

Opti-Therm[®] Rack Monitor System and Associated Equipment

Installation and Wiring Instructions Manual

Manual Part Number: H51688PA



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QUICK-START[®] is a registered trademark of CIVAcon, A Dover Company

API = American Petroleum Institute
IS = Intrinsically Safe

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1. Product Description

This manual describes the installation, operation, and troubleshooting of the Civacon **OPTI-THERM**® and Thermistor Loading Rack Monitoring Systems. It is intended to help operators, maintenance men, and specifiers understand the operation and features of the **OPTI-THERM**® system. Some of the information in this manual has come from the field experience of our sales representatives and customers. It is recommended reading this manual before installation of any equipment.

The **OPTI-THERM**® (or Thermistor) monitor is a loading rack mounted monitoring system that usually has a junction box(s) with extension cables and plugs connected to it. The **OPTI-THERM**® (or Thermistor) monitor detects and communicates an overflow condition to the loading rack control automation equipment. The **OPTI-THERM**® (or Thermistor) monitor optionally can communicate this "NON-PERMISSIVE" condition to the loading operator by way of status lights, if so equipped. The **OPTI-THERM**® (or Thermistor) monitor can also be used in fixed storage overflow monitoring situations.

An overall loading rack system contains a loading rack control monitor (**OPTI-THERM**® Model 84X0 Series, Thermistor Model 83X0 Series, or Optic Model 81X0 Series), junction boxes (Model 7500 Series), an API optic cordset and plug (Model 7100), an API thermistor cordset and plug (Model 7300), and optional ground verification devices (Model 7600, 7620, or 7720, etc.). Plug Hangers are also available. Please consult the factory for the current availability of all optional products. Thermistor and Optic signal inputs allow compatibility with the two API standard signaling conventions commonly used in the industry. Either of these signals comes from the truck/trailer mounted onboard control monitor or sensors. The Thermistor Monitor (Model 83X0 Series) can only accept thermistor type signals. The Optic Monitor (Model 81X0 Series) can only accept optic type signals. The CIVAICON **OPTI-THERM**® (or Optic or Thermistor) loading rack control monitor is designed to provide many years of trouble free service.

These CIVAICON Rack Monitor products are available in three major versions. The version that can handle both OPTIC and THERMISTOR type sensors and signals is called the **OPTI-THERM**® (Series 84X0). The other versions are the THERMISTOR (Series 83X0) and OPTIC (Series 81X0).

Each of these versions are available in 240 volt models; these models have a "S" suffix to their base model number, along with a "0240" sort code. Another model option that is available is the Canadian thermistor channel models. The Canadian models have eight (8) thermistor channels, as opposed to the standard USA models which have only six (6) thermistor channels. These Canadian models have a "C" suffix to their model number.

The final model options that are available are the four types of operator indicators. The "8X00" version has none. The "8X20" version has a RED non-permissive and a GREEN permissive indicator. The "8X40" version has a RED non-permissive, a GREEN permissive, a YELLOW by-pass indicator, and a "keyed" by-pass switch. The "8X60" version has a RED non-permissive, a GREEN permissive, a WHITE by-pass/ground verification indicator, and a "keyed" by-pass switch. See the next section of this manual for specific model numbers.

1.1 Products

All CIVACON Loading Rack Monitors are suitable for Class I , Division 1, Group D hazardous locations with intrinsically safe outputs, and housed in an Explosion Proof Enclosure. All monitors are FM approved and CSA certified. In addition, we have a European version that is CENELEC (BASEEFA) approved. Please consult the factory for the availability of this model.

Product #	Description
08100-8100	Basic Optic Rack Monitor
08120-8120	Basic Optic Rack Monitor w/ 2 lights
08140-8140	Basic Optic Rack Monitor w/ 3 lights & a by-pass switch
08160-8160	Basic Optic Rack Monitor w/ 3 lights & a by-pass switch; plus ground/verification
08300-8300	Basic 6 channel Thermistor Rack Monitor
08320-8320	Basic 6 channel Thermistor Rack Monitor w/ 2 lights
08340-8340	Basic 6 channel Thermistor Rack Monitor w/ 3 lights & a switch
08360-8360	Basic 6 channel Thermistor Rack Monitor w/ 3 lights, a switch, plus ground/verification
08300C-8300	Canadian 8 channel Thermistor Rack Monitor
08320C-8320	Canadian 8 channel Thermistor Rack Monitor w/ 2 lights
08340C-8340	Canadian 8 channel Thermistor Rack Monitor w/ 3 lights & a switch
08360C-8360	Canadian 8 channel Thermistor Rack Monitor w/ 3 lights, a switch, plus ground/verification
08400-8400	Basic 6 channel Thermistor & Optic Rack Monitor
08420-8420	Basic 6 channel Thermistor & Optic Rack Monitor w/ 2 lights
08440-8440	Basic 6 channel Thermistor & Optic Rack Monitor w/ 3 lights & a switch
08460-8460	Basic 6 channel Thermistor & Optic Rack Monitor w/ 3 lights, a switch, plus ground/verification
08400C-8400	Canadian 8 channel Thermistor & Optic Rack Monitor
08420C-8420	Canadian 8 channel Thermistor & Optic Rack Monitor w/ 2 lights
08440C-8440	Canadian 8 channel Thermistor & Optic Rack Monitor w/ 3 lights & a switch
08460C-8460	Canadian 8 channel Thermistor & Optic Rack Monitor w/ 3 lights, a switch, plus ground/verification

All twenty (20) models of the rack monitors shown above are available with a 240 volts AC input option. All switches referred to above are by-pass switches.

1.2 Voltage Selection

Depending on the model used, two different input voltages are available for installation. The standard model is rated at 120 VAC, 50/60 Hz., but a 240 VAC, 50/60 Hz., model is available. Both voltage models provide two relay outputs with SPDT contacts rated at 240 VAC, 5 Amps.

