



CONSPEC®

GAS DETECTION SOLUTIONS

Universal Transmitter

OPERATIONS & MAINTENANCE MANUAL

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Version: 091201



Warranty & Disclaimer Information

Due to Conspec Controls Inc.'s continuous effort to produce the highest quality monitoring equipment possible, products described in this manual are subject to change at any time without notice. While every effort has been made in preparing this manual to include all information pertinent to the installation, maintenance, and calibration of the product, Conspec Controls Inc. assumes no responsibility for errors, omissions, or any loss due to said errors or omissions.

A gas monitoring system alone cannot prevent hazardous conditions from occurring. The reliability of a gas monitoring system, and the resultant safety level is dependent on, and the responsibility of the user. The user's responsibilities include, but are not limited to:

- Insuring that the correct equipment is specified for conditions at the particular site
- Meeting all applicable safety and electrical codes
- Replacing inoperative or questionable parts or units
- Following recommended installation and wiring guidelines
- Scheduling regular calibrations and servicing

WARRANTY

Conspec Controls Inc. provides warranty service for one (1) year from the shipping date on all electronic and mechanical components. Sensor elements are considered a consumable part subject to varying conditions, which can affect their expected life. Sensor elements are covered under warranty for a period of six (6) months. Damage to sensor elements due to overexposure of the target gas, poisoning, or other factors beyond Conspec's control are not covered under warranty. Warranty service is limited to defects in materials and workmanship on units, which fail under normal use. Conspec will repair or replace any unit found to have failed due to defects in materials or workmanship. This warranty is voided if the unit has been misused, damaged due to incorrect wiring, or altered before return to the factory. Warranty claims that are denied will be billed at the standard rate. Expedited shipping is not covered under warranty.

No other warranty is authorized other than the above.

Before returning a product for service, call Conspec Controls Inc. for a Return Authorization Number (RA#) at 1 (877) 526-6773. Returned units should be packaged securely as damages incurred during shipping are not covered under warranty.

1.0 GENERAL DESCRIPTION

The Universal Gas Transmitter is a micro-controller based electronic sensor that accepts signals delivered by several types of industry standard cells including **Electrochemical, Catalytic Bead, Infrared, Photo-ionization & Thermal Conductivity** to determine ambient levels of target gas. The monitor can operate stand alone, providing local display and alarm indication, or it can be connected to a larger fixed point detection system by incorporating the 900745 MODBUS protocol 2W 485 communications trunk adapter board, or the 900741 Conspec protocol trunk adapter board. Alternatively, a 4-20 mA current signal is provided when the instrument is used as a remote sensor.

Alarm indicators are provided on the monitor. Normal condition will cause a green visual indicator to blink once every two seconds. If the first level of alarm is exceeded, this indication will change to one red blink every two seconds. When the second level of alarm is exceeded, the red visual indicator will blink twice every two seconds. Available options include the 900739 Alarm Relay Board. The 900739 contains three SPDT relays that activate via the programmable alarm set points. Optional self contained or remote audible and visual alarms can be connected with the incorporation of the Relay Board. This also enables control devices to be activated during an alarm condition. The monitor has a 2-line, 8-character alphanumeric Liquid Crystal Display that is used to display status, readings, and prompts to the user. User configuration and status indication is initiated via keypad entry. The standard keypad is a self-contained infrared encoder. The Universal Transmitter is temperature compensated over its entire range of operation in software. The one-person calibration feature is simple and adjustment free.

