Installation & Operating Instructions for
Integrated Series
Area Alarm Zone Valve Box Systems
Features & Benefits

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

Easy to program

One man adjustable digital pressure display
(at the panel, not the transducer)

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

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

Independent gas modules
When service is interrupted to one alarm module the other(s) continue to operate independently.

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

Accommodate valve sizes from ½” to 2”

Up to 7 valves per box

Plastic insulators on valves to protect from galvanic corrosion

Easy to install and service
Hinged circuit board panel for easy accessibility.

Dry remote signal contacts (high & low) for each gas module
Dry contacts are provided so that both the high & low line pressure alarms may be remotely wired to a remote or master alarm.

Digitized transducers
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, 220/140 for N2 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
Minimizes wall space by combining area alarm and zone valve box into a single panel.

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.

Area Alarm repeat feature
Adjustable from 1 minute to 240 minutes (factory programmed for 10 minutes).
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Features &amp; Benefits</td>
<td>2</td>
</tr>
<tr>
<td>Major components</td>
<td>4</td>
</tr>
<tr>
<td>Introduction</td>
<td>5</td>
</tr>
<tr>
<td><strong>Alarm Panel Installation</strong></td>
<td>6</td>
</tr>
<tr>
<td>Rough-In Box Installation</td>
<td>7</td>
</tr>
<tr>
<td>Plumbing of ball valves</td>
<td>8</td>
</tr>
<tr>
<td>Wiring/AC</td>
<td>9</td>
</tr>
<tr>
<td>Plumbing</td>
<td>8</td>
</tr>
<tr>
<td>Installing the window frame</td>
<td>10</td>
</tr>
<tr>
<td>Installing the circuit board panel</td>
<td>10</td>
</tr>
<tr>
<td>Wiring alarm front to power supply</td>
<td>10</td>
</tr>
<tr>
<td>Assembling the ground wiring</td>
<td>11</td>
</tr>
<tr>
<td>Wiring the circuit board panel/DC</td>
<td>10</td>
</tr>
<tr>
<td>Installing the Transducers</td>
<td>12</td>
</tr>
<tr>
<td>Wiring the transducers</td>
<td>12</td>
</tr>
<tr>
<td>Installing the gauges</td>
<td>12</td>
</tr>
<tr>
<td>Installing the transducers</td>
<td>13</td>
</tr>
<tr>
<td>Labeling the Alarm Front</td>
<td>14</td>
</tr>
<tr>
<td><strong>Alarm Start Up</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Alarm Displays &amp; Functions</strong></td>
<td>16</td>
</tr>
<tr>
<td>Component identification</td>
<td>16</td>
</tr>
<tr>
<td><strong>Button module displays &amp; functions</strong></td>
<td>17</td>
</tr>
<tr>
<td>Power on indicator</td>
<td>17</td>
</tr>
<tr>
<td>Silence button</td>
<td>17</td>
</tr>
<tr>
<td>Test button</td>
<td>17</td>
</tr>
<tr>
<td>↑ (up) button</td>
<td>17</td>
</tr>
<tr>
<td>↓ (down) button</td>
<td>17</td>
</tr>
<tr>
<td>→ (right) button</td>
<td>17</td>
</tr>
<tr>
<td>← (left) button</td>
<td>17</td>
</tr>
<tr>
<td>History button</td>
<td>17</td>
</tr>
<tr>
<td>View Alarm History</td>
<td>17</td>
</tr>
<tr>
<td>Clear Alarm History</td>
<td>17</td>
</tr>
<tr>
<td><strong>Gas (Area) module displays &amp; functions</strong></td>
<td>17</td>
</tr>
<tr>
<td>System LED</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Digital Display</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Hi/Normal/Low Display</td>
<td>16</td>
</tr>
<tr>
<td>Units of measure LED display</td>
<td>16</td>
</tr>
<tr>
<td><strong>Alarm Operation</strong></td>
<td>18</td>
</tr>
<tr>
<td>Gas (area) module</td>
<td>18</td>
</tr>
<tr>
<td>Silencing the alarm</td>
<td>18</td>
</tr>
<tr>
<td>Testing the alarm</td>
<td>18</td>
</tr>
<tr>
<td>System alarm/alert &amp; error codes</td>
