

USER **MANUAL**

301 Series

301-C, AA96D, 301-R8, AA96D-RM8,
420MDBS, 420-I, 301-AP, 301-ADI, 301-EM,
301-EMRP, S301-IRF, and S301-D2

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This manual covers software version 4.002 and optional BACnet module firmware version 1.4.9.

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Symbol Definitions

The following table lists the symbols used in this document to denote certain conditions:

Symbol	Definition
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user, often in terms of performing a task.
	REFERENCE _ INTERNAL: Identifies an additional source of information within the booklet.
CAUTION	Indicates a situation which, if not avoided, may result in equipment or work (data) on the system being damaged or lost, or may result in the inability to properly operate the process.
	CAUTION: Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices. CAUTION: Symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	WARNING: Indicates a potentially hazardous situation which, if not avoided, could result in serious injury or death. WARNING: symbol on the equipment refers the user to the product manual for additional information. The symbol appears next to required information in the manual.
	DANGER: Indicates a hazardous situation which, if not avoided, will result in serious injury or death

Dangers, Warnings and Cautions



- Installation, Commissioning, and all other Maintenance should be performed only by trained personnel in accordance with the manual and local codes to prevent damage to equipment
- Install only in accordance with specification table in the manual for proper environments
- Install per recommended procedures in the manual for proper mounting, fastening, wiring (see wiring diagram), and grounding to ensure proper operation
- Prior to power-up, ensure that all external devices are properly connected and use only voltages and cabling specified in the circuit and wiring specification section of the manual
- For network connections, refer to the Test Menu section of the manual for proper address communication prior to commissioning
- Follow all warnings, cautions and instructions
- Monitor suitability is the responsibility of that systems integrator
- Routinely check for proper operation and replace damaged or non-operating devices immediately
- Remove printed circuit board prior to mounting enclosures or removing knock-outs from enclosures
- Alarms are factory set in accordance with OSHA and other regulations. Change only in accordance with local codes. Always repeat commissioning after changing alarm settings.
- Use appropriate ESD protection while handling the PC board (PCBA) and during installation.
- Except for models in NEMA-rated enclosures, care should be taken to protect equipment from water, snow, and excessive humidity. Do not install in wash-down areas.
- Risk of electrical shock - disconnect all power (input and relay) before servicing.
- Keep all devices and wire runs away from mercury vapor lights, variable speed drives, radio repeaters or other RFI sources.
- Selecting buzzer means that pressing the Silence key will turn off the unit's audible alarm. Selecting Rel #1, #2 or #3 means that pressing the Silence key will deactivate a relay that was activated by an alarm.
- Full system commissioning or system check **MUST** be performed to ensure proper operation.
- 301-EM: Selecting the "OTHER" event type creates an event with all fields and events are blank. Therefore, no events will appear when pressing the arrows. Events must be created before they appear in the scroll list. To comply with ASHRAE 15 and CSA B52 standards, Type 1, 2 or 3 must be used. Once the configuration type has been selected, it can no longer be changed without erasing **ALL** events and reconfiguring the system anew.
- Never calibrate any unit's Zero with ambient air. Always use Nitrogen (N₂) for infrared technologies and Zero Grade Air for all other technologies at the calibration port or with the approved calibration cap.
- After all the devices in a system have been installed, verify that each device has a unique communication address. If needed, change the communication address for each device before scanning the network. The 301-ADI Modbus address must be set to 097 for it to be recognized by the 301-C and AA96D controllers.



WARNING

- It is the user's responsibility to understand this Technical manual and the individual products' Quick Start Guide.
- The safety of any system incorporating 301 series equipment is the responsibility of that system's assembler.
- 301 series products must be installed only by trained personnel and service engineers.
- Install all products in accordance with local codes.
- If the package or any of its contents are damaged, please refer to the Warranty section at the back of the manual for instructions.
- Do not connect power to system or components until all wiring connections are complete and confirmed to be of proper polarity.
- The procedures in the quick start guide and the product's technical manual must be followed carefully and performed only by trained personnel and service engineers.
- Verify that power to the 301 Series product(s) and relay(s) is off during installation and when installing sensor cartridges.
- Install, service, and operate the product only as specified in the Quick Start Guide and the product's Technical Manual. Failure to do so may impair the protection it is designed to provide and may also void the warranty. 301 series manual and other information about this product is available on the Honeywell Analytics website:



www.honeywellanalytics.com

www.honeywell.com

- Calibration, set-up, and test modes are intended for use by trained personnel and service engineers only. Access to these modes are password protected.
- Follow local and site procedures when working with the device. When applicable, verify that the associated control panel is inhibited, to prevent false alarms during installation.
- Use only Honeywell accessories/parts or accessories/parts meeting or exceeding Honeywell Analytics' specifications.
- Some devices require warm-up time. See the appropriate product-specific sections within this Technical Manual to understand their unique requirements.
- To avoid damaging electronic components during installation, pre-drill all mounting holes.
- Once processes are initiated, wait until they are completed. Do not interrupt or stop any process once it has begun.
- 420-I, 301-EM and 301-EMRP: A dedicated power supply must be used with each unit. Considerable damage may occur if this condition is not strictly met.
- 420-I: milliamp adjustment, Do NOT use Current Sourcing Configuration if there will be voltage on the line.
- Make certain that no two devices share an address as this may result in network conflicts. All sensors are shipped from the factory as address 1. 301-EM; it is important to add one sensor at a time to ensure proper address assignment.
- 301-EM: If ManSW#1(or #2) was selected at the previous step this screen will only have 2 options: Open or Closed. Set to Open if the output is set to Normally Closed, or to Closed if the output is set Normally Open.
- 301-EM and 420-I: Analog output, the Output must be connected (to an ampmeter or to the DDC) for readings to be viewed and adjusted.



CAUTION

- Use caution when opening enclosures; the clasps are designed to secure the covers firmly.
- To prevent electrical interference, keep controllers, monitors, and wire runs away from mercury vapor lights, variable speed drives, and radio repeaters.
- Protect controllers and monitors from physical damage (fork lifts, etc.).
- Do not mount controllers and monitors over doors in refrigerated areas.
- Mount Unit with Display upright at a height making device easy to view, program and use.
- Ensure that the cable shield is properly connected to ground.
- Use only voltages and cabling specified in the manual.
- Shutdown jumper (SHDN) must be removed from 301-C, 301-AP, and 301-ADI controllers to initiate power-up.
- 420-I: Before changing the S1 DIP switch settings for the 4-20 mA adjustments, note the actual setting to reset the dip switch for normal operation.
- Refrigeration: See the APPENDIX section for more details about B-52 and ASHRAE 15 standard configurations.

Manual Format

This manual is for the 301 Series of Honeywell gas detection devices. After a brief description of each of the available devices, General Information is provided with instructions common to all models as well as wiring diagrams.

The remainder of the manual includes sections for each specific model. Please refer to these sections for greater detail on wiring, addressing, setting faults and alarms, and configuration specifics.

Introduction

The described devices may use one of the two protocols which include Modbus and Vulbus (a proprietary protocol) for interfacing between devices.

The only device that has multiple protocols is the 301EM. The 301EM is a gateway through the 301C Controller for connection to building automation systems.

Modbus Devices

The **301-C** (commercial applications) or **AA96D** (ruggedized enclosure) controller acts as a nerve center for a gas detection network, providing continuous monitoring for up to 96 connected units (plus 1 301-ADI). Once installed and connected, the controllers allow the user to monitor, adjust, or reconfigure an entire network of units.

The **301-R** (commercial applications) or **AA96D-RM8** (ruggedized enclosure) act as an output for the 301-C, and provides a standard 8 relays (DPDT 5A, 30 Vdc or 250 Vac resistive load) for the indirect activation of accessories. Since the relay module is an output for the controller, it can be located anywhere within the gas detection network. The 301-R or AA96D-RM8 is fully compatible with the 301-C or AA96D and offer LED indicators for each relay (visible only when housing is open).

The **301-AP** is a remote annunciator panel to the 301-C or AA96D controller. The 301-AP provides 3 relays (DPDT 5A, 30 Vdc or 250 Vac resistive load) for the indirect activation of accessories. Since the annunciator panel is an output for the controller, it can be located anywhere within the gas detection network. The 301-AP is fully compatible with the 301-C or AA96D and offer LED indicators for each relay (visible only when housing is open). The 301-AP is not compatible for direct interface with the 301-EM.

The **420-I** converts the transmitter digital signal to 4-20 mA analog outputs. The 420-I contains 8 individual milliamp output channels for individual detectors. It may also be programmed through the 301-C to multiplex multiple detectors to a single milliamp output.

The **301-ADI** is a microprocessor based converter unit for use with Honeywell control units, such as the 301-C or AA96D controller. The 301-ADI LCD display screen, enclosed in the housing, serves as a programming interface. The unit has 3 LED indicators, 16 (loop) inputs that read 4-20mA signals and 8 contact inputs that read contact, or relay signals.

The **420MDBS** translates 4-20mA output to Modbus. This device must be placed in a suitable enclosure or other approved Honeywell Analytics/Manning gas detectors. Contact Honeywell Analytics for further details.

Vulbus Devices

The **301-EM** controller acts as a nerve center for the 301-EMRP, S301-IRF and the S301-D2 devices on a gas detection network, providing continuous monitoring for up to 20 connected sensors. The controller is factory programmed based on region to meet ASHRAE 15 and CSA B52 codes (see Appendix B). The 301-EM provides 4 predicated (labeled) relays (DPDT 5A, 30 Vdc or 250 Vac resistive load) for the activation of accessories. Manual override connections required by ASHRAE 15 and CSA B52 are also provided.

The **301-EMRP** is a remote display panel to the 301-EM controller. The 301-EMRP provides 4 predicated (labeled) relays (DPDT 5A, 30 Vdc or 250 Vac resistive load) for the activation of accessories. Manual override connections required by ASHRAE 15 and CSA B52 (See Appendix B) are also provided. Since the Remote panel is an output for the controller, it can be located anywhere within the gas detection network. The 301-EMRP is not compatible for direct interface with the 301-C or AA96D.

The **S301-IRF** is a gas detection sensor for refrigerant gases.

The **S301-D2** is a gas detection sensor for combustible and toxic gases.

See Appendix D for communication protocols of the products in this series.

System Design and Intended Use

The 301 series products are intended to create a system to monitor an entire gas detection network around the clock and initiate a response that may include (but is not limited to) ventilation, horn, strobe, etc. The system offers optional logging capabilities; creates log files of all transmitter concentrations and alarms for analysis. The controllers are equipped with grouping or zoning capabilities that allow users to query and monitor specific groups of transmitters or specific transmitter zones.

The system design must be carefully planned to adequately monitor the areas; permit routine maintenance; and properly alert. Guidance such as the number of monitors required and recommended heights (Page 14) or how to create a California Title 24 System (Appendix C) is provided to help define the required components. The adequacy of the final, installed system is the responsibility of the assembler of the system and must be in accordance with all local codes.

Receiving and Unpacking

Upon receiving the controller units:

- Check that the package is undamaged
- Carefully open the package
- Locate the packing slip or purchase order and verify that all items on the order are present and undamaged
- Locate Quick Start Guide—read and understand the content



If the package or any of its contents are damaged, please refer to the Warranty section at the back of the manual for instructions.

General Specifications

General Information for All Models

Voltage: 24 ± 10% Vac, 50/60 HZ, 24 ± 10% Vdc

Voltage (S301-IRF and S301-D2): 12Vdc

Certifications: USA: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements [UL 61010-1:2012 Ed.3+R:29Apr2016]

Canada: Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements (R2017) [CSA C22.2#61010-1-12:2012 Ed.3+U1;U2]

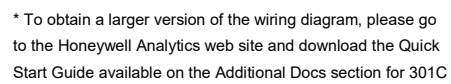
Products with C24 suffix - Comply with California Title 24, Part 6 and associated Administrative Regulations in Part 1

Operating environment: Indoor Use, Ordinary Location 0 - 95% RH, non-condensing Up to 3000 m (9843 ft.) altitude (see specific system monitor types for sensor limitations)

Specification Summary: A table of technical specifications for all models can be found in Appendix E.

System design should be carefully considered prior to beginning to install. All components as designed to be wired together as shown in the Wiring Diagram (Page 13). Guidelines for the required number and height on monitors is provided (page 14).

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Number of Sensors/Monitors

The number of units required to protect an area is determined by the unit's detection radius, which depends on the gas detected, as shown in the following table.

Gas Detected		Surveillance Radius	Area Covered
CO	Carbon monoxide	15 m (50 ft.)	707 m ² (7610 ft ²)
NO ₂	Nitrogen Dioxide	15 m (50 ft.)	707 m ² (7610 ft ²)
	Others	7 m (23 ft.)	154 m ² (1658 ft ²)

Sensor/Monitor Heights

Detected Gas		Relative Density (air = 1)	Installation Height
CO	Carbon Monoxide	0.968	1 - 1.5 m (3 - 5 ft.) from floor
*NO ₂	Nitrogen Dioxide	1.58 (cold)	30 cm -1 m (1-3 ft.) from ceiling
CL ₂	Chlorine	2.5	30 cm (1 ft.) from floor
H ₂ S	Hydrogen Sulfide	1.19	30 cm (1 ft.) from floor
O ₂	Oxygen	1.43	1 - 1.5 m (3 - 5 ft.) from floor
SO ₂	Sulfur Dioxide	2.25	30 cm (1 ft.) from floor
R11	Refrigerants	5.04	30 cm (1 ft.) from floor
R114	Refrigerants	5.9	30 cm (1 ft.) from floor
R22	Refrigerants	3.11	30 cm (1 ft.) from floor
R123	Refrigerants	5.27	30 cm (1 ft.) from floor
R125	Refrigerants	4.14	30 cm (1 ft.) from floor
R134A	Refrigerants	3.52	30 cm (1 ft.) from floor
R404A	Refrigerants	3.43	30 cm (1 ft.) from floor
R407C	Refrigerants	3	30 cm (1 ft.) from floor
R410A	Refrigerants	3	30 cm (1 ft.) from floor
R507	Refrigerants	3.43	30 cm (1 ft.) from floor
R1234yf	Refrigerants	4.00	30 cm (1 ft.) from floor
R1234ze	Refrigerants	4.00	30 cm (1 ft.) from floor
1233zd	Refrigerants	5.50	30 cm (1 ft.) from floor
R514a	Refrigerants	5.00	30 cm (1 ft.) from floor

COMB Most combustibles are heavier than air, with the exception of methane, hydrogen, ethylene and acetylene. Sensors for gases that are heavier than air should be installed approximately 30 cm (1 foot) from the floor. For combustibles that are lighter than air, sensors should be installed 30 cm (1 foot) from the ceiling, close to the potential leak source.

Note: Detectors for other gases are available, please refer to individual Gas Detector Data Sheets.

These Data Sheets can be located at www.honeywellanalytics.com or contact Honeywell Analytics at 800-538-0363 for further assistance.

Installation

For proper installation and operation of the 301 series products, follow the instructions in the Quick Start Guide and in this manual carefully.

- Locate all units in areas easily accessible for service.
- Avoid locations where instruments are subject to vibrations
- Avoid locating units near sources of electromagnetic interference
- Avoid locating units in areas subject to significant temperature swings
- Review all Danger, Warnings and Cautions and ensure that your chosen location is appropriate, given those cautions
- Refer to the wiring diagram in the next section on for an overview of wiring protocols for devices in a gas detection system utilizing 301 series devices.

Verify local requirements and existing codes that may impact choice of installation location.



Risk of electrical shock - disconnect all power (input and relay) before servicing.

Mounting

Pre-drill 1/4-inch (0.5 cm) mounting holes matching the mounting holes of the enclosure. Use the mounting hardware indicated in this table.

Mounting Hardware

Mounting Surface	Example Part	Description	Drill Bit Size	Torque (max)
Block, Brick, Concrete	QTY (2) McMaster-Carr #97026A021	Metal Anchor for Block and Brick · 1" long · Pull-out Strength: 60 lbs.	1/4"	8.7 in-lb. (1 Nm)
	AND QTY (2) McMaster-Carr #91555A111	AND Rounded Head Screw · No. 6, 7 or 8 sheet metal or wood screw · 2" long		
Electrical Box or Duct	As recommended by the manufacturer of the box or duct		N/A	

Orient the product with the knockouts for power and signal wiring at the bottom of the enclosure.

Mounting Hardware

Mounting Surface	Example Part	Description	Drill Bit Size	Torque (max)
Drywall, Plaster, Wood Paneling	QTY (2) McMaster-Carr #97121A011	Rounded head Toggle Bolt · 6-32 · 3" long · 1-1/2" wingspan toggle · Pull-out Strength: 35 lbs.	3/8"	8.7 in-lb. (1 Nm)

- While using appropriate ESD protection, remove the PCBA from the controller and monitor. Carefully place the PCBA in the enclosed antistatic envelope.
- Mount 301 Series equipment (with displays) on vertical surfaces at approximately 5 ft. (1.5 m) from the floor.
- Use the product case to mark where to drill mounting holes on the mounting surface. Drill the holes without the enclosure in place.
- To mount monitors, refer to individual product information for mounting heights based on gas being sensed.
- Use the appropriate mounting hardware noted in the table above to mount the product case to the mounting surface.
- Remove the knockouts before reinstalling the PCBA.
- Reinstall the PCBA.
- Complete wiring as shown in the Wiring diagram.

Input Wiring

Circuit and Wiring Specifications

Follow local codes when sizing power wiring:

- Terminal Blocks, input, and communication: R/C (AVLV2) AWM minimum 300 V, 10 A, 16-22 AWG solid or stranded
- Terminal blocks relays: R/C (XCFR2) minimum 300 V, 10 A, 14-22 AWG stranded, 16-22 AWG solid (AVLV2) AWM
- All communication wiring should be shielded.

Refer to Specifications table for communication line lengths.

Daisy-chain the network cable without T-taps. The 24V supply must be properly grounded in accordance to all local electrical codes.

Dedicated Circuit-breaker and Transformer Requirements

A dedicated circuit-breaker must be used.

Ensure the transformer selected has sufficient output specifications to power the entire system at start-up. Ensure proper polarity is followed per the instruction of the individual device. Contact Honeywell Analytics for further assistance based on the system design.

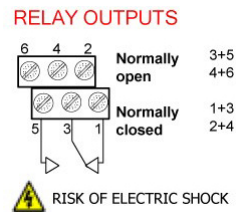
Output Wiring

Relays

Relays are provided in: 301-C, AA96D, 301-R8, AA96d-R8, 301-AP, 301-EM and 301-EMRP. The relay outputs are rated to 5A at 30Vdc or 250Vac resistive load. Relays can be used to activate horns, strobes or other devices.

See Appendix B for details about ASHRAE 15 and CSA B52 standards.

Although each relay is programmed with a default setting (normally open/de-energized), they can be configured using the controller programming menu to be “fail-safe” (normally closed/energized).



Product	Relay Count	Controlled by
301-C and AA96D	4	Internally programmed Events, Relay 1 and 2 can be controller by external BACNet system
301-R8 and AA96D-R8	8	301-C and AA96D programmed Events
301-AP	3	301-C and AA96D programmed Events
301-EM	4	Factory programmed based on region
301-EMRP	4	Controlled by 301-EM Events

Communication

Please see wiring diagram on page 11 and specifications in Appendix E. Ensure wiring size, lengths and number of devices daisy chained together comply with the instructions. Do not use T-Tap configurations for the communication connections. Use shielded cable for all communication wiring and terminate the shield to a solid ground on a single end only. Follow the wiring diagram to ensure no crosses between A and B communication channels. Keep all devices and wire runs away from mercury vapor lights, variable speed drives, radio repeaters or other RFI sources. 4-20mA loops will require a power source, see Appendix E for specifics.

Range and Alarm Levels

The following alarms are factory set in accordance with OSHA and other regulations. Change only in accordance with local codes. Always repeat commissioning and bump testing after changing alarm settings.

	Gas Detected	Range	Alarm A	Alarm B	Alarm C
CL2	Chlorine	0-15 ppm	0.5 ppm	1 ppm	13.5 ppm
CO	Carbon monoxide*	0-250 ppm	25 ±2 ppm	100 ±5 ppm	200 ±10 ppm
H2S	Hydrogen sulfide	0-50 ppm	10 ppm	15 ppm	45 ppm
NO2	Nitrogen dioxide	0-10 ppm	0.72 ppm	2 ppm	9 ppm
O2	Oxygen	0-25% Vol.	19.5% Vol.	22% Vol.	22.5% Vol.
SO2	Sulfur dioxide	0-10 ppm	2 ppm	5 ppm	9 ppm
R-123	Refrigerant	0-1000 ppm	50 ppm	500 ppm	900 ppm
R-11	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R114	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R-22	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R-125	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R134A	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm

R404A	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R407C	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R410A	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R507	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R514A	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R1233zd	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
R1234ze	Refrigerant	0-1000 ppm	250 ppm	500 ppm	900 ppm
Comb	Combustibles	0-100% LEL	25% LEL	50% LEL	90% LEL

*COLA compliant with E3Point and SensePoint XCL

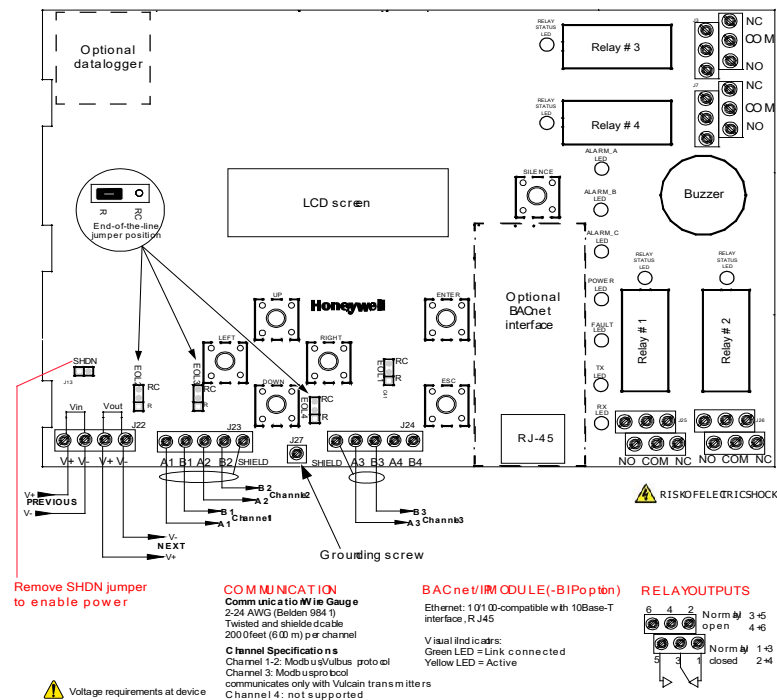
Note: Detectors for other gases are available, please refer to individual Gas Detector Data Sheets. These Data Sheets can be located at www.honeywellanalytics.com or contact Honeywell Analytics at 800-538-0363 for further assistance.

Specific Set-up Instructions by Model

301-C and AA96D

Wiring Details

The diagram below provides the details required to connect the 301C controller with power, transmitters, external relay loads, and BACnet.



Topic	Description
J22 Power Input	Connect the power supply to the controller (see Wiring Details for cabling diagrams)
J23, J24 Communication inputs	Connect communication cables to channels 1 through 3.

Topic	Description
Relay Outputs 1-4	Depending on the desired configuration, connect the relay cables to either N.O. or N.C. Relays 1 and 2 are controlled by either internal events or by BACnet; relays 3 and 4 are driven only by internal events.
SHDN jumper	Place the jumper over the Shutdown header pins to reset or restart the system.
EOL Resistors 1-4	Place the jumper over the header pins to include resistors to attenuate communication echoes.



Shutdown jumper (SHDN) must be removed from 301-C, 301-AP, and 301-ADI controllers to initiate power-up.



Risk of electrical shock - disconnect all power (input and relay) before servicing.

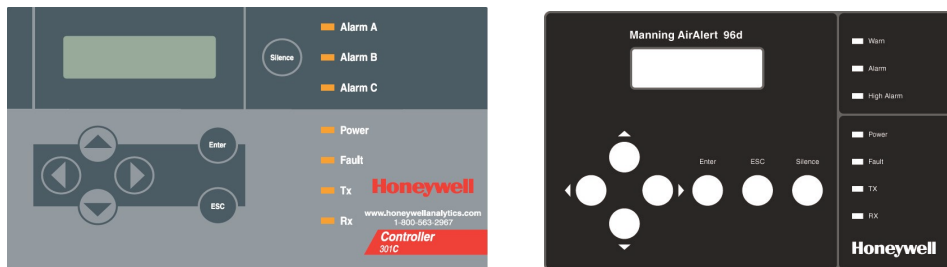
- Once wiring has been completed, remove the shutdown jumper (SHDN) from all devices where applicable to initiate power-up.
- Close the unit cover.
- Program system (and all devices) in accordance to the application requirements and device instructions.
- Perform a system test (commissioning) to complete the installation.

301C and AA96D Programming

Programming Interface

The front panels provide programming keypad (buttons) and LEDs.

301C and AA96D controller front panel keypad:



Keypad Functions

Each unit has 7 keypad keys.

The display contrast can be adjusted by pressing the Up and Down keys when the main screen is displayed.

Keys	Description
Arrows	Used to move the cursor through the various programming fields (Up, Down, Left and Right), or to adjust the display contrast (press and hold the up or down arrow until desired contrast is reached and release).
ESC	Used to exit the programming menu or to cancel a change or input.
Enter	Used to access the programming menu and to modify programming fields.
Silence	Turns off the controller's buzzer.

LED Definitions

The controller is equipped with 7 LEDs that provide a status for each function related to that indicator:

LED	Description
Alarm A	A blinking red light indicates that an event has been activated. A constant red light indicates that one or more transmitters have reached Alarm A or Alarm 1.
Alarm B	When the red indicator is on, one or more transmitters have reached Alarm B or Alarm 2.
Alarm C	When the red indicator is on, one or more transmitters have reached Alarm C.
Power	Green indicates that the unit is powered up and functional
Fault	When the amber LED is on, it indicates a fault (i.e. a communication, maintenance or device problem)
Tx	When the amber LED is blinking, it indicates that the controller is <i>sending</i> information or requests on the communication channel.
Rx	When the green LED is blinking, it indicates that the controller is <i>receiving</i> information.

Each of these functions is linked to parameters programmed in the control unit, which we will discuss in the following section.

Groups and Events Programming

Creating a Group

1. Navigate to the “Groups” menu
2. Use arrow keys to move cursor to group line and press Enter
3. Edit the field when the brackets stop blinking and the word “end” blinks
4. Use up/down arrows to scroll through the list of units connected to the 301C until the desired address is displayed
5. Press Enter to validate the address
6. The address is added to the group and the <end> bracket is shifted one position to the right

Creating an Event

1. Navigate to the “Events” menu
2. Use arrow keys to move cursor to events line and press Enter
3. Select:
 - a) Target (device)
 - b) Relay (output)
4. Press Enter
5. Define Before and After Delays (if applicable)
6. Define Conditions
 - a) Number of devices: All, Mean, Max, Min, 1/4, 1/3, 1/2, 2/3, 3/4, 1 or + (1 or more)
 - b) Value set: =, <=, <, >=, >, != (not equal), max, min
 - c) Define Group or Transmitter
 - d) “and” / ”or” statement (if applicable)
 1. Repeat “a” through “d”
7. Define Coverage period (if applicable)
8. Enable the Event
9. **Preform a final test system for proper operation**

System Programming

The system's Normal programming mode offers several menu options that are accessible from the main menu screen:

Mode	Description
1. Tx Info	Allows transmitter parameters to be programmed
2. Groups	Allows sets of multiple transmitters to be aggregated for simpler programming of a common response.
3. Events	Facilitates creation of logical terms which respond to transmitters or events. These Boolean outputs can respond to concentration, alarm, or fault status. These events facilitate voting within a group and can drive relay outputs.
4. Acqui	Allows the datalogging feature to be activated or deactivated
5. Copy	Allows data or parameters to be copied from the (controller) configuration to parameters
6. Config	Allows system parameters and password to be set
7. Network	Allows actions on the network to be performed, communication statistics to be consulted, and remote calibrations to be performed
8. Tests	Allows each device to be tested sequentially (inputs, outputs, communications, events, etc.) and operation of various parameters to be validated
9. BACNet	Allows a device's BACNet parameters to be set
10. Wireless	Not supported.