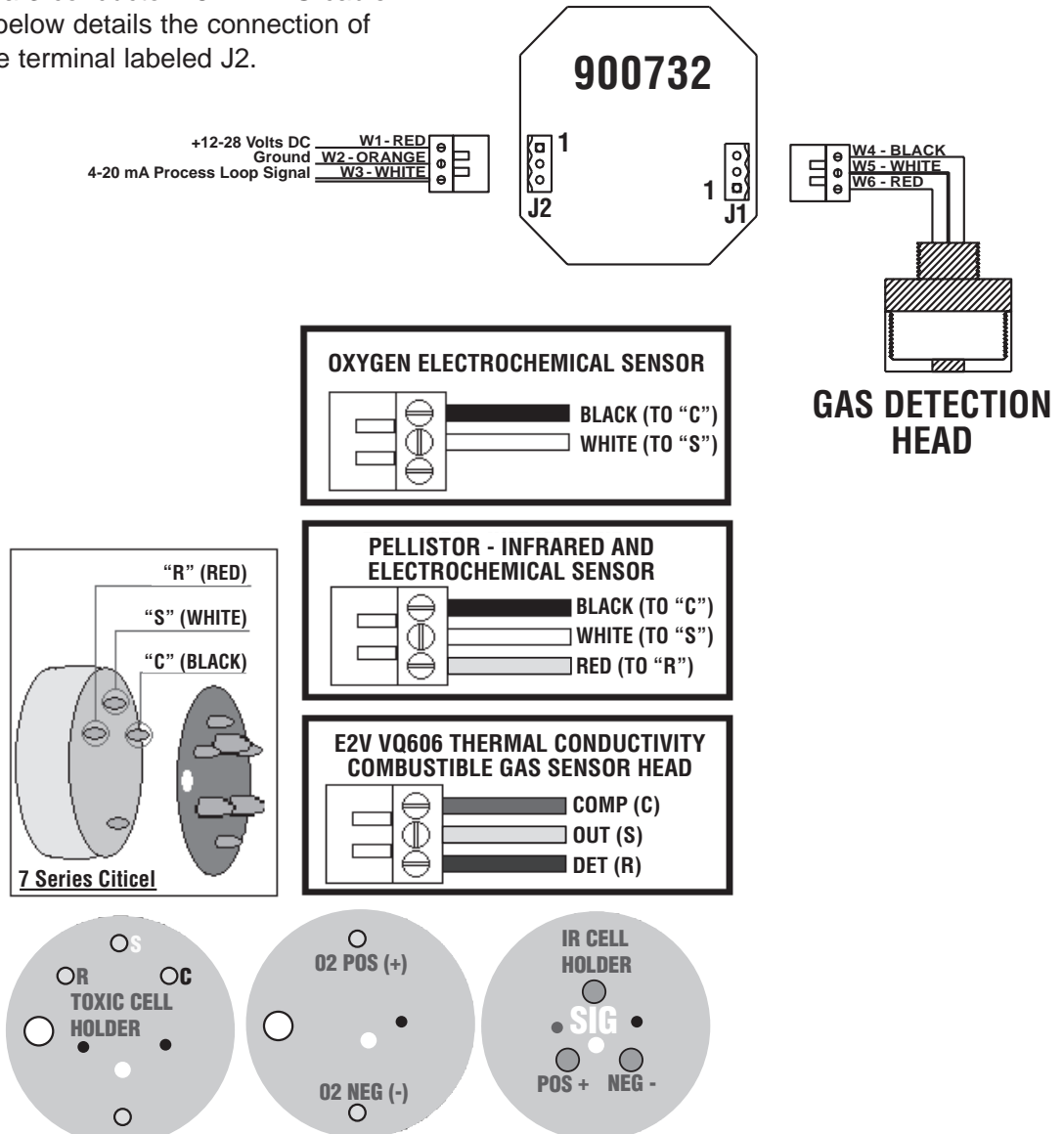
2.0 TECHNICAL DESCRIPTION

Control Voltage:	12-24 Volt DC, 50 mA typical load
Analog Output:	4-20 mA current source standard
Operating Temperature:	-20 to +50° C
Humidity:	10-95%, non-condensing
Accuracy:	+/- 2% Full Scale
Repeatability:	+/- 2% Full Scale
Stability:	+/- 2% over 24-hour test, full temperature range

3.0 INSTALLATION INSTRUCTIONS

The Universal Transmitter is available in a NEMA 4X rated electronic enclosure and also in a NEMA 7X rated Explosion Proof enclosure rated for use in Classified Areas. Locate a suitable location free of drips and drafts that allows the user to safely access the unit. The Universal Transmitter shall be mounted so the detection head is pointing downward. Securely mount the unit using industry approved methods and materials taking into account sound mechanical and electrical practices. (**NOTE:** It is the user's responsibility to follow all applicable Federal, State, and Local Building and Electrical Codes.) The Universal Transmitter Card is powered via a 3-conductor 18-22AWG cable.

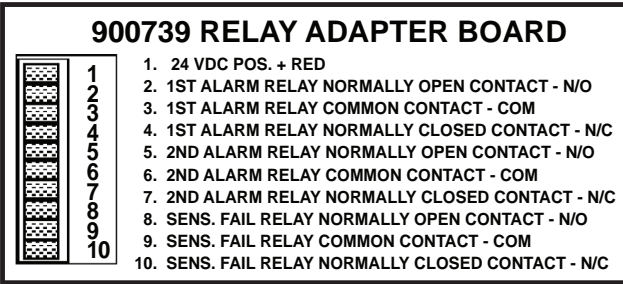
The wiring diagram below details the connection of V+, GND, SIG on the terminal labeled J2.



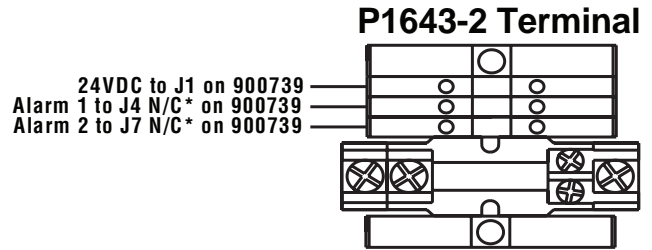


900739

(3) SPDT Rated .5A @ 120VAC, 60W



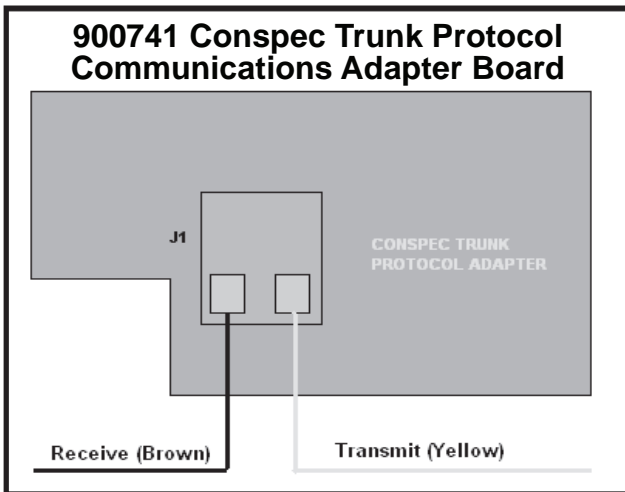
Connecting the P1643-2 to 900739



Note: Wiring is in a failsafe configuration. N/C held open during normal operation and closes when alarmed or during power loss

