LONWORKSTM MODULE
3-CHANNEL MECHANICAL OR SOLID STATE RELAY OUTPUT

This Instruction contains installation and servicing procedures for the LonWorks module(s) listed in the table below. Acromag, Inc. manufactures the module(s). The table provides the module description, the Moore part number, and the equivalent Acromag model number.

<table>
<thead>
<tr>
<th>MODULE DESCRIPTION</th>
<th>MOORE P/N</th>
<th>ACROMAG MODEL NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-Channel Mechanical Relay Output Module</td>
<td>27005-13</td>
<td>560L3-601-3MR-10-NCR</td>
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<tr>
<td>3-Channel Solid State Relay Output Module</td>
<td>27005-14</td>
<td>560L3-601-3SS-10-NCR</td>
</tr>
</tbody>
</table>

Two major sections are found in this Instruction. General information on a LonWorks module ordered from Moore is located in this section. The Acromag User’s Manual for the module is the second section.

Go to the Acromag section of this Instruction to install or calibrate a module. For product support or repair, read the following paragraphs. These statements supersede or amend similar information in the Acromag section.

PRODUCT SUPPORT

Product support can be obtained from a Technical Information Center (TIC). Each regional TIC is a customer service center that provides direct telephone support on technical issues related to the functionality, application, and integration of all products supplied by Moore. Regional TIC contact information is provided in the following table. Your regional TIC is the first place you should call when seeking product support information. When calling, it is helpful to have the following information ready:

- Caller ID number or name and company name - When you call for support for the first time, a personal caller number is assigned. Having the number available when calling for support will allow the TIC representative taking the call to use the central customer database to quickly identify the caller’s location and past support needs.

- Product part number or model number and version

- If there is a problem with product operation:
  - Whether or not the problem is intermittent
  - The steps performed before the problem occurred
  - Any error messages or LED indications displayed
  - Installation environment

Customers that have a service agreement (ServiceSuite or Field Service Agreement) are granted access to the secure area of our Web site (www.mooreproducts.com/techservices). This area contains product support information. To log on, you will be prompted to enter your username and password.
TIC North America also offers a free faxback service called FaxRequest. You can dial-in to this service to access documents such as press releases, product information sheets, and training schedules. The service is completely automated and available 24 hours a day. To access this service, call the FaxRequest number listed in the tables below. The first document you should request is the directory (document number 9999). This document is updated as new documents are added. Each document has a number code assigned to it that you enter along with your fax number (area code entry is always required). Upon completing your entry, the FaxRequest computer automatically calls your fax machine and sends the requested documents.

<table>
<thead>
<tr>
<th>TIC NORTH AMERICA</th>
<th>Tel: +1 215 646 7400, extension 4842, option 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fax: +1 215 283 6343</td>
</tr>
<tr>
<td></td>
<td>E-mail: <a href="mailto:tiegroup@mpco.com">tiegroup@mpco.com</a></td>
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<td>FaxRequest: +1 215 646 7400, extension 4842, option 2</td>
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<tr>
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<td>Bulletin Board Service: +1 215 283 4968</td>
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<tr>
<td></td>
<td>E-mail: <a href="mailto:lohho@mpco.com">lohho@mpco.com</a></td>
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<tr>
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<th>TIC EUROPE</th>
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<td></td>
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<td>E-mail: <a href="mailto:uktie@mpco.com">uktie@mpco.com</a></td>
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<td></td>
<td>Hours of Operation: 8:30 a.m. to 5:15 p.m. GMT/BST</td>
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</table>
RETURN FOR REPAIR

This section modifies the General Maintenance section in the Acromag User’s Manual.

During the warranty period, remove a failed instrument from service and proceed as follows to return it to Moore for repair. For out of warranty repair, return the module to either Moore or Acromag.

TO RETURN EQUIPMENT

- Call Moore Products Co. at (215) 646-7400, ext. 4RMA (4762) weekdays between 8:00 a.m. and 4:45 p.m. Eastern Time. If outside of North America go to www.mooreproducts.com for the address and telephone and FAX numbers of your nearest Moore Products Co. subsidiary. Ask for an RMA (Return Material Authorization) number and be sure to mark the RMA number prominently on the outside of the shipment.

When calling for an RMA number, provide the reason for the return. If returning equipment for repair, failure information (e.g., error code, failure symptom, installation environment) will be requested. A purchase order number will also be needed.

MATERIAL SAFETY DATA SHEET

- A Material Safety Data Sheet (MSDS) must be included with each item being returned that was stored or used anywhere hazardous materials were present.

