Tally Relay

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Table of Contents

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1.1 Manual Overview

This manual provides detailed instructions for installing and operating the PESA Tally Relay Panel. This manual is divided into five sections as shown.

Section 1, **INTRODUCTION**, summarizes the manual, describes the Tally Relay Panel product, presents a list of terms, and provides the panel specifications.

Section 2, **INSTALLATION**, provides installation and setup instructions.

Section 3, **OPERATION**, describes system operation procedures

Section 4, **FUNCTIONAL DESCRIPTIONS**, presents an in-depth description of each Tally Relay component.

Section 5, **MAINTENANCE**, explains procedures for maintenance.

1.2 General Description

The Tally Relay panel provides a virtual tally interface. Sixteen front panel mounted LEDs provide a visual indication of which relays are energized. Two additional front panel mounted LEDs indicate the presence of +5VDC and +/-12VDC (Labeled +5V and +24V). With each of sixteen available relays, the user can assign , via software menus on the System Terminal, which system input is represented by each relay. This allows users to tally only those inputs which need to have tally. If more than sixteen inputs need tally, additional Tally Relay panels can be added to the system. In addition to assigning inputs, the user can also specify, again via software menus on the System Terminal, whether FULL OUTPUT or LIMITED OUTPUT tally is to be used for each Tally Relay panel. FULL OUTPUT tally is any system output selecting an input assigned to the panel which causes the relay associated with that input to be energized. If no outputs are entered into the assignment list when configureing the panel at the System Terminal, the panel operates in the FULL OUTPUT mode. LIMITED OUTPUT tally is a subset of outputs defined for this panel (the list can be comprised of as few as one, to as many as sixty four randomly assigned entries chosen from among all system outputs). When any of the outputs defined in the subset list selects an input which has been assigned to a relay on this panel, the relay will be energized. There is also an INCLUDE/EXCLUDE option associated with the LIMITED OUTPUT mode of operation. In the INCLUDE mode, the panel operates as described previously in the LIMITED OUTPUT mode definition. In the EXCLUDE mode, all outputs EXCEPT the ones in the assigned list control the tally. The INCLUDE/EXCLUDE mode is defined on the System Terminal. The System Controller updates the Tally Relay panel each time system status changes.

Each Tally Relay panel must have a unique polling address for proper system communications. This polling address is set on the panel by a DIP switch. Access to the Address DIP switch is provided through plastic covers located in the top of the panel. Communications with the controller are over the PESA coax bus in the form of Manchester II encoded data at 62.5K baud.

Input and Output connections for the Tally Relay are located on the rear of the unit. I/O connections for the relay contacts (J1-J16) are two part, removeable, mini screw, terminal block connector (one six position connector per relay, sixteen total). An auxiliary 25 pin, Female Receptacle, “D” type connector is provided as a parallel I/O interface. This connector allows an external device to actuate a relay independently or to connect an external tally indicator. Two 75 Ohm BNC's (J19 and J20) connected in parallel provide the interconnect to the PESA Coax Communications Bus on the System Controller. A power connector (J18) is supplied ±12VDC and +5VDC by a Plug-in-the-wall style power supply for 115VAC or a desktop style power supply for 230VAC. The unit is housed in a standard 19" wide, 15" deep by 1.75" (1RU) high chassis.

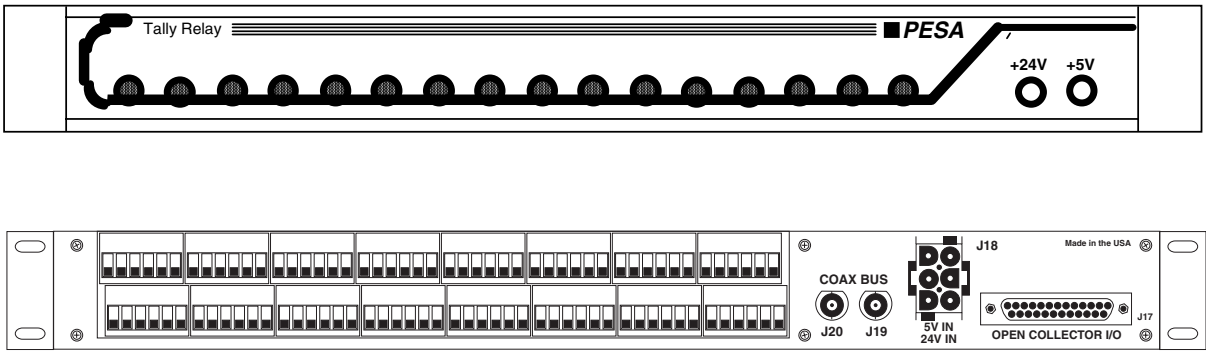


Figure 1-1 Front and Rear View of Tally Relay Panel

SPECIFICATIONS

GENERAL

Mounting	Standard 19" Rack
Displays	1-16 Yellow LED +5V Green LED +24V Green LED

INPUT

Input Number	2
Input Type	75ý BNC Loop-Thru

POWER

Voltage Requirements	+5Vdc @750mA ±12Vdc @200mA
Input Type	115VAC Plug In
Input Connection	6 Pin M-N-L Power Pack 230VAC Desk Model Power Pack
Auxiliary Connection	25 Pin 'D" Receptacle
Switching Relays	Max. Switched Power 60W or 125VA
Max. Switched Current	2AMPS
Max. Switched Voltage	220VDC or 250VAC
U.L. Rating	2AMP @ 30VDC 1AMP @ 120VAC