<td>19</td>
</tr>
<tr>
<td><strong>Programming the Alarm</strong></td>
<td>21</td>
</tr>
<tr>
<td>Keypad identification</td>
<td>20</td>
</tr>
<tr>
<td>Accessing the Program Mode</td>
<td>21</td>
</tr>
<tr>
<td>Hi/Low pressure limits</td>
<td>21</td>
</tr>
<tr>
<td>Alarm Repeater Delay</td>
<td>22</td>
</tr>
<tr>
<td>Units of Measure Display</td>
<td>22</td>
</tr>
<tr>
<td>Adjusting the line pressure display</td>
<td>23</td>
</tr>
<tr>
<td>Adding/removing modules</td>
<td>23</td>
</tr>
<tr>
<td>Board Identification #</td>
<td>23</td>
</tr>
<tr>
<td><strong>Adding T-Net™ Interface Circuit Board</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>Alarm Start Up</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Alarm Displays &amp; Functions</strong></td>
<td>16</td>
</tr>
<tr>
<td>Component identification</td>
<td>16</td>
</tr>
<tr>
<td><strong>Button module displays &amp; functions</strong></td>
<td>17</td>
</tr>
<tr>
<td>Power on indicator</td>
<td>17</td>
</tr>
<tr>
<td>Silence button</td>
<td>17</td>
</tr>
<tr>
<td>Test button</td>
<td>17</td>
</tr>
<tr>
<td>↑ (up) button</td>
<td>17</td>
</tr>
<tr>
<td>↓ (down) button</td>
<td>17</td>
</tr>
<tr>
<td>→ (right) button</td>
<td>17</td>
</tr>
<tr>
<td>← (left) button</td>
<td>17</td>
</tr>
<tr>
<td>History button</td>
<td>17</td>
</tr>
<tr>
<td>View Alarm History</td>
<td>17</td>
</tr>
<tr>
<td>Clear Alarm History</td>
<td>17</td>
</tr>
<tr>
<td><strong>Gas (Area) module displays &amp; functions</strong></td>
<td>16</td>
</tr>
<tr>
<td>System LED</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Digital Display</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Hi/Normal/Low Display</td>
<td>16</td>
</tr>
<tr>
<td>Units of measure LED display</td>
<td>16</td>
</tr>
<tr>
<td><strong>Alarm Operation</strong></td>
<td>18</td>
</tr>
<tr>
<td>Gas (area) module</td>
<td>18</td>
</tr>
<tr>
<td>Silencing the alarm</td>
<td>18</td>
</tr>
<tr>
<td>Testing the alarm</td>
<td>18</td>
</tr>
<tr>
<td>System alarm/alert &amp; error codes</td>
<td>19</td>
</tr>
<tr>
<td><strong>Programming the Alarm</strong></td>
<td>21</td>
</tr>
<tr>
<td>Keypad identification</td>
<td>20</td>
</tr>
<tr>
<td>Accessing the Program Mode</td>
<td>21</td>
</tr>
<tr>
<td>Hi/Low pressure limits</td>
<td>21</td>
</tr>
<tr>
<td>Alarm Repeater Delay</td>
<td>22</td>
</tr>
<tr>
<td>Units of Measure Display</td>
<td>22</td>
</tr>
<tr>
<td>Adjusting the line pressure display</td>
<td>23</td>
</tr>
<tr>
<td>Adding/removing modules</td>
<td>23</td>
</tr>
<tr>
<td>Board Identification #</td>
<td>23</td>
</tr>
<tr>
<td><strong>Adding T-Net™ Interface Circuit Board</strong></td>
<td>24</td>
</tr>
<tr>
<td><strong>Alarm Start Up</strong></td>
<td>15</td>
</tr>
<tr>
<td><strong>Alarm Displays &amp; Functions</strong></td>
<td>16</td>
</tr>
<tr>
<td>Component identification</td>
<td>16</td>
</tr>
<tr>
<td><strong>Button module displays &amp; functions</strong></td>
<td>17</td>
</tr>
<tr>
<td>Power on indicator</td>
<td>17</td>
</tr>
<tr>
<td>Silence button</td>
<td>17</td>
</tr>
<tr>
<td>Test button</td>
<td>17</td>
</tr>
<tr>
<td>↑ (up) button</td>
<td>17</td>
</tr>
<tr>
<td>↓ (down) button</td>
<td>17</td>
</tr>
<tr>
<td>→ (right) button</td>
<td>17</td>
</tr>
<tr>
<td>← (left) button</td>
<td>17</td>
</tr>
<tr>
<td>History button</td>
<td>17</td>
</tr>
<tr>
<td>View Alarm History</td>
<td>17</td>
</tr>
<tr>
<td>Clear Alarm History</td>
<td>17</td>
</tr>
<tr>
<td><strong>Gas (Area) module displays &amp; functions</strong></td>
<td>16</td>
</tr>
<tr>
<td>System LED</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Digital Display</td>
<td>16</td>
</tr>
<tr>
<td>Pressure LED Hi/Normal/Low Display</td>
<td>16</td>
</tr>
<tr>
<td>Units of measure LED display</td>
<td>16</td>
</tr>
</tbody>
</table>