PACKAGING

- Package assembly in original shipping materials. Otherwise, package it for safe shipment or contact the factory for shipping recommendations.

   An electronic module must be placed inside a static shielding bag to protect it from electrostatic discharge.

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Procedures in this document have been reviewed for compliance with applicable approval agency requirements and are considered sound practice. Neither Moore Products Co. nor these agencies are responsible for repairs made by the user.
**INTRODUCTION:**

These instructions cover the model types listed in Table 1 below. Supplementary sheets are attached for units with special options or features.

<table>
<thead>
<tr>
<th>Table 1:</th>
<th></th>
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<tbody>
<tr>
<td>A. Model Number Format :</td>
<td>560L1-Function-Output-Power-Certification</td>
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<tr>
<td>B. Typical Model Number:</td>
<td>560L1-601-3MR-10-NCR</td>
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<table>
<thead>
<tr>
<th>Series/Network</th>
<th>-Function</th>
<th>-Output</th>
<th>-Power</th>
<th>-Cert.</th>
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<tbody>
<tr>
<td>560L1</td>
<td>-601</td>
<td>-3MR</td>
<td>-3SS</td>
<td>-10</td>
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<td>560L3</td>
<td>-601</td>
<td>-3MR</td>
<td>-3SS</td>
<td>-10</td>
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</tbody>
</table>

**Notes (Table 1):**
1. Consult the factory for current information on agency (e.g. Canadian Standards Association, etc.) approvals.

**DESCRIPTION:**

The Series 550L is a member of the Acromag SmartPack family. It accepts five independent process input network variables (from a LONWORKS control network), and provides a digital or proportional analog interface to five alarm outputs. A discrete on/off input network variable is provided for simple digital control of the output state, and a proportional analog input variable is provided for an analog alarm or controller function.

Each proportional (analog) input variable is represented as a -100% to +100% value and compared to a high and/or low limit setpoint variable. If the input variable exceeds the setpoint value, the output will change state. In addition to high and/or low limit settings, each alarm provides a configuration network variable for alarm deadband, failsafe or non-failsafe operation, initial power-up/reset state, and a watchdog timer that allows the user to specify the maximum time that may expire between updates for each alarm. Three alarms of this device have a physical output (isolated relay contact), and all five have a logical ON/OFF network variable output. Logical outputs differ from physical outputs in that they provide only a logical (ON/OFF) network output variable, with no local hardware contacts. Logical alarms use their corresponding network output variables to control devices external to the module. Additionally, this unit also provides network variables for performing Boolean AND (NAND) and OR(NOR) gate functions.
All SmartPack modules are designed for harsh industrial environments. They feature RFI and EMI protection, a wide operating temperature range, and isolation between power, network and I/O. They are DC powered, DIN-rail mountable, and available with either a twisted pair (TP/TF-78) or free topology (TP/FT-10) transceiver. Up to 64 modules can be connected on a single network segment. Multiple segments may be connected using repeaters to increase the number of modules and distance.

SmartPacks are interoperable with LONWORKS products from other manufacturers that use standard network variable types (SNVTs). Module calibration, configuration and network management are performed using a Windows™ configuration program on a PC.

SPECIFICATIONS:

DEFINITION: This family of isolated, DC-powered, SmartPack, LONWORKS Network alarm modules convert five independent analog or discrete input network variables to five alarm outputs (three have physical relay outputs, all five provide logical outputs). Each alarm has configuration variables for a high and/or low limit setpoint, deadband, failsafe or non-failsafe operation, and for a watchdog timer function. Unit provides three-way isolation between output contacts, the network, and power circuits. The module is DIN-rail mounted.

MODEL/SERIES: 560 (Color coded with a Red label)

NETWORK (Designated by ‘LX’ of 560LX Model prefix):

Protocol: LonTalk®

L1: TP/TF-78, Twisted Pair
Speed: 78.1kb per second.
Media: Unshielded twisted pair, UL Level IV, No. 22 gauge wire.
Distance: Up to 5500 feet (2000 meters).
Nodes per Network Segment: 64 (0 to +70°C), 44 (-25 to +85°C). A LONWORKS router configured as a repeater is required for more than 64 nodes.

L3: TP/FT-10, Free Topology
Speed: 78.1kb per second.
Media: See Cable Type in Table 2 below.
Distance: See Table 2 below.

<table>
<thead>
<tr>
<th>Table 2: Free Topology Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Type</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>Belden 65102</td>
</tr>
<tr>
<td>Belden 8471</td>
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<tr>
<td>Level IV, 22 AWG</td>
</tr>
<tr>
<td>JY (Si) Y 2x2x0.8</td>
</tr>
</tbody>
</table>

Nodes per Network Segment: 64. A LONWORKS router configured as a repeater is required for more than 64 nodes.