MECHANICAL

Dimensions **1 3/4** [44.45mm] H x **19** [482.6mm] W x **15** [381.0mm]D

ENVIRONMENT

Temperature	0°C to 40°C (32°F to 104°F)
Humidity	20% to 90%

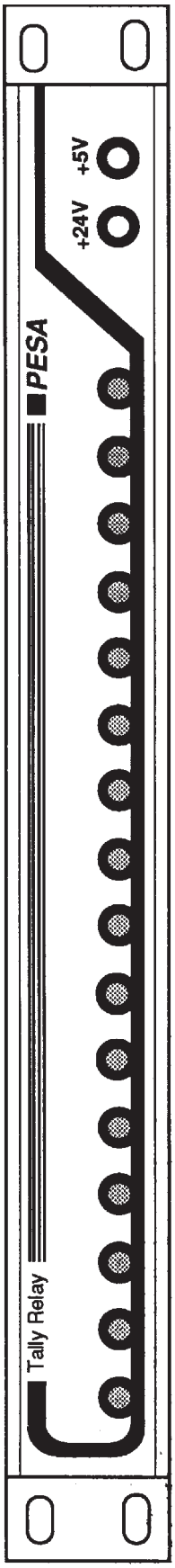


Figure 1-2 Front View of Tally Relay Panel

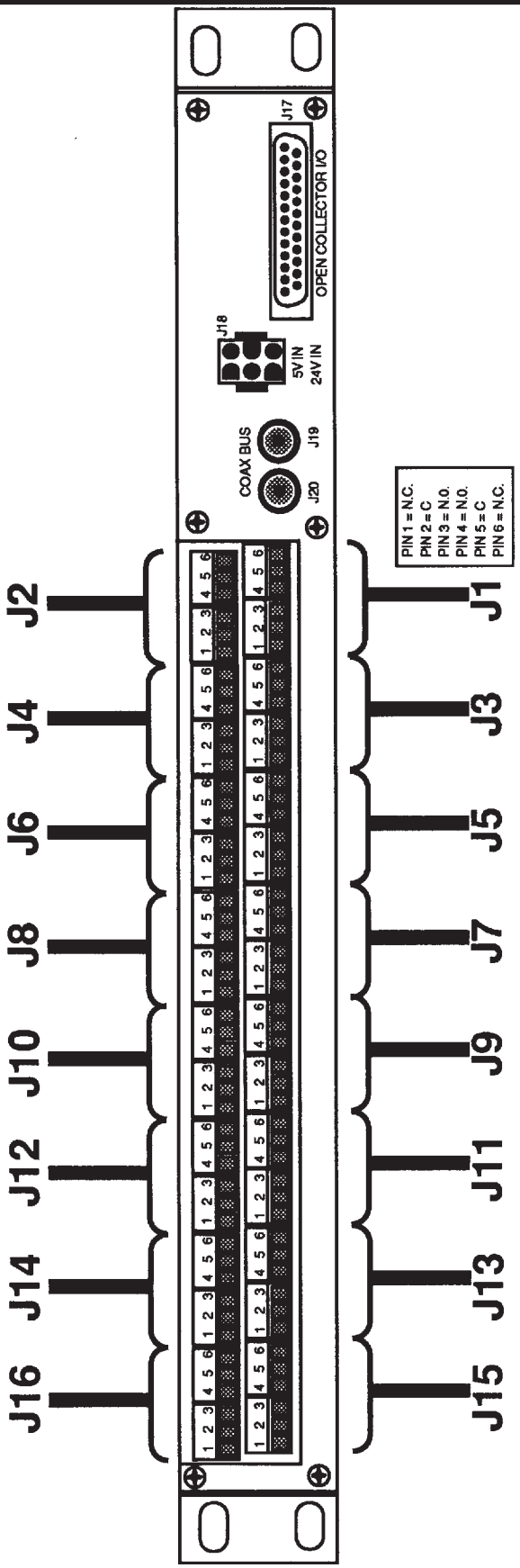


Figure 1-3 Rear View of Tally Relay Panel

2.1 Introduction

This section details the Tally Relay panel installation procedures. The following topics are discussed:

- Receipt Inspection
- Location
- Chassis Mounting
- Power Connections
- Cabling

Receipt Inspection

The Tally Relay panel was inspected and tested prior to leaving PESA's Factory. Upon receipt, inspect the unit for shipping damage. If damage is detected, notify the carrier immediately and hold all packing material for inspection. After unpacking, compare all parts received against the packing document. If the unit is undamaged and all components have been received, proceed with the installation of the Tally Relay.

All Tally Relay panels should have the following items included in the shipping container:

• Tally Relay Unit	81906503859
• Power Pack (one type only)	
115VAC Version	81906509831
230VAC Version	81906514188
• Service Manual (this book)	81905900643

Before installing the Tally Relay panel into the rack it is suggested that the serial number be recorded and written down on the Ordering Assistance, Service, and Inquiries Page located in the front of this manual. The serial number can be found on the rear of the panel. Recording this number and referring to it when dealing with Customer Service provides PESA the ability to better service you in the future.

Location

The Tally Relay panel should be positioned for convenient visual and physical location. An area should be selected where temperatures do not exceed 40°C inside the equipment rack. A minimum panel depth of 16 inches is required behind the panel to allow for cabling when installed into a console or equipment rack.