---

**Alarm Panel Installation**

- Rough-In Box Installation
- Plumbing of ball valves
- Wiring/AC
- Plumbing
- Installing the window frame
- Installing the circuit board panel
- Wiring alarm front to power supply
- Assembling the ground wiring
- Wiring the circuit board panel/DC
- Installing the Transducers
- Wiring the transducers
- Installing the gauges
- Installing the transducers
- Labeling the Alarm Front

**Alarm Start Up**

- Alarm Operation
- Gas (area) module
- Silencing the alarm
- Testing the alarm
- System alarm/alert & error codes

**Programming the Alarm**

- Keypad identification
- Accessing the Program Mode
- Hi/Low pressure limits
- Alarm Repeater Delay
- Units of Measure Display
- Adjusting the line pressure display
- Adding/removing modules
- Board Identification #

**Adding T-Net™ Interface Circuit Board**

**Alarm Displays & Functions**

- Button module displays & functions
- Power on indicator
- Silence button
- Test button
- ↑ (up) button
- ↓ (down) button
- → (right) button
- ← (left) button
- History button
- View Alarm History
- Clear Alarm History
- Gas (Area) module displays & functions
- System LED
- Pressure LED Digital Display
- Pressure LED Hi/Normal/Low Display
- Units of measure LED display

---

**Appendix A Glossary of Terms**

**Appendix B Alarm Specifications & Maintenance**

**Appendix C Servicing Ball Valve Seals**

**Appendix D Wiring Diagram**

**Warranty**

**Technical Assistance**

---

Tel. 1-800-253-8692 -or- 440-937-6244 Fax. 440-937-5060 Form # 99-0308 5/4/07
Web site www.tri-techmedical.com Email address: sales@tri-techmedical.com

---

© 2012 Tri-Tech Medical Inc. 35401 Avon Commerce Pkwy, Avon, Ohio 44011
No. 99-00412
Major Components

- Rough-in box or back box
- Window Frame and Window
- Circuit board panel
- Transducer Assemblies
Introduction
The Tri-Tech Medical gas alarm system monitors the status of the medical gas distribution system and provides audible and visual indicators. 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 Z7396.1.

Tri-Tech Medical ball valves and zone valve boxes are cleaned for use with oxygen. Each valve is tested for leakage in both the open and closed position. Each unit is designed and built in accordance with the National Fire Protection Association and Compressed Gas Association guidelines.