Determine which voltage model was purchased by the voltage rating on the nameplate; and wire according to the proper line voltage. Failure to do so may void the warranty. Voltage selection is made by a factory pre-wired plug that is next to the transformer on the main electronics PCB. These plugs can only be obtained from the factory.

2. Mounting Diagram

Maximum diameter bolt holes for mounting the enclosure are 7/16" diameter.

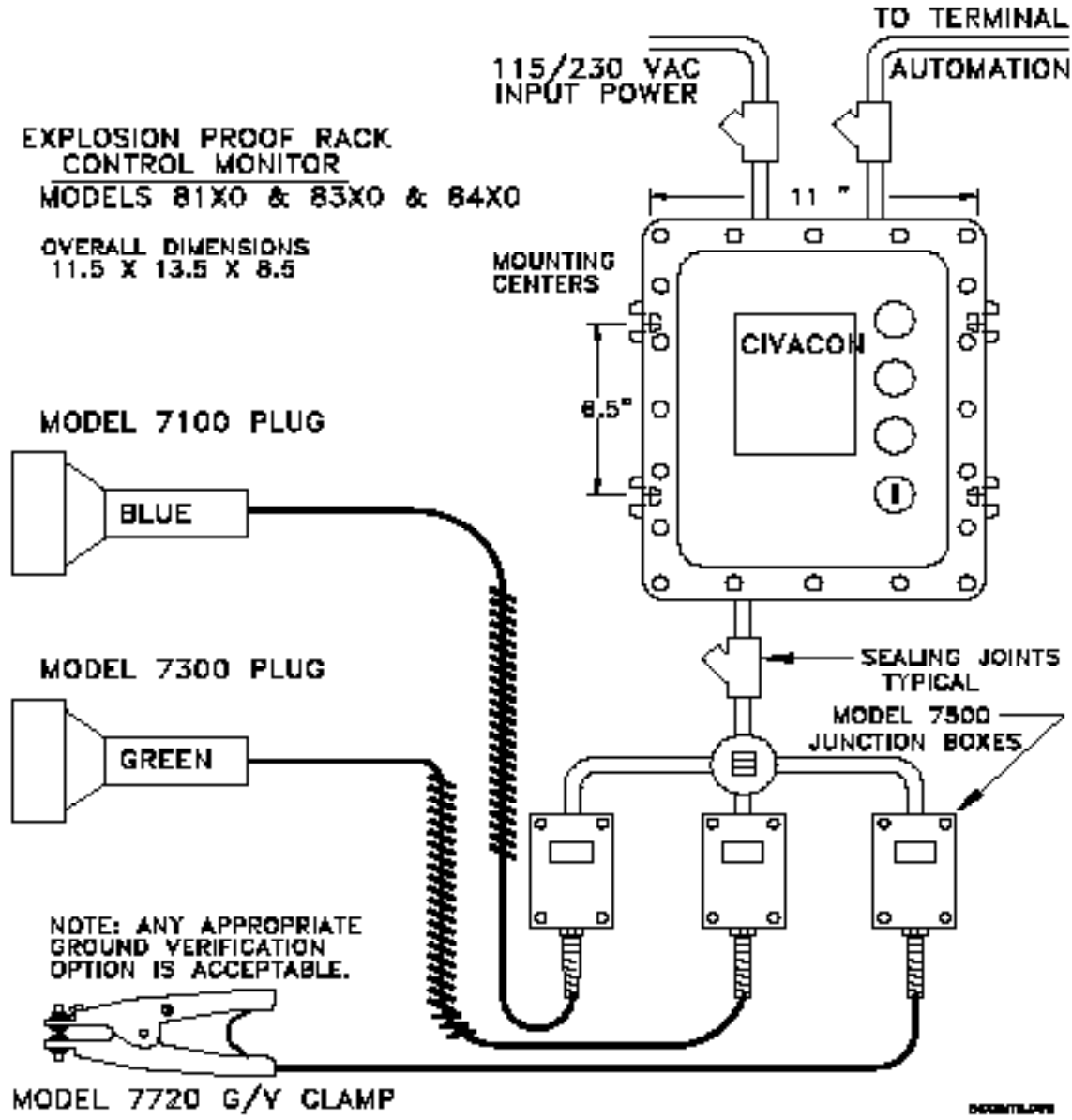


FIGURE 1 - MECHANICAL INSTALLATION

2. Mounting Diagram

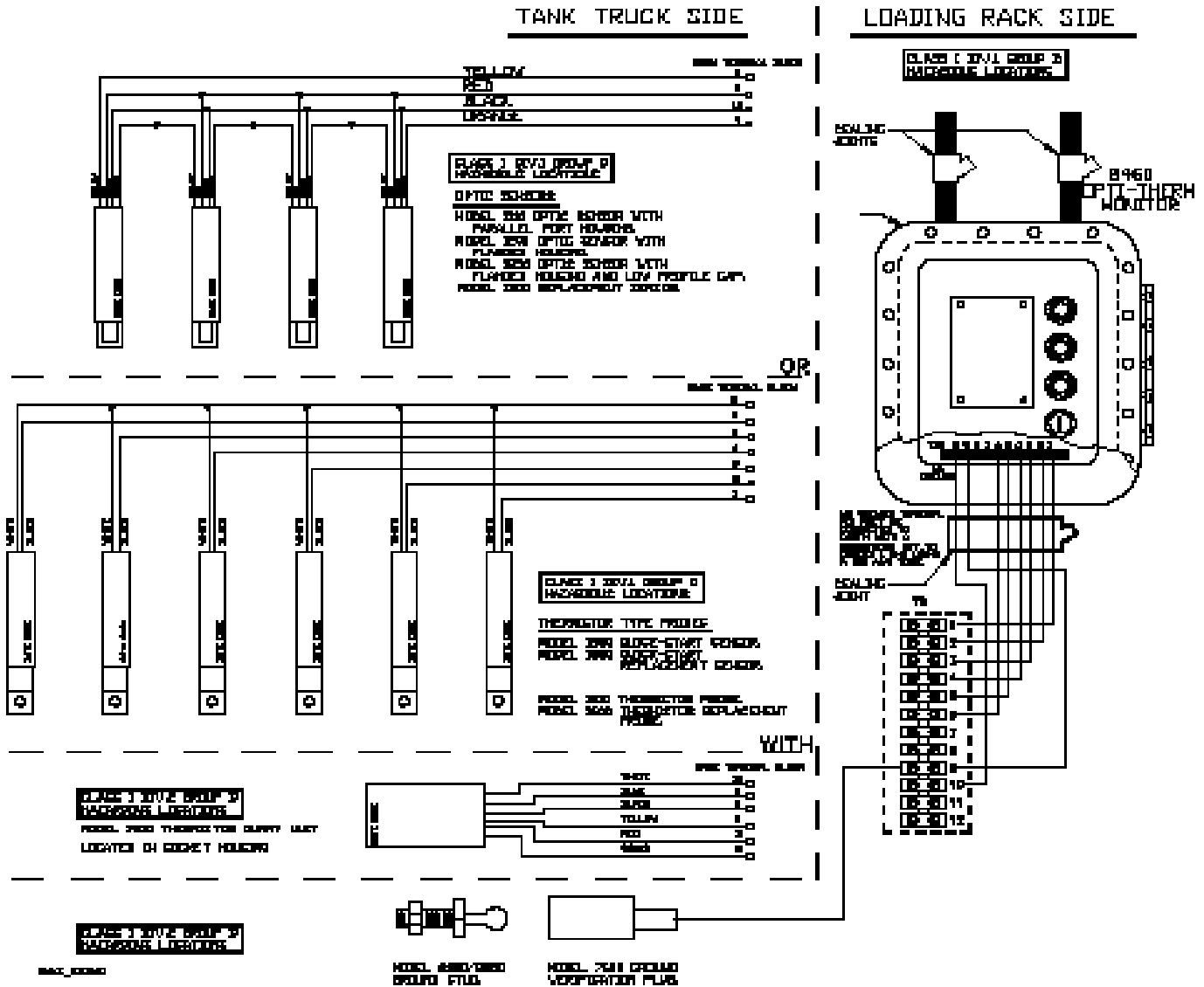


FIGURE 2 - SYSTEM CONTROL DIAGRAM

Notes:

- Control Equipment and Electrical Apparatus connected to the Rack Monitor should not use or generate more than 250 Volts.
- Installation should be in accordance with NEC ANSI/NFPA 70 and ANSI/ISA RP12.6 .
In Canada, the system must be installed in accordance with the Canadian Electrical Code, CEC Part I.
- Maximum ambient temperature is 60o C (144o F).
- Explosion-proof seals must be mounted within 18 inches of the enclosure.

4. Wiring Instructions - Power

All wiring entering the rack monitor enclosure must enter through the NPT conduit openings provided by the factory. Use weathertight conduit fittings and thread sealant on pipe threads to keep out external moisture. Ensure that the proper sealing fittings are installed, and potted (sealed) appropriately.

CAUTION:

The control monitor's wiring and terminal strips on one side are intrinsically safe, and are separated from the AC power wiring by barriers. This separation of wires must be maintained. All sensor wires must enter the bottom (intrinsically safe side) of the monitor enclosure, and not mix with the AC power wiring or any other wiring at the top. AC power and control circuit wiring must enter through the conduit openings in the top of the enclosure. Wires should be cut to length with no excessive wire coiled inside the enclosure.

