True Wireless® Class I, Div. 1 Explosion Proof Transmitter

Installation, Operation and Wiring Manual for Models TW-XP-X-X

Model Matrix Soldo AXF Antenna Couper, for Haz. Gr. BCDFG:

SOLDO AXF	UHF	VHF	GPRS	LEO SAT
DC Powered	TW-XP-U-D	TW-XP-V-D	TW-XP-G-D	TW-XP-L-D
AC Powered	TW-XP-U-A	TW-XP-V-A	TW-XP-G-A	TW-XP-L-A

Model Matrix for Analynk CTX/CTB Antenna, for Haz. Gr. CD:

ANALYNK	ISM		GPRS	LEO SAT
DC Powered	TW-XP-I-D		TW-XP-P-D	TW-XP-S-D
AC Powered	TW-XP-I-A		TW-XP-P-A	TW-XP-S-A

Model Matrix for Hardwired, for Haz. Gr. BCDEFG:

HARDWIRED		4-20MA		
DC Powered		TW-XP-X-D		
AC Powered		TW-XP-X-A		

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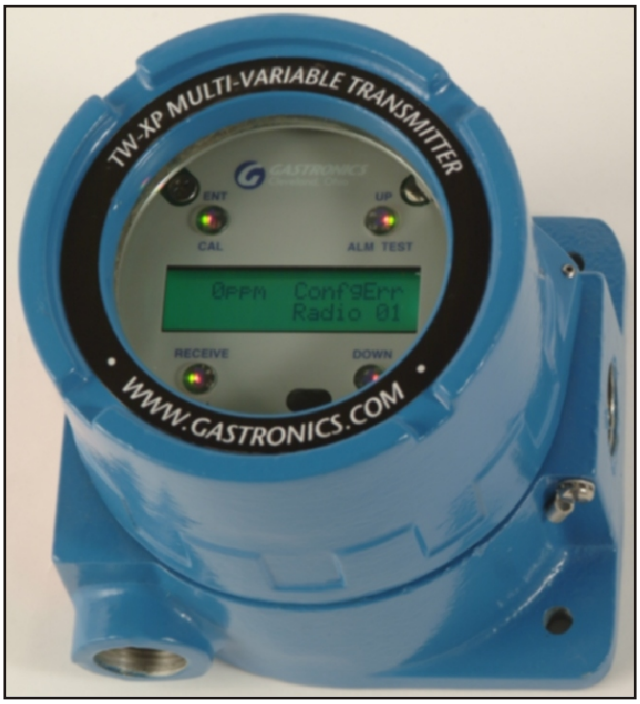
11/01/2010, rev. 1

MODEL TW-XP MULTI-VARIABLE TRANSMITTER

OVERVIEW



The TW-XP Multi-Variable Transmitter is designed for use as a hardwired 4-20mA, 3-Wire Output Transmitter and/or a Wireless Radio Transmitter suitable for use with a multitude of input / output signal applications.

Inputs include accommodations for two Gas Sensors, a Digital Input, a 4-20mA Analog Input, a 0-5V Analog Input, and an RS232. Outputs include Dual Relays, a 4-20mA Analog and an RS232. The Gas Sensor inputs include one circuit to operate a Pellistor, IR or Photo Ionization Detector and another circuit designed to operate an Electrochemical Toxic or Oxygen Sensor.

Setup, configuration, scaling and calibration is done non-intrusively through the display window using either a magnet or an infrared hand held remote programmer. Multiple input readings are displayed (when enabled) in a hierarchical fashion determined by the user. When more than two inputs are enabled, the bottom displayed reading will toggle between the second and additional input readings.

When the 4-20mA hardwired output is used the user can select which input to apply to the 4-20mA output signal. If multiple outputs are desired for hardwired applications, the RS232 can be used or converted to RS485 to transmit all readings, statuses and logged data back to a central control station. The alarm relays are assignable to any and all inputs each with their own individually set trip points.

If wireless radio telemetry is used, all readings, statuses and data can be transmitted to a central control center with a Gastronics base transceiver, an internet IP address or a wireless node, depending on which type of radio technology is used. If UHF/VHF is used, a Gastronics base transceiver is required; if GPRS is used, the signal can be received via an internet IP address or Point-to-Point, and if ISA100.11a 2.4GHz technology is used, the user will have to already have a ISA100 compatible wireless infrastructure in place.

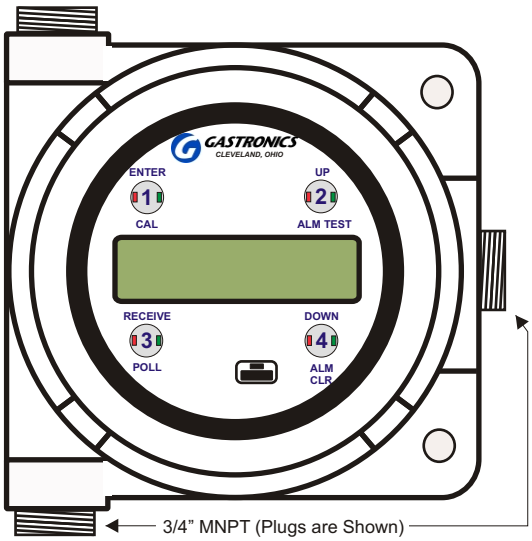
IMPORTANT SAFETY NOTES

The wiring procedures in this manual are intended to insure proper functioning of the device under normal conditions. However, because of the many variations in wiring codes and regulations, total compliance to these ordinances cannot be guaranteed. Be certain that all wiring complies with applicable regulations that relate to the installation of electrical equipment in a hazardous area. If in doubt, consult a qualified official before wiring the system.

The TW-XP contains semiconductor devices that are susceptible to damage by electrostatic discharge. Therefore, observe the normal precautions when handling electrostatic sensitive devices. To minimize risk of damage, handle the circuit boards by the edges only. Do not touch the circuit boards or electronics components.

The fault detection circuitry does not monitor the operation of external devices. It is important that these devices be checked periodically to ensure proper operation.

INSTALLATION



Front View and Conduit Ports

WIRING REQUIREMENTS

- Install per local installation practices and in accordance with local authority having jurisdiction.

IMPORTANT

Proper installation practices must be followed to ensure that condensation does not enter the junction box and interfere with the electronic circuitry.

WIRING PROCEDURE

This manual's electrical wiring procedures covers the wiring terminations for the TW-XP Transmitter and not other external devices.

Refer to these figures and table when installing and wiring the TW-XP.

Figure 1 - Powering the Main Board

Figure 2 - 4-20mA Out Hardwiring

Figure 3 - Dry Contact Alarm Relay Wiring.

Figure 4 - DC Sourcing Alarm Relay Wiring.

Figure 5 - DC Sourcing Alarm Relay Wiring Alternate.

Figure 6 - External Loop Powered 2-Wire 4-20mA Input.

Figure 7 - External Powered 3-Wire 4-20mA Input.

Figure 8 - 0-5 Volt DC Analog Input.

Figure 9 - Digital Input Wiring.

Fig. 10 - Powering using AC Board.

Fig. 11 - Configuring Main Board for use with the AC Board.