The installation and maintenance should be conducted in accordance with the following standards: NFPA 99 or CSA Z7396.1

Warranty
All Tri-Tech Medical alarm zone valve box mechanical components are warranted against defects in material and workmanship for the period of one year from date of purchase and circuit boards for the period of three years from date of purchase.

Ball valves must be inspected periodically for closure ability and leakage. A defective product should be repaired or replaced immediately. Parts that are broken, missing, worn, distorted or contaminated should be replaced immediately.

Components
The Tri-Tech Medical gas alarm system is a two or three section assembly comprised of a rough-in back box, a window frame, a circuit board panel, and transducer(s).

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.

The circuit board 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 **Gas (Area) module(s)** on the front panel are identified with gas specific, color coded labels (per NFPA 99 or CSA Z7396.1). 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. Each module is supplied with dry contacts for remote signaling of high and low pipeline pressure.

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 pressure test (required per NFPA 99) has been completed** the pressure/vacuum transducers may be connected to the medical gas pipeline. Should a transducer require service or replacement it is considerably safer and less time consuming to locate and replace transducers which have been installed in the appropriate zone valve box as opposed to remotely located the transducers above the ceiling. Installation of the transducers in the zone valve box also eliminates contamination issues – such as having to set up a tent in order to remote ceiling tiles.
Installation

Installation of the Tri-Tech Medical alarm involves installing the rough-in box, the risers & the transducers 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 Z7396.1. Zone valves must be installed in accordance with NFPA99 or CSAZ7396.1. Verify the valve is in the fully open position. An internal nitrogen purge must be used during the brazing operation. The purge gas should flow away from the valve body. Brazing alloys per appropriate standards must be used. Before brazing, wet rags must be wrapped around the tube extensions next to the valve flanges to prevent overheating and possible damage to the valve seals. Direct the flame away from the valve body. The valve body temperature must not exceed 300 degrees F to prevent damaging the Teflon seals. Do not braze the opposite side of the valve assembly until after the first side has cooled.

WARNING: Electrical power intended for the alarm to be installed 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 three gas three valve alarm and zone valve box. Your rough-in box should look the same or similar to this unit. (Note: the transducers and gauges are shipped loose, for protection during shipment, and must NOT be installed until after the initial pressure test is completed.

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 ends. The metal flanges provided on both ends 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. Flanges are adjustable to allow for a drywall depth of 1/2” to 1 1/8”.

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

1. Tri-Tech Medical Integrated alarm / zone valve box should be plumbed with inlet gas on the left and the patient (use) side on the right.

2. The rough-in (back box) is shipped with a cardboard dust cover installed. You will need to remove the dust cover to install the rough-in and perform the initial pressure test. The dust cover should be re-installed after the pressure test to protect the valves until the wall covering (drywall, paint etc.) is complete.

3. The rough-in box should be installed in accordance with NFPA 99. The height above the finished floor will vary depending on the back box size. Fasten the valve box to horizontal braces installed between the studs so that the front edge of the rough in box will be flush or slightly recessed with the finished wall covering.

4. Before brazing, remove the plastic tube caps from the valves. Ball valves must be installed in accordance with “Installation of Ball Valves” instructions on page 8.

5. The system must be tested (per appropriate standards) to ensure that no cross-connections have been made. The system must be tested (per appropriate standards) for leaks. Gauges should not be installed until after the leak testing is completed. Excessive pressure will damage the gauges. Note: Pressure in the system will increase or decrease with temperature rise or fall.

6. After the system passes the leak test, gauges may be installed. Gauges must be installed on the downstream (patient) side of the valve. Pipe sealants used to install the gauges must comply with NFPA 99 or CSA Z7396.1. Use care to exclude pipe sealants from the valve cavity and from interior tube surfaces exposed to medical gas flow or vacuum service. Properly applied Teflon tape is an acceptable alternative to pipe sealants.

