

2800 Series Marquees **4" Alpha-Numeric L.E.D. Display**

*With DF1CRC Protocol (1761-NET-ENI Compatible)
PP-2111-189A, AB-2476-020*

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1.0 Description

The 2800 series LED alpha-numeric marquee, is a 4 inch unit designed for low cost applications. It is designed to display alphabetic and numeric characters, in 1 line of 4 inch text.

Optional firmware PP-2111-189 implements DF1CRC protocol. This makes it possible to use Allen-Bradley communication modules to connect the marquee to EthernetIP or Controlnet networks. This manual provides detailed directions for using the marquee with a 1761-NET-ENI EthernetIP communications module, and sending alarm text to the marquee from a SLC5/05 PLC, but other configurations are possible.

2800 series marquees may be ordered in single line and multi-line configurations. Multi-Line 2800 series marquees are constructed by installing the electronics from several single line 2800 series marquees in a single enclosure. Each display line is thus an independent 2800 series marquee.

Electrical power required for the 2800 series marquee is 120 VAC at 1 Amp per display line. A screw terminated barrier strip is provided within the enclosure for connection of power and communication signals.

2.0 General Specifications

ENCLOSURE ----- 14 GAUGE NEMA 12
PAINTED STEEL (GRAY)
5/16" EYE BOLTS
OPTIONAL NEMA 4
OPTIONAL STAINLESS STEEL
OPTIONAL NEMA 1 EXTRUSION

POWER REQUIREMENTS ----- 120 VAC @ 1 AMP PER LINE

COMMUNICATIONS----- RS-232 (DF1CRC)

FONT----- 4" MONO SPACED

3.0 Initial Inspection

Every 2800 series marquee is carefully inspected both mechanically and electrically, before shipment. Inspect the display for damage, which may have occurred in transit. If there is evidence of damage or the display fails to operate, file a claim with the Transportation Company and notify American LED-gible ® Inc.

In any case where the damage occurs in transit, American LED-gible ® obligations under warranty are dependent upon the customer's immediate notification of the carrier, so that an inspection can be made and a claim filed.

Note: Save the shipping materials for inspection.

4.0 Installation and wiring

2800 series marquees can be purchased in many different formats and with several options that affect installation of the unit. Please check each installation section.

4.1 Mechanical Installation

Most 2800 series marquees are designed to be hung by cable or chain. Optional mounting methods include wall mount brackets and Uni-strut.

Standard NEMA-12 / NEMA-4 marquees are shipped without external connections or holes in the enclosure. ALI has provided two knock outs for ¾" rigid conduit. It is up to the customer to remove a knock out, or punch a hole in the enclosure for conduit or connectors as appropriate. A screw terminated barrier strip is provided within the enclosure for all electrical connections. Optional power connectors are available on some models. Optional data communication connectors are available on some models.

NEMA-1 marquees provide an industry standard six foot, three prong power cord and a DB connector for data communications.

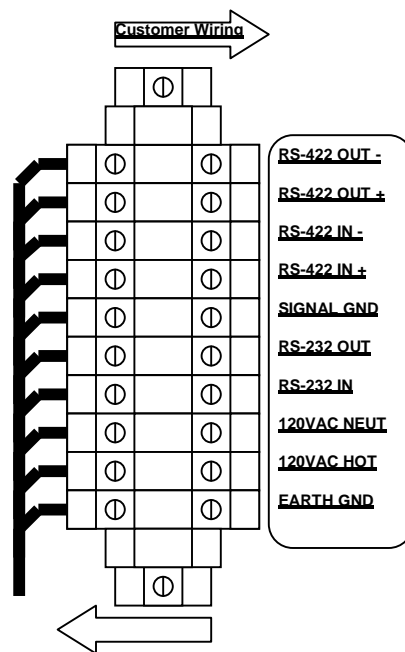
4.2 Electrical Power Installation

Bring the power and communications wiring to the marquee ***separately*** through conduit, to avoid noise problems. Power wires should be AWG #16 with 600 volt insulation rating.

Standard NEMA-12 / NEMA-4 marquees are shipped without external connections or holes in the enclosure. ALI has provided two knock outs for 3/4" rigid conduit. A screw terminated barrier strip is provided within the enclosure for all electrical connections. Optional power connectors are available on some models. A typical optional power connector is a three foot power cord terminated in a 120VAC 20 Amp twist lock connector.

NEMA-1 marquees provide an industry standard six foot, three prong power cord.

A copy of a typical connection label is shown below.



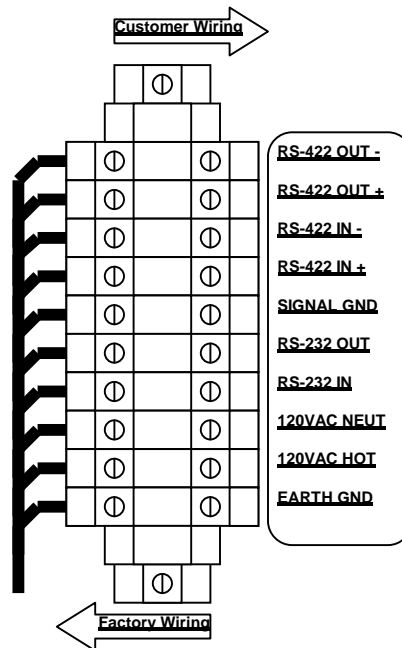
4.3 Serial Communications Installation

Bring the power and communications wiring to the marquee **separately** through conduit, to avoid noise problems. Power wires should be AWG #22 with 600 volt insulation rating.