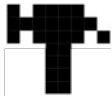
Note: Access to the programming functions is password protected. The default password is 2967.

The screen display shown below appears initially. This display can be configured to scroll among the information screens for each device connected to the controller.

VA301C	Ver. 3.00
Ad: 1	Gr:0 Ev:0
	
2007-01-17	13:18:18

If one or more of the connected devices is in an alarm mode, the controller will only scroll between the main information screen and the screens for device(s) in alarm mode. In this case, you must scroll manually to view screens for other devices.

Icons and their meanings

Icon	Description
	BACNet: Indicates that there is a BACNet module present and that it is communicating with the controller.
	BACNet error: Indicates that a BACNet module is present but communication with the controller has failed (error)
	Debug: Indicates whether the controller is in debug mode (Single TX, Debug or Simulation modes). When in simulation mode, SIM appears next to this icon.
	Log: Indicates that either “Tx Logging” or “Event logging” is enabled. SD card size support: Software version 1.085 and previous – 512M Software Version 1.086 and above – 2G
	Log error: Indicates that an error occurred during TX or Event logging. All logging functions are stopped.
	SDC: Indicates that an SD card is present and functioning. The icon “fills” (from white to black) progressively as memory is used. A white icon indicates empty memory and black indicates full memory.
	SDC error: If this symbol persists for more than 5 seconds, an SD card is present but not functioning properly.
	Wireless network: Indicates that the wireless network coordinator (wireless communication module) is present and communicating with the controller.
	Wireless network error: Indicates that the wireless network coordinator (wireless communication module) is present but is not communicating with the controller.

Since the controller's programming functions are password protected, it is necessary to access the login screen:

- Press Enter to access the programming options. The password screen appears:
- Use the keypad Up or Down arrows to increase or decrease the value, one digit at a time, starting with the first digit
- When all the digits of the password are correct, press Enter to access the programming functions.

PASSWORD

The first MENU options screen appears. Use the keypad arrows to navigate through multiple screens to the desired function and press Enter to access it.

MENU →	
→ 1. Tx info	3. Events
2. Groups	4. Acqui

←	MENU	→
→ 5. Copy	7. Network	
6. Config	8. Tests	

←	MENU	
→ 9. BACNet		
10. Wireless		

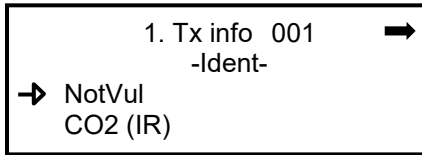
Tx Info Menu

Tx Info is the menu option dedicated to transmitter information and several sub-menu options. They are summarized here and detailed on the following pages. Exact screens will vary with transmitter types.

Menu Option	Description	Screen
Ident	Allows the network component's identification information to be viewed.	
COM	Allows the communication protocol to be viewed or changed	
Detection or Scale (1) and Scale (2)	Allows the detection range and the unit of measurement parameters to be viewed and changed	
Display	Allows the label (or name) of a specific component to be changed	
Alarms	Allow alarm thresholds to be viewed and sometimes changed. There can be significant variations in this screen depending on transmitter type.	
Status Displays	Transmitter and node status (in hexadecimal values)	
Erase Current Tx	Erases or changes the Tx address	

Ident Menu

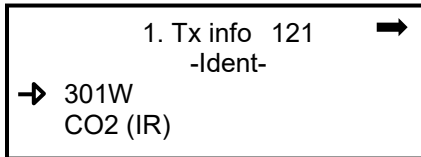
The Ident, or identification menu allows a component's network ID to be consulted:



1. The upper right corner of the screen shows the component's address. If the address of the device whose information must be viewed is known:
 - Use the arrows to move the cursor arrow to the on-screen address
 - Press Enter (the value can be edited while the number is flashing)
 - Use the up or down arrows to increase or decrease the value
 - Press Enter again to validate the entry and display the information for the desired device.
2. The bottom left corner of the display shows the transmitter name (ex.: S301-D2 - product name) and the sensor type (ex.: CH4 - methane sensor). These values can also be changed for Group or Vulbus product types. The procedure is identical for both fields: Programming or changing a product or sensor type
 - Use the arrows to move the cursor to the product type field.
 - Press Enter to select the field (the value can be modified when flashing)
 - Use the arrows to scroll through the list of product types and press Enter when the desired product or sensor appears

Product and Sensor Types

This is a list of all the (preprogrammed) product types available from the Identification option in the Tx Info menu.



Compatible products:

- E3Point
- XCL
- 420MDBS
- ECFX
- 301R
- 301EM
- SQN8X
- XCD
- XRL
- XNX
- IAQPoint2
- Legacy Vulcain products

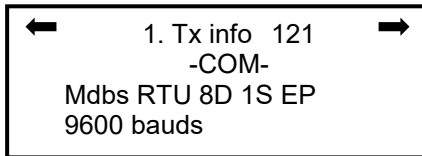
Note: When Group is selected as a product type, the remaining Tx INFO screens are not accessible (because each product in the group has already been individually programmed). Only the Ident and Erase current Tx screens will be available.

The sensor type list applies to address ranges 1-96 and is not dependent on the type of product selected. Devices in the address range from 97-170 will display a BACNet object identifier, rather than a sensor type.

*An additional Product Type, simply called “Group”, represents a group created in the Groups Menu in the controller. When scrolling through the available product type list, this name will appear as many times as there are groups created in the controller (example: Group 1, Group 2, Group 3, etc.). If a group is selected as the product type, then the sensor type options are limited to MIN, MAX and MEAN.

COM Menu

This screen displays the selected communication protocol for device addresses from 1 to 96. Each transmitter's protocol is defined by the controller (see Network Auto-configuration section)



If a transmitter is compatible with several different protocols, it can be modified using to one of the following options:

- Vulbus
- Mdbb ASCII 7D 2S NP 9600 bauds
- Mdbb RTU 8D 2S NP 9600 bauds
- Mdbb RTU 8D 1S NP 9600 bauds
- Mdbb RTU 8D 1S OP 9600 bauds

When a transmitter is configured with the Modbus communication protocol, the transmitters automatically sends the programmable parameters to the controller.

Note: Vulbus transmitter parameters must be programmed manually.

Scale Menus

These menus appear only for certain devices.

Scale(1) allows the detection range, minimum and maximum, to be defined for the selected device. Whatever value is specified is the value that will appear at the device display (if applicable). The Minimum value is generally left at 0. Parameters for the XNX and XCD gas detectors can be viewed here but can be changed only at the transmitter.

←	1. Tx info	→	001	→
	-Scale (1)-			
	Max		00250	
	Min		00000	

Scale(2) allows the factor by which to divide the scale (between 0 and 65535) and the unit of measurement for the selected scale to be determined.

←	1. Tx info	001	→
	-Scale (2)-		
	Factor		00010
	Units		%

The factor allows precise scale limits for detection to be set. By dividing the maximum scale value in the first Scale screen (250 in this example) by 10, a scale value of 25.0 can then be displayed.

The “Units” allow the device’s unit of measurement to be selected:

°F = Sets degree Fahrenheit as the unit of measurement

°C = Sets degree Centigrade as the unit of measurement

%RH = Sets Relative Humidity as the unit of measurement

mV = Sets millivolts as the unit of measurement

V = Sets volts as the unit of measurement

mA = Sets milliamps as the unit of measurement

% = Sets the percentage of gas as the point unit of measurement

ppm = Sets parts per million of gas as the point unit of measurement

Detection Menu

The detection menu (available only for devices with addresses between 1 and 96) displays the detection range (scale: 0-100.0) and the unit of measurement (unit: %) for the selected component. If a transmitter uses the Modbus protocol, the detection parameters are automatically defined during network configuration and are not editable. Vulbus protocols must be manually defined by the programmer.

The detection scale is between 0 and the maximum value (0.00) and the unit of measurement is either ppm or percent (% for oxygen and

% LEL for combustibles).

The detection menu is not available for the VA301R or VA301AP.

←	1. Tx info 001	→
	-Detection-	
→	Scale: 0-0.00	
	Unit: %	

Programming or modifying the scale range or unit:

- Use the arrows to move the cursor to the scale or unit option
- Press Enter and use the arrow to increase or decrease the value
- Press Enter when the desired value is obtained

Display Menu

This option allows a specific label or name to be assigned to the selected component (transmitters, relay modules, annunciators). Up to 20 characters, including spaces, can be used in the label (example: BOILER ROOM). The default Modbus transmitter labels are composed of the component (or transmitter) name, sensor type and address.

Vulbus transmitter labels contain 20 blank characters (spaces).

←	1. Tx info	→	001	→
	-Display-			
	Edit (20 char.max)			
	S301-D2 CH4 Ad001			

Alarm A, B, and C Menus

The screens for viewing alarm thresholds are combined in this manual. There will be either two or three levels, depending on transmitter type.

If present, separate “MIN” and “MAX” levels permit manual control of the hysteresis of each alarm. Normally, the “MAX” level is set greater than “MIN.” However, alarms can be made to trigger on falling concentration (as with oxygen) by setting the “MAX” threshold smaller than the “MIN” threshold.

With certain transmitters, only one threshold will be displayed.

Additionally, with certain transmitters, the alarm thresholds are read-only at the controller. These thresholds can be set only at the transmitter.

These are typical screens:

◀	1. Tx INFO 001	▶
	-Alarm B-	
	Level 1	
	20.0 ppm	

Typical screen for viewing alarms A or B on XCD and XNX transmitters

◀	1. Tx INFO 001	▶
	-Alarm C-	
	MIN	MAX
	60.0%	65.0%

Typical screen for viewing or changing alarm A, B, or C thresholds on other transmitters.

Servicing and Operating Menus

These functions vary depending on the transmitter type. These displays show the total time the device has been in service and the amount of time remaining until the next required calibration or replacement.

◀	1. Tx INFO 001	▶
	-Operating Times-	
	Lifetime	0h
	Since Calib	1234h

◀	1. Tx INFO 001	▶
	-Servicing-	
	1234 Hours on	
	15514 before cal.	

◀	1. Tx INFO 001	▶
	-Operating Times-	
	Sensor life left:	
	321 days	

Status Code

These screens display transmission or node status and sensor status for the selected transmitter. This read-only information can assist service personnel in troubleshooting.

The XNX and XCD gas detectors will report the warning or fault number (iFault-WarnNumber) in hexadecimal on the third line. These transmitters will also report the monitoring state (iMonitoringState) in the fourth line. See the transmitter documentation for interpretation of fault numbers and monitoring states.

◀	1. Tx	INFO	001	▶
-Status Codes-				
Tx Status		0000h		
Monitor State		0001h		

Typical display for XNX or XCD

◀	1. Tx	INFO	001	▶
-Status Codes-				
Tx Status		0000h		
Snsr Staus		0000h		

Typical display for other transmitters

Erase Current Tx

This function allows the configuration to be erased or the Tx address for the displayed component to be changed.

Note: Selecting erase current Tx only erases the current device entry Tx Info configuration. No other data is erased.

◀	1. Tx	info	→	001	➡
Erase current Tx					
Change Tx Adress					

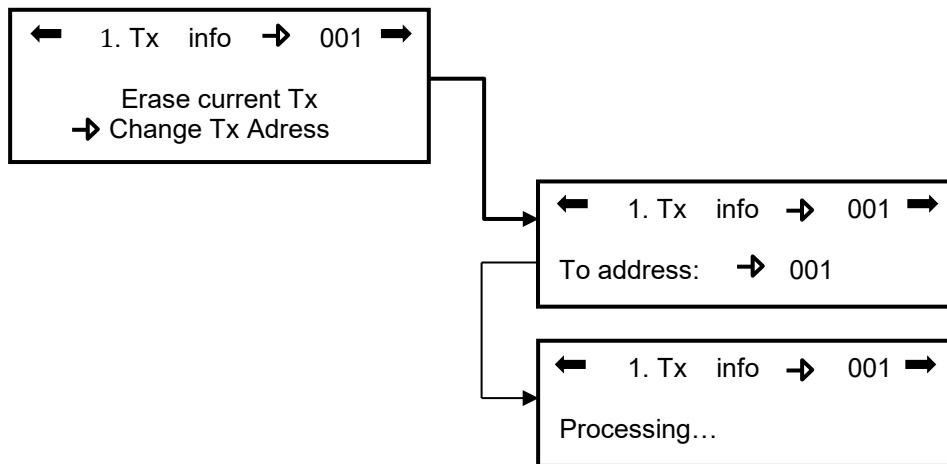
Change Tx Address

Selecting Change Tx Address allows users to move a device from one TX address to another:

- Use the arrows to scroll to Change Tx Address and press Enter to select
- In the next screen, scroll to the address number and press Enter to select
- Use the up or down arrows to increase or decrease the address value and press Enter to validate the new address.

The Change Tx address option is only available (active) for device address 1 to 96 and if there is a Modbus device connected.

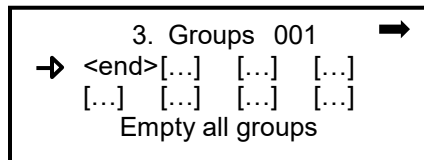
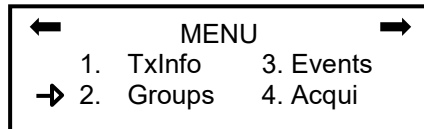
If the address is valid, the screen will display “Processing”. If the address is invalid, the screen will display “Invalid Tx” and return to the Change Tx Address screen (the address for GasPoint devices cannot be changed). A final screen will display either “Error” or “Success” (restart procedure if Error is displayed).



Note: If a device address is changed to one already associated with another device, the existing data will be overwritten. Customers should know their network's address assignments and be careful when changing a Tx address. Delete the original Tx address to avoid duplicate entries. This feature is not supported with XNX and XCD transmitters.

2. Groups Menu

Programming groups of transmitters allows several units to be combined which then enables actions (events) to be taken based on a series of units rather than each unit, individually.



A group is a stack containing the addresses from each of the transmitters included in the group.

Groups are displayed in a single line; if a group contains more than four components, the arrows must be used to scroll left and right of the display window to view all members of a group.

The cursor in the Group screen is represented by the blinking brackets

(<end>). Any information between the brackets can be edited

Creating Groups

The 301C controller accepts a variety of transmitter models with a variety of gas sensors. It can organize the data conveniently using groups and events. However, the group logic requires that all the members of the group be from the same transmitter models and the same sensor type. Mixing dissimilar sensors or transmitters in a group can cause incorrect results.

- Use the arrows to move the cursor to a group line and press Enter
- The field can be edited when the brackets stop blinking and the word “end” blinks
- Use the up or down arrows to scroll through the list of all units connected to the 301C controller, until the desired address is displayed.
- Press Enter again to validate the address.

- The address is added to the group and the <end> bracket is shifted one position to the right.
- Do not add duplicate copies of a transmitter.

The process can be repeated until all the desired transmitters in the group (up to 126) have been added. The address for each transmitter added in the Tx Info menu is available when creating groups.

Note: *Groups created in the Groups menu will appear in the product type list (Tx Info - Ident screen) as "Group xx" (the number assigned to the group when it was created).*

Deleting Groups

Use the *empty all groups* command to delete all groups previously programmed in the controller.

Single groups can be deleted with a simple procedure:

- Scroll to the first transmitter in the group list,
- Select the transmitter (its address blinks) and scroll to
(erases the entry and <end> marks the end of the stack)
- Press enter and the group is emptied.

This procedure makes it possible to delete one, several or all entries previously included in a group.

Note: *Up to 126 groups, with a maximum of 128 members each, can be created.*

3. Events Menu

The Events menu is programmable. Event programming lets specific actions to be defined:

Menu Topic	Description	
Action	What will be done if programmed criteria are reached	3. Events → 001 → -Action- Target: Ctrl Relay: #01
Delays	Defines the length of time to wait before taking an action on an event and time to wait after an event has returned to normal before the action output is returned to normal state.	← 3. Events 001 → -Delays- Before: → 99min After: 01min
Conditions	AND, OR or none (---); equations that allow more detailed control of an event	← 3. Events 001 → $\left[\begin{array}{l} 1/3 \text{ Gr036 } \text{Q} \\ = 2.01\% \end{array} \right] \text{AND}$
Coverage period	Determines the period during which the event is applicable	← 3. Events → 001 → -Coverage Period- All day All week
Status disabled	Disables or enables a programmed Event	← 3. EVENEMENT 001 → -Status : disabled- → Enable event
Database	Erases the selected event or all events	← 3. Events 001 → -Database- → Erase current event Erase all events

Action Menu

Actions are comprised of two parameters:

←

3. Events → 001

→

-Action-

Target: Ctrl

Relay: #01

Parameter	Description
Target	Indicates which component is responsible for the action to be taken; Tx (transmitter) Re (Relay/Annunciator) Ctrl (Controller)
Relay	Indicates which of three possible outputs will be activated when the event is true; #XX (activates the component's #xx relay), Buzzer (activates the component's audible alarm) ALL (activates the relays and audible alarms)

Example: Tx 007 detects a concentration exceeding the set values. The target (controller) triggers relay 1 connected to that event (a fan perhaps). Multiple events may be associated with a single relay. If so, the relay will be activated if any of the associated events are true.

Delays Menu

This option allows Before and After settings that will delay the activation or deactivation of an action to be programmed.

- Before** Delays the action for the specified length of time. If the condition persists beyond this delay, the defined action is executed.
- After** The time to wait after an event has returned to normal before returning action output to normal state. The after delay also offers a Latch option, described below.

←	3. Events	001	→
	-Delays-		
	Before:	→ 99min	
	After:	01min	

Before and After delays can be configured at either 30 or 45 seconds or from 1 to 99 minutes, in one minute increments. Five dashes (-----) indicates that no delay has been programmed.

- Use the keypad arrows to scroll to the desired option
- Press Enter to select the option
- Use the keypad arrows to scroll through the second or minute settings
- Press Enter at the desired setting. The delay is set.

Latch Mode

- The Latch function is executed on an Event state
- It is possible to select the Latch mode by changing the after delay to "latch"
- The Event stays active until the Silence keypad button is pressed
- The Silence keypad button has two functions: Silence the buzzer and unlatch the event.
- When the Silence keypad button is pressed, events in Latch mode are unlatched and reevaluated. If the Event condition persists, the Event remains active and returns to Latch mode. If the condition does not persist, the event is deactivated.

Note: If the Event has a Before delay and the Silence button is pressed while the Event conditions are still true, the buzzer will be silenced only for the length of the programmed delay.

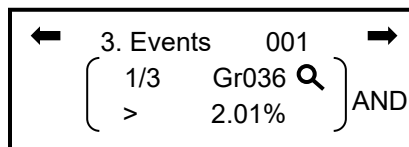
Conditions

Conditions are the parameters that define what makes an Event true. Each condition is defined by four elements and can be combined with other conditions to provide greater flexibility. A condition, as in the example provided below, defines:

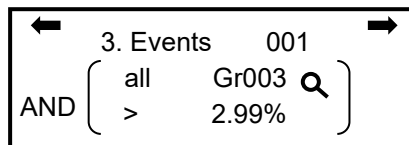
F at least 1/3 of group 36 detects concentrations greater than 2.01% of specified gas AND all of group 03 detects a concentration greater than 2.99% of gas, then the specified action (Actions were set at the first Event screen) for that Event will be triggered.

Since the display screens offer limited space, scroll left and right to view and edit further information.

Condition programming screens



← 3. Events 001 →
[1/3 Gr036 🔍] AND
> 2.01%



← 3. Events 001 →
AND [all Gr003 🔍]
> 2.99%

The portion of the Events condition screen that is within the brackets is divided into four editable list fields:

1. Top left portion contains the statistic quantifier (available only for Groups) that take only the specified part of the group into the equation. Options available in this field are:

Option	Description
all	includes all transmitters in the group
mean	includes the average concentration for the group's transmitters
max	includes the group's maximum concentration
min	includes the group's minimum concentration
1/4	includes at least a quarter of the group's transmitters that meets set conditions
1/3	includes at least a third of the group's transmitters that meets set conditions
1/2	includes at least half of the group's transmitters that meets set conditions
2/3	includes at least two thirds of the group's transmitters that meets set conditions
3/4	includes at least three quarters of the group's transmitters that meets set conditions
1 or +	at least one or more than one of the group's transmitters that meets set conditions
outl	The transmitter that deviates the most from the average concentration reading of a group of transmitters is known as an outlier. This quantifier is only available in 301C24 models. Further dialog facilitates specifying the deviation from average required to activate the event and the minimum duration for this deviation. For example, it is possible to set the deviation to 15 ppm and the duration to 30 minutes. This is explained further in <i>How to Build a California Title 24 Compliant System</i> in Appendix C

2. Bottom left portion contains the logic, or operator, quantifier that determines how conditions are calculated. Options available in this field are:

Operator Symbol	Meaning
---	No operator
=	Equal to
<=	Equal to or smaller than
<	Smaller than
>=	Equal to or larger than
>	Larger than
!=	Not equal to
max	When the maximum value is reached, an action is triggered. It will not be deactivated until levels fall below minimum value
min	When concentrations fall below minimum value, an action is triggered. It will not be deactivated until concentrations rise above set maximum value
TSC	The time since calibration reported by the sensor is evaluated. This number is also listed in the "1. TxInfo / Operating Times / Since Calib" menu. Further dialog allows the time limit to be set from 0 minutes to 98 months. This logic function is supported only with E ³ Point transmitters.

- Top right portion contains the source, which defines what device or group of devices the Event will be based on. The list provides the following options:

Option	Description
GrAll	Includes all transmitters (see note)
GR _ _ _	Includes only the devices in the specified group (see note)
Tx000	Includes only the specified transmitter (connected to the controller)
Clock	Includes only information gathered between the specified times. Selecting clock sets a condition that is applied only between the start and end time frame. It is possible to set one condition screen to specific parameters and the second to clock, which means that the specified condition will trigger an event only if it occurs during the set time period.

Note: Clicking on the magnifying glass to the right of a Group number on the display opens a view of the Group for consultation or editing. Press Esc to close the group view and return to the Event condition screen.

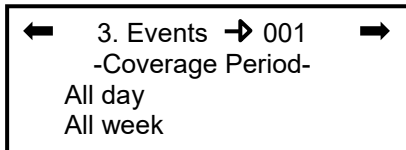
- Bottom right portion contains the operand, which defines what device or group of devices on which the Event will be based. The list provides the following options:

Option	Description
OFF	Used for status on binary inputs (ex.: used with 301ADI)
ON	Used for status on binary inputs (ex.: used with 301ADI)
Fault	Bases trigger on maintenance alarm, communication failure or device failure
Alrm A	If the chosen device or group has an Alarm A or Alarm 1, an event will be triggered.
Alrm B	If the chosen device or group has an Alarm B or Alarm 2, an event will be triggered
Alrm C	If the chosen device or group has an Alarm C, an event will be triggered.

The Coverage Period screen allows the period that will be covered by the Event to be defined. (The time frames for each of these periods can be defined in the controller Config menu.) This option provides two further selection fields:

Day definition field: allows All day, Daytime, or Nighttime to be selected

Week definition field: Weekend, Working Days, All week



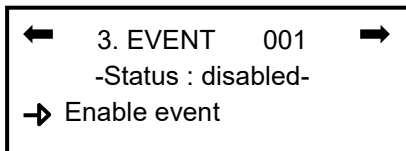
← 3. Events → 001 →
-Coverage Period-
All day
All week

1. Use the keypad up or down arrows to scroll to either All day or All week
2. Press Enter to select. The value can now be changed
3. Use the keypad up or down arrows to scroll through options (see above)
4. Press Enter to select.

Status

This screen displays the current event status and allows it to be either enabled or disabled, depending on the current status.

Enable event: Toggles between Enable and Disable.



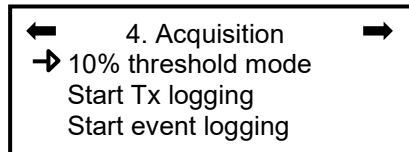
← 3. EVENT 001 →
-Status : disabled-
→ Enable event

After going through all the steps and programming an event, this screen will display “Enable event”. Press Enter to activate all the parameters and enable the Event.

If an existing Event is being consulted, this screen would display “Disable event”. Press Enter to disable an Event (it will not be deleted but will not function). The programming of this Event is always present, which means that it easily can be re-activated by scrolling to this screen and pressing Enter.

4. Acqui Menu

The Acquisition mode is accessible only when there is an SD card present (controllers with the Data Logging, or DLC function). It is used to enable or disable the logging of system Events or transmitter information. The information is logged (or recorded) on an SD card. Intervals or conditions must be defined before using this option.



The first line of the Acquisition screen offers either:

First Line	Description
Delay mode	Allows for delay intervals of 10 to 59 seconds or 1 to 60 minutes.
Threshold mode	Allows log values to be set per variation thresholds (based on last reading) of 3% or more, 5% or more or 10% or more of last detected concentration.

If a 3% threshold is selected, the system will not log a value at 3% but will log a value of 3.1%. Remember that the sampling rate (system refresh rate) may have an impact on logging.

Here is an example of threshold logging. The logs a semi-colon delineated text files.

```
2005-04-27 11:05:20;1_CO2_ppm;574;-normal-:
2005-04-27 11:06:02;1_CO2_ppm;503;-normal-:
2005-04-27 11:06:15;1_CO2_ppm;562;-normal-:
2005-04-27 11:06:28;1_CO2_ppm;645;-normal-:
2005-04-27 11:06:39;1_CO2_ppm;557;-normal-:
2005-04-27 11:30:45;1_CO2_ppm;715;-normal-:
```

Starting and Stopping Tx Logging

In the previous step, “Acquisition”, the frequency at which Tx logs would be recorded can be configured. To start the logging function:

When “Start Tx logging” appears on the display, it indicates that the acquisition, or logging, mode is inactive. When “Stop Tx logging” appears, it indicates that Tx data is being logged. The log message is displayed on the screen per the chosen mode and LED 1 will light up.

Press the Enter keypad button to stop or start Tx logging.

