Installation & Operating Instructions for DU / DC Series Area, Master & Combination Alarm Systems

Master Alarm

Area Alarm

Combination Alarm

Introduction

The Tri-Tech Medical gas alarm system monitors the status of the medical gas distribution system and provides audible and visual indicators. The master alarm can be furnished with building management interface circuit board(s) to communicate all master alarm/status information to the building management system. The alarm can be used in conjunction with the Tri-Tech Medical T-Net system to monitor the status of all T-Net equipped alarm and manifold systems on a PC. The Tri-Tech alarm system monitors the status of the medical gas sources in accordance with NFPA 99 and CSA Z305.1.

Features & Benefits

Microprocessor controlled
State of the art maintenance free electronics provide excellent reliability.

Remote signal modules
Each circuit board provides monitoring of 16 separate remote devices.

Self test program – alarm code display
LED display reveals the nature of the malfunction and reduces maintenance time.

Three year PC board guarantee
A quality product you can buy with confidence.

Independent multiple master alarms
When service is interrupted to one alarm the other(s) continue to operate independently.

Transient signal filter
Prevents or reduces nuisance (false) alarms signals (less than 0.7 seconds) created by RFI interference.

Audio & visual signal indicators
Audible alarm and visual display of both normal and abnormal status of each signal monitored assures prompt and informative indication of a problem.

Optional building management interface circuit board(s) – MCP boards
Allows communication of remote signals (master alarm points) with building management system.

Easy to install and service
Hinged frame with lanyards for easy accessibility.

Remote wiring of Area Alarm (Gas Module) Signal Points
Dry contacts are provided so that both the high & low line pressure alarms may be remotely wired to a remote or master alarm.

Programmable remote signals (Master Module)
Configure each remote signal independently (either normally closed, normally open or turn unused signals off).

Digitized transducers
Allow remote locating of transducers up to 5,000 feet away from alarm panel. Extremely resistant to RFI.

Programmable gas module high and low set points
Pre-programmed from factory at 60/40 psig for 50 psig delivery pressure gases and 12 in Hg for Medical Vacuum & WAGD/EVAC. Programmable in 0.5 psig or In Hg increments from 0.5 psig or In Hg up to 30 In Hg or 100 psig or 250 psig (depending on which type of transducer is used).

Compact unit
Requires minimal wall space.

Alarm history recall
Can recall previous alarm signals (both area and master alarms) even after the alarm condition has been corrected and the alarm panel has been cleared.

Alarm repeat feature
Adjustable from 1 minute to 999 minutes (factory programmed for 10 minutes).

Contents

Technical Assistance---- 800-253-8692
or 440-937-6244

Rough-in box or back box

Riser assemblies (for installing transducers in alarm back box)

Demand valves (for installing transducers remotely)

(Note: Risers & transducers are only supplied with area or combination alarms)

Transducer Assemblies

Front panel or front

Introduction

The Tri-Tech Medical gas alarm system monitors the status of the medical gas distribution system and provides audible and visual indicators. The master alarm can be furnished with MCP building management interface circuit board(s) to communicate all master alarm/status information to the building management system. The alarm can be used in conjunction with the Tri-Tech Medical T-Net system to monitor the status of all T-Net equipped alarm and manifold systems on a PC. The Tri-Tech alarm system monitors the status of the medical gas sources in accordance with NFPA 99 and CSA Z305.1.

The Tri-Tech Medical gas alarm system is a two or three section assembly comprised of a rough-in box, a front panel and transducers (only if it is an area alarm or combination alarm).

Rough-in box

The rough-in box houses the power supply, fuse, on/off switch, and a terminal strip for electrical wiring. An isolated transformer reduces the 110V or 220V AC input to low voltage DC.

Front panel

The front panel includes enclosed printed circuit boards with programming circuitry.

The **Push Button module** includes a power on indicator, programming buttons and an audible alarm.

The **Remote Signal module**(s) can monitor up to 16 signals per circuit board. Multiple remote signal modules can be ordered in a single alarm. The signals can be configured to display an abnormal condition on either a normally closed (NC) or a normally open (NO) circuit. Each signal may also be turned off if it is not being utilized.

The **Remote Signal module(s) with MCP** are equipped with all of the above described features as the standard Remote Signal module(s) described above. In addition this circuit board is equipped with an extra set of remote signal contacts to interface with a building management system.

The **Gas (Area) module**(s) on the front panel are identified with gas specific, color coded labels (per NFPA 99 or CSA Z305.1). The gas displays include LED's which indicate high/normal/low pipeline pressure. A digital LED display shows the actual gas pressure. The gas pressure may be displayed in PSI and In Hg, or BAR or kPa. The unit is pre-programmed to display PSI / In Hg from the factory, but may be re-programmed in the field to display BAR or kPa. In addition there are LED's which illuminate to indicate System and Program failures.

Transducers

The transducer converts pressure to an electrical signal and supplies the electrical signal to the alarm circuit board Gas module panels. **After the initial 24 hour 150 psi standing pressure test (required per NFPA 99) has been completed** the pressure/vacuum transducers are connected to the medical gas pipeline. The transducers may be remotely attached to the piping system at distances up to 5,000 feet using standard 18 gauge stranded twisted pair wire. Tri-Tech Medical recommends mounting the transducers in the zone appropriate zone valve box (utilizing the Tri-Tech Medical E Z Backfeed™ and E Z Find™ features or in the alarm back box. Should a transducer require service or replacement it is considerably more of a safety issue and more time consuming to locate and replace transducers which have been remotely located above the ceiling.

Alarm Installation

Installation of the Tri-Tech Medical alarm involves installing the rough-in box, the risers & the transducers (if it is an area alarm or combination alarm) and front panel and making the necessary conduit, plumbing and electrical connections. All installation and testing should be done in accordance with NFPA 99 or CSA Z305.1.

WARNING: All electrical power should be disconnected prior to installation.

WARNING: This device should only be installed by qualified personnel. Installation should not be attempted by anyone not having general experience with the installation of devices of this nature.

Rough-In Box Installation

This is a rough-in box for a combination alarm. Your rough-in box should look the same or similar to this unit. (Note: risers are furnished with alarms ordered as non-remote. The risers are shipped loose, for protection during shipment, and must be installed. Alarms ordered as remote are supplied with DISS demand check valves instead of risers. It is recommended that the DISS demand check valves be installed in the corresponding zone valve box equipped with the Tri-Tech E Z Backfeed™ and E Z Find™ features.)

Refer to the building plans to determine the location of the alarm.

The contractor is to provide rigid mounting that will support the alarm box on both sides. The metal flanges provided on both sides of the rough-in box are to rest against the rigid mounting brackets. Screws (contractor provided) are to be driven thru the holes in the metal flanges into the mounting brackets.

Mount alarm rough-in box so it will be flush or just below the finished wall surface using the adjustment feature on the flanges.

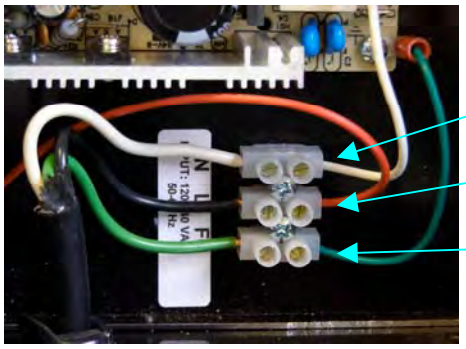
(Side/end view of rough-in back box)

The power supply hole is located in the bottom (left side) of the rough-in box. Remove the plaster cover and panel covering the power supply. Remove the plug from the hole. Make conduit connections for wiring from the facility **emergency power source**.

To remove the power supply cover, loosen the two screws at the top of the cover and slide the cover to the right, then lift the cover over the screw heads. Slide the wiring harness strain relief to the left until it is free from the cover.

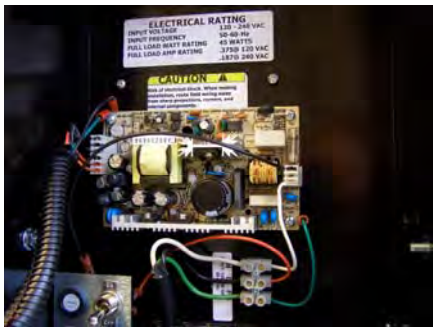
Wiring

Use the ½" conduit knock-out provided on the bottom left side of the rough-in box to route conduit to supply either 110 or 220 V AC to the power supply. **Note: Separate conduit should be used for low voltage wires (use knock outs provided on the top of the box)**.



Route wires through the power supply conduit installed in the bottom and left side of the rough-in box. Connect the 110 or 220V AC facility **emergency power source** electrical wiring to the terminal strip provided on the lower left side of the box. (N = neutral, L = Line (hot), FG = field ground)

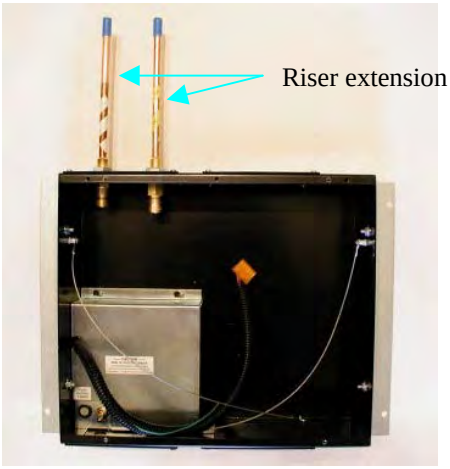
The wiring harness will be provided pre-wired to the power supply. If by chance you are replacing a wiring harness, the single green ground wire should be fastened to the screw on the top left corner of the power supply board. The wiring plug in connector (which should contain the rest of the wires), plugs into the connector terminal on the upper left corner of the power supply board. The black wire will be on the top.



This is how the power supply should look when the wiring is completed.

