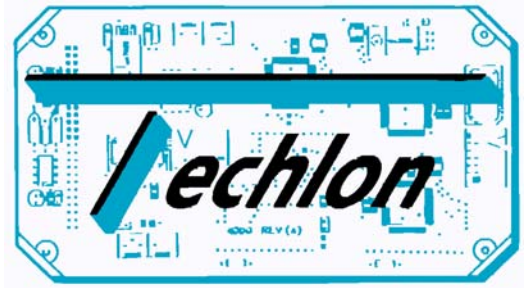

Simple.Sensible.Smart

TELN 1037
Automotive 5 Relay Node
Version 1.0

Users Manual
January 1998

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TELN 1037
Automotive 5 Relay Node

LonWorks™ Automotive 5 Relay Node

INTRODUCTION

Techlon's Automotive 5 Relay Node (Teln 1037) is designed to supply five separate DC (12 volt) load-monitored source to ground relay outputs. This Relay module is primarily designed to power devices where direct switch control is advantageous, (i.e. lights and motors). The module has a five input remote switch control for convenient local access. The module is supported with a reset switch, service switch and service LED, a 15-entry FIFO error array, internal self test, local set-point, and value scaling. (See Figure 1.0) Each output is supported by local load fusing, a manual override button, load state indication, programmable output function, and load current and voltage sensing.

A number of connector schemes are supported:

- Communication and logic power: dual RJ45 phone or .2" center to center terminal locks.
- Load supply: .3" center to center terminal block, .25" Fastcon spade connection, or AMP INNERGY series PC mount connectors.
- Load output: .3" center to center terminal block, .25" Fastcon spade connector, or AMP INNERGY series PC mount connectors.
- Switch input .25" center to center terminal block.

The board is mounted on grounding standoffs. There is also a grounding connection to the board, and a chassis ground stud on the outside of the module enclosure.

Contacts and Service representatives:

Susan Gabel -President	Services Warranty Information.
Brian Gabel - VP/Director of Engineering	Services Hardware Problems.
Kevin Miller -Senior Software Engineer	Services Software Problems.

Call 1-(610)682-9764 and ask to be connected to your party.

Specifications.

- 2K Ram
- 512 Byte EEPROM on Neuron Chip for (Network Information).
- 32K EPROM for (application code).
- Voltage: Operating: 8V–18V DC; Max.: 7.5V–33V DC
  Expanded voltage available.
- Five Loads @Max. 20A.
- Max. Power for each load 240 Watts.
- Operating Temperature: -40° C to +85° C.
- Storage Temperature: -60° C to +100° C.

Dimensions

- Board Dimensions 5.25”w x 3.0” h x 1.2” deep.
- NEMA 1 packaging is supported by a 7.5”w x 4.0” h x 1.75”deep two-part irradiated aluminum chassis, with slots for mounting screws and an external 6-32 stud for chassis grounding.
- Other package and connector configurations available by request.

Transceiver Support

TELN 1037 Provides support for the following types of transceivers:

- 1.2M TPT
- 78K TPT
- RS-485
- 78K Free Topology (FTT-10)
- Direct-Connect (up to 90 feet)

DC Power Supply Information

Module logic power can be drawn from any fused load supply or from the module’s communications cable. ***Note***: Although the communication cable supplies positive and chassis ground voltages for the board logic, you must supply separate load returns (chassis ground) to each load for operation.

Module positive (+)load power is supplied to the node through the Bus Bar terminals T1 and T2 (marked +SUP. on the enclosure cover). ***Note***: These two terminals are electrically connected on the board, so that both blocks must be disconnected to remove power from the board.

Equipment

Techlon Provides:

- 1 TELN 1037 Automotive 5 Relay Node unmounted or mounted in a NEMA 1 packaging supported by a 7.5"w x 5.75" h x 1.75"deep two-part irradiated aluminum chassis, with slots for mounting screws and an external 6-32 stud for chassis grounding. (Customized mountings are available.).

Must be supplied by customer:

- Power source: 12V DC, 500mA source for logic.
- Power cables.
- Communication cables.

Operation

Safety Warning

HAZARD OF SEVERE ELECTRICAL SHOCK OR BURN.
Remove power to unit before opening the cover.
Replace fuses only with approved automotive types rated for the loads connected to this device.