Fig. 12 - Digital Ammeter Hookup for calibrating the 4-20mA Current Loop Input.

INSTALLATION NOTES

IMPORTANT

FOR WIRELESS APPLICATIONS, THE SOLDO ANTENNA COUPLER IS REQUIRED FOR HAZARDOUS AREAS DESIGNATED CLASS I, DIVISION 1 GROUPS B, C, D, F & G.

THE ANALYNK ANTENNA IS LIMITED FOR USE IN HAZARDOUS CLASSIFIED AREAS DESIGNATED CLASS I, DIVISION 1, GROUPS C & D.

POWERING THE TW-XP-X-D

The TW-XP Main Board is powered by 11-28VDC if the DC Version is used. The DC version is identified by Model numbers ending in a D, such as TW-XP-X-D. Power is applied to the SPLY and the GND terminals. The DC Version uses a short cover whereas the AC version uses the tall cover and adds an additional AC power board. **NOTE: IF UHF/VHF or GPRS RADIO IS USED, ALLOWABLE POWER IS LIMITED TO 11 TO 15 VDC UNLESS POWER IS CONVERTED THROUGH AC BOARD.**

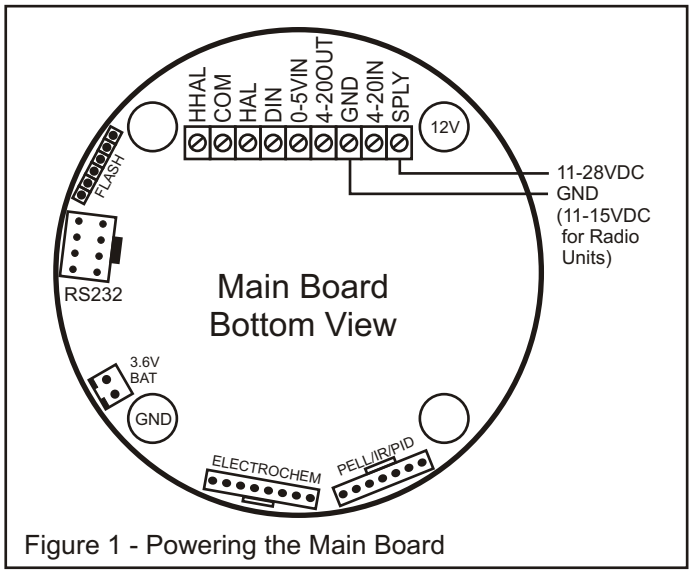


Figure 1 - Powering the Main Board

4-20MA OUT HARDWIRING

The TW-XP has an assignable 4-20mA output that consists of three wires. Power and ground require an external 11-28VDC source with the analog output providing a 4-20mA sourcing signal. The 4-20mA output will provide an analog signal that corresponds to the sensor input that is set as primary during user initial configuration. If multiple sensors are installed such as a temperature sensor being tied into the 0-5VDC input, a toxic electrochemical gas sensor and a combustible gas sensor being tied into their respective inputs, the user would select which one of these sensors to be primary and the other two as secondary. The primary would then be assigned to the 4-20mA output and read at the top of the display continuously. The secondary device inputs would toggle their readings on the second line of the display as well as be included in the telemetry array and relay outputs.

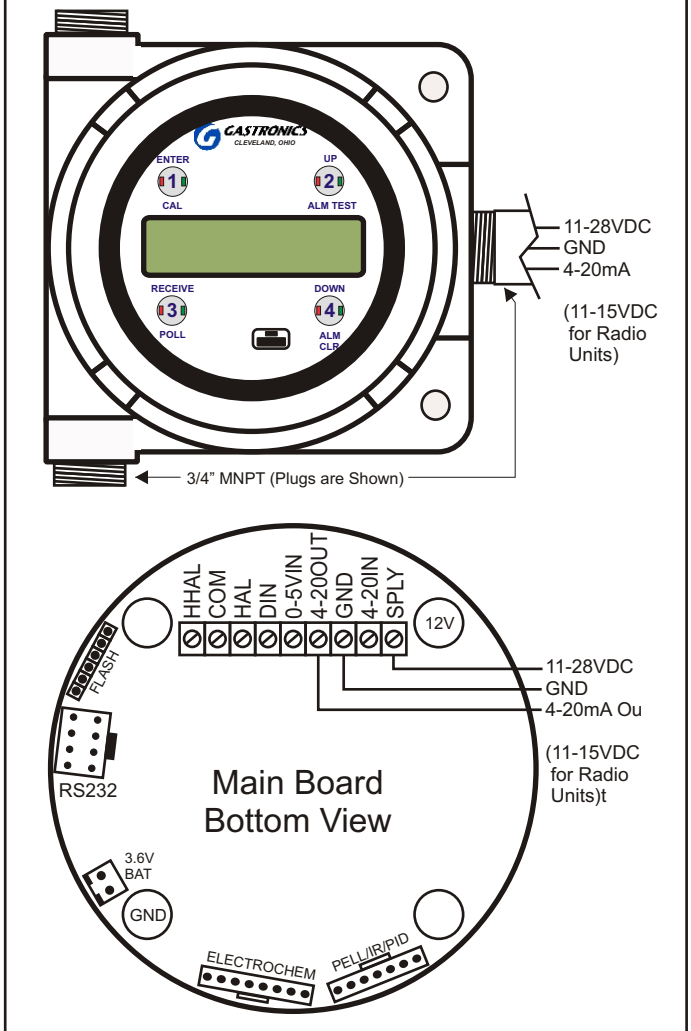


Figure 2 - Hardwired DC 3-Wire 4-20mA

DRY CONTACT RELAY WIRING

When using the Hi and HHi Alarm relay contacts as sinking (non-sourcing), be sure to give attention to the limitations of the contact ratings. The relays are rated for 2 Amps at 30VDC or 0.4 Amps at 125VAC.

Figure 3 illustrates wiring when using external power to actuate alarm devices. **Dry Contact board configuration requires Zero-Ohm Resistor to be present at R52 and no resistor at R51. These locations are located on back of main board directly behind relays.**

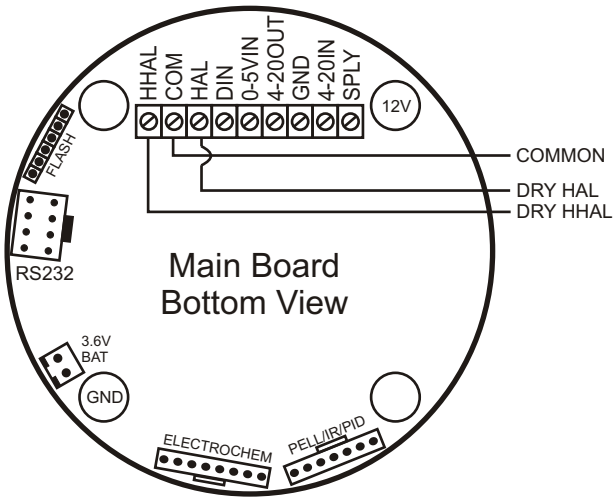


Figure 3 - Dry Contact Alarm Wiring

DC SOURCING RELAY WIRING

When using the Hi and HHi Alarm relay contacts as sourcing, be sure to give attention to the limitations of the contact ratings. The relays are rated for 2 Amps at 30VDC.