Replace the power supply cover and plaster cover (to protect the unit while the drywall and wall covering work are being done) after wiring is complete

Plumbing the Riser Extension Tubes



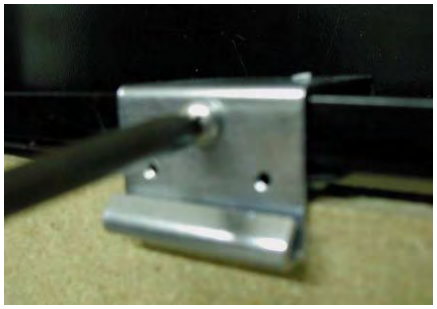
After removing the protective plastic caps, connect the riser extension tubes (only included if this is a non-remote area or combination alarm) to the gas piping system per NFPA 99. Make sure the drop is for the proper gas service. Using a purge gas to insure cleanliness in the tubes, silver braze the joints. **Do not use soft solder.** Conduct heat away from the check valves. (A purge kit is required for purge equipment connection to the system). The 150 psi (60 psi for vacuum & WAGD/EVAC) standing pressure test of the piping system must be successfully completed and all pressure removed from the system before connecting the transducers to the system. **Attaching transducers without depleting the 150 psi or 60 psi standing pressure first will result in damage to the transducers! Opening the check valves in the Medical Vacuum & WAGD/EVAC risers without first depleting the 60 psi standing pressure will damage the check valves in the risers!**

Note: It is recommended that gas piping system tubing be connected from the extension tube to the ceiling for a future or blank gas display even though a transducer is not being installed. Cap the unused tube at the ceiling. This will simplify future expansion.

Note: It is also possible to install the transducers remotely (not in the alarm box). In this type of installation the DISS demand check valves, (furnished when alarm is ordered as a remote) or risers (if alarm is ordered as a non-remote model) may be connected to the gas piping system up to 5,000 feet away from the alarm panel.

Note: Tri-Tech Medical recommends mounting the transducers either in the zone valve box (remote) in conjunction with the E Z Backfeed™ and E Z Find™ products or in the alarm back box – **not** remotely above the ceiling. Should a transducer require service or replacement is considerably more time consuming to locate and replace or service transducers remotely located above the ceiling.

Installing the Hinges



After the walls are finished, the hinges may be installed onto the rough-in box. The two hinges should be fastened to the lower front edge of the rough-in box using the screws provided. The hinge should rest flat against the surface of the drywall.

Installing the Alarm Front Panel

Slide the holes cut into the bottom edge of the front panel over the front catch of the hinges. Support the front panel in the open position to attach the lanyards.

Attach the two (left & right side) lanyard cables to the alarm front panel using the screws provided.

Wiring the Alarm Front Panel to the Power Supply

Attach the green ground wire, which is in the wiring harness, to the ground screw on the left corner of the front panel – just in front of the power supply.

Attach the plug connector at the end of the wiring harness to the appropriate connector located at the top left corner of the CPU circuit board. The plug should lock into place. The plug can only be inserted one way.

This is how the wiring harness plug connector should look when properly installed on the back of the CPU board.

Installing the Transducers (non remote)

After depressurizing the 150 (positive pressure gases) or 60 psig (vacuum & evac / WAGD) standing pressure from the piping system, install the appropriate transducers to the appropriate riser extension tube connectors inside the rough-in box. Hand-tighten then torque lightly with a wrench.

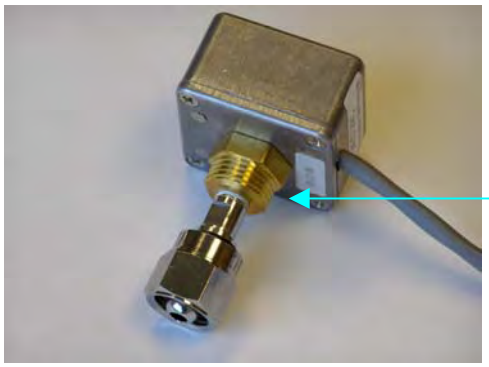
Installing the Transducers (remote)

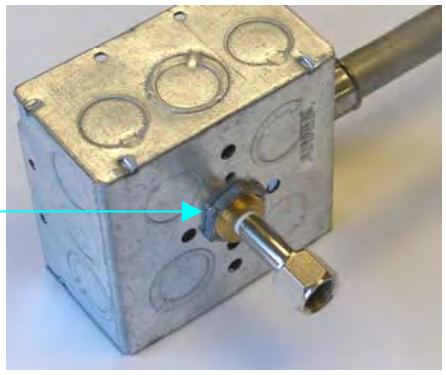
Gas specific DISS x ¼ NPT male demand check valves have been provided. These fittings should be installed in the medical gas piping system in the appropriate location as provided by the mechanical engineering drawings.

Transducer assemblies with DISS gas specific fittings have also been provided and, after the 24 hour standing pressure test is completed and normal operating pressure has been restored to the medical gas piping system, must be connected to the DISS demand valves. Note: maximum of 5,000 feet away from the alarm panel to which it will be wired. Follow the wiring instructions in Appendix F.

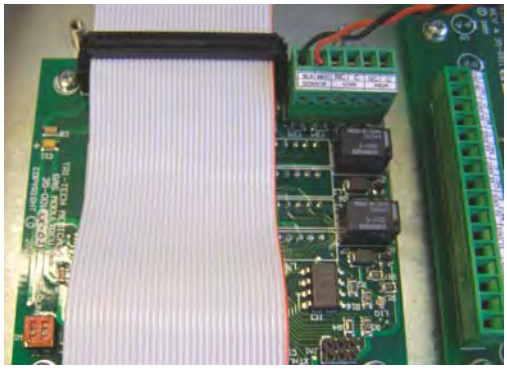
The transducers have been designed so that they may be installed in a standard 2 gang electrical junction box for added protection.

A panel mount feature has been provided to allow mounting of the transducer using standard EMT conduit connections and 2 gang junction boxes. Note: The DISS nut & nipple will need to be removed to allow installation of the EMT nut and then re-installed using oxygen safe Teflon tape.

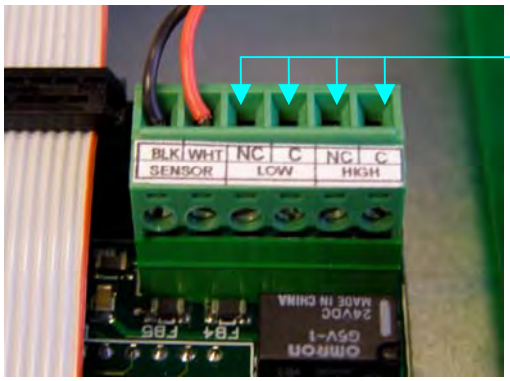




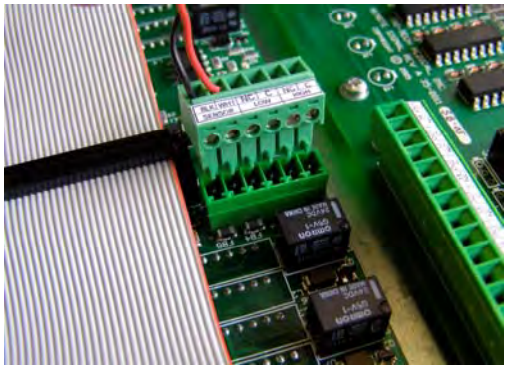
Connecting the Transducer Wiring to the Alarm Front Circuit Board



The wire terminal connector on the gas board has six wire connection slots. The two wires from the transducer should be installed in the BLK & WHT SENSOR slots. These are the two slots closest to the center of the gas board (as shown). It is preferred that the black wire be closest to the center of the gas board.



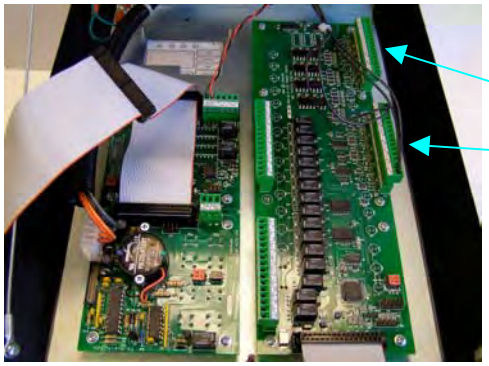
The other four connection slots are for optional remote signals of the low and high line pressure alarms.



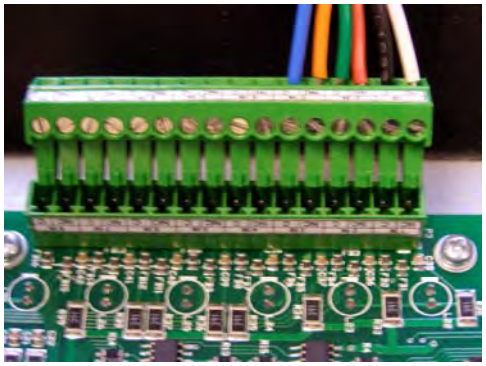
The transducer plug may be removed from the gas module to make it easier to install the wires.

Visually verify that the appropriate transducer wire pair has been attached to the appropriate gas module by looking at the front of the alarm panel. If there is *not* an Error Condition and a System alarm (as shown), the proper (matching gas service) transducer has connected to the gas board.

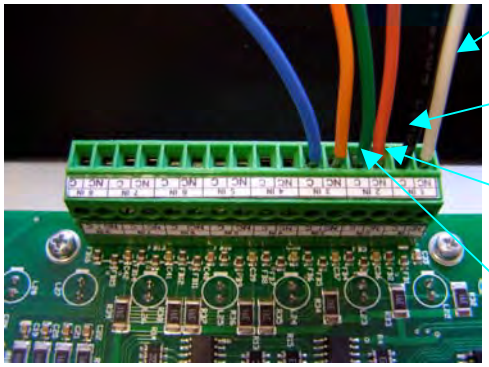
Wiring the Remote Devices to the Remote Signal (Master) Board



Locate the two banks of 16 terminal connectors on the back of the remote signal (master) board. There are a total of 32 connection points – two connection points for each remote signal. The pairs are labeled 1 IN thru 16 IN on the circuit board. **The NC labeled terminal of each pair is where the signal wire should be landed**.