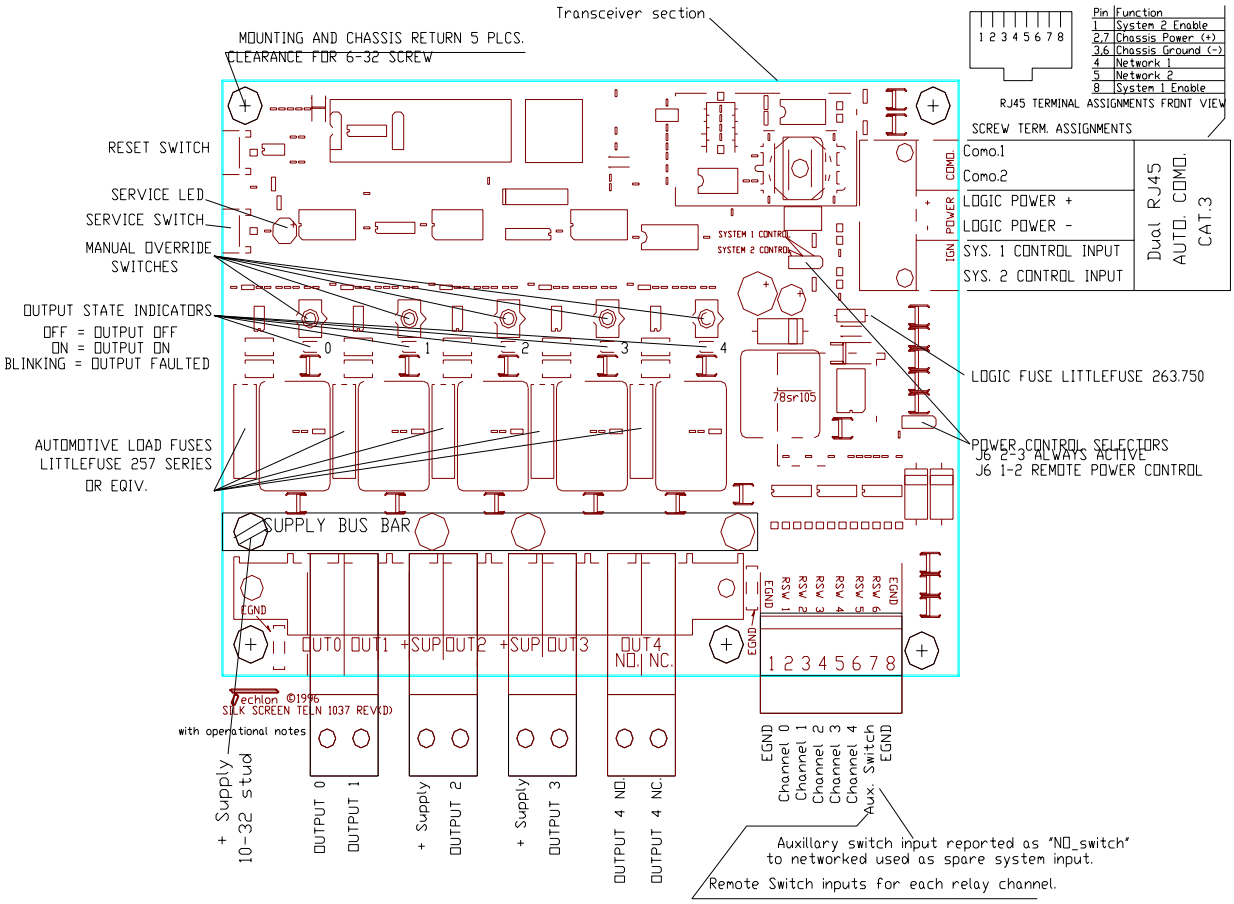
When the unit is first powered up, Service LED will flash once quickly. After approximately 1 second the board will have completed self tests, and any changes to unit status will be indicated by the module's LED indicators:

LED	ON	OFF	Flash
Service (yellow) Indicates the state of the module	Application-less (off-line) and unconfigured	On-line and Neuron application and network parameters configured	With application (on-line) but unconfigured. Or, board information is being downloaded to the network
Load (red) Indicates the state of each load	Load is ON	Load is OFF	Load has fault. Fuse may need to be changed.

The Service switch is used to initiate a network management message identifying the module to the network. The Reset switch resets system logic and forces all outputs to their OFF state.There are five manual override switches located behind the load terminals, these switches are used to turn on and off the power to the loads. The switches can be used independent of the Network to verify the working order of the hardware.

- The input network variables are used for controling the TELN 1037.
- The output network variables are used for status from the TELN 1037.
- The Configuration network variables are used for the configuration of the TELN 1037 .The Network Variables can be found in the following appendiecs.
- Appendix A: has a list of Input Network Variables.
- Appendix B: has a list of Output Network Variables.
- Appendix C: has a list of the Configuration Network Variables.

TELN 1037 Automotive 5 Relay Node



Techlon TELN 1037 Rev.(D) Installation Notes

Figure 1.0 TELN 1037 Automotive 5 Relay Node

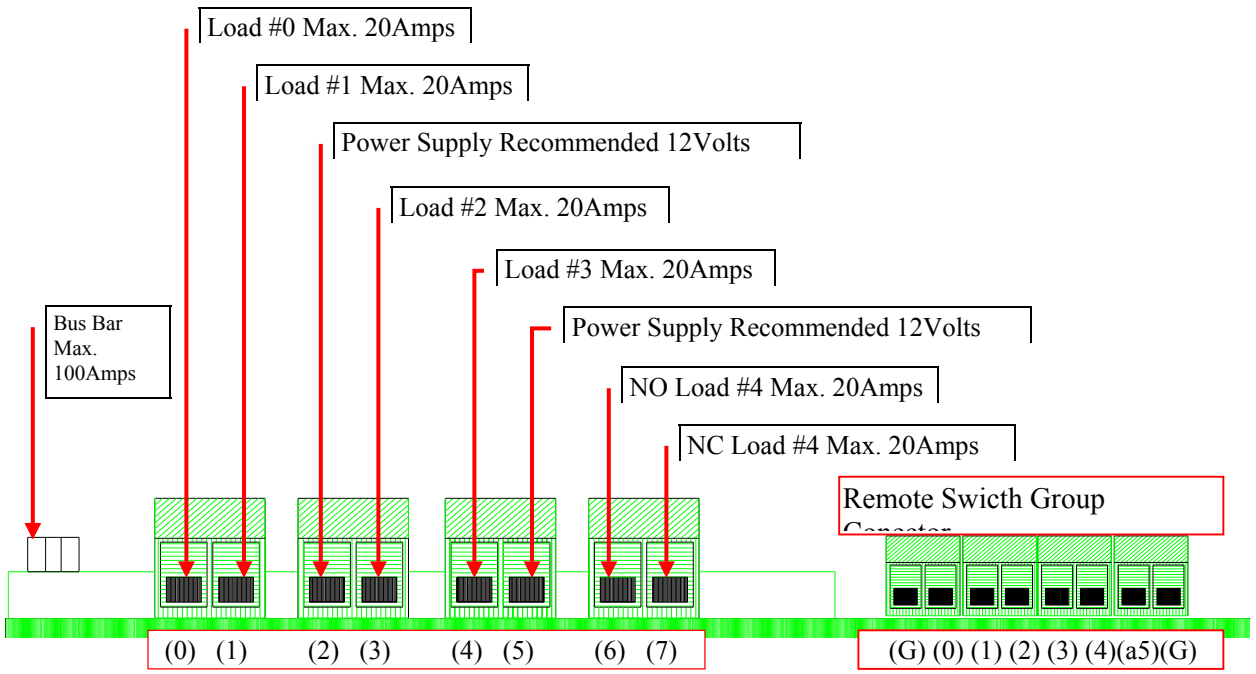


Figure 2.0 TELN 1037 Automotive 5 Relay Node

The TELN 1037 may be connected to 5 loads.
Warning the MAXIMUM LOAD must not exceed 12V with a 20A draw. If over loaded, the Relays could be damaged.The wire gauge and fuse size should be chosen accordingly to the current drawn for each load