FUNCTION: Code number used to represent the module’s firmware functionality.

-601: See the network variables section for a description of the module’s standard network variable types and operation.

OUTPUT: This module has five functional alarm circuits. Three have physical outputs (relays). Two have only logical outputs. The physical output relay types are described below. The output state of each alarm is available as a network variable output to be used to control other modules on the network.

-3MR: Three Independent Mechanical Relay Outputs. High Reliability Electromagnetic Relay Form A (Normally Open), or B (Normally Closed) SPST contacts - field selectable. (Unit is shipped with all outputs configured with NO contacts). To control a higher amperage device, such as a pump, an interposing relay may be used (see Drawing 4501-445).

- CSA ratings of these isolated contacts: 2.0A, 25V DC; Resistive 0.5A, 50V DC; Resistive 1.0A, 120V AC, Resistive
- Contact Material: Stationary contacts: Gold overlay on silver. Movable contacts: 60% palladium, 40% Silver alloy.
- Breakdown Voltage: Between coil and contacts, between contacts of different poles, and between contacts of the same pole: 1000VAC, 50-60 Hz for one minute.
- Service Life (Mechanical): 20 million operations; Electrical: 300,000 operations @ 1.5A, 24VDC, resistive; or 1,000,000 operations @ 1.0A, 24VDC, resistive; 100,000 operations @ 1.0A, 120VAC, resistive.

-3SS: Three Independent Solid State Relay Outputs. Solid-State Relay (SSR) Form A (Normally Open) SPST output. To control a higher amperage device, such as a pump, an interposing relay may be used (see Drawing 4501-445).

Output Voltage (OFF): 0 to 55VDC.
Output Current (ON): 0 to 1 Amp DC (0 to 40°C).
Derate "ON" Current Above 40°C: 10 mA per °C.
Output (OFF) Leakage Current: 1uA DC @ 55VDC.
Output (ON) Resistance: 0.4Ω Maximum
Output (ON) Voltage @ 1 Amp DC: 0.4VDC maximum.
Output Fuse: 2 Amp (LiteFuse 255002)

Isolation: Three-way isolation is provided between the relay output contacts, DC power, and the network. Contacts are also isolated from each other.

Output-to-Power, Network-to-Output, and Output-to-Output: Output contacts can operate at up to 250V AC, or 354V DC off DC power ground, on a continuous basis (will withstand 1500V AC dielectric strength test for one minute without breakdown). This complies with test requirements outlined in ANSI/ISA-S82.01-1998 for the voltage rating specified.
Network-to-Power: The network can operate at up to 277V AC off DC power ground, on a continuous basis (will withstand 1000V AC dielectric strength test for one minute without breakdown).

POWER: Connect an external DC power supply to the Power (P) and (N) terminals. Currents specified are maximum values with outputs ON (each output) and the module transmitting on the network. An internal diode provides reverse polarity protection.

-10: +10 to 36V DC, current draw is a function of supply voltage and output type (refer to Table 3 below).

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>L1 (-3MR)</th>
<th>L1 (-3SS)</th>
<th>L3 (-3MR)</th>
<th>L3 (-3SS)</th>
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<tbody>
<tr>
<td>10V</td>
<td>115mA</td>
<td>65mA</td>
<td>115mA</td>
<td>55mA</td>
</tr>
<tr>
<td>12V</td>
<td>96mA</td>
<td>55mA</td>
<td>96mA</td>
<td>45mA</td>
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<tr>
<td>15V</td>
<td>77mA</td>
<td>45mA</td>
<td>77mA</td>
<td>38mA</td>
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<tr>
<td>24V</td>
<td>50mA</td>
<td>30mA</td>
<td>50mA</td>
<td>26mA</td>
</tr>
<tr>
<td>36V</td>
<td>38mA</td>
<td>25mA</td>
<td>38mA</td>
<td>20mA</td>
</tr>
</tbody>
</table>

CAUTION: Do not exceed 36V DC peak, to avoid damage to the module.

Power Supply Effect: None.

Reset/Service Toggle Switch:
Reset Position: Allows the module to be reset to power-up conditions (toggle right).
Service Position: Causes the Neuron® chip inside the node to transmit its unique 48-bit ID and 8-byte program ID string (toggle left).