The power supply circuit should contain a disconnect switch and an appropriate fuse or circuit breaker with a minimum current rating of 1 Amp. for proper monitor operation. We strongly suggest the use of a high quality stranded and tinned copper wire with a minimum thickness of 18 gauge for all electrical connections. It is recommended that the power be switched off when servicing the electrical system. See Section 6 for proper monitor fuse replacement values.

SAFETY FIRST!!

POWER MUST BE OFF WHEN INSTALLING OR REMOVING POWER LEADS TO THE MONITOR. THE WIRES FOR THE POWER FROM THE POWER PANEL MUST BE KEPT SEPARATE FROM THE PLUG (SENSOR) WIRING! THEY CANNOT BE RUN TOGETHER IN THE SAME CONDUIT!

50 mm (approx. 2 inches) of separation must be maintained between this wiring.

This is important to maintain safe current levels in the Intrinsically Safe wiring.

Do not apply power to the monitor without reading this manual and thoroughly checking all connections. If your unit is an 120VAC unit, it will operate satisfactorily within a range of voltage from 105VAC to 125VAC. If your unit is an 240VAC unit, it will operate satisfactorily within a range of voltage from 210VAC to 250VAC. If the power wires pass through a Class I, Division 1, Group D area, the conduit and wire type must be suitable for this use.

ATTENTION:

Be sure to check the local electrical and fire codes for proper installation. Many localities require an inspection to be performed before circuits are energized.

Three terminals are provided on the power input terminal strip on the monitor. These are L1 (LINE), L2 (NEUTRAL), and GROUND. The proper power source must be wired to these terminals, including a GREEN ground wire. A ground lug terminal is provided on the enclosure of the monitor. The IS safety ground should be connected to this terminal lug point. In all cases, the appropriate NEC or CEC code should be followed.