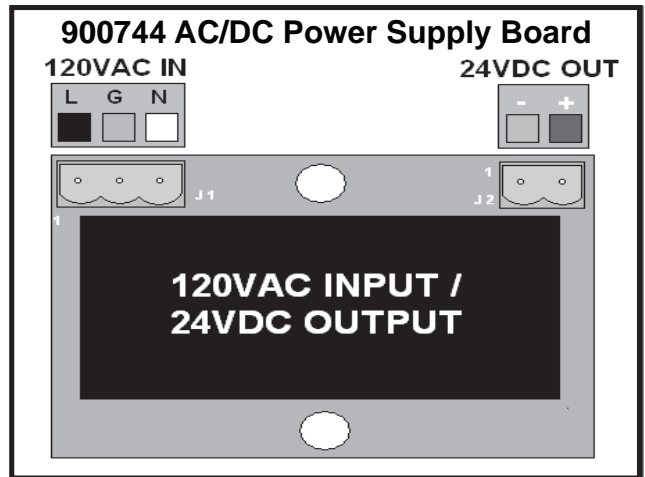
900741

10V RS232 Comm. Board



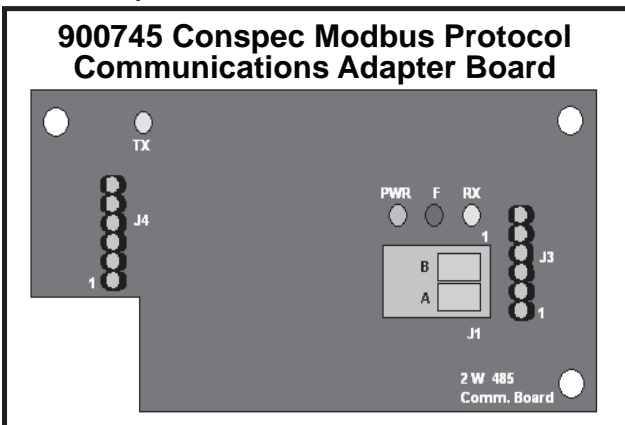
900744

100-240VAC/+24V/.23A



900745

4.5V Half duplex RS485 Comm. Board





4.0 COMMAND CODES

The Universal Transmitter Card is configured using the UP99 Infrared Keypad Encoder. Command Codes consist of a number followed by the "ENTER" key. ENTER is the key labeled 'E'.

25 Unlock Monitor

Enter Command Code 25 to unlock the monitor. A prompt will be displayed requesting entry of the User Password. The User Password is factory preprogrammed to "1". When the User Password is entered, the monitor will go into unlocked condition for a 15-minute period. In the unlocked condition, instrument settings can be modified.

100 Programmable Parameters

Enter Command Code 100 to activate the Programmable Parameters Menu. The **Gas Type, Full Range, Span Gas Input,** and **Alarm screens** will be displayed. Each screen will be displayed until a new value is entered, the Enter key is hit, or a 10-second timeout occurs. If the monitor is unlocked, a new value can be entered over the existing value displayed on each screen. Unlocked condition is indicated by a "?" being displayed on the bottom line. Refer to the example below.

ex. CN0352 0-500ppm CO

1st Screen / Full Range	500	(Sensor's Maximum Detectable Value)
2nd Screen / Span Input	250	(Actual Value of Span Calibration Gas)
3rd Screen / Alarm Level One	35	(Value at which Alarm Level 1 Activates)
4th Screen / Alarm Level Two	200	(Value at which Alarm Level 2 Activates)
5th Screen / Alarm Delay	5	(Delay prior to alarm activation in seconds)

Additional programming may be present on specific Universal Transmitter gas detection devices. Review the data listed below.

Combustibles	Gas Type	(Choose %LEL or %Volume)
Chlorine / Bromine	Gas Type	(Choose Chlorine or Bromine)
Oxygen	Alarm Type	(Select how the transmitter will determine an alarm condition)

*See Oxygen Sensor Note 100 Programmable Parameters on next page.

*See 0-4.00% H2 Calibration/ Programming Note on page 8.

*See Chlorine Detector Note on page 8.

**Oxygen Sensor Note** 100 Programmable Parameters

Command Code 100 contains a "Type" option that allows the operator to select how the Transmitter will detect an alarm condition. The value entered will determine if the alarm outputs will operate failsafe or non-failsafe. The value will also determine the manner in which the alarm outputs will activate (**ex. 1st - Norm - 2nd**, or **Norm - 1st - 2nd**, or **1st - 2nd - Norm**). The list below describes the operation and magnitude of bits 0-7.