To wire the TELN 1037 Automotive 5 Relay Node:

1. Refer to figure 2.0 for connector locations. Connect wires into connectors as needed following location and descriptions from figure 2.0

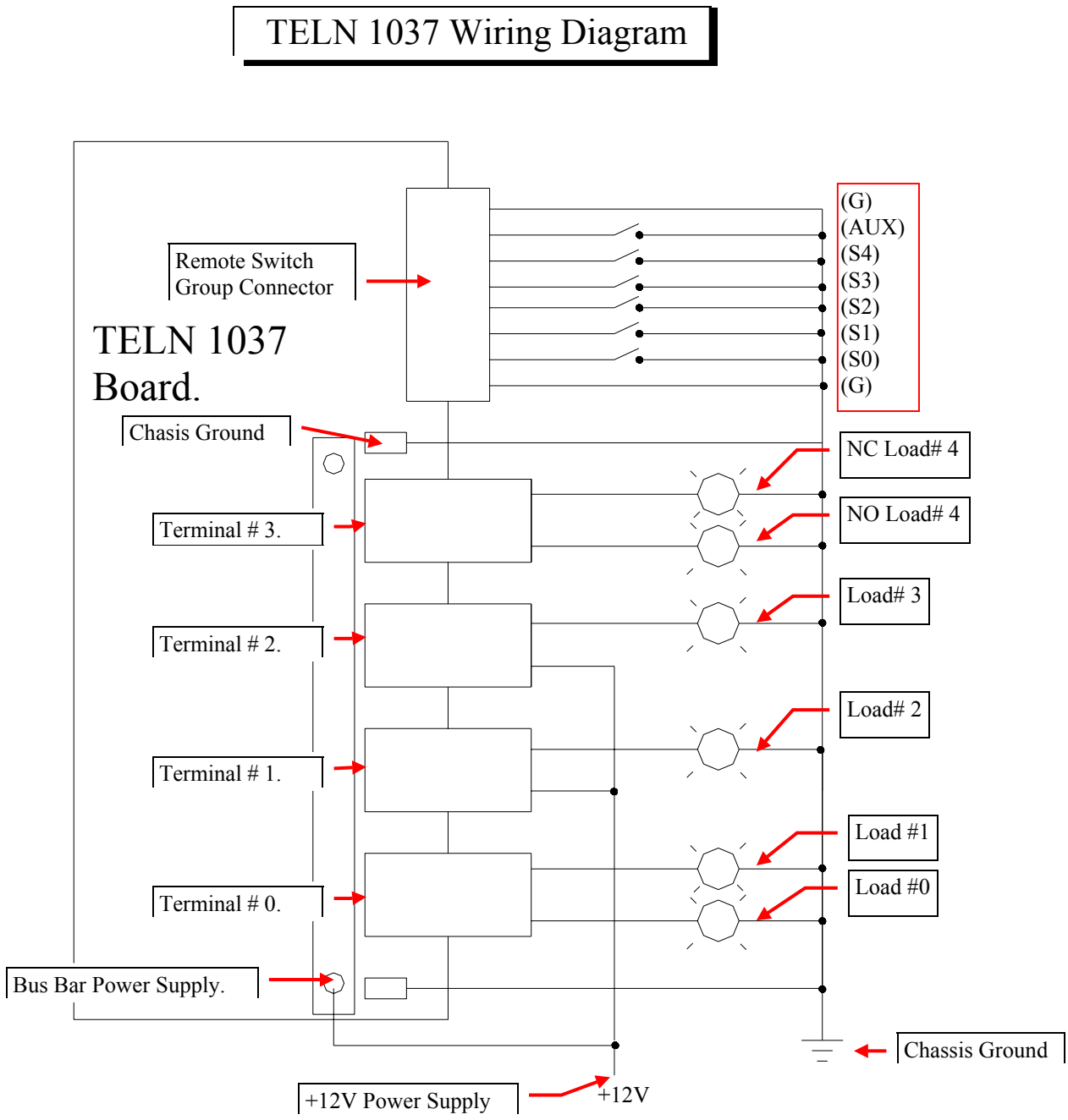


Figure 3.0 TELN 1037 Wiring Diagram

RJ45 Communication Wire Schematic

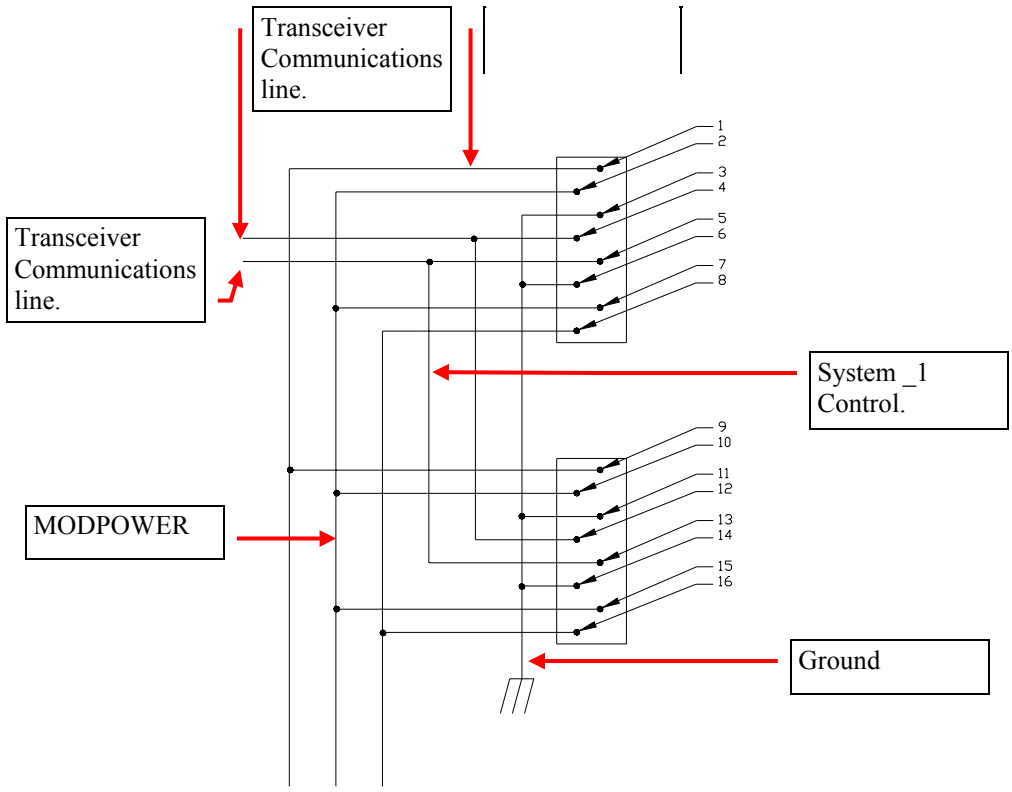


Figure 4.0 RJ45 Com. Connectors

MODPOWER- Secondary Power supply.[Pins 2,7,10,15]
System _1 Control.- Control for alternate power supply of System_1.[Pins 16,8]
System_2 Control.- Control for alternate power supply of System_2. [Pins 9,1]
Ground-System Ground [Pins 11,5,3,7]
Transceiver Communications line(1) -Twisted pair [Pins for TP1 are 12,4]
Transceiver Communications line(2) -Twisted pair [Pins for TP2 are 13,5]

Network

Though the TELN 1037 may be used as a standalone device, connecting it as a member of an integrated peer to peer network, it will permit all the board's functions to be used and configured to their maximum benefit.This allows you to control outputs, read the status, check error tables, calibrate and scale analog values, and rebind control devices.
To install the device onto a network:

Module Installation Into The Network

1. Check to make sure that the module's transceiver type is supported by the general network arrangement (i.e., TP/XF-78). If not, a router module may be required.

2. Connect the ground wire to the lug on the board or the stud on the enclosure.

3. Connect the Power and Output wires as depicted in figure. 2.0 This will power the board and connect the loads to the Outputs.

4. Connect the telephone type cable [RJ45] from the Network.

5. With the Network Management tool attached to the Network, INSTALL the node. Click on INSTALL; then, when prompted, press the service button [next to the yellow LED] on the TELN 1037 board. At this time the network will be downloading application information to the node and the Yellow service LED will blink for the duration indicating the download is taking place. When the download is completed the LED will turn off. When the process is completed, click the WINK button. This will cause the 5 small load LEDs on the TELN 1037 board to blink for 10 seconds. Do a TEST for the TELN 1037 node (See table 1.0 for more information). When this is finished, click on the CLOSE button to return.

6. Manual override test. Press each manual override button [small pushbuttons located next to the 4 plug connectors]. The corresponding load will turn on, as well as its load LED [the small LED located behind the heatsink of each load terminal].

7. This board can now be used for its intended Network application.

Table 1.0 Test Results
Node TELN 1037 Test Results

Name:	Result:	Explanation:
General Information		
Neuron Chip Model:	The model number.	This returns the model number of the neuron chip used on the TELN 1022.
Software Version:	The firmware version number.	This gives a version number for the neuron firmware code.
Last Error logged:	This gives an Error Condition Code found in Appendix E:	The Last Error logged.
Last Reset Caused:	Either a Network or Hardware reset. A. Power Up. B. Watchdog Time-out. C. External. D. Software.	The reasons that the node reset.
Bypass:	Either: Yes or NO	This refers to the nodes ability to repetitively pass on network messages.
State:	Status of Node. A: On-line B: Off-line C: Unconfigured. D: Applicationless.	The states are defined as. A: On-line means all Normal and activated. B: Off-line means all Normal but not activated. C: Unconfiguared means all Normal but configuration variables not set. D. Applicationless could be either a normal or abnormal condition. This means that there is no Application code for the node or the application code is corrupted.
Lost messages:		
Network Layer:	The result will be a number of errors.	The node received a message that it did not understand.
Application layer:	The result will be a number of errors.	The node received a message but was confused by an application code error and did not know how to proceed with internal operations. If the error occurs the reason could be that there is either inadequate buffer space or the node is too busy.
Communications Problem:		
Transmission Errors	The result will be a number of errors.	These errors are due to a bad communications cable connection.
Receive trasns full error:	The result will be a number of errors.	The receive message buffer is full. All messages cannot be received and are consequently lost.
Transaction Time-outs:	The result will be a number of errors.	The time limit set (time needed for a message to be sent and received by the node) has expired.

Network Variables

Input variables are for the following (see Appendix A for functional Input Network Variables and Appendix C for configuration Input Network Variables):

- Control sequence of each channel
- Various presets for each load
- Module "MASTER" input
- Module "DISABLE" input
- Module "SYNC" input
- Configuration and scaling

Output variables are for the following (see Appendix B for Output Network Variables):

- Status of each load
- Status of module
- Sequence pass-through of each load
- Supply voltage of module
- Applied current and voltage of each load
- Error log for module
- Diagnostic information for module

Appendix A: Input Network Variables

The node uses the following input network variables. The network variables are ordered alphabetically by variable name, i.e., NI_*name*.