Three terminals are provided for the overflow permissive signal on the monitor. These are C1 (COMMON 1), NC1 (Normally Closed 1), and NO1 (Normally Open 1), Form C type contacts. The proper control signal source must be wired to these terminals. It is suggested that the control signal source be wired into the C1 (COMMON 1) terminal, as it is the fused control terminal. The wire going to the controlled device should then be connected to the NO1 (or NC1 if applicable) contact of the terminal strip. See Figure 3.

Three terminals are also provided for the ground verification permissive signal. These are C2 (COMMON 2), NC2 (Normally Closed 2), and NO2 (Normally Open 2), Form C type contacts. The proper control signal source must be wired to these terminals. It is suggested that the control signal source be wired into the C2 (COMMON 2) terminal, as it is the fused control terminal. The wire going to the controlled device should then be connected to the NO2 (or NC2 if applicable) contact of the terminal strip. See Figure 3.

If two separate control outputs are not desired, the two outputs may be combined into a single output. This is accomplished by wiring the control signal source to the C1 (COMMON 1) terminal, connecting a jumper between the NO1 (Normally Open 1) terminal and the C2 (COMMON 2) terminal. The wire going to the controlled device should then be connected to the NO2 (or NC2 if applicable) contact of the terminal strip. See Figure 3.

IMPORTANT:

The control monitor's enclosure has a grounding terminal. Connect a 10 AWG (minimum conductor size) solid copper wire from the terminal to an earth ground. The ground connection must be within one (1) ohm of true ground. There must be only one earth ground for the system to maintain an intrinsically safe circuit.

4.1 Power Wiring

The monitor must be wired according to Figure 3.

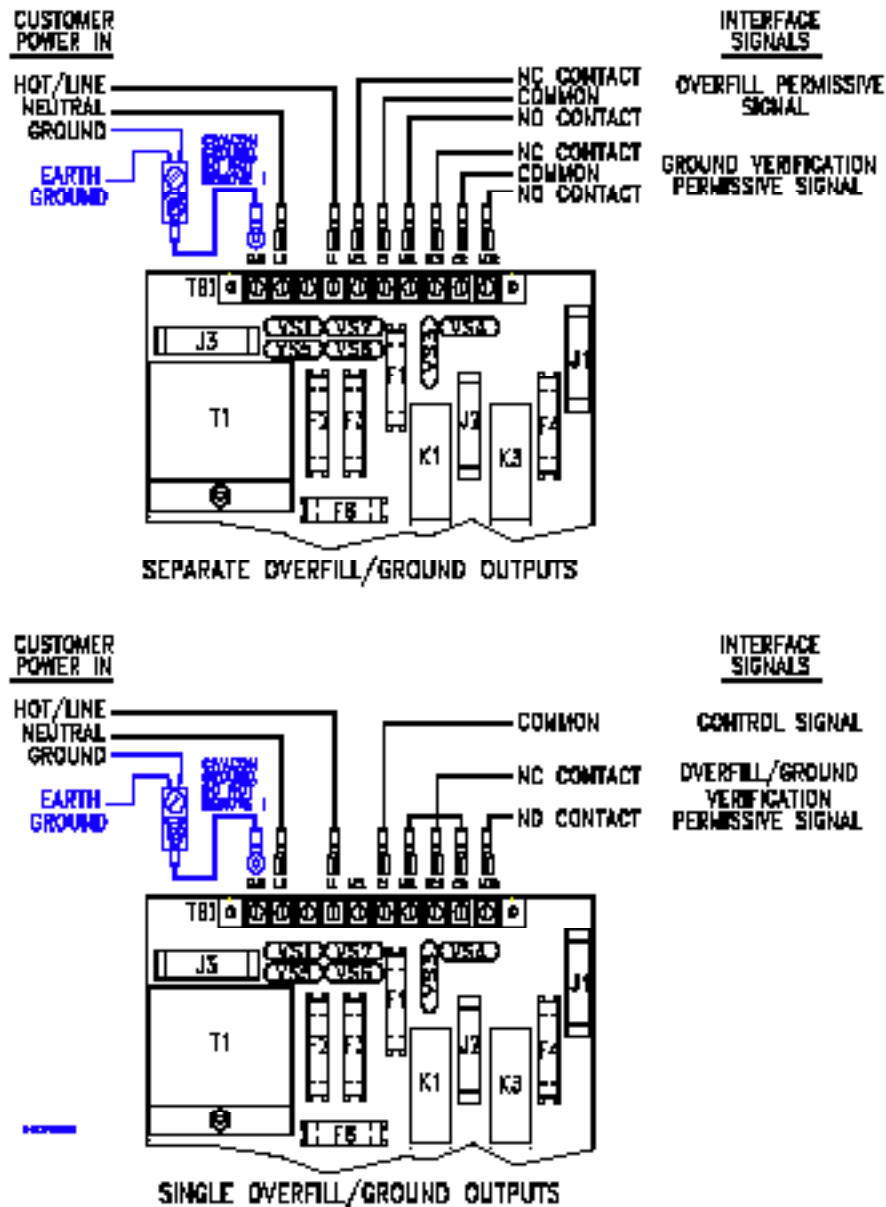


FIGURE 3 - POWER WIRING

Additional Notes:

- Installation should be in accordance with NEC ANSI/NFPA 70 and ANSI/ISA RP12.6 . In Canada, the system must be installed in accordance with the Canadian Electrical Code, CEC Part I.