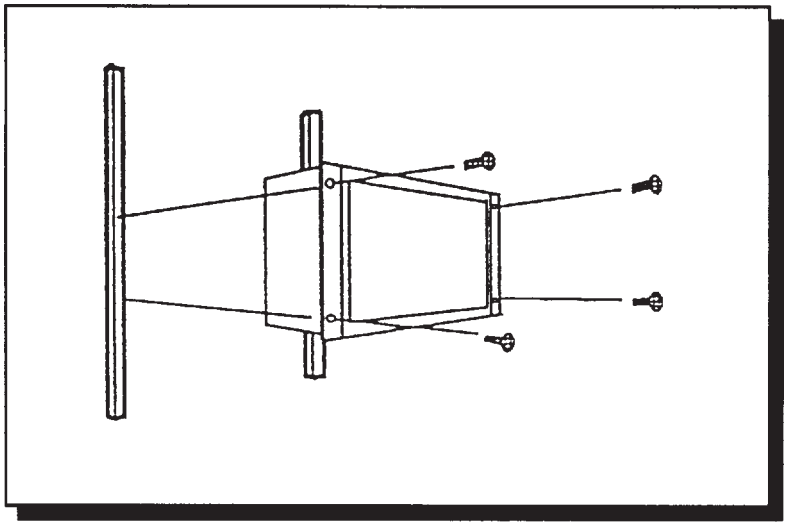
Chassis Installation

Rack Mounted: The Tally Relay panel will fit any standard 19" equipment rack. Sufficient space should be provided behind the chassis to allow for coax and power cable installation. Use the following steps when installing the Tally Relay into a rack mounted unit.

1. Align the Tally Relay panel with the threaded or slotted openings in the rack
2. For ease of installation, and to support the unit, install the two bottom screws first.

(Because of the variety of equipment rack specifications, Rack Screws are not provided with the Tally Relay panel.)

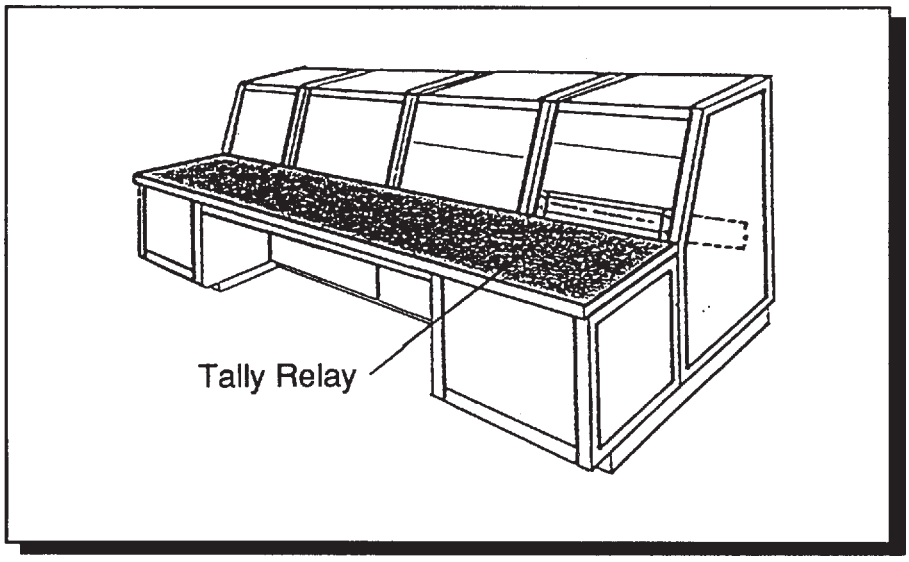
3. Install the two top screws
4. Tighten all four screws securely



RACK INSTALLATION FIG. 2-1

Console Mounted: To mount the Tally Relay panel into a console, first check to insure that a minimum depth of 17 inches is open behind the area the chassis will be located. Use the following steps when installing the Tally Relay panel into a console.

1. Mark an opening:
   17.50 in X 1.75 in
2. Insert the Tally Relay panel into the opening and mark the panel mounting hole locations (4 each)
3. Remove the panel from the opening
4. On panels without metal clips use a drill bit slightly smaller than the mounting screws to be used, drill 4 mounting holes in the center of each mounting hole location.
5. Insert the panel back into the opening and secure with mounting screws.

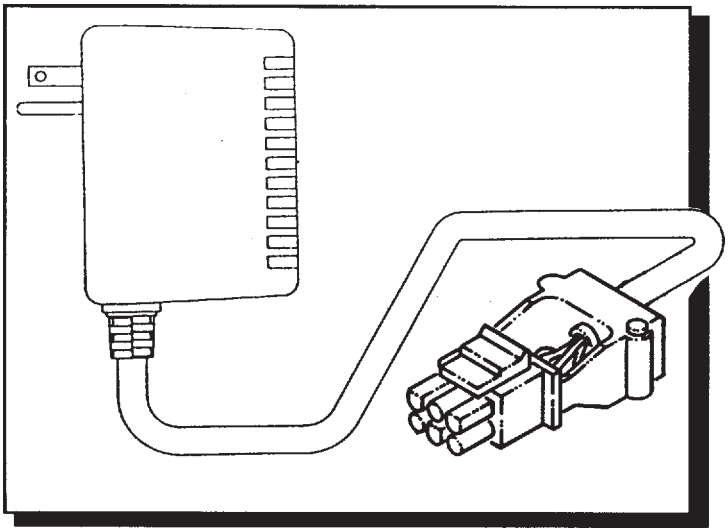


CONSOLE INSTALLATION FIG. 2-2

Power Connections

Power for the Tally Relay panel is supplied by a either a Plug-In-The-Wall type power pack for 115V panels or Desk type power packs for 230V versions.

