LONWORKS™ MODULE
3-CHANNEL ISOLATED DC OR AC DISCRETE INPUT

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 Isolated DC Discrete Input Module</td>
<td>27005-10</td>
<td>540L3-401-3DC-10-NCR</td>
</tr>
<tr>
<td>3-Channel Isolated AC Discrete Input Module</td>
<td>27005-11</td>
<td>540L3-401-3AC-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.

### TIC North America

<table>
<thead>
<tr>
<th></th>
<th>Tel:</th>
<th>1 215 646 7400, extension 4842, option 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fax:</td>
<td>+1 215 283 6343</td>
<td></td>
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<tr>
<td>E-mail:</td>
<td><a href="mailto:tiegroup@mpco.com">tiegroup@mpco.com</a></td>
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<tr>
<td>FaxRequest:</td>
<td>+1 215 646 7400, extension 4842, option 2</td>
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<tr>
<td>Bulletin Board Service:</td>
<td>+1 215 283 4968</td>
<td></td>
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<tr>
<td>Hours of Operation:</td>
<td>8 a.m. to 6 p.m. eastern time</td>
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<td>Secure Web Site:</td>
<td><a href="http://www.mooreproducts.com/techservices">www.mooreproducts.com/techservices</a></td>
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### TIC Asia

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<tr>
<th></th>
<th>Tel:</th>
<th>65 299 6454</th>
</tr>
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<tbody>
<tr>
<td>Fax:</td>
<td>+65 299 6053</td>
<td></td>
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<tr>
<td>E-mail:</td>
<td><a href="mailto:lohho@mpco.com">lohho@mpco.com</a></td>
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<tr>
<td>Hours of Operation:</td>
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<td><a href="http://www.mooreproducts.com/techservices">www.mooreproducts.com/techservices</a></td>
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### TIC Europe

<table>
<thead>
<tr>
<th></th>
<th>Tel:</th>
<th>44 1935 470172</th>
</tr>
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<tbody>
<tr>
<td>Fax:</td>
<td>+44 1935 706969</td>
<td></td>
</tr>
<tr>
<td>E-mail:</td>
<td><a href="mailto:uktic@mpco.com">uktic@mpco.com</a></td>
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</tr>
<tr>
<td>Hours of Operation:</td>
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<tr>
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<td><a href="http://www.mooreproducts.com/techservices">www.mooreproducts.com/techservices</a></td>
<td></td>
</tr>
</tbody>
</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 1:

<table>
<thead>
<tr>
<th>Series/Network</th>
<th>Function</th>
<th>Input</th>
<th>Power</th>
<th>Cert.</th>
</tr>
</thead>
<tbody>
<tr>
<td>540L1-401-3DC-10-NCR</td>
<td>540L1</td>
<td>401</td>
<td>-3DC</td>
<td>-10</td>
</tr>
<tr>
<td>540L3-401-3AC-10-NCR</td>
<td>540L3</td>
<td>401</td>
<td>-3AC</td>
<td>-10</td>
</tr>
</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 converts three individually isolated 0 to 55V DC, or 80 to 125V AC inputs, into three corresponding network variables. Each input includes basic configuration network variables for configuring debounce and update interval. Additionally, network variables are provided for performing Boolean AND, OR, and NOT (invert) functions, as well as D flip-flop 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 toplogy (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.

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8500-462-C95M011
SPECIFICATIONS:

DEFINITION: This family of isolated, DC-powered, SmartPack, LonWORKS modules accept three independent AC or DC input voltage signals, and convert the ON/OFF state of these signals to network variables using standard network variable types (SNVT). Each input has configuration network variables for debounce and update time. Other network variables are provided for Boolean logic functions. Three-way isolation is provided between the inputs, the network, and the power circuit. This module is DIN-rail mounted.