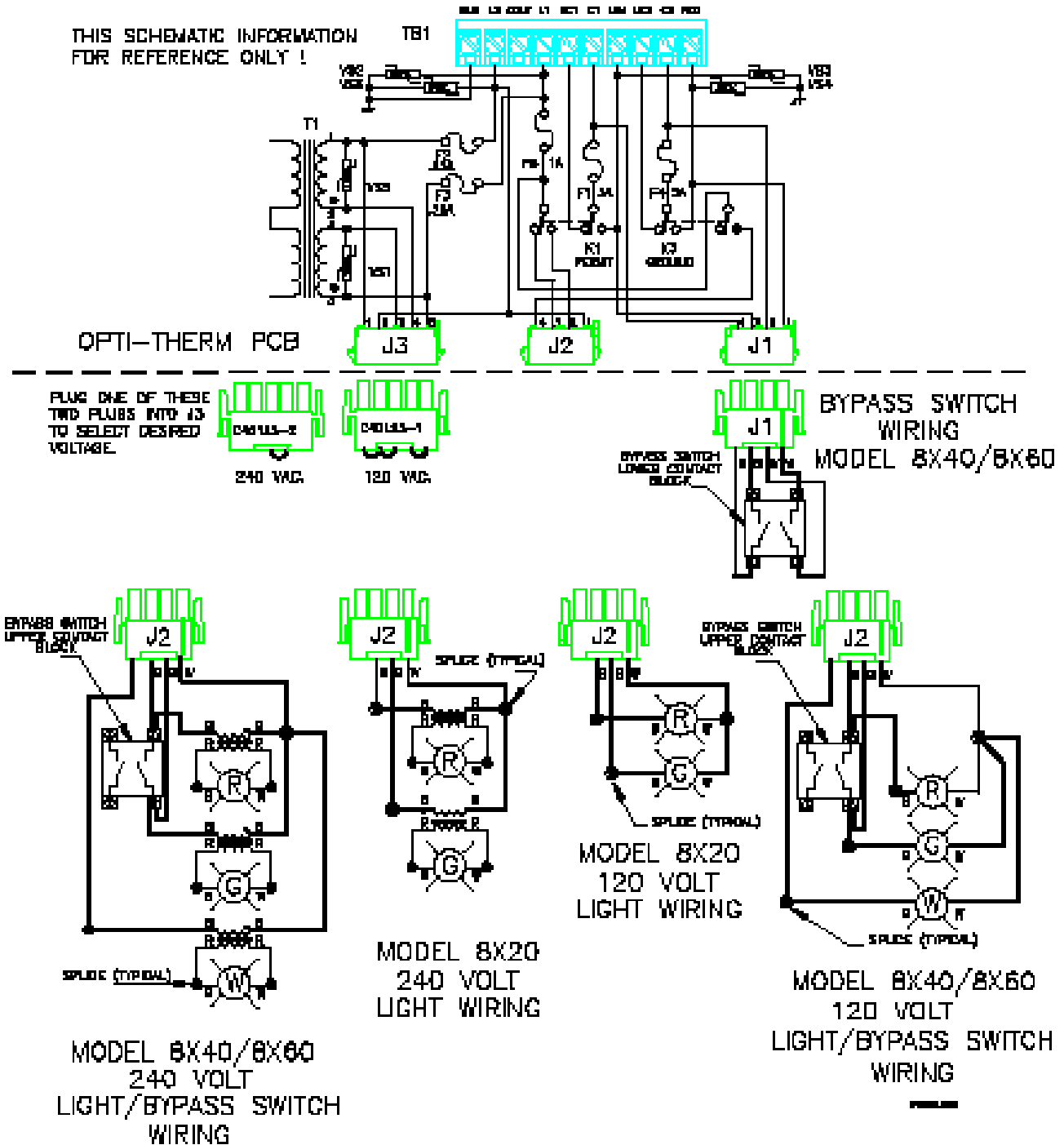


FIGURE 4 - INTERNAL WIRING

THIS FIGURE IS PROVIDED FOR REFERENCE ONLY!

5. Wiring Instructions – Intrinsic Safety (IS) Signals

We strongly suggest the use of a high quality stranded and tinned copper wire with a minimum thickness of 18 gauge for all electrical connections to the intrinsically safe area connections. For wire lengths greater than 1000 feet (300 m.), please consult the factory.

WARNING:

These recommendations must be followed to limit the inductance and capacitance of the IS field wiring. Failure to do so will impair the intrinsic safety and approvals of the system.

CAUTION:

Hazardous conditions exist in fixed tank or large open rack installations. For lightning protection, above ground wiring runs must be in metal conduit, which must be weather-proof and have grounding rods to earth at each end. Underground wiring runs can be in non-metal liquid-tight conduit, however, such runs must terminate in a metal weather-proof junction box upon surface transition. It is suggested that underground wiring runs be run in metal conduit. This junction box must have a ground rod to earth. Lightning suppression equipment can be added at each sensor and control monitor. If additional protection is desirable, consult the factory.

Refer to Instruction Sheet H50582PA for additional application wiring to the "C" versions of the 83/84X0 Series Rack Monitor System. The "C" versions are 8 Thermistor channel versions of the standard 83/84X0 Series Rack Monitor.

Additional installation information can be obtained from Civacon for the other products used in the IS wiring portion of this installation. This information is usually shipped with the other products when they are purchased. If you misplace or lose this information, use the following information for obtaining replacements.

Use CIVACON Instruction Sheet or Manual H50457PA for additional information on installing Model 7500 series Junction Boxes.

Use CIVACON Instruction Sheet or Manual H50204PA for additional information on installing Model 7100 or 7300 series Rack Connector Plugs.

MODEL 81X0, 83X0, 84X0, 83X0C, & 84X0C
SERIES RACK MONITORS.