LED Indicators:
Power LED (Green): Indicates power applied to unit.
Output LED (Red): Physical outputs: For a process variable input, the LED is ON when a limit is exceeded, for a discrete variable input, the LED will be ON when the relay is energized.
NOTE: Following power-up or after a reset, the output LED’s are turned ON (lamp check) and remain ON independent of the output state, until a network variable update occurs for the corresponding output.
Service LED (Red): LED blinks at a 1/2 Hz rate for an unconfigured node. LED OFF for a properly functioning node. LED ON for failed node.
Status LED (Yellow): (See Figure 1) LED remains ON indefinitely upon receiving an “offline” network management command. LED remains OFF upon receiving an “online” network management command (normal operation). LED blinks at a 2.5Hz rate for 10 seconds upon receiving a “wink” network command. LED flashes quickly 3 times each second to indicate that the watchdog timer has timed out on one of the process input variables or input state variables.

Figure 1: Status LED Behavior

1. Offline/Online Commands:
   - Offline Command
   - Online Command

2. Wink Command:
   - ON
   - OFF
   - 10 Seconds
   - 200 mS
   - 200 mS

3. Fault Sequence:
   - ON
   - OFF
   - Fault Removed
   - 1 Second
   - Continues Until

Reference Test Conditions: Network (78kB/S); 77°F (25°C); +15V DC supply.

Ambient Temperature Range: L1 (44 nodes); -13°F to +185°F (-25°C to +85°C), L1 (64 nodes); +32°F to +158°F (0°C to 70°C), L3 (64 nodes); -13°F to +185°F (-25°C to +85°C).

Ambient Temperature Effect: None.

Response Time: For a network variable change in value, the output will change states within 25mS, typical.

RFI Resistance: Outputs do not change states under influence of RFI for field strengths up to 10V/meter at frequencies of 27MHz, 151MHz, and 467 MHz.

EMI Resistance: Outputs do not change states under the influence of EMI from switching solenoids or commutator motors.

Surge Withstand Capability (SWC): Input/Output, power and network terminations are rated per ANSI/IEEE C37.90-1978. Unit is tested to a standardized test waveform that is representative of surges (high frequency transient electrical interference) observed in actual installations.

Mounting: General Purpose Housing with integrated DIN-Rail Mount compatible with “G” & “T” rails. “G” Rail (32mm), Type EN50035; “T” Rail (35mm), Type EN50022. Refer to Drawing 4501-411 for outline and clearance dimensions. Shipping Weight: 1 pound (0.45 Kg) packed.

Construction:
Circuit Boards: Military grade FR-4 epoxy glass circuit board.
Terminals: Compression type, wire size 14 AWG maximum.
Mounting Position: Position insensitive.
Case: Self-extinguishing NYLON Type 6.6 polyamide thermoplastic UL94 V-2, color black. General Purpose, NEMA Type 1 enclosure.
CERTIFICATION: Consult the factory for current information on the availability of agency (e.g. Canadian Standards Association, Factory Mutual, etc.) approvals.

-NCR: No Certification Required.

INSTALLATION:

The module is packaged in a general purpose enclosure. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within -13°F to 185°F (0°C to 79°C) for satisfactory performance. Connect module as shown in Connection Drawing 4501-410.

Mounting: Mount module assembly as noted below- refer to Drawing 4501-411 for mounting and clearance dimensions.

DIN Rail Mounting: Use suitable fastening hardware to secure the DIN rail to the designated mounting surface. A module, can be mounted to a "T" or "G" Rail. Installation of the module to the rail depends on the type of DIN rail used (see Drawing 4501-411). Units can be mounted side-by-side on 1.6 inch centers, if required.

Electrical Connections:

The wire size used to connect the unit to the control system is not critical. All terminal strips can accommodate wire from 14-26 AWG. Strip back wire insulation 1/4-inch on each lead before installing into the terminal block. Input wiring may be shielded or unshielded twisted pair. Network wires should be twisted pair. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. It is recommended that network and power wiring be separated from the signal wiring for safety, as well as for low noise pickup.

1. Power: Connect DC power supply per Connection Drawing 4501-410. These modules operate from DC power supplies only. Power supply voltage is not critical and normally should be from 10.0V to 36V DC. The supply voltage must not exceed 36 Volts, even momentarily. Variations in power supply voltage, above the minimum required have negligible effect on module accuracy. Refer to "POWER" in the preceding SPECIFICATIONS section for current requirements. This device includes reverse polarity protection.

2. Network: Connect network per Connection Drawing 4501-410. Note: Network circuit is isolated from output and power circuits. See NETWORK specifications for the maximum number of nodes per network segment.

