The format is Ethernet TCP to Port 9761, which can be forwarded by the local router. The syntax of the command is plain ASCII, with comma-delimited fields, and carriage return is terminated.

## Usage Notes

- Only send messages that are relevant to the specified configuration. The protocol is for a single A/C unit; some sensors, including evaporator and hot gas sensors, may not be available due to the design of the system.
- When the General Status is changed, messages are automatically returned to the host, with the feedback message being #5.
- It is advised that no more than one instruction per second should be sent to the controller.

## Host to Controller Messages

**General Status Request – Code 105**

Function Code
Example 105 <CR>
Request general status information – Send up to once per five seconds or slower.

**AC Unit Status Request – Code 106**

Function Code, 1
Example 106,1 <CR>
Request status of AC Unit 1, fixed to 1 in 3P protocol.

**System Error Request – Code 107**

Function Code
Example 107 <CR>
Error state of various components in enclosure.

**Water Present Request – Code 111**

Function Code
Example 111 <CR>
Request state of water present sensor.

**Request Controller Firmware Version – Code 113**

Function Code
Example 113 <CR>
Request controller firmware version number.

**Request Evaporator Temperature – Code 116**

Function Code, 1
Example 116,1 <CR>
Returns cold side temperature

*Continued on the next page.*

**Request Condenser Temperature – Code 117**

Function Code, 1
Example 117,1 <CR>
Returns hot side temperature

**Reset Timers – Code 119**

Function Code, 1 (Must be 1)
Example 119,1 <CR>
Reset timer Compressor usage timer.

**Request Timer Feedback – Code 121**

Function Code
Example 121 <CR>
Returns 2 Timer Readings: Total Time and Compressor Time

**Controller Configuration – Code 130**

Function Code, Setting Number, Configuration

| Setting Number | Configuration values |
|---|---|
| 1-Turn on AC temperature | 11 to 39 C |
| 2-Turn on Heat temperature | 1 to 10 C |
| 3-Hysteresis (AC only) | 1 to 6 C |
| 4-AC Turn On Delay | 0 to 6 Minutes |
| Example 130,1,24<CR> | (Turns on AC at 24 C) |
| Example 130,2,10<CR> | (Turns on Heat at 10 C) |
| Example 130,3,2<CR> | (sets AC hysteresis to 2 C) |
| Example 130,4,1<CR> | (sets delay time for AC turn on to 1 minute) |

**Request Configuration Setting – Code 131**

Function Code,Setting Number 1 to 4
Example 131,2 <CR>
Request setting for heat turn on.

# Maintenance

**Disclaimer:** Warranty does not cover any damage caused by blocked or dirty filters to the enclosure or the air conditioner unit. Furthermore, warranty does not cover maintenance such as filter checking and cleaning; this is the responsibility of the customer. In the event that the enclosure is not covered by warranty or service agreement, the customer is solely responsible for monitoring the enclosure and the air conditioner, as well as any necessary maintenance, and is liable for any associated costs and repairs.

## General Routine Maintenance

- Examine the exterior of the enclosure for any signs of damage, corrosion or rust.
- Ensure that all filters and coils are free of contaminants.
    - Clean or replace filters as needed.
- Ensure that all drain holes are free-flowing and clean.
- Inspect all mounting bolts and ensure that they are securely fastened.
- Test the HVAC system.
    - Ensure that all fans are functioning correctly and in good working order.
    - Make sure the heater is functioning correctly and that it turns on at the set temperature.(typically 10C)
    - Check to make sure the air conditioner turns on and off at the set temperature. (typically 25C)
    - Examine whether the air conditioning unit produces cold air when operating.
- Ensure that the interior is free of dust and debris that may have built up.
    - Remove all dust and debris from surfaces and components with the use of a vacuum cleaner or air compressor.
- Windows should be clean and free from chips and cracks.
- Examine the door seals, as well as the exterior and interior surfaces for any signs of water ingress.
    - Examine internal surfaces for signs of water infiltration.
- Examine all conductors for pinch points, corrosion, and irregular routing.
    - Identify and secure any loose electrical wiring.
    - Wires should be inspected for any signs of damage.
    - Reroute and secure any pinch points.
    - Examine the wires for any loose or irregular connections and resolve the problem.