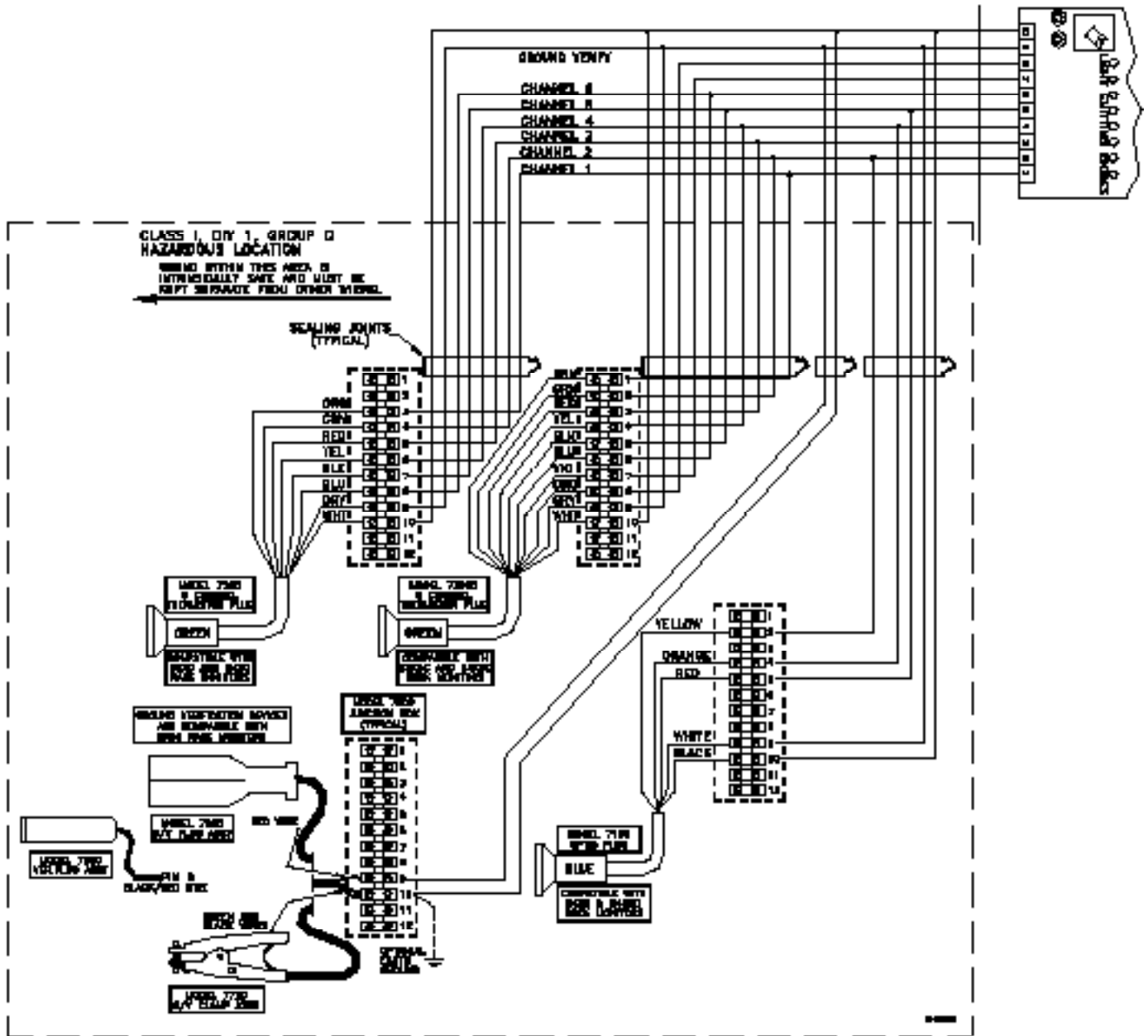


FIGURE 5 - Intrinsic Safety (IS) WIRING

Note:

- Use optional earth ground when the monitor's earth ground is questionable in G/V plug or clamp source applications.

6. Monitor Indicators

See the Figure 6 in Section 6.1 for the operation of the indicator lamps on Rack Monitor Models 8X40 and 8X60, and the same "C" versions. Models 8X00 have NO indicators installed, while Models 8X20 only have a RED and GREEN indicator installed. The logic associated with the 8X20 is very simple. RED indicator ON means NON-PERMISSIVE; while a GREEN indicator ON means PERMISSIVE. They should never be on at the same time, except in the 8X60 monitor under certain conditions.

In the 8X40 monitor, when the by-pass switch is activated, the NO1 and NO2 contacts are by-passed and the YELLOW indicator will come on indicating by-pass mode.

The 8X60 monitor does not have a YELLOW indicator. When its bypass switch is activated, the NO1 and NO2 contacts are by-passed and both the RED and GREEN indicator will come on indicating bypass mode. It has a WHITE light that indicates the presence of a ground connection. In both the 8X40 and 8X60, the key can only be removed from the by-pass switch when it is in the NON-by-passed mode.

Upon opening the rack monitor cover and removing the protection plate from the main printed circuit, LEDs that indicate operational functions will be visible. An LED is visible on the top edge of each thermistor board. This LED indicates the state of the corresponding thermistor channel. The monitor is normally in optic mode. Receiving a thermistor signal on channel 6 causes the monitor to switch to thermistor mode. Therefore channels 2, 3, 4 and 5 will normally be indicating an optic mode signal until a valid thermistor signal is present on channel 6. It then switches to thermistor mode. The indications for these LEDs are as follows:

RED LED = Open wiring or probe;

GREEN LED = Shorted wiring or probe;

ORANGE LED = Valid thermistor indication.

If all the LEDs are indicating a valid thermistor signal, then you should be able to get a thermistor PERMISSIVE indication.

CAUTION:

DO NOT apply power to this monitor without thoroughly reading this manual and checking all connections. DO NOT connect a power source other than what's marked on the label to this monitor, as this may permanently damage it.

6.1 Indicator Operation Table

The following table outlines the operation of the indicator lamps on Rack Monitor Models 8X40 and 8X60, and the same "C" versions.