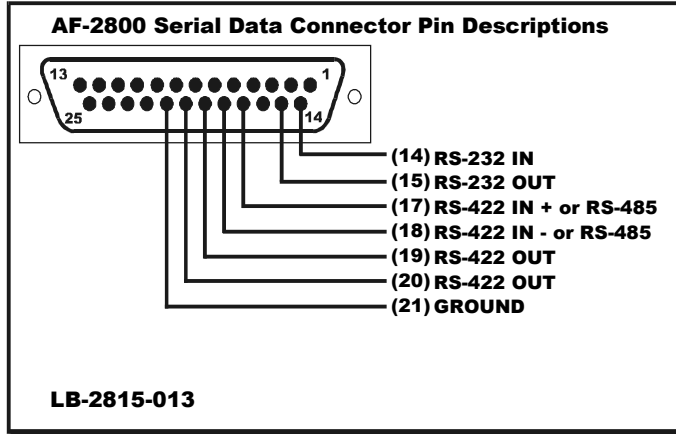
The device being used to control the marquee must be configured to use 19200 baud, eight data bits, no parity, and one stop bit, DF1 Master Protocol with CRC.

The serial port of the marquee may be connected directly to channel 0 of the PLC, or may alternately be connected to the serial port of an Allen Bradley communications module such as the 1761-NET-ENI.

STANDARD EL-2800 SERIES NEMA-12, NEMA-4, NEMA-4X



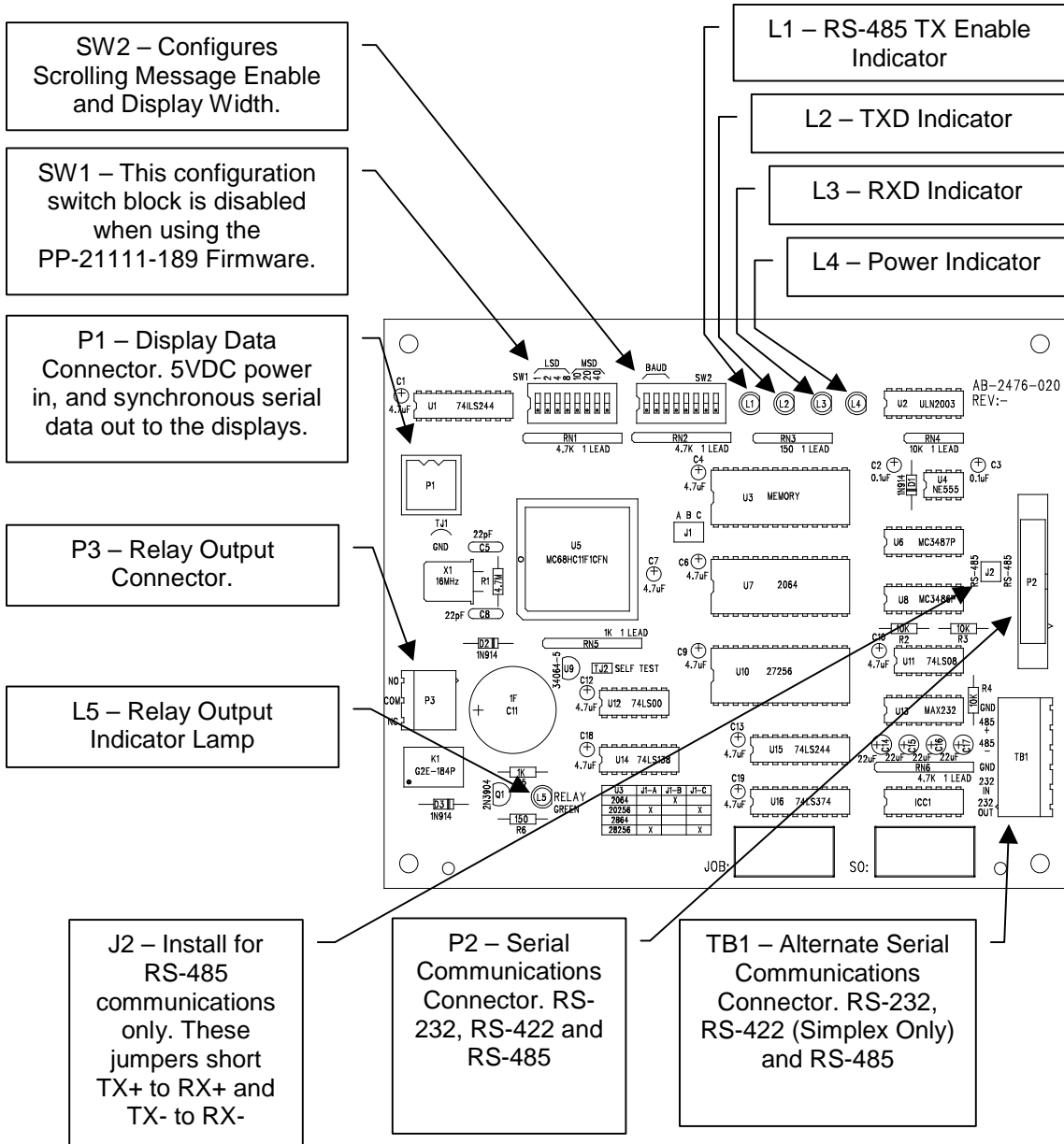
**STANDARD EL-2800 SERIES
NEMA-1**



5.0 Configuration

Configuring the jumpers, switch settings, and software settings for 2800 series marquees is described in this section.

A diagram of the AB-2476-020 microprocessor board for 2800 series marquees is provided below.