The connector terminal may be un-plugged from the circuit board – to simplify installation of the remote signal wires.



Remote signal #1 – signal wire (white)

Remote signal #1 – common wire (black)

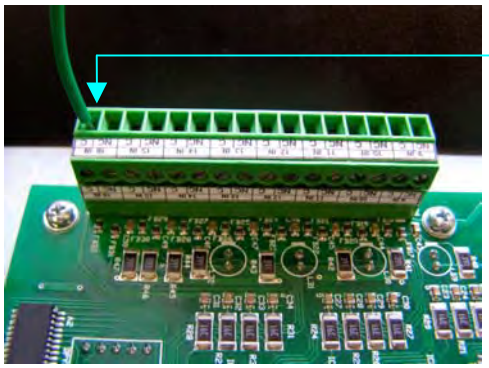
Remote signal #2 – signal wire (red)

Remote signal #2 – common wire (green)

There are two options for landing the common wire(s).

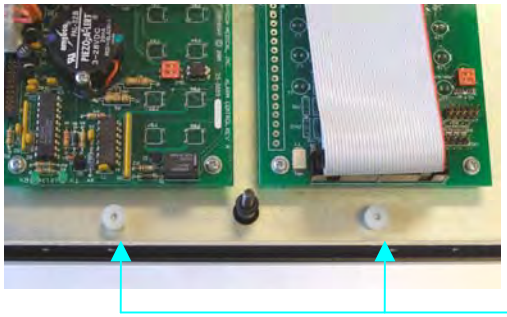
Option #1 – you can land the corresponding common wire on the bottom terminal of each pair of terminal connectors.

This option is recommended for maximum interference suppression.



Option #2 – you can connect all of the common wires together and land just one common wire on the C (common) terminal of 16 IN.

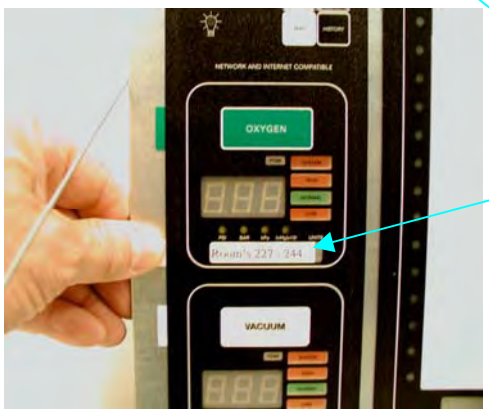
Labeling the Alarm Front



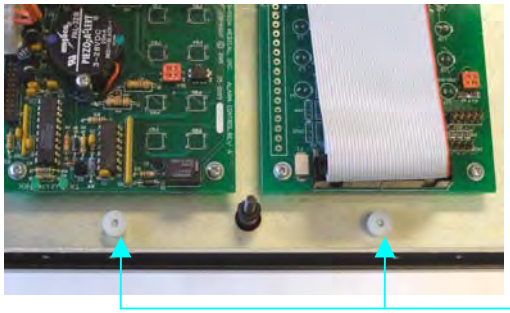
After all remote signal (master) wires have been landed, identified & cataloged (using appendix C in this manual), you are ready to apply the remote signal labels. Remove by unthreading the two nylon nuts shown here from the back of the alarm front panel.

The panel will now lift out of the black frame. Provided in the packaging with the alarm front panel is a long white card and a pre-printed sheet of labels for the remote alarm signals. **Wash your hands before handling these labels and cards!** Apply the labels to the appropriate position on the card using the guide lines on the card. When complete, insert the card into the "Monitored Signals" label pocket of the "Monitored Signals" label.

The gas modules are shipped pre-labeled from the factory. If a gas service is changed to a different gas or added to the alarm, it will be necessary to insert the appropriate label in the pocket of the gas module. The new gas label supplied by Tri-Tech Medical will slide into the gas module label pocket of the gas module label.



A blank label has been provided at the bottom of each gas module for room identification. You may type directly onto this label or apply a pre-printed label. The label supplied by Tri-Tech Medical will slide into the gas module label pocket of the gas module label.



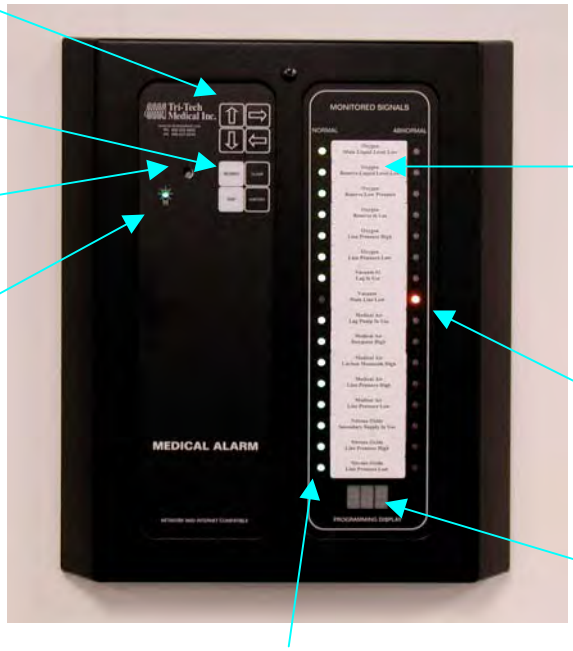
When the labeling is completed, install the plate into the black frame and re-attach with the two nylon nuts.

You are now ready to supply power to the alarm. The toggle switch on the front of the power supply should be placed in the ON position.

Check the green power LED indicator on the front of the CPU module. It should be illuminated.

You are now ready to pressurize the piping system to normal operating pressures. The alarm is shown here with Oxygen & Medical Vacuum at normal operating pressures. All remote signal points (master alarm signals) are shown in normal condition.


Programming keypad
Alarm silence button
Color coded gas identification label
Audible alarm indicator
Power on indicator
Gas (Area) Module
Room ID label slot
Alarm test button
Digital pressure display
Status code LED's
Unit of measure indicators PSI, In Hg, Bar or kPa
MEDICAL ALARM


Programming keypad
Alarm silence button
Audible alarm
Power on indicator
Remote signal (master) description label
Remote signals abnormal status LEDs - Red
Programming display for remote signal (master) circuit board
Remote signals normal status LEDs - Green
MONITORED SIGNALS
MEDICAL ALARM

Alarm Displays & Functions

Push Button Module

Power on Indicator
The power on indicator (green LED) is illuminated whenever electrical power (120 or 240 VAC) is connected to the alarm and the on/off switch is turned on.

Test Button
When the Test button on the front panel is pressed, the alarm illuminates all segments of all lights and LED's and sounds the buzzer.

Alarm Silence
In the event of an alarm condition an audible alarm sounds. The audible alarm can be silenced by pressing the alarm silence button. The high or low pressure LED or the remote signal LED will remain illuminated until the alarm condition is rectified. If a Gas module (area alarm) had alarmed, depressing the silence button will silence the alarm for approximately 10 minutes (factory setting). After approximately 10 minutes, the audible alarm will sound again.

History Button
The History button may be pressed and held at any time to view alarm history. Viewing alarm history is only active when the History button is pressed, releasing the button returns the alarm to normal operation. Pressing the History Button will display the following:
Gas(Area) Module - If there was an alarm condition for any gas (area) module, the High and/or Low Pressure LEDs will be illuminated. If both the High and Low Pressure LEDs are illuminated, the gas has had both a High and Low alarm.

Remote Signal (Master) Module – If there was an alarm condition for any Remote Signal the Red LED will be illuminated. All other LED's will be off.

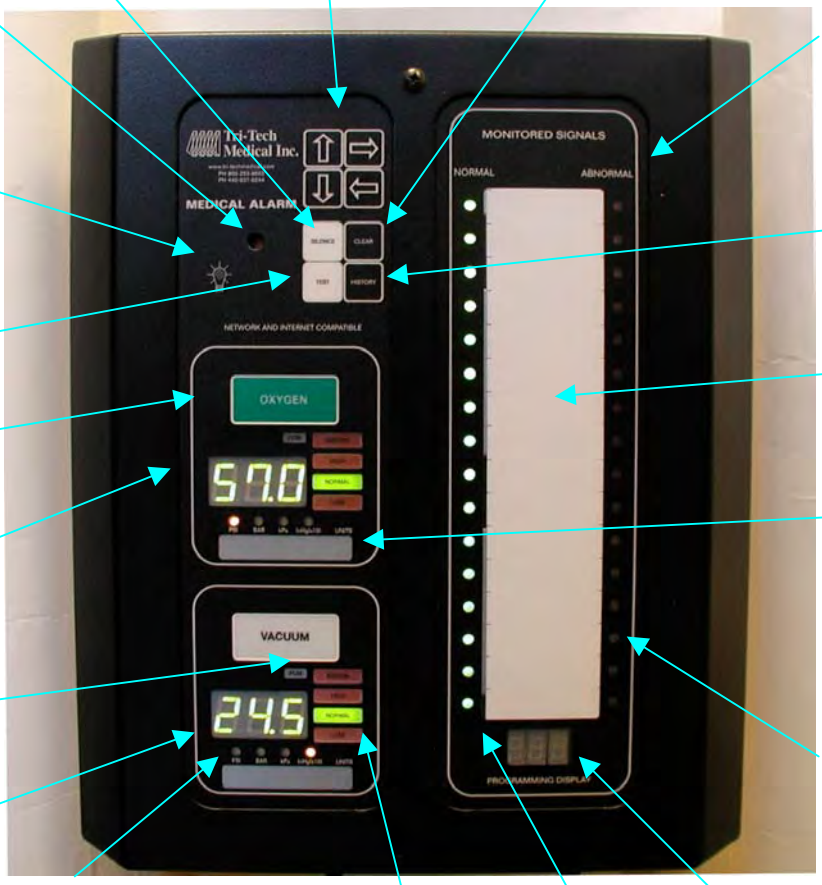
Clear Alarm History – To clear alarm History you simply press the History button, hold it down and simultaneously press the Clear button.