Figure 4 illustrates wiring when alarm contacts provide sourcing SPLY power with COM being common with GND. **Sourcing contact board configuration requires Zero-Ohm Resistor to be present at R51 and no resistor at R52. These locations are located on back of main board directly behind relays.**

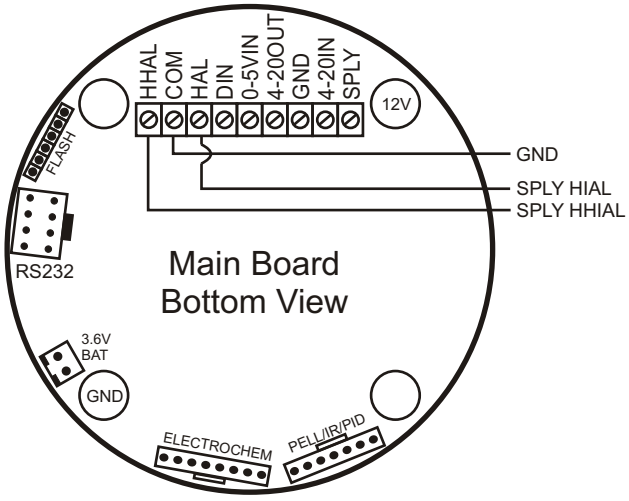


Figure 4 - DC Sourcing Alarm Wiring

DC SOURCING RELAY WIRING

Figure 5 illustrates same as above equivalent. Not that COM and GND are same.

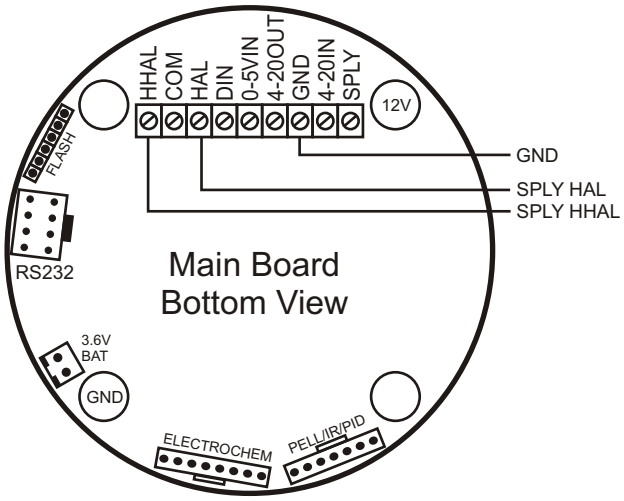


Figure 5 - DC Sourcing Alarm Wiring Alternate

4-20MA 2-WIRE INPUT WIRING

For an external 4-20mA 2-wire loop powered device, wire to the 4-20IN and the SPLY. Note: If AC power board is used to power the TW-XP transmitter, the SPLY will be limited to providing 12VDC to power the loop. Therefore the external device will have to be rated for 12VDC operation. If the AC power board is not used, the SPLY will provided the same voltage that the TW-XP transmitter is powered with.

Figure 6 illustrates wiring for tying an external loop powered device into the TW-XP.

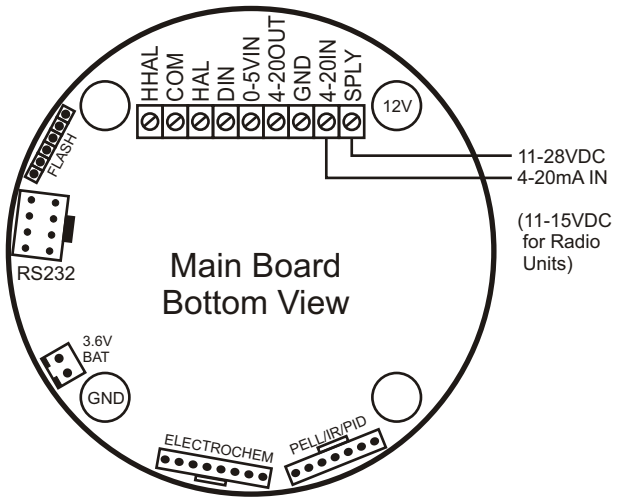


Figure 6 - External 2-Wire Loop Powered 4-20mA Input

4-20MA 3-WIRE INPUT WIRING

For an external 4-20mA 3-wire device, wire to the 4-20IN, SPLY and GND. Note: If AC power board is used to power the TW-XP transmitter, the SPLY will be limited to providing 12VDC to power the loop. Therefore the external device will have to be rated for 12VDC operation. If the AC power board is not used, the SPLY will provided the same voltage that the TW-XP transmitter is powered with.

Figure 7 illustrates wiring for tying an external 3-wire 4-20mA device into the TW-XP.

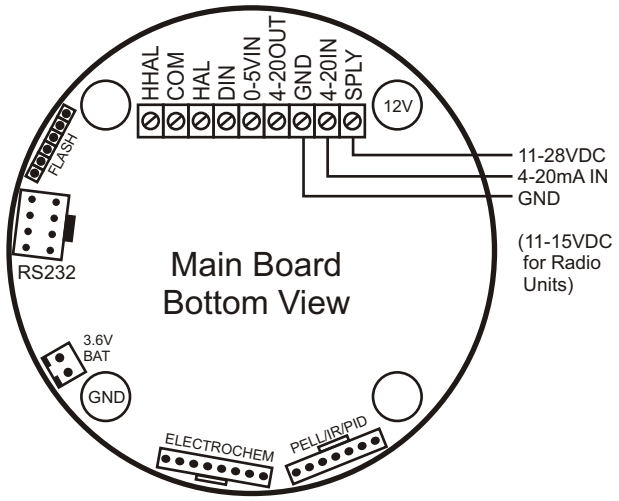


Figure 7 - External 3-Wire 4-20mA Input

0-5 VDC ANALOG IN WIRING

Figure 8 illustrates the wiring for the 0-5 VDC Analog Input.

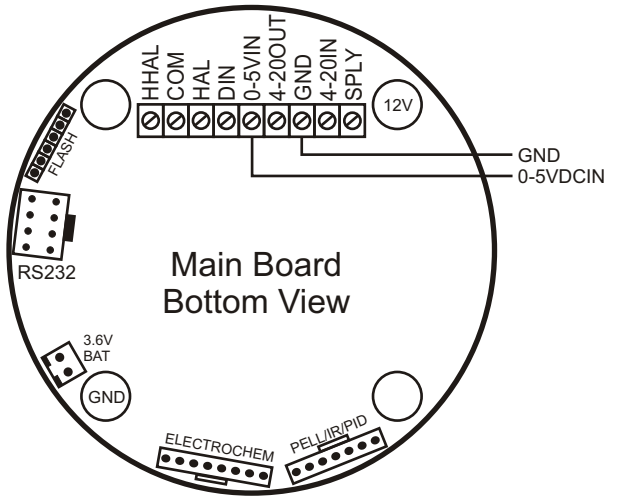


Figure 8 - 0-5VDC Analog Input

DIGITAL INPUT WIRING

Figure 9 illustrates the wiring for the Digital Input. The digital input is self powered and just needs to be taken to ground. No external voltage is applied.