Input Network Variables	Variable Description and Content
NI_disable_ctrl Type: Level Continuous, SNVT_LEV_CON	Disable control input Controls access of all the outputs at once. NI_diable_ctrl is assaciated with Disable_Control (See network variable NI_control_type). 0= Disable off. Any other value disable On.
NI_dummy[] Type: Level Continuous, SNVT_LEV_CON	Dummy input variable to help in binding.
NI_error_clear Type: Count, Event SNVT_COUNT	Clears the stored error list. Any non-zero value will clear all entries in the error list, including the new error flag (first byte of string).
NI_load_level[] Type: Level Continuous, SNVT_LEV_CON	Directly sets each output. 0 = Off 100.0 = 100% = full On. Condition for each of the loads. Zero will turn the load off. Any other value will turn the load on to the percentage indicated. Offset 0 is associated with load 0. Offset 1 is associated with load 1.
NI_load_onetwo Type: Level Continuous, SNVT_LEV_CON	Condition for both loads 0 and 1. Zero will turn both loads off. Any other value will turn both loads on.
NI_load_threefor Type: Level Continuous, SNVT_LEV_CON	Cndition for both loads 2 and 3. Zero will turn both loads off. Any other value will turn both loads on.

NI_master_ctrl Type: Level Continuous, SNVT_LEV_CON	Master Control Input controls all the outputs at once. NI_master_ctrl is accossated with Master_ Controle (See network variables NI_control_type). 0= Off. Any other value load On.

NI_seq_in[] Type: Level Continuous, SNVT_LEV_CON	Sets the state of a load for a sequence action. 0 = Off. 100.0 = 100% = full On. For each load's input sequence level. A value of zero will turn off the associated load and start the sequence timer to turn off the next node connection. A non-zero value will turn the associated load on and start the sequence timer to send the sequence level to the next node connection. Offset 0 is associated with load 0. Offset 1 is associated with load 1. Offset 2 is associated with load 2. Offset 3 is associated with load 3. Offset 4 is associated with load 4.
NI_sync Type: Level Continuous, SNVT_LEV_CON	Synchronizes the load outputs of flash controlled loads. The sync signal for the timer used by the flash controlled loads.

Appendix B: Output Network Variables

The system uses the following output standard network variable types (SNVT). SNVTs are ordered alphabetically by variable name, i.e., NO_*name*.

Output Network Variables	Subdivisions	Variable Description and Content
NO_ad_reading Type: Int'l char set, SNVT_STR_INT		Shows each a/d reading in raw counts. Each analog's raw reading (a/d counts). These are displayed as word strings. The string contains (starting at word zero). The load current readings. The load voltage readings. The supply voltage. The internal a/d test readings. The offsets 11, 12 and 13.
	wide_char[0]	Channel 0 raw current readings.
	wide_char[1]	Channel 1 raw current readings.
	wide_char[2]	Channel 2 raw current readings.
	wide_char[3]	Channel 3 raw current readings.
	wide_char[4]	Channel 4 raw current readings.
	wide_char[5]	Channel 0 raw voltage readings.
	wide_char[6]	Channel 1 raw voltage readings.
	wide_char[7]	Channel 2 raw voltage readings.
	wide_char[8]	Channel 3 raw voltage readings.
	wide_char[9]	Channel 4 raw voltage readings.
	wide_char[10]	Module raw voltage readings.
	wide_char[11]	A/d half scale reading(512).
	wide_char[12]	A/d zero reading (0).
	wide_char[13]	A/d full scale reading(1024).

NO_all_status Type: Level Continuous, SNVT_LEV_CON		The combination of both loads' status's. Faults take precedents. Status States: 0.0 = **Off** - The load is not energized. 0.5 = **Green** - The load is energized and no load errors indicated. 1.0 = **Red** - The load is not energized and either the load voltage or the fuse voltage was too high. 1.5 = **Yellow** -The load is energized, but either the load voltage or the fuse voltage is low. 2.0 = **Blink Green** - The load is energized with a remote switch and the network. 2.5 = **Blink Red** - The load is not energized, and the current was too high. 3.0 = **Blink Yellow** - The load is energized, but the current was too low. 3.5 = **Flash Green** - The load is energized using either the on-board pushbutton or the manual switch. 4.0 = **Flash Red** - The load is not energized and there was a high voltage error. 4.5 = **Flash Yellow** - The load is energized, but there is an a/d error.
NO_current[] Type: count, SNVT_COUNT_INC		Each load's current reading displayed in engineering units. Offset 0 is associated with load 0. Offset 1 is associated with load 1. Offset 2 is associated with load 2. Offset 3 is associated with load 3. Offset 4 is associated with load 4.
NO_dummy[] Type: Level Continuous, SNVT_LEV_CON		Dummy output variable to help in binding.

NO_error Type: Int'l char set, SNVT_STR_INT		The most recent 15 errors. Offset 0 contains the newest and offset 14 contains the oldest. As an error occurs, the oldest error is dropped, all the rest move down one offset, and the new error is loaded in offset 0. The error values are bit mapped. See Appendix E.
	wide_char[0]	Most recent errors.

	" "	Errors {1} though {13}.
	wide_char[14]	Oldest error.
NO_load_status[] Type: Level Continuous, SNVT_LEV_CON		Determines the status of each load. The state of each of the node's loads is given by the load status states listed below. Status States. 0.0 = **Off** - The load is not energized. 0.5 = **Green** - The load is energized and no load errors indicated. 1.0 = **Red** - The load is not energized and either the load voltage or the fuse voltage was too high. 1.5 = **Yellow** -The load is energized, but either the load voltage or the fuse voltage is low. 2.0 = **Blink Green** - The load is energized with a remote switch and the network. 2.5 = **Blink Red** - The load is not energized, and the current was too high. 3.0 = **Blink Yellow** - The load is energized, but the current was too low. 3.5 = **Flash Green** - The load is energized using either the on-board pushbutton or the manual switch. 4.0 = **Flash Red** - The load is not energized and there was a high voltage error. 4.5 = **Flash Yellow** - The load is energized, but there is an a/d error. Offset 0 is associated with load 0. Offset 1 is associated with load 1. Offset 2 is associated with load 2. Offset 3 is associated with load 3. Offset 4 is associated with load 4.