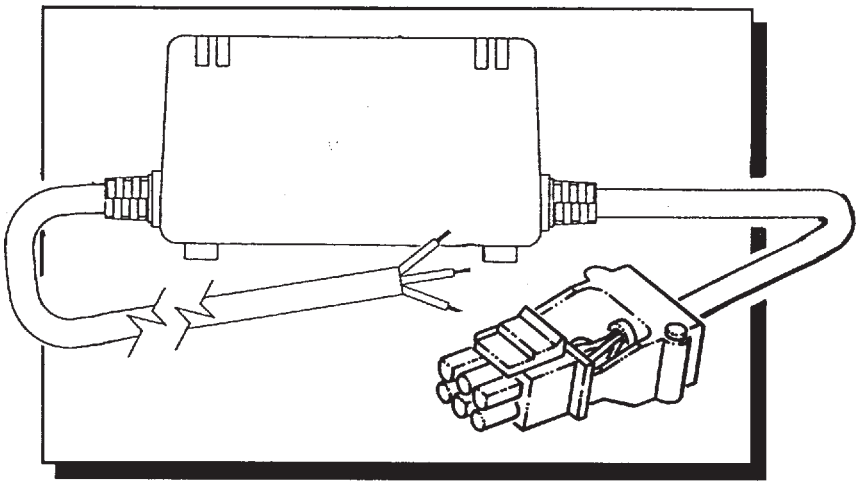
• 115V panels: Remove the Power Pack from the box it was shipped in and check to insure that no damage has occurred in shipping. The 3 pin Mate-N-Lock connector should be plugged into the **POWER IN** position on the back of the Tally Relay panel. The Power Pack is configured for any standard 110VAC-120VAC plug outlet and will immediately power the unit upon connections to AC Voltage.



115V POWER SUPPLY FIG 2-3

• 230V panels: Remove the Power Pack from the box it was shipped in and check to insure that no damage has occurred in shipping. The 3 pin Mate-N-Lock connector should be plugged into the **POWER IN** position on the back of the Tally Relay panel. The 230V version power pack does not have an AC plug. PESA does not provide outlet plugs for 230V Power Packs and leaves the outlet connections up to the customer to provide. A 210V to 240V 50-60Hz power plug outlet for the specific area should be installed. Contact your authorized

PESA products distributor or sales representative if connection hook up cannot be specified.



230V POWER SUPPLY FIG 2-4

Polling and Address Switches

Polling

Settings for the Auxilliary switch are shown in the table below. Position 1 should always be up and positions 2-8 should be down.

TABLE: AUXILLARY DIP SETTINGS		
1	ON	ON=UP POSITION
2	OFF	
3	OFF	
4	OFF	
5	OFF	
6	OFF	
7	OFF	
8	OFF	

DIP SWITCH TABLE - AUX FIG 2-5

Panel Address

The address switch located on the rear of the Tally Relay panel is an 8-bit DIP switch with positions 1 through 8 representing a binary address for each panel. Each panel in the system must have a unique polling address to properly communicate with the Controller and the panel address switch is used to select this address. Positions 1-8 corresponds to the numbers **1**, **2, 4, 8, 16, 32, 64** and **128**. A switch in the DOWN position does not add to the address while a switch in the UP position adds the number associated with that switch. EXAMPLE: Switch **3** (*add. 4*) and **7** (*add. 64*) are up and all others down will give you address 68.

TABLE: PANEL ADDRESS DIP SETTINGS

POSITION	ADDRESS
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128

UP = ON DOWN = OFF

EXAMPLE [FOR PANEL ADDRESS 68
POS. 3 (ADDRESS 4) = UP
POS. 7 (ADDRESS 64) = UP
POS. 1,2,4,5,6,8 = OFF

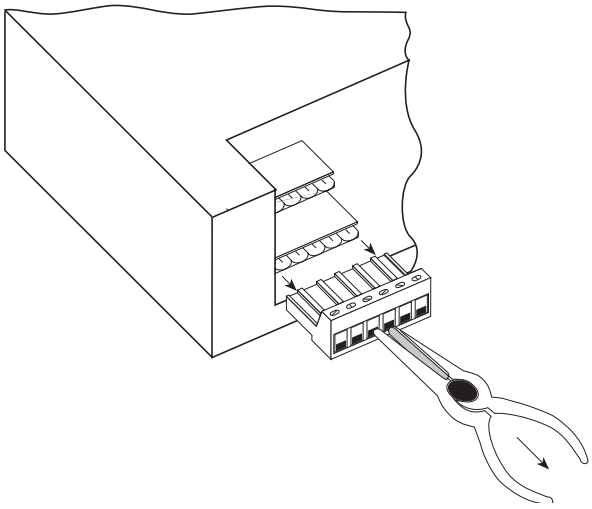
DIP SWITCH TABLE -PANEL ADDRESS FIG 2-6

2.2 System Interconnects

J1-J16 Output Terminal Plugs

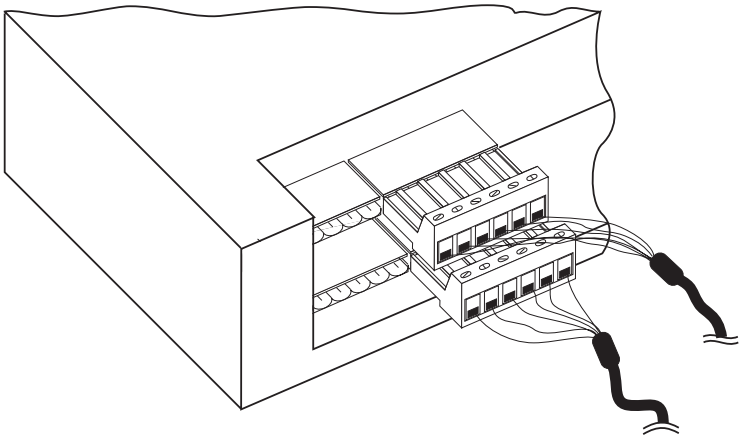
Sixteen 6 position terminal blocks are used to connect I/O connections to the relay contacts inside the Tally Relay panel. These removeable screw clamp terminals allow easy installation of equiment wiring. Each terminal pole in numbered consecutively 1-6 left to right. Wire sizes from #26AWG to #22 AWG

may be used. To install the wires loosen the screw clamp on top of the terminal until the clamp is loose enough to install the wire. Insert the wire and tighten the screw clamp.
To insert the terminal block push the wired connector into the housing. Insure that the two locking clamps on top of the housing are in place.
To remove the terminal block use a set of needle nose pliers. Place the ends of the pliers between two adjancent wire slots and grip firmly. Pull the terminal straight out.