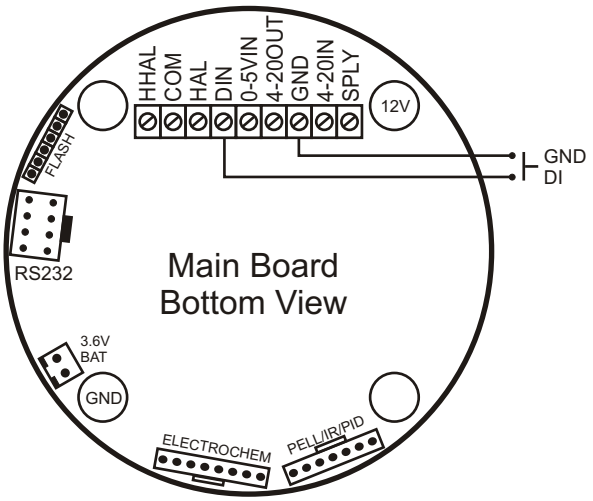


Figure 9 - Digital input Wiring

POWERING THE TW-XP-X-A

The TW-XP Transmitter can be powered with 110VAC or 220VAC if the AC Version of the Transmitter with the AC Board is used. Model numbers ending in an A, such as TW-XP-X-A, are AC Versions. The AC Board converts 110 and 220VAC to 12VDC. The AC Board also has a 24VDC Input, which will convert 24VDC to 12VDC. The purpose of the 24VDC Input is for applications where the UHF/VHF or GPRS radio is used which only operate on 12VDC. In this case, the SPLY must be powered with 12VDC instead of 11-28VDC.

When using an AC Version of the TW-XP, the AC Board would stack on the internal mount bracket first and then the Main Board would stack on top of the AC Board.

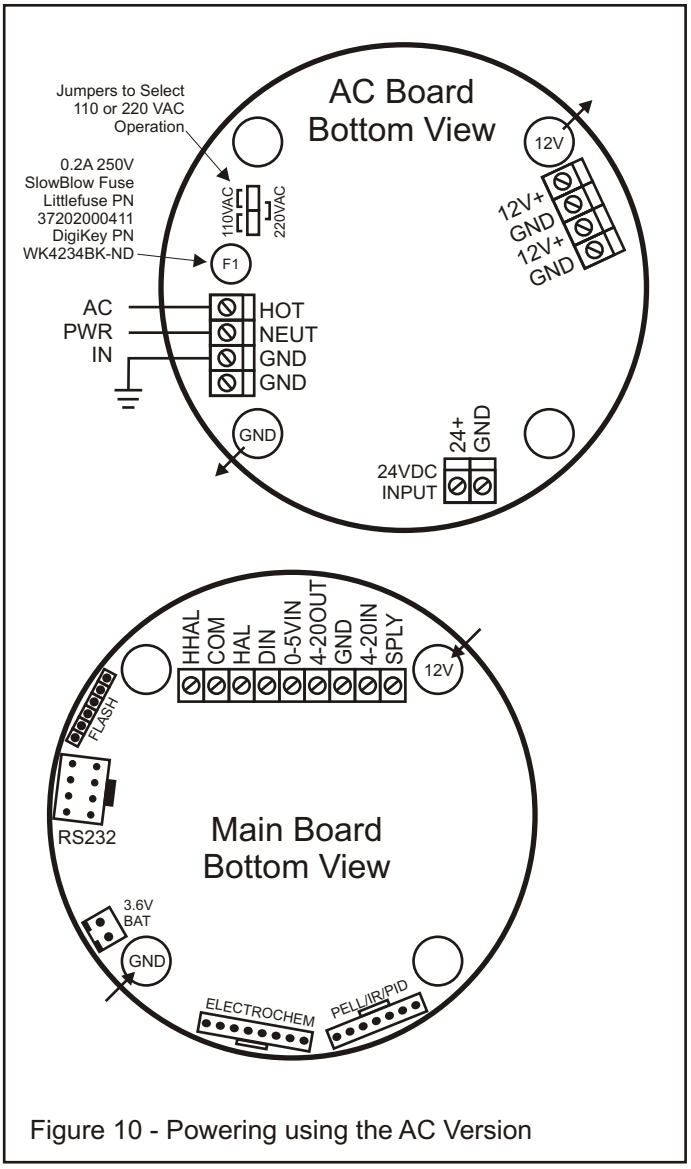


Figure 10 - Powering using the AC Version

SETUP DC BOARD FOR AC

If the AC power board is used to supply 12VDC to the Main Board, the SPLY source can be run by connecting two wires from the 12V and GND output terminals on the AC board to the SPLY and GND on the Main Board, or the 12VDC can run through the mounting posts if Solder Points SP10 & SP17 are jumpered closed. This is normally set up at the factory. **CAUTION: IF SP10 & SP17 ARE JUMPERED, DO NOT APPLY EXTERNAL POWER TO SPLY & GND. USE AC BOARD TO POWER MAIN BOARD ONLY.**

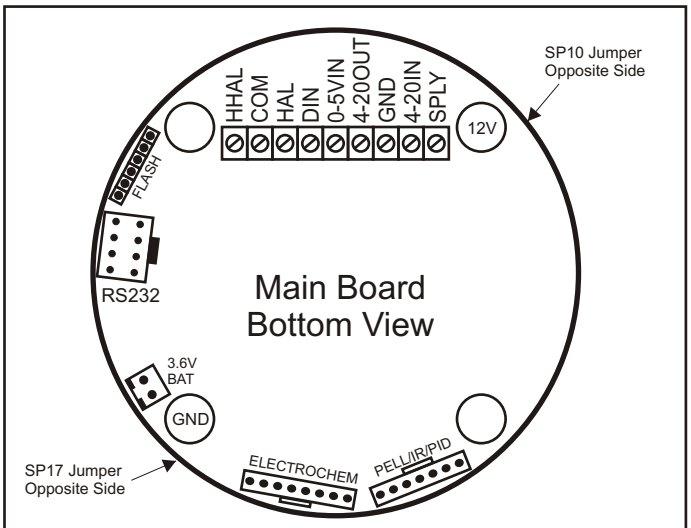
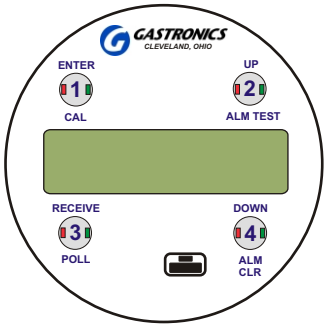


Figure 11 - Configuring Main Board for AC Board

OPERATIONAL FUNCTIONS

FACE PLATE FEATURES

The face of the TW-XP has 4 operation switches. Each switch operates with the use of a surface mount magnetic hall effect switch. At each switch are also a red and a green surface mount LED. These LEDs are used for various functions as will be illustrated in the following sections. There is also an IR transceiver for downloading data and external provisioning, along with a light sensor which can be activated to illuminate the LCD in the dark. The LCD is a 2-line by 16 character display with backlighting.