5.1 Configuring the Serial Port

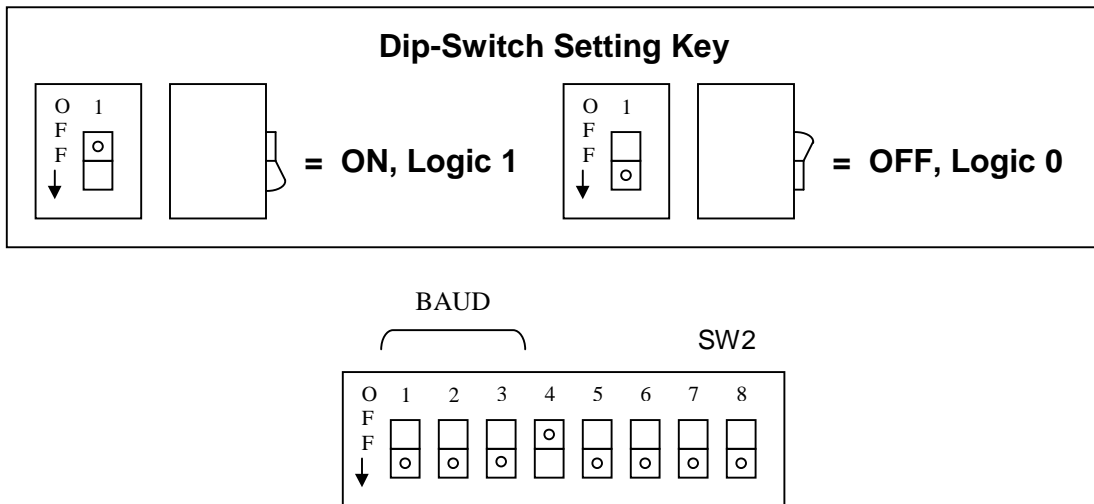
When PP-2111-189 firmware is used with the 2800 marquee, the serial port configuration switches are disabled, and the firmware hard codes the serial port to operate at 19200 baud, 8 data bits, 1 stop bit, with DF1 Master protocol using CRC checksums. The device connected to the marquee must be configured to operate in the same fashion.

5.2 Configuring Scrolling / Truncation

If the text sent to the marquee is too long to fit on the LED display, the marquee can be configured to automatically scroll the text horizontally, or to truncate the text as need to fit.

To disable message scrolling, set switch SW2.4 to the OFF position. Message text will automatically be truncated to fit on the LED display.

To enable message scrolling, set switch SW2.4 to the ON position as shown below.



5.3 Configuring the Display Width

The 2800 series marquee can be purchased in 10, 20, and 30 character widths. The microprocessor board needs to know how wide the LED display is so that it can properly position text on the LED display.

The proper display width is factory configured before the 2800 series marquee is shipped. However to set the parameter is covered here for completeness.

SW2.7	SW2.6	SW2.5	LED Boards	Characters
OFF	OFF	OFF	1	10
OFF	OFF	ON	2	20
OFF	ON	OFF	3	30
<i>OFF</i>	<i>ON</i>	<i>ON</i>	3	30*
<i>ON</i>	<i>OFF</i>	<i>OFF</i>	3	30*
<i>ON</i>	<i>OFF</i>	<i>ON</i>	3	30*
<i>ON</i>	<i>ON</i>	<i>OFF</i>	3	30*
<i>ON</i>	<i>ON</i>	<i>ON</i>	3	30*

* = This setting may be changed in future revisions of the firmware.

5.6 Power on messages

When power is applied to the marquee, it will go through a short power up.

- 1) Power on self test. The LED display will remain blank.
- 2) Display firmware number **PP-2111-189A**
- 3) Display communications mode **DF1CRC**
- 4) Display baud rate **19200,N,8,1**

6.0 Operation

To operate the 2800 marquee with PP-2111-189A firmware, periodically send text to display to the marquee from the controlling PLC using a MSG instruction. The message instruction will need to be configured such that a **PLC5 Typed Write** to **ST10:0** is generated. The text written to **ST10:0** will be displayed on the marquee.

If the marquee does not receive a command from the PLC for 15 seconds, the marquee switches to displaying **DF1TIMEOUT** to signify the apparent loss of communications with the PLC. This prevents the marquee from displaying stale alarm data when the PLC is shutdown, or loss of communications occurs.

6.1 Operation Example

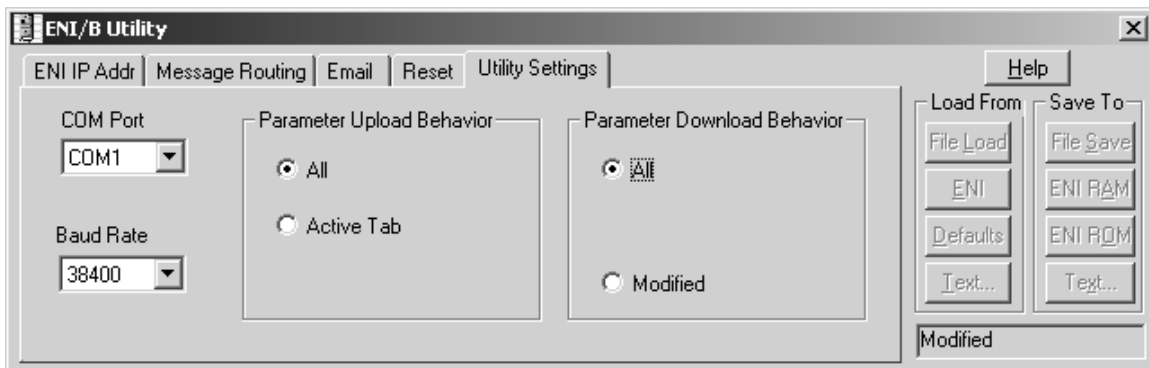
For our operation example, we will use a SLC5/05 PLC to manage the marquee. The SLC will send alarm text to the marquee through a 1761-NET-ENI module using EthernetIP via Channel-1.

The SLC will use a string file to store all possible alarm messages, and a bit file in which each bit enables one of the alarm messages. The SLC ladder logic will scan the bit file to identify which alarms are active and should be displayed on the marquee. In the event no alarms are active, a default message will be sent to the marquee.

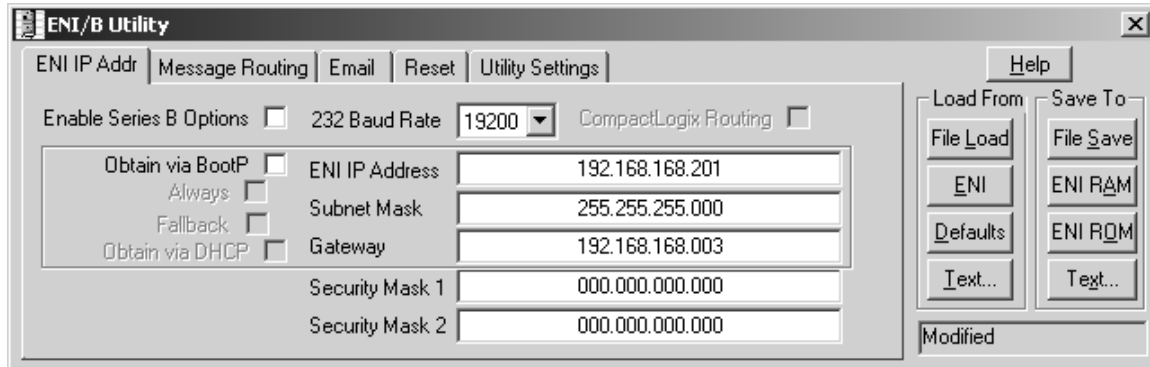
6.2 Configuring the 1761-NET-ENI

First we need to configure the 1761-NET-ENI module. The easiest way to do this is to download the ENI/B Utility from Allen Bradley. Connect the ENI module to a PC via a serial port, and launch the utility.