7. Mark the areas controlled by each valve on the labels provided on each valve.

8. After the wall covering is complete, the dust cover may be removed from the rough-in box and the window frame and window may be installed.

WARNING: Mis-connection of the gases could lead to serious or fatal injury to patients. Following installation, valves must be tested for cross-connection (per appropriate standards) to ensure that the intended services are correctly connected to the appropriate service lines.

WARNING: Make certain the labeling coincides with the gas service, and areas controlled by the valve and that it is easily read.
Installation of Ball Valves
Ball valves must be installed in accordance with NFPA99 or CSAZ7396.1. Verify the valve is in the fully open position. An internal nitrogen purge must be used during the brazing operation. The purge gas should flow away from the valve body. Brazing alloys per appropriate standards must be used. Before brazing, wet rags must be wrapped around the tube extensions next to the valve flanges to prevent overheating and possible damage to the valve seals. Direct the flame away from the valve body. The valve body temperature must not exceed 300 degrees F to prevent damaging the Teflon seals. Do not braze the opposite side of the valve assembly until after the first side has cooled.

Note: the valve bolts may need to be re-tightened after brazing due to the effects of heating & cooling. Torque the hex nuts in ¼ turn increments, using a cross pattern until the proper torque setting is reached per the chart below:

<table>
<thead>
<tr>
<th>Valve Size</th>
<th>Torque (inch pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>½” to 1”</td>
<td>100</td>
</tr>
<tr>
<td>1 ¼” to 1 ½”</td>
<td>150</td>
</tr>
<tr>
<td>2”</td>
<td>270</td>
</tr>
</tbody>
</table>

The system must be tested (per appropriate standards) to ensure that no cross-connections have been made.

The system must be tested (per appropriate standards) for leaks.

Gauges should not be installed until after the leak testing is completed. Excessive pressure will damage the gauges.

Note: Pressure in the system will increase or decrease with temperature rise or fall.

After the system passes the leak test, gauges may be installed. Pipe sealants used to install the gauges must comply with NFPA 99 or CSA Z7396.1. Use care to exclude pipe sealants from the valve cavity and from interior tube surfaces exposed to medical gas flow or vacuum service. Properly applied Teflon tape is an acceptable alternative to pipe sealants.

Check shutoff valve handle operation for proper clearance from any obstructions.

**WARNING:** Miss-connection of the gases could lead to serious or fatal injury to patients. Following installation, valves must be tested for cross-connection (per appropriate standards) to ensure that the intended services are correctly connected to the appropriate service lines.

**Maintenance**
1. Ball valves should be operated periodically and tested for closure ability and leakage. If seals stick or leak, they should be replaced.

2. Clean the exterior of the valve boxes routinely with soap and water. Strong solvents will damage the lexan window and the silk screened printing on the window.

3. The ball valves have a removable swing out body design which allows for the changing of internal components. All valve bodies can be accessed by loosening all bolts and nuts and removing only one bolt, at this point the body may be swung out for servicing.

**WARNING:** To protect the lives of patients, always notify the appropriate medical facility staff before shutting off the supply of medical gas or vacuum through a ball valve. Do not close ball valves except in cases of emergency. Authorized hospital should close ball valves in the event of fire, explosion or damage to the pipeline or equipment.
Wiring

The power supply is located in the top (left side) of the rough-in box. Remove the cardboard dust cover and panel covering the power supply. Remove the 3/4” conduit knock-out 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 bottom 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.

Use the 3/4” conduit knock-out provided on the top left side of the rough-in box to route conduit to supply either 120 or 240 VAC to the power supply. **Note: Should optional low voltage wires be used, they should be installed in a separate conduit.**

Route wires through the power supply conduit installed on the top left side of the rough-in box. Connect the 120 or 240 VAC facility **emergency power source** electrical wiring to the terminal strip provided in the upper left side of the box. (N = neutral, L = Line (hot), FG = field ground)
Installing the window frame and circuit board panel

After the wall covering and finishing have been completed, remove the cardboard dust cover and attach the window frame to the rough-in box using the 12-3115-8-32 x 3/4” screws provided.