Level 1 is always defined as being between 0.0 and AL1. Level 2 is always defined as being between AL1 and AL2. Level 3 is always defined as being between AL2 and 25.0%.

- Bit 7 - Controls relay output fail safe. If you want the alarm relay outputs to be fail safe, set this bit to a 1. If you do not want fail safe mode on the alarm relay outputs, clear this bit to a 0. This bit has magnitude = 128.
- Bit 6 - Controls sensor fail relay fail safe. If you want the sensor fail relay output to be fail safe, set this bit to a 1. If not, clear it to a 0. This bit has magnitude = 64.
- Bit 5 - Relay 2 Active Level 3 control. If you want level 3 to activate relay 2, set this bit. If not, clear it. Magnitude = 32.
- Bit 4 - Relay 2 Active Level 2 control. If you want level 2 to activate relay 2, set this bit. If not, clear it. Magnitude = 16.
- Bit 3 - Relay 2 Active Level 1 control. If you want level 1 to activate relay 2, set this bit. If not, clear it. Magnitude = 8.
- Bit 2 - Relay 1 Active Level 3 control. If you want level 3 to activate relay 1, set this bit. If not, clear it. Magnitude = 4.
- Bit 1 - Relay 1 Active Level 2 control. If you want level 2 to activate relay 1, set this bit. If not, clear it. Magnitude = 2.
- Bit 0 - Relay 1 Active Level 1 control. If you want level 1 to activate relay 1, set this bit. If not, clear it. Magnitude = 1.

For example, if all outputs were to be non-fail safe, relay 1 activate at 20.0% or lower, relay 2 activate at 10.0% or lower, the following would be entered within function 100: Range = 250. AL1 = 100. AL2 = 200. TYPE = 00001011 = 11 decimal.

All other parameters within function 100 are entered as 10 times the true numerical value.



Programming Note 0-4.00% H2

The CN0642-1 requires the user to enter the concentration of target gas applied as span gas prior to calibrating the monitor. The CN0642-1 has been factory preset for one percent (1%) Hydrogen (1/4 scale) as the span gas. This value will not require adjustment if the span gas concentration applied equals one percent Hydrogen. The CN0642-1 software requires the programming to be entered as %LEL. The lower explosive limit (LEL) of Hydrogen is equal to 4.00% Hydrogen. Therefore, a full range of 4.00% Hydrogen will be entered as 100, implying 100% LEL. The span gas value should also be entered as LEL. The full scale range of the monitor equals 100% LEL or 4.00% Hydrogen, therefore 25% LEL is equal 1% Hydrogen or 1/4 of full scale and will be entered as 25 when programming this setting. The monitor will also accept a calibration by applying 2% Hydrogen, which should be entered as 50 (1/2 scale or 2% Hydrogen), or by applying 4% Hydrogen, which should be entered as 100 (full scale or 4% Hydrogen). The CN0642-1 software will extract the value of target gas in terms of %LEL, then multiply the constant 0.04. This is the ratio of 4% to 100%. The result of this calculation will display the actual live value as % Hydrogen. Consider the reference listed below before attempting calibration. Refer to the calibration section contained within the users manual which describes a typical calibration procedure in detail.

Full Scale	= 4.00% H2 or 100% LEL	Enter as 100
Half Scale	= 2.00% H2 or 50% LEL	Enter as 50
Quarter Scale	= 1.00% H2 or 25% LEL	Enter as 25

CN0411 Chlorine (CL2) Detector Note

The CN0411 requires a warm up duration of 24 hours before the electrochemical cell stabilizes completely and the displayed value can be considered accurate. Allow 24 hours following initial activation or long term power loss before calibrating. The CN0411 has been factory calibrated prior to shipment. The CN0411 should be calibrated after installation within the environment for intended operation before being considered reliable. Due to the absorption characteristic of Chlorine, Tygon tube (3") should be used when calibrating to accelerate the rate at which the gas saturates the electrochemical cell. The Span Calibration may take up to 5 minutes before fully saturating the calibration chamber due to absorption of target gas by the sensor casing and tubing from the gas cylinder to the calibration adapter.

111 Gas Sensor Calibration

Enter Command Code 111 while the monitor is unlocked to activate the gas sensor calibration routine. The Calibration routine is detailed on the next page.

150 Signal Current Calibration

Enter Command Code 150 while the monitor is unlocked to calibrate signal output current and display contrast.

Each displayed parameter can be adjusted up or down by one incremental value per key hit. The '1' key decreases value, while the '2' key increases the value within operational limits.

170 Change User Password

Enter Command Code 170 while the monitor is unlocked to change User Password. The user password is factory preset to "1". The display will request entry of a new User Password. The new password needs to be entered twice before being accepted. The password can be any number from 1 to 9999.

200 Informational Screens

Enter Command Code 200 to display informational screens. The code version, input voltage, ambient temperature, slope, and live signal values will be displayed one at a time. This information is often useful during performance checks and troubleshooting following installation.