CAUTION

Do not pull on the wires connected to the terminal block for terminal removal. A pair of needle nose pliers or equivlent tool should be used. Use care when pulling on the terminal block to prevent damage to the connected pins.



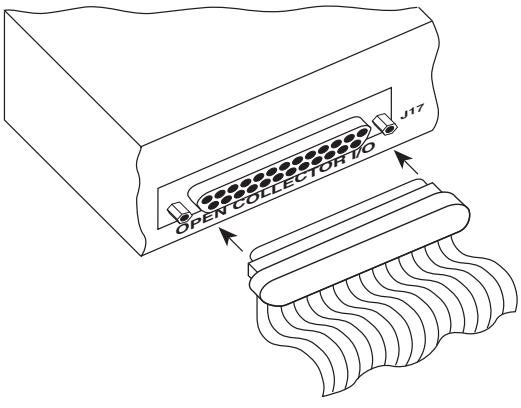
CONNECTOR DETAIL FIG. 2-7

CONNECTOR PINOUT J1-J16	
PIN 1	N.C. A
PIN 2	C A
PIN 3	N.O. A
PIN 4	N.O. B
PIN 5	C B
PIN 6	N.C. B

CONNECTOR PINOUT TABLE FIG. 2-8

J17 Open Collector I/O

A 25 Pin "D" Connector is used to provide a parallel I/O interface for an external device that can actuate the relays independantly. This connector can also be used to connect an external tally indicator.Pins 1 through 16 are the collector outputs for the individual optoisolators which drive each relay, while pins 21 through 25 are connected to all the emitters of all the optoisolator drivers and to -12VDC. The other side of the relay coils are connected to +12VDC. To actuate a relay independently, connect the collector output to the -12VDC common. For example, to actuate Relay 1, connect J17 pin 1 to J17 pin 21. As the optoisolator drivers are switched on and off, the outputs on J17 pins 1 through 16 will toggle between -12VDC and +12VDC respectively. The -12VDC is supplied through the optoisolator and represents a relatively low impedance, while the +12VDC is supplied through the 24V relay coil and represents a relatively high impedance, (typically 2880 ohms).



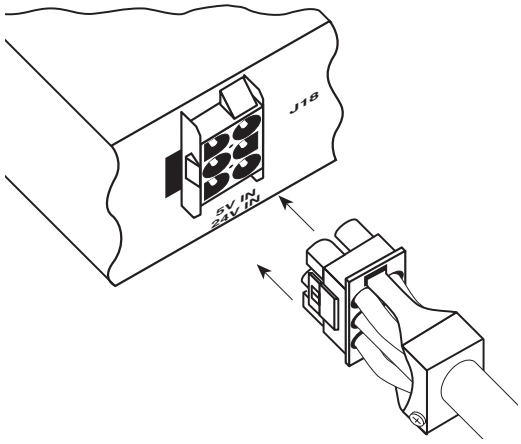
25 PIN "D" CONNECTOR DETAIL FIG 2-9

PINOUT CHART FIG. 2-10		
Connector Pin NO.	Description	
1	Relay K1-Pin 16	To J1
2	Relay K2-Pin 16	To J2
3	Relay K3-Pin 16	To J3
4	Relay K4-Pin 16	To J4
5	Relay K5-Pin 16	To J5
6	Relay K6-Pin 16	To J6
7	Relay K7-Pin 16	To J7
8	Relay K8-Pin 16	To J8
9	Relay K9-Pin 16	To J9
10	Relay K10-Pin 16	To J10
11	Relay K11-Pin 16	To J11
12	Relay K12-Pin 16	To J12
13	Relay K13-Pin 16	To J13
14	Relay K14-Pin 16	To J14
15	Relay K15-Pin 16	To J15
16	Relay K16-Pin 16	To J16
17	No Connection	
18	No Connection	
19	No Connection	
20	No Connection	
21	-12V	
22	-12V	
23	-12V	
24	-12V	
25	-12V	

J18 Power Input Connection

Power input to the Tally Relay is through a 6 pin M-N-L Connector. Both ±12V and +5V are powered through this connector by an external power pack.

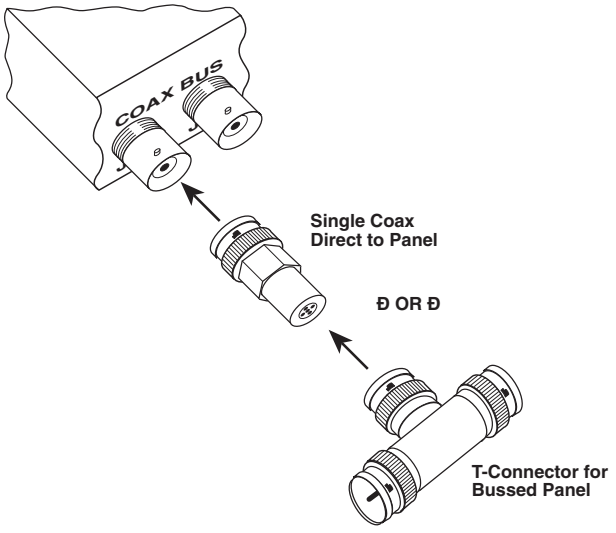
PINOUT CHART FIG. 2-11	
Connector Pin No.	Description
1	+12V
2	-12V
3	N/C
4	Circuit Ground
5	+5V
6	Chassis Ground