Temporarily hang the circuit board panel from the window frame by the bottom edge using one of the 12-3085-6-32 x 7/16” screws as shown. This will make it easier to assemble the ground wires.

This photo shows the ground wires partially assembled as supplied from the factory.
Assembling the ground wiring and attaching the circuit board panel

Assemble the ground wires as shown and attach the brass grounding screw to the bottom left corner hole in the window frame and rough-in box.

The finished ground wiring assembly should look like this. Remove the 12-3066 6-32 x 3/8” screw while supporting the circuit board panel.

Position the circuit board panel into the window frame so that the displays are in the normal reading position with the panel at 90° (open position). The window frame has built-in hinge pin holes on the left side at the top and bottom – as shown here. The circuit board panel has a mating fixed hinge pins. Insert the top hinge pin into the top hole first.

Insert the bottom hinge pin into the bottom frame hole.
Wiring the circuit board panel

Attach the yellow/orange plug connector at the end of the wiring harness to the appropriate connector located at the bottom right corner of the button module circuit board as shown here. The plug should lock/clip into place. The plug can only be inserted one way.

There is a green ground wire in the wiring harness which must be fastened to the nearest grounding screw terminal on one of the gas board sub-plates.

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).

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.

Gauges have been provided and packaged separately for protection during shipment. There are three different gauges for the different gas pressure applications; 0 – 30 in Hg for medical vacuum and WAGD service, 0 – 300 psig for high pressure (100 psig and above), and 0 – 100 psig for all other applications. Use oxygen safe Teflon tape on the threads and tighten wrench-tight until gauge face is facing forward. Pressurize each line and use oxygen safe leak test to verify each connection is free from leaks.
Installing the transducers and circuit board panel

The transducers have been shipped with gas specific DISS fittings and are labeled for a specific gas service. Match the transducer to the valve labeled with the same gas service and connect it (wrench tight) to the mating DISS gas fitting. Pressurize each line and use oxygen safe leak test to verify each connection is free from leaks.

When finished the gauges and transducers will look like this.

After all of the transducer wires have been attached and the transducers attached to the proper DISS gas connections, the circuit board panel may be closed and fixed in place using two each 12-3066 6-32 x 3/8” screws as shown here.

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, the proper (matching gas service) transducer has been connected to the gas board.

**WARNING:** If the transducer leads are shorted together – the display may freeze. To clear this condition, turn power off to the alarm for a few seconds, correct the wiring, and then turn power back on.
Labeling the Alarm Front

After the alarm has been assembled and tested you are ready to apply the room number labels. First, remove the top and bottom screws holding the circuit board panel closed and swing the panel open.

Remove by unthreading the two nylon nuts shown here from the back of the alarm front panel. The gas module circuit board may now be flipped over with all wires still attached to permit access to the labels.

The panel will now lift off of the metal plate. Provided in each of the gas module circuit boards is a white card (shown partially removed here). **Wash your hands before handling these labels and cards!** You may create and apply labels, print or simply write on the card the room numbers or area of the facility that the alarm services. When complete, re-insert the card into the label pocket, flip the gas module circuit board back over and re-install the two white nylon nuts to secure it in place.

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 and to re-program the gas board for the new gas service. The new gas label supplied by Tri-Tech Medical will slide into the gas module label pocket of the gas module label.
Alarm Start Up

You are now ready to supply power to the alarm. Restore power to the circuit feeding this alarm panel. 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 button module. It should be illuminated.

If you haven’t already, you are now ready to pressurize the piping system to normal operating pressures. The gas circuit board shown here is an Oxygen module at normal operating pressures.