3. Grounding: The module housing is plastic and does not require an earth ground connection.

4. Output Contacts: Wire contacts as shown in Connection Drawing 4501-410. See label on unit for relay type and contact rating. Refer to Drawing 4501-444 for suggestions on relay contact protection.

Electromechanical Relay Contact Protection: To maximize relay life with inductive loads, external protection is required. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with cathode to (+) and anode to (-). For AC inductive loads, place a Metal Oxide Varistor (MOV) across the load. See Drawing 4501-444.

Solid-State Relay Protection: When driving relay coils or other inductive loads, diodes should be placed across each load to limit the voltage spike generated when an inductive load is switched off quickly. For DC inductive loads, place a diode across the load (1N4006 or equivalent) with cathode to (+) and anode to (-), see Drawing 4501-444.

CONFIGURATION (-3MR Versions Only):

This section provides information for the configuration of electromechanical relay contacts on a 560L-1-3MR alarm module. The 560L-1-SSS version has no internal configuration jumpers to configure.

Mechanical Relay - Shunt Block Configuration Procedure:

The three physical electromechanical relay contacts can be configured as Normally Open (Factory Default Configuration), or Normally Closed. Refer to Drawing 4501-442 for details. To gain access to the configuration jumpers, first remove the alarm from the installation. Second, remove the circuit boards from the plastic enclosure as described in the following Disassembly Procedure (refer to Drawing 4501-442). Third, configure the jumpers (shunt blocks) as described in the Jumper Configuration procedure below. Fourth, install the circuit board into the plastic enclosure as described in the Assembly Procedure.

Disassembly Procedure for the 560L Plastic Housing:

The plastic housing has no screws; it "snaps" together. A flat-head screwdriver (Acromag 5021-216 or equivalent) is needed to pry the housing apart as described in the following steps.

CAUTION: Do not push the screwdriver blade into the housing more than approximately 0.1 inches while prying it apart. Handling of the printed circuit boards should only be done at a static-free workstation, otherwise damage to the electronics could result.
1. To begin disassembly (refer to Drawing 4501-442), place the screwdriver at point A (left side of the alarm). While pressing the blade into the seam, use a twisting motion to separate the sides slightly. Repeat this operation at point B.

2. Now that the two pieces have been partially separated, use the screwdriver blade to work the left side of the package loose by working around the alarm and carefully prying the sides further apart. Repeat this action until it is easy to remove the left side from the plastic pins holding the pieces together.

3. Repeat this operation for the right side starting at points C&D.

**CAUTION:** If the two PC boards become separated while taking the package apart, re-align the boards making sure that both interconnection headers are aligned with their mating sockets and carefully push the boards back together.

**Jumper Configuration (Shunt Blocks):**

Shunt blocks are provided to accommodate in-field configuration changes. In case of misplacement, additional shunt blocks may be ordered from the factory (refer to part 1004-332 when ordering additional shunt blocks).

1. Select Normally Open or Normally Closed contacts for each output. Refer to table on Drawing 4501-442 for proper jumper (shunt) position.

2. Repeat for all relays as required.

3. **IMPORTANT:** Mark the Alarm's Configuration on the calibration label located on the enclosure. Example: CH1: NO, CH2: NO, CH3: NC.

4. After programming the jumpers, install the alarm circuit boards back into their case as described in the assembly procedure below.

**Assembly Procedure for the 560L Plastic Housing:**

1. Refer to Drawing 4501-442 and line up the left plastic side with the board and terminal assembly. Carefully press the pieces together.

2. Align the pins of the center section with the side and press the pieces together.

3. Now line up the right side of the housing with the left side and center assembly and carefully press the pieces together.

**NETWORK VARIABLES:**

To provide interoperability, standard network variable types are used for all external interface and configuration variables. Figure 2 below illustrates the 560L's network variable types. See Drawing 4501-496 for a detailed block diagram.

**Figure 2: Series 560LX-601-3xx-10 SNVT Diagram**

** Hardware Outputs**

- nvi_instate[5] SNVT_level_disc
- nvi_pvin[5] SNVT_level_percent
- nvi_and[4] SNVT_level_disc
- nvi_or[4] SNVT_level_disc
- nci_highlimit[5] SNVT_level_percent
- nci_lowlimit[5] SNVT_level_percent
- nci_deadband[5] SNVT_level_percent
- nci_op_mode[5] SNVT_state
- nci_watchdog[5] SNVT_time_passed

**Configuration Section**

- nvo_state[5] SNVT_level_disc
- nvo_pwm[5] SNVT_level_disc
- nvo_pwm[5] SNVT_level_disc
- nvo_or[5] SNVT_level_disc
- nvo_nor SNVT_level_disc
- nvo_nand SNVT_level_disc
- nvo_and SNVT_level_disc

**External Interface Section**

- nvo_wd_status[5] SNVT_level_disc

- Output 1
- Output 2
- Output 3
All non-Boolean network variables are 5-element arrays. The network variables for the three physical alarms are referenced using an array subscript of 0 for alarm output 1, 1 for alarm output 2, and 2 for alarm output 3. The network variables for the two logical alarms are referenced using array subscripts of 3 and 4.