MODEL/SERIES: 540 (Color coded with a White label)

NETWORK (Designated by ‘LX’ of 540LX Model prefix):
Protocol: LonTalk®

L1: TP/XF-78, Twisted Pair:
Speed: 78.1kb per second.
Media: Unshielded twisted pair, UL Level IV, No. 22 gauge wire.
Distance: Up to 6500 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 2: Free Topology Specifications

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Maximum module-to-module distance</th>
<th>Maximum total wire length for SmartPack Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belden 85102</td>
<td>1640 ft (500 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>Belden 8471</td>
<td>1312 ft (400 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>Level IV, 22 AWG</td>
<td>1312 ft (400 m)</td>
<td>1640 ft (500 m)</td>
</tr>
<tr>
<td>JY (St) Y 2x2x0.8</td>
<td>1050 ft (320 m)</td>
<td>1640 ft (500 m)</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.

-401: See the network variables section for a description of the module’s standard network variable types and operation.

INPUT: Units have three independently isolated 0 to 55VDC, or 80 to 125V AC/DC inputs.

-3DC: Three Independent DC Inputs, 0 to 55VDC.
Input Voltage Range: 2 Jumper Selectable Ranges, 4-25V DC, or 20-55VDC.
Input Threshold: 4VDC maximum (4-25V DC range), 20V DC maximum (20-55V DC range).
Input Current: 17.5mA DC typical @ 25V (4-25V range), 5.6mA DC typical @ 55V (20-55V range).
Input Optocoupler Response: 7uS maximum.
Network Response Time: less than 30mS, typical (to Network Message), less than 40mS, typical (to Network Acknowledge).

-3AC: Three Independent AC/DC Inputs: 80 to 125V AC/DC.
Input Voltage Range: 80 to 125 VAC/DC
Input Frequency: 47 to 63 Hz
Input ON Threshold: 80VAC/DC maximum
Input OFF Threshold: 40VAC/DC maximum
Input Current: 2.4mA typ. @ 125VAC/DC
Input Optocoupler Response: 20mS maximum
Network Response Time: less than 30mS, typical (to Network Message), less than 40mS, typical (to Network Acknowledge).

Isolation: Three-way isolation is provided between the inputs, DC power, and the network as follows:

Input-to-Power, Network-to-Input, and Input-to-Input: Inputs can operate at up to 250V AC, or 354V DC off 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-S82.01-1986 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 (-) terminals. Currents specified are maximum values with all inputs active 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 3: Supply Current

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>L1 (-3AC)</th>
<th>L1 (-3DC)</th>
<th>L3 (-3AC)</th>
<th>L3 (-3DC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10V</td>
<td>50mA</td>
<td>50mA</td>
<td>37mA</td>
<td>42mA</td>
</tr>
<tr>
<td>12V</td>
<td>40mA</td>
<td>40mA</td>
<td>31mA</td>
<td>35mA</td>
</tr>
<tr>
<td>15V</td>
<td>35mA</td>
<td>35mA</td>
<td>26mA</td>
<td>29mA</td>
</tr>
<tr>
<td>24V</td>
<td>25mA</td>
<td>25mA</td>
<td>18mA</td>
<td>20mA</td>
</tr>
<tr>
<td>36V</td>
<td>20mA</td>
<td>20mA</td>
<td>14mA</td>
<td>16mA</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.
Input LED (Red): Each input, the LED is ON for active inputs (signal above threshold), and OFF for inactive inputs (signal below the threshold).
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.

Figure 1: Status LED Behavior

1. Offline/Online Commands:

<table>
<thead>
<tr>
<th>ON</th>
<th>Indefinite</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offline Command</td>
<td></td>
<td>Online Command</td>
</tr>
</tbody>
</table>

2. Wink Command:

<table>
<thead>
<tr>
<th>ON</th>
<th>10 Seconds</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>mS</td>
<td>200</td>
</tr>
</tbody>
</table>

Reference Test Conditions: Input: 0 to 55VDC (-3DC), or 0 to 125V AC/DC (-3AC); Network (78k/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 input change in state, an output message will be transmitted on the network within 30mS, typical, plus Debounce time (user configured 0 to 8mS).

