LONWORKSTM MODULE
4-INPUT AND 4-OUTPUT DC DISCRETE

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>4-Input and 4-Output DC Discrete Module</td>
<td>27005-16</td>
<td>580L3-810-C1-10-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>Fax: +1 215 283 6343</td>
<td></td>
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<tr>
<td>E-mail: <a href="mailto:ticgroup@mpco.com">ticgroup@mpco.com</a></td>
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<tr>
<td>FaxRequest: +1 215 646 7400, extension 4842, option 2</td>
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<tr>
<td>Bulletin Board Service: +1 215 283 4968</td>
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<tr>
<td>Hours of Operation: 8 a.m. to 6 p.m. eastern time</td>
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<tr>
<td>E-mail: <a href="mailto:lohho@mpco.com">lohho@mpco.com</a></td>
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<tr>
<td>Hours of Operation: 9 a.m. to 6 p.m. Singapore time</td>
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<th>TIC EUROPE</th>
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<tr>
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<td></td>
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</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:
A. Model Number Format:
   580L1-Function-I/O-Power-Certification
   580L1-810-4I40-10-NCR

B. Typical Model Number: 580L1-810-4I40-10-NCR

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

DESCRIPTION:

The Series 580L is a member of the Acromag SmartPack family. It provides four general purpose discrete inputs and four general purpose discrete outputs. The eight I/O lines share a common, and as a group are isolated from the power circuit and network. Each input includes basic configuration network variables for configuring debounce and update interval. Associated with each digital output is an input network variable to control the output's state, and a watchdog timer that allows the user to specify the maximum time that may expire between updates for each output.

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/XF-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 (SNV/VTs). Module calibration, configuration and network management are performed using a Windows™ configuration program on a PC.
SPECIFICATIONS:

DEFINITION: This DC-powered, SmartPack, LONWORKS module converts four independent input network variables to four discrete outputs, and converts four independent discrete inputs to four network variable outputs. Unit provides three-way isolation between the input/output circuits, the network, and power circuit. The module is DIN-rail mounted.

MODEL/SERIES: 580 (Color coded with a Blue label)

NETWORK (Designated by 'LX' of 580LX 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>
<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 85102</td>
</tr>
<tr>
<td>Belden 8471</td>
</tr>
<tr>
<td>Level IV, 22 AWG</td>
</tr>
<tr>
<td>JY (Str) 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.

-810: See the network variables section for a description of the module's standard network variable types and operation.

INPUT: This module has four, 0 to 42 VDC, TTL threshold inputs.

-41: Four DC Inputs, 0 - 3V to 42V DC, 45V DC max. (all share a common return).
   Input Threshold (L to H): 2.2V DC nominal.
   Input Threshold (H to L): 1.0V DC nominal.
   Input Hysteresis: 1.2V DC typical.
   Input Resistance: 82KΩ, typical

Input Current: (pull-up resistors removed).
100µA max. at 42V DC

Network Response Time: less than 30mS, typical (to Network Message), less than 40mS, typical (to Network Acknowledge).

Excitation: Four volts DC nominal, current limited (24mA nominal). Used with an externally mounted resistor to interface to switch contacts or logic inputs, one resistor per input. Minimum pull-up resistor 1000Ω.

OUTPUT: This module has four general purpose discrete outputs (open drain FETs with a common return). The output state of each discrete output is available as a network variable output to be used to control other modules on the network.

-4O: Four Independent Open Drain FET Outputs, which share a common return. Form A ( Normally Open)
   SPST output. To control a higher amperage device, such as a pump, an interposing relay may be used (see Drawing 4501-481).

Output Voltage (OFF): 0 to 42VDC.
Output Current (ON):
   -25 °C to 50 °C: 0 to 275mA DC continuous,
   Above 50 °C: derate 2mA / °C
Output (OFF) Leakage Current: 10uA DC @ 42VDC.
Output (ON) Resistance: 1.5Ω Maximum
Output (ON) Voltage @ 275mA DC: 0.30VDC typical.

Isolation: Three-way isolation is provided between the digital I/O circuits, DC power, and the network. Outputs share a common return.

I/O-to-Power, and Network-to-Power: I/O circuits, as a group, 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- S82.01-1988 for the voltage rating specified.