5.0 GAS CALIBRATION PROCEDURE

1. Unlock the monitor using Command Code 25 and the User Password factory preset to "1".
2. Initiate calibration by entering Command Code 111. The display will request zero gas be applied to the sensor head. The LED status indicator will turn on green continuously.
3. Apply zero gas to the sensor head using the calibration adapter, tubing, and proper gas cylinder. (The zero gas for toxic transmitters is 20.9% Oxygen or certified Zero Gas). The zero gas for an Oxygen sensor is certified 99.9% Nitrogen.

The display will indicate the raw decimal value of the cell head output. While in calibration, 4.0 mA is generated on the signal output.

4. When the raw value on the display has stabilized, hit ENTER to accept. This should take approximately 2-4 minutes.
5. The display will request span gas be applied to the sensor head. The span gas is a known concentration of target gas. (Example: Carbon Monoxide gas transmitter would possibly use a 25ppm concentration of calibration gas). The LED status indicator will turn red continuously. Remove the zero gas from the sensor head and apply the proper span gas. As the target gas is applied, the raw value on the display will increase. (*Chlorine, Bromine & Nitrogen Dioxide will display a negative response to target gas during calibration.*)
6. When the raw value has stabilized, hit ENTER to accept. This should take approximately 2-4 minutes.

If the new calibration information is accepted, 'Calibration Done' will be displayed for 1 second, then the instrument will return to normal operation.

If the calibration information is not accepted, 'Calibra. Error' will be displayed for a period of 8 seconds. The pre-existing calibration data will be reused at this point, to help prevent an invalid calibration. Two common reasons the calibration may be rejected are (1) Entering the data before the sensor has fully reacted to the target gas, or (2) The sensor has passed its expected life and can no longer produce a signal within the acceptable calibration limits. The sensor element is in most cases a consumable part that periodically requires replacement. See page 12 for Sensor replacement instructions.

Calibration gases, accessories & kits can be purchased from Conspec for all available gas detection transmitters and monitors supplied by Conspec.

6.0 SIGNAL CURRENT CALIBRATION

This feature allows the user to calibrate the 4-20mA Analog Output Signal. A Multi-Meter can be connected in series with the SIG (signal) wire to the controller.

1. Unlock the monitor using Command Code 25 and the User Password factory preset to "1".
2. Initiate calibration by entering Command Code 150. The unit will display the Raw Analog Zero Count.
3. Use Key number "1" to decrease or "2" to increase the Raw Zero Count.
4. When the Multi-Meter reads 4.0mA, the user may press Enter to confirm.
5. The monitor then prompts 20mA and displays the Raw Count.
6. Adjust the Raw Count with keys "1" & "2" until the Multi-Meter displays 20mA. Press the Enter key to confirm.

The typical Raw Count for 4mA should be approximately 190, and 950 for the 20mA.



7.0 GAS LEVEL INDICATORS

Sensor Failure:

The Universal Transmitter Card is designed to detect failures in the sensor cell and electrical connections. If any of the three contacts to the electrochemical cell are opened, or if the cell's output is diminished the signal voltage will be driven outside the limits for normal operation. This will be detected and constitute a sensor failure. The monitor will go into sensor fail if ambient temperature falls outside the range -20 to +50°C.

LED Status Indication:

Normal Mode:	One short green flash, 2-second interval
Alarm Level 1:	One short red flash, 2-second interval
Alarm Level 2:	Two short red flashes, 2-second interval
Sensor Fail:	Alternating red-green, 1-second interval
Calibration Span:	Constant red
Calibration Zero:	Constant green

Optional Alarm Status Indication:

Alarm Level 1:	Activates Halogen Strobe Visual Alarm
Alarm Level 2:	Activates Intervox Horn Audible Alarm
Sensor Fail:	Activates 3rd Relay on Optional 900739 Relay Board

Output Signal Current:

Normal Mode:	4.0 to 20.0 mA, linearly proportional from zero to full scale range
Sensor Fail:	2.0 mA
Temperature Fail:	0.0 mA
Start Up:	4.0 mA
Calibration Mode:	4.0 mA



8.0 MAINTENANCE & REPAIR GUIDELINES, REPLACEMENT PARTS:

- 1. **Maintenance:** This Gas Detection Monitor requires evaluation every thirty (30) days to ensure accuracy. The Monitor should be checked for accuracy by applying a known concentration of the target gas that exceeds the programmed alarm levels. The displayed gas value will stabilize as the gas fills the calibration chamber within the sensor head. When the programmed alarm levels are breached, the alarm output for that level would be activated subsequently to the programmed alarm delay duration. The displayed target gas value should match that of the concentration of test gas. Any warning or control devices connected to the alarm outputs should remain connected during this test to ensure proper operation of the entire gas detection system. Replace any inoperative or questionable parts immediately. This gas detection monitor requires calibration every ninety (90) days to ensure accuracy and to correct sensor drift. The gas detection “cell” located within the sensor housing is in most cases, a consumable part with an expected life. The cell’s output decreases slowly as it nears the end of its expected life. The rate at which the output decreases depends greatly on the concentration and presence of target gas. This must be corrected by calibrating the monitor often to ensure an accurate reading and dependable alarming and control of connected devices. Conspec recommends that no modifications be made to this monitor without first consulting Conspec Technical Services. Modifying this equipment without consulting the factory could result in unsafe operation and/or unsafe atmospheric conditions. Modifying this equipment will void any warranty authorized by Conspec Controls Inc.