TW-XP Face consists of 4 Magnetic/LED swtiches, LCD Display, IR Transceiver and Light Switch.

LCD DISPLAY LAYOUT

The LCD Display is laid out to communicate information in 4 separate corners: Upper Left; Upper Right; Lower Left; Lower Right. When the display is in setup or calibration mode, functions are displayed in these four corners and the switch closest to that corner is used to select that function.

LCD Display Functions in Normal Operating Mode.

Primary Sensor Reading	Alarm Status Indication
Other Sensor Readings	Supervisory Status

SWITCH FUNCTION

When using the supplied magnet to operate a switch, the Red LED will illuminate indicating the operation of the switch.

Switch 1 allows the user to access the setup and calibration password menus, and confirm a setting.

Switch 2 is used to trigger a 3 second alarm test when in normal operating mode, and to increase a setting value when in setup or calibration mode.

Switch 3 is used to perform a manual poll to the base receiver when in normal operating mode. A green illumination indicates a successful reply. **Note: Switch 3 also allows the user to abort calibration during the calibration sequence of a specific sensor.**

Switch 4 is used to trigger a 5 minute alarm clear and when in normal operating mode, and to decrease a setting value when in setup or calibration mode.

Note: When increasing or decreasing a setting, the value can be rapidly changed by holding the magnet on the appropriate up or down switch. Otherwise, individual taps will change the value incrementally.

PASSWORD MENU INSTRUCTIONS

PASSWORD LOGINS

Press SW#1 to Access Passwords. There are two user passwords. To access the Calibration Menu, the default password is 1-2-3-4. To access the Setup Menu, the default password is 4-3-2-1. These passwords can be changed at the first display screen in the

Enter Password:
– – – –

Calibration Menu Password = 1-2-3-4
Setup Menu Password = 4-3-2-1

Change Password Menu (Setup Menu)

Spvr PW	Cal PW
	next

INITIAL SETUP MENU INSTRUCTIONS

RADIO OR NON RADIO

The first consideration is to select a unique site address for the remote wireless transmitter and base station address, or if this is a non radio application, set the site address to zero and the unit will operate as a SLAVE in the hardwired mode.

Set remote site address and master address; or for hardwired set SiteAdr to 0.

SiteAdr	MstrAdr
TxRetries	next

TxRetries is the number of transmit retries when there is no reply before going on to the next value. Default is 3.

POLL TMR RADIO SETTINGS

The Poll Timer is used to transmit in periodically for supervision. The base station has timers programmed in for each remote site address. Periodic transmissions keep these timers reset. If a timer times out, the base station will alert a communication fail for the corresponding site address. This setting can be set from 5 to 20 minutes.

Poll Timer is factory set to 15 minutes and can be adjusted by user.

PollTmr	RFDiags
	next

RF DIAGS / FREQ SETTINGS

RF Diagnostics is where the radio's transmit and receive frequencies can be verified and set. Also, the KeyTx activates a 3 second radio transmission for use when verifying the radio output power with a Watt Meter.

Set UHF/VHF radio frequency per user's licensed transmit and receive frequencies.

SetFReq	KeyTx
RadCtrl	next

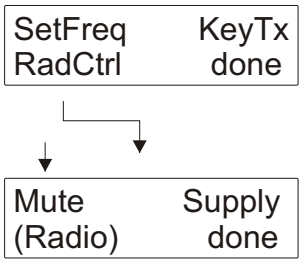
Test radio signal power with Watt Meter using KeyTx. This will hold transmit power for 3 seconds.

INITIAL SETUP MENU INSTRUCTIONS CONTINUED

RADIO MUTE FUNCTION

The Radio Mute function allows the user to put the remote transmitters in a radio silence mode where the radio stays powered on, but can only hear and not transmit. This function can be both set on the individual monitor as well as sent out to all the remote monitors as a command from the base transceiver. This feature is often used during explosive blasting when radio silence is required.

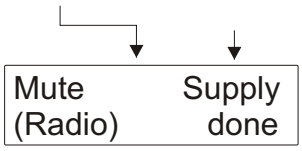
Select Radio Control.



RADIO POWER SAVE

With the radio Supply turned off, the radio will only power up on transmit. This saves 100mA of nominal power. **Note: Radio will stay powered up during Radio Silence mode to listen.**

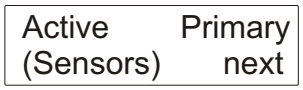
Select radio power supply setting to continuous on or power only on transmit.



SENSOR ACTIVATION

The applicable sensor inputs must be manually activated to be recognized by the TW-XP transmitter. The selection includes Pellistor Type Sensors (Pellistor, IR, PID); Current Loop In (4-20mA); Electrochemical Sensor (H2S, CL2, SO2, etc.); Analog In (0-5V); Digital In (open/closed); Supply In (Main Board Power VDC); and Battery In (Lithium Battery VDC). Note: The Current Loop In allows for selection of various scales, resolutions and unit of measures.

Choose Active and scroll up to select the sensors being applied to the application.

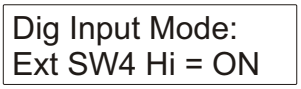


Once the desired sensor inputs are activated, select the Primary sensor. The primary sensor is the sensor that will be read on the top line of the main display continuously, while the other sensor input readings will toggle between each other on the lower line of the display. **Note: The primary sensor is also that sensor that is assigned to the 4-20mA Output for hardwired applications.**

ACTIVATING DIGITAL INPUT

In the Sensor Activation menu, activate the digital input first, then choose if the digital input will be used to activate a local alarm relay or used to simulate the faceplate switch #4 to provide a 5 minute ALM CLR function. **Note: If the latter function is selected, the external triggering device (ie. button) must be momentary.** Chose if the digital input will trigger from the button being momentarily closed (Hi) or opened (Lo).

Choose Digital Input Alarm function to Lo (Normally Open), Hi (Normally Closed), or Disabled.



INITIAL SETUP MENU INSTRUCTIONS CONTINUED

SETTING ALARMS

Alarms can be set for Hi and Hi Hi levels for Pellistor Type Sensor, Current Loop In, Electrochemical Sensor, Analog In and Digital In.

Choose Alarms and set Hi and Hi Hi alarms for each active sensor input.

Alarms Deadbands
(Sensors) next

SET DIGITAL INPUT ALARM

In the Alarm Setup menu, the Digital Input can be set to turn on the local Hi Alarm relay if the Digital Input is taken to ground (Lo) or if the Digital Input is open (Hi), or this feature can be not used (Disabled). **Note: For the Digital Input to be used, it must first be Activated in Drive Alarms setting.**

Choose Digital Input Alarm function to Lo (Normally Open), Hi (Normally Closed), or Disabled.

Hi Alarm Level
DigIn Disabled

SET SENSOR DEADBANDS

For Wireless Applications, deadbands for each sensor input must be set. A deadband is the amount of change in reading to trigger a radio transmission.

Choose appropriate deadband setting for each active sensor input.