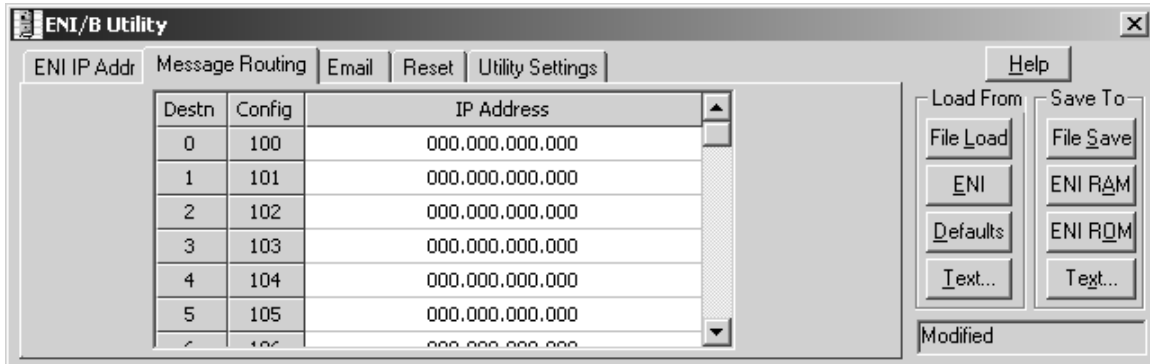
On the Utility Settings Tab, set the upload and download behavior to ALL.



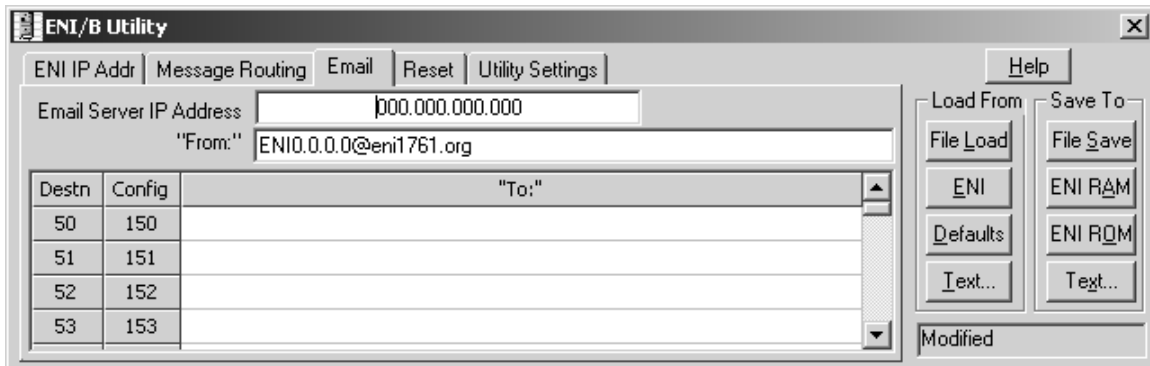
On the ENI IP Addr Tab, disable series B Options, set the baud rate to 19200, disable Bootp, and enter the IP address you wish to use with the marquee as shown below. For our example, the ENI module will use IP address **192.168.168.201**.



On the Message Routing Tab, since the marquee never initiates messages leave the routing table blank. It will not be used.



On the Email Tab, since the marquee never initiates messages, leave the table blank. It will not be used.



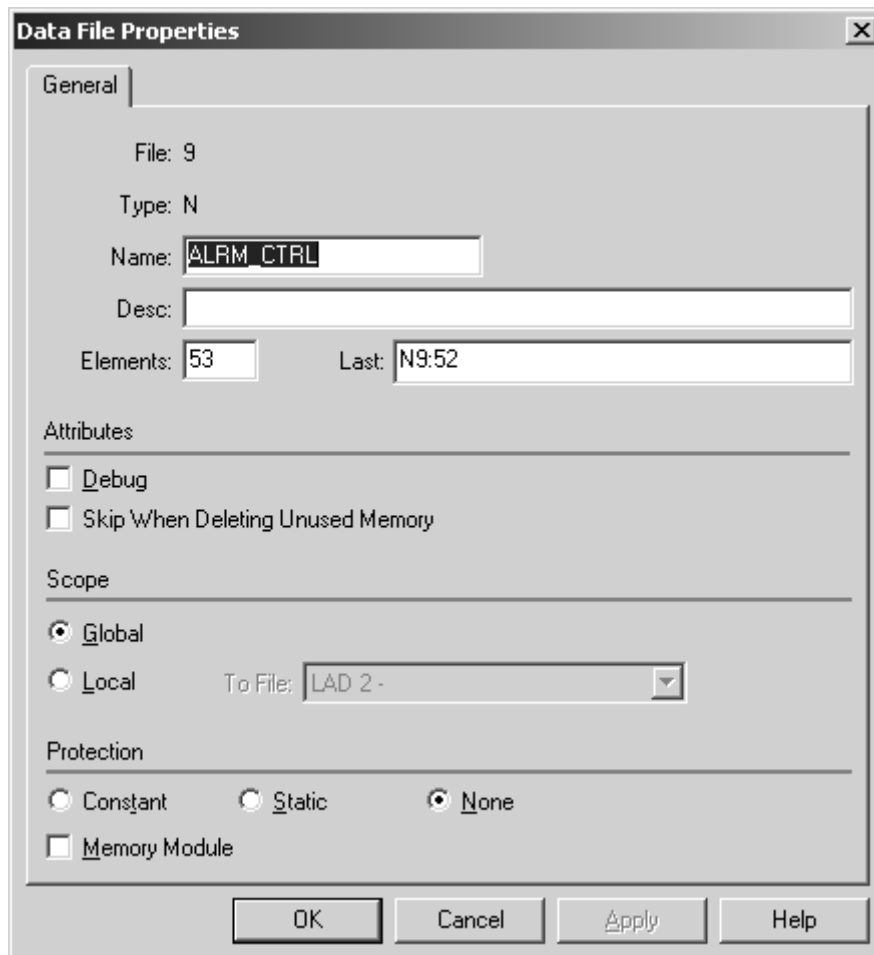
Click on Save To ENI ROM to save the configuration in the ENI module.