When Tx data is logged, the system creates files named **tayymmdd.log**, **tbyymmdd.log** and **tcyymmdd.log**, each representing one third of the network. The record includes the transmitter’s date, time and address, the sensor type, the concentration read, as well as the alarm status. Here is a sample of what a Tx log looks like:

```
2004-01-23 17;54;25; 001_CO_ppm;0;-normal-;002_NO2_ppm;1.5;-normal-  
;003_CO_ppm;0;-normal-  
2004-01-23 17;55;25; 001_CO_ppm;0;-normal-;002_NO2_ppm;0.5;-normal-  
;003_CO_ppm;0;-normal-  
2004-01-23 17;56;25; 001_CO_ppm;0;-normal-;002_NO2_ppm;0.5;-normal-  
;003_CO_ppm;0;-normal-  
2004-01-23 17;57;25; 001_CO_ppm;0;-normal-;002_NO2_ppm;1.0;-normal-  
;003_CO_ppm;0;-normal-  
2004-01-23 17;58;25; 001_CO_ppm;0;-normal-;002_NO2_ppm;1.5;-normal-  
;003_CO_ppm;0;-normal-
```

These log files are delimited by semicolons and are thus easily read by popular spreadsheet programs such as Microsoft Excel. The first column of the Tx log displays the date (yyyy-mm-dd) and the time (hh:mm:ss) of the log. In this example, the “Delay mode” was set to one minute intervals.

The third column of the Tx log displays the transmitter address and the fourth displays the gas type, gas concentration and unit of measurement.

The display then lists the next transmitter address with its gas type, concentration and unit of measurement, and so on until all the transmitters have been listed.

Starting and Stopping Event Logging

The Acquisition menu offers an event logging option. Event Logging records controller transactions, events, Tx and alarm flags and relay status.

When “Start Event logging” appears on the display, it indicates that the acquisition, or logging, mode is inactive. When “Stop Event logging” appears, it indicates that Event data is being logged.

Press the Enter keypad button to stop or start Event logging.

When Event data is logged, the system creates a file named **evyyymmdd.log**. The record includes the date, time and the event. Here is a sample of what an Event log looks like:

```
2004-01-23 17:54:25: Event logging enable
2004-01-23 17:55:25: Event logging enabled
2004-01-23 19:05:47; Simulation sequence activated
2004-01-23 19:05:48; Tx 6 communication no more in fault
2004-01-23 19:05:48; Tx 8 communication no more in fault
```

The first column of the Event log displays the date (yyyy-mm-dd) and time (hh:mm:ss) of the log. Column A displays the date and time of the log. In this example, the event’s “Delay mode” was set to one minute intervals.

The system logs the following types of events:

- Event Log
- Event status changed
- Alarm A, B, C, Fault, and X status changed

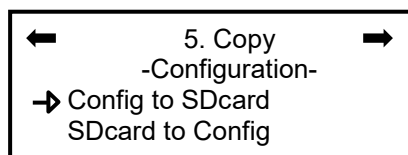
Note: New log files are created when the existing files reach 32 000 lines or at the start of a new week (0h00 Sunday)

5. Copy Menu

The Copy menu allows programmed parameters to be copied and transferred. Data from the SD card can be transferred to a controller or from a controller to the SD card or copy parameters from one device to the next. The Copy option offers three screens: Configuration, Parameters and System Log.

Configuration

If the controller is equipped with an SD card, the configuration function allows data to be transferred either from the 301C controller to the SD card or the reverse. This makes it possible to transfer the controller's programming to a computer or from a computer to the controller.



The first option in the configuration screen is 301C controller to SDcard. Selecting this option copies the controller's configuration and parameters into a "config.ini" file¹.

Note: The second option is SDcard to 301C controller allows the configuration and parameters of the "config.ini" file on an SDcard to be copied to the controller. Power must be cycled to fully implement the SD card's configuration by stowing the jumper on the SHDN pin (see the illustration on page 20). The "config.ini" file contents can be modified at any time and from any computer.

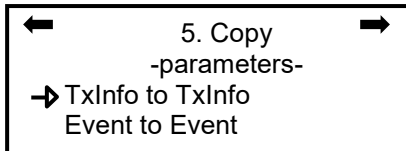
¹When transferring data, the system will automatically search for an existing "config.ini" file before proceeding. If one exists, the system searches for a "config.bak" file.

If found, the file is deleted. Then, the pre-existing "config.ini" file is renamed "config.bak", making it possible to save the new "config.ini" file and keep a backup copy of the previous one.

After inserting an SD card into the controller, the controller's system looks for an existing "config.ini" file that contains an "autoload" tag equal to 1 (yes). If the tag is found, the system loads the contents of the file and resets "autoload" to 0 (no). This is a useful feature for editing the file on a computer without having any impact on the controller (such as recorded Events).

Parameters

The “parameters” function allows one transmitter’s configuration to be copied to another or one event’s parameters to be copied to another event. This allows several devices that share identical or similar parameters to be quickly configured.



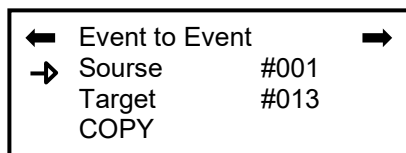
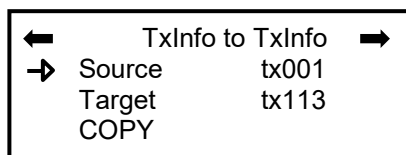
The options within this screen are:

Tx Info to Tx Info copies transmitter parameters from one device to another.

Event to Event copies parameters from Event to Event.

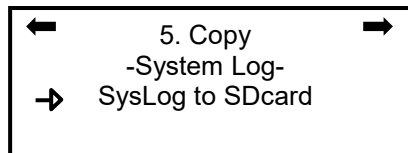
The process is identical for both options:

- Select source, (the data to be copied) using the up/down keypad arrows and press Enter.
- When the transmitter address is flashing, use the up/down keypad buttons to search for the desired device address.
- Press Enter to select the new address
- Select the target address (where the data is to be copied to) in the same way as source
- Select COPY and press Enter. The parameters have been copied.



System Log Menu

The controller will record log information to its internal memory. If the controller is equipped with an SD card, the system log function allows users to save system log information to the memory card in text format.



When this option is selected, a log of all the last actions performed on the controller is copied to the SDcard, with the filename **slyymmdd.log**. This file can contain up to a maximum of 64Kb of information in text format. Once the memory card is full, the oldest log entries are erased and replaced by new entries. Here is an example of a system log:

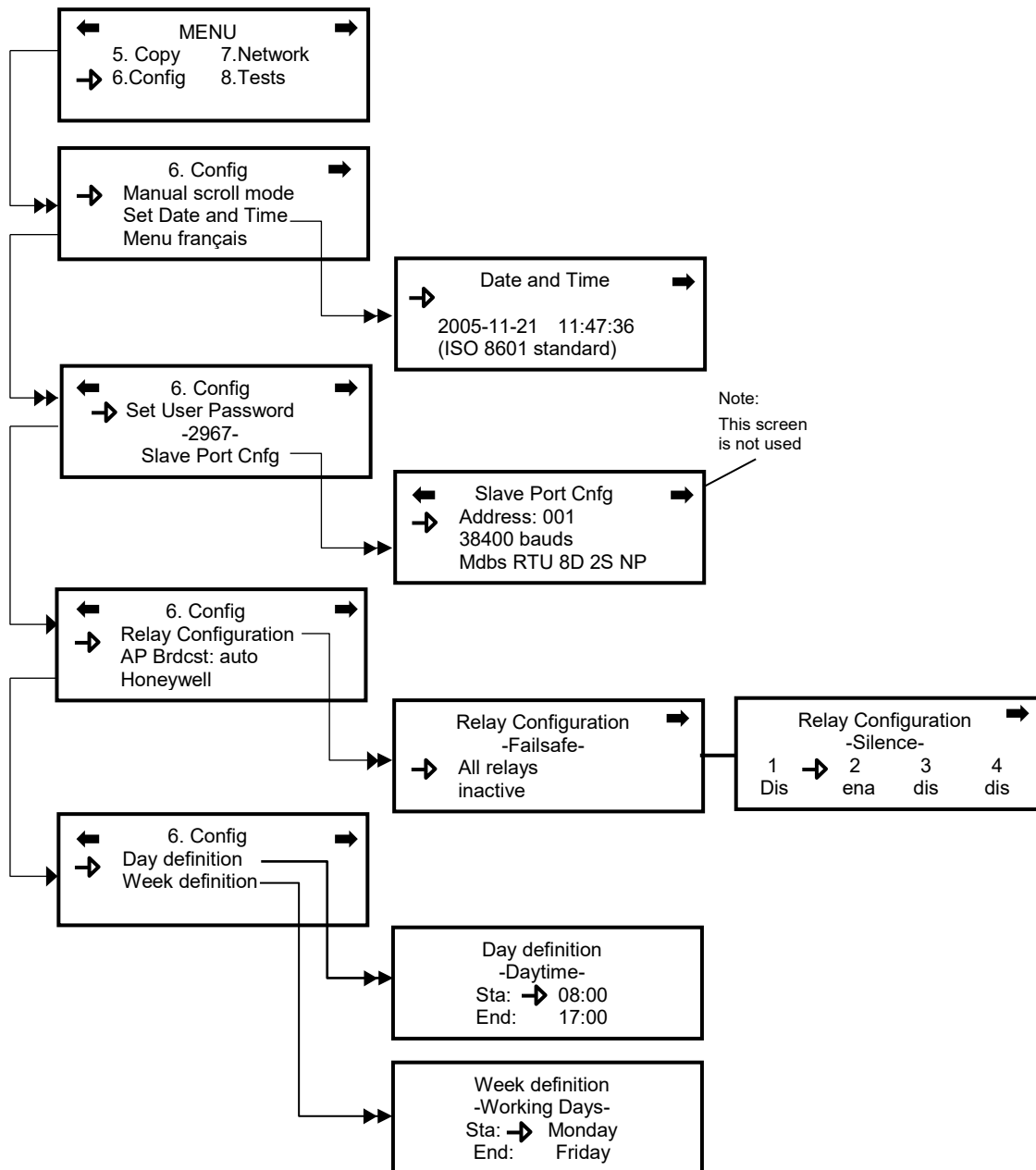
--- START of system log dump : 2007-04-18 13:19:05 ---

2007-04-04 18:42:06;Accessing menu;
2007-04-04 18:43:47;Event 1 definition modified;
2007-04-04 18:48:12;Exiting menu;
2007-04-04 18:54:49;System power-down;
2007-04-04 18:56:40;System power-up;
2007-04-04 19:02:44;Accessing menu;
2007-04-04 19:03:07;Event 6 definition modified;
2007-04-04 19:03:21;Exiting menu;
2007-04-05 10:51:28;Accessing menu;
2007-04-05 10:54:59;Database reset;
2007-04-05 10:55:18;Tx 25 parameters modified;
2007-04-05 10:55:29;Group 0 definition modified;
2007-04-05 10:55:36;Group 0 definition modified;
2007-04-05 10:55:46;Group 0 definition modified;
2007-04-05 10:55:55;Group 4 definition modified;
2007-04-05 10:55:57;Exiting menu;
2007-04-05 10:56:02;Accessing menu;
2007-04-05 10:56:19;Tx 24 parameters modified;

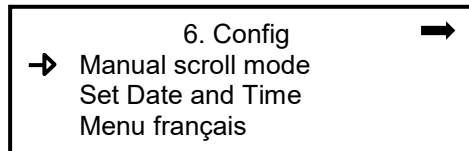
6. Config Menu

The Config menu contains several main configuration screens and is used to program the controller display mode, adjust the date and time, select the display language, change the controller access password, set the Relay Configuration, and select the AP Broadcast mode.

Each main screen offers further programming options, as shown.



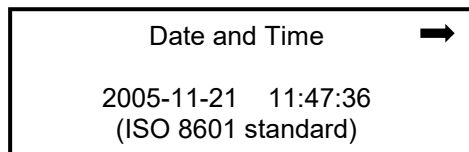
Selecting the first line of the first screen allows selection from three display modes: Manual scroll, 3-second scroll, 5-second scroll. If Manual scroll mode is chosen, the screen will only advance if you press on the arrow keypad buttons. If either 3 or 5 second scroll mode is chosen, the screens will automatically scroll display readings for all devices connected to the controller after 3 or 5 seconds.



3 or 5 second scroll modes do not prevent the keypad arrows to be used to return to a previous screen or move ahead through the screens manually.

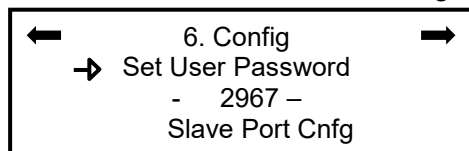
Selecting the second line allows the date and time in a new screen to be adjusted; Date and Time. When a number is flashing, the value can be changed using the up/down keypad arrows. The year, month, day and the hour, minute and second values can be changed.

The controller does not manage Daylight Savings Time; therefore, users must manually adjust any time changes.



Selecting the third line allows the display language to be changed. If the display is already in English, it will then display the Menu François option (and vice-versa). Simply scroll to the line and press Enter to change the language.

Second main screen in the Config menu allows a new user pass-word to be set.



The default password is 2967. Select Set User Password to change the password:

- When the first digit blinks, change the value by using the up/down keypad arrows to increase or decrease the number
- Use the left/right keypad arrows to move from one digit to the next.
- When the desired e has been set, press Enter to validate it and exit the editing mode.

Note: Contact Honeywell technical support for help with lost passwords at 1-800-563-2967.

The slave port is not used

Scroll through the main Config menu screens using the left (previous) or right (next) keypad arrows.

The third main screen in the Config menu allows the relay configuration to be set, the AP broadcast mode and to select from four separate manufactures for the given controller.

←
6. Config
→

→ Relay Configuration
AP Brdcst: auto
Honeywell

When *Relay Configuration* is selected, two further options to configure the relays are available: The first screen, Failsafe, appears allowing the failsafe to be activated for all relays using the Enter keypad button. This function inverts relay operation to be normally energized. If power is cut, the relay will activate the connected device. (ex. a light.)

←
Relay Configuration
→

-Failsafe-

→ All relays
inactive

Scrolling to the right displays the “Silence” screen that enables or disables the silence option for each relay, using the Enter keypad button.

←
Relay Configuration
→

-Silence-

1
Dis

→ 2
ena

3
dis

4
dis

Fourth screen in the Config menu allows a definition of a day and a week to be programmed.

←
6. Config
→

→ Day definition
Week definition

Day and Week definition allows hours (time frames) to be defined for either Day-time and Working Days respectively.

Date definition
-Daytime-

Sta:

→ 08:00

End:

17:00

Week definition
-Working Days-

Sta:

→ Monday

End:

Friday

Note: Remember, the controller uses a 24-hour clock (0:00 to 23:59). Any time changes (e.g., for Daylight Savings Time) must be made manually or through BACNet time synchronization (BACNet module required).

7. Network Menu

The Modbus network menu allows network device information to be either scanned or reset.

This menu offers four options, divided into two screens; the first screen contains three options:

Option	Description
Reset Database	Resets all network device Tx information in the database. This only resets the Tx information for the network device. It does not affect programmed Groups or Events.
Network Scan	Begins an auto-detect of all network devices that allows the system to configure the Tx database for network devices (i.e. it will scan and add new devices but will not overwrite or erase the old database). This process takes approximately one minute.
Reset and Scan	Performs both previous functions simultaneously.

7. Network	→
→ Reset Database	
Scan Network	
Reset and Scan	

Note: Once one of these options has been set, wait until the controller completes the process. Do not interrupt or stop the process once it has begun.

Second Network screen offers the Statistics and Calibration options.

← 7. Network →
→ Statistics
Calibration

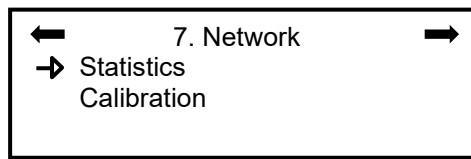
Selecting Statistics from the Network menu displays a screen containing the statistics for the selected device address.

Statistics		
Valid	16	100%
Errors	0	0%
Timeouts	0	0%

Term	Description
Valid	Indicates the number of valid responses for the last 16 requests
Errors	Indicates the number of errors in the response for the last 16 requests
Timeouts	Indicates the number of timeouts (no response) for the last 16 requests

Remote Calibration

The network menu also offers a Calibration option for use with devices that support network calibration.



The Calibration screen contains four lines of information:

Calib	→ 007	S301M
Status:	Normal	
Set Zero		
Set Span	246	PPM

Term	Description
Line 1	Indicates the mode (Calib, meaning calibration), the (Modbus) address of the device to calibrate (001) and the type of device to calibrate (S301-D2)
Line 2	Indicates the status (Normal or In calib...) of the specified device
Line 3	Displays the function to perform (Set Zero)
Line 4	Displays the function to perform (Set Span) and the span gas concentration value (246 ppm)

1. On the first line, scroll to the device address and press Enter
2. Scroll through the devices to display the desired device* and press Enter to select.
3. The second line displays the device's status
4. Scroll to select the desired function, Set Zero to set the device's zero, and press Enter to select.
5. Upon pressing Set Zero, the controller requests confirmation.

Calib	→ 007	S301M
Status:	Normal	
Set Zero		
Set Span	246	PPM

**The device must be configured in the 301C controller's database in order to be included in the device addresses displayed on screen.*

6. Press Enter to confirm or Esc to cancel. If confirmed, the controller calibrates the sensor's Zero. This takes only a few moments and the display returns to the default calibration screen.

Note: Never calibrate any unit's Zero with ambient air. Always use Nitrogen (N₂) at the calibration port to calibrate the Zero.

7. To calibrate the device, scroll to Set Span** and change the span gas calibration value using this procedure;

Calib	001	:	S301-D2
Status:	Normal		
Set Zero			
Set Span	→	2.60	ppm

- a. Using the right arrow, move the cursor to xxx PPM (span value field). Press Enter to select the field (it is editable when flashing).
- b. Use the up or down arrows to increase or decrease the value, press Enter to validate the new value.
- c. Move the cursor back to Set Span and press Enter to start the calibration.

Calib	001	:	S301-D2
Status:	In calib...		
Set Zero			
→ Set Span		2.60	ppm

The device Span is being calibrated. The screen will display the device's status as "In calib..." until the calibration is complete.

***When selecting Set Span, make sure that the device has been supplied with the appropriate calibration gas before and during the calibration process.*

8. Test Menu

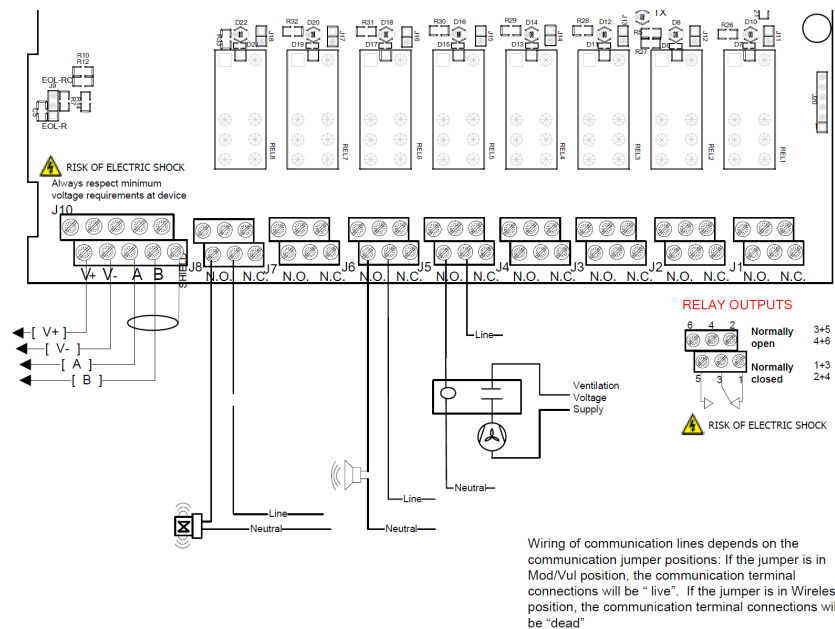
Refer to Page 107

9. Wireless Menu

Not supported, Contact Honeywell Analytics

301-R8 and AA96D-RM8

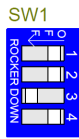
Wiring details



Risk of electrical shock - disconnect all power (input and relay) before servicing.

Addressing DIP Switches

The DIP switches are used to change relay module addresses. If the relay module is connected to a controller, the addresses range available begins at 81.



PRODUCT ADDRESSES	DIP SWITCH POSITIONS			
	Dip1	Dip2	Dip3	Dip4
301-C and AA96D				
81	Off	Off	Off	Off
82	On	Off	Off	Off
83	Off	On	Off	Off
84	On	On	Off	Off
85	Off	Off	On	Off
86	On	Off	On	Off
87	Off	On	On	Off
88	On	On	On	Off
89	Off	Off	Off	On
90	On	Off	Off	On
91	Off	On	Off	On
92	On	On	Off	On
93	Off	Off	On	On
94	On	Off	On	On
95	Off	On	On	On
96	On	On	On	On

LED Definitions

The unit has two externally visible LEDs:

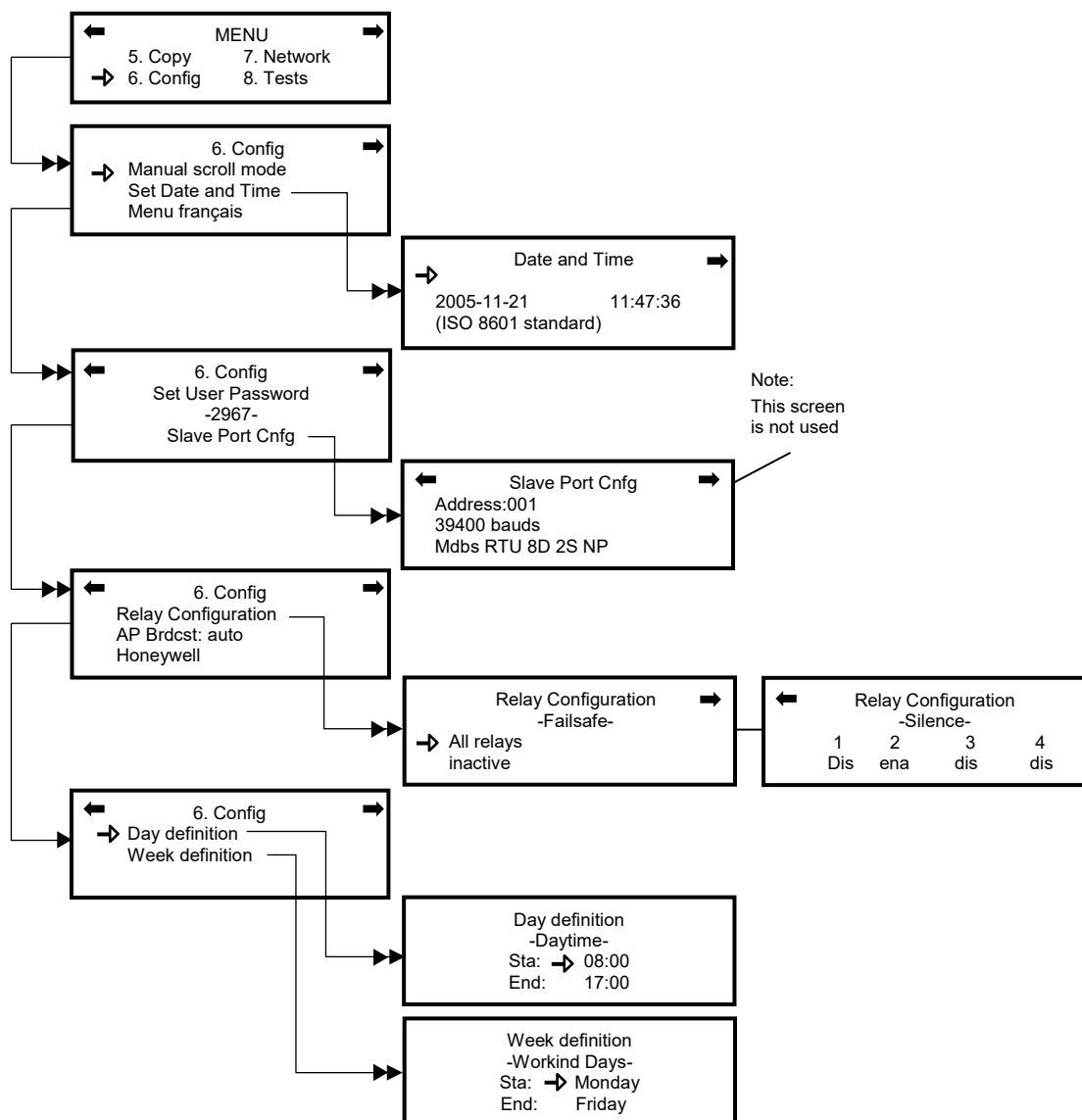
The green LED indicates power status. When the unit is powered up and function the LED is lit, when the LED is off, the unit is off

The amber LED indicates communication status. This LED blinks to indicate communication between the relay module and the controller.

Relay Configuring

The 301C Config menu contains several main configuration screens and is used to program the controller display mode, adjust the date and time, select the display language, change the controller access password, set the Relay Configuration, and select the AP Broadcast mode.

Each main screen offers further programming options, as shown.



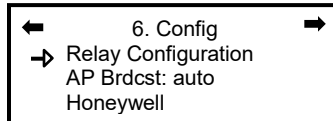
The default password is 2967. Select Set User Password to change the password:

- When the first digit blinks, change the value by using the up/down keypad arrows to increase or decrease the number
- Use the left/right keypad arrows to move from one digit to the next.
- When the desired value has been set, press Enter to validate it and exit the editing mode.

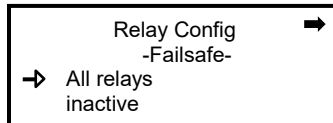


Contact Honeywell technical support for help with lost passwords at 1-800-563-2967.

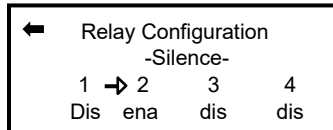
From the main menu screen scroll to the Config menu. This menu allows the relay configuration to be set, the AP broadcast mode and to select from four separate manufacturers for the given controller.



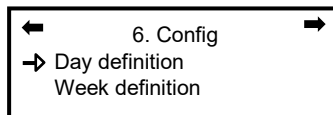
When *Relay Configuration* is selected, two further options to configure the relays are available: The first screen, *Failsafe*, appears allowing the failsafe to be activated for all relays using the Enter keypad button. This function inverts relay operation to be normally energized. If power is cut, the relay will activate the connected device (ex. a light).



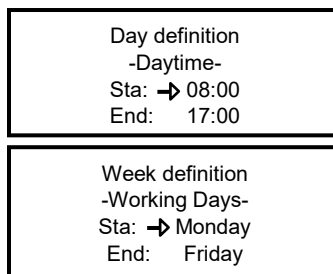
Scrolling to the right displays the “Silence” screen that enables or disables the silence option for each relay, using the Enter keypad button.



The fourth screen in the Config menu allows a definition of a day and a week to be programmed.



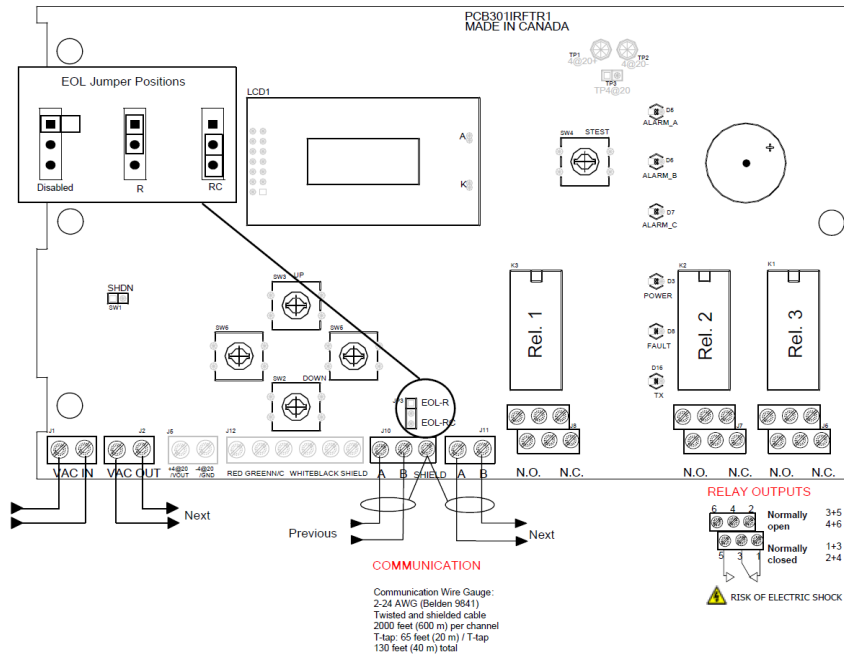
Day and Week definition allows hours (time frames) to be defined for Daytime and Working Days respectively.