MODEL	8X40				
OPERATIONS					
	OFF	OFF	ON	ON	
	ON	OFF	ON	OFF	
	OFF	ON	OFF	ON	
	OFF	OFF	ON	ON	
TEST CONDITIONS	NO PERMIT	PERMIT	NO PERMIT BYPASSED	PERMIT BYPASSED	

MODEL	8X60				
OPERATIONS					
	OFF	OFF	ON	ON	ON OR OFF
	ON	OFF	ON	OFF	ON
	OFF	ON	OFF	ON	ON
	OFF	OFF	OFF	OFF	ON
TEST CONDITIONS	NO GROUND +NO PERMIT	NO GROUND +PERMIT	GROUND +NO PERMIT	GROUND +PERMIT	BYPASSED

FIGURE 6 - INDICATOR OPERATION TABLE

Notes:

- ON for indicators means the lamp is illuminated. ON for the switch means by-pass mode.

6.2 Checkout Procedure

For 83/8460 (C) Series Rack Monitors, use CIVACON Installation Manual H50527PA for an appropriate checkout procedure.

1. Before applying AC line power to the 81/83/84X0 Series Rack Monitor, perform a visual inspection of the power and control wiring according to Figure 3.
2. Apply the proper AC line power to the 81/83/84X0 Series Rack Monitor. Ensure the rack monitor's plug(s) is not connected to anything. The RED indicator on the Rack Monitor should light. The YELLOW and GREEN indicators should NOT be lit. Check the rack automation equipment for a NO "PERMISSIVE" signal.

3. Connect the Rack Monitor's plug to an appropriate test sensor source.

NOTE: Use a known working tank truck with appropriate sensors installed that can connect through the plug and socket to the Rack Monitor for a permit signal source. A Civacon Model 1386 Rackcheck-RTM Test Unit may be used if it is available.

The GREEN indicator on the 81/83/84X0 Series Rack Monitor should light. The RED indicator should go out.

Check the rack automation equipment for a "PERMISSIVE" signal.

4. Disconnect the appropriate test sensor permit source. The RED indicator should be ON. The GREEN indicator should extinguish appropriately.
5. Turn the key on the Bypass switch to the "ON" position. The YELLOW and RED indicators should both be ON.
6. Turn the key on the Bypass switch to the "OFF" position.
7. The RED indicator should remain ON.
8. Troubleshoot any problems if the monitor's operation is not as stated above.

The TB2 terminals may be measured for voltage presence. Using a voltmeter set on a 15 volt DC or higher scale, and the ground (negative) lead of the meter on terminal #10, measure the following voltages. With nothing connected to the rack plug, Terminals #1, 3, 5, 6, (also 7 & 8 on eight channel versions) should measure between 14 and 15 volts DC. The default mode of operation for the monitor is Optic mode. So, with nothing connected to the rack plug, no voltage will be readable on Terminals #2 & 4. To measure these channels, the monitor must be in Thermistor mode (i.e.- A thermistor signal present on channel 6). Terminal #9 should measure approximately -12 VDC with nothing connected to the rack plug.

There are NO field adjustments required on this PCB. Do not disturb the factory settings of the adjustment pots.

CAUTION:

Hazardous conditions exist on the printed circuit board. Only a qualified technician should be probing around on the circuitry contained within. Please consult the factory with any questions.

6.3 Replacement Parts

The printed circuit board (PCB) in the rear of the monitor can be replaced in the field.

SAFETY FIRST!!

POWER MUST BE OFF WHEN INSTALLING OR REMOVING THE PRINTED CIRCUIT BOARD IN THE MONITOR. THE WIRES FOR THE POWER TERMINALS FROM THE POWER PANEL MUST BE KEPT TURNED OFF DURING THE BOARD REPLACEMENT! This is important to maintain safe repair practices.

Open the cover to the enclosure; and then remove the four screws holding the safety panel in. Remove the safety panel carefully around the wires. Remove the wires from the terminal strips, appropriately marking them so they can be re-connected properly. Disconnect the plugs, if so equipped, going to the lights on the front cover. Remember their positions. Now you can remove the hex standoffs holding the PCB in place, and then remove the PCB for repair or replacement. As always, save all mounting hardware for re-installation when a new PCB is installed.

The following is a list of repair PCBs for the monitors. Replace with the correct version.

Product #	Description
D51761-120	Basic Optic Rack Monitor PCB
D52084-120	Basic Optic Rack Monitor PCB w/GV
D51761-240	Basic Optic Rack Monitor PCB @ 240VAC
D52084-240	Basic Optic Rack Monitor PCB w/GV @ 240VAC
D52121-120	Basic 6 channel Thermistor Rack Monitor PCB
D52122-120	Basic 8 channel Thermistor Rack Monitor PCB
D52121-240	Basic 6 channel Thermistor Rack Monitor PCB @ 240VAC
D52122-240	Basic 8 channel Thermistor Rack Monitor PCB @ 240VAC
D52125-120	Basic 6 channel Thermistor & Optic Rack Monitor PCB
D52126-120	Basic 8 channel Thermistor & Optic Rack Monitor PCB
D52125-240	Basic 6 channel Thermistor & Optic Rack Monitor PCB @ 240VAC
D52126-240	Basic 8 channel Thermistor & Optic Rack Monitor PCB @ 240VAC
D52123-120	Basic 6 channel Thermistor Rack Monitor PCB w/GV
D52124-120	Basic 8 channel Thermistor Rack Monitor PCB w/GV
D52123-240	Basic 6 channel Thermistor Rack Monitor PCB w/GV @ 240VAC
D52124-240	Basic 8 channel Thermistor Rack Monitor PCB w/GV @ 240VAC
D51504-120	Basic 6 channel Thermistor & Optic Rack Monitor PCB w/GV
D52127-120	Basic 8 channel Thermistor & Optic Rack Monitor PCB w/GV
D51504-240	Basic 6 channel Thermistor & Optic Rack Monitor PCB w/GV @ 240VAC
D52127-240	Basic 8 channel Thermistor & Optic Rack Monitor PCB w/GV @ 240VAC

LEGEND: @ 240VAC = 240 VAC Input voltage GV = Ground Verification

Note: Model numbers and availability are subject to change. Please consult the factory for current model numbers.