RFI Resistance: Unit performs under the influence of RFI for field strengths up to 10V/Mmeter at frequencies of 27mhz, 151mhz, and 467mHz.

EMI Resistance: Unit operates without error under the influence of EMI from switching solenoids or commutator motors.

Surge Withstand Capability (SWC): Input/Output terminations are rated per ANSI/IEEE C37 90-1978. The 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. Supports “G” & “T” rails: “G” Rail (32mm), Type EN50035; “T” Rail (35mm), Type EN50022. Refer to Drawing 4501-407 for outline and clearance dimensions. Shipping Weight: 1 pound (0.45 Kg) packed.

Construction:

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 type of enclosure. Use an auxiliary enclosure to protect against unfavorable environments and locations. Maximum operating ambient temperatures should be within -13 to 185°F (0 to 70°C) for satisfactory performance. Connect as shown in Connection Drawing 4501-406.

Mounting: Mount module assembly - refer to Drawing 4501-407 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 4501-407). Units can be mounted side-by-side on 1.6 inch centers, if required.

“T” Rail (35mm), Type EN50022: To attach a module to this style of DIN rail, angle the top of the unit towards the rail and locate the top groove of the adapter over the upper lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove a module, insert a screwdriver into the lower arm of the connector and pull downward while applying outward pressure to the bottom of the unit.

“G” Rail (32mm), Type EN50035: To attach a module to this style of DIN rail, angle the unit so that the upper groove of the adapter hooks under the top lip of the rail. Firmly push the unit towards the rail until it snaps solidly into place. To remove a module, pull the lower part of the unit outward until it releases from the rail, lift unit from rail.
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 4501-406. 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 35 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 4501-406. 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. **Input:** Connect input per connection diagram, observe proper polarity, see label for input type. If unit is factory calibrated, the calibration label indicates range of input. NOTE: Each input circuit is electrically isolated from the network/power circuits, allowing the input to operate up to 250V AC, or 354V DC, off ground on a continuous basis.

**CONFIGURATION (3DC Input Units Only):**

This section provides information for configuration of the input range on Model 540L1-3DC input modules. Model 540L1-3AC units have no internal jumper to configure.

**DC Input Range Configuration Procedure:**

The Model 540L1-3DC input circuits can be individually configured for an input range of 4 to 25V DC (Factory Configuration), or 20 to 55 V. Refer to Drawing 4501-443 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 4501-443). 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 540L 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 4501-443), 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 (Model 540L1-3DC Only). In case of misplacement, additional shunt blocks may be ordered from the factory. When ordering additional shunt blocks, refer to Acromag part 1004-332.

1. Select Low Range (4-25V DC), or High Range (20-55V DC). Refer to table of Drawing 4501-443 for proper jumper (shunt) position.

2. Repeat for all inputs as required.

3. **IMPORTANT:** Mark the Alarm's Configuration on the calibration label located on the enclosure. Example: IN1: 4-25VDC, IN2: 4-25VDC, IN3: 20-55VDC.

4. After programming the range jumpers, reconnect the input board to the power board and install the board assembly back into its case as described in the assembly procedure below.

**Assembly Procedure for the 540L Plastic Housing:**

1. Refer to Drawing 4501-443 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 540L's network variable types.

**Figure 2: Series 540LX-401-3xx-10 SNVT Diagram**

Network variables corresponding to hardware inputs are three element arrays. Input 1's network variables are referenced using array subscript 0; input 2's via subscript 1; input 3's via subscript 2. 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 10,000 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. 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.

**BASIC NETWORK VARIABLE FUNCTIONS:**

nvo_outstate[ x ]; Discrete Output Variable

**Declaration**
network output SNVT_lev_disc nvo_outstate[ 3 ];

**Description**
This output network variable contains the latest value of the corresponding digital input in units of SNVT_lev_disc. A value of ST_ON indicates the input is active. A value of ST_OFF indicates the input is inactive. The update rate of this variable is controlled by nci_debounce[ x ] and/or nci_pvtme[ x ].