# Specifications

## Air Conditioner

| | |
|---|---|
| Cooling Capacity | 6.5kw/22,100BTU |
| Voltage | DC 24V |
| Current | 65A(24V) |
| Air Flow Volume of Evaporator | 1900M3/H |
| Compressor | DC-powered |
| Controller | Digital/Manual |
| Refrigerant | R134A |

## Eye Bolt Requirements

| | |
|---|---|
| Lifting Capacity | 4,000lbs |
| Specification Met | ASTM A489 |
| Diameter | ⅝” |
| Thread Count (per inch) | 11 |
| Length | 1 ¾” |

## Enclosure

| | |
|---|---|
| Weight | 750lbs |
| Weight Including Projector | 950lbs |
| Dimensions | See mechanical drawings |

# Notices

## General

Display Devices provides this document without warranty, whether expressed or implied, but not limited to the completeness, merchantability or fitness for any purpose. Display Devices withholds the right to modify and/or change the products(s) design or documentation without prior notice.

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# Customer Support

If you need technical support or have any inquiries, you may contact Display Devices via phone, email, or postal service. Kindly ensure that you have the product's serial number and model number ready, if applicable.

**Phone**

Sales 303-412-0399 x2

Tech Support 303-412-0399 x3

**E-Mail**

Sales sales@displaydevices.com

Tech Support tech@displaydevices.com

**Mailing Address**

21075 Westgate Road
Golden, CO 80403

For more information, please visit us online at displaydevices.com.

# Troubleshooting w/ TempCont Utility Program

TempCont514 is used for configuring and troubleshooting the enclosure's environmental control system. It was specifically developed for Windows, although it may not be compatible with every Windows version. If you have any inquiries about TempCont514 or want the latest version, please reach out to DDI Tech Support.

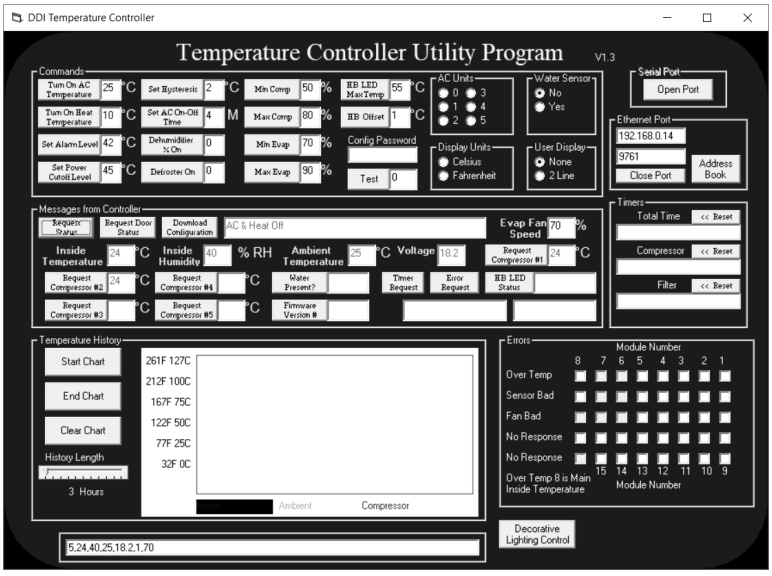
## Installation

To install the program, extract or open the TempCont514 zip file and then run the setup.exe file. Simply follow the instructions provided until the software is successfully installed. If you encounter any problems during the installation process, please reach out to DDI Tech Support for further assistance.

## Connecting Over TCP/IP

1. To connect the Environmental Control Server Module, use an RJ45 (ethernet) cable. You can connect it either to a switch or directly to the current network. If the enclosure doesn't have an Environmental Control Server Module, connect the cable to the internet port of the AC Main Control Boards. Avoid plugging it into the Control Bus on the Main Board, as this uses a unique protocol with 24v running down some of the lines. You can identify the Environmental Control Server Module by locating two RJ45 ports right next to each other.
2. Open the Temperature Control Utility Program.