Network variables within the External Interface Section are intended to be bound, polled, or written by other nodes on the network. These variables are maintained in RAM. Network variables within the Configuration Section are intended to be accessed by a network management tool to configure the module. These variables are maintained in EEPROM and are limited to 10000 write cycles. In addition, values written into configuration network variables do not take effect until the module is reset. Reset can occur as the result of powering-up, toggling the RESET switch, or issuing a "reset" network management command to the module.

**BASIC NETWORK VARIABLE FUNCTIONS:**

`nvi_instate[x]`: Discrete Variable Input (ON/OFF)

**Declaration**

network input SNVT_leve_disc nvi_instate[5];

**Description**

In addition to the analog process variable inputs, five discrete (ON/OFF) input network variables of SNVT_leve_disc provide a digital interface to the alarm outputs. Associated with each discrete variable input is a configuration variable for a Watchdog Timer. When this module is powered up or reset, all bound nvi_instate[x] variables are polled to obtain the most recent values. This input type should not be used in combination with a input process (proportional/analog) variable type.

**Power-up/Reset Value**

ST_OFF

`nvi_pvin[x]`: Process Variable Input (Analog / Proportional)

**Declaration**

network input SNVT_leve_percent nvi_pvin[5];

**Description**

This input network variable provides an analog interface to the alarm output. Its range is -163.840% to +163.835% (Resolution: 0.005%). Associated with each process network variable input are configuration variables for High Limit and/or Low Limit Setpoints, for Deadband, for Fail safe or Non-Fail safe operation, and for a Watchdog Timer. When an update occurs, high and low limits are checked and the digital output is updated if a limit is exceeded. When this module is powered up or reset, all bound nvi_pvin[x] variables are polled to obtain the most recent values. This input type should not be used in combination with a discrete (ON/OFF) network variable input type.

**Power-up/Reset Value**

0.0%

`ncl_highlimit[x]`: High Limit (Setpoint) Configuration Variable

**Declaration**

eeprom network input SNVT_leve_percent ncl_highlimit[5];

**Description**

This configuration input network variable specifies the high limit setpoint value for a process variable input. The configuration of each alarm is independent. A high limit is exceeded when the input process variable is greater than or equal to the specified limit value. This configuration input network variable specifies the high limit value and has a range of -153.840% to +163.835% (Resolution: 0.005%). This variable is maintained in EEPROM, and does not take effect until module reset.

**Initial Factory Value**

+163.835%

`ncl_lowlimit[x]`: Low Limit (Setpoint) Configuration Variable

**Declaration**

eeprom network input SNVT_leve_percent ncl_lowlimit[5];

**Description**

This configuration input network variable specifies the low limit setpoint value for a process variable input. Its range is -163.840% to +163.835% (Resolution: 0.005%). The configuration of each alarm is independent. A low limit setpoint is exceeded when the input process variable is less than or equal to the specified limit value. This variable is maintained in EEPROM, and does not take effect until module reset.

**Initial Factory Value**

-163.840%

`ncl_deadband[x]`: Process Variable Deadband

**Declaration**

eeprom network input SNVT_leve_percent ncl_deadband[5];

**Description**

This configuration input network variable specifies the deadband for each of the process variable inputs in percent of span units. Its range is 0% to +163.835% (Resolution: 0.005%). Note: A negative deadband is not valid. If a negative value is entered, it is converted to a positive value in the module. Note also, the deadband value is independent of the setpoint value.

For a typical process variable alarm application, the deadband should be set in the (+)0.5 to (+)20% range. If the module is used in a controller application, the deadband can be set as required in the application.
Deadband does not alter the threshold at which a limit becomes exceeded, rather it functions to keep the limit exceeded until the signal returns to a level beyond a specified dropout value. Each alarm provides momentary alarm action (Non-Latching)—that is, the alarm will reset to its non-alarm state as soon as the signal is outside of the selected deadband. See Drawing 4501-426. For high limits, the limit remains exceeded until the process variable input has returned below its threshold value, minus the deadband. For low limits, the process variable input must return above its threshold value, plus the deadband. If large deadbands are used, the input process variable may not be able to return within limit and the alarm will not be automatically reset to its non-alarm state. If this happens, the module will require that a reset command be issued (via software or by the reset switch), or that a power off/on cycle reset occur to transfer the output to its non-alarm state. This variable is maintained in EEPROM, and does not take effect until module reset.