NO_seq_out[] Type: Level Continuous, SNVT_LEV_CON		Sets the state of the next sequenced output by module. Sends cascade to the next module (~1/4 sec.) of each load's output sequence level. 0 = Off. 100.0 = 100% full On. After the load's sequence timer expires, the received sequence in level associated with that load, will be sent to the next node connection to control one of that node's loads. Offset 0 is associated with load 0. Offset 1 is associated with load 1. Offset 2 is associated with load 2. Offset 3 is associated with load 3. Offset 4 is associated with load 4.
NO_status Type: Level Continuous, SNVT_LEV_CON		Indicates the board status. combination of each load's status plus on-board self test. The node's status. this indicates the state of the node. Module Status States. 0.0 = **Off** - Board not energized. 0.5 = **Green** - Board is energized and no errors indicated. 1.0 = **Red** - Any supply voltage error, any high votage or current error. 1.5 = **Yellow** - An a/d error.
NO_switch Type: Level Continuous, SNVT_LEV_CON		This indicates the state of the auxillary switch. A value of zero indicates that the switch is not connected to ground. A value of 200 (100%) indicates that the switch is connected to ground.
NO_voltage[] Type: count, SNVT_COUNT_INC		Each load's voltage reading displayed in engineering units. Offset 0 is associated with load 0. Offset 1 is associated with load 1.

The module uses the following Configuration network variables. The network variables are ordered alphabetically by variable name, i.e., NI_*name*.

SNVT	Subdivisions	Variable Description and Content
NI_control_type[] Type: Level Continuous, SNVT_LEV_CON		This sets four control functions. A. Master_Control. B. Disable_Control. C. Remote_Control. D. Flash_Control.
	master_control	Controls all Outputs at once. The Master_Control function works in conjuction with NI_master_ctrl. It has three states. 0.0= No effect to NI_master_ctrl. 0.5= Off unconditionaly. 1.0= Toggle present effect of NI_master_ctrl.
	disable_control	Controls disable input effect for each load. The Disable_ Control function works in conjuction with NI_disable_ctrl and NI_load_lev. It has three states. 0.0=No effect. 2.0=Disable Off. 4.0=Disable On.
	remote_contol	Controls the remote switch input for each load. It has three states. 0.0=No effect 8.0=Remote Switching Off 16.0=Remote Switching On 24.0=Remote Switching On with no error alam return for no cuurent draw.
	flash_control	Gives Load ability to Flash on and off. It has four states. 0.0 =No effect. 32.0= 0.5 second on/off cont. flash 64.0= 1 second on/off cont. flash 96.0= 2 second on/off cont. flash

The NI_control_type[ ] sets four control variable types as mentioned above.
A. Master_Control.
B. Disable_Control.
C. Remotre_Control.
D. Flash_Control .
The Master_Control controls the functions of loads. It controls their ON/OFF state.

The Disable_Control controls the functions of loads. The Disable_Control functions works in conjunction with NI_load_lev and NI_disable_crtl. Disable_Control can disable or enable NI_load_lev functions in conjuction with NI_disable_ctrl and control loads ability to change from an ON/OFF state.
The Flash_Control allows for a continuous ON/OFF power pulsation of 0.5s, 1.0s, or 1.5s. when load is On.
These Control types can be combined. The following is an example of a combination:
1.0= Master_Control ON.
4.0= Disable_Control ON.
32.0= Flash_Control for a 0.5 second ON/OFF continuous flash.
Thus 37.0 is the variable that sets the load to the above mentioned states.

NI_high_setpt Type: Int'l char set, SNVT_STR_INT		Sets the high set points for each analog channel. The variable is a string. It is used to set the high set points for current and voltage readings. The settings are as follows. 0= disabled. Greater than 0= enabled. 0 to Max. voltage for device by 1/100th of a V. 0 to Max.Current for device by 1/100th of a A. **If these settings are exceeded, the device will shutdown, give an error code and status of Red or Blink Red.**
	wide_char[0]	Set point for current reading on load 0.
	wide_char[1]	Set point for current reading on load 1.
	wide_char[2]	Set point for current reading on load 2.
	wide_char[3]	Set point for current reading on load 3.
	wide_char[4]	Set point for current reading on load 4.
	wide_char[5]	Set point for voltage reading on load 0.
	wide_char[6]	Set point for voltage reading on load 1.
	wide_char[7]	Set point for voltage reading on load 2.
	wide_char[8]	Set point for voltage reading on load 3.
	wide_char[9]	Set point for voltage reading on load 4.