3. The window below will open.



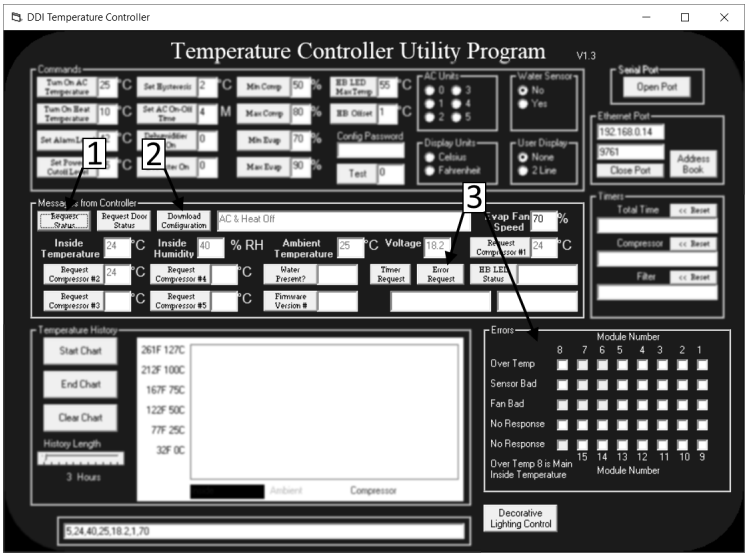

4. Enter the IP 192.168.0.14, or other if changed from default, into the Ethernet Port box.

5. Enter the port number 9761 in the box below the IP box and click on Open Port. If you face any difficulties in connecting, reach out to the person responsible for IT aspects of the enclosure or the person who set up the enclosure. Alternatively, you can contact DDI Tech Support for further assistance.
6. Once the port is opened, the Ethernet Port box will display "Close Port". However, it is important not to press the button. Check the messages from the controller for the phrase "Found Controller Port #". This message confirms that you are connected and can proceed with downloading the configuration and requesting the status.

## Using The Utility

If you have successfully connected to the Main Board, refer to the previous section if not. Feel free to contact DDI Tech Support if you have any questions.

To start, request the status and download the parameters provided below.




1. Click the Request Status button to update the Inside Temperature, Inside Humidity, Ambient Temperature, and Voltage.
2. Click the button labeled "Download Configuration" to update all the information in the Commands Window.
3. To find errors and display them in the Errors window, simply click on the Error Request button.

## Commands Window

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Turn on AC Temperature | 25 | Set Hysteresis | 2 | Min Comp | 80% | HB Led Max Temp | 55 |
| Turn on Heat Temperature | 10 | Set AC On-Off Time | 4 | Max Comp | 100% | HB Offset | 255 |
| Set Alarm Level | 40 | Dehumidifier | 0 | Min Evap | 70% | Config Password | |
| Set Power Cutoff Level | 45 | Defroster On | 0 | Min Evap | 100% | Test | 0 |

*Typical Configuration*

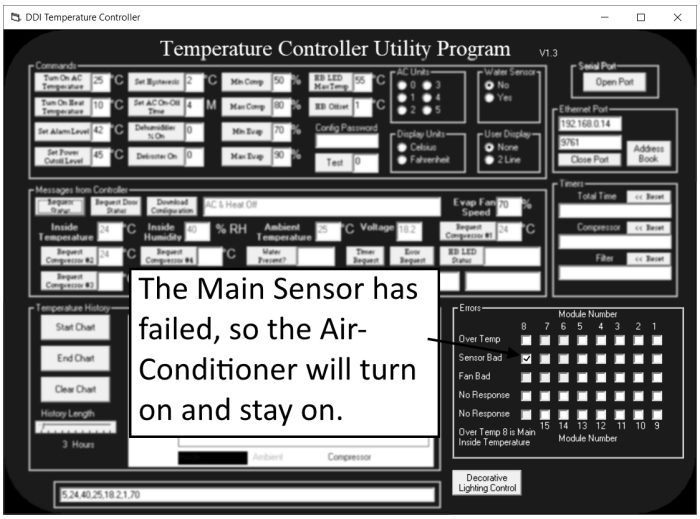
You will have access to the first column, which represents the set points of the system.