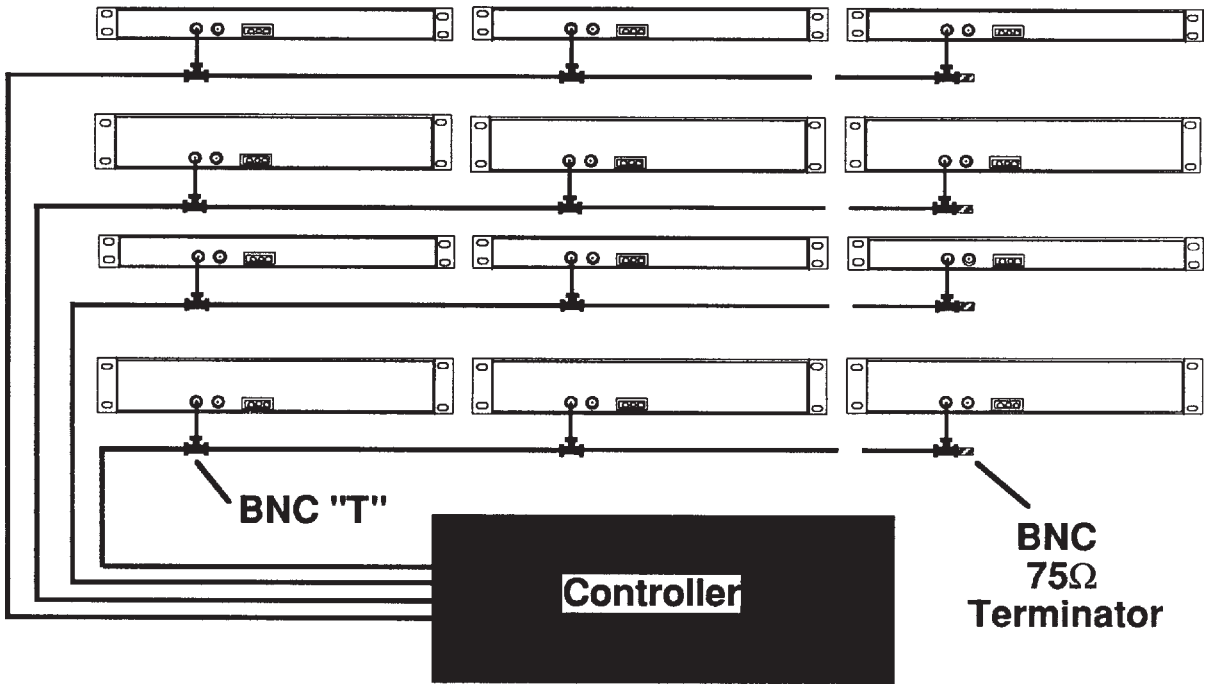
CONNECTOR DETAIL FIG 2-12

J19 and J20 Coax Bus Connectors

Two BNC Loop Thru Polling Ports are mounted on the rear panel of the Tally Relay panel. Connect the 75ý Coax supporting communications from the Controller to either one of the loop-thru ports. Coaxial cables using RG-59b/u or equivalent cable are run to the control panels and branched out with BNC type “T” fittings. This arrangement allows a panel to be removed from the line without disrupting service to the other units on that line. Up to a total of 128 panels can be driven by the controller, however, cable runs to panels exceeding 100 feet should be terminated with a Pesa-supplied 75 ohm terminator. (Part no. 81906502538)



COAX CONNECTOR DETAIL FIG 2-13



TYPICAL PANEL HOOKUP DIAGRAM FIG 2-14

3.1 Operations

General

The Tally Relay panel is a passive device which receives all instructions from the system controller. In general, the Tally Relay is input specific in that it is designed to monitor the usage of system input signals.
After the Tally Relay has been properly installed, system configuration should be performed. Refer to the system controller manual for specific information on panel setup.

Panel Displays

Below are the list of active LEDS's on the front of the Interface Card.

INPUT STATUS (YELLOW LED)
Indicates active status of single level inputs or multiple level outputs

+5V (GREEN LED)
+5V is active

+24V (GREEN LED)
+24V is active

Panel Configuration

Note: The following information is condensed from the Controller Operator's Manual. Refer to these manuals under the Panel Configuration section for full instructions.

Setting up the Tally Relay in conjunction with the Systems operation is a simple process of working through a series of menu-driven operations within the System Controller . The process consist of setting up the addressing scheme to handle the appropriate number of Tally Relays one at a time, setting up the data, and then loading in the data that is specific to the panel.
The Tally Relay will allow the user to assign a system input to a specific relay in the unit. Optionally, the user may select

whether the Tally Relay will be setup for Full Output or Limited Output. The following is a brief description of commands for the Tally Relay that are used under the Configure Panel Menu.

• **Assign Address**: Opens the menu to allow addressing the Tally Relay Panel.

• **Deassign Address**: Opens the menu to allow removing the assigned address selected for the Tally Relay Panel.

• **Exclude/Assigned Output Toggle**: Opens the menu to allow assigning or excluding a set of outputs from the monitoring process.

• **Previous Page**: A second page must be attached when more than 32 outputs are assigned.

• **Next Page**: Moves through pages when more than 32 outputs are assigned.

• **Exit**: This command exits the Configure Panel menu for the Tally Relay

Output Selections

FULL OUTPUT: When outputs are not selected during the Configure Panel Menu, the Tally Relay Panel will default to Full Output Mode. Any system output selecting an input assigned to the panel causes the relay associated with that input to be energized.