- 2. **Repair:** Any monitor found to be defective or questionable should be returned to Conspec Controls for evaluation and repair. Conspec requires any returned equipment to first be issued a Return Authorization Number (R.A.#) by calling Conspec at 1 (877) 526-6773 Mon. - Fri. 8 am - 5 pm EST. Conspec also offers on-site Repair and Start-up service for Conspec Gas Detection Equipment.

- 3. **Replacement Parts:** Damaged or questionable parts should be replaced immediately upon detection. Damaged or inoperative parts could contribute to hazardous and/or unsafe conditions. Any consumable parts should be replaced if the reliability is questionable or within the part’s specific expected life. Consumable parts include any filters, pump motors, sensors... etc.

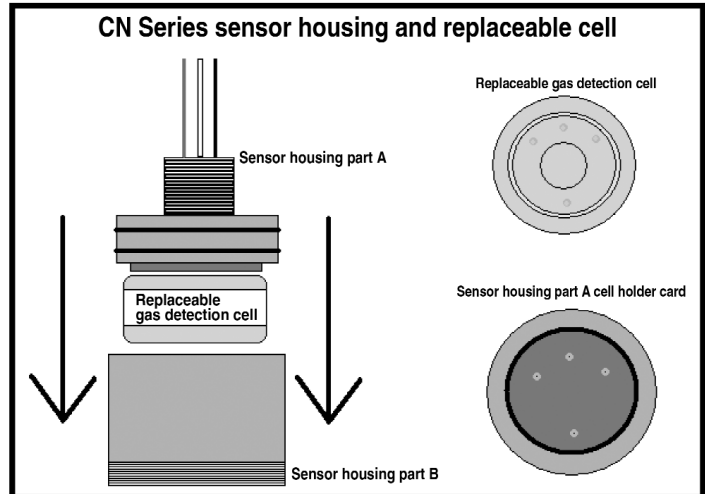
Questions / Technical Support	.....	1 (877) 526-6773 Mon-Fri 8 am - 5 pm EST
Conspec Sales	.....	1 (877) 870-8277 Mon-Fri 8 am - 5 pm EST
Fax	.....	1 (416) 736-1684
E-mail	.....	sales.canada@conspec-controls.com
Web site	.....	www.conspec-controls.ca

Sensor Replacement: NEMA 4X CN SERIES

The NEMA 4X CN Series sensor housing is opened by pulling downward and twisting sensor housing part B until released from the compression seal on part A.

The replaceable cell can be removed by unplugging the cell from the cell holder card.

Plug the new cell into the cell holder card and replace sensor housing part B.



Sensor Replacement: HAZARDOUS/CLASSIFIED AREA CX SERIES

***WARNING: Remove power or declassify area before opening the sensor housing.**

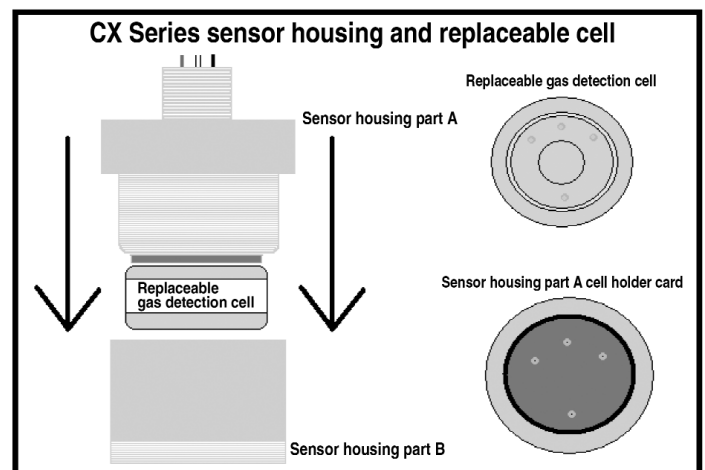
The Hazardous/Classified Area CX Series sensor housing is opened by loosening the Allen screw and unthreading sensor housing part B from part A.

The replaceable cell can be removed by unplugging the cell from the cell holder card.

Plug the new cell into the cell holder card and rethread sensor housing part B then retighten the Allen screw.

Contaminant/Small Particulates Effects:

Dust, coal fines, and rust are all small particulates that are encountered often within industrial environments. If preventative measures are not taken, these contaminants will likely block the flow of target gas into the sensor chamber. Once blocked, it can be nearly impossible to clean some sensor housings, and the housing may need to be entirely replaced. Preventive measures should be taken to avoid the sintered metal filter from becoming clogged. Available options include PTFE Hydrophobic disc filters to prevent moisture, rust and build up of small particulates.