- **Turn on AC Temperature:** Parameter that indicates when the Air Conditioner will turn on.
- **Turn on Heat Temperature:** The temperature at which the heater will turn on.
- **Set Alarm Level:** The temperature that a communication alarm will be sent out.
- **Set Power Cutoff Level:** The temperature that the cutoff controller will turn off the outlets that are connected to the monitors.
- **Set Hysteresis:** Is set at 2 so the air conditioner will turn off at 23C since the set point is at 25C.
- **Set AC On-Off Time:** Is set to 4, so it will take 4 minutes for the air conditioner to turn back on once it is shut off.
- **Dehumidifier:** Is set to 0, so there is no dehumidifier controlled by the system.
- **Defroster On:** Iis set to 0, so there is no defroster controlled by the system.
- The percentage values are the min and max fan speeds in percent duty cycle of the evaporator and compressor fans.
- **HB led Max Temp:** Is set to 0, so it is not used on this environmental enclosure
- **HB Offset:** Is set to 255, and it is not used on this environmental enclosure
- **Config Password:** Is used by DDI personnel to adjust the other settings not accessible by the customer.

**Note:** The Test button is used by DDI personnel to test Enclosures.

## Error Request

To refresh the Errors Window, simply press the Error Request button while the Utility is open.




| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| Temperature Errors | Inside Enclosure | HB LEDs | | AC#5 Comp | AC#4 Comp | AC#3 Comp | AC#2 Comp | AC#1 Comp |
| Sensor Errors | Inside Enclosure | Outside Enclosure | Water Sensor | AC#5 | AC#4 | AC#3 | AC#2 | AC#1 |
| Fan Errors | | | | AC#5 | AC#4 | AC#3 | AC#2 | AC#1 |
| Modules 1-8 Errors | Heater | Cutoff #2 | Cutoff #1 | AC#5 | AC#4 | AC#3 | AC#2 | AC#1 |
| Modules 9-15 Errors | Water Present | Aux#5 (15) | Aux#4 (14) | Aux#3 (13) | Aux#2 (12) | Aux#1 (11) | Defroster | Dehumidifier |
| 2^bits | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |

- Bits are set when: Temperature errors exceed alarm point or are above compressor limits.
- Fan errors- fans with feedback register non-functional.

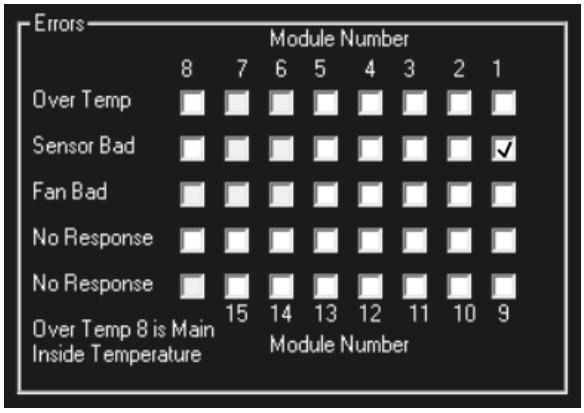
**Examples**

7,0,128,0,0,0 Main Sensor Failure or Inside Enclosure sensor failure.
7,0,001,0,0,0 Compressor sensor failure or AC #1.
7,0,064,0,0,0 Ambient or outside sensor failure.

These are examples of the protocol in use, explained more in the pages above.