↑ (up arrow)
The up arrow may be pressed & held at any time to display the high line pressure alarm set points of the gas module (area) boards. When in the program mode, the up arrow is used to raise the high line pressure alarm set point on gas module (area) boards and to toggle between your choice of Green condition, Red condition or Disabled condition on remote signal (master) boards.

↓ (down arrow)
The down arrow may be pressed & held at any time to display the low line pressure alarm set points of the gas module (area) boards. When in the program mode, the down arrow is used to lower the low line pressure alarm set point on gas module (area) boards and to toggle between your choice of Green condition, Red condition or Disabled condition on remote signal (master) boards.

→ (right arrow)
The right arrow may be pressed & held at any time to display the gas service for which the gas module (area) board is currently programmed. When in the program mode, the right arrow is used to toggle between the various options of services on the gas module (area) boards and to toggle to the next remote signal point on the remote signal master boards.

← (left arrow)
The left arrow may be pressed & held at any time to display the type of transducer that is connected to each gas module (area) board. The 3 types are 0 – 30 In Hg, 0 – 100 psig and 0 – 250 psig. When the left arrow is pressed "30" will be displayed for a 0 – 30 In Hg transducer, "100" will be displayed for a 0 – 100 psig transducer and "250" will be displayed for a 0 – 250 psig transducer. When in the program mode, the left arrow is used to save the updated programming information. After the changes have been made and the left arrow is pressed three horizontal lines will appear on the digital pressure display of the gas module being programmed or on the programming display for the remote signal (master) board being programmed.



Programming keypad

Clear button

Alarm silence button

Audible alarm buzzer

Remote signal (master) module

Power on indicator

History button

Alarm test button

Master labels ID slot

Color coded gas identification label

Room ID label slot

Gas (Area) Module

Program mode indicator

Remote signals abnormal status LEDs - Red

Digital pressure display

Programming display for remote signal (master) circuit board

Units of measure indicator PSI, In Hg, Bar, or kPa

Status code LED's

Remote signals normal status LEDs - Green

Gas Module (Area alarms)

Pressure Reading Display
The LED Digital Pressure Display displays the pressure as indicated by the transducer. The gas pressure may be displayed in PSIG/In Hg, BAR or kPa. PSIG and In Hg is the factory setting.

Note: Vacuum & evacuation are actually displayed as inches of Hg in the PSI mode. In kPa mode the Nitrogen gas display indicates one tenth of the actual pressure when the pressure exceeds 999 kPa (i.e. 1100 kPa is displayed as 110 and the kPa and (x 10) LED is lit.

Note: Alarm settings are maintained even if power is interrupted.

Units of Measure Indicator
The Units of Measure Indicator illuminates PSIG/In Hg, BAR or kPa (whichever is selected during programming – PSIG and In Hg is factory setting) providing the unit of measure displayed on the LED pressure reading. In the kPa mode the Nitrogen gas display indicates one tenth of the actual pressure when the pressure exceeds 999 kPa (i.e. 1100 kPa is displayed as 110 and the kPa and (x 10) LED is illuminated).

High / Normal / Low Status Lights
Should the line pressure of a gas exceed the programmed alarm set points for low or high line pressure, the corresponding low or high line pressure LED will be illuminated simultaneously with the buzzer sounding to announce an alarm condition has occurred. When the line pressure is neither high nor low it is considered within the normal range and the green Normal LED is illuminated. These indications are relative to the high and low pressure set points which have been programmed into the alarm. These high and low set points should be set in accordance with NFPA 99 and CSA Z305.1 at ± 20% of the normal operating pressure.

System LED
The System LED illuminates in the event of a system problem or malfunction. The following codes will be displayed when a System Error or Failure is detected, or when the History button is pressed:

Code	Error
0	No error (History only)
1	Flash EE corrupt, defaults loaded
2	Sensor: open or broken line
3	Sensor: com timeout, data not received when expected
4	Sensor: Noise on line, or data errors
5	Sensor: Gas type/range mismatch
Actual low psig	Low pressure (History only)
Actual high psig	High pressure (History only)

Remote Signal Status LED's (Master Module)

Normal Status Light (Green)
The normal green status light when illuminated signifies that the equipment being monitored is not in an alarm condition.

Abnormal Status Light (Red)
The abnormal status light when illuminated signifies that the equipment being monitored is in an alarm condition.

Note: If no LED is illuminated the remote signal status LEDs have probably been set in the disabled or off position. This can be verified by placing the Remote Signal circuit board in the programming mode and pressing the → to view the status of the remote signal point in question or by simply pressing the Test button to verify that the LED's are functional.

Program Mode
When a circuit board is placed in the program mode (see Programming Modules – page xx) the board may be re-programmed. The brightness level of the circuit boards other than the one in the program mode is decreased. In addition, on Gas Displays (Area Modules) the PGM (Program) LED is illuminated, on Remote Signal Displays (Master Modules) the first Remote Signal point will blink

Alarm Operation

This section deals with the daily operational aspects of the alarm panel. The *Programming The Alarm* section covers the procedures to follow in order to configure the alarm if the preprogrammed settings are not appropriate, a module is added or deleted or if the alarm is being incorporated into a T-Net system. After installation has been completed and the alarm has been properly configured, it is ready for operation.

Master Alarm Panels

Remote Signal (Master) Module
With electrical power applied to the alarm, the system will monitor the status of the medical gas distribution system.

The remote signals (master) module displays (via LED indicators) the normal/abnormal status of the remote equipment connected to the alarm. All alarm panels are pre-programmed upon leaving the factory to monitor normally closed signals (per NFPA 99). In normal operation all active signals will be green. Whenever an abnormal status signal is detected the corresponding green LED will be extinguished and the red LED will illuminate. Simultaneously an audible alarm will sound. Pressing the Silence button silences the audible alarm (the Red LED continues to be lit). The appropriate personnel should be notified immediately of the alarm condition. When the alarm condition has been rectified the Red LED is automatically extinguished and the Green LED illuminates.

Silencing the Alarm
Press the **Silence** button when the alarm is sounding and the alarm will be silenced.

Testing the Alarm
Pressing and holding the **Test** button initiates a self-test of the alarm. All LED's and seven segment displays will illuminate for as long as the Test button is depressed. In addition the buzzer will sound. If any LED or seven segment display does not illuminate – it is faulty and the circuit board should be replaced. If the buzzer does not sound, it is faulty and the circuit board should be replaced.

Note: The alarms (both Area & Master) are programmed to ignore transient signals that are less than 0.7 seconds in duration.

Area Alarm Panels

Gas Modules
With the electrical power applied to the alarm and the gas systems adequately pressurized, the following indicators are illuminated: 1) the Power On LED, 2) the pressure readings of the gas on each gas display, 3) the Normal LED (green) on each gas display.

If the pressure of one of the gases drops below the low limit setting, the following events take place simultaneously: 1) the Normal LED will be extinguished, 2) the Pressure Low LED (red) will illuminate, 3) an audible alarm will sound.

If the pressure of one of the gases rises above the high limit setting, the following events take place simultaneously: 1) the Normal LED will be extinguished, 2) the Pressure High LED (red) will illuminate, 3) an audible alarm will sound.

Silencing the Alarm
Press the **Silence** button when the alarm is sounding and the alarm will be silenced.

The area alarm is equipped with a Repeater Delay feature which monitors only the Gas Module (Area) alarms. The Repeater Delay has been factory programmed to make the alarm re-sound every 10 (ten) minutes as long as the alarm condition exists. Note: Remote Signal (Master) alarms are **not** monitored by the Repeater Delay.

System Alarm

The audible buzzer will sound, the **System** Led will illuminate and an Error Code "Err" will be displayed on the digital pressure display when a system failure occurs or the history button is depressed. The System LED and "Err" will illuminate and flash on and off and alternate with a number (per table below) being displayed on the digital display.

Note: If "Err" should be displayed on the Gas Pressure Display of any gas module, this indicates a problem. Some possible problems and corrective actions are:

The transducer is not connected to the Gas Module. To correct, check the transducer connection to the back side of the Gas Module.

A transducer for a different gas service has been connected to the Gas Module. To correct, check the transducer and the Gas Module gas identification labels and make sure they match.

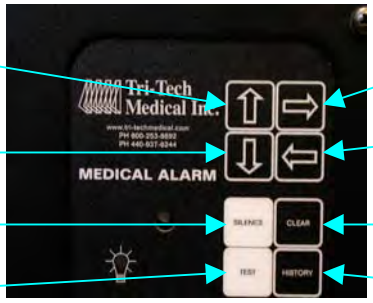
If the above corrective actions do not correct the problem, contact the factory for assistance.

Code	**Error**
0	No error (history only)
1	Flash EE corrupt, defaults loaded
2	Sensor: Open or broken line
3	Sensor: Com timeout, data not received when expected.
4	Sensor: Noise on line, or data errors
5	Sensor: Gas type/range mismatch
Actual Pressure	Low pressure (history only)
Actual Pressure	High pressure (history only)

PGM notification

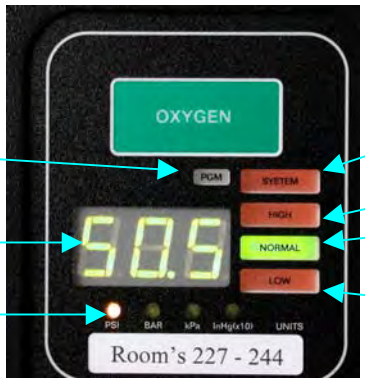
The **PGM** (program mode) LED will flash off & on when a gas module circuit board is manually placed in the program mode. ***It is important to note that while a gas module is in the program mode, it is not monitoring the medical gas pipeline.*** See the "Programming the Alarm" section of this manual for instructions on programming the gas module.