**Initial Factory Value**
0.0%

**nci_op_mode[ x ]**: Operating Mode Configuration Variable

**Declaration**
eeprom network input SNVT_state nci_op_mode[5];

**Description**
This configuration input network variable specifies the FailSafe or Non-FailSafe mode of operation, and the power-up/reset default state of the outputs for each alarm relay. Each output is set independently. FailSafe refers to the operation when the relay is energized in the normal input range, and de-energized when the input value exceeds the setpoint value, or the module’s power is lost. Non-FailSafe refers to the operation when the relay is de-energized in the normal range of input, and energized when the input value exceeds the setpoint value. The power-up/reset state of the output relay is the state that is assumed following power-up and after a reset, until a network variable update occurs for the output. This variable is maintained in EEPROM, and does not take effect until the module is reset.

- bit0: FailSafe/Non-FailSafe - 0=FailSafe, 1=Non-FailSafe.
- bit1...bit7: Reserved for future use.
- bit8: Power-up/Reset state definition - 0=relay de-energized, 1=relay energized.
- bit9: Power-up/Reset state enable - 0=disabled, 1=enabled.
- bit10...bit15: Reserved for future use.

See Drawing 4501-497 for a truth table describing the reset behavior of the output relays and LEDs.

**Initial Factory Value (all bits cleared)**
bit0: 0 (FailSafe Operating Mode), bit8: 0 (Output Relay De-energized), bit9: 0 (Reset disabled, default reset to relay de-energized)

**nci_watchdog[ x ]**: Watchdog Timer Configuration Variable

**Declaration**
eeprom network input SNVT_time_passed nci_watchdog[5];

**Description**
This configuration input network variable allows the user to specify the maximum amount of time that can expire between updates of the associated nvi_pvin[x] or nvi_instate[x] variable. Failure to update the associated nvi_pvin[x] or nvi_instate[x] variable within the specified time period sets the corresponding nvo_wd_status[x] variable to ST_ON, optionally resets the output relay and LED, and causes the Status LED to flash its fault sequence. The maximum allowable time expressed in HH:MM:SS:LL format is 17:59:59:00 (64799 seconds). Anything greater will be clipped at 17:59:59:00. The internal resolution of the timer is 1 second. The 10 millisecond (LL) member is ignored. To disable the output watchdog timer function, set HH to 255, or all members to 0. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Initial Factory Value**
HH=255, MM=00, SS=00, LL=00: Output watchdog timer disabled.

**nvo_statefb[ x ]**: State Feedback Variable

**Declaration**
network output SNVT_lev_disc nvo_statefb[5];

**Description**
This output network variable is used to determine the present state of the output of each alarm. A value of ST_ON indicates the output is energized and any other value indicates the output is not energized. Physical alarms use array subscripts 0, 1, and 2 to control hardware outputs 1, 2, and 3 within the module. Logical alarms use array subscripts 3 & 4 and function exactly as physical alarms, except the logical alarms have no hardware contacts within the module.

**Power-up/Reset Value**
ST_OFF

**nvo_pvinfb[ x ]**: Process Variable Feedback

**Declaration**
network output SNVT_lev_percent nvo_pvinfb[5];

**Description**
This output network variable contains the same value as the process input variable. This output may be connected to other process variable inputs within the module to cascade alarm functions. Network variable range -163.840% to +163.835%.

**Power-up/Reset**
0.0%
nvo_wd_status[ x ]: Watchdog Timer Status

Declaration
network output SNVT  lev_disc nvo_wd_status[ 5 ];

Description
This output network variable contains the status of the output watchdog timer for the corresponding process or state input. Under normal conditions, its value is ST_OFF. Upon timing out, its value becomes ST_ON, and the Status LED flashes its fault sequence. In addition, the output relay and LED are optionally reset. The next update of the corresponding process or state input network variable updates the output to the new value, returns nvo_wd_status[ x ] to ST_OFF and removes the Status LED fault. See Figure 1 for an illustration of the Status LED behavior.

See Drawing 4501-497 for a truth table describing the reset behavior of the output relays and LEDs.