The window has been shipped with a clear plastic protective covering on both sides. This should be removed before installing the window into the window frame.
**Tri-Tech Medical Inc.**

**Alarm Displays & Functions**

- Button Board Module
- Programming keypad
- Audible alarm indicator
- Power on indicator
- Alarm silence button
- Alarm test button
- Gas (Area) Module
- Color coded gas identification label
- Digital pressure display
- Unit of measure indicators (PSI, In Hg, Bar or kPa)
- Status code LED’s
- Room ID label slot
- Rooms 200 – 236

**Gas (Area) Module**

- Color coded gas identification label
- Status code LED’s
- Room ID label slot
- Rooms 200 – 236

**Button Board Module**

- Audible alarm indicator
- Power on indicator
- Alarm silence button
- Alarm test button
Alarm Displays & Functions

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 while 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.

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.

↓ (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.

→ (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.

← (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.
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.

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 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 programmed 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 programmed 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.
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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No error (history only)</td>
</tr>
<tr>
<td>1</td>
<td>Flash EE corrupt, defaults loaded</td>
</tr>
<tr>
<td>2</td>
<td>Sensor: Open or broken line</td>
</tr>
<tr>
<td>3</td>
<td>Sensor: Com timeout, data not received when expected.</td>
</tr>
<tr>
<td>4</td>
<td>Sensor: Noise on line, or data errors</td>
</tr>
<tr>
<td>5</td>
<td>Sensor: Gas type/range mismatch</td>
</tr>
</tbody>
</table>

Actual Pressure

| Actual | Low pressure (history only) |

| Actual | 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.
Programming the Alarm

**Button Label**

- Up button
- Down button
- Silence button
- Test button
- Toggle button
- Save button
- Clear button
- History button

**Gas Board (back view – showing dip switch)**

- DIP Switch PGM/RUN
  (only outer switch labeled PGM/RUN should be used)

**Gas Board**

- Program mode indicator
- Digital pressure display
- Units of measure LEDs
- SYSTEM LED
- HIGH Line Pressure LED
- NORMAL Line Pressure LED
- LOW Line Pressure LED

---

Tri-Tech Medical Inc.

Programming the Alarm
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 the alarm identification number needs to be changed
- f) you wish to change the repeater delay time
- g) you wish to change the units of measure from psig and In Hg to either BAR or kPa
- h) 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 be 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 programming buttons, located on the front of the alarm, upper left corner (see photo on page 20) may now 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.

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 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 – 240 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.

Note: If a value of 0 (zero) is programmed and saved for any board, the repeater is disabled. If left programmed this way after 72 hours, the board(s) will automatically revert back to the pre-programmed factory setting of 10 minutes.

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 “bAЃ” 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 & EVAC / WAGD 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 High Pressure Air) 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 /WAGD ± 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 module 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 #. Then press the ← SAVE button when you are finished.

Note: Each gas module 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 a gas module 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.

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

<table>
<thead>
<tr>
<th>Gas # displayed</th>
<th>Gas service</th>
<th>Transducer type</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Nitrogen</td>
<td>250</td>
</tr>
<tr>
<td>24</td>
<td>Oxygen</td>
<td>100</td>
</tr>
<tr>
<td>04</td>
<td>Nitrous oxide</td>
<td>100</td>
</tr>
<tr>
<td>08</td>
<td>CO2 or CO2-O2 mix</td>
<td>100</td>
</tr>
<tr>
<td>22</td>
<td>Medical Vacuum</td>
<td>30</td>
</tr>
<tr>
<td>32</td>
<td>WAGD / AGSS</td>
<td>30</td>
</tr>
<tr>
<td>16</td>
<td>Medical air</td>
<td>100</td>
</tr>
<tr>
<td>06</td>
<td>Helium or Heliox</td>
<td>100</td>
</tr>
<tr>
<td>H16</td>
<td>High pressure air</td>
<td>250</td>
</tr>
<tr>
<td>H24</td>
<td>Hyperbaric oxygen</td>
<td>100</td>
</tr>
<tr>
<td>H08</td>
<td>Medium pressure carbon dioxide</td>
<td>100</td>
</tr>
<tr>
<td>SP</td>
<td>Gas mixture</td>
<td>100</td>
</tr>
<tr>
<td>HSP</td>
<td>High Pressure gas mix</td>
<td>250</td>
</tr>
<tr>
<td>3SP</td>
<td>Tri-Gas</td>
<td>100</td>
</tr>
</tbody>
</table>
Tri-Tech Medical Integrated 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, 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 left corner of the alarm back box. The wireless antenna drops thru a hole in the bottom of the back box.