Remember, the controller uses a 24-hour clock (0:00 to 23:59). Any time changes (e.g., for Daylight Savings Time) must be made manually or through BAC-Net time synchronization (BACNet module required)

301-AP

Wiring Details



Warning: Do not connect power to this unit until all wiring connections are complete.



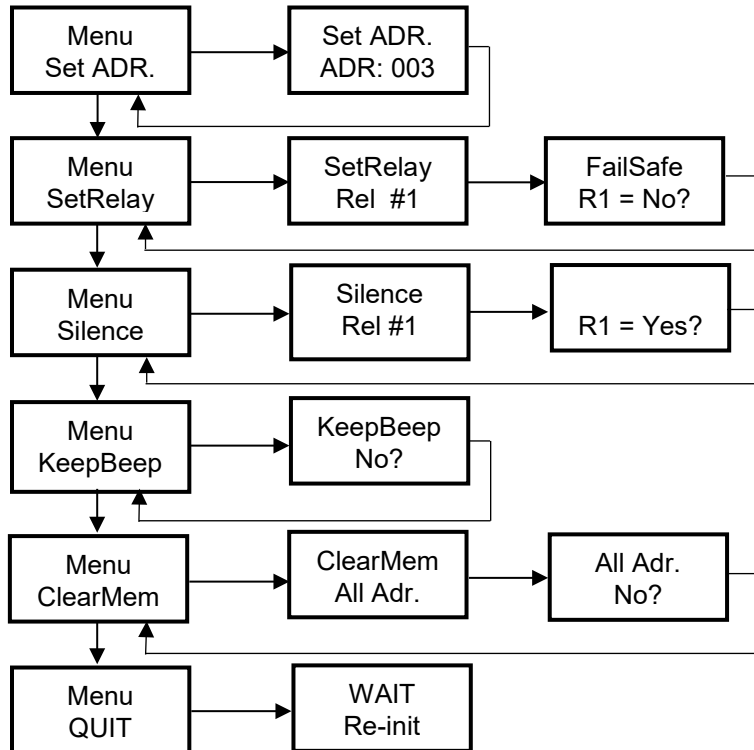
Risk of electrical shock - disconnect all power (input and relay) before servicing.

Note: When using Vdc for power, the left most position of the VAC IN and VAC OUT will be 24Vdc and the right most position will be 0Vdc.

Programming

Menu Options

The 301-AP programming menu offers many options, as illustrated in the image below:



Using the Menu

Follow these steps to access and use the programming menu:

1. Press the Enter pushbutton to access the menu. The password screen appears requesting the password.
2. The first letter in the password is underlined to show that it can be changed. Press the up or down arrow to scroll to the desired letter or number.
3. Press the Enter pushbutton to confirm the first letter or number.
4. Use the arrows to scroll to the desired second letter.
5. Press the Enter pushbutton to confirm the password. If it is correct, the following screen appears.

PASSWORD
VA

Menu
Set ADR.



The default password is **2967** for newer 301-AP and **VA** for older versions. If an incorrect password is entered, the menu cannot be accessed and the unit returns to normal operation mode.

Setting the Address

Each unit is configured with a default address. However, if the unit is part of a network of devices, each should have a different address.

Follow these steps to set the address:

1. When the screen is displaying, the **Menu Set ADR.** option (immediately after password login), press the Enter pushbutton to select the option.
2. Press an arrow pushbutton to scroll through the different addresses (001 to 254). When the desired address is displayed, press Enter to set the new address. The display returns to the **Menu Set ADR.** screen.
3. Press an arrow to scroll to the next desired option or to the **QUIT** screen and press Enter to confirm the selection or exit the programming menus.

Menu
Set ADR.

Set ADR.
ADR: 003



If the 301-AP is to be compatible with the 301-C and AA96D controllers, the address must be between 1 and 96.

Changing Relay Settings

Although the unit is ready to use, with default relay settings, this option allows users to modify relay failsafe settings.

The process to change the settings for each relay is identical:

1. Press an arrow to scroll to the **SetRelay** menu option and press Enter to select.

Menu
SetRelay

2. **SetRelay Rel #1** appears on the screen. Press an arrow to scroll to the desired relay number and press Enter to select.

SetRelay
Rel #1

The screen now shows the current failsafe setting. Use the arrows to scroll to the desired setting (Yes to activate the failsafe, No to deactivate) and press Enter to confirm the new setting.

FailSafe
R1 = No?

3. Once the new value is accepted, the unit returns to the **SetRelay Rel #1** screen.

Changing Silence Settings

The unit user interface contains a “Silence” pushbutton. This button is only functional if the Silence setting has been activated for each option using this menu.

1. Press an arrow to scroll to the **Menu Silence** option and press Enter to select.

Menu
Silence

2. **Silence Rel #1** appears on the screen. Press an arrow to scroll to the desired relay number (or Buzzer) and press Enter to select.

Silence
Rel #1

3. The screen now requests confirmation. Use the arrows to scroll to the desired setting (Yes activates the Silence pushbutton for the specified relay or buzzer, No leaves the pushbutton inactive) and press Enter to confirm the new setting.

R1 = Yes?

4. Once the new value is accepted, the unit returns to the **Silence Rel #1** screen.

Repeat for other options.



Selecting buzzer means that pressing the Silence key will turn off the unit's audible alarm.

Selecting Rel #1, #2 or #3 means that pressing the Silence key will deactivate a relay that was activated by an alarm.

Activating Key Beeps

This function activates the Beep function, which makes the unit emit a beep whenever a pushbutton is pressed:

1. When the screen displays the **Menu KeyBeep** option, press the Enter pushbutton to select.

Menu
KeyBeep

2. Press an arrow pushbutton to scroll to Yes or No and press Enter to set the new value. The display returns to the **Menu Set ADR.** screen.

KeyBeep
No?

3. Press an arrow to scroll to the next desired option or to the **QUIT** screen and press Enter to confirm the selection or exit the programming menus.

Erasing Unit Memory

This function enables the user to clear the unit's memory. This is useful if, for reasons unknown, the 301-AP display panel experiences technical difficulties. Once the 301-AP memory is cleared, the 301-C controller re-sets the AP memory and the display should return to normal.

1. Press an arrow to scroll to the **Menu ClearMem** option, press the Enter pushbutton to select.
2. The screen displays **ClearMem All Adr.** Press the Enter pushbutton to select the option or use the arrows to select the address to delete.
3. Press an arrow pushbutton to scroll to Yes or No and press Enter to confirm. The display returns to the **Menu Set ADR.** screen.
4. Press an arrow to scroll to the next desired option or to the **QUIT** screen and press Enter to confirm the selection or exit the programming menus.

Exiting the Programming Menu

Follow the steps below to exit the programming menu.

Press an arrow to scroll to the **QUIT** screen and press Enter to exit the programming menus.

301C Programming

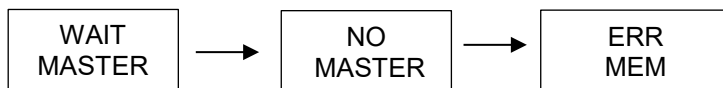
Under the 301C Config Menu, change AP Broadcast (AP Brdcst) from Auto to Act.

The LCD displays * **WAIT** * **Re-init** as the transmitter implements all the changes that were made in the user's menu before returning to normal operation.

Fault LED

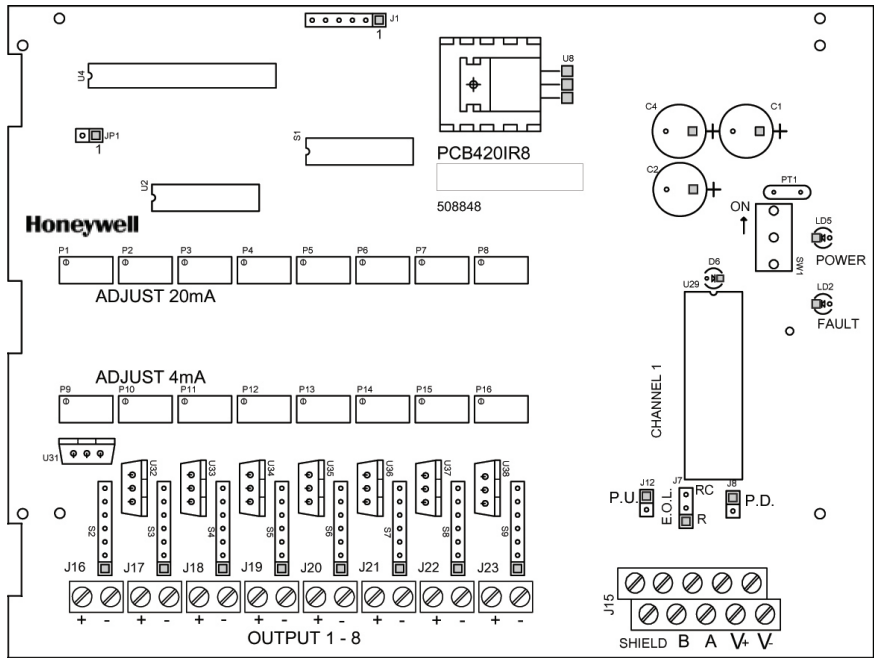
If the transmitter experiences any communication difficulties, the fault LED will automatically turn on. The fault LED will also light when a fault occurs on the 301-C or AA96D controller. If the system is in fault mode, contact Honeywell.

In the event of a fault, the LCD will display the following messages:



420-I

The image below is the 420-I PCB. Pass the wires the knock-outs provided at the bottom of the unit.



Addressing Dip Switch Settings

	1	2	3	4*	5	6	7	8	Mode
301-C or AA96D	0	0	0	0/1	1	0	0	0	Modbus listen; Adr. 1-8
	0	0	0	0/1	0	1	0	0	Modbus listen; Adr. 9-16
	0	0	0	0/1	1	1	0	0	Modbus listen; Adr. 17-24
	0	0	0	0/1	0	0	1	0	Modbus listen; Adr. 25-32
	0	0	0	0/1	1	0	1	0	Modbus listen; Adr. 33-40
	0	0	0	0/1	0	1	1	0	Modbus listen; Adr. 41-48
	0	0	0	0/1	1	1	1	0	Modbus listen; Adr. 49-56
	0	0	0	0/1	0	0	0	1	Modbus listen; Adr. 57-64
	0	0	0	0/1	1	0	0	1	Modbus listen; Adr. 65-72
	0	0	0	0/1	0	1	0	1	Modbus listen; Adr. 73-80
	0	0	0	0/1	1	1	0	1	Modbus listen; Adr. 81-88
	0	0	0	0/1	0	0	1	1	Modbus listen; Adr. 89-96
	0	0	0	0/1	1	0	1	1	Not Available
	0	0	0	0/1	0	1	1	1	Not Available
	0	0	0	0/1	1	1	1	1	Not Available

Note: * When DIP Switch four (4) is set to 1, it is in statistic mode (except for adjustment settings)

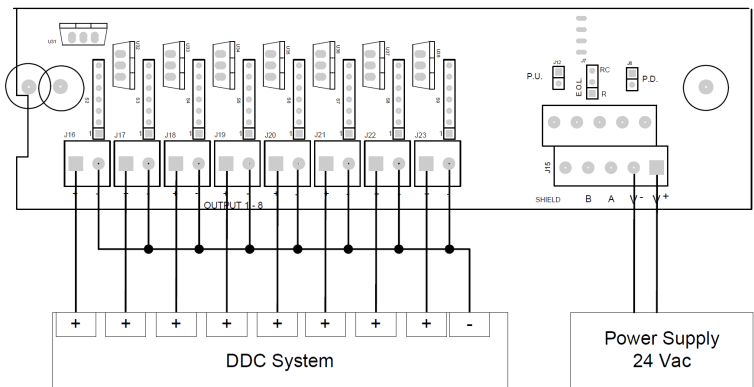
Wiring Details

4-20 mA Current Sourcing Output Wiring

The transmitter supplies the loop current. The maximum impedance supported by the loop is 400 ohms. To enable this configuration, the three jumpers must be placed on positions 1-2, 3-4 and 5-6 at distinct outputs J16 through J23.



A dedicated power supply must be used with each unit. Considerable damage may occur if this condition is not strictly met.



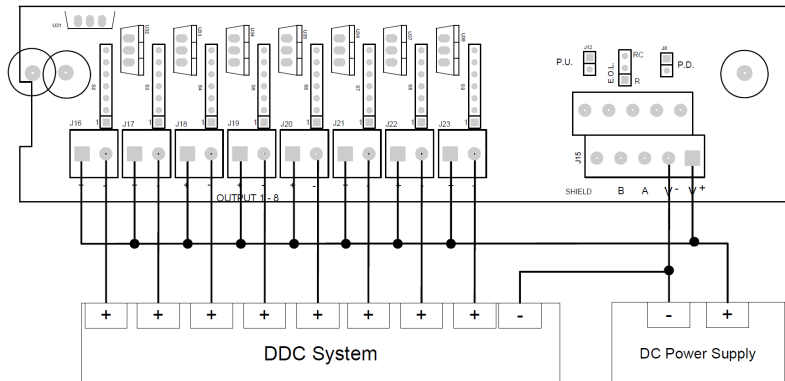
4-20 mA Output Loop-powered Wiring (Factory Setting)

The 4-20 mA output is factory set for loop-powered operation and requires a power source of 12 Vdc to 30 Vdc. The overall permitted impedance depends on the voltage supplied at the 4-20 mA loop. To enable this configuration, the three jumpers must be placed on positions 2-3, 4-5 and 6-7 at distinct outputs J16 through J23.

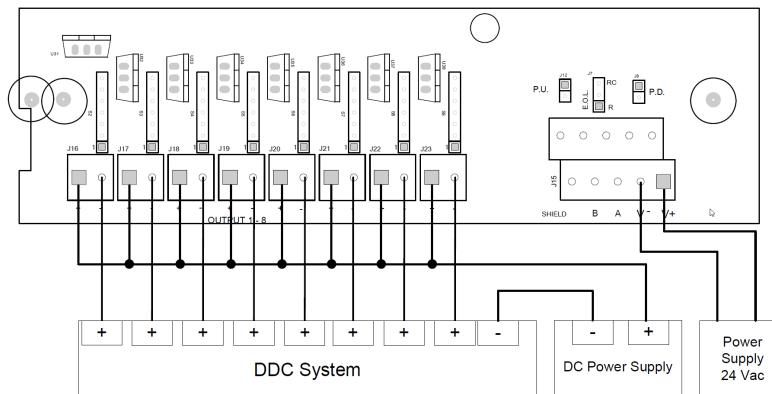
Permitted Impedance in the 4-20 mA Loop

Voltage Source Applied	Total Impedance
12 Vdc	400 Ohms
16 Vdc	600 Ohms
20 Vdc	800 Ohms
24 Vdc	1000 Ohms
30 Vdc	1300 Ohms

3-wire configuration



4-wire configuration



4-20 mA Output Configuration

The 420-I has 8 4-20 mA outputs. It converts a digital signal entering at J15 into an analog signal through outputs J16 to J23. The output signal is linear to the input. The 4mA output represents the minimum scale from the input and the 20mA output represents the maximum scale from the input.

Configuration

The unit can be factory set to one of three configurations. In the most standard configuration, the 420-I converts the transmitter digital signal to 4-20 mA analog outputs.

Although the unit is preconfigured, it is also possible to modify configurations using the unit's DIP switch (see Changing the 420-I Configuration section).

Listening Mode

In this mode, the 420-I only listens to the information transmitted between the controller and the transmitters. It does not intervene in network operation. The converter transforms the digital signal from the transmitters into a 4-20 mA analog signal.

Each converted signal is associated to a distinct output (J16 through J23).

Addresses can be selected in groups of 8 (i.e. 1 - 8, 9-16 and so on until 89-96. See DIP Switch settings for further details). There are also three (3) statistic values available for selected groups:

Output J20: Average	Output J18: Minimum	Output J16: Maximum
---------------------	---------------------	---------------------

Listening Mode for 301-C and AA96D

Available Configuration for 301-C

This function is only available with recent versions (2005 onward). When used with the 301-C, it is in listening mode only; the broadcast mode must be activated on the controller side.

Addresses can be selected in groups of 8 (i.e. 1 - 8, 9-16 and so on until 89-96. See DIP Switch settings for further details). There are also three (3) statistic values available for selected groups: Minimum, Maximum and Average.

Each converted signal is associated to the following outputs:

Output J20: Average	Output J18: Minimum	Output J16: Maximum
---------------------	---------------------	---------------------

Polling Mode

In this mode, the converter polls the network. The 420-I (master) polls the transmitters (slaves) and converts the digital signal from the transmitters into a 4-20 mA analog signal.

Addresses can be selected in groups of 8 (i.e. 1 - 8, 9-16 and so on until 89-96. See DIP Switch settings for further details). Each converted signal is associated with a distinct output (J16 through J23).

Three statistic values are also available: Minimum, Maximum and Average, with the appropriate settings.

Split Mode

This mode is used with a SQN8x (4 points, 2 gases). The SQN8x uses 4 points per gas. Addresses 1 to 4 are for the first gas and addresses 9 to 12 for the second gas.

On the 420-I, the addresses are fixed. Addresses 1 to 4 are attributed to the first 4 outputs and addresses 9 to 12 are attributed to the last 4 outputs. This configuration allows for the use of only one 420-I with a SQN8x with two gases.

4-20 mA Output Adjustments



Before changing the S1 DIP switch settings for the 4-20 mA adjustments, note the actual setting to reset the dip switch for normal operation. After the adjustments are made, replace jumpers at S2 through S9 to the correct configuration.

Outputs must be set for current sourcing configuration. Install jumpers at positions 1-2, 3-4 and 5-6 for S2 through S9.



Do NOT use Current Sourcing Configuration if there will be voltage on the line.

Set Dipswitch S1 as follows for 4 mA adjustment:

Dip1: OFF	Dip2: OFF
Dip3: ON	Dip4: OFF

With your amp meter at each output, adjust the 4 mA with Potentiometers P9 through P16.

Set Dipswitch S1 as follows for 20 mA adjustment:

Dip1: OFF	Dip2: ON
Dip3: ON	Dip4: OFF

With your amp meter at each output, adjust the 20 mA with potentiometers P1 through P8.

Once completed, replace the settings to their original places.

301C Programming

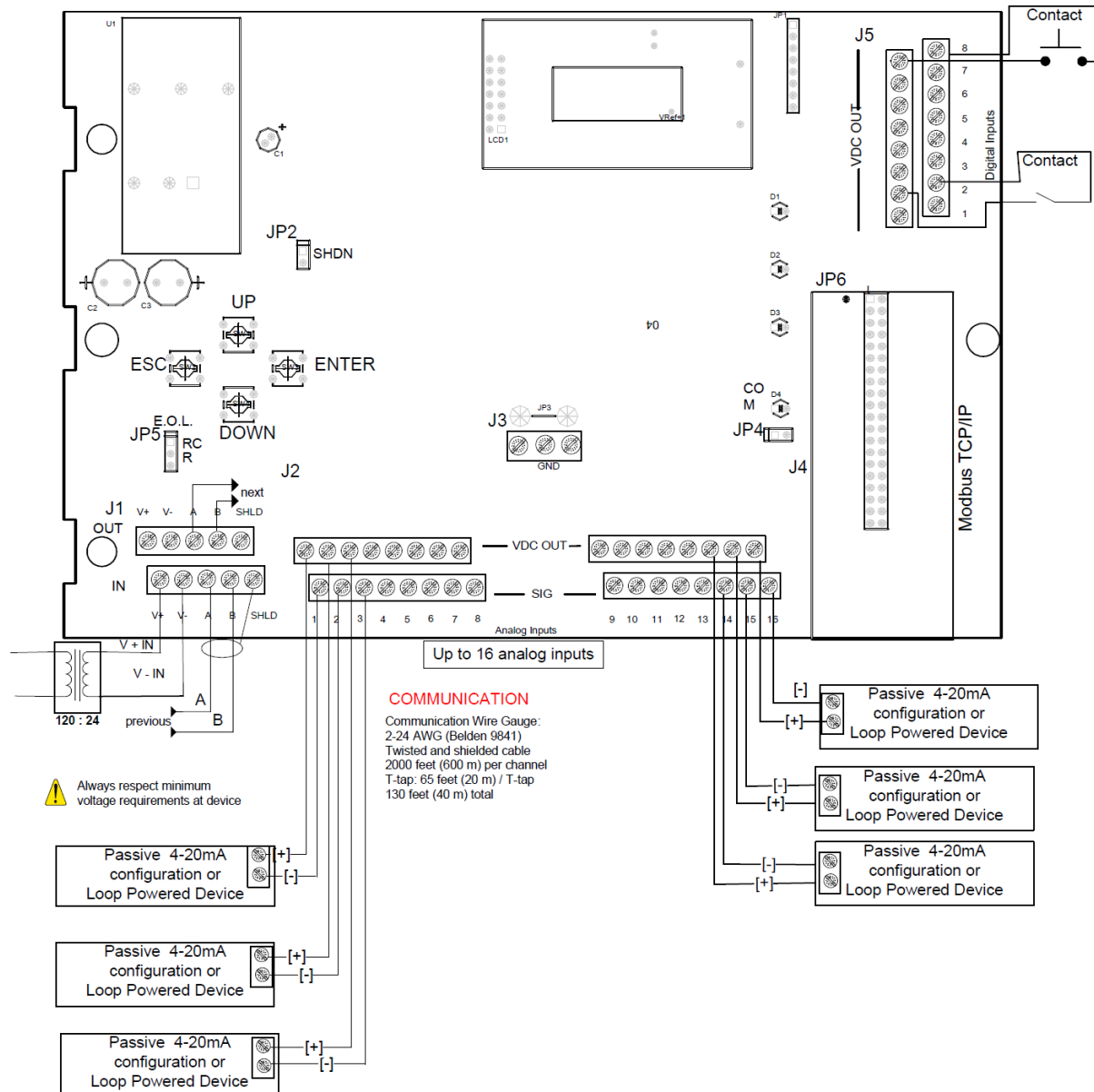
Under the 301C Config Menu, change AP Broadcast (AP Brdcst) from Auto to Act.

Multiplexing multiple detectors to a single mA output see Appendix F

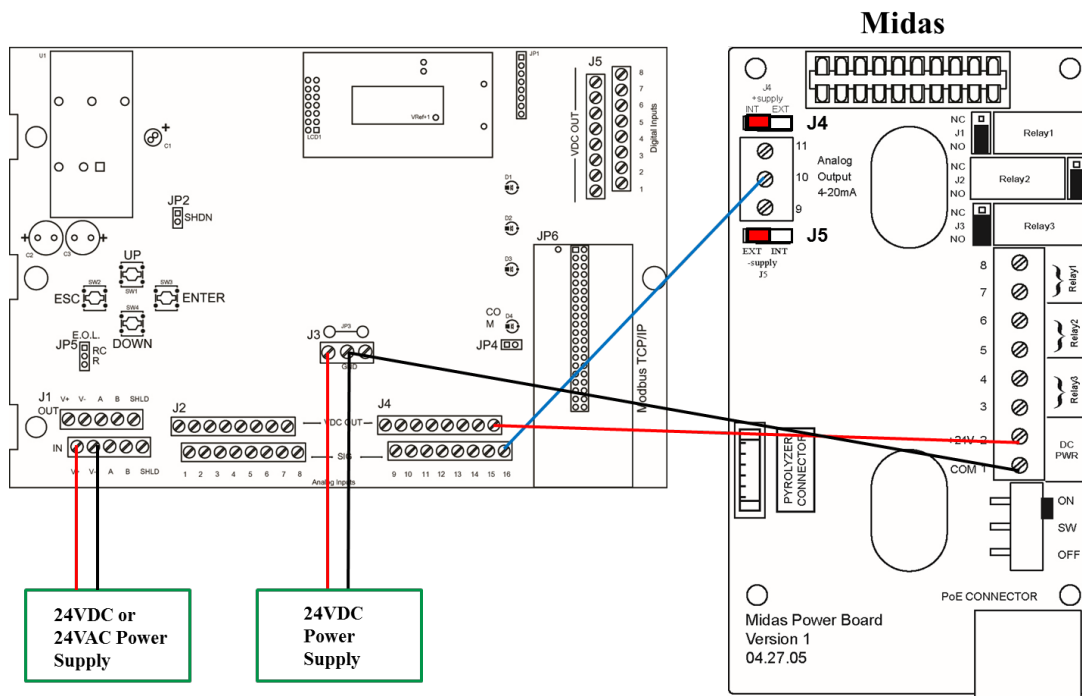
301-ADI

Wiring Details

The image below is the 301-ADI PCB. Pass the wires the knock-outs provided at the bottom of the unit.



J3 requires a 24Vdc source to be connected. J3-1 and J3-3 are 24Vdc and J3-2 is 0Vdc



1. Disconnect power supply before proceeding to connect any wiring.
2. Connect the communication wires from the controller's (301-ADI) RS-485 port into communication terminals A and B (J1).
3. Connect the transmitter wires to the analog inputs (J2, J4), in SIG and VDC OUT.
4. Connect the contact device to the digital inputs (J5).

When all connections are complete, you can proceed to the configuration of the unit.

Programming

Accessing the Menus

The 301-ADI is equipped with a 2 x 8-character LCD display screen within its housing that allows you to configure the settings for the 16 analog inputs and the 8 digital inputs. Use the keypad arrows (Up, Down, Esc, Enter) provided on the PCB to scroll through programming options.

When you open the 301-ADI housing (to access the display screen), the LCD screen displays only the product name and the Modbus address. This is displayed whenever the screen is idle. The programming function is password protected, you must log a password to access this function. The default password is VA.

- Press Enter once to display the password screen.
- When the password screen is first displayed, it shows AA as the password, with the cursor under the first letter.

PASSWORD
AA

- Use the Up or Down arrow buttons to change characters.
- When the first letter is correct, press Enter to move to the second letter.
- Press Enter once more to validate the password.

Once the password has been validated, the screen displays "*Menu* ConfigAI?", the first of three (3) main menu options. Use the Up and Down buttons to scroll through the options and Enter to select the desired one:

- Press the UP button once to move from the Config AI screen to the Config DI screen (press DOWN to return to the previous screen)

MENU
Cfg AI

MENU
Cfg DI

- Press the UP button again to move to the "Modbs ID" screen

MENU
ModbsID

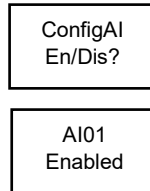
- Pressing ENTER at any screen opens a sub-menu that allows you to either enable or disable an input or to change the Modbus address.

Configure Analog Input (ConfigAI)

The steps below show the "ConfigAI" menu progress for each main menu option.