Button Label

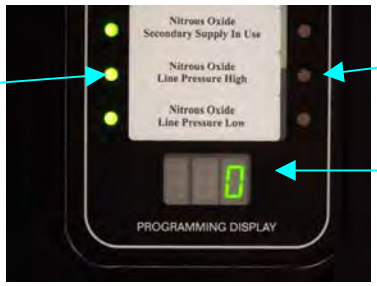


Gas Board (back view – of typical Dip switch

Gas Board



Remote Signal (Master) Board



Programming the Alarm

The alarm has been programmed at the factory prior to shipment. Programming of the alarm may be necessary if: a) the high or low pressure limits for a gas need to be modified, b) if a future gas module is being put into service for an added gas service, c) if a gas service is being deleted, d) if a gas service is being changed, e) if a remote signal alarm point needs to be re-configured, f) if a remote signal module is being added in the place of a blank module, g) if the alarm identification number needs to be changed, h) you wish to change the repeater delay time, i) you wish to change the units of measure from psig and In Hg to either BAR or kPa, j) the alarm panel is being set up on the T-Net system.

Note: Only authorized personnel should program the alarm! It is important to note that while the alarm is in the program mode, it is **not** monitoring the medical gas system and alarm conditions will **not** trigger an alarm.

Accessing the Alarm Program Mode

To program the alarm, the circuit boards must me placed individually, one at a time in the program mode. To place a circuit board in the programming mode, the dip switch located on the back side of the circuit board to be re-programmed, must be changed from the "run" to the "pgm" position.

After this is done, the gas module (area) board being reprogrammed will be brighter than the rest of the gas module (area) boards (when viewed from the front) and the yellow "PGM" LED indicator will be flashing to indicate that the alarm is in the program mode and the board which is illuminated more brightly and has the flashing "PGM" LED is ready to be reprogrammed.

The remote signal (master) board being reprogrammed will have the top (first) signal point flashing and the programming display LED's (at the bottom of the board) will illuminate displaying either an "O" (open circuit) or a "C" (closed circuit) or a "d" (disabled).

The programming buttons, located on the front of the alarm, upper left corner (see photo on page 22) may now to be used to make the needed program changes.

When you have successfully accessed the program mode, it is important to note that some of the buttons revert to their sub-functions:

When programming a gas (area) module:
The UP key ↑ is used to raise the pressure set point and / or to toggle upward thru the list of sub-options.
The DOWN key ↓ is used to lower the pressure set point and / or to toggle downward thru the list of sub-options.
The RIGHT key → is used to toggle (scroll) thru the list of major options.
The LEFT key ← is used to SAVE the new programming options after they are selected.

When programming a remote signal (master) module:
The UP key ↑ is used to toggle between the choices of the green LED or the red LED or both the green & reds illuminated (disabled).
The DOWN key ↓ is used to toggle between the choices of the green LED or the red LED or both the green & reds illuminated.
The RIGHT key → is used to toggle (scroll) down to the next remote signal point.
The LEFT key ← is used to SAVE the new programming options after they are selected.

Note: *In order to perform any of the following programming features you must first set the alarm in the program mode.*

Programming the High & Low Gas Pressure set points

Immediately upon entering a gas module (area) board in the program mode, the high line pressure set point major option is displayed. If the gas module being programmed is a typical 50 psig delivery pressure gas, the board has been pre-programmed at the factory with the high line pressure set point at 60 psig, so the display should show the number 60. If you wish to raise or lower this setting, simply use the up ↑ or down ↓ keys to adjust the pressure setting.

After the setting has been changed to the new desired setting, press the LEFT key ← (SAVE) to save the new setting. Note: if the SAVE ← LEFT key is not pressed after making the change to the programming and before pressing any other keys, the new setting will not be saved and the alarm will revert to the previously saved setting(s). When the SAVE key ← is depressed, three horizontal dashes will appear in the display.

Press the → key to move on to the low line pressure and repeat the above procedure.

Note: The alarm is designed with a safety feature so that the high and low set points must be at least 0.5 (psig / in Hg), 0.05 (bar) or 5 (kPa) increments apart. The high set point will not be able to be set below the low set point and visa versa.

Programming the Remote Signal (Master) Alarm Points

While in the program mode, the top signal point LED will be blinking. At the bottom of the same remote signal board, the Programming Display LED set will display the contact state for the blinking signal point. "O" = open, "C" = closed and "d" = disabled. The contact point that is flashing is capable of being re-programmed. (Note: in compliance with NFPA 99, all contacts are programmed as **closed** contact equals a normal condition from the factory). If it is necessary to re-program a signal point; press the → key to view the next Remote Signal Alarm Point, when the desired Remote Signal (Master) point is flashing, use the ↑ or ↓ keys to alter the point to the desired status, after the desired change is achieved, press the ← to save the change.

Note: Any contact point that has been disabled will have both the green (normal) and red (alarm) LED illuminated only when in the programming mode, to make it easy to identify them. In the normal mode of operation, both LED's of a disabled signal point will not illuminate nor will this signal point trigger an alarm.

Programming the Gas Alarm Repeater Delay

After placing a gas board in the program mode, press → until "dLY" is displayed on the digital display of the gas module then let go of the → key. A number will be displayed on the digital display. This number is the setting (in minutes) of the repeater delay. Using the ↑ or ↓ keys, adjust the repeater delay to the desired length of time (0 – 999 minutes). (Note: the repeater delay is pre-programmed from the factory at 10 minutes – per NFPA 99). To save the change and return the alarm to the normal alarm mode, press the ← button, then change the dip switch back to the "run" setting. Note***: this procedure must be repeated for all gas boards on the alarm panel***.

Programming the Units of Measure Displays

While in the program mode, press the → button until "-U-" is displayed on the digital display of the gas module then let go of the → key. The letters "PSI" or "bAŕ" or " PA" will be displayed on the digital display. This is the unit setting that the gas board is set to display. If you wish to alter the unit display, use the↑ or ↓ keys to select the desired unit display, then press the ← SAVE key. Note***: this procedure must be repeated for all gas boards on the alarm panel***.

Note: Vacuum & Evacuation Gas Modules will automatically display in in/Hg when PSI is selected.
Note: The kPa and x10 LED's will both illuminate on all high delivery pressure Gas Modules (i.e. – Nitrogen and Hyperbaric Oxygen) when kPa is selected. Because the Gas Pressure LED Display is only able to display three digits and high delivery pressures viewed in kPa are four digits, the Gas Pressure LED must be read as a four digit number by multiplying the displayed number by ten. I.E. – the Gas Pressure LED Display is displaying 125 in kPa. The pressure should be read as 1,250 kPa (125 x 10).

Adjusting the Digital Line Pressure

The digital line pressure may be adjusted slightly (per the chart below) by following the simple procedure below. *This can be done by one person at the alarm panel – no need to open/adjust the transducers!*

1. Put the gas module you want to adjust into the PROGRAM MODE.
2. Using the TOGGLE (right arrow) button go to the CAL mode.
3. Use the UP ARROW button to increase the pressure reading and the DOWN ARROW to decrease the pressure reading. The adjusted reading will be displayed as the changes are made.
4. Press the SAVE button (left arrow) to save the setting.
5. You can return to the original calibration setting by pressing CLEAR then press the SAVE button (left arrow) while at CAL in the PROGRAM MODE. This should be done if a transducer is ever replaced, as the reading offset will be applied to the new transducer readings.

Range of adjustment:
VAC or EVAC ± 0.5 In hg
100 psig transducers ± 2.5 psig
250 psig transducers ± 6.0 psig

Programming the Board Identification

Note: This feature is only used when the alarm is used in conjunction with a Tri-Tech Medical T-Net system.

Note: Each gas and master (remote signal) circuit board must have a unique Identification Number – no two can share the same number.

After placing a gas board in the program mode, press → until "Cld" is displayed on the digital display of the gas module then let go of the → key. A number will be displayed on the digital display. This number is the board identification # assigned to that circuit board. Using the ↑ or ↓ keys, select the desired board identification #. Use the ← SAVE button when you are finished.

Note: Each gas and master (remote signal) circuit board must have a unique Identification Number – no two can share the same number.

Note: Valid identification numbers are 1 – 999. The alarm is pre-programmed at the factory with 0 (zero) as the zone identification number.

Adding/Removing Modules or Changing the Gas Service of a Gas Board

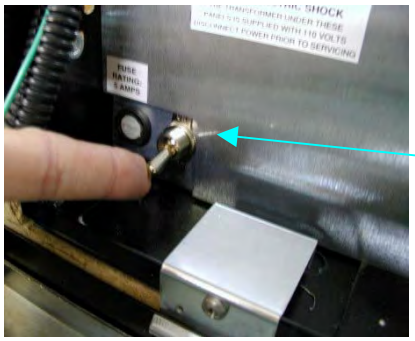
To remove either a gas board or a remote signal master board from an alarm – you simply need to turn off the power to the alarm panel (using the switch on the outside of the power supply in the back box), unplug the ribbon cable from the board being removed and then turn the power back on. The alarm will automatically reset itself.

To add a remote signal master board to an alarm – you follow the same instructions above.

Note: The following feature is only used if; an additional gas service is being added to an area alarm, a future gas module is being set up for a new gas service or and existing gas module board is being changed to a different gas service.