The circuit board mounts to the existing pem studs.

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

All of the gas 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.

Note: For additional information – see T-Net Manual # 99-0314.
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 & Maintenance

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

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

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

DC output (to remote signal devices):  5 VDC

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

Power Consumption:  45W maximum @ 120 V
                    50 W maximum @ 240 V

Pressure Measurement Accuracy:  0-30 inHg transducer +/-1%
                                 Vacuum, WAGD (Gas Evacuation)
                                 0-100 PSIG transducer +/-1%
                                 Oxygen, Nitrous Oxide, Medical Air, Carbon Dioxide
                                 0-250PSIG transducer +/-1%
                                 Nitrogen

Transducer Dimensions: Housing dimensions: 1.105 Dia x 3.700 Length (includes DISS nut/nipple)

Maintenance

1. Ball valves should be operated periodically and tested for closure ability and leakage. If seals stick or leak, they should be replaced.

2. Clean the exterior of the valve boxes routinely with soap and water. Strong solvents will damage the lexan window and the silk screened printing on the window.

3. The ball valves have a removable swing out body design which allows for the changing of internal components. All valve bodies can be accessed by loosening all bolts and nuts and removing only one bolt, at this point the body may be swung out for servicing.

WARNING: To protect the lives of patients, always notify the appropriate medical facility staff before shutting off the supply of medical gas or vacuum through a ball valve. Do not close ball valves except in cases of emergency. Authorized hospital personnel should close ball valves in the event of fire, explosion or damage to the pipeline or equipment.

Please note there is no required maintenance for area alarm components.
Appendix C
SERVICING BALL VALVE SEALS

FOR TRI-TECH MODEL NUMBERS:

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Part Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2&quot;</td>
<td>52-02</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td>52-03</td>
</tr>
<tr>
<td>1&quot;</td>
<td>52-04</td>
</tr>
<tr>
<td>1 1/4&quot;</td>
<td>52-05</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>52-06</td>
</tr>
<tr>
<td>2&quot;</td>
<td>52-07</td>
</tr>
</tbody>
</table>

BALL VALVE
Removal of the seals and o-rings

**Figure 1**
Remove and discarded the warn-out seals and o-rings from Ball Valve.

<table>
<thead>
<tr>
<th>Seal Kit Part Number</th>
<th>Valve Size</th>
<th>Seal Kit Includes the Following</th>
</tr>
</thead>
<tbody>
<tr>
<td>52-0002S</td>
<td>1/2&quot;</td>
<td>2 Ball Seat Seals</td>
</tr>
<tr>
<td>52-0003S</td>
<td>3/4&quot;</td>
<td>2 Flange O-Rings</td>
</tr>
<tr>
<td>52-0004S</td>
<td>1&quot;</td>
<td>1 Stem Seal</td>
</tr>
<tr>
<td>52-0005S</td>
<td>1 1/4&quot;</td>
<td></td>
</tr>
<tr>
<td>52-0006S</td>
<td>1 1/2&quot;</td>
<td>1 Stem Thrust Washer</td>
</tr>
<tr>
<td>52-0007S</td>
<td>2&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Tools Needed
1- Adjustable Wrench 7/16", 1/2", 9/16", 5/8" and 11/16" Hex Wrench