LIMITED OUTPUT: By selecting the EXCLUDED/ ASSIGNED OUTPUTS TOGGLE menu, the Tally Relay Panel can have a subset of outputs to the panel. Under this command selection, output subsets can be defined as assigned or excluded, depending on the requirements. Upon initial menu selection the EXCLUDED OUTPUTS will be active. At this time insert only those outputs to be excluded. Inversely, all outputs not selected will be included in the Limited Output (ASSIGNED) subset.

4.1 Functional Description

INTRODUCTION

This section contains the functional description of the Tally Relay panel.

GENERAL

The main circuit board in the Tally Relay provides 16 relays which serve as switches for high current external indicator devices, i.e. “On Air” signs. The opto-isolators drive the sixteen front panel LEDs.

DESCRIPTION

The parallel input/output (I/O) lines, PA-PD, of microprocessor, U20, are open-collector. Resistor networks RN1-RN4 provide the pull-up resistors required for these I/O lines. PC5 and PC4 are pulled high when the microprocessor is reading DIP switches A and B, respectively. The DIP switch data is then read from port D.

The microprocessor’s address and data lines connect to the EPROM (U21) and RAM (U22), each of which is 8K-bytes in size. Address decoding is provided for each of these chips, derived from address lines A13, A14, and A15 on (U20). The microprocessor’s 02 and R/W lines are combined, via U25 and U26, to provide chip enable (CE) and output enable (OE) signals.

Transistor, Q6, driven by the Reset line, is used to disable U22 in order to prevent accidental writing to the RAM during power-up or power-down conditions. Diode, D18, isolates capacitor, C26, from the +5V supply, so that C26 will continue to supply power to the RAM in the event of a power failure.

When +5 volts is applied to J18, the precision voltage divider comprised of resistors R30 and R31 will present a nominal 4.74 volts to pin 9 of comparator, U27. This voltage will be compared to that of the precision voltage reference, D26, which is nominally 2.5 volts. This will hold the open-collector output, pin 14, of U27 low until the voltage applied at J18 exceeds 4.6 volts. This temporary low-going pulse is used to trigger timers U28 and U29.

When U29 is triggered, its output, pin 3, goes high for one second as established by the time-constant of R48 and C16. This holds Q4 off and prevents relay, K17, from being energized. U29's output also turns on Q5, which keeps C13 discharged until U29 has timed-out. When U29's output goes low, Q4 is turned on and activates K17, applying power to the rest of the circuitry and connecting the communications ports to the receiver and transmitter circuitry. Additionally, Q5 is turned off and U28's 100ms timeout is allowed to proceed. This ensures that the output of U28 remains high for 100ms after power is applied to K17.

The output of U28 is tied to the inverting input, pin 10, of one of the comparators in U27. The non-inverting input of this comparator is tied to the 2.5 volt precision voltage reference. Consequently, the output, pin 13, of the comparator will be low whenever U28's output is high and is therefore used as the Reset signal for the remaining circuitry.

The Reset signal is coupled through R22 to Q9. When the Reset line is low, Q9 turns on and applies +5 volts directly to what is normally the precision voltage divider's output. This is done to prevent a false retriggering of the timers when the relay closes and applies power to the rest of the circuitry.

The Watchdog Timer (WDT) signal from the microprocessor is AC coupled to Q1. On rising edges of the WDT signal, Q1 turns on and discharges C3. If the WDT pulses cease, C3 will charge, through R46, towards +5 volts. Pin 7 of comparator U27 is **normally biased at about 3.7 volts because of the voltage divider formed between the +5 volt rail and the 2.5 volt reference by R29, R53, and R54.** It takes about ten seconds for C3 to charge to the point that pin 6 of U27 is more positive than pin 7. If this happens, pin 1 of U27 will go low and trigger the timers, generating a reset cycle. Note that C3 will be discharged through D17 and R44 during the time that the Reset line is low. This ensures that the software has up to ten seconds from power-up to begin toggling the WDT line.

The 2MHz system clock, CO, is generated by the Manchester II encoder/decoder, U23, at pin 11.
When the microprocessor is ready to transmit, it pulls U23's

CTS line, pin 15, low. U23 then sends a synchronization sequence, AC coupled through C17 and C18, to the transmitter driver transistors, Q7 and Q8. The output of this totem pole driver is coupled through R37 and one set of the relay contacts to the communications ports, J19 and J20.
Serial data out of the microprocessor comes into U24, pin 12. The data is latched into U24 on the rising edge of the ECLK signal from U23. The Q output of U24, pin 9, presents the data to be encoded into Manchester II format to U23, pin 4. This is done to ensure that the data is stable during the falling edge of ECLK.
The same data stream that is presented to the transmitter's totem pole driver is also applied to the falling-edge trigger inputs of both sections of dual one-shot, U30. As shown on the schematic, the top stage of the dual one-shot is non-retriggerable and has a time constant of one second. The bottom stage is retriggerable and has a time constant of 100us. Together, these serve to limit the maximum continuous transmission time to one second. If this time limit is exceeded, pin 7 of U30 will go high, clocking a "one" into pin 2 of U24. This will cause pin 5 of U24 to also go high, turning on transistor, Q10, and triggering a reset cycle.
Data coming in the communications ports is applied to the receiver circuitry, consisting of clippers D24 and D25, filter R41, C20, and C27, and comparator U27. Since the incoming signal swings between ground and +5 volts, the comparator's inputs are biased at 2.5 volts. The output of the comparator, pin 2, is then applied to the Unipolar Data Input (UDI), pin 3, of U23. The Manchester II data is decoded and combined with a Non-Valid Manchester (NVM) signal before being passed on to the serial data input of the microprocessor. The NVM signal is combined with the decoded data to ensure that the serial input data line defaults to a high state when no data is present. Since the microprocessor would interpret a low state on the serial data input as a start bit of another serial byte, it is imperative that this not be the default condition.