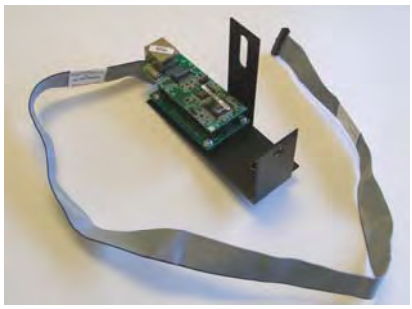
The gas boards are pre-programmed for a specific gas service from the factory. After placing a gas board in the program mode, it is possible to change the gas service of the board. The following list cross references the number that is actually displayed on the gas board numeric display with the full names of the gases:

Gas # displayed	Gas service	Transducer type
12	nitrogen	250
24	Oxygen	100
04	Nitrous oxide	100
08	Carbon dioxide	100
22	Vacuum	30
32	Evacuation/Wagd	30
16	Medical air	100
06	Heliox	100
H16	High pressure air	250
H24	Hyperbaric oxygen	100
H08	Medium pressure carbon dioxide	100
SP	Gas mixture	100
HSP	Gas mixture	250
3SP	Tri-Gas	100

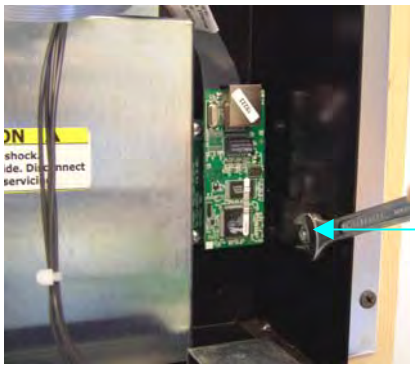


Tri-Tech Medical DU/DC series alarms may be ordered without T-Net Interface Circuit boards. The T-Net Interface Circuit boards may be installed later.

The toggle switch on the front of the power supply should be placed in the OFF position.

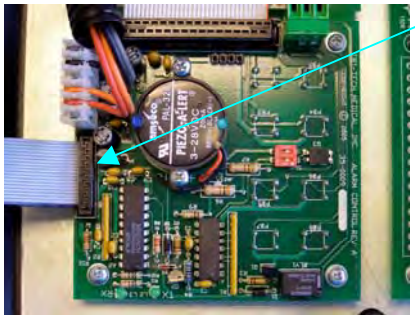


You will be installing one of three types of interface circuit boards, bracket and cable connector; RS485, Ethernet or Wireless. The Ethernet Interface board is shown here left and the Wireless board is shown here right.



Any of the three types installs into the bottom right corner of the alarm back box. The wireless antenna drops thru a hole in the bottom of the back box.

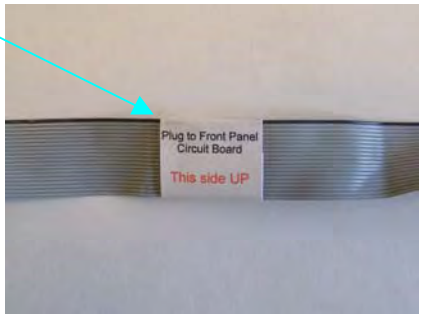
The bracket mounts to the existing flange nut.

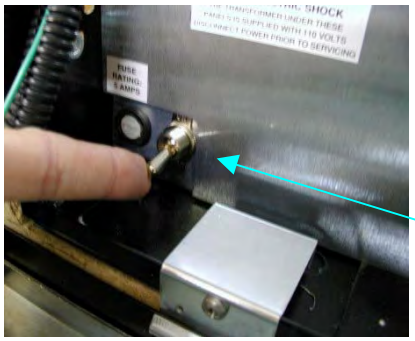


The cable must be installed into the socket on the Button Board properly – per the instructions on the cable.

All of the gas boards and remote signal (master boards) will need to be re-programmed with a unique identification number and set up in the T-Net software per the T-Net installation instructions provided with the T-Net software.

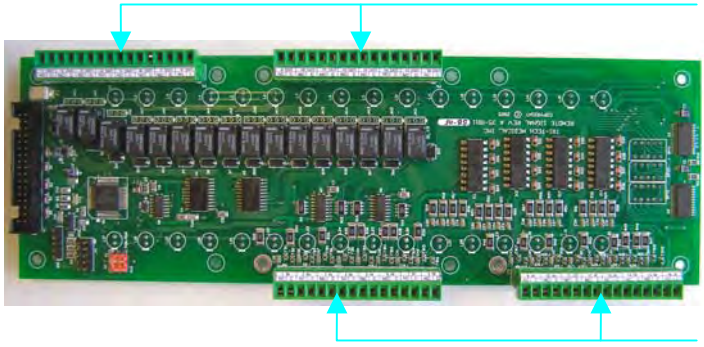
The power may now be restored to the alarm. The alarm is fully functional – even if the T-Net software is not yet installed or is out of service.





Tri-Tech Medical DU/DC series alarms may be ordered with standard remote signal circuit board(s) or with building management interface circuit board(s). The building management interface circuit board(s) may be installed later, replacing the standard remote signal circuit board(s). It is only necessary to install building management interface board(s) in one of the master alarm panels.

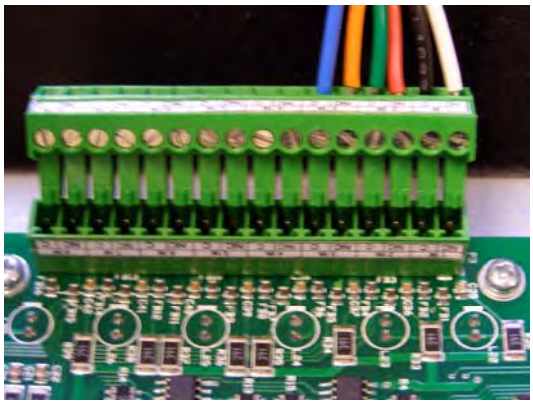
The toggle switch on the front of the power supply should be placed in the OFF position.



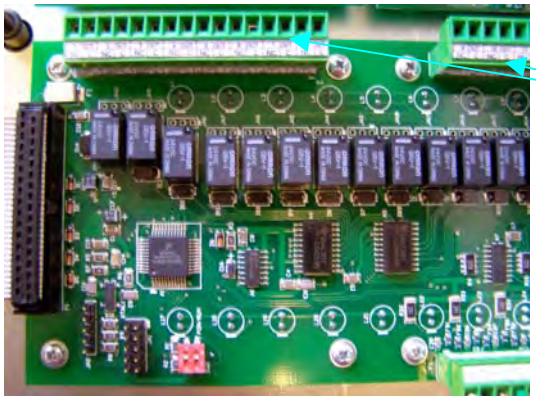
Output connections – to building management system

Refer to Wiring Remote Devices to Remote Signal (Master) Board page 12 – the building management interface circuit boards (MCP boards) are wired the same way as the standard remote signal circuit boards. The additional two sets of connection terminal are the connection points for the wires outputting the signal information to the building management system.

Input connections – from remote signal devices



The connector terminals may be un-plugged from the circuit board – to simplify installation of the remote signal wires. There is no need to remove the wires, simply unplug the connectors from the standard remote signal board and plug them back into the new building management interface circuit board.



The additional connector terminals are labeled 1 OUT thru 16 OUT and are located on the left edge of the new building management interface circuit board. These correspond with the pairs labeled 1 IN thru 16 IN on the right edge of the circuit board. **The NC labeled terminal of each pair is where the signal wire should be la The C labeled terminal of each pair is where the common wire should be landed**.

Appendix A

Glossary of Terms

AC ***Alternating Current***
An electric current that reverses direction or polarity at regular intervals.

DC ***Direct Current***
An electric current that flows in one direction. The current can be steady or pulse.

IN Hg ***Inches of Mercury***
A measurement of the force in a gas vacuum system. 1 IN Hg = 3.38 kPa.

KPa ***Kilopascals***
A measurement of the force in a compressed gas system.
1 kPa = .14 PSI

LED ***Light Emitting Diode***
A semiconductor diode that converts applied voltage to light.

NFPA ***National Fire Protection Association***
The National Fire Protection Association is an association engaged in standards development.

NO ***Normally Open***
An electrical circuit in which the switch is normally open. No current flows through the circuit in normal operation. Only when the switch is closed is the flow of current started.

NC ***Normally Closed***
An electrical circuit in which the switch is normally closed. Current flows through the circuit in normal operation. Only when the switch is opened is the flow of current stopped.

PSI ***Pounds per Square Inch***
A measurement of the force in a compressed gas system.
1 PSI = 6.9 kPa

Transducer
A device that converts pressure into an electrical signal.

V ***Voltage***
Voltage is electrical pressure or force. One volt is equal to the difference of electrical potential between two points on a conducting wire carrying a constant current of one ampere when the power dissipated between the points is one watt.

Transient Signal
An intermittent and brief signal that quickly corrects and returns the alarm to a normal operating mode before monitoring personnel can silence the alarm.