Power-up/Reset
ST_OFF

EXPANDED VARIABLE FUNCTIONS (Logic Functions)

nvi_and[ x ]: ‘AND’ Boolean Function Input Variable

Declaration
network input SNVT  lev_disc nvi_and[ 4 ];

Description
Unit supports one four-input AND(NAND) gate. These input network variables form the inputs of an AND gate. When a value of ST_ON is written to all inputs, the corresponding output network variable nvi_and will propagate a value of ST_ON. If any input receives a value of ST_OFF, the output network variable nvi_and will propagate a value of ST_OFF. The inputs of the gate default to ST_ON at power up or reset to permit operation with less than four inputs. After power up or reset, the inputs are polled to obtain the most recent values.

Power-up / Reset Value
ST_ON

nvo_and: ‘AND’ Boolean Function Output Variable

Declaration
network output SNVT  lev_disc nvo_and;

Description
This output network variable forms the output of an AND gate. When a value of ST_ON is written to all the corresponding input network variables nvi_and[ x ], this output will propagate a value of ST_ON. If any input network variable nvi_and[ x ] receives a value of ST_OFF, this output network variable will propagate a value of ST_OFF. The output of the gate defaults to ST_OFF at power up or reset. After power up or reset, the inputs to this gate are polled to obtain the most recent values.

Power-up / Reset Value
ST_OFF

nvo_nand: ‘NAND’ Boolean Function Output Variable

Declaration
network output SNVT  lev_disc nvo_nand;

Description
This output network variable forms the output of an Inverter, which is internally connected to the output of an AND gate to form the NAND gate function. When a value of ST_ON is written to all the corresponding input network variables nvi_and[ x ], this output will propagate a value of ST_OFF. If any input network variable nvi_and[ x ] receives a value of ST_OFF, this output network variable will propagate a value of ST_ON. The output of the gate defaults to ST_OFF at power up or reset. After power up or reset, the inputs to this gate are polled to obtain the most recent values.

Power-up / Reset Value
ST_OFF

nvi_or[ x ]: ‘OR’ Boolean Function Input Variable

Declaration
network input SNVT  lev_disc nvi_or[ 4 ];

Description
Unit supports one four-input OR(NOR) gate. These input network variables form the inputs of an OR gate. When a value of ST_OFF is written to all inputs, the corresponding output network variable nvo_or will propagate a value of ST_OFF. If any input receives a value of ST_ON, the corresponding output network variable nvo_or will propagate a value of ST_ON. The inputs of the gate default to ST_OFF at power up or reset to permit operation with less than 4 inputs. Upon power up or reset, the inputs are polled to obtain the most recent values.

Power-up / Reset Value
ST_OFF

nvo_or: ‘OR’ Boolean Function Output Variable

Declaration
network output SNVT  lev_disc nvo_or;

Description
This output network variable forms the output of an OR gate. When a value of ST_OFF is written to all the corresponding input network variables nvi_or[ x ], this output will propagate a value of ST_OFF. If any input network variable nvi_or[ x ] receives a value of ST_ON, this output network variable will propagate a value of ST_ON. The output of the gate defaults to ST_OFF at power up or reset. After power up or reset, the inputs to this gate are polled to obtain the most recent values.

Power-up / Reset Value
ST_OFF
nvo_nor: 'NOR' Boolean Function Output Variable

Declaration
network output SNVT lev_disc nvo_nor;

Description
This output network variable forms the output of an inverter, which is internally connected to the output of an OR gate to form the NOR gate function. When a value of ST_OFF is written to all the corresponding input network variables nvi_or[x], this output will propagate a value of ST_ON. If any input network variable nvi_or[x] receives a value of ST_ON, this output network variable will propagate a value of ST_OFF. The output of the gate defaults to ST_OFF at power up or reset. After, power up or reset, the inputs to this gate are polled to obtain the most recent values.

Power-up / Reset Value
ST_OFF

GENERAL MAINTENANCE:

The module contains solid-state components and requires no maintenance, except for periodic cleaning and verification. When a failure is suspected, a convenient method for identifying a faulty module is to exchange it with a known good unit. It is highly recommended that a non-functioning module be returned to Acromag for repair, since Acromag makes use of tested and burned-in parts, and in some cases, parts that have been selected for characteristics beyond that specified by the manufacturer. Further, Acromag has automated test equipment that thoroughly checks the performance of each module.
SERIES 560L-3MR NORMALLY OPEN/CLOSED JUMPER CONFIGURATION

FAILSAFE ALARM CONDITIONS
(RELAY NORMALLY ENERGIZED)

NON-FAILSAFE ALARM CONDITIONS
(RELAY NORMALLY DE-ENERGIZED)

SERIES 560L ALARM CONDITIONS