Network-to-I/O: 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 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 excitation supply loading (refer to Table 3).
### Table 3: Supply Current

<table>
<thead>
<tr>
<th>Supply Voltage</th>
<th>L1 without excitation</th>
<th>L1 with excitation</th>
<th>L3 without excitation</th>
<th>L3 with excitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>10V</td>
<td>45mA</td>
<td>85mA</td>
<td>32mA</td>
<td>42mA</td>
</tr>
<tr>
<td>12V</td>
<td>50mA</td>
<td>95mA</td>
<td>38mA</td>
<td>47mA</td>
</tr>
<tr>
<td>15V</td>
<td>55mA</td>
<td>105mA</td>
<td>42mA</td>
<td>52mA</td>
</tr>
<tr>
<td>24V</td>
<td>35mA</td>
<td>75mA</td>
<td>28mA</td>
<td>38mA</td>
</tr>
<tr>
<td>36V</td>
<td>20mA</td>
<td>25mA</td>
<td>16mA</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.
- **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 2.5 Hz 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 discrete input variables.

**Figure 1: Status LED Behavior**

1. **Offline/Online Commands:**
   - ON
   - OFF
   - Offline Command
   - Indefinite
   - Online Command

2. **Wink Command:**
   - ON
   - OFF
   - 10 Seconds
   - 200 mS
   - 200 mS
   - Continue
   - Fault Removed

3. **Fault Sequence:**
   - ON
   - OFF
   - 1 Second
   - 6 mS
   - M S M S

**Reference Test Conditions:** Network (75kB/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.

**Input Response Time:** For an input change in state, an output message will be transmitted on the network within 20mS, typical, plus Debounce time (user configured 0 to 6mS).

**Output Response Time:** For a network variable change in value, the output will change states within 20mS, 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 terminations 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 4501-480 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.
- I/O terminal block is field unpluggable.
- 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 (-25°C to 85°C) for satisfactory performance. Connect module as shown in Connection Drawing 4501-479.

**Mounting:** Mount module assembly as noted below, refer to Drawing 4501-480 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 4501-480). 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 4501-479. 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 4501-479. Note: Network circuit is isolated from I/O 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. NOTE: The I/O circuits, as a group, are 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.

5. **Output Contacts:** Wire outputs as shown in Connection Drawing 4501-479. Refer to Drawing 4501-481 for interfacing to a DC interposing relay and for suggestions on relay contact protection.

**Open Drain FET 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 the cathode to (+) and anode to (-), see Drawing 4501-479.

**NETWORK VARIABLES:**

To provide interoperability, standard network variable types are used for all external interface and configuration variables. Figure 2 below illustrates the 580L's network variable types.

**Figure 2: Series 580LX-810-4I4O-10 SNVT Diagram**

- **HARDWARE OUTPUT**
  - Output 1
  - Output 4
  - nvi_instate[4]
  - SNVT_lev_disc
  - nvo_statefb[4]
  - SNVT_lev_disc
  - nvo_wd_status[4]
  - SNVT_lev_disc
  - nvo_outstate[4]
  - SNVT_lev_disc

- **External Interface Section**
  - nci_pvttm[4]
  - SNVT_elapsed_tm
  - nci_debounce[4]
  - SNVT_elapsed_tm
  - nci_op_mode[4]
  - SNVT_state
  - nci_watchdog[4]
  - SNVT_elapsed_tm

- **Configuration Section**
  - HARDWARE INPUT
    - Input 1
    - Input 4

All network variables are four-element arrays. Discrete I/O 1's network variables are referenced with an array subscript of 0; 1 for discrete I/O 2, and so on. 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.
nvo_outstate[x]: Discrete Output Variable

**Declaration**

network output SNVT_lev_disc nvo_outstate[4];

**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 for this variable is controlled by nci_debounce[x] and/or nci_pvtime[x].

**Power-up/Reset Value**

Per input.

nci_debounce[x]: Input Debounce Configuration Variable

**Declaration**

eeprom network input SNVT_elapsed_tm nci_debounce[4];

**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 (LL) member of this network variable structure determines the debounce time (0 to 8 ms). The hour, minute and second members are ignored and should be set to 0. To disable the debounce delay function, set the day (DD) member to 65535, or the millisecond member to 0. This variable is maintained in eeprom, and does not take effect until the module is reset.