NI_low_setpt Type: Int'l char set, SNVT_STR_INT		Sets the low set points for each analog channel. The variable is a string. It is use to set the low set points for current and voltage readings. The setting are as follows. 0= Alarm disabled. Greater than 0= Alarm enabled. 0 to Max. voltage for device by 1/100th of a V 0 to Max.Current for device by 1/100th of a A If Voltage lower than set point, a steady yellow status will be indicated. If Current lower than set point, a flashing yellow status will be indicated. **(The output will remain energized.)**
	wide_char[0]	Set point for current reading on load 0.
	wide_char[1]	Set point for current reading on load 1.
	wide_char[2]	Set point for current reading on load 2.
	wide_char[3]	Set point for current reading on load 3.
	wide_char[4]	Set point for current reading on load 4.
	wide_char[5]	Set point for voltage reading on load 0.
	wide_char[6]	Set point for voltage reading on load 1.
	wide_char[7]	Set point for voltage reading on load 2.
	wide_char[8]	Set point for voltage reading on load 3.
	wide_char[9]	Set point for voltage reading on load 4.
NI_lock_enable Type:Count,event SNVT_COUNT		This Enables or Disables the ERROR LOAD LOCKING. 0=Lock Disabled. 1=Lock Enabled. If the load is Lock Enabled and a "RED Code" error occurs, then the load will automatically shut off. Default: Lock Enable.
NI_max_on Type: Level Continuous, SNVT_LEV_CON		Sets the maximum PWM level for both of the loads. The range is from 0 to 200, but it is defined as a percent from 0% to 100%. DEFAULT{90%} This is a primary control for PWM. All other variables used to define PWM level will be set to the NI_max_on value if their value exceeds the NI_max_on value.

NI_min_on Type: Level Continuous, SNVT_LEV_CON		Set the minimum PWM level for both of the loads. The range is from 0 to 200. but it is defined as a percent from 0% to 100%. DEFAULT {10%} This is a primary control for PWM All other variables used to define PWM level will be set to the NI_min_on value if their value is less-than the NI-min_on value.
NI_seq_level[] Type:Level Continuous, SNVT_LEV_CON		Determines the level of each sequenced output. This is the load level that will be sequenced out and sent to the next node connection. 0= is associated with load 0. 1= is associated with load 1. 2= is associated with load 2. 3= is associated with load 3. 4= is associated with load 4.
NI_span Type: Int'l char set, SNVT_STR_INT		Sets the maximum setting for each A/D channel (Engineering Units). The span is calculated with the following formula. (RAW A/D count + Present offset)*span/1023 RAW is the digital reading for the A/D. span for Current is 0 to 16.15A. span for Voltage is 0 to 24.00V.
	wide_char[0..4]	Load 0..4's current span setting. Default value set at 1615 = 16.15A.
	wide_char[5..9]	Load 0..4's voltage span setting. Default value set at 2400 = 24.00V.
NI_offset Type: Int'l char set, SNVT_STR_INT		Set the offsets for each A/D channel (RAW COUNTS) 0 to 1 for current readings, and 2 to 3 for voltage readings. All self adjusting.
	wide_char[0..4]	Raw current counts for Load 0..4.
	wide_char[5..9]	Raw voltage counts for Load 0..4.

Appendix D: Master SNVT List

The following is a list of SNVT types used with TELN 1037. SNVT types can be bound only with like SNVT types.

Name	Measurement	Range (Resolution)
SNVT_LEV_CONT	LEVEL, CONTINUOUS	0..100% (0.5%)
SNVT_COUNT	COUNT, EVENT	0..65,535 COUNTS (1 COUNT)
SNVT_CONT_INC	COUNT	-32,768..32,767 COUNT (1 COUNT)
SNVT_STR_INT	INT'L CHAR SET. CHAR SET CODE. 16 BIT CHARS. TERMINATOR.	14 WIDE CHARTERS. 0..255 14 CHAR. 0x0000.

Appendix E: Error Condition Codes

ERROR CONDITION	LOAD 0	LOAD 1	LOAD 2	LOAD 3	LOAD 4
LOW FUSE VOLTAGE	257	513	769	1025	1281
HIGH FUSE VOLTAGE	258	514	770	1026	1282
LOW LOAD VOLTAGE	260	516	772	1028	1284
LOW LOAD AND LOW FUSE VOLTAGE	261	517	773	1029	1285
LOW LOAD AND HIGH FUSE VOLTAGE	262	518	774	1030	1286
HIGH LOAD VOLTAGE	264	520	776	1032	1288
HIGH LOAD AND LOW FUSE VOLTAGE	265	521	777	1033	1289
HIGH LOAD AND HIGH FUSE VOLTAGE	266	522	778	1034	1290
LOW CURRENT	272	528	784	1040	1296
LOW CURRENT AND LOW FUSE VOLTAGE	273	529	785	1041	1297
LOW CURRENT AND HIGH FUSE VOLTAGE	274	530	786	1042	1298
LOW CURRENT AND LOW LOAD VOLTAGE	276	532	788	1044	1300
LOW CURRENT, LOW LOAD AND LOW FUSE VOLTAGE	277	533	789	1045	1301
LOW CURRENT, LOW LOAD AND HIGH FUSE VOLTAGE	278	534	790	1046	1302
LOW CURRENT AND HIGH LOAD VOLTAGE	280	536	792	1048	1304
LOW CURRENT, HIGH LOAD AND LOW FUSE VOLTAGE	281	537	793	1049	1305
LOW CURRENT, HIGH LOAD AND HIGH FUSE VOLTAGE	282	538	794	1050	1306
HIGH CURRENT	288	544	800	1056	1312