9.0 COMMUNICATIONS

The Universal Transmitter is equipped standard with a 4-20mA current signal output that can be connected to a Conspec single or multi channel controller, or PLC controller for remote monitoring and alarming. Alternatively, Conspec offers ModBus and Conspec protocol communications adapter boards for use with larger fixed-point detection systems where trunk communications are required. The 900745 ModBus communications board is designed for 4.5v half duplex RS485 protocol. The 900741 Conspec protocol communications board is designed for Conspec 10v RS232 trunk communications systems.

1. 900745 MODBUS PROTOCOL COMMUNICATIONS ADAPTER BOARD

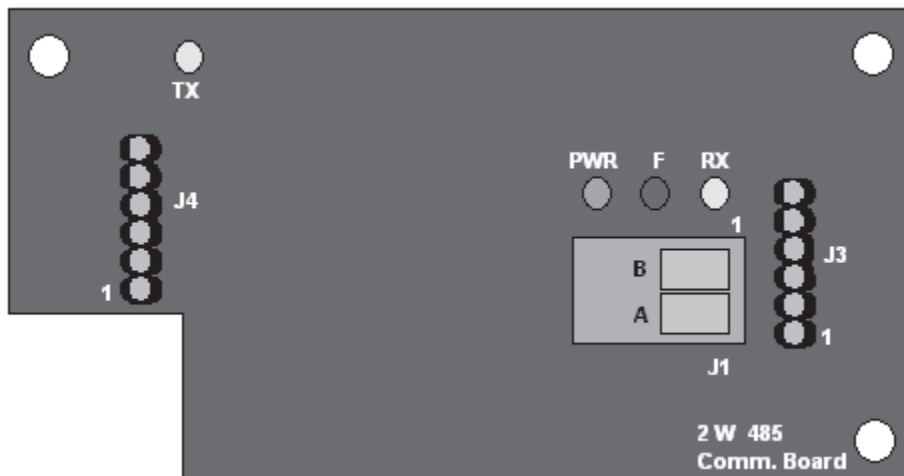
1.0 OVERVIEW

The Conspec 900745 communication board allows interconnection of a Universal Remote Sensor to a standard 2-wire, RS-485, ModBus communication system.

Supported ModBus Parameters

- RTU Transmission Mode
- Slave Address – 1 to 247
- Even, None, and Odd Parity
- 19200, 9600, 4800, and 1200 Baud
- Function Code 04 – Read Input Registers

900745 2W ModBus 485 Communications Board



2.0 DATA LINE CONNECTIONS

CONNECTOR	EIA/TIA 485 NAME	DESCRIPTION
J1-1	B	Transceiver Terminal 1
J1-2	A	Transceiver Terminal 2



3.0 STATUS LEDS

- D1 Power (Green). Turns ON steady following a proper power initialization cycle.
- D2 Communication Fault (Red). Flashes once during power initialization cycle. Flashes again each time a communication error occurs with the Universal Remote Sensor microprocessor.
- D3 Data Receive Indicator RX (Yellow). Illuminates when data is present on RS-485 communication bus, indicating the Master or another Slave is talking.
- D4 Data Transmit Indicator TX (Yellow). Illuminates when a response is being sent from this Slave to the Master.

4.0 COMMUNICATION SETTINGS

Trunk Address, Parity, and Baud are read from the 900732 Universal Remote Sensor (URS) during power-on initialization. These parameters are entered into the URS via Command Code 100 entry method. Following parameter modification, a power cycle must take place for the new settings to take effect. Default values are address = 1, parity = even, baud = 4800.

Parameter	Value
Trunk Address	1 - 247
Parity	0 - None 1 - Even 2 - Odd
Baud	0 - 1200 1 - 4800 2 - 9600 3 - 19200

5.0 MODBUS REGISTER DESCRIPTIONS

A total of 20 input registers can be read by the use of function code 0x04. Any number of registers from 1 to 20 can be requested as a single read process. Any attempt to request additional function codes or registers outside the valid limits will result in an exception code response.

5.0.1 Register Format

16-Bit Word Format

Msb															Lsb
Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
High Byte (8-bit format)								Low Byte (8-bit format)							



5.0.2 Register Mapping

ModBus Register	Contents	ModBus Register	Contents	ModBus Register	Contents
R0	Live Concentration	R8	Alarm 1	R16	Delay / Trunk Address
R1	Status	R9	Alarm 2	R17	Parity / Baud
R2	Temperature	R10	Slope - Low	R18	Gas Type / Decimals
R3	Input Supply Voltage	R11	Slope - High	R19	Polarity
R4	Raw Input	R12	Y Intercept	R20	Code Version – Month
R5	Password	R13	Zero Out	R21	Code Version – Day
R6	Range	R14	Full Out	R22	Code Version – Year
R7	Span	R15	Contrast		

- Dynamic Register Values. Measured/computed once per second in URS.
- User entered parameters. Updated following parameter modification in URS.
- Computed values. Updated by URS during calibration cycle.
- Static values. Defined by URS firmware.

Register 0 – Live Concentration

Register 0 contains the active live concentration computed by the Universal Remote Sensor. The register contents are an integer representation of the gas reading. If Decimals is equal to zero, the value is used directly. If Decimals is equal to one, the value represents tenths of a unit.

Bit 15 of Register R0 is used as an indicator of status. When the URS status is in startup, sensor fail, temperature error, or calibration bit 15 will be set to 1. Under normal operation, bit 15 will be cleared to 0.