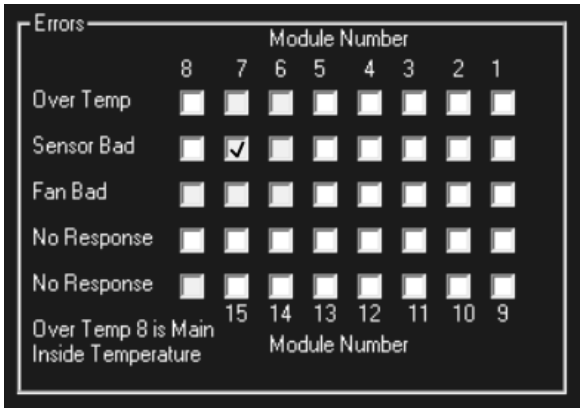
**The Compressor 1 Sensor has failed.**

7,0,1,0,0,0



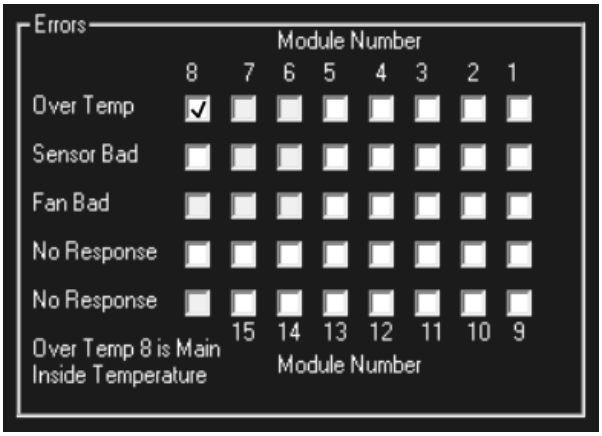

**The Ambient Temp Sensor has failed.**

7,0,64,0,0,0




**The Monitors/Projectors power is cut off due to an Over Temp error reported by the Inside Temp Sensor.**

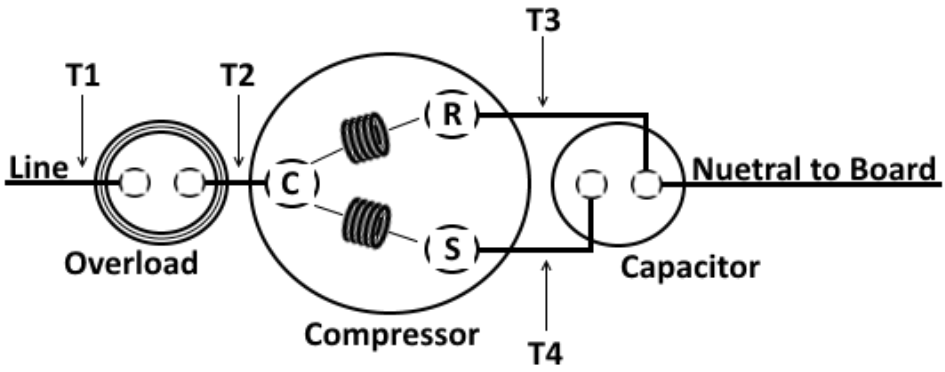
7,128,0,0,0




**Error chart**

In this representation, rows correspond to an 8-bit message, and columns represent individual bits within those bytes. Specifically, column 1 equals 1, column 2 equals 2, column 3 equals 4, column 4 equals 8, column 5 equals 16, column 6 equals 32, column 7 equals 64, and column 8 equals 128. This configuration facilitates a concise way of expressing data, as demonstrated in the three examples provided.

# Air Conditioner Troubleshooting




***Prior to taking any readings, it is imperative to thoroughly review the manufacturer's datasheet for the component in question and rigorously adhere to all recommended safety measures and precautions.***

1. When the compressor is operational, it's essential to verify the voltages between the board and the compressor circuit at T1, T2, T3, and T4 concerning either the ground (GND) or neutral. The voltage readings should align with the system's voltage level, which can be either approximately 120/240VAC for single-phase systems. If the recorded voltages do not match these expected levels at the specified test points, a systematic troubleshooting approach is recommended. For example, if T1 reads 120VAC while T2 registers no voltage, it may indicate a malfunctioning Overload Switch. Likewise, if voltage is present at T2 but absent at T3, a faulty compressor may be the cause.

2. Take off wires to check resistance. Check the resistance of c to r (1st), c to s(2nd), and r to s (3rd). If one of the measurements is open the compressor is bad.
3. Check for continuity from pins c, r, s, to GND. Make sure compressor leeds are not grounded.
4. If voltage and overload are good -check current at T1 from Neutral or GND.
    a. If high amps, it could be a locked rotor, refer to the compressors data sheet for LRA (locked rotor amps) levels.

*Continued on the next page.*

5. Check if the refrigerant is in the compressor using sight glass and or a pressure gauge.
    a. **Yellow** = Wet, leak, if the system doesn't have a good vacuum and it will also show yellow.
    b. **Green** = Dry, good, no water moisture.
6. Check by system pressure differentials. If the AC is running there should be a difference in pressure. If both sides are the same, the compressor is not running.
7. If the compressor rotor is locked you can add a start capacitor.


**Warning! Start capacitors hold a very high voltage, touching the contacts can cause severe injury or death.**

DISPLAY DEVICES
*Design • Engineering • Manufacturing*

## Maintenance LOG

| **Enclosure Serial #** | | **Date Of Install:** | |
|---|---|---|---|

| Date | Performed By | Notes |
|---|---|---|
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