HIGH CURRENT AND LOW FUSE VOLTAGE	289	545	801	1057	1313
HIGH CURRENT AND HIGH FUSE VOLTAGE	290	546	802	1058	1314
HIGH CURRENT AND LOW LOAD VOLTAGE	292	548	804	1060	1316
HIGH CURRENT, LOW LOAD AND LOW FUSE VOLTAGE	293	549	805	1061	1317
HIGH CURRENT, LOW LOAD AND HIGH FUSE VOLTAGE	294	550	806	1062	1318
HIGH CURRENT AND HIGH LOAD VOLTAGE	296	552	808	1064	1320
HIGH CURRENT, HIGH LOAD AND LOW FUSE VOLTAGE	297	553	809	1065	1321
HIGH CURRENT, HIGH LOAD AND HIGH FUSE VOLTAGE	298	554	810	1066	1322
STUCK RELAY	320	576	832	1088	1344
STUCK RELAY AND LOW FUSE VOLTAGE	321	577	833	1089	1345
STUCK RELAY AND HIGH FUSE VOLTAGE	322	578	834	1090	1346
STUCK RELAY AND LOW LOAD VOLTAGE	324	580	836	1092	1348
STUCK RELAY, LOW LOAD AND LOW FUSE VOLTAGE	325	581	837	1093	1349
STUCK RELAY, LOW LOAD AND HIGH FUSE VOLTAGE	326	582	838	1094	1350
STUCK RELAY AND HIGH LOAD VOLTAGE	328	584	840	1096	1352
STUCK RELAY, HIGH LOAD AND LOW FUSE VOLTAGE	329	585	841	1097	1353
STUCK RELAY, HIGH LOAD AND HIGH FUSE VOLTAGE	330	586	842	1098	1354
STUCK RELAY AND LOW CURRENT	336	592	848	1104	1360
STUCK RELAY, LOW CURRENT AND LOW FUSE VOLTAGE	337	593	849	1105	1361
STUCK RELAY, LOW CURRENT AND HIGH FUSE VOLTAGE	338	594	850	1106	1362
STUCK RELAY, LOW CURRENT AND LOW LOAD VOLTAGE	340	596	852	1108	1364
STUCK RELAY, LOW CURRENT, LOW LOAD AND LOW FUSE VOLTAGE	341	597	853	1109	1365
STUCK RELAY, LOW CURRENT, LOW LOAD AND HIGH FUSE VOLTAGE	342	598	854	1110	1366
STUCK RELAY, LOW CURRENT AND HIGH LOAD VOLTAGE	344	600	856	1112	1368

STUCK RELAY, LOW CURRENT, HIGH LOAD AND LOW FUSE VOLTAGE	345	601	857	1113	1369
STUCK RELAY, LOW CURRENT, HIGH LOAD AND HIGH FUSE VOLTAGE	346	602	858	1114	1370
STUCK RELAY AND HIGH CURRENT	352	608	864	1120	1376
STUCK RELAY, HIGH CURRENT AND LOW FUSE VOLTAGE	353	609	865	1121	1377
STUCK RELAY, HIGH CURRENT AND HIGH FUSE VOLTAGE	354	610	866	1122	1378
STUCK RELAY, HIGH CURRENT AND LOW LOAD VOLTAGE	356	612	868	1124	1380
STUCK RELAY, HIGH CURRENT, LOW LOAD AND LOW FUSE VOLTAGE	357	613	869	1125	1381
STUCK RELAY, HIGH CURRENT, LOW LOAD AND HIGH FUSE VOLTAGE	358	614	870	1126	1382
STUCK RELAY, HIGH CURRENT AND HIGH LOAD VOLTAGE	360	616	872	1128	1384
STUCK RELAY, HIGH CURRENT, HIGH LOAD AND LOW FUSE VOLTAGE	361	617	873	1129	1385
STUCK RELAY, HIGH CURRENT, HIGH LOAD AND HIGH FUSE VOLTAGE	362	618	874	1130	1386

Appendix F: Network Maintenance Neuron Error Codes

no error	0
bad_event	129
nv_length_mismatch	130
nv_msg_too_short	131
eeprom_write_fail	132
bad_address_type	133
preemption_mode_timeout	134
already_preempted	135
sync_nv_update_lost	136
invalid_resp_alloc	137
invalid_domain	138
read_past_end_of_msg	139
write_past_end_of_msg	140
invalid_addr_table_index	141
incomplete_msg	142
nv_update_on_outupt_nv	143
no_msg_avail	144
illegal_send	145
unknown_PDU	146
invalid_nv_index	147
divide_by_zero	148
invalid_appl_error	149
memory_alloc_failure	150
write_past_end_of_net_buffer	151
appl_cs_error	152
cnfg_cs_error	153
invalid_xcvr_reg_addr	154
xcvr_reg_timeout	155
write_past_end_of_appl_buffer	156
io_ready	157
self_test_failed	158
subnet_router	159
Authentication_mismatch	160
self_inst_semaphore_set	161
read_write_semaphore_set	162
appl_signature_bad	163
router_firmware_version_mismatch	164
EEPROM recovery occured	166
triac clockedge +- not supported	167
checksum error over system	168
state byte semaphore	192-223

Appendix G: Trouble Shooting

Problem:	Suggested Solution:
Load (0), (1), (2), (3), Or (4) will not Turn ON.	1. FUSE blown. See figure. 1.0 and check the load to see if less than 20A. Replace Fuse.
	2. No Power to system. A. Cable not in correct place; compare with figure 2.0 for cable placement. B. Power not on; verify with volt meter. C. Power supply insufficient: verify with volt meter.
	3. Load does not work or is not connected. See figure 2.0 for wire locations.
	4.*** Neuron Unconfigured. Load application.
	5.* Neuron chip applicationless. Load application
Manual Override Switches turn On and Off the loads , but loads controlled over the network do not turn On and Off.	1. Check network binding. 2. Check communication cables.
Network Voltage and Current Reading incorrect.	1.** Need to Load scaling. Load Scaling. Refer to Apppendix C: for Network Variable information on NI_SPAN.
	2.* Neuron Applicationless. Load application.
	3. Supply voltage incorrect. Use voltmeter and compare.
Does not talk to Network.	1. Look to see if communication cables are connected. Connect unconnected cables.
	2. Check to see if board is powered. Power unpowered board.
	3.*** Unconfigured. Load application.
	4. Compare communication cables to figure 3.0 if cables are not the same, redo according to schematic.
Board has Power but does not work.	An internal fuse may be blown. You may have an over voltage or too large of a current pull. Verify with a meter.
For all other problem please consult your warranty contract or call the service representatives as listed.	

* Note *

* Using a third party Network management to Load a new application.

** Using a third party Network management tool Load scaling values for your application.

*** Using a third party Network management tool load your application to Configure the Neuron parameters.