6.3 Allocating Memory in the SLC5/05

Now we will construct the SLC5/05 logic to control the marquee. First we will need an integer file large enough to store the control block for the **MSG** instruction and an additional two words.

In our example **N9:0** through **N9:50** are used as a control block for a SLC5/05 message instruction. **N9:51** is used to keep track of the current alarm number. **N9:52/0** is used to back a one shot rising instruction.

Create a new integer file two words larger than the size of the **MSG** control block for your PLC. On the SLC5/05, **MSG** instructions using Channel-1 require a 51 element control block. (**N9:0** through **N9:50**)



The screenshot shows the 'Data File Properties' dialog box with the following settings:

- General** tab selected.
- File: 9
- Type: N
- Name: ALRM_CTRL
- Desc: (empty)
- Elements: 53
- Last: N9:52
- Attributes**:
 - Debug
 - Skip When Deleting Unused Memory
- Scope**:
 - Global
 - Local (To File: LAD 2 -)
- Protection**:
 - Constant
 - Static
 - None
 - Memory Module
- Buttons: OK, Cancel, Apply, Help

Next we will need a string file to store all of the alarm messages text. In our example we will support 32 alarms (**ST10:0** through **ST10:31**), however you may expand this as required by your application. The only limits are running out of memory in the SLC, or exceeding numerical range of an integer (-32767 to +32768).

Note: The SLC5/05 **MSG** instruction does not support indirect addresses in the source data table address field. To work around this limitation, we will use a **COP** instruction to copy the current alarm to **ST10:32** before initiating the message instruction. Thus our string file will need to hold 33 elements to support 32 alarms. Also keep in mind that the last alarm (**ST10:31** in our example) will be the default alarm.

Create a new string file one element larger than the total number of alarm messages to be supported

Data File Properties

General

File: 10

Type: ST

Name:

Desc:

Elements: Last:

Attributes

Debug

Skip When Deleting Unused Memory

Scope

Global

Local To File:

Protection

Constant Static None

Memory Module

OK Cancel Apply Help

Finally we will need a bit file to specify which of the alarms are currently active. We will need one bit for each alarm message. Bit **B11:0/0** will activate alarm message **ST10:0**, **B11:0/1** will activate **ST10:1**, **B11:0/15** activates **ST10:15**, and **B11:0/31** activates **ST10:31**.

Note: It is allowable to specify bit addresses with bit offsets greater than 15. **B11:0/16** is equivalent to **B11:1/0**. No extra bits are required in this file, we only need one bit for each of the alarm messages (**ST10:0** through **ST10:31**).

Create a new bit file large enough to store 32 bits (2 words).

Data File Properties

General

File: 11

Type: B

Name:

Desc:

Elements: Last:

Attributes

Debug

Skip When Deleting Unused Memory

Scope

Global

Local To File:

Protection

Constant Static None

Memory Module

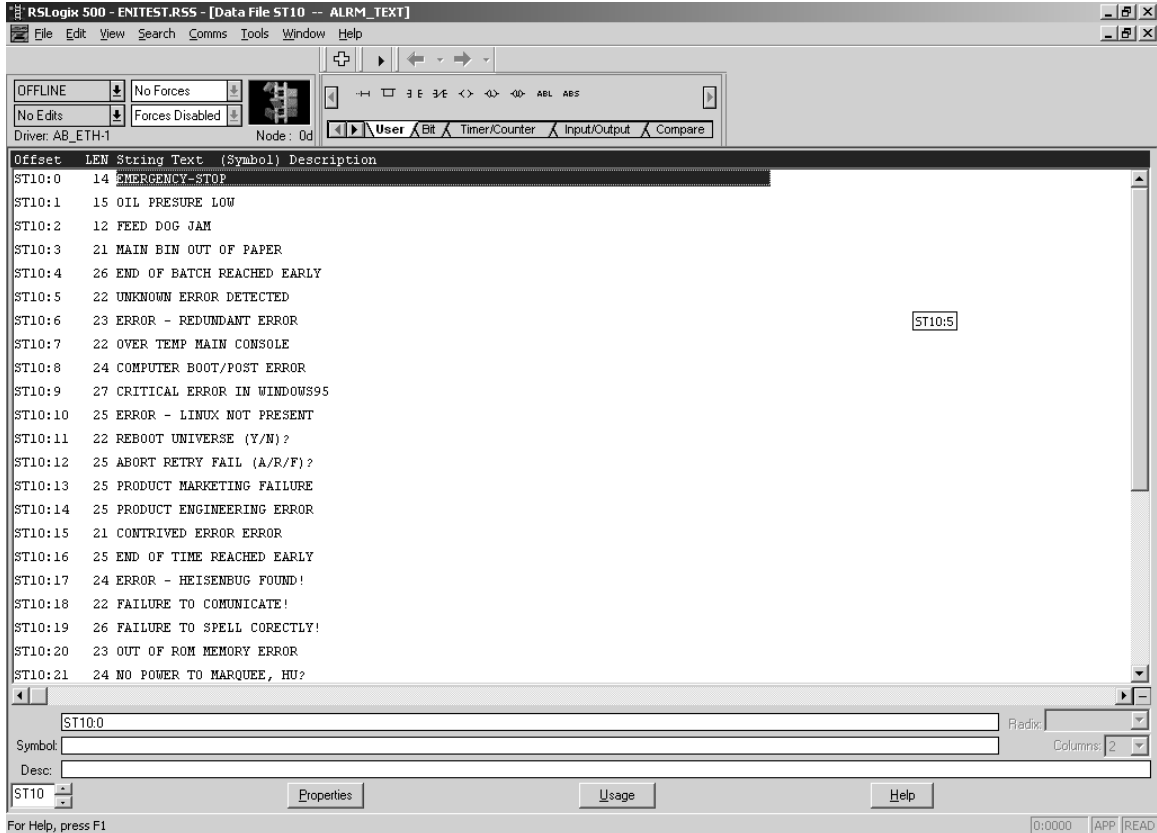
OK Cancel Apply Help

6.3 Entering the Alarm Text

Open the Alarm Text string file **ST10**, and enter the text of your alarm messages. Keep in mind that the last alarm (**ST10:31** in our example) will be the default alarm. The ladder logic will automatically activate the default alarm if none of the other alarms are active. The default alarm is typically set to something like “Welcome to the paint shop!” or “All is well!”.

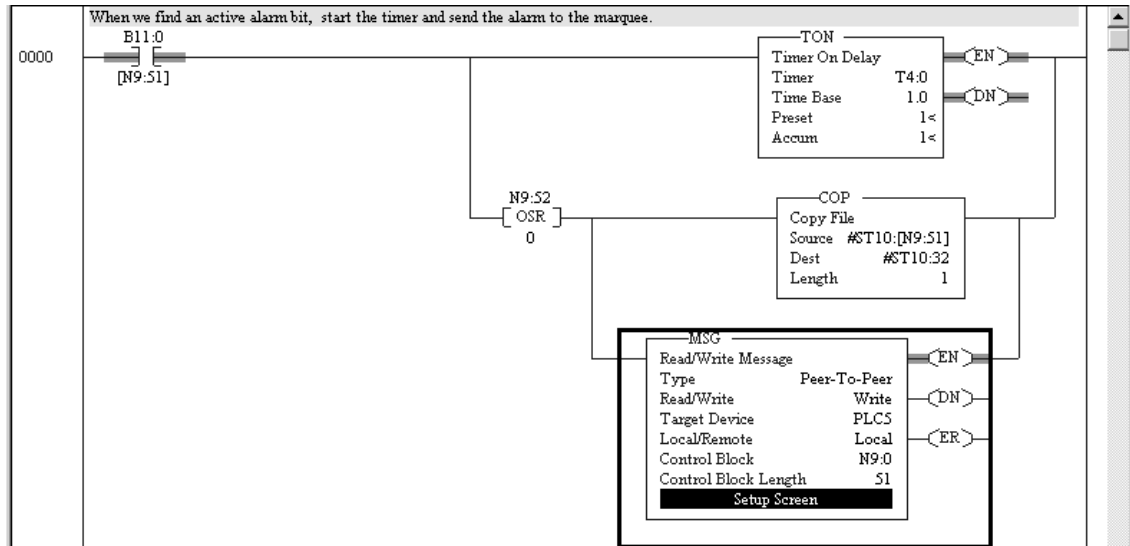
For our example **ST10:0** through **ST10:30** store the text to display on the marquee when the associated alarm bit is set. **ST10:31** stores the default alarm message, which is displayed on the marquee when none of the other alarm messages are active.

The text of the currently displayed alarm is copied into **ST10:32** before being sent to the marquee via the **MSG** instruction.



6.4 Creating the Ladder Logic

Now we will create ladder logic that will scan the bit file to locate active alarms, and send those alarms to the marquee. It takes three rungs of logic to accomplish this. The first rung is shown below.



Later in the logic, we will arrange for **N9:51** to index from 0 to 31 repeatedly. The **XIC** (Examine If Closed) instruction that begins this rung uses indirect addressing to check a bit in the bit file. The bit checked is pointed to by **N9:51**. Thus when **N9:51** is 12, **B11:0/12** is the bit checked. When **N9:51** is 31 then **B11:0/31** also known as **B11:1/15** is checked.

If the alarm bit is true, then we start a timer (**TOC T4:0**), copy the selected alarm message **ST10:[N9:51]** to **ST10:32**, and send the alarm message to the marquee using the **MSG** instruction.

The **TON** (Timer On-Delay) instruction preset value controls how long the alarm should be displayed before moving on to the next alarm. This should probably be set to something between one and three seconds.

The **OSR** (One Shot Rising) instruction limits the **COP** (Copy) and **MSG** (Message) instructions to only executing one time for each active alarm. In our example, we used a spare bit in **N9**, **N9:52/0** to back the **OSR** instruction.

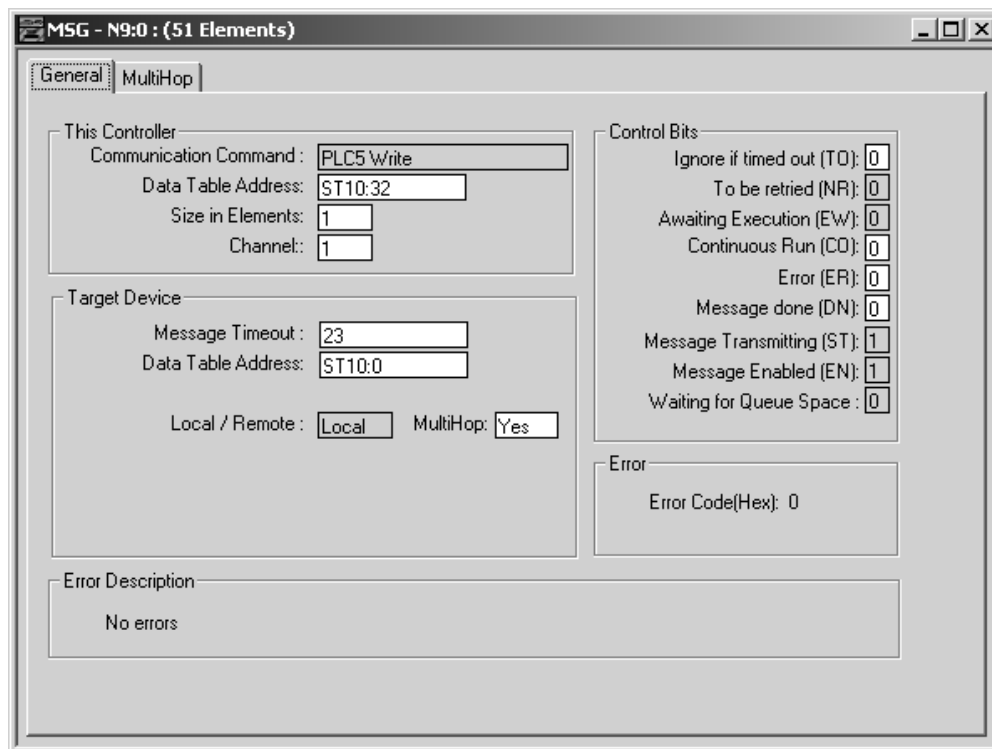
The **COP** instruction copies the text for the current alarm **ST10:[N9:51]** to **ST10:33**. This is to work around the fact that the SLC5/05 MSG instruction does not support indirect addressing.