ConfigAI En/Dis?: This option lets you configure whether a transmitter is enabled or not or simply to verify its status. The screen displays the transmitter number and whether it is enabled or not.

- Use the Up and Down buttons to scroll through all 16 analog inputs, or transmitters.
- Use the Enter button to change a transmitter's status from Enabled to Disabled (depending on status displayed)



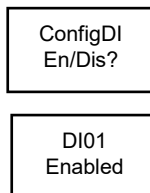
- When you are done configuring input statuses, press ESC to return to the main menu. Pressing ESC will not cancel the changes you made.

Configure Digital Input (ConfigDI)

The steps below show the "ConfigDI" menu progress for each main menu option.

ConfigDI En/Dis?: This option lets you configure whether a transmitter is enabled or not or simply to verify its status. The screen displays the transmitter number and whether it is enabled or not.

- Use the Up and Down buttons to scroll through all 8 contact inputs.
- Use the Enter button to change a contact input's status from Enabled to Disabled (depending on status displayed)



- When you are done configuring input statuses, press ESC to return to the main menu. Pressing ESC will not cancel the changes you made.

MODbus Addressing (ModbsID)

This option lets you set a different Modbus address than the factory set address.



The 301-ADI Modbus address must be set to 097 for it to be recognized by the 301-C and AA96D controllers.

When you first access the Modbus ID option, the screen displays the current address with the first character underlined.

- Use the UP or DOWN buttons to increase or decrease the character value.
- When the correct value is displayed, press ENTER.
- Continue until all characters are set as desired for the new Modbus address
- Press ESC to return to the previous menu.

ModbsID 097

Using the 301-ADI with the 420MDBS (Scale)

When used with the 301-ADI and the 420MDBS, the 301-C menu “Scale” option (within the Tx Info menu) allows users to scale their 4-20 mA signal to more practical reading values. This menu also allows the system to display values below 4mA (for non-standard devices that operate on a 0 - 20 mA range).

The Scale menu option is composed of two screens that let you set specific data for your scale conversion: Min, Max, (scaling) factor and

Units (of measurement):

←	1. Tx info 001	→
	-Scale(1)-	
→	Max 00250	
	Min 00000	

←	1. Tx info 001	→
	-Scale(2)-	
→	Factor 00001	
	Units ppm	

The basic Engineering Unit* conversion formula for standard 4-20 mA devices is:

$$\frac{(\text{Loop current} - 4 \text{ mA}) \times (\text{range max} - \text{range min})}{20 \text{ mA} - 4 \text{ mA}} \times (\text{specified factor}) + \frac{\text{range min}}{\text{specified factor}}$$

Here are two examples of the scale conversion formula:

Example 1:
$$\frac{(12 \text{ mA} - 4 \text{ mA}) \times (1000 \text{ ppm} - 0 \text{ ppm})}{(20 \text{ mA} - 4 \text{ mA}) \times 1} + \frac{0 \text{ ppm}}{1}$$

Example 1 result = 500 ppm

Example 2:
$$\frac{(12 \text{ mA} - 4 \text{ mA}) \times (+500 \text{ }^{\circ}\text{C} - -200 \text{ }^{\circ}\text{C})}{(20 \text{ mA} - 4 \text{ mA}) \times 10} + \frac{200 \text{ }^{\circ}\text{C}}{10}$$

Example 2 result = 15.0 °C

Note: In the example 2, the range is multiplied by a factor of 10, which allows you to obtain a range of +50.0°C to -20.0°C with a precision of one decimal point.

*Engineering units represent the following measurement types: %, ppm, °C, °F and RH.

There is also a basic Raw Unit* conversion formula for non-standard 0-20 mA devices:

$$\frac{(\text{Loop current}) \times (\text{range max} - \text{range min})}{(28 \text{ mA}^{**} - 0 \text{ mA}) \times (\text{specified factor})} + \frac{\text{range min}}{\text{specified factor}}$$

In this formula, there is no 4mA offset, which enable the controller to read devices that do not adhere to the 4-20 mA standard. *Note that, in this mode, no fault will be generated for signal readings below 3 mA (for 301-ADI) or below 1 mA (for 420MDBS).*

*Raw units represent the following measurement types: mA, mV, V and no units.

** The mA range for the 301-ADI is 28 mA to 0, however, the range for the 420MDBS is 25 mA - 0 mA.

Special notes for 301-ADI and for 301-C (firmware version 2):

301-C Event menu: Measurement units other than PPM for all 4-20 inputs (identified as AI) will be displayed as %, however the selected value will be correct and the even will function normally (as shown in the menu samples below).

←	3. Events	001	→	←	1. Tx info	097	→
	Tx097				-Scale(2)-		
	> 25.0%			→	Factor	00001	
					Units	mA	

It is not possible to program an event using a negative value with this version of the firmware.

420MDBS

Wiring Details

The 420MDBS replaces the standard four position sensor plug normally provided with all Manning 4-20mA output sensors. Since the plug is a stand-alone device, only two (2) wires are required to power the plug (see Figure 1), thereby powering the sensor as well.

The 420MDBS module is wired using the terminal block located at the bottom of the module (see Figure 1).

Important notes:

- The maximum number of modules on a single daisy chain twisted pair is 32.
- The last module on a chain must have an “End of Line” terminating jumper installed. See Diagram 1. There are two options for the EOL.

Option one is a purely resistive termination “R”. This is most common and should be used first.

Option two is a resistive/capacitive termination “RC”. Use this option only if system is installed in a noisy “high RF or nearby strong electric fields”. This option is a trial and error approach and should be attempted only when sporadic packet loss occurs in communication.

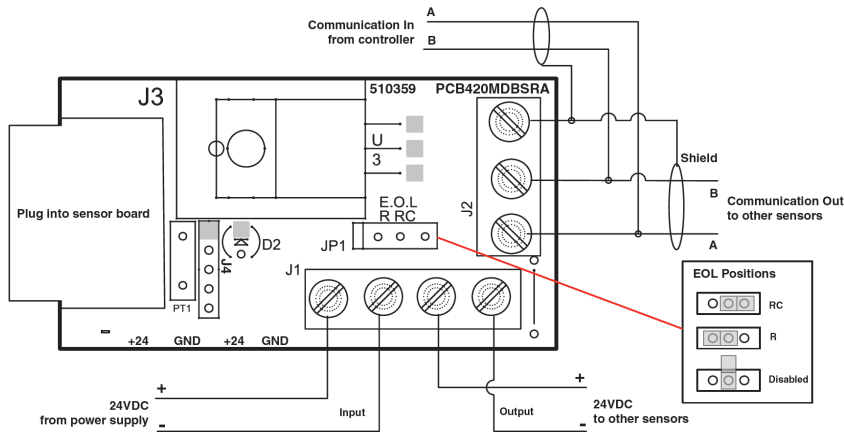


Figure 1. Manning 420MDBS Wiring Diagram



Figure 2. Modbus address labels

Optional Connector Wiring Diagram

The option of connecting the module to a sensor that doesn't have the Manning interface plug is shown in the next figure. Ensure the interface connector is securely fastened to the module and the screw terminals are tight against a bare copper conductor.

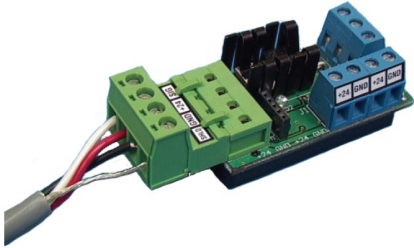


Figure 3. 420MDBS Optional Connector Wiring

Addressing

- Each module has a Modbus address pre-programmed from the factory. See Diagram 2.
- The 4-20mA output Modbus register is #14. It is coded as a 16-bit signed integer (PLC interface only).
- Divide the numeric value in register #14 by 100 to convert to mA (PLC interface only).
- The device responds to Modbus RTU protocol, 9600bps, 8-bit data, 2 stop bits. It supports Modbus function 0x03 "Read holding registers" for a length of 1 to 35 registers. It also supports Modbus function 0x10 "Write multiple registers" for a length of 1 register only.
- The procedure to change the Modbus address (using a Modbus master device such as a PLC or PC):
 1. Write register #6 (using function 0x10) with value 144 (0x90)
 2. Write register #1 with the desired Modbus address (1-247)
 3. After this write operation, the 420MDBS will respond to its new Modbus address

Writing values other than those described above or writing to any other registers, may lead to unexpected behavior.

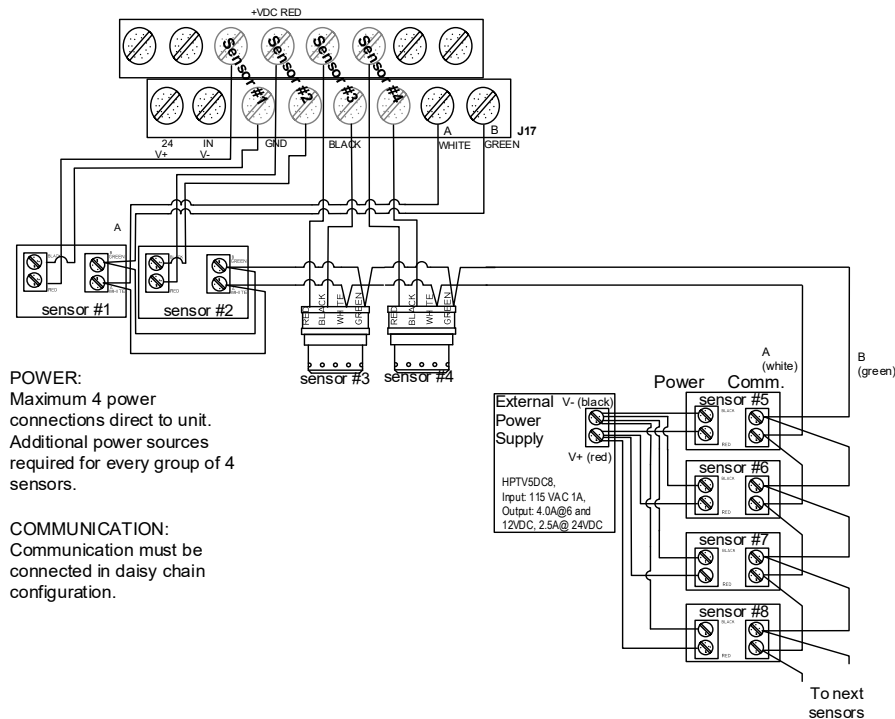
Faults and Alarms

- Sensor faults are identified as a 0.5mA reading on Modbus register #14 (PLC interface only).
- For PLC applications, the alarm levels are programmed within the PLC.
- For 96D controller applications, the alarm levels, ppm levels, fault status, gas type, sensor type etc. can be programmed at the factory in each module upon ordering. In this case Register #14 is no longer a 4-20mA output.

Connecting sensors to transmitter

Connect the sensor to the transmitter as shown in the diagram below. The maximum distance between sensor and power supply is 200 ft. (60 m) for refrigerant (S301-IRF) and 500 ft. (160 m) for toxic and combustible gases (S301-D2). Color coding (black, red, green, white) must be respected.

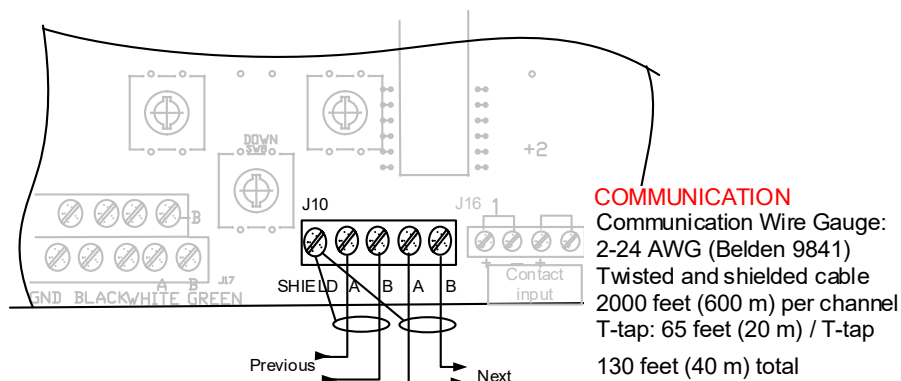
The first four sensors can be connected directly to the 301EM. Additional sensors must have external power supplies (T300VA, 120/24Vac-300VA Transformer) for every group of 4 sensors and communication must be in daisy-chain connection



Note: Use 2-18 AWG wire gauge for toxic and explosives sensor power wiring. Use 14 AWG wire gauge for refrigerant sensor power wiring.

Communication to Controller

Terminal J10 is for communication connections from the 301EM to the 301C Controller. The cables must be grounded using the shield terminal. The network can be up to 2000 ft. (609 m) per channel. This diagram illustrates network communication wiring on terminal J10; wires come in from a previous device and go out to the next device.



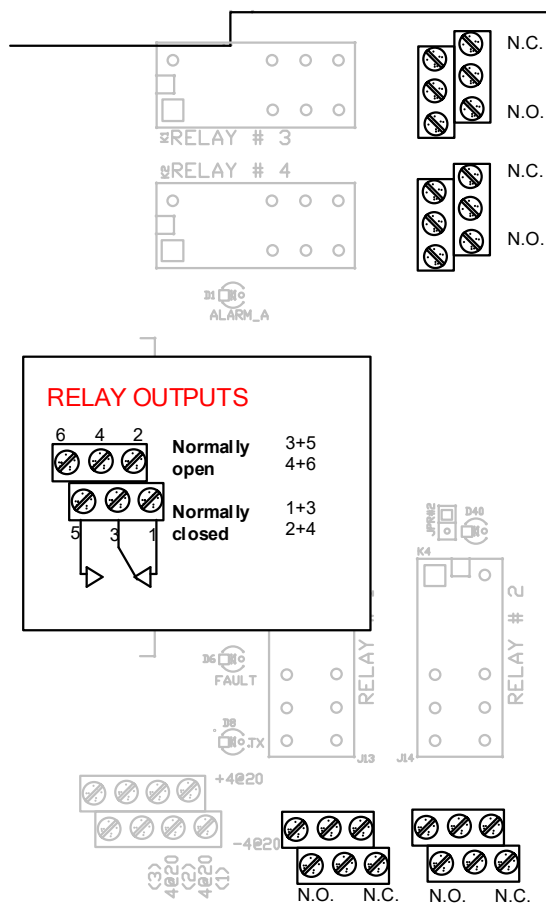
Relay Outputs

The relay outputs will withstand up to 5 amps at 30 Vdc or 250 Vac (resistive load only). They can be used to activate horns, strobes, etc. Refer to the drawing for proper wiring.

Failsafe Relay Outputs

When power is applied to the 301EM, these relays are also powered up. The devices connected to these outputs will be triggered when power is cut, which allows detection of power failures or interruptions.

The 301EM is factory configured in Normal mode, which means that the relay outputs are not in failsafe mode.



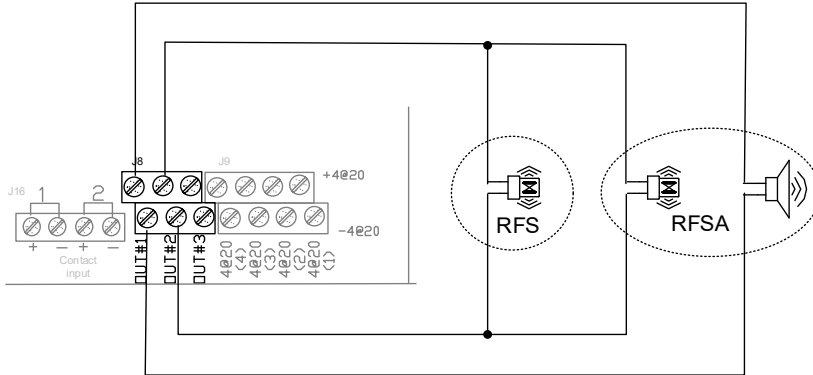
See the APPENDIX section for more details about B-52 and ASHRAE 15 standard configurations.



Risk of electrical shock - disconnect all power (input and relay) before servicing.

24 Vdc Output

The three 24 Vdc / 250 mA outputs are provided to activate DC horn, strobe, etc.



Note: Terminal connectors labeled OUT #1 and OUT #2 must be dedicated to RFSA use only, if applicable. Terminal connector labeled OUT #3 must be used for RFS only, if applicable.

RFS: Optional built-in strobe

RFSA: Optional built-in strobe and horn

4-20 mA Configuration

Output 4-20 mA, J9

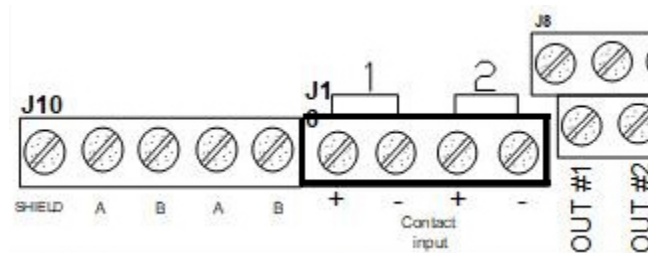
The 4-20 mA output option will provide a real time analog readout of the gas concentration read by the 301EM for each of its sensors. It can be connected to a third-party controller, DDC, BMS, etc.



Polarity must be observed.

Do not apply electrical power to the 301EM until all connections are made. Significant damage can result from incorrect wiring.

Contact Input, J16



The contact input is mainly used to connect a manual break glass switch to comply with the mechanical code. It is also possible to connect a third break glass switch in series if needed.

The drawing illustrates the ASHRAE 15 configuration where:

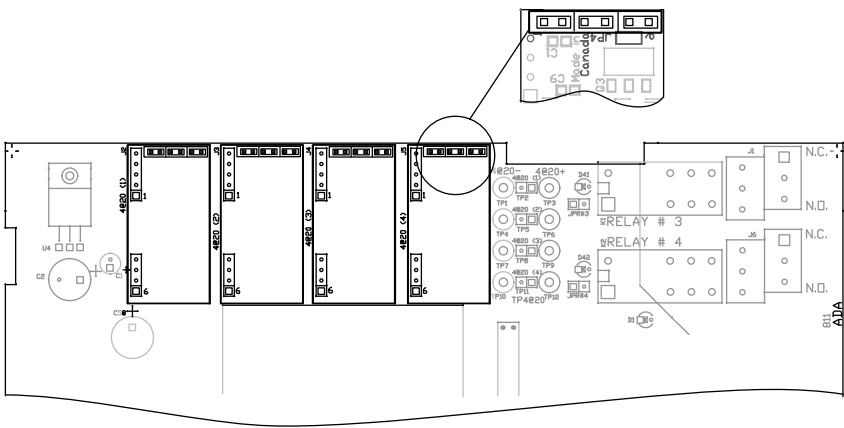
Contact 1 = Electrical shut down (ASHRAE 15 config.)

Contact 2 = Fan activation (ASHRAE 15 config.)

4-20 Output Configuration

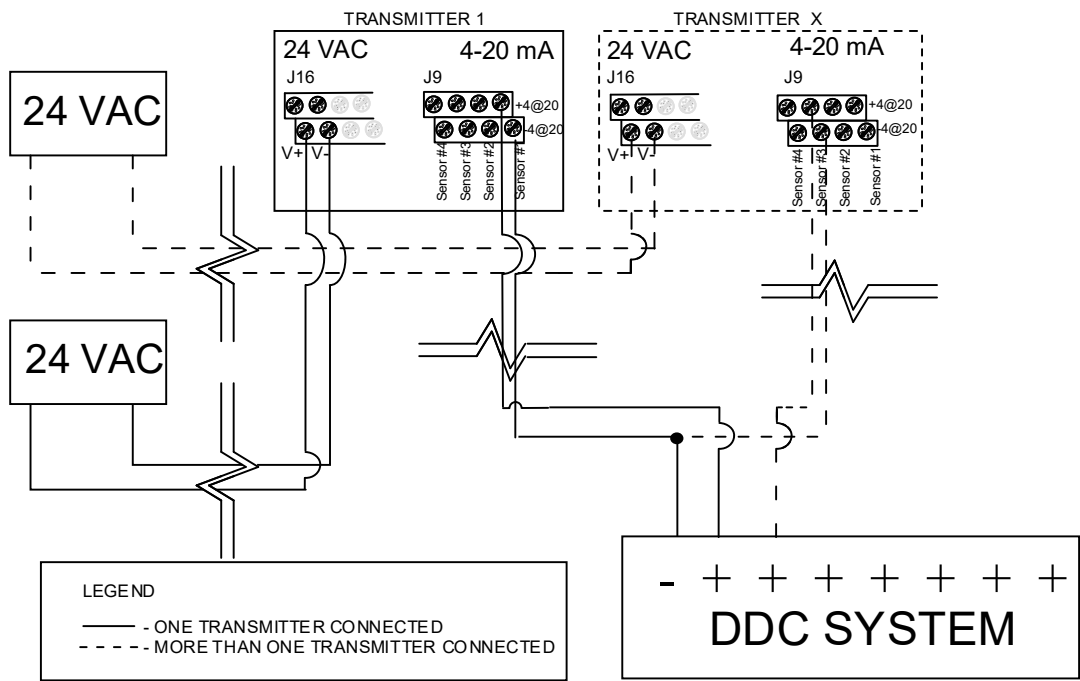
4-20 mA Current Sourcing Output Configuration

The transmitter supplies the loop current. The maximum impedance supported by the loop is 400 ohms. Set jumpers on JP4 at 1-2, 3-4 and 5-6.



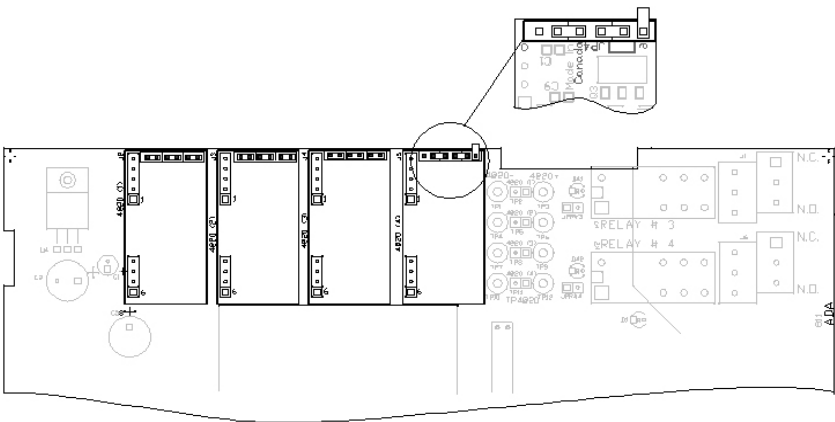
A dedicated power supply must be used with each 301EM. Considerable damage may occur if this condition is not strictly followed.

Current Sourcing Output Configuration



Output Loop-Powered Operation (Factory Setting)

The 4-20 mA output is factory set for loop-powered operation and requires a power source of 12 Vdc to 30 Vdc. The overall impedance depends on the voltage supplied at the 4-20 mA loop. Set jumpers on JP4 at 2-3, 4-5 and 6 for this type of configuration.



Permitted Impedance in the 4-20 mA Loop

Voltage Source Applied	Total Impedance
12 Vdc	400 Ohms
16 Vdc	600 Ohms
20 Vdc	800 Ohms
24 Vdc	1000 Ohms
30 Vdc	1300 Ohms

Programming and Calibration

User Interface

When power is initially applied, the unit's LCD screen will display the product's name and firmware version.

Operating Mode

- Normal Mode

When the 301EM is in Normal mode, no user intervention is required. The display will scroll to display (gas and concentration) readings from up to 20 sensors. The Tx LED will blink when there is a transmission on the communication channel (if the unit is connected to a controller)
- Alarm Mode

Red LEDs light per the alarm level detected (Alarm A, B or C). If the unit is equipped with a horn or strobe, these will also be activated with the corresponding alarm.
- Fault Mode

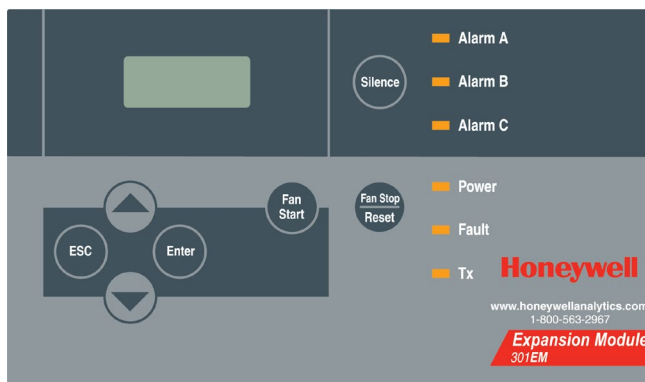
If a sensor has communication problems, the yellow Fault LED lights. This LED will also light when the service alarm is activated.
- Programming Mode

The programming mode is password protected.
- Mode

Only qualified technicians should access this mode. The enter key provides access to programming and confirms an entry, while the arrow keys allow technicians to increase or decrease values and scroll throughout the menus.

Button Definitions

The 301EM has “pushbuttons” that serve as an interface to the unit’s programming functions. Below is a description for each button’s function:



Key	Description
	Used to exit the menus or cancel an input. Used to stop the alternating reading between the connected sensors.
	Used to scroll through the sensor data displays or through menus or to change a specific value.
	Serves as an “enter” key and is used to access a programming field or to confirm a specific value.
	Fan start switch (For B-52 or ASHRAE 15 programming). See the Events table
	Used to reset all outputs after system returns to normal operating mode (linked to the Reset function in the Events menu).
	Turns off the buzzer and horns

Programming the Unit

The 301EM is equipped with a programming menu that allows users to modify certain parameters and to calibrate the unit.

Menu Option	Description
Password	Provides password restricted access to programming menus
Set Adr.	Let's users select a specific address for the device
Mem SD	Inactive option: Reserved for technicians' use only
Sensor	Let's users add or remove a sensor
Set #RP	Let's users add up to ten 301EMRP units
Service	Let's users specify different Service alarm settings
SetEvent	Let's users configure specific events for some or all sensor types
SetRelay	Let's users specify whether a relay will be set to failsafe
Buzzer	Let's users activate or deactivate the silence button
Set Alr	Let's users set specific minimum and maximum alarm levels (for alarms A, B and C)
SetAnOut	Let's users adjust the 4-20 outputs
Set Zero	Let's users adjust the sensor zero
Set Span	Let's users calibrate each sensor
Quit	Let's users exit the programming menus

Accessing the Programming Menus

Access to the 301EM's programming is password protected for security reasons. The password is "VA".

- Press the enter key to access the programming menus. The PASSWORD screen is displayed

PASSWORD
AA

- The first letter is underlined. Press the up or down arrow to change the letter until V is displayed
- Press Enter to confirm. The next letter is underlined. Press the up or down arrow until A is displayed
- Press Enter to confirm the password and access the menus

Setting the Unit's Address for Communications with 301C Controller

The 301EM is shipped with the default address set to 1. If you are using the unit in a network, this menu lets you select a specific address, per your network configuration.

- Access the menu and use the arrows to scroll to the Set Adr. menu and press enter to select.

Menu
Set Adr.

- The Set Adr. menu is displayed. Use the arrows to change the address and press enter when the desired address (Modbus addresses M001 to M254 and Vulbus addresses V01 to V30) is displayed.

Set ADDR
M001 V01

- The screen returns to the main menu



Make certain that no two devices share an address as this may result in network conflicts

Configuring a Sensor

Note: All sensors are shipped from the factory as address 1 (SD1). To change or add new sensors it may be required to disconnect the communications to the existing sensors address to avoid a duplication of addresses may exist and will cause communications issues.