**Power-up/Reset Value**
Per input.

nci_debounce[ x ]; Input Debounce Configuration Variable

**Declaration**
eeprom network input SNVT_elapsed_tm nci_debounce[ 3 ];

**Description**
This configuration input network variable specifies the amount of delay between updates (0 to 8 milliseconds) before the input ON or OFF state will be accepted as a correct input. This is used to eliminate false state transfers due to spikes or glitches on the input signal. Glitches are frequently caused by contact bounce in mechanical relays and switches. Only the millisecond member of this network variable structure is used. All other members are ignored and should be set to 0. Resolution is 1 millisecond. A value of zero disables the debounce delay. The maximum value is 8 milliseconds. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Initial Factory Value**
0: Debounce delay disabled.
nvo_qoutf[x]: D Flip-flop - 'QFB' Output Variable

**Declaration**

network output SNVT lev_disc nvo_qoutf[4];

**Description**

This output network variable forms the Q output of the flip-flop. When ST_ON is received at the nvi_clk[ x ] input, the value present at the nvi_din[ x ] will propagate to the corresponding output network variable nvo_qout[ x ]. When ST_OFF is present at the nvi_clr[x] input, the value at the corresponding output network variable nvo_qout[ x ] will transfer to ST_OFF. Both the nvi_din[ x ] and nvi_clk[ x ] inputs are ignored until ST_ON is present at the nvi_clr[ x ] input. Only values of ST_ON or ST_OFF may be used. The Q output defaults to ST_OFF at power up or reset.

**Power-up/Reset Value**

ST_OFF

nci_pvtimex[n]: Output Update Time Configuration Variable

**Declaration**

eeprom network input SNVT_time_passed nci_pvtimex[3];

**Description**

This configuration input network variable specifies the period of time between updates of nvo_outstate[ x ]. Internal resolution is 0.1 seconds. The maximum allowable time expressed in HH:MM:SS:LL format is 01:49:13:50 (65535.5 s). Anything greater will be clipped at 01:49:13:50. To disable periodic updates, set HH=255 (FF), or all members to 0. This variable is maintained in EEPROM and does not take effect until the module is reset. Note that any change in state at the input automatically causes nvo_outstate[ x ] to be updated, independent of this delay.

**Initial Factory Value**

HH=255, MM=00, SS=00, LL=00: Periodic updates disabled.

**EXPANDED VARIABLE FUNCTIONS (Logic Functions)**

nvi_and[x]: 'AND' Boolean Function Input Variable

**Declaration**

network input SNVT lev_disc nvi_and[4];

**Description**

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 nvo_and will propagate a value of ST_ON. If any input receives a value of ST_OFF, the output network variable nvo_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 to this gate 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

nvi_or[x]: 'OR' Boolean Function Input Variable

**Declaration**

network input SNVT lev_disc nvi_or[4];

**Description**

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
nvi_not[ x ]: 'NOT' (invert) Boolean Function Input Variable

Declaration
network input SNVT lev_disc nvi_not[ 8 ];

Description
This input network variable forms the input of a NOT (inverting) gate. When a value of ST_ON is written to this input, the corresponding output network variable nvo_not[ x ] will propagate a value of ST_OFF. When a value of ST_OFF is written to this input, the corresponding output network variable nvo_not[ x ] will propagate a value of ST_ON. The input of the gate defaults to ST_ON at power up or reset. Upon power up or reset, the inputs are polled to obtain the most recent values.

Power-up/Reset Value
ST_ON

nvo_not[ x ]: 'NOT' (invert) Boolean Function Output Var.