Under this scheme, valid range of live concentration will be from 0 to 32,768. It is the user’s responsibility to detect bit 15 know when to assume the contents of R0 are valid. Status Register 1 must be read to determine the cause of bit 15 being set.

Register 1 – Status

Register 1 contains the status of the Universal Remote Sensor. The various indications of status are represented in bit format as shown in the following table.

Register Bit	Indication	
Bit 0 - Start-up Flag	0 - start-up mode active	1 - normal run mode active
Bit 1 - Lock Flag	0 - password lock on	1 - password lock off
Bit 2 - Calibration Flag	0 - not in calibration mode	1 - calibration mode active
Bit 3 - Alarm 1 Flag	0 - alarm level 1 inactive	1 - alarm level 1 active
Bit 4 - Alarm 2 Flag	0 - alarm level 2 inactive	1 - alarm level 2 active
Bit 5 - Sensor Fail Flag	0 - sensor fail inactive	1 - sensor fail active
Bit 6 - Temperature Error Flag	0 - temperature within range	1 - temperature range exceeded
Bit 7 - ‘Heart Beat’ Indicator	Toggles every 32 seconds	
Bit 8 - VHC4 Error Flag	0 - VCH4 level within range	1 - VCH4 limits exceeded
Bits 9 through 15	Unused	

Register 2 – Ambient Temperature

Register 2 contains the ambient temperature of the Universal Remote Sensor. The register contents represent degrees Centigrade in 16-bit, signed integer format.

Register 3 – Input Supply Voltage

Register 3 contains the active supply voltage measured by the Universal Remote Sensor.

Several scalar factors apply when converting the register contents to input voltage. The following equation takes these into account.

$$\text{Supply Voltage} = (\text{Register 3 contents}) / (1,980)$$

Register 4 – Raw Sensor Input

Register 4 contains the active raw input level measured by the Universal Remote Sensor.

Register 5 – User Password

Register 5 contains the present User Password.

Register 6 – Range

Register 6 contains the present Range parameter.

Register 7 – Span

Register 7 contains the present Span parameter.

Register 8 – Alarm 1

Register 8 contains the present Alarm Level 1 parameter.

Register 9 – Alarm 2

Register 9 contains the present Alarm Level 2 parameter.

Register 10 – Slope, Low Register

Register 10 contains the low register of the gas response slope. The register contents are computed and updated each calibration cycle.

Register 11 – Slope, High Register

Register 11 contains the high register of the gas response slope. The register contents are computed and updated each calibration cycle.

Register 12 – Y-Intercept

Register 12 contains the temperature-compensated, zero-gas level computed by the Universal Remote Sensor at the last calibration cycle. The register contents are computed and updated each calibration cycle.

Register 13 – Zero Output

Register 13 contains the numeric value used to set the 4.0 mA output signal current on the Universal Remote Sensor.

Register 14– Full Output

Register 14 contains the numeric value used to set the 20.0 mA output signal current on the Universal Remote Sensor.

Register 15– Contrast Control

Register 15 contains the present contrast control parameter for the URS display.



Register 16 – Delay / Trunk Address

Register 16 contains two parameters, stored in 8-bit word format.

High Byte: contains the delay-to-alarm parameter for the Universal Remote Sensor.

Low Byte: contains the Slave Trunk Address.

Register 17 – Parity / Baud

Register 17 contains two parameters, stored in 8-bit word format.

High Byte: contains the parity setting value.

Low Byte: contains the baud setting value.

Register 18 – Gas Type / Decimals

Register 18 contains two parameters, stored in 8-bit word format.

High Byte: contains the numeric value used to identify the gas sensor type.

Gas Type	Monitor	Range	Gas Type	Monitor	Range
1	CO	100 ppm	5	CH4 IR	5.00%
2	CO	500 ppm	6	CH4 IR	100% LEL
3	CO	1,000 ppm	7	CH4 IR	100% VOL
4	H2S	50 ppm	8	O2	25%

Low Byte: contains the numeric value for the number of decimals to apply to the live concentration reading. When this value is zero, the live concentration represents whole units. When this value is one, the live concentration represents tenths of the base unit.

Register 19 – Polarity

Register 19 contains the response polarity parameter for the gas sensor type.

Register 20 – Code Version, Month

Register 20 contains the numeric value of the month in which the firmware was released. Range of values between 1 and 12.

Register 21 – Code Version, Day

Register 21 contains the numeric value of the day of the month in which the firmware was released. Range of values between 1 and 31.

Register 22 – Code Version, Year

Register 22 contains the numeric value of the year in which the firmware was released. Range of values from 08 upwards.

5.0.3 Exception Code Response Messages

ModBus defined exception codes, in proper response format, will be sent to the Master for the following conditions.

Code	Name	Meaning
01	ILLEGAL FUNCTION	Received Function Code other than 0x04
02	ILLEGAL DATA ADDRESS	Data Address outside limits
03	ILLEGAL DATA VALUE	Data Address size exceeds limits
04	SLAVE DEVICE FAILURE	Error occurred during communication with URS



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