The **MSG** instruction does the heavy lifting of sending the alarm text stored in **ST10:32** to the marquee. Details on the **MSG** instruction setup are covered next.

We need to configure the **MSG** instruction in such a way that a **PLC5 Typed Write** to **ST10:0** will be sent to the marquee. For our example, configure the **MSG** instruction as follows:

- Set the Type field to **Peer-To-Peer**
- Set the Target Device field to **PLC5**
- Set the Local/Remote field to **Local**

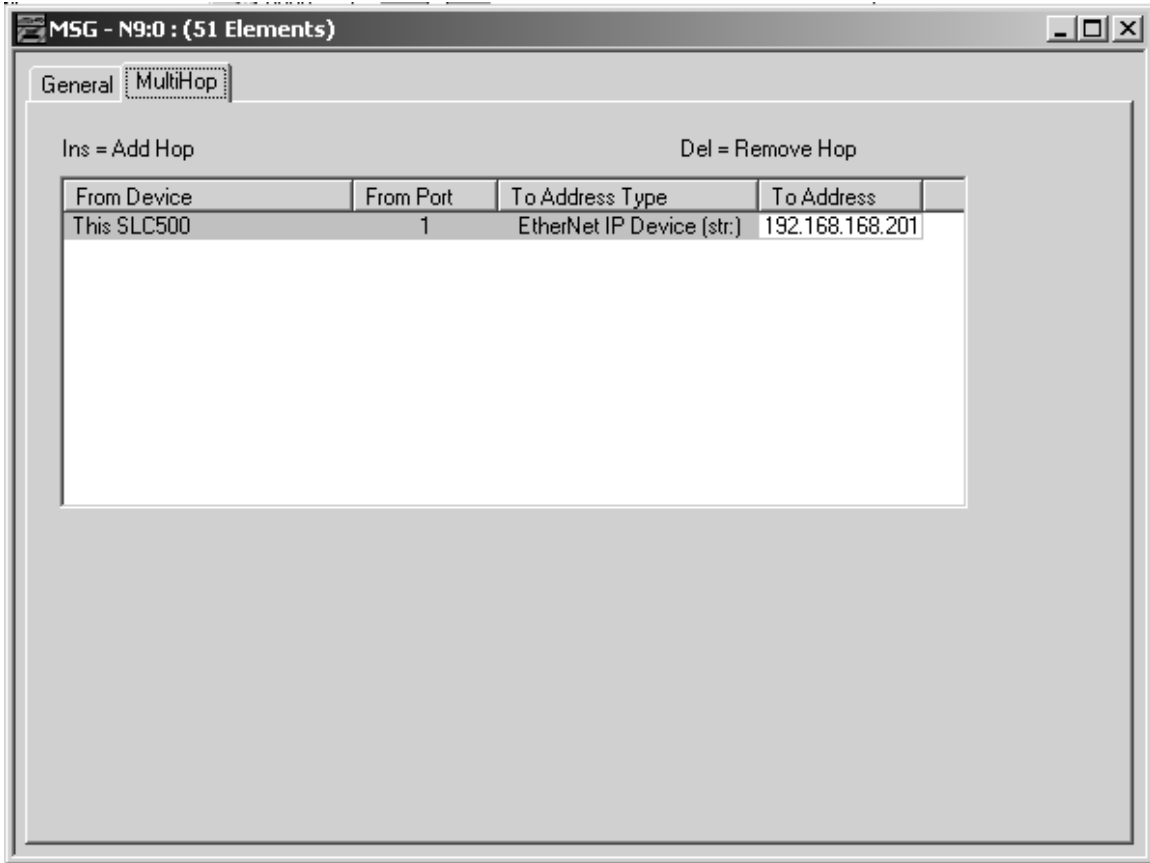
Double Click Setup Screen to bring up the **MSG** Instruction configuration dialog box.



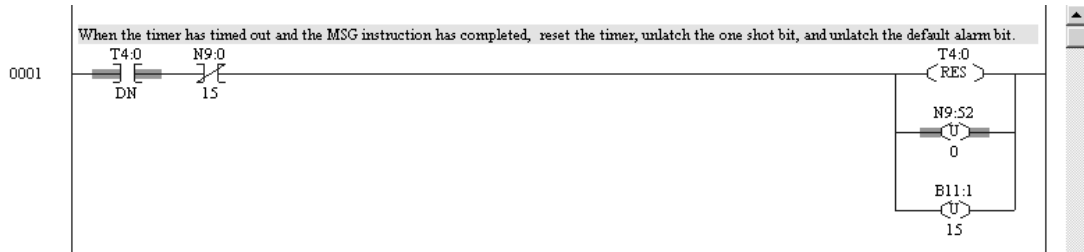
Set This Controller Data Table Address to **ST10:32**. Set the size in elements to **1**, and for our example we will use **Channel-1** which is an EthernetIP port.