The Sensor menu option allows users to add a new sensor, to scan for new sensors or to remove a sensor. Access the menu and use the arrows to scroll to the **Sensor** menu and press enter to select.

Menu
Sensor

There are now 4 possible actions available: NewSens?, Chg Adr., Scan SD, Disable. Use the arrows to scroll up or down through these options and press enter to select.

Note: The NewSens? menu is reserved for and should only be used by qualified technicians.

Changer the Sensor Address

This menu lets users change the sensor's address (position) in the 301EM. Pay special attention when changing a sensor's address that you do not change to an address that is already in use as this will replace the existing sensor.

- Scroll to the **Chg Adr.** menu and press enter to select.
- The screen displays the sensor gas type, sensor # and its address. Use the arrows to scroll through the sensors until the desired sensor is displayed.
- Press enter to select the sensor. The screen displays the sensor gas type and its address. Use the arrows to scroll to the address desired (between 1 and 20) and press enter to confirm.

Sensor
Chg Adr.

NO2 #1
SD #1

NO2 #1
For #2 ?

The sensor's address has been changed.

Adding a new Sensor

This menu lets users add new sensors (to expand the network or to replace an expired sensor).



When adding new sensors, it is important to add one sensor at a time to ensure proper address assignment.

All sensors are shipped from the factory as address 1 (SD1). To change or add new sensors it may be required to disconnect the communications to the existing sensors address to avoid a duplication of addresses may exist and will cause communications issues.

- Scroll to the **Scan SD** menu option and press enter to select.

Sensor
Scan SD

The device searches for any new sensor and assigns the new sensor the first available address. The screen displays a wait message while the device searches for the sensor.

Scan sd
Sd3 164

When the device has found the sensor, it displays the sensor device address (its position in the 301EM) and its firmware version.

Removing a Sensor

This menu lets users remove a sensor from the 301EM.

- Scroll to the **Disable?** menu option and press enter to select.

Sensor
Disable?

Adding Remote Panels

The **Set #RP** menu lets users add up to 10 remote panels (301EMRP) to the 301EM's network.

- Scroll to the **Set #RP** menu option and press enter to select.

Menu
Set #RP

- In the **Set #RP** screen, use the arrows to scroll the desired number (since you can add up to ten remote panels you can select a number between 1 and 10) and press enter to select.

Set #RP
0 EMRP

Once entered the 301EM's network, the remote panels will display or announce the status of the 301EM's sensors.

Using the Service Menu

The **Service** menu allows users to configure several service related options, such as when and how to activate service alarms. Service alarms are used to signal when a sensor needs to be replaced or calibrated.

Menu
Service

This menu contains two options: **Set Act** and **Set Time**.

Service
Set Act

The **Set Act** menu lets users select the action that will be taken. Available options are: Fault, OFF or Visual

Fault: A service alarm will be activated whenever there is a fault status

OFF: No service alarm will be triggered at any time (factory default setting)

Visual: Only a visual service alarm will be activated

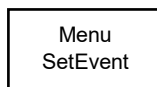
The **Set Time** menu lets users configure a specific deadline at which a service alarm will be activated.

Use the arrows to scroll between 12 to 24 months to trigger a service alarm after the specified number of months in service. Select the Reset option to turn off the Service alarm for a period of 100 days (after the alarm was triggered).

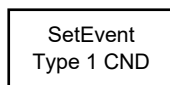
Using the SetEvent Menu

Although the 301EM is fully configured with specific event configurations (see the tables in Appendix A for details on available configurations), it is nonetheless possible to modify events to suit different applications.

- Scroll to the **SetEvent** menu and press enter to select.



If this is the initial setup and no previous events have been configured, you must select the event configuration (Type) from the menu (see the tables in Appendix A for details).



- Use the arrows to scroll through the options and press enter to select. The available options (described in greater detail in Appendix A) are: Type1 CND, Type2 CND, Type3 US, Type # 4 and OTHER.



Danger: Selecting the “OTHER” event type creates an event with all fields and events blank. Therefore, no events will appear when pressing the arrows. Events must be created before they appear in the scroll list.



Caution: To comply with ASHRAE 15 and CSA B52 standards, Type 1, 2 or 3 must be used.



Once the configuration type has been selected, it can no longer be changed without erasing **ALL** events and reconfiguring the system anew. Consult the tables in Appendix A to make certain that the appropriate event configuration is selected.

Changing Event Configurations

The various event menus allow users to modify standard configurations or to create completely customized event configurations, based on their needs. Each event menu provides a set of four options, which also contain a subset of options, as described below.

The first screen that appears is the main event screen. Press enter to select the event displayed or use the arrows to scroll through the event numbers to select a specific event.

Type 1 CND
Event# 1

The first event screen lets users specify which sensors will be linked to the event. The screen displays SD All (the default value). Press enter to enable the field and use the arrows to scroll through the available options. When the desired option is displayed, press enter to select.

Event# 1
SD All

SD All: Applies the event action to all sensors

SD #1: (through SD #4) Applies the event action to only the selected sensor

ManSW#1: (through ManSW#2) Applies the event action to the selected switch

SD #---: Displays the EraseALL screen. When “Yes?” is selected from the Event #1 menu, all configuration data for events will be erased.

EraseALL
No?

Note that when “SD #---” is selected at any other event number, the EraseALL screen does not appear and only the data for the active event number will be erased (and events will change numbers, moving up one).

When you have selected the option, and pressed enter, the field is disabled and you can proceed to the next screen. Use the arrows to move ahead one screen.

The second event screen lets users specify what will trigger an event. The screen displays **ALRA** (the default value).

Event# 1
= ALRA

- Press enter to enable the field and use the arrows to scroll through the options:

= ALRA: (through ALRC) Links the event to Alarm A, B or C

= Fault: Links the event to a fault condition

= ALL: Links the event to all conditions (alarm and fault)

= ---: Displays the EraseALL screen. When “Yes?” is selected from the Event #1 menu, all configuration data for events will be erased.

Note that when “---” is selected at any other event number, the EraseALL screen does not appear and the data for the active event number will be erased (and events will change numbers, moving up one).

EraseALL
No?



If ManSW#1(or #2) was selected at the previous step this screen will only have 2 options: Open or Closed.

Set to Open if the output is set to Normally Closed, or to Closed if the output is set Normally Open.

When you have selected the option, and pressed enter, the field is disabled and you can proceed to the next screen. Use the arrows to move ahead one screen.

The third event screen lets users specify the actions linked to the event. The screen displays **REL #1** (the default value).

Event# 1
REL #1

- Press enter to enable the field and use the arrows to scroll through the options:

REL #1: (through REL #4) Triggers the devices connected to the selected relay

OUT #1: (through OUT #3) Triggers the devices connected to the selected Output

BUZZER: Triggers the audible alarm for this event

---: Displays the EraseALL screen. When “Yes?” is selected from the Event #1 menu, all configuration data for events will be erased.

Note that when “---” is selected at any other event number, the EraseALL screen does not appear and the data for the active event number will be erased (and events will change numbers, moving up one).

EraseALL
No?

When you have selected the option, and pressed enter, the field is disabled and you can proceed to the next screen. Use the arrows to move ahead one screen.

The final screen, **RESET**, lets users specify that an event will remain active, even after it has returned to normal.

Event# 1
RESET N?

- Press enter to enable the field and use the arrows to scroll to Y?.
- Press enter once again to activate the Reset function.

Note: The Reset key on the front panel lets you deactivate the event

Using the SetRelay Menu

The **SetRelay** menu lets users specify whether the relay for the event will be in failsafe mode and whether the Silence button on the user interface (front of housing) will be enabled for this event.

Menu
SetRelay

Press enter to select the menu and use the arrows to scroll through the options:

FAILSAFE? Puts the relay in Failsafe mode (the default setting is no failsafe).

Silence Enables the Silence button function of the user interface for this event.

When you have selected the option, and pressed enter, the field is disabled and you can proceed to the next screen. Use the arrows to move to the next menu.

Deactivating the Buzzer

The 301EM is shipped with the buzzer function activated by default. This menu lets you activate or deactivate the Silence button on the keypad and to silence or activate the key beep function.

- Access the menu and use the arrows to scroll to the **Buzzer** menu and press enter to select. The display moves to the next screen.

Menu
Buzzer

- The **Silence** screen displays Yes?, press enter to select (or scroll to No? to disable the Silence button). The keypad Silence button is enabled; when the buzzer sounds, pressing the silence button will turn the buzzer off.

Silence
Yes?

- The next screen, **Key Beep**, allows you to activate a sound for any key activation. Use the arrows to display either Yes or No and press enter to confirm.

Keep Beep
No?

- The screen returns to the main menu

Configuring the Unit's Alarms

Although the 301EM is shipped with the default alarm settings, this menu allows you to set specific minimum and maximum levels for alarms A, B and C.

- Access the menu and use the arrows to scroll to the **Set Alr.** menu and press enter to select

Menu
Set Alr

- The menu displays the first sensor's information screen. Use the up or down arrows to scroll between sensors and press enter when the desired sensor is displayed.

HS2 #1
SD #1

- The next six screens let you modify both the minimum and maximum alarm setting for all alarm levels (A, B, C). Use the arrows to scroll and press enter to select the desired alarm.

HS2 #1
Min AlrA

- In the selected alarm screen, use the arrows to increase or decrease the value and press enter to confirm the desired value.

Min AlrA
9.0 PPM

- The screen returns to the first sensor menu

Repeat these steps for each alarm level to modify.

Setting the Unit's Analog Outputs

This menu lets you adjust each of the four analog outputs, minimum and maximum (e.g. the 4 and the 20).



Note that this menu does not display how the output is being adjusted. The Output must be connected (to an ammeter or to the DDC) for readings to be viewed.

- Access the menu and use the arrows to scroll to the **SetAnOut**. menu and press enter to select.

Menu
SetAnOut

- The **SetAnOut** menu is displayed. In this menu, you can scroll to select the output (from Min 1 to Min 4 and Max 1 to Max 4) and press enter to select.

AdjAnOut
Set Min 1

- The **AdjAnOut** screen appears. Press on the up arrow to increase the analog output value or the down arrow to decrease (the 301EM's screen does not change or display any changes; the value will only be visible on the connected meter).

4.

Set Min 1
AdjAnOut

- When the desired output value is reached, press enter to confirm. The screen displays *WAIT* while the unit is reinitialized.

Set Min 1
WAIT

- The screen returns to the main menu.

Repeat these steps for each output to adjust.

Calibrating the Unit

Honeywell provides its customers with specialized gas detection equipment. Beyond the warranty period, the systems must be maintained and calibrated on a regular basis with at minimum a 6-month Bump Test and Annual calibration.

If unit span or zero cannot be adjusted, the sensor may be approaching its end-of-life and must be replaced. Keep an operation log of all maintenance, calibrations and alarm events.

The unit requires warm-up time before being put into service and calibrated. The warm-up time required depends on the type of sensor, however a standard minimum of fifteen (15) minutes is recommended.

Connecting the Hardware

1. Plug the calibration adaptor onto the gas sensor inlet.
2. Screw the regulator to the appropriate calibration gas cylinder (for either span or zero adjustment) and set the flow rate to 0.1LPM for the S301-IRF or 0.5LPM for the S301-D2.
3. Connect the tubing to the regulator outlet and to the calibration adaptor or to calibration port.

Adjusting the Zero (If Required)

When the unit displays 0 %/ppm in an area with no presence of the target gas, proceed to “Calibrating the Sensor” on the following page.

To adjust the zero, inject zero gas (nitrogen) at the specified flow rate. The gas must be allowed to flow into the unit for a minimum of 2.5 minutes before beginning and then throughout the adjustment.

1. Press enter to access the programming menu. Since the menus are password protected you must first enter the password in the PASSWORD screen
2. Use the up or down button to change each letter until VA is displayed. Press enter after each letter to confirm and to access the menus.

PASSWORD
AA

3. Use the up or down arrow to scroll to the Set Zero menu screen and press enter to select.

Menu
Set Zero

4. Use the up or down arrow to select the sensor to be calibrated and press enter to select.

H2S #1
SD #1

5. Press enter again when the screen displays GoCalib to start the zero adjustment

H2S #1
GoCalib?

6. The Wait screen is displayed throughout the adjustment and the menu returns to the main menu screen when the adjustment is complete.
7. Use the up or down arrow to scroll to the Quit menu and press enter to exit the programming menus.

Menu
Quit

301-EM LED Function

The 301EM sensor LED has 2 functions. If the sensor is working properly, the LED will blink per the sensor addresses on the 301EM. In that case, the LED will blink as shown:

Address 1 = The LED blinks 2 times during 2,8 seconds

Address 2 = The LED blinks 3 times during 2,8 seconds

Address 3 = The LED blinks 4 times during 2,8 seconds

Address 4 = The LED blinks 5 times during 2,8 seconds

Addresses 5 to 20 = The LED blinks once during 2,8 seconds

If the sensor is connected to a 301IRF, the LED will be on during 0,2 seconds and off during 2,6 seconds (blinking). If the sensor has a problem (failsense), the LED will remain on.

Replacement LED Parts for RFS or RFSA Option

LED replacement instructions for RFS or RFSA option:

- Turn the cap until the diamond shape aligns with the triangle outline shape
- Pull off the cap
- Use the insertion tool to remove the LED;
- Use the insertion tool to put in the new LED;
- Put the cap back on (press down firmly)
- Turn the cap until the diamond is aligned with the white triangle shape.

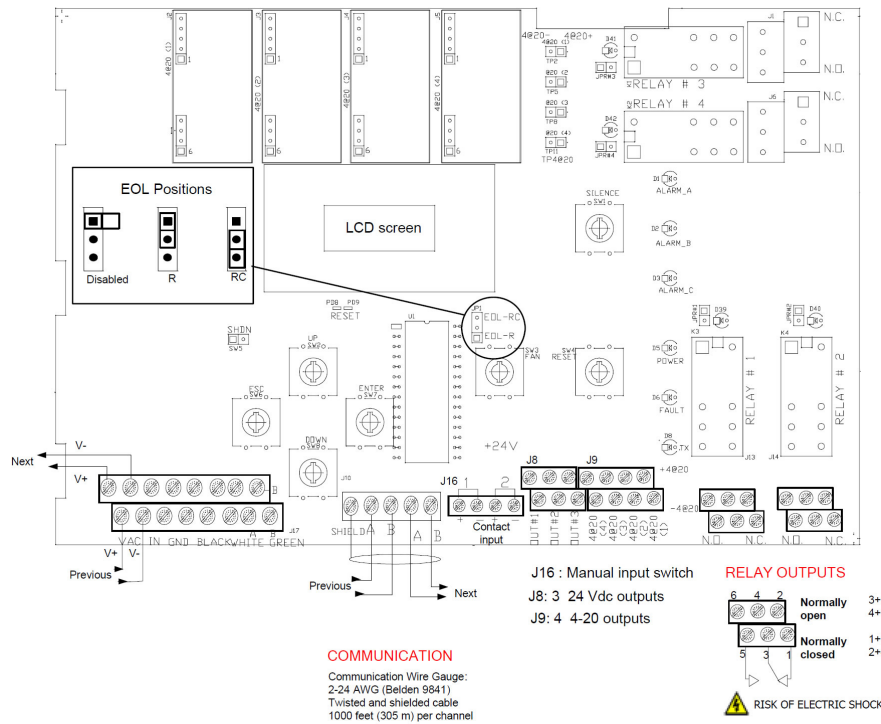
Due to the continuous evolution of our products, please contact our service department for ordering parts or for more details.

Technical Support Line: 1-800-563-2967

301-EMRP

Wiring Details

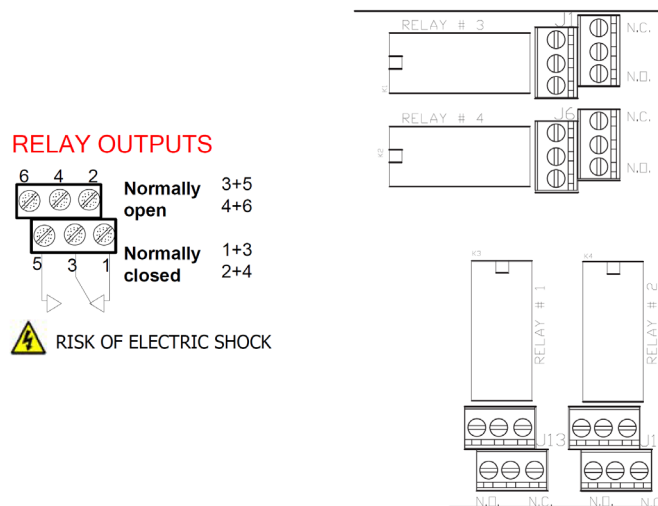
The image below is the 301-EMRP PCB. Pass the wires the knock-outs provided at the bottom of the unit.



Relay Outputs

The relays outputs will withstand up to 5 amps at 30 Vdc or 250 Vac (resistive load only). They can be used to activate horns, strobes, etc. Refer to drawing below for proper wiring.

See APPENDIX section in the 301EM User's Manual for more details about B-52 and ASHRAE standard configuration.



Risk of electrical shock - disconnect all power (input and relay) before servicing.

Calibration/Programming

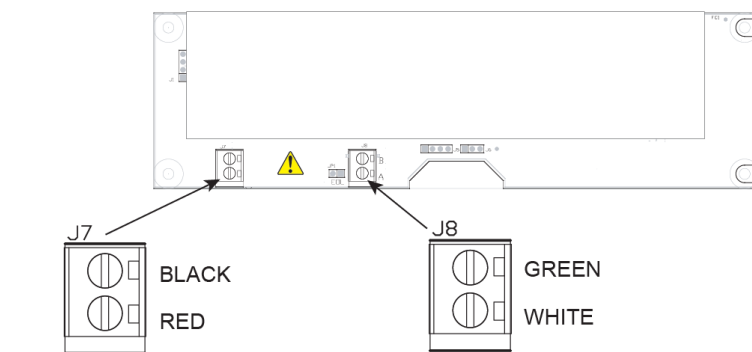
User interface

When power is initially applied, the unit's LCD screen will display the product's name and firmware revision.

Programming

The unit performs the programmed actions depending on what accessories are connected to the unit. The 301EMRP addresses must be programmed on each unit to enable them to receive information from the 301EM. Once the addresses are programmed, the 301EM will detect the remote panels through network scans.

Wiring Details



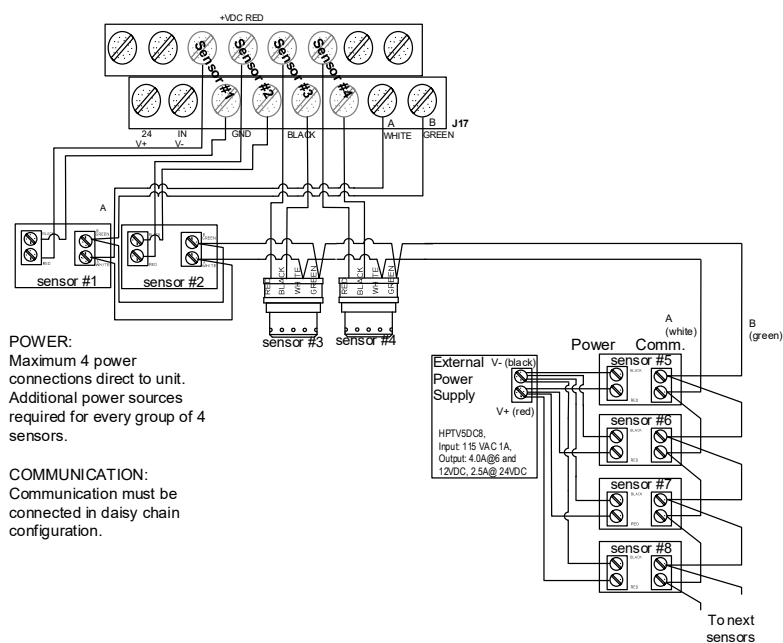
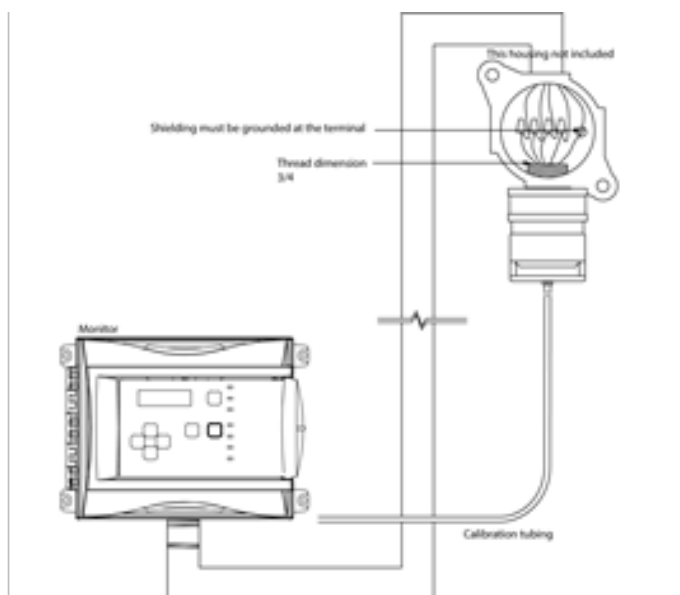
S301-D2

Wiring Details

The drawing below illustrates the connection for a S301-D2 sensor with the D2RS-PC option.

Communication: Use 2-24 AWG, twisted and shielded cable (Belden 9841 or equivalent)

Power: Use 2-18 AWG cable, maximum length of 160 m (500 ft.).

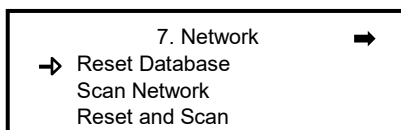


Network Scan Menu 301-C AND AA96D

The Modbus network menu allows network device information to be either scanned or reset.

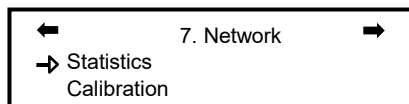
This menu offers four options, divided into two screens; the first screen contains three options:

Option	Description
Reset Database	Resets all network device Tx information in the database. This only resets the Tx information for the network device. It does not affect programmed Groups or Events.
Network Scan	Begins an auto-detect of all network devices that allows the system to configure the Tx database for network devices (i.e. it will scan and add new devices but will not overwrite or erase the old database). This process takes approximately one minute.
Reset and Scan	Performs both previous functions simultaneously.



Once one of these options has been set, wait until the controller completes the process. Do not interrupt or stop the process once it has begun.

The second Network screen offers the Statistics and Calibration options.



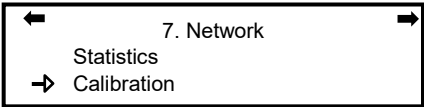
Selecting Statistics from the Network menu displays a screen containing the statistics for the selected device address.

Statics		
	001	
Valid	16	100%
Errors	0	0%
Timeouts	0	0%

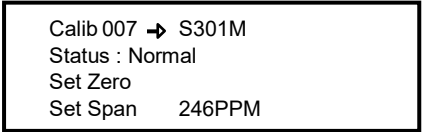
Term	Description
Valid	Indicates the number of valid responses for the last 16 requests
Errors	Indicates the number of errors in the response for the last 16 requests
Timeouts	Indicates the number of timeouts (no response) for the last 16 requests

Remote Calibration

The network menu also offers a Calibration option for use with devices that support network calibration.

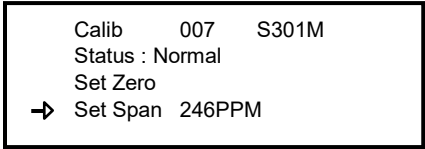


The Calibration screen contains four lines of information:



Term	Description
Line 1	Indicates the mode (Calib, meaning calibration), the (Modbus) address of the device to calibrate (001) and the type of device to calibrate (S301-D2
Line 2	Indicates the status (Normal or In calib...) of the specified device
Line 3	Displays the function to perform (Set Zero)
Line 4	Displays the function to perform (Set Span) and the span gas concentration value (246 ppm)

1. On the first line, scroll to the device address and press Enter
2. Scroll through the devices to display the desired device* and press Enter to select.
3. The second line displays the device's status
4. Scroll to select the desired function, Set Zero to set the device's zero, and press Enter to select.
5. Upon pressing Set Zero, the controller requests confirmation.



**The device must be configured in the controller's database to be included in the device addresses displayed on screen.*

6. Press Enter to confirm or Esc to cancel. If confirmed, the controller calibrates the sensor's Zero. This takes only a few moments and the display returns to the default calibration screen.



Never calibrate any unit's Zero with ambient air. Always use Nitrogen (N₂) at the calibration port to calibrate the Zero

7. To calibrate the device, scroll to Set Span** and change the span gas calibration value using this procedure;

Calib	001 : S301-D2
Status :	Normal
Set Zero	
Set Span	→ 2.60ppm

- Using the right arrow, move the cursor to xxx PPM (span value field). Press Enter to select the field (it is editable when flashing).
- Use the up or down arrows to increase or decrease the value, press Enter to validate the new value.
- Move the cursor back to Set Span and press Enter to start the calibration.

Calib 001 :	S301-D2
Status :	In calib...
Set Zero	
Set Span	→ 2.60ppm

The device Span is being calibrated. The screen will display the device's status as "In calib..." until the calibration is complete.

***When selecting Set Span, make sure that the device has been supplied with the appropriate calibration gas before and during the calibration process.*

Tests Menu 301-C and AA96D

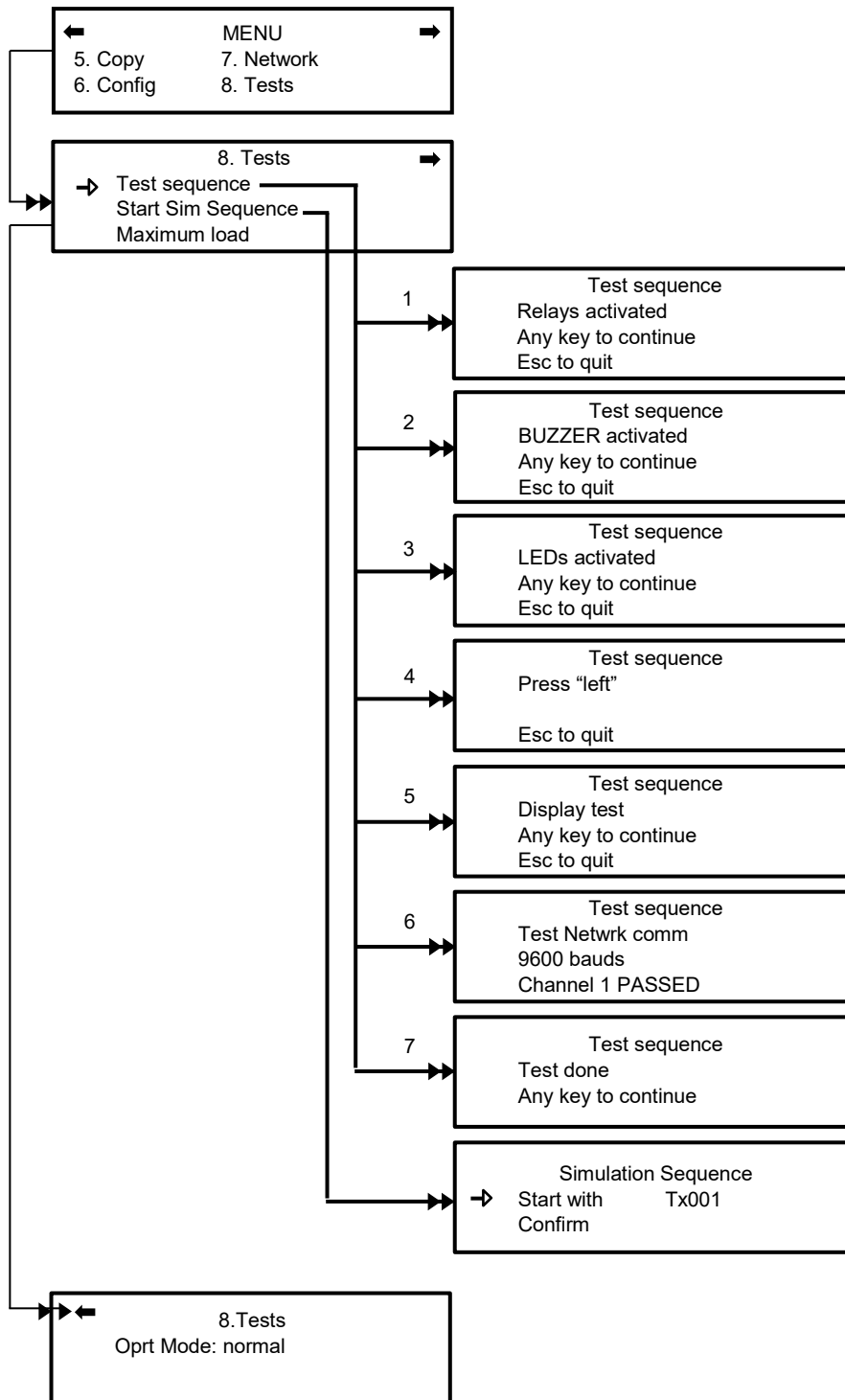
A test of the system using the steps in this section should be conducted initially as well as every time there is any change to the system. However, system Validation Test or Commissioning of the gas detection system is not complete until it is tested to verify it functions per its design objectives or specifications.