CAUTION:

The monitor chassis contains NO components that are field replaceable except the five (5) AC fuses. Any substitution of components may impair the intrinsic safety and approvals of the system.

SAFETY FIRST!!

POWER MUST BE OFF WHEN REMOVING AND REPLACING THE AC FUSES IN THE MONITOR. THE WIRES FOR THE POWER TERMINALS FROM THE POWER PANEL MUST BE KEPT TURNED OFF DURING ANY FUSE REPLACEMENT! This is important to maintain safe repair practices.

The five (5) AC fuses that are field replaceable are F1, F2, F3, F4 & F6. The following list of specifications should be followed.

F1 = 3AG Type, 250V, 5 AMP; For control relay common C1.

F2 = 3AG Type, 250v, 1/4 AMP, SLO-BLOW; For AC line input, L2 terminal; By-passed in 120VAC applications.

F3 = 3AG Type, 250V, 1/4 AMP, SLO-BLOW; For AC line input, L1 terminal.

F4 = 3AG Type, 250V, 5 AMP; For control relay common C2.

F6 = 3AG Type, 250V, 1 AMP; For indicator lights.

Internally connected to the line voltage, L1.

Please note that fuse F5 is NOT a field replaceable component. Observe the CAUTION statement above.

H50513M – REPLACEMENT BULBS

7. System Operation

The purpose of the Civacon OPTI-THERM® liquid level sensing system is to detect a liquid point level signal from a sensor mounted in compartments of a tank truck, or storage tanks. The system provides an automatic signal to the rack automation equipment to shut-off the flow of liquid, and warn of an impending overflow condition of a tank truck or storage tank.

The OPTI-THERM® system uses self-checking principles to provide a continuous check on all system components. This is accomplished by the exchange of digital pulses between sensor and rack monitor. These digital pulses must pass through all active components in the sensor, sensor wiring, and back to the control monitor to test all the components in the circuit. If at any time the circuit detects a failure in any of the components, the system reverts to a NON-PERMISSIVE condition. The unit must then be repaired before it can return to an operational condition. Sensors and probes cannot be “jumpered” out of the circuit and have it work.

The OPTI-THERM® system provides an “AUTO-SWITCH” capability between API optic signal format and API thermistor signal format. The monitor statically remains in the optic mode, providing optic signals to terminals 2, 3, 4 and 5 on the monitor, which correspond to pins 4, 5, 6 and 7 on an optic plug. The monitor also monitors channel 6 (pin 8 of a thermistor plug) for a thermistor signal. If one is detected, it switches the optic signal tracks going to terminals 2, 3, 4 and 5 off, and the input terminals over to thermistor channels 2, 3, 4 and 5.

The monitor will work with any API 5 wire optic sensor. The monitor only uses 4 of the 5 wires, because the fifth wire is used for onboard monitor diagnostics ONLY. Up to eight standard load optic sensors may be connected to the monitor.

The monitor will work with any API 2 wire thermistor probe. The monitor is optimally set up for use with GREEN thermistor, 200 ohm, type probes. It will also work with SILVER thermistor, 2,000 ohm, type probes, but the time to warm-up will take longer. The monitor will also work with any electronic type 2 wire probe that conforms to the API thermistor signal format. Civacon’s electronic 2 wire sensor is called a QUICK-START® sensor. Please refer to the factory for current model numbers and availability. Depending on the amount of channels the monitor is equipped with, the monitor can handle either six (6) or eight (8) probes. Civacon’s 2 wire ROM sensor does NOT conform to this API 2 wire signal format.

The monitor will work with any API 2 wire thermistor format DUMMY. Most dummies have multiple units within themselves. Civacon’s DUMMY comes with five sensor dummies inside it. It has 6 wires coming from inside it, with a single white wire being the ground or common line. The monitor is also designed to work with any OnBoard Monitor’s API optic or API thermistor signal format outputs. Of course the monitor can only be connected to one type of signal source at any one time. You cannot have both optic and thermistor plugs connected at the same time. This is an illegal condition, and the results are indeterminate.

8. Warranty

All parts and products are thoroughly inspected and tested from the time raw material is received at our plant, until the product is completed. We guarantee that all products are free from defects in materials and workmanship for a period of one year from the date of shipment. Any product that may prove defective within said one year period will, at our option, be promptly repaired, or replaced, or credit given for future orders.

This warranty shall not apply to any product which has been altered in any way, which has been repaired by any party other than an authorized service representative, or when such a failure is due to misuse or conditions of use. We shall have no liability for labor costs, freight costs, or any other cost or charges in excess of the amount of invoice for the products.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND SPECIFICALLY THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

WARNING:

OPW Engineered Systems' products should be used in compliance with applicable federal, state, and local laws and regulations. Product selection should be based on physical specifications and limitations, compatibility with the environment, and the material to be handled. OPW Engineered Systems makes no warranty of fitness for a particular use.

IMPORTANT: OPW products should be used in compliance with applicable federal, state, provincial, and local laws and regulations. Product selection should be based on physical specifications and limitations and compatibility with the environment and materials to be handled. OPW MAKES NO WARRANTY OF FITNESS FOR A PARTICULAR USE. All illustrations and specifications in this literature are based on the latest product information available at the time of publication. OPW reserves the right to make changes at any time in prices, materials, specifications and models and to discontinue models without notice or obligation.