Set Target Device Data Table Address to **ST10:0**. The marquee will ignore writes to any data table address other than **ST10:0**. Set MultiHop to **Yes**. The ENI module will not forward the packet to the marquee unless MultiHop is set to Yes.

On the MultiHop Tab, enter a single hop, from the SLC5/05 to the ENI IP address (192.168.168.201 in our example). Even though it is only one hop, the ENI module will not deliver the message to the marquee unless MultiHop is enabled



The 2nd rung detects when both the timer has timed out and the message instruction has completed. The **MSG** instruction typically completes in a fraction of a second, but can take tens of seconds to complete when there is a communications problem between the SLC and the marquee. The timer times out at the specified preset time interval, typically about two seconds.



When both the timer has timed out and the message instruction has completed sending the message, we reset the timer **T4:0**, unlatch the one shot rising bit **N9:52/0**, and unlatch the alarm bit associated with the default alarm **B11:1/15**.

Resetting the timer allows the third rung to begin indexing again so we can find the next active alarm.

Unlatching the one shot rising bit allows the **COP** and **MSG** instructions in the first rung to execute when we find the next active alarm.

We unlatch the default alarm bit because we found an alarm to display, the default alarm should not be displayed as well.

The logic that makes **N9:51** index from 0 to 31 also latches the default alarm bit (**B11:0/31** also known as **B11:1/15**) when **N9:51** wraps back to zero. When an active alarm has completed display, this rung unlatches the default alarm bit. This logic guarantees that at least one alarm is active. The marquee will display an error message if no alarms are received for 15 seconds.

If you expand the number of supported alarms, adjust this rung to unlatch the bit associated with the default alarm. The default alarm is the last alarm.

7.0 Alarm Text Enhancements

Text enhancements are character sequences that are embedded in an alarm to modify the way in which the alarm is presented on the marquee.

7.1 Flash Toggle [CTRL-F]

To make a word or phrase in an alarm flash, surround the word or phrase with [Control-F] characters. It is important to always use [Control-F] characters in pairs. One to turn flashing on, and one to turn flashing back off.

The following alarm text makes the word “Flashing” flash on the marquee:

`^FFlashing^F Message`

7.2 Line Control [CTRL-Z][n]

Embed a [CTRL-Z][n] sequence within an alarm to change which line the text is printed on. A [Control-Z][1] sequence instructs the marquee to display text in a two inch tall font, on the top half of the marquee. A [Control-Z][2] sequence instructs the marquee to display text in a two inch tall font, on the bottom half of the marquee. A [Control-Z][0] sequence instructs the marquee to display text in a four inch tall font, in the center of the marquee. If you do not embed any line control commands in your alarm text, the 2800 defaults to displaying the alarm on line 0 – 4” font centered on the marquee vertically.

The alarm text makes the marquee display the text “2800” in a four inch font, the text “Top” in a two inch font on the top half of the marquee, and the text “Bottom” in a two inch font on the bottom half of the marquee.

`2800 ^Z1Top^Z2Bottom`

8.0 Problem Solving

Before contacting ALI for technical support, please verify the following:

- 1) BAUD RATE, The baud of the sign must be identical to the controlling device.
- 2) SELF TEST, The power on test performed properly.
- 3) WIRING, Review the sections on electrical installation.

8.1 Getting Technical Support by Phone or Fax

If you need technical assistance, contact us by phone or fax and please have the following information available:

- 1) Customer Name, Address, Phone, Fax.
- 2) Model number.
- 3) Serial number.
- 4) Description of the problem.

The serial number and model number of the marquee can be located on the backside of the meeting timer imprinted on a SILVER ID TAG.

American LED-gible Inc. (614) 851-1100 September 2003 Model # EL-2800-902 Serial # SO-6316-001
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American LED-gible technical support may be reached at:

Phone: (614) 851-1100
Fax: (614) 851-1121
E-mail: ledgible@ledgible.com
WWW: www.ledgible.com

9.0 Limited Warranty

We warrant to you that your AMERICAN LED-gible BRAND DISPLAY, when purchased by you, will be free from defects in material and workmanship, under normal use, for one year from date of delivery. If your LED-GIBLE BRAND DISPLAY should prove to be defective within the warranty period, we will repair it (or, if we think necessary, replace it) without charge to you.

To obtain service, please call our Customer Service Department at 1-614-851-1100 or write to:

AMERICAN LED-gible Inc.
1776 LONE EAGLE STREET
COLUMBUS, OHIO 43228

We will furnish you with shipping instructions. This warranty covers merchandise returned to American LED-gible for repair, not in plant repairs. Should you need an in plant repair at your facility, American LED-gible will schedule a trip. Rates are per diem, plus travel expenses.

ALI shall have the right of final determination as to the existence and cause of the defect. This warranty expressly excludes any defects or damages caused by accessories, replacement parts, or repair service, other than those which have been authorized by ALI. This warranty does not cover any damage caused by accident, misuse, shipment, or other than ordinary use.

This warranty excludes all incidental or consequential damages. Some states do not allow the exclusion of, or limitation of, incidental or consequential damages, so the foregoing exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. This warranty is in lieu of any other warranty, express, written, implied, or statutory, and no agreement extending or modifying it will be binding upon ALI, unless in writing and signed by duly authorized officer.

If your AMERICAN LED-gible DISPLAY is outside the warranty period, please call our Customer Service Department as above. After you return the unit to American LED-gible, we will estimate the repair charges, and contact you so a purchase order can be issued. Again, should you require in-house repair of your displays, ALI rates are per diem, plus travel expenses. Please make sure to call, so a trip can be scheduled if this option is preferred.

LIMITATION OF LIABILITY:

If this product is not in good working order as warranted above, your sole remedy shall be repair or replacement as provided above. In no event will ALI be liable for special, indirect, or consequential damages, or any damages whatsoever resulting from loss of use, data, or profits arising out of, or in connection with this contract or the use or performance of ALI products, whether in an action of contract or tort, including negligence. ALI's liability for damage to property shall be limited to the cost of the product sold to the buyer.