After all the devices in a system have been installed, verify that each device has a unique communication address. If needed, change the communication address for each device before scanning the network.

Validation includes but is not limited to:

- Verification tests of the functions of each component in the individual system architecture.
- Verification that all inputs to the system result in the correct outputs.
- Verification that, where required, a back-up power supply system is in place.
- Verification that all personnel who will be working with and/or affected by the system have received proper instruction on use and purpose.
- The Tests menu allows a variety of tests to be performed on components and on the network communications. It also allows the system to be operated in four different modes which, in turn, provide different functionalities.



Option	Description
Test sequence	Enables each output to be activated and validates operation of each controller keypad buttons, display pixels, and various communication protocols. Selecting this option starts the Simulation mode. While in simulation mode, events are not logged because this mode deactivates network communication Information Updates. It can be combined with any of the three previous modes (example: using the Simulation mode when in Debug mode allows the user to test the entire system [groups, events, etc.] without triggering any actions or using any additional material such as gases). It allows gas concentrations to be simulated over an associated scale for each transmitter, sequentially:
Start Sim Sequence	Alarm levels A, B and C are evaluated per the simulated gas concentration and events are evaluated and actions are taken. This type of alarm simulation at the controller does not work with certain transmitters with falling alarms. In these cases, an alarm can be simulated at the transmitter. The Start Sim Sequence will not function for 420I outputs that use a Virtual Address, and the transmitter(s) within a Virtual Group will need to be tested with actual gas for the output in the 420I to function properly. While in simulation mode, the controller is unaware of the device's actual network status. This mode can be stopped at any time in the Test menu (see Normal System Operation). If one of these modes has been activated, the system will automatically return to Normal Mode after 12 hours of inactivity. (No changes will be lost.)
Maximum load	Activates all controller components.
Normal	Normal controller operation mode. This is the system's normal (default) operation mode. When the system is in normal mode, some values can be changed without interrupting services. When a value has been changed in any of the menu fields, the change will take effect upon returning to the main menu screen.

Setting	Description
Single Tx	Activates the polling mode on a single transmitter. This mode allows transmitters to be analyzed one at a time. The controller polls only the selected device, which subsequently has its information updated. This mode does not interfere with Event Evaluation functions.
Debug	Activates the service mode to perform a calibration and to test Events without triggering actions. This mode allows complete system operation to be evaluated and tested without affecting operations (outside of debug mode). <i>Events are evaluated and displayed as necessary but no action is triggered.</i>

Test Sequence

When test sequence is selected from the main Tests menu, the controller will display the Test sequence screen.

Test sequence
Relays activated
Any key to continue
Esc to quit

If Esc is pressed on the keypad, the main Tests menu screen will be displayed. However, to perform system tests, press any key to proceed to the first test screen.

Test sequence
Buzzer activated
Any key to continue
Esc to quit

This screen tests each component individually and will advance only to the next component when a key is pressed. This option will display 13 screens. Screens 1, 2, and 3 test Relays, BUZZER and LEDs.

The following six screens prompt the user to press the keypad buttons, in turn: left, right, up, down, Silence, Enter and Esc. The system will not advance until a key is pressed.

Test sequence
Press "left"

Esc to quit

The system then moves to the Display test. When the blank screen is displayed, it is testing for display pixels. Press any key to proceed to the next step.

Test sequence
Display test
Any key to continue
Esc to quit

The final test that the system performs is a network communication test:

Test sequence
Test Network comm
9600 bauds
Channel 1 PASSED

Once these tests have begun, do not interrupt or stop them.

When the system has completed the test, it displays the final Tests screen. Press any key to return to the main Tests menu.

Test sequence
Test done
Any key to continue

BACnet Menu 301-C and AA96D

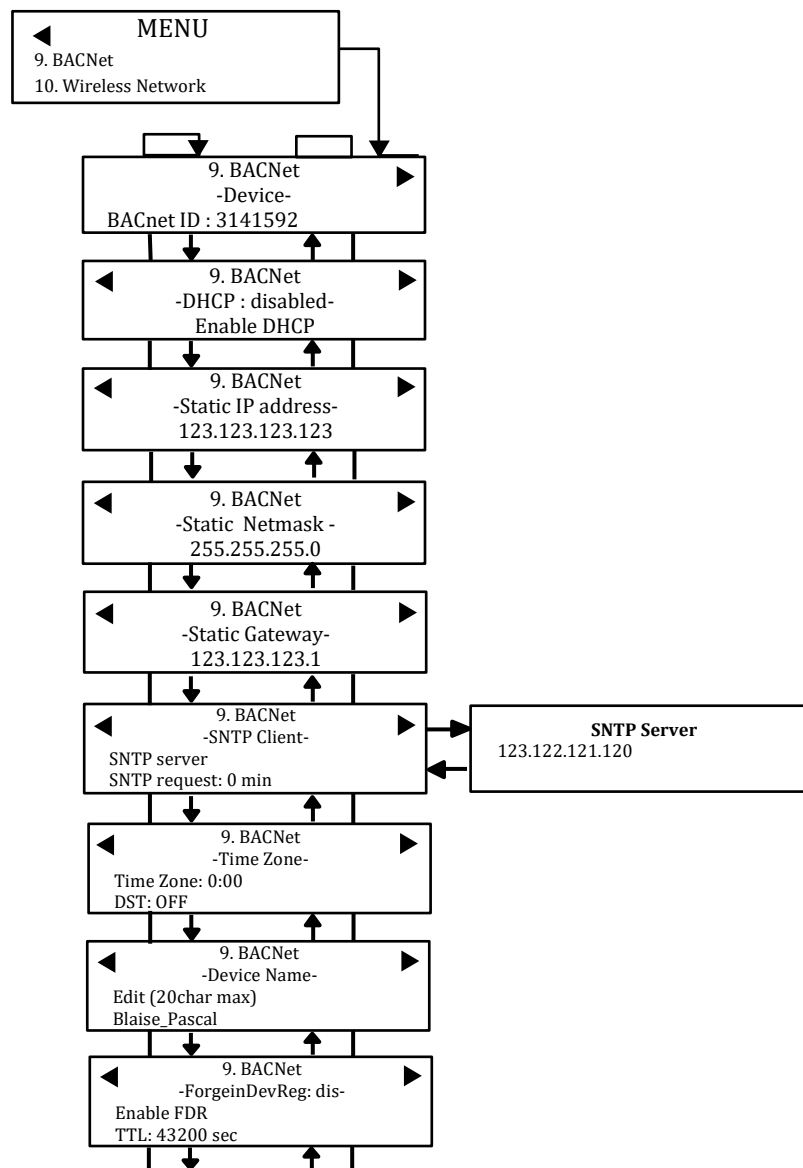
The BACNet menu on the following page offers several main menu screens to configure the BACNET IP connection, DHCP, server, time zone information and more. Communications parameter changes to the BACnet interface may not be implemented for up to 30 seconds after modification. These parameters include the device ID, the IP address, and the subnet mask.

BACnet/IP Module

(BIP option)

This section configures the optional BACnet interface (included with models with “BIP” in the part number).

The BACnet/IP interface has been listed by BACnet Testing Labs as complying with the BACnet protocol version S301 of the manufacturer.



```

  9. BACNet
  -BBMD Info-
  IP: 123.124.125.126
  Port: 0xBAC0
  
```

Programming

ID and address

The first of these screens allows the identification and address to be configured:

```

  9. BACNet
  -Device-
  BACnet ID : 1
  Static IP address
  
```

BACnet ID: (Building Automation and Control Networks) is the device ID number assigned to this controller on a network.

```

  9. BACNet
  -Static IP address-
  123.123.123.123
  
```

Static IP address: This is an address that is used when DHCP is disabled.

Changing BACnet values

- Use the keypad arrows to scroll down to select the desired line and press Enter to select it.
- Selecting BACnet ID activates the field. The ID value (0-4194303) can be increased or decreased using the up or down keypad arrows.

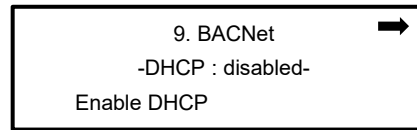
If the Static IP address option is selected, the following screen appears. All controllers are shipped with a pre-set IP address as shown in the example below.

```

  -IP address-
  192.168.1.254
  -Network mask-
  255.255.255.0
  
```


Dynamic Host Configuration

The next screen allows the device DHCP (Dynamic Host Configuration Protocol) to be enabled or disabled.

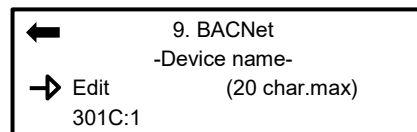


A screenshot of a terminal window showing the configuration menu for '9. BACNet'. The menu options are '-DHCP : disabled-' and 'Enable DHCP'. A right-pointing arrow is visible in the top right corner of the menu box.

- Press Enter to change the field value.

Naming

The Device Name screen allows a specific name to be assigned to the BACNet device.



A screenshot of a terminal window showing the configuration menu for '9. BACNet'. The menu options are '-Device name-' and 'Edit (20 char.max)'. The current value '301C:1' is displayed below the 'Edit' option. A left-pointing arrow is visible in the top left corner of the menu box.

For more information on this subject, please consult the ASHRAE standard number 135-2001, Annex J, section J5.

The BACnet port number is fixed at hexadecimal 0xBAC0 or decimal 47808. It will not function with other port numbers.

The following tables are also available on the Honeywell Analytics' Commercial Products CD that accompanied the 301-C controller and from the Honeywell Analytics technical library (www.honeywellanalytics.com > *Products > Commercial Solutions > 301-C > Technical Library*).

Objects

Device Object

Group	Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Device	Object_identifier	Unsigned	R	N	N	Set form LUI
	Object_type	Enumerated	R	C	N	Device (8)
	Vendor_identifier	Enumerated	R	C	N	Honeywell Inc. (17)
	Apdu_timeout	Unsigned	R	C	N	0
	Application_software_version	Character string	R	C	N	"1.1"
	Firmware_revision	Character string	R	C	N	"1.4.9"
	Max_apdu_length_accpeted	Unsigned	R	C	N	1476
	Model_name	Character string	R	C	N	"301C-BIP"
	Numer_of_apdu_retries	Unsigned	R	C	N	0
	Object)name	Character string	R	N	N	Default "VAC301C:1", settable from LUI
	Protocol_object_types_support	Bit string	R	C	N	Device, analog_input, and binary_input. If configured, analog_value object appear, bur is outside of BTL approval.
	Protocol_services_supported	Bit string	R	C	N	Read property, read property multiple, write property, who_has, who_is
	Protocol_version	Unsigned	R	C	N	1
	Segmentation_supported	Enumerated	R	C	N	No_segmentation (3)
	System_status	Enumerated	R	C	N	Operational (0)
	Vendor_names	Character string	R	C	N	Honeywell
	Protocol_revision	Unsigned	R	C	N	7
	Database_revision	Unsigned	R	C	N	Increments as objects added

Note:

- 1 - "R" indicates that this property is required by ASHRAE Standard 135
- "O" indicates that this property is optional by ASHRAE Standard 135
- 2 - "C" Indicates that this property is hard-coded as a constant
- "N" indicates that this property is stored in non-volatile memory
- "R" indicates that this property is computed constantly and stored in RAM

Base Objects

Group	Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Binary inputs	Rel 1 to rel 4	Object_identifier	R	C	N	46344 (or 0xB508) for Relay #1 up to 46347 (or 0xB50B) for Relay #4
		Object_type	R	C	N	Binary_input (3)
		Event_state	R	C	N	Normal (0)
		Object_name	R	N	N	"device_object_name.relX", where device_object_name is programmed on the LUI and defaults to "VAC301C:1" and X is relaynumber (1 to 4). Thus the default object_namefor Relay #4 will be "VAC301C:1. Rel4"
		Out_of_service	R	C	N	FALSE
		Polarity	R	C	N	Always normal (0)
		Present_value	R	R	N	True if and only if the relay is driven by an event. This bit is not inverted by "failsafe" (normally energized) mode.
		Reliability	O	C	N	No_fault_detected (0)
		Status_flags				
		In_alarm	R	C	N	Always "false" (0)
		Fault	R	C	N	Always "false" (0)
		Overridden	R	R	N	Always "false" (0)
		Out_of_service	R	R	N	Always "false" (0)
	buzz	Object_identifier	R	C	N	40360 (or 0xB518)
		Object_type	R	C	N	Binary_input (3)
		Event_state	R	C	N	Normal (0)
		Object_name	R	N	N	"device_object_name.buzz", where device_object_name is programmed on the LUI and defaults to "VAC301C:1". Thus the default object_namefor Relay #4 will be "VAC301C:1.buzz"
		Out_of_service	R	C	N	FALSE
		Polarity	R	C	N	Always normal (0)
		Present_value	R	R	N	True state of the buzzer
		Reliability	O	C	N	No_fault_detected (0)
		Status_flags				
		In_alarm	R	C	N	Always "false" (0)
		Fault	R	C	N	Always "false" (0)
		Overridden	R	R	N	Always "false" (0)
		Out_of_service	R	R	N	Always "false" (0)

IAQPoint2 Objects

Group		Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Binary inputs	Rel 1 to rel 4	Object_identifier		R	C	N	46344 (or 0xB508) for Relay #1 up to 46347 (or 0xB50B) for Relay #4
		Object_type	Enumerated	R	C	N	Binary_input (3)
		Event_state	Enumerated	R	C	N	Normal (0)
		Object_name	Character string	R	N	N	"device_object_name.relX", where device_object_name is programmed on the LUI and defaults to "VAC301C:1" and X is relaynumber (1 to 4). Thus the default object_namefor Relay #4 will be "VAC301C:1. Rel4"
		Out_of_service	Boolean	R	C	N	FALSE
		Polarity	Enumerated	R	C	N	Always normal (0)
		Present_value	Enumerated	R	R	N	True if and only if the relay is driven by an event. This bit is not inverted by "failsafe" (normally energized) mode.
		Reliability	Enumerated	O	C	N	No_fault_detected (0)
		Status_flags					
		In_alarm	Boolean	R	C	N	Always "false" (0)
		Fault	Boolean	R	C	N	Always "false" (0)
		Overridden	Boolean	R	R	N	Always "false" (0)
		Out_of_service	Boolean	R	R	N	Always "false" (0)
	buzz	Object_identifier		R	C	N	40360 (or 0xB518)
		Object_type	Enumerated	R	C	N	Binary_input (3)
		Event_state	Enumerated	R	C	N	Normal (0)
		Object_name	Character string	R	N	N	"device_object_name.buzz", where device_object_name is programmed on the LUI and defaults to "VAC301C:1". Thus the default object_namefor Relay #4 will be "VAC301C:1.buzz"
		Out_of_service	Boolean	R	C	N	FALSE
		Polarity	Enumerated	R	C	N	Always normal (0)
		Present_value	Enumerated	R	R	N	True state of the buzzer
		Reliability	Enumerated	O	C	N	No_fault_detected (0)
		Status_flags					
		In_alarm	Boolean	R	C	N	Always "false" (0)
		Fault	Boolean	R	C	N	Always "false" (0)
		Overridden	Boolean	R	R	N	Always "false" (0)
		Out_of_service	Boolean	R	R	N	Always "false" (0)

E³Point Objects

Group		Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog inputs	Gas	Object_identifier		R	C	N	Sensor number *256+1. Sensor number for temperatures is Modbus address+1. For example an E3Point at Modbus address 009 will appear as 2305 or 0x0901.
		Object_type	Enumerated	R	C	N	Analog_input (0)
		Event_state	Enumerated	R	R	N	If gas sensor fault (1), if alarm offnormal (2), else normal (0)
		Object_name	Character string	R	N	N	"E3POINT GGGG AdXXX.GGGG" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "CO" and "COMB"
		Out_of_service	Boolean	R	R	N	FALSE
		Present_value	Real	R	R	N	Gas reading
		Reliability	Enumerated	O	R	N	As appropriate reports no_fault_detected (0) or unreliable other (7) Fault is detected within 60 seconds
		Status_flags					
		In_alarm	Boolean	R	R	N	If not purchased or faulty "true" (1) else "false" (0)
		Fault	Boolean	R	C	N	If not purchased or faulty "true" (1) else "false" (0)
		Overriden	Boolean	R	R	N	"false" (0)
		Out_of_service	Boolean	R	R	N	"false" (0)
		Units	Enumerated	R	N	N	ppm (96) or % (98)
	Rel 1 (really buzzer)	Object_identifier		R	C	N	Sensor number *256+8. Sensor number for temperatures is Modbus address+1. For example an E3Point at Modbus address 009 will appear as 2312 or 0x0908.
		Object_type	Enumerated	R	C	N	Binary_input (3)
		Event_state	Enumerated	R	C	N	Normal (0)
		Object_name	Character string	R	N	N	"E3POINT GGGG AdXXX.rel1" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "CO" and "COMB"
		Out_of_service	Boolean	R	C	N	FALSE
		Polarity	Enumerated	R	C	N	Always normal (0)
		Present_value	Real	R	R	Y	True if and only if the buzzer is driven by an event
		Reliability	Enumerated	O	C	N	No_fault_detected (0)
		Status_flags					
		In_alarm	Boolean	R	C	N	Always "false" (0)
		Fault	Boolean	R	C	N	Always "false" (0)
		Overriden	Boolean	R	C	N	Always "false" (0)
		Out_of_service	Boolean	R	R	N	Always "false" (0)
		Units	Enumerated	R	R	N	Always "false" (0)

XXN and XCD Objects

Group		Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog inputs	Rel2 (physical relay)	Object_identifier		R	C	N	Modbus address *256+9. For example an E3Point at Modbus address 009 will appear as 2313 or 0x0909.
		Object_type	Enumerated	R	C	N	Binary_input (0)
		Event_state	Enumerated	R	C	N	Normal (0)
		Object_name	Character string	R	N	N	"E3POINT GGGG AdXXX.rel2" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "CO" and "COMB"
		Out_of_service	Boolean	R	C	N	FALSE
		Polarity	Enumerated	R	C	N	Always normal (0)
		Present_value	Real	R	R	Y	True if and only if the buzzer is driven by an event. This ir is nor inverted by "failsafe" (normally energized) mode
		Reliability	Enumerated	O	C	N	No_fault_deteted (0)
		Status_flags					
		In_alarm	Boolean	R	C	N	Always "false" (0)
		Fault	Boolean	R	C	N	Always "false" (0)
		Overriden	Boolean	R	C	N	Always "false" (0)
		Out_of_service	Boolean	R	C	N	Always "false" (0)
		Units	Enumerated	R	C	N	Always "false" (0)

301-EM Objects

Group	Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog input	Gas (one instance per sensor on the 301EM)	Object_identifier	R	C	N	TxNumber *256+1. The TxNumber is the Modbus address plus the sensor number in the 301EM. For example sensor 2 on a 301EM at Modbus address 030 will appear as 7937 or 0x1F01.
		Object_type	R	C	N	Analog_input (0)
		Event_state	R	R	N	Not meaningful
		Object_name	R	N	N	"VA301EM GGGG AdXXX.GGGG" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "R11" and "0x1F01"
		Out_of_service	R	R	N	FALSE
		Present_value	R	R	N	Gas reading
		Reliability	O	R	N	As appropriate reports no_fault_detected (0), NO_SNSOR (1), or unreliable other (7). Fault is detected within 60 seconds
		Status_flags				
		In_alarm	R	R	N	Not meaningful
		Fault	R	R	N	It fault "true" else "false" (0)
		Overridden	R	R	N	"false" (0)
		Out_of_service	R	R	N	"false" (0)
		Units	R	N	N	From 301EM, usually ppm (96)
Binary inputs (seven instances per 301EM, regardless pf sensor)	Rel1 ro rel4, buzzer, out1 to out 3	Object_identifier	R	C	N	For rel1, Modbus address 256+8 For rel2, Modbus address 256+9 For rel3, Modbus address 256+10 For rel4, Modbus address 256+11 For Buzzer, Modbus address 256+24 For out1, Modbus address 256+25 For out2, Modbus address 256+26 For out3, Modbus address 256+27
		Object_type	R	C	N	Binary_input (3)
		Event_state	R	R	N	Normal (0)
		Object_name	R	N	N	"VA301EM GGGG AdXXX.DDDD" where GGGG is the gas name XXX is the Modbus address. Values for DDDD can be "Rel1"... "Rel3", "Buzz" or "out1"... "out3"
		Out_of_service	R	R	N	FALSE
		Present_value	R	R	N	True if the output is active
		Reliability	O	R	N	Not meaningful
		Status_flags				
		In_alarm	R	R	N	Not meaningful
		Fault	R	R	N	Not meaningful
		Overridden	R	R	N	"false" (0)
		Out_of_service	R	R	N	"alse" (0)

EC-FX Objects

Group	Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog input	Gas	Object_identifier	R	C	N	Modbus address *256+1. For example an EC-F9 at Modbus address 003 will appear as 769 or 0x0301.
		Object_type	R	C	N	Analog_input (0)
		Event_state	R	R	N	Not meaningful
		Object_name	R	N	N	"VA301EM GGGG AdXXX.GGGG" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "R11" and "0x1F01"
		Out_of_service	R	R	N	FALSE
		Present_value	R	R	N	Gas reading
		Reliability	O	R	N	Appropriate reports no_fault_detected (0), NO_SENSOR(1), or unreliable other (7). Fault is detected within 60 seconds
		Status_flags				
		In_alarm	R	R	N	If fault or alarm "true" (1) else "false" (0)
		Fault	R	R	N	If fault "true" else "false" (0)
		Overriden	R	R	N	"false" (0)
		Out_of_service	R	R	N	"false" (0)
		Units	R	N	N	Usually ppm (96)

420MDBS IR-F9 Objects

Group	Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog input	Gas	Object_identifier	R	C	N	Modbus address *256+1. For example an EC-F9 at Modbus address 003 will appear as 769 or 0x0301.
		Object_type	R	C	N	Analog_input (0)
		Event_state	R	R	N	Not meaningful
		Object_name	R	N	N	"VA301EM GGGG AdXXX.GGGG" where GGGG is the gas name XXX is the Modbus address. Values for gas name include "R11" and "0x1F01"
		Out_of_service	R	R	N	FALSE
		Present_value	R	R	N	Gas reading
		Reliability	O	R	N	Appropriate reports no_fault_detected (0), NO_SENSOR(1), or unreliable other (7). Fault is detected within 60 seconds
		Status_flags				
		In_alarm	R	R	N	If fault or alarm "true" (1) else "false" (0)
		Fault	R	R	N	If fault "true" else "false" (0)
		Overriden	R	R	N	"false" (0)
		Out_of_service	R	R	N	"false" (0)
		Units	R	N	N	Usually ppm (96)

301-ADI Objects

Group		Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog input	Gas	Object_identifier		R	C	N	(Modbus address + channel number) *256- 255, where channel number is 1 to 16. For example analog input 7 from a 301ADI at address 097 will appear as 26369 or 0x6017
		Object_type	Enumerated	R	C	N	Analog_input (0)
		Event_state	Enumerated	R	R	N	Not meaningful
		Object_name	Character string	R	N	N	"adXXX.AI.CC" where CC is the channel number from 1 to 16 and XXX is the Modbus address
		Out_of_service	Boolean	R	R	N	FALSE
		Present_value	Real	R	R	N	Reading from 301C, mA by default. Scaling in the 301C is supported
		Reliability	Enumerated	O	R	N	Not meaningful
		Status_flags					
		In_alarm	Boolean	R	R	N	Not meaningful
		Fault	Boolean	R	R	N	"false" (0)
		Overriden	Boolean	R	R	N	"false" (0)
		Out_of_service	Boolean	R	R	N	"false" (0)
		Units	Enumerated	R	N	N	mA(02) by default. Reconfiguration in the 301C is possible. New units may not propagate until power cycle

301-R8 and AA96D-RM8 Objects

Group		Property	Data Type	Required ¹	Storage type ²	BACnet writeable?	Value
Analog input	Gas	Object_identifier		R	C	N	RelayModbus + Modbus address *256+7. For relay in a 301R at Modbus address will appear as 24331 or 0x5F0B.
		Object_type	Enumerated	R	C	N	Binary_input (3)
		Event_state	Enumerated	R	C	N	Normal (0)
		Object_name	Character string	R	N	N	"VA301R AdXXX.relR" where XXX is the Modbus and R is the relay number
		Out_of_service	Boolean	R	C	N	FALSE
		Polarity	Enumerated		C		Always normal (0)
		Present_value	Real	R	R	N	True if and only if the relay is driven by an event
		Reliability	Enumerated	O	C	N	No_fault_detected (0)
		Status_flags					
		In_alarm	Boolean	R	C	N	Always "false" (0)
		Fault	Boolean	R	C	N	Always "false" (0)
		Overriden	Boolean	R	R	N	Always "false" (0)
		Out_of_service	Boolean	R	R	N	Always "false" (0)

Appendix A: Protocol Implementation Conformance Statement (Normative)

(This annex is part of this Standard and is required for its use)

BACnet Protocol Implementation Conformance Statement

Date: 2015 May 07
Vendor: Honeywell International
Name: _____
Product Name: 301-C Controller
Product Model Number: 301-C-DLC-BIP, AA96D-DLC-BIP
Application Software Version: 1.1 Firmware Revision: 1.4.9
BACnet Protocol Revision: 7

Product Description:

Gas Detection controller offering unique zoning capabilities which permit the averaging and comparison of multiple sensor readings. Up to 96 sensors including the E3Point and the SensePoint XCD may be connected. Includes 4 relays. Available in a heavy duty industrial housing and with a datalogging option.