Alarms Deadbands
(Sensors) next

Examples:
H2S = 2 ppm
CO2 = 0.25%

ALARM LED / BACKLIGHT

The last display allows the user to choose to have the four test points flashing during alarm conditions. Additionally the light sensor on the face plate can be activated to illuminate the display back light during low light periods. This should not be activated for solar applications. The back light will still illuminate during alarm, calibration, setup and for 5 seconds after magnetic face plate switches are tripped.

Select Alarm LED flashing feature option.

AlrmLED BckLght
done

Select night time back light option. Not recommended for solar applications.

CALIBRATION MENU INSTRUCTIONS

CALIBRATION OPTIONS

Calibration will be limited to only the sensors that are activated. The Illustration shows calibration options for three activated sensors: Pellistor Type Sensor (Pellistor, IR, PID); Current Loop In (4-20mA Input); and Electrochemical (H2S, CL2, SO2, etc.). Choose the sensor to calibrate. **Note: When in the calibration mode for a sensor input, the operation can be aborted by switch 3.**

Choose sensor to calibrate.

PellSnr	CrntLoop
ElctroChm	next

For Pellistor and Electrochemical type sensor inputs, test gas is required, whereas for the current loop input, a digital amp meter will be required.

CALIBRATING PELLISTOR

Calibration of the pellistor type sensor requires calibration test gas with a mixture of a known quantity within the range of the sensor readout mixed with a carrier gas. For pellistors, the carrier gas must be air since pellistors require some oxygen to function properly. For IR or PID sensor, the carrier gas can be air or nitrogen. The calibration menu allows you to select the gas quantity within the

Press 1 to Zero and once zeroed, it will prompt you to enter calibration gas amount. Then hit enter and apply gas. Raw counts will rise. Once reasonably stabilized, enter again. Now sensor is calibrated.

SET	Raw 0107
#1 to Zero Pell	

It is recommended to keep track of raw counts for zero and span in PM Log.

CALIBRATING ELECTROCHEM

Calibration of the electrochemical type sensor requires calibration test gas with a mixture of a known quantity within the range of the sensor readout mixed with a carrier gas. This operation works similar to the pellistor calibration.

Press 1 to Zero and once zeroed, it will prompt you to enter calibration gas amount. Then hit enter and apply gas. Raw counts will rise. Once reasonably stabilized, enter again. Now sensor is calibrated.

SET	Raw 0254
#1 to Zero EC	

It is recommended to keep track of raw counts for zero and span in PM Log.

CALIBRATING CURRENT LP IN

Calibration of the 4-20mA Current Loop Input requires hooking a digital ammeter between terminals 4-20IN and 4-20OUT on the board. The 4-20OUT will act as the 4-20mA calibration standard for calibrating the Current Loop In. Therefore no external 4-20mA simulator is required.

When the TW-XP is in calibration mode, the 4-20mA output is locked at 4mA except when adjusting Current Loop In to 20mA. **However, it is important to note that since the sensor assigned as primary will also be the sensor assigned to the 4-20mA output, once you exit the calibration mode into normal operating mode, the 4-20mA output will reflect the reading of the primary sensor. If your ammeter is still attached at this time, you will see the milliamp reading that reflects the reading of the primary sensor.**

Figure 12 illustrates the hook up for the Digital Ammeter.

When selecting to calibrate the Current Loop In, the first menu will prompt to attache DVM between Current Loop Out and Current Loop In.

Connect Ammeter CL out to CL In

Then hit Enter and the DVM will read near 4mA. Adjust that with switches 2 & 4 to get as close to 4.00mA as possble, then hit enter.

Adjust for meter reading 4.0mA

Now the display prompts to adjust for 20mA. Do the same and adjust using switches 2 & 4.

Adjust for meter reading 20.0mA

Then hit enter and the Current Loop In is calibrated.

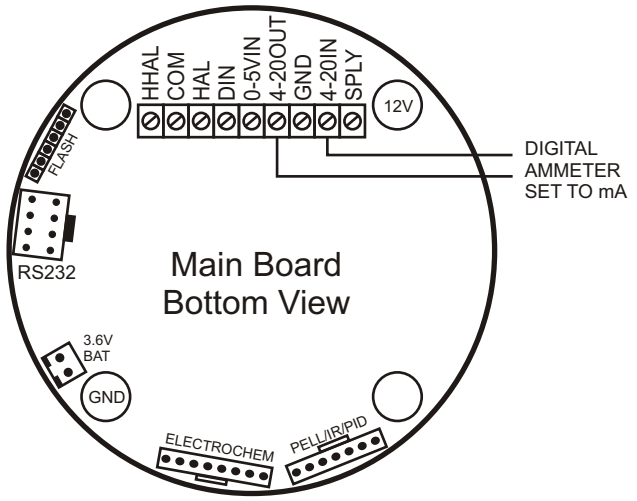


Figure 12 - Digital Ammeter Hookup

RF DIAGNOSTICS

SCANNER

Transmit and receive signals can be verified with a radio scanner that operates at UHF/VHF ranges. We suggest the Uniden BC95XLT NASCAR Scanner available at Radio Shack on-line. This scanner, which cover both UHF and VHF has no initial delay and will catch the fast transmission immediately.

To use, hit FUNC, E and enter frequency, then hit E twice. Set squelch and volume.

To use scanner, hit FUNC, E and enter frequency, then hit E twice. Set squelch and volume. To manually poll TW-XP, hit switch 3 which will go red momentarily and then go green on receive from base station.

TESTING RADIO POWER

Testing radio output power is normally done using a what meter. For this purpose, when testing the UHF/VHF, we suggest the following:

1. Bird Model 43 Truline Wattmeter with Female N Connectors and Peak Hold feature.
2. 10 Watt Slug for UHF/VHF depending on radios. (UHF Slug is PN#10E 400-1000MHz)
3. Bird 5-T-MN 10 Watt, 50 Ohm Load with Male N Connector.
4. Two foot coax jumper with Male N Connectors.

The Watt Meter must be connected to the TW-XP antenna coupler as show in Figure 14 with the 50 ohm load arrow pointing toward the 50 ohm load. The next step is to login to the Setup Menus and go to the RFDiags menu. In the RF Diagnostics menu press the KeyTX and the TW-XP radio will stay keyed for 3 seconds which is long enough to get a proper reading on the watt meter. The radio output reading should be between 40 and 60 percent of the 10 watt scale on the watt meter. Note: There may be some power loss due to external and internal connections.