Appendix B – Medical Gas Alarm Specifications

Operating Ambient Temperature range: +10C(50F) to +50C(122F)

Storage Temperature: -20C(-4F) to +85C(185F)

AC Input: 120 - 240 volts AC - 50-60 Hz

Input Fuse: 5 amp input AC line fuse protects the input wiring to power supply

Power Consumption: 45W maximum

Pressure Measurement Accuracy:

0-30 inHg transducer +/-1%
Vacuum, Gas Evacuation

0-100 PSIG transducer +/-1%
Oxygen, Nitrous Oxide, Medical Air, Carbon Dioxide

0-250PSIG transducer +/-1%
Nitrogen

Dimensions

Rough-in Box - All dimensions are in inches and cover the basic box only (mounting flange excluded)

Two vertical slot panel
8.125W x 11.875H x 4.000D

Three vertical slot panel
13.625W x 11.875H x 4.000D

Five vertical slot panel
19.625W x 11.875H x 4.000D

Front Panel

Two vertical slot panel
10.945W x 13.125H x 1.250D

Three vertical slot panel
14.870W x 13.125H x 1.250D

Five vertical slot panel
22.720W x 13.125H x 1.250D

Transducers: Housing dimensions: 1.990W x 1.990H x 3.625 Length including inlet fittings

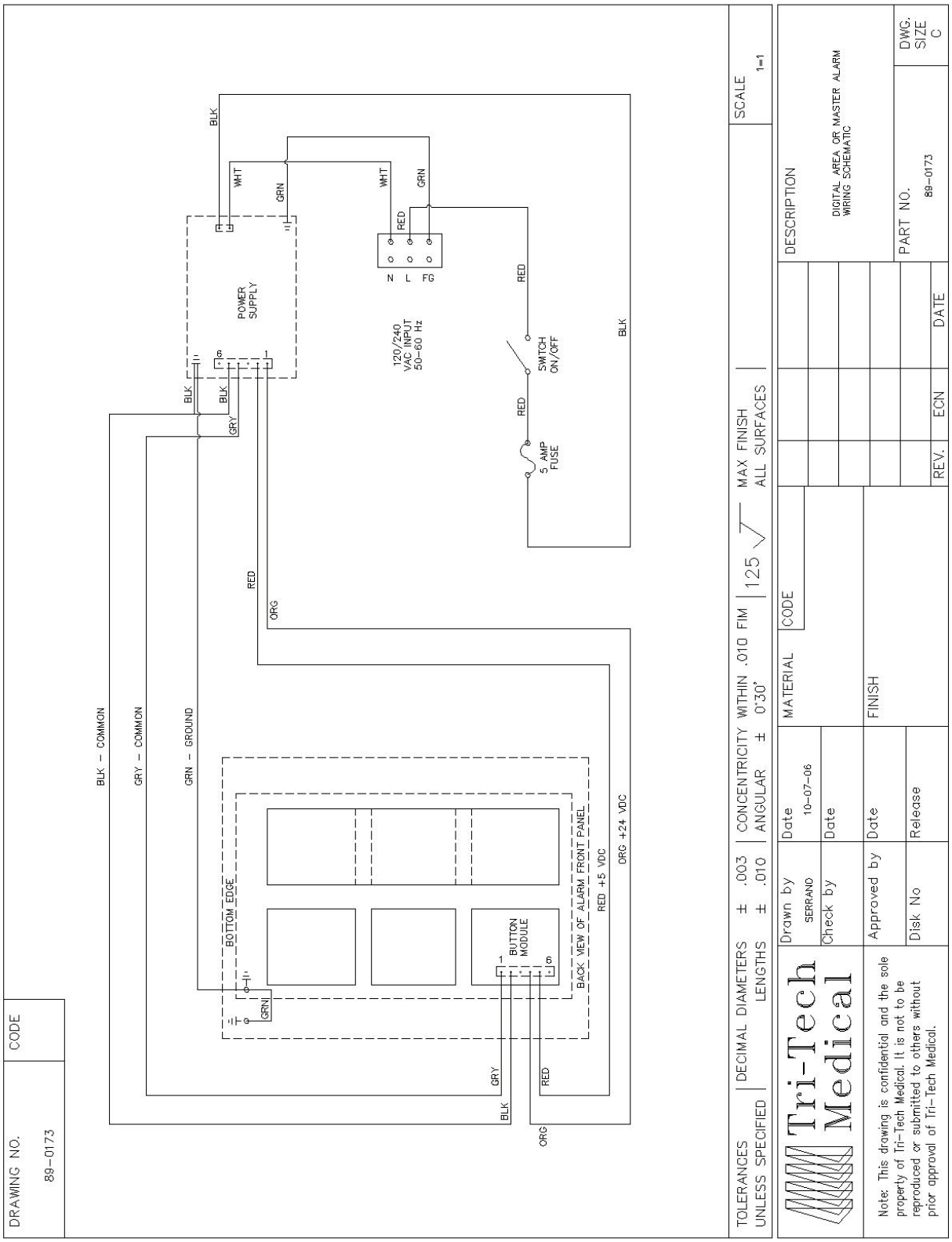
Appendix C Signal Wire Color Code Log

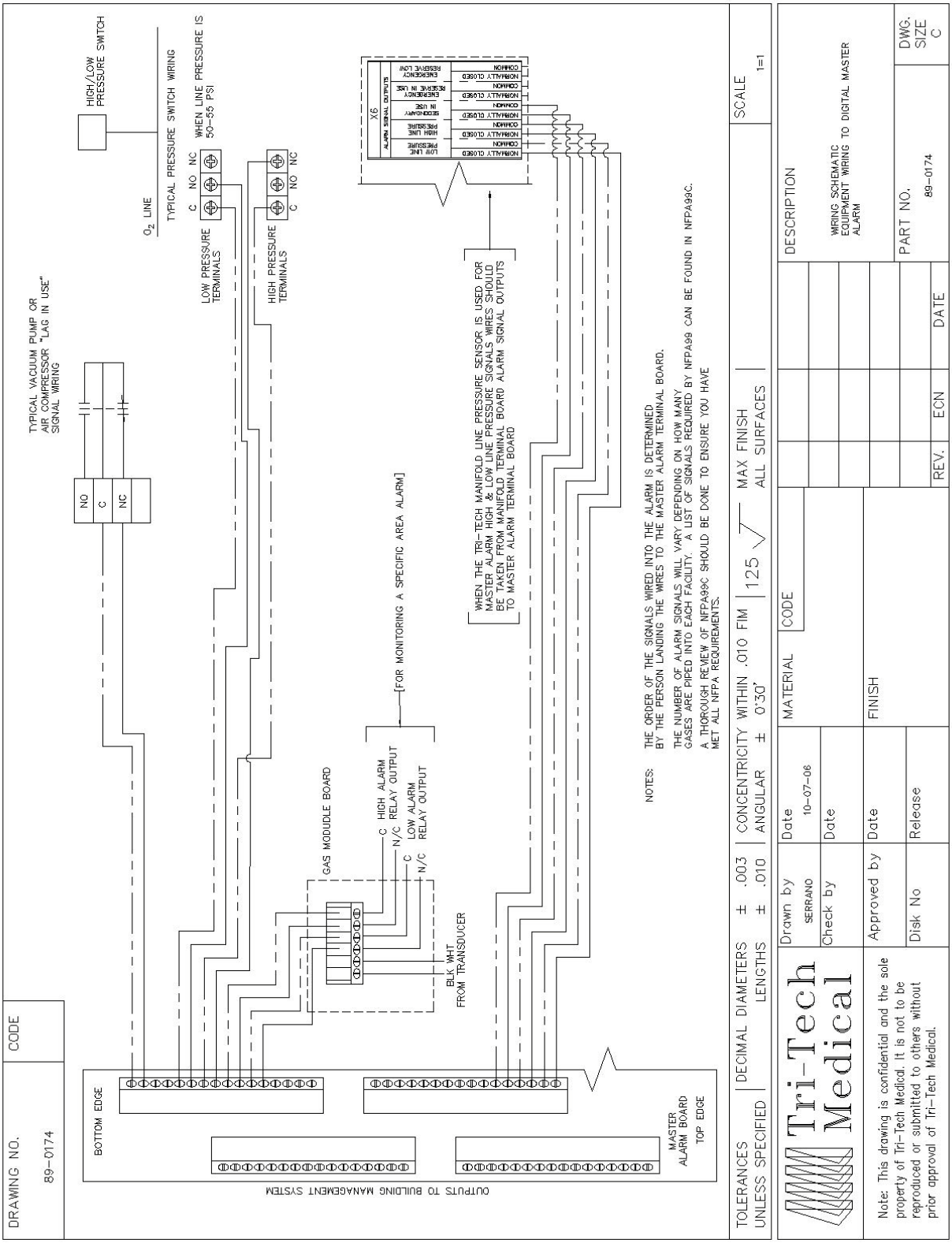
Remote Signals

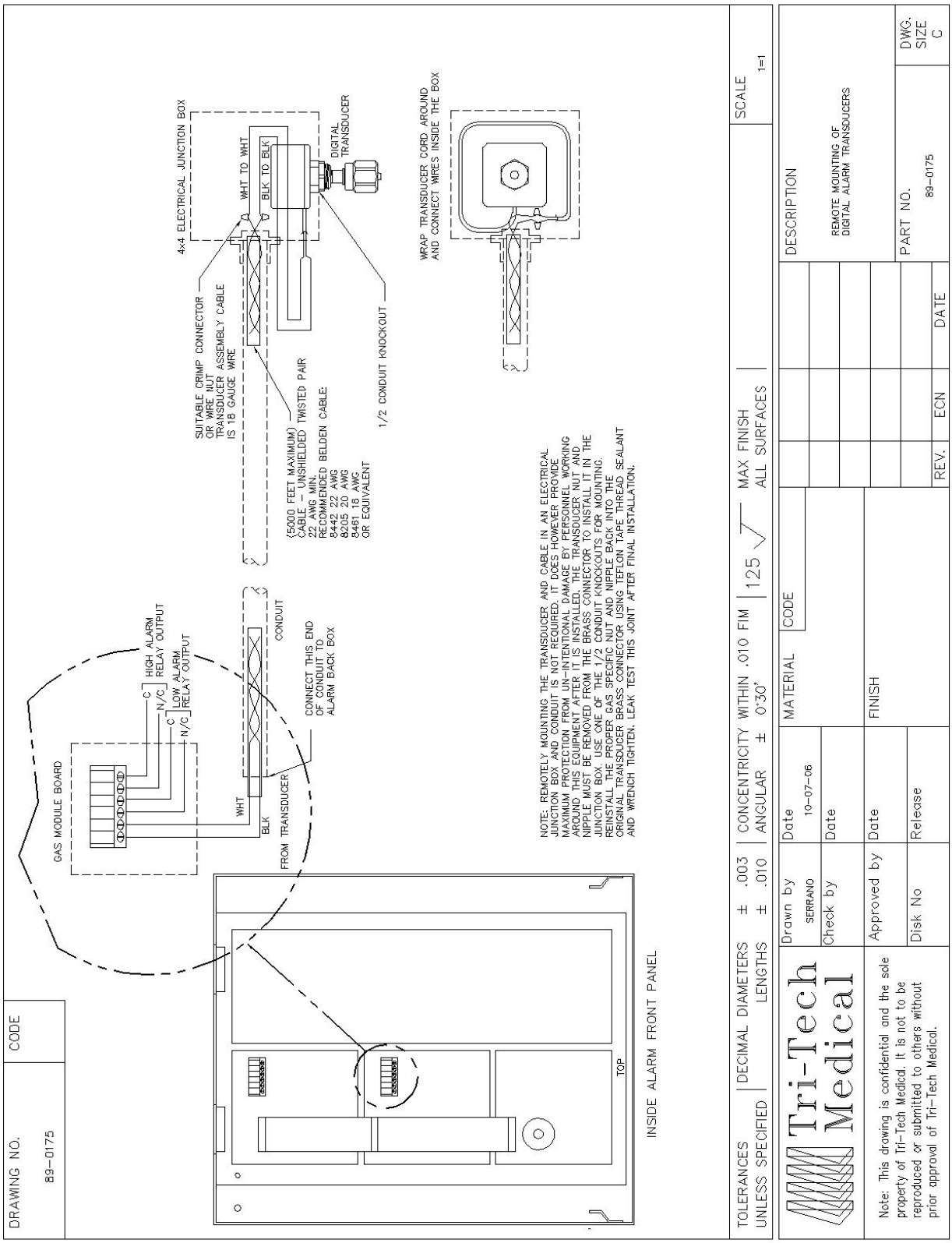
Signal Position #	Remote Signal Label	Signal Wire Color	Common Wire Color