BACnet Standardized Device Profile (Annex L):

- ☐ BACnet Operator Workstation (B-OWS)
- ☐ BACnet Advanced Operator Workstation (B-AWS)
- ☐ BACnet Operator Display (B-OD)
- ☐ BACnet Building Controller (B-BC)
- ☐ BACnet Advanced Application Controller (B-AAC)
- ☐ BACnet Application Specific Controller (B-ASC)
- ☒ BACnet Smart Sensor (B-SS)
- ☐ BACnet Smart Actuator (B-SA)

List all BACnet Interoperability Building Blocks Supported (Annex K):

- Data Sharing-ReadProperty-B (DS-RP-B)
- Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)
- Data Sharing-WriteProperty-B (DS-WP-B)
- Device Management-Dynamic Object Binding-B (DM-DOB-B)
- Device Management-Dynamic Device Binding-B (DM-DDB-B)
- Device Management-TimeSynchronization-B (DM-TS-B)

Segmentation Capability:

☐ Able to transmit segmented messages Window Size _____

☐ Able to transmit segmented messages Window Size _____

Standard Object Types Supported:

Object	Dynamically Creatable?	Dynamically Deletable?	Optional Properties Supported	Writable Beyond Standard	Range Restrictions
device	N	N	local_date local_time UTC_offset Daylight_Savings_Status	N	none
analog_input	N	N	reliability	N	none
binary_input	N	N	reliability	N	none

Data Link Layer Options:

- ☐ BACnet IP, (Annex J)
- ☐ BACnet IP, (Annex J), Foreign Device

Device Address Binding:

Is static device binding supported? (This is currently necessary for two-way communication with MS/TP slaves and certain other devices.)

☐ Yes ☒ No

Networking Options:

- ☐ Router, Clause 6 - List all routing configurations, e.g., ARCNET-Ethernet, Ethernet-MS/TP, etc.
- ☐ Annex H, BACnet Tunneling Router over IP
- ☐ BACnet/IP Broadcast Management Device (BBMD)

Does the BBMD support registrations by Foreign Devices? ☐ Yes ☐ No

Does the BBMD support network address translation?

☐ Yes ☐ No

Network Security Options:

- ☐ Non-secure Device - is capable of operating without BACnet

Network Security Options:

- ☐ Non-secure Device – is capable of operating without BACnet Network Security

Character Sets Supported:

- ☐ ISO 10646 (UTF-8) ☐ IBM™/Microsoft™ DBCS
- ☐ ISO 8859-1 ☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4)
- ☐ JIS X 0208

If this product is a communication gateway, describe the types of non-BACnet equipment/networks(s) that the gateway supports:

This supports translating data from Honeywell Analytics proprietary Modbus-RTU gas detectors to BACnet/IP. Supported detectors include the E3Point and the SensePoint XCD.

Appendix B: 301EM

Available Pre-programmed configurations

Type 1 CND (B-52 Canadian Standard for R123)

SetEvent	Input	Status	Output	Reset	Silence
Event # 1	SD All	Alr A	Relay #1	Yes	No
Event # 2	SD All	Alr A	Relay #4	Yes	No
Event # 3	SD All	Alr A	Out 1	Yes	Yes
Event # 4	SD All	Alr A	Out 2	Yes	No
Event # 5	SD All	Alr A	Out 3	Yes	No
Event # 6	SD All	Alr A	Buzzer	Yes	Yes
Event # 7	SD All	Alr A	Relay #2	Yes	Yes
Event # 8	SD All	Alr A	Relay #3	Yes	No
Event # 9	SD All	Fault	Relay #3	Yes	No
Event #10	SD All	Alr B	Relay #1	No	No
Event #11	SD All	Alr C	Relay #1	No	No

Type 2 CND (B-52 Canadian Standard for other Refrigerants)

Event	Input	Status	Output	Reset	Silence
Event # 1	SD All	Alr A	Relay #1	Yes	No
Event # 2	SD All	Alr A	Out 1	Yes	Yes
Event # 3	SD All	Alr A	Out 2	Yes	No
Event # 4	SD All	Alr A	Out 3	Yes	No
Event # 5	SD All	Alr A	Buzzer	Yes	Yes
Event # 6	SD All	Alr A	Relay #2	Yes	Yes
Event # 7	SD All	Alr B	Relay #4	Yes	No
Event # 8	SD All	Alr A	Relay #3	Yes	No
Event # 9	SD All	Fault	Relay #3	Yes	No
Event #10	SD All	Alr C	Relay #1	No	No

Type 3 US (ASHRAE 15 Standard for Refrigerants)

Event	Input	Status	Output	Reset	Silence
Event #1	SD All	Alr A	Relay #1	Yes	No
Event #2	SD All	Alr A	Out 1	Yes	Yes
Event #3	SD All	Alr A	Out 2	Yes	No
Event #4	SD All	Alr A	Out 3	Yes	No
Event #5	SD All	Alr A	Buzzer	Yes	Yes
Event #6	SD All	Alr A	Relay #2	Yes	Yes
Event #7	SD All	Alr B	Relay #4	No	No
Event #8	SD All	Alr A	Relay #3	Yes	No
Event #9	SD All	Fault	Relay #3	No	No
Event #10	ManSw #1*	Open	Relay #1	Yes	No
Event #11	ManSw #1*	Open	Relay #4	Yes	No
Event #12	ManSw #1*	Open	Out 1	Yes	Yes
Event #13	ManSw #1*	Open	Out 2	Yes	No
Event #14	ManSw #1*	Open	Out 3	Yes	No
Event #15	ManSw #1*	Open	Buzzer	Yes	Yes
Event #16	ManSw #1*	Open	Relay #2	Yes	Yes
Event #17	ManSw #1*	Open	Relay #3	Yes	No
Event #18	SD All	Alr C	Relay #1	No	No
Event #19	ManSw #2**	Open	Relay #1	No	No

*ManSw #1 Trigger an electrical shut down.

**ManSw #2 Trigger relay #1.

Type 4 (Default configuration - other than B-52 and ASHRAE 15)

Event	Input	Status	Output	Reset	Silence
Event # 1	SD All	Alr A	Relay #1	No	No
Event # 2	SD All	Alr B	Relay #2	No	Yes
Event # 3	SD All	Alr C	Relay #3	No	No
Event # 4	SD All	Fault	Relay #4	No	No
Event # 5	SD All	Alr B	Out 1	No	Yes
Event # 6	SD All	Alr A	Out 2	No	No
Event # 7	SD All	Alr C	Out 3	No	No
Event # 8	SD All	Alr B	Buzzer	No	Yes



Danger: Selecting the “OTHER” event type creates an event with all fields and events blank. Therefore, no events will appear when pressing the arrows. Events must be created before they appear in the scroll list.



Caution: To comply with ASHRAE 15 and CSA B52 standards, Type 1, 2 or 3 must be used.

Appendix C: How to Build a Title 24 Compliant System

California Title 24 Part 6 specifies mandatory requirements for enclosed parking garages. A compliant gas detection system can be constructed from the Honeywell Analytics 301C24 version controller and E³Point Network gas sensor. This section describes how to configure the 301C controller to accomplish this.

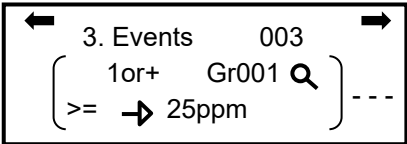
Glossary

The terminology for a couple of technical concepts differs between Honeywell and California.

California's Term	Honeywell's Term	Description
proximity zone	group	A region of a garage containing several sensors. Gas readings in the region are presumed to be similar because of free air circulation.
alarm	fault	A notification from the gas detection system that the system is not working correctly.

Requirement: Section 120.6(c)4 “CO concentration at all sensors is maintained at 25 ppm or less at all times.”

Solution: Create an event for each group such that if one or more sensors report a concentration greater than 25 ppm the event is activated.



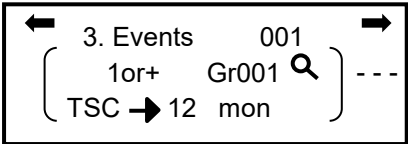
Requirement: Section 120.6(c)7 A-D “CO sensor shall be:

- A. Certified by the manufacturer to be accurate within plus or minus 5 percent of measurement.
- B. Factory calibrated.
- C. Certified by the manufacturer to drift no more than 5 percent per year.
- D. Certified by the manufacturer to require calibration no more frequently than once a year.

Solution: Use Honeywell Analytics E3Point Network Gas Monitor with carbon monoxide cartridges.

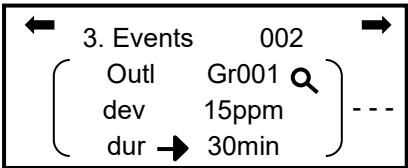
Requirement: Section 120.6(c)7Ei “The CO sensor shall be monitored by a control system. If any sensor has not been calibrated per the manufacturer’s recommendations within the specified calibration period, the sensor has failed.”

Solution: Use E3Point carbon monoxide sensors, which require calibration every 12 months. Create an event to activate if time since calibration (TSC) is 12 months. Configure this event to activate fans and the alarm device.



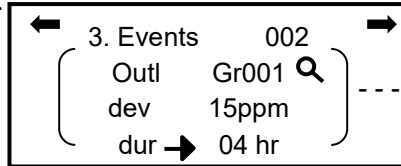
Requirement: Section 120.6(c)7Eiii “The CO sensor shall be monitored by a control system. During occupied periods the system compares the readings of sensors in the same proximity zone, e.g. if the 30-minute rolling average for any sensor in a proximity zone is more than 15 ppm above or below the 30-minute rolling average for other sensor(s) in that proximity zone, the sensor has failed.”

Solution: Create an event to activate if the concentration reading of any sensor in a group is an outlier deviating by 15 ppm for longer than 30 minutes.



Requirement: Section 120.6(c)7Eii “The CO sensor shall be monitored by a control system. During unoccupied periods the system compares the readings of all sensors, e.g. if any sensor is more than 15 ppm above or below the average of all sensors for longer than 4 hours, the sensor has failed.”

Solution: Configure an event to activate if the concentration reading of any sensor in a group is an outlier deviating by 15 ppm for longer than 4 hours.



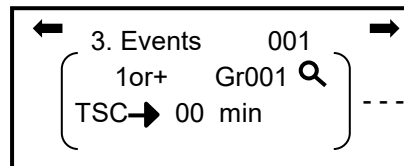
Note that this requirement is less strict than Section 120.6(c)7Eiii above because the aberrant reading can persist longer. This requirement is only meaningful for garages that are rarely occupied. And the only rationale for implementing this looser requirement would be to avoid superfluous faults.

The 301C controller can discriminate between occupied and unoccupied duration limits this by making two outlier events (for 30 minutes and 4 hours) and making the 30-minute event coverage period only “Daytime”. The hours of “Daytime” can be set under menu function 6. If occupancy is based on some other criterion than the time of day, this binary condition can be accepted into the 301C controller system by a digital input channel of a 301ADI. The event can be made conditional on the outlier and the digital input.

Note: The following requirements are from the 2013 Nonresidential Compliance Manual Appendix A form NRCA-PRC-03-F “Enclosed Parking Garage Exhaust System Acceptance”

Requirement: Step A 3 instructs “Temporarily override the programmed sensor calibration/ replacement period to 5 minutes.”

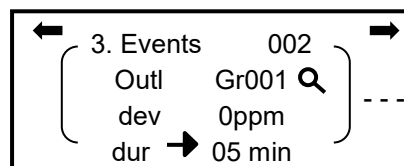
Solution: Reconfigure the time since calibration (TSC) event time limit to 0 minutes. Alternatively, a stale cartridge can be temporarily plugged into the E³Point.



Note that the 301C controller/E³Point system reports time since calibration in days. Therefore, setting the time limit to 5 minutes would cause an event to activate 1140 minutes (1 day) after calibration.

Requirement: Form NRCA-PRC-03-F step A 4 instructs “Temporarily place the system in unoccupied mode and override the programmed unoccupied sensor alarm differential from 30% for 4 hours to 1% for 5 minutes.”

Solution: Note that the 301C controller measures deviation in ppm, not percent. Change the event screen to outlier deviation 0 ppm duration 5 minutes.



Note that Honeywell Analytics E3Point CO sensors have a resolution of 1 ppm.

Requirement: Form NRCA-PRC-03-F step A 5 instructs “Temporarily override the programmed occupied sensor proximity zone alarm differential from 30% for 4 hours to 1% for 5 minutes.”

Solution: Like step A 4, Set the event screen to deviation 0 ppm and duration 5 minutes.

Appendix D:

Communication Protocols for 301 Series Product line

Protocol	Products					
Modbus	301-C and AA96D	301-R8 and AA96D-RM8	420MDBS	420-I	301-AP	301-ADI
Vulbus	301-EM	301-EMRP	S301-IRF	S301-D2		
	*Consult individual gas detector information for protocol types					

Appendix E: Technical Specification Table

Topic	Model Specifics					
	301-C	AA96D	301-R8	AA96D-RM8	420MDBS	420-I
Voltage	24 ± 10% Vac, 50/60 HZ 24 ± 10% Vdc	24 ± 10% Vac, 50/60 HZ 24 ± 10% Vdc	24 ± 10% Vac, 50/60 HZ 24 ± 10% Vdc	24 ± 10% Vac, 50/60 HZ 24 ± 10% Vdc	24 ± 10% Vdc	24 ± 10% Vac, 50/60 HZ 24 ± 10% Vdc
Current @24Vdc	500 mA	500 mA	280 mA	280 mA	50 mA (200 mA to 800 mA supply current forward)	500 mA
Operating Environment: Indoor Use, Ordinary Location, 0 - 95% RH, non-condensing, Up to 3000 m (9843 ft) altitude (see specific system monitor types for sensor limitations)	-20°C to 50°C (-4°F to 122°F)	-20°C to 50°C (-4°F to 122°F)	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	Must be enclosed. -18°C to 54°C (0°F to 130°F) 0 - 100% RH, non-condensing	-20°C to 50°C (-4°F to 122°F)
Network Limits	Up to 96 transmitters, 32 per channel	Up to 96 transmitters, 32 per channel	Maximum 16 modules per 301C / AA96D	Maximum 16 modules per 301C / AA96D	Maximum 32 modules on a single daisy chain twisted pair	Unlimited on network loop (Listen Only mode operation)
Inputs/Outputs (other than relay - see below)	<u>Inputs</u> Channels 1, 2 = Modbus and Vubus Master Channel 3 = Modbus Master only Channel 4 = Not supported <u>Output</u> - Optional BACnet/IP interface. BTL listed as a smart sensor.	<u>Inputs</u> Channels 1, 2 = Modbus and Vubus Master Channel 3 = Modbus Master only Channel 4 = Not supported <u>Output</u> - Optional BACnet/IP interface. BTL listed as a smart sensor.	<u>Input</u> - Modbus standard RTU over 2-wire multi-drop RS-485, 9600 baud	<u>Input</u> - Modbus standard RTU over 2-wire multi-drop RS-485, 9600 baud	<u>Input</u> 4-20 mA <u>Input Impedance</u> - 162 Ω resistive <u>Max Input</u> - 25 mA <u>Output</u> - Modbus, 9600 bps, 8 bits data, 2 stop bits	<u>Input</u> - Modbus standard RTU over 2-wire multi-drop RS-485, 9600 baud <u>Output</u> - 8 dedicated 4-20 mA outputs
Relay outputs	4 DPDT relays (3 alarm and 1 fault)	4 DPDT relays (3 alarm and 1 fault)	8 DPDT relays	8 DPDT relays		
Relay output rating	5A, 30 Vdc or 250 Vac (resistive load)	5A, 30 Vdc or 250 Vac (resistive load)	5A, 30 Vdc or 250 Vac (resistive load)	5A, 30 Vdc or 250 Vac (resistive load)		
Communication line lengths	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel
Groups (Zone)	Up to 126 programmable	Up to 126 programmable	Up to 126 programmable	Up to 126 programmable	Up to 126 programmable	Up to 126 programmable
User interface	- Graphic 122 x 32 dot matrix backlit display - User friendly keypad - Optional 2GB removable SD card for configuration, readings, and events		Dip switch configuration for addressing	Dip switch configuration for addressing	Factory Programmed	Dip switch configuration for addressing
	- Power - Green LED					
User interface	- Graphic 122 x 32 dot matrix backlit display - User friendly keypad - Optional 2GB removable SD card for configuration, readings, and events		Dip switch configuration for addressing	Dip switch configuration for addressing	Factory Programmed	Dip switch configuration for addressing
Visual indicators	- Power - Green LED - Receive Communication (Rx) - Green LED - Transmit Communication (Tx) - Amber LED <u>Event LEDs</u> - Alarm A - Warn - Red Blinking LED - Alarm B - Alarm - Red LED - Alarm C - High Alarm - Red LED - Fault - Amber LED		- Power - Green LED - Receive/Transmit Communication (Rx/Tx) - Amber LED	- Power - Green LED - Receive/Transmit Communication (Rx/Tx) - Amber LED		
Audible alarm	65dBA at 1 m (3 ft)	65dBA at 1 m (3 ft)				
Optional Accessories						
Time delays	0.30 sec, 45 sec, 1-99 minutes before and after alarm					
Events	Flexible programming that can include alarms, gas concentrations, faults, real time clock, voting, optional outlier detection and time since calibration. Up to 200+ events.					
Security	User configurable password protection for tamper resistance					
Battery	3 volt lithium (2 year life)	3 volt lithium (2 year life)				
Enclosure	ABS-polycarbonate	Metal	ABS-polycarbonate	Metal	Contact Honeywell Analytics for available options.	ABS-polycarbonate
Dimensions (HxWxD)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm)	11.26 x 14.1 x 3.31 in. (28.6 x 35.8 x 8.4 cm)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm)	11.26 x 14.1 x 3.31 in. (28.6 x 35.8 x 8.4 cm)		8 x 11 x 2.8 in. (28 x 20.3 x 7 cm)
Weight	2.4 lbs (1.1 kg)	11.4 lbs (5.2 kg)	2.4 lbs (1.1 kg)	11.4 lbs (5.2 kg)		2.4 lbs (1.1 kg)
Certifications	USA: Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use - Part 1: General Requirements [UL 61010-1:2012 Ed 3+R29Apr2016] Canada: Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use - Part 1: General Requirements (R2017) [CSA C22.2 #61010-1-12:2012 Ed 3+U1,U2] Products with C24 suffix - Complies with California Title 24, Part 6 and associated Administrative Regulations in Part 1					

Topic	Model Specifics					
	301-AP	301-ADI	301-EM	301-EMRP	301-IRF	S301-D2
Voltage	24 ± 10% Vac, 50/60 Hz 24 ± 10% Vdc	24 ± 10% Vac, 50/60 Hz 24 ± 10% Vdc	24 ± 10% Vac, 50/60 Hz 24 ± 10% Vdc	24 ± 10% Vac, 50/60 Hz 24 ± 10% Vdc	12Vdc (max 14Vdc)	12Vdc (max 14Vdc)
Current @24Vdc	200 mA	520 mA	2 A	2 A	2A	2A
Operating Environment: Indoor Use, Ordinary Location, 0 - 95% RH, non-condensing, Up to 3000 m (9843 ft) altitude (see specific system monitor types for sensor limitations)	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	0°C to 40°C (32°F to 104°F)	-40°C to 40°C (-40°F to 104°F)
Network Limits		Maximum 1 module per 301-C / AA96D	Maximum 20 sensors	Maximum 10 301-EMRP for each 301-EM	Maximum 20 sensors	Maximum 20 sensors
Inputs/Outputs (other than relay - see below)	<u>Input</u> - Modbus standard RTU over 2-wire multi-drop RS-485, 9600 baud	<u>Analog Input</u> - Sixteen (16) 4-20 Ma Current Loop Measurement (Max 28 mA) 100 ohms input impedance. <u>Digital Input</u> - Eight (8) contact inputs (max 30 V). <u>Output</u> - Modbus standard RTU over 2-wire multi-drop RS-485, 9600 baud	<u>Inputs</u> - Vulbus <u>Output</u> - 4-20 mA for each sensor <u>Output</u> - 3 Outputs at 24 Vdc @ 250 mA each <u>Output</u> - Modbus to 301-C or AA96D	<u>Inputs</u> - Vulbus <u>Output</u> - 3 Outputs at 24 Vdc @ 250 mA each	Output - Vulbus	Output - Vulbus
Relay outputs	3 DPDT relays		4 DPDT relays (factory pre-labeled for specific use)	4 DPDT relays (factory pre-labeled for specific use)		
Relay output rating	5A, 30 Vdc or 250 Vac (resistive load)		5A, 30 Vdc or 250 Vac (resistive load)	5A, 30 Vdc or 250 Vac (resistive load)		
Communication line lengths	Up to 2000 ft (609 m) per channel	Up to 2000 ft (609 m) per channel	- Up to 2000 ft (609 m) per channel connection to the 301-C or AA96D controllers - Maximum 200 ft (60 m) between sensor and power supply. Maximum 4 sensors directly connected to unit power supply. Additional power sources required for every group of 4 sensors.	Maximum distance between the 301-EM and the last 301-EMRP is 1000 ft. (305 m)	200ft (60.9m)	500ft (160m)
Groups (Zone)	Up to 126 programmable	Up to 126 programmable	Factory pre-set for ASHRAE 15 and B52	Factory pre-set for ASHRAE 15 and B52		
User interface	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad		
	Up to 126 programmable	Up to 126 programmable	Factory pre-set for ASHRAE 15 and B52	Factory pre-set for ASHRAE 15 and B52		
User interface	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad	- Alphanumeric backlight liquid crystal display (LCD) - User friendly keypad		
Visual indicators	- Power - Green LED - Transmit Communication (Tx) - Amber LED <u>Event LEDs</u> - Alarm A - Warn - Red Blinking LED - Alarm B - Alarm - Red LED - Alarm C - High Alarm - Red LED - Fault - Amber LED	- Power - Green LED - Fault - Amber LED - Transmit Communication (Tx) - Amber LED	- Power - Green LED - Transmit Communication (Tx) - Amber LED (Activated in network mode) <u>Event LEDs</u> - Alarm A - Warn - Red Blinking LED - Alarm B - Alarm - Red LED - Alarm C - High Alarm - Red LED - Fault - Amber LED		Address 1 = LED blinks 2 times during 2.8s. Address 2 = LED blinks 3 times during 2.8s. Address 3 = LED blinks 4 times during 2.8s. Address 4 = LED blinks 5 times during 2.8s. Address 5-20 = LED blinks 1 time during 2.8s.	No visual indicator
Audible alarm	65dBA at 1 m (3 ft)		65dBA at 1 m (3 ft)			
Optional Accesories			<u>Optional Horn</u> - Min. 85 dBA min. @ 10 ft Max. 103 dBA min. @ 10 ft <u>Optional Strobe</u> - STAS flashing LED, 24 Vac/Vdc			
Time delays						
Events			Factory pre-set for ASHRAE 15 and B52	Factory pre-set for ASHRAE 15 and B52		
Security	User configurable password protection for tamper resistance	Factory set password	Factory set password	Factory set password		
Battery						
Enclosure	ABS-polycarbonate	ABS-polycarbonate	ABS-polycarbonate		ABS-polycarbonate	Stainless Steel
Dimensions (HxWxD)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm) (without options)	8 x 11 x 2.8 in. (28 x 20.3 x 7 cm) (without options)	4 x 11 x 2.5in. (10.6 x 20.3 x 7cm)	2.75in. tall, 2in. diameter
Weight	2.4 lbs (1.1 kg)	2.4 lbs (1.1 kg)	2.4 lbs (1.1 kg) (without options)	2.4 lbs (1.1 kg) (without options)	1.33lbs (0.6kg)	4lbs
Certifications	USA: Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use - Part 1: General Requirements (UL 61010-1:2012 Ed.3-R29Apr2016) Canada: Safety Requirements For Electrical Equipment For Measurement, Control, And Laboratory Use - Part 1: General Requirements (R2017) [CSA C22.2 #61010-1-12:2012 Ed.3+U1:U2] Products with C24 suffix - Complies with California Title 24, Part 6 and associated Administrative Regulations in Part 1					Class 1, Division 1, Groups B,C,D

Appendix F: China RoHS table

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCB 板	X	0	0	0	0	0

本表格中未列出的所有部件和配件包含的有害物质都没有超过 GB/T 26572 所要求的限制。

本表格依据 SJ/T 11364 的规定编制

0 : 表示该有害物质在该部件所有均质材料中的含量均在 GB/T26752 规定的限量要求以下。

× : 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T26572 规定的限量要求。

Re-order code: 2004Y2001C_2 A05095 China RoHS Declaration 01 (Pb PCB)

Limited Warranty

Honeywell Analytics, Inc. warrants to the original purchaser and/or ultimate customer ("Purchaser") of these gas detection instruments ("Product") that if any part thereof proves to be defective in material or workmanship within twelve (12) months, such defective part will be repaired or replaced, free of charge, at Honeywell Analytics' discretion if shipped prepaid to Honeywell Analytics at 405 Barclay Blvd., Lincolnshire IL 60069 USA, in a package equal to or in the original container. The Product will be returned freight prepaid and repaired or replaced if it is determined by Honeywell Analytics that the part failed due to defective materials or workmanship. The repair or replacement of any such defective part shall be Honeywell Analytics' sole and exclusive responsibility and liability under this limited warranty.

Re-Stocking Policy

The following restocking fees will apply when customers return products for credit:

- 15% restocking fee will be applied if the product is returned within **1 month** following the shipping date
- 30% restocking fee will be applied if the product is returned within **3 months** following the shipping date

A full credit (less restocking fee) will only be issued if the product is in perfect working condition. If repairs are required on the returned product, the cost of these repairs will be deducted from the credit to be issued.

No credits will be issued beyond the three-month period.

Exclusions

A. If Gas sensors are part of the Product, the gas sensor is covered by a twelve (12) month limited warranty of the manufacturer.

B. If gas sensors are covered by this limited warranty, the gas sensor is subject to inspection by Honeywell Analytics for extended exposure to excessive gas concentrations if a claim by the Purchaser is made under this limited warranty. Should such inspection indicate that the gas sensor has been expended rather than failed prematurely, this limited warranty shall not apply to the Product.

C. This limited warranty does not cover consumable items, such as batteries, or items subject to wear or periodic replacement, including lamps, fuses, valves, vanes, sensor elements, cartridges, or filter elements.

Warranty Limitation and Exclusion

Honeywell Analytics will have no further obligation under this limited warranty. All warranty obligations of Honeywell Analytics are extinguishable if the Product has been subject to abuse, misuse, negligence, or accident or if the Purchaser fails to perform any of the duties set forth in this limited warranty or if the Product has not been operated in accordance with instructions, or if the Product serial number has been removed or altered.

Disclaimer of Unstated Warranties

The warranty printed above is the only warranty applicable to this purchase. All other warranties, express or implied, including, but not limited to, the implied warranties of merchantability or fitness for a purpose are hereby disclaimed.

Limitation of Liability

It is understood and agreed that Honeywell Analytics' liability, whether in contract, in tort, under any warranty, in negligence or otherwise shall not exceed the amount of the purchase price paid by the purchaser for the product and under no circumstances shall Honeywell Analytics be liable for special, indirect, or consequential damages. The price stated for the product is a consideration limiting Honeywell Analytics' liability. No action, regardless of form, arising out of the transactions under this warranty may be brought by the purchaser more than one year after the cause of actions has occurred.

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[https://sps.honeywell.com/us/en/
products/safety/gas-and-flame-detection/
commercial-gas-detection/301c-controller](https://sps.honeywell.com/us/en/products/safety/gas-and-flame-detection/commercial-gas-detection/301c-controller)

Honeywell

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