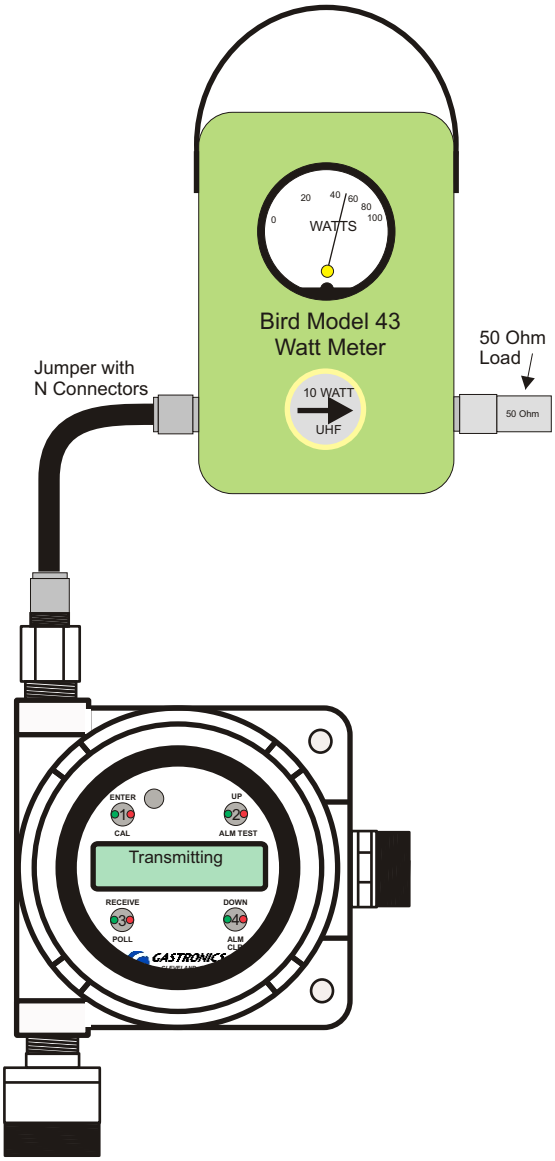
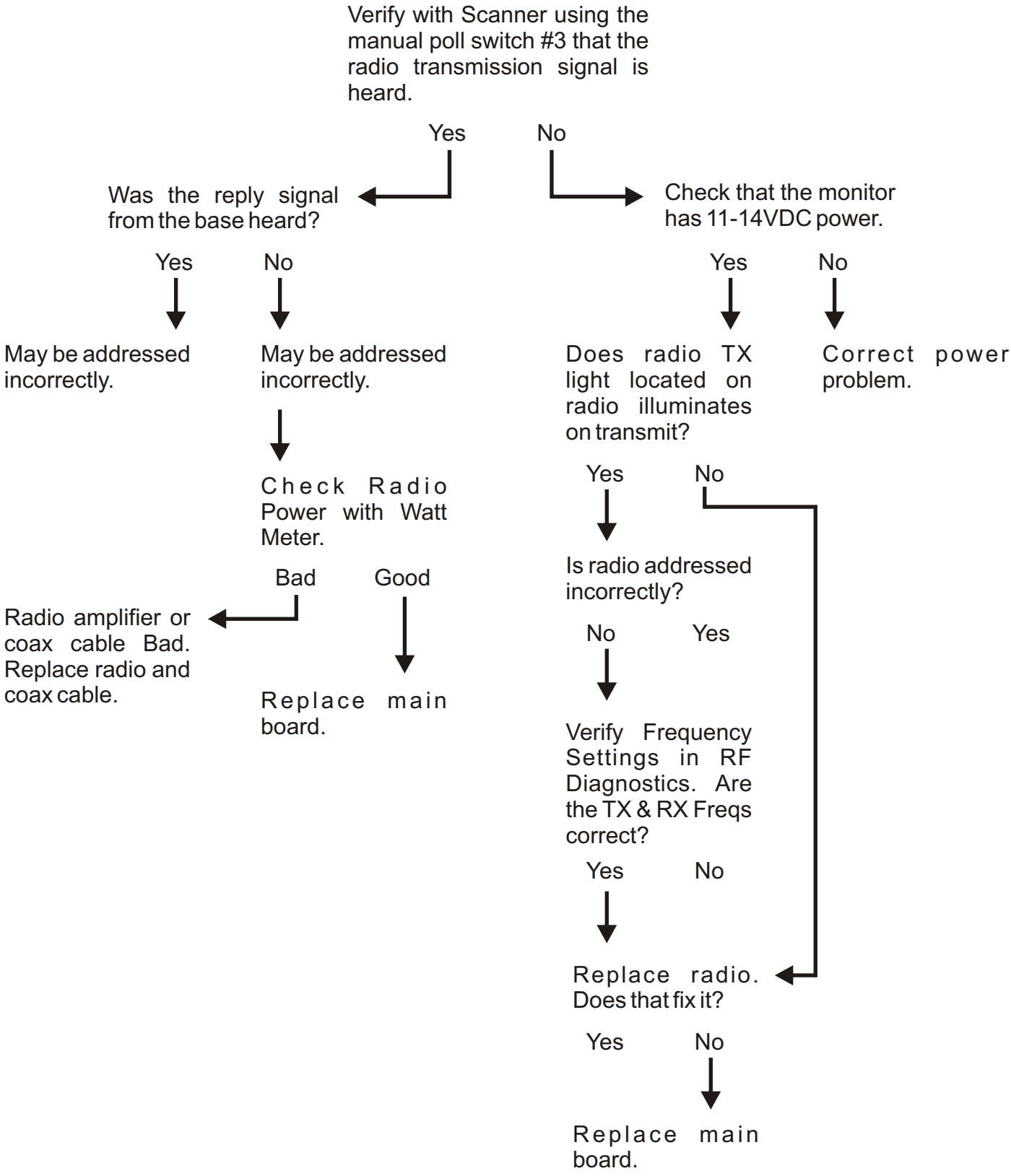
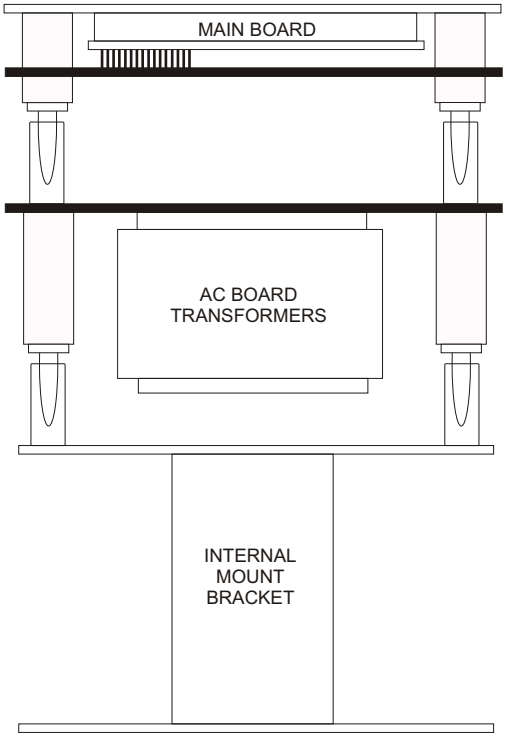
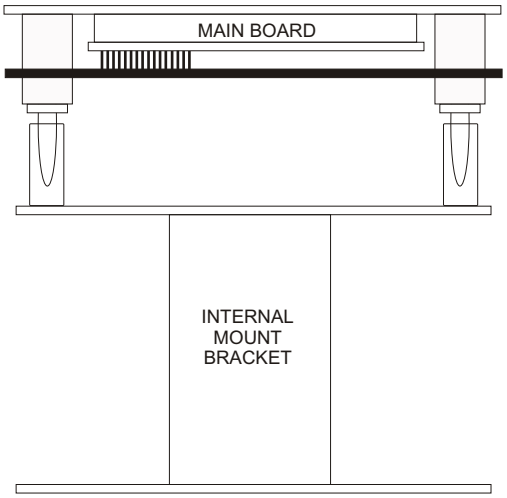