Declaration
network output SNVT lev_disc nvo_not[ 8 ];

Description
This output network variable forms the output of an inverting gate. When a value of ST_ON is written to the corresponding input network variable nvi_not[ x ], this output will propagate a value of ST_OFF. When a value of ST_OFF is written to the corresponding input network variable nvi_not[ x ], 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. Upon power up or reset, the inputs to this gate are polled to obtain the most recent values.

Power-up/Reset Value
ST_OFF

nvi_clk[ x ]: D Flip-flop 'CLOCK' Input Variable

Declaration
network input SNVT lev_disc nvi_clk[ 4 ];

Description
This input network variable forms the clock input of a flip-flop. When ST_ON is received at the nvi_clk[ x ] input, the value present at nvi_dim[ x ] will propagate to the corresponding output network variable nvo_qout[ x ]. Only values of ST_ON or ST_OFF may be used. The clock input defaults to ST_OFF at power up or reset.

Power-up/Reset Value
ST_OFF (until first update occurs)

nvi_clear[ x ]: D Flip-flop 'CLEAR' Input Variable

Declaration
network input SNVT lev_disc nvi_clear[ 4 ];

Description
This input network variable forms the clear input of a flip-flop. When ST_ON is present at the nvi_clear[ x ] input, the value present at nvi_dim[ x ] will propagate to the corresponding output network variable nvo_qout[ x ], when ST_ON is received at the nvi_clk[ x ] input. When ST_OFF is present at the nvi_clear[ x ] input, the value at the corresponding output network variable nvo_qout[ x ] will transfer to ST_OFF. Both the nvi_dim[ x ] and nvi_clk[ x ] inputs are ignored until ST_ON is present at the nvi_clear[ x ] input. Only values of ST_ON or ST_OFF may be used. The clear input defaults to ST_ON at power up or reset. Upon power up or reset, the inputs are polled to obtain the most recent values.

Power-up/Reset Value
ST_ON (until first update occurs)

nvi_din[ x ]: D Flip-flop 'D' Input Variable

Declaration
network input SNVT lev_disc nvi_din[ 4 ];

Description
This input network variable forms the D input of a flip-flop. When ST_ON is received at the nvi_clk[ x ] input, the value present at nvi_dim[ x ] will propagate to the corresponding output network variable nvo_qout[ x ]. Only values of ST_ON or ST_OFF may be used. The D input defaults to ST_ON at power up or reset. Upon power up or reset, the inputs are polled to obtain the most recent values.

Power-up/Reset Value
ST_ON (until first update occurs)

nvo_qout[ x ]: D Flip-flop 'Q' Output Variable

Declaration
network output SNVT lev_disc nvo_qout[ 4 ];

Description
This output network variable forms the Q output of the flip-flop. When ST_ON is received at the nvi_clk[ x ] input, the value present at the nvi_dim[ x ] will propagate to the corresponding output network variable nvo_qout[ x ]. When ST_OFF is present at the nvi_clear[ x ] input, the value at the corresponding output network variable nvo_qout[ x ] will transfer to ST_OFF. Both the nvi_dim[ x ] and nvi_clk[ x ] inputs are ignored until ST_ON is present at the nvi_clear[ x ] input. Only values of ST_ON or ST_OFF may be used. The Q output defaults to ST_OFF at power up or reset.

Power-up / Reset Value
ST_OFF
GENERAL MAINTENANCE:

This 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 540L - 3AC/3DC SIMPLIFIED SCHEMATIC

SERIES 540L - 3AC/3DC INPUT MODULE

FIGURE A: DC POWER CONNECTIONS

MODEL: 540L - 3DC/15V
DC VOLTAGE INPUTS

INPUTS: 10 to 36V DC

FIGURE B: CONNECTION TO OPTIONAL 35PS POWER SUPPLY

MODEL: 540L - 3AC/15V
AC VOLTAGE INPUTS

INPUTS: AC 100-240V

LOW NETWORK CONNECTION

35PS OUTPUT

SERIES 540L - 3DC/3AC ELECTRICAL CONNECTIONS