**Initial Factory Value**

DD=65535, HH=0, MM=0, SS=0, LL=0: Debounce delay disabled.

nci_pvtime[x]: Output Update Time Configuration Variable

**Declaration**

eeprom network input SNVT_elapsed_tm nci_pvtime[4];

**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 DD:HH:MM:SS:LL format is 00:01:49:13:500 (65535.5 s). Anything greater will be clipped at 01:49:13:500. To disable periodic updates, set the day (DD) member to 65535, 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**

DD=65535, HH=0, MM=0, SS=0, LL=0: Periodic updates disabled.

nvo_instat[e][x]: Discrete Variable Input (ON/OFF)

**Declaration**

network input SNVT_lev_disc nvo_instat[e][4];

**Description**

This input network variable, in conjunction with nci_op_mode[x], controls the state of the corresponding discrete output. See the truth table in Table 4. Associated with this network variable is a Watchdog Timer configuration variable. When this module is powered up or reset, all bound nvo_instat[x] variables are polled to obtain the most recent values.

**Power-up/Reset Value**

ST_OFF

nci_op_mode[x]: Operating Mode Configuration Variable

**Declaration**

eeprom network input SNVT_state nci_op_mode[4];

**Description**

This configuration input network variable configures the input state that energizes the relay, and the power-up/reset default state of the relay. Three of the sixteen available bits are currently defined. Bit 0 is the invert bit, which determines the state (ST_ON or ST_OFF) of the value written to nvo_instat[x], that causes the relay to turn on and conduct load current. Bits 8 and 9 determine the reset behavior of the relay. Tables 4 and 5 below summarize the functions of the configuration bits. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Table 4: Input Network Variable Truth Table**

<table>
<thead>
<tr>
<th>bit0 (invert)</th>
<th>nvo_instat[x]</th>
<th>relay</th>
<th>nvo_state[x]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>ST_OFF</td>
<td>De-energized</td>
<td>ST_OFF</td>
</tr>
<tr>
<td>0</td>
<td>ST_ON</td>
<td>Energized</td>
<td>ST_ON</td>
</tr>
<tr>
<td>1</td>
<td>ST_OFF</td>
<td>Energized</td>
<td>ST_ON</td>
</tr>
<tr>
<td>1</td>
<td>ST_ON</td>
<td>De-energized</td>
<td>ST_OFF</td>
</tr>
</tbody>
</table>

**Table 5: Relay Reset Behavior Truth Table**

<table>
<thead>
<tr>
<th>Reset Conditions</th>
<th>Config. Bits</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HW/SW/PU Reset</td>
<td>nvo_wd_status[x]</td>
<td>bit9 Reset Enable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>¬</td>
<td>set to ST_OFF</td>
<td></td>
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<td>¬</td>
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<tr>
<td>¬</td>
<td></td>
<td></td>
</tr>
<tr>
<td>¬</td>
<td>ST_ON (timer expires)</td>
<td></td>
</tr>
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<td>¬</td>
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</tbody>
</table>
**nci_watchdog[x]: Watchdog Timer Configuration Variable**

**Declaration**
eeprom network input SNVT_elapsed_tm nci_watchdog[4];

**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_instate[x] variable. Failure to update nvi_instate[x] within the specified time period sets the corresponding nvo_wd_status[x] variable to ST_ON, and causes the Status LED to flash its fault sequence. The maximum allowable time expressed in DD:HH:MM:SS:LL format is 00:17:59:59:00 (64799 seconds). Anything greater will be clipped at 00:17:59:59:00. The internal resolution of the timer is 1 second. The millisecond (LL) member is ignored. To disable the output watchdog timer function, set the day (DD) member to 65535, or all members to 0. This variable is maintained in EEPROM, and does not take effect until the module is reset.

**Initial Factory Value**
DD=65535, HH=0, MM=0, SS=0, LL=0: Output watchdog timer disabled.

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

**Declaration**
network output SNVT_lev_disc nvo_statefb[4];

**Description**
This output network variable is used to determine the present state of the discrete output. A value of ST_ON indicates the output is energized and any other value indicates the output is not energized.

**Power-up/Reset Value**
ST_OFF

**nvo_wd_status[x]: Watchdog Timer Status**

**Declaration**
network output SNVT_lev_disc nvo_wd_status[4];

**Description**
This output network variable contains the status of the output watchdog timer for the corresponding input network variable. 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 is optionally reset. The next update of the corresponding 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.

**Power-up/Reset**
ST_OFF

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**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.