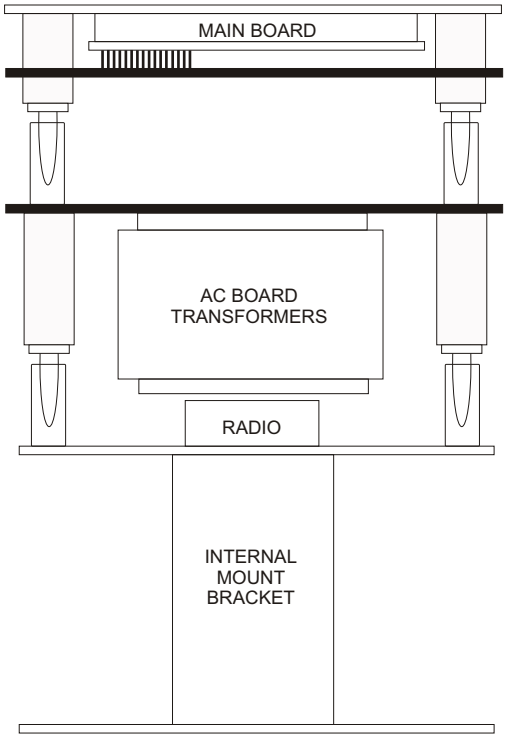
Figure 14 - Connecting Watt Meter

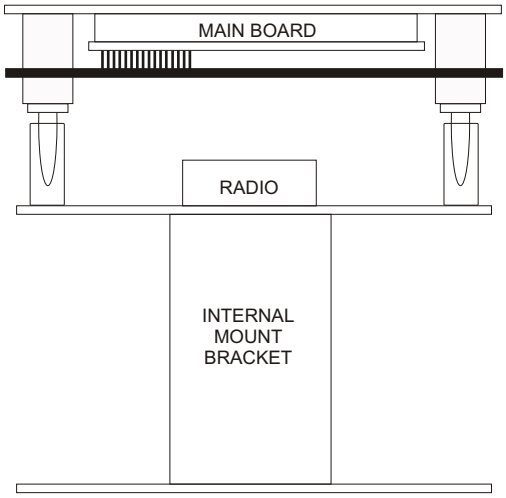
REMOTE RF TROUBLE SHOOTING











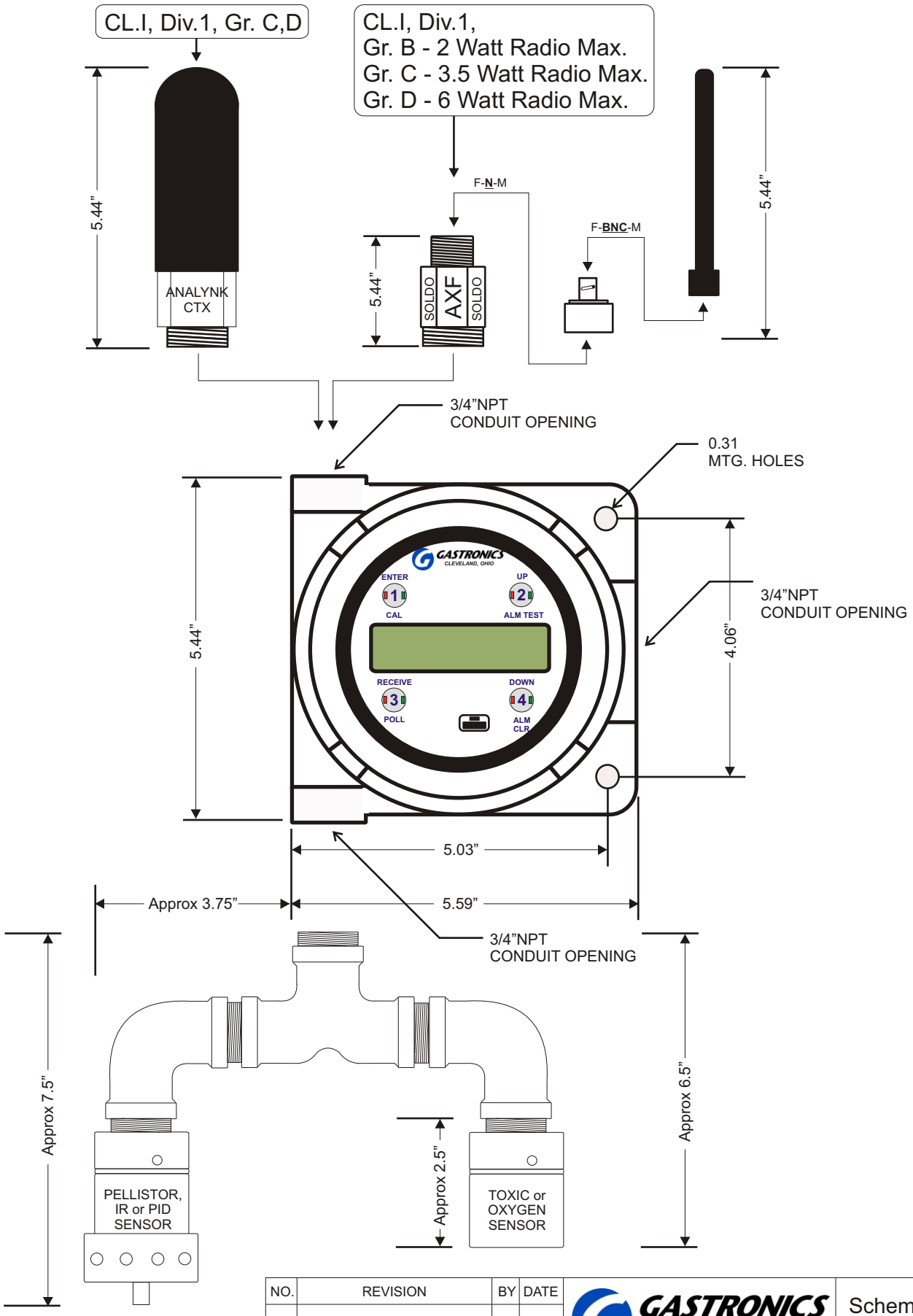
NO.	REVISION	BY	DATE

GASTRONICS
True Wireless® Gas Detection Technology

DRAWN BY:	DATE:
CHECKED BY:	DATE:
APP BY:	DATE:
APP BY:	DATE:

Internal Side View for DC & AC w/wo Radio

SCALE	DWG.	REV.
NONE	1-0	0



NO.	REVISION	BY	DATE

GASTRONICS
True Wireless® Gas Detection Technology

DRAWN BY:	DATE:
CHECKED BY:	DATE:
APP BY:	DATE:
APP BY:	DATE:

Schematic for Mounting Considerations

SCALE	DWG.	REV.
NONE	1-0	0