Parallel I/O lines from the microprocessor come through J22 and connect to the inputs of buffers U17, U18, and U19. The outputs of the buffers are connected to the cathodes of the front panel's indicating LEDs, which are wired in series with the LEDs in the opto-isolators U1-U16. The open-collector output of each

opto-isolator (pin 5) is connected to pin 16 of its associated relay and also to the anode of one of the snubbing diodes, D1-D16. When an I/O line of the microprocessor goes low, the collector of the corresponding opto-isolator also goes low and sinks current through the coil of its associated relay, causing the relay to close. Each relay contains two “form C” switch contacts which are wired to the relay’s corresponding connector on the rear of the Tally Relay panel. In addition, the open-collector output of each opto-isolator is wired to a pin in J17, also located on the rear of the unit.

An external 24 volt DC power source is required for driving the relay coils. This is provided as a +/- 12 volt supply connected through J18. Diode, D27, provides a front-panel visual indication that the required 24 volt power source is connected.

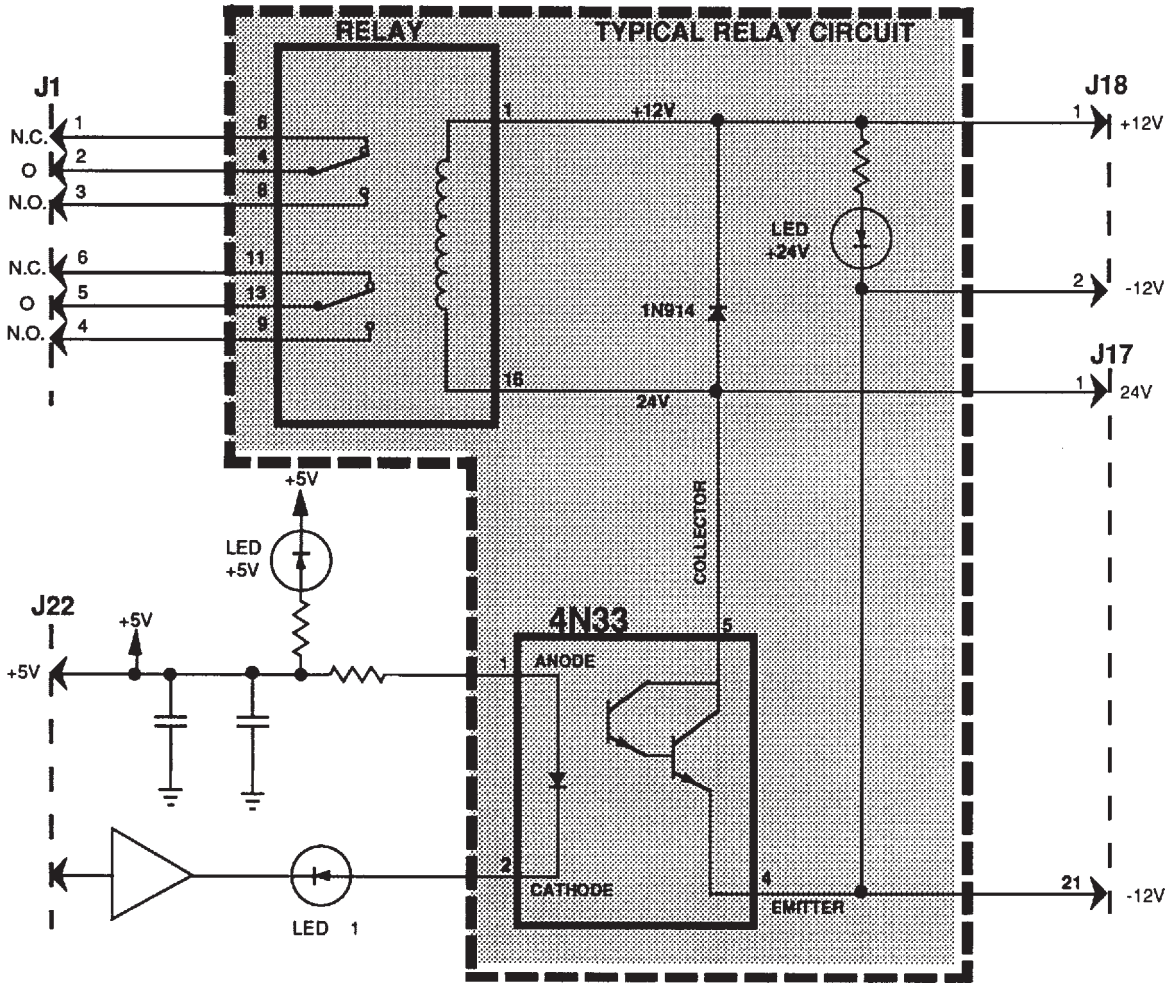


Figure 4-1 Typical Relay Circuit

5.0 Maintenance

General

The TALLY RELAY panel is designed to provide extended, troublefree service with minimum maintenance requirements. No other maintenance other than the normal care which should be given to any advanced solid-state electronic device is required.
There are no adjustments to this unit other than the connections and addressing requirments mentioned in the Installation Chapter.

If additional technical assistance is required, please refer to the Ordering Assistance, Service, and Inquiries Sheet in the front of this manual.

NOTE:
Do not repair equipment under warranty without first contacting PESA. Remember, PESA warrants the TALLY RELAY panel equipment against defective workmanship or materials for a period of one year from the date of delivery. Refer to the Equipment Warranty Sheet in the front of this manual for further information.

Equipment may be returned to the Factory freight pre-paid for repair. Contact PESA's customer service Dept. for an RMA number before shipment. Use the original packing material if at all possible, othewise securly pack and carefully label the carton to prevent damage, delay or even loss during transit.