Remote Signals

Signal Position #	Remote Signal Label	Signal Wire Color	Common Wire Color


DRAWING NO. 89-0173
CODE
TOLERANCES UNLESS SPECIFIED
DECIMAL DIAMETERS ± .003
LENGTHS ± .010
CONCENTRICITY WITHIN .010 FIM
ANGULAR ± 0°30'
125
MAX FINISH ALL SURFACES
SCALE 1=1
DESCRIPTION
DIGITAL AREA OR MASTER ALARM WIRING SCHEMATIC
PART NO. 89-0173
DWG. SIZE C
REV. ECN DATE
MATERIAL
CODE
FINISH
Drawn by SERRAND Date 10-07-06
Check by Date
Approved by Date
Disk No Release
Tri-Tech Medical
Note: This drawing is confidential and the sole property of Tri-Tech Medical. It is not to be reproduced or submitted to others without prior approval of Tri-Tech Medical.
BLK - COMMON
GRY - COMMON
GRN - GROUND
RED +5 VDC
ORG +24 VDC
BACK VIEW OF ALARM FRONT PANEL
BOTTOM EDGE
BUTTON MODULE
POWER SUPPLY
120/240 VAC INPUT 50-60 Hz
N L FG
SWITCH ON/OFF
5 AMP FUSE
BLK
WHT
GRN
RED
ORG
GRY


DRAWING NO. 89-0174
CODE
TOLERANCES UNLESS SPECIFIED
DECIMAL DIAMETERS ± .003
LENGTHS ± .010
CONCENTRICITY WITHIN .010 FIM
ANGULAR ± 0°30"
125
MAX FINISH ALL SURFACES
SCALE 1=1
DESCRIPTION
WIRING SCHEMATIC EQUIPMENT WIRING TO DIGITAL MASTER ALARM
PART NO. 89-0174
DWG. SIZE C
REV.
ECN
DATE
MATERIAL
CODE
FINISH
Drawn by SERRANO
Date 10-07-06
Check by
Date
Approved by
Date
Disk No
Release
Tri-Tech Medical
Note: This drawing is confidential and the sole property of Tri-Tech Medical. It is not to be reproduced or submitted to others without prior approval of Tri-Tech Medical.
OUTPUTS TO BUILDING MANAGEMENT SYSTEM
BOTTOM EDGE
MASTER ALARM BOARD TOP EDGE
BLK WHT FROM TRANSDUCER
GAS MODULE BOARD
C HIGH ALARM N/C RELAY OUTPUT
C LOW ALARM N/C RELAY OUTPUT
[FOR MONITORING A SPECIFIC AREA ALARM]
TYPICAL VACUUM PUMP OR AIR COMPRESSOR "LAG IN USE" SIGNAL WIRING
NO C NC
HIGH/LOW PRESSURE SWITCH
O_2 LINE
TYPICAL PRESSURE SWITCH WIRING
C NO NC
WHEN LINE PRESSURE IS 50-55 PSI
LOW PRESSURE TERMINALS
HIGH PRESSURE TERMINALS
X6
ALARM SIGNAL OUTPUTS
LOW LINE PRESSURE
HIGH LINE PRESSURE
SECONDARY IN USE
EMERGENCY RESERVE IN USE
EMERGENCY RESERVE LOW
NORMALLY CLOSED
COMMON
WHEN THE TRI-TECH MANIFOLD LINE PRESSURE SENSOR IS USED FOR MASTER ALARM HIGH & LOW LINE PRESSURE SIGNALS WIRES SHOULD BE TAKEN FROM MANIFOLD TERMINAL BOARD ALARM SIGNAL OUTPUTS TO MASTER ALARM TERMINAL BOARD
NOTES:
THE ORDER OF THE SIGNALS WIRED INTO THE ALARM IS DETERMINED BY THE PERSON LANDING THE WIRES TO THE MASTER ALARM TERMINAL BOARD.
THE NUMBER OF ALARM SIGNALS WILL VARY DEPENDING ON HOW MANY GASES ARE PIPED INTO EACH FACILITY. A LIST OF SIGNALS REQUIRED BY NFPA99 CAN BE FOUND IN NFPA99C.
A THOROUGH REVIEW OF NFPA99C SHOULD BE DONE TO ENSURE YOU HAVE MET ALL NFPA REQUIREMENTS.


4x4 ELECTRICAL JUNCTION BOX
SUITABLE CRIMP CONNECTOR OR WIRE NUT TRANSDUCER ASSEMBLY CABLE IS 18 GAUGE WIRE
WHT TO WHT
BLK TO BLK
DIGITAL TRANSDUCER
(5000 FEET MAXIMUM) CABLE – UNSHIELDED TWISTED PAIR 22 AWG MIN. RECOMMENDED BELDEN CABLE: 8442 22 AWG 8205 20 AWG 8461 18 AWG OR EQUIVALENT
1/2 CONDUIT KNOCKOUT
WRAP TRANSDUCER CORD AROUND AND CONNECT WIRES INSIDE THE BOX
GAS MODULE BOARD
C
N/O
HIGH ALARM RELAY OUTPUT
C
N/C
LOW ALARM RELAY OUTPUT
WHT
BLK
FROM TRANSDUCER
CONDUIT
CONNECT THIS END OF CONDUIT TO ALARM BACK BOX
NOTE: REMOTELY MOUNTING THE TRANSDUCER AND CABLE IN AN ELECTRICAL JUNCTION BOX AND CONDUIT IS NOT REQUIRED. IT DOES HOWEVER PROVIDE MAXIMUM PROTECTION FROM UN-INTENTIONAL DAMAGE BY PERSONNEL WORKING AROUND THIS EQUIPMENT. AFTER IT IS INSTALLED THE TRANSDUCER NUT AND NIPPLE MUST BE REMOVED FROM THE BRASS CONNECTOR TO INSTALL IT IN THE JUNCTION BOX. USE ONE OF THE 1/2 CONDUIT KNOCKOUTS FOR MOUNTING. REINSTALL THE PROPER GAS SPECIFIC NUT AND NIPPLE BACK INTO THE ORIGINAL TRANSDUCER BRASS CONNECTOR USING TEFLON TAPE THREAD SEALANT AND WRENCH TIGHTEN. LEAK TEST THIS JOINT AFTER FINAL INSTALLATION.
TOP
INSIDE ALARM FRONT PANEL
DRAWING NO. 89-0175
CODE
TOLERANCES UNLESS SPECIFIED
DECIMAL DIAMETERS ± .003
LENGTHS ± .010
CONCENTRICITY WITHIN .010 FIM
ANGULAR ± 0°30'
125
MAX FINISH ALL SURFACES
SCALE 1=1
Drawn by SERRANO
Date 10-07-06
Check by
Date
Approved by
Date
Disk No
Release
MATERIAL
CODE
FINISH
Tri-Tech Medical
Note: This drawing is confidential and the sole property of Tri-Tech Medical. It is not to be reproduced or submitted to others without prior approval of Tri-Tech Medical.
REV.
ECN
DATE
DESCRIPTION
REMOTE MOUNTING OF DIGITAL ALARM TRANSDUCERS
PART NO. 89-0175
DWG. SIZE C

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Prices and transportation
Seller's published prices, terms of payment, including discounts, and transportation terms in effect at date of shipment of goods, shall apply. Prices are subject to change without notice. All pricing is in U.S. dollars.

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Liability for all taxes, licenses, or other fees imposed upon the production, sale, shipment, or use of the Seller's products or services covered by this catalog and resulting in quotations shall be assumed and paid for by buyer. If Buyer is a health care facility and a sales tax should be paid, it is Buyer's responsibility to file a Use Tax Return in your state.

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Delivery will be made F.O.B. Seller's shipping point or Vendor's plant, all risk of loss shall pass to Buyer upon delivery to carrier, and Buyer shall be responsible for obtaining insurance if desired. Seller will ship by carrier selected by Seller unless specified by Buyer in its order.

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Minimum billing $100.00