Tracktronics Australia

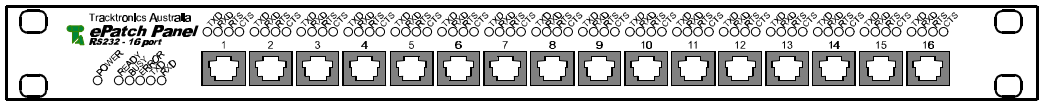
Electronics Engineering & Manufacturing ABN 64 078 631 688
46 Leray Rd, Elimbah QLD 4516 ACN 078 631 688
Phone 07 5497 4384 Fax 07 5497 4656
http://www.tracktronics.com.au Email enquire@tracktronics.com.au

Product Specification

ePatch panel
RS232 / RS422
Matrix Switch Unit
4-lines / 16-port

Rev I

29 July, 2004



Tracktronics Australia
Electronics Engineering & Manufacturing ABN 64 078 631 688
46 Leray Rd, Elimbah QLD 4516 ACN 078 631 688
Phone 07 5497 4384 Fax 07 5497 4656
http://www.tracktronics.com.au Email enquire@tracktronics.com.au

Table of Contents

Tracktronics Australia
Electronics Engineering & Manufacturing ABN 64 078 631 688
46 Leray Rd, Elimbah QLD 4516 ACN 078 631 688
Phone 07 5497 4384 Fax 07 5497 4656
http://www.tracktronics.com.au Email enquire@tracktronics.com.au

1. Abstract

This specification provides preliminary details of the ePatch Panel unit being developed by Tracktronics Australia. Note that some specific details may be subject to change as the product development progresses.

2. Introduction

The ePatch Panel unit(s) is a multi-channel serial switch which is able to connect multiple transmit input signals to multiple receive outputs of a series of RS232 ports. Selection of the required port configuration is performed via an asynchronous serial connection with a host computer or similar.

3. Description

Each unit will have 16 ports available, with 2 RS232/RS422 inputs and 2 RS232/RS422 outputs per port (eg. TXD, RXD, RTS, CTS). In addition, units can be linked together via an extender cable, to increase the port capacity. The expansion capability is limited to 4 units total, and a maximum expansion cable length of 2 metres.

Regardless of the number of ePatch units connected together, the total number of interconnections is limited to 16. For example, one interconnection may be to connect Port 1 to Port 2, 3, 4, 5. Even though multiple ports are involved, this multi-drop port allocation only constitutes the use of one interconnection.

The ePatch Panel serial connections are protocol and baud rate-independent, and an upper limit of 19200 bps has been placed on the baud rate specification. For the purpose of the multi-drop functionality, it is also assumed that idle units are transmitting a ‘constant mark (off)’ RS232 level.

To limit the unit complexity, only 2 sets of lines are implemented within the unit, TXD/RXD and RTS/CTS. Both sets of lines are fully independent of each other.

The internal layout of the ePatch Panel unit resembles a series of bus lines which is inter-connected with the serial lines from each port via a system of crosspoint switches.

The TXD and RTS transmit lines are connected with their respective bus’s via a series diode, which permits a multi-drop configuration to be specified if required.

4. Block Diagrams

4.1 System Representation

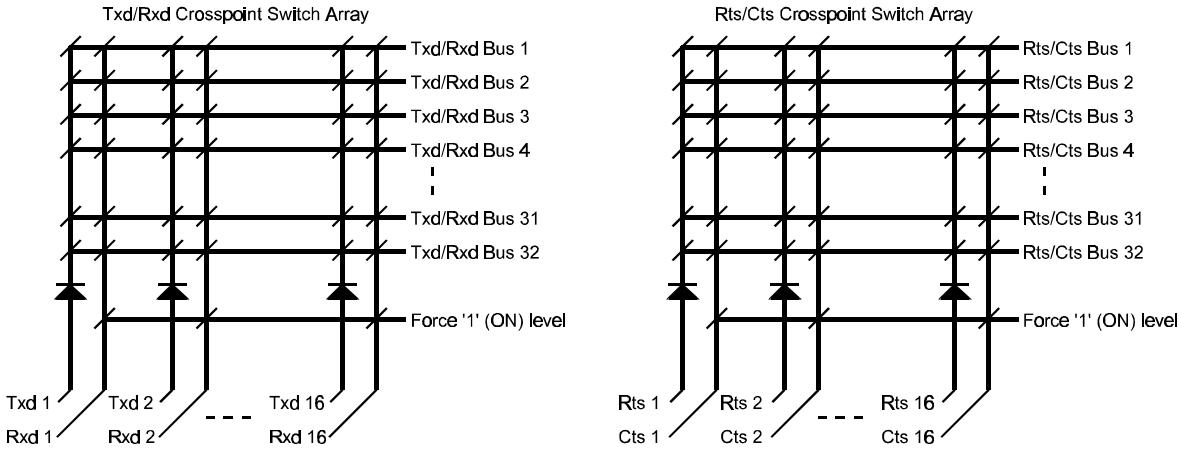


Figure 4-1 System Block Diagram showing a single unit representation

Note that the block diagram shown above does not show the expansion capability.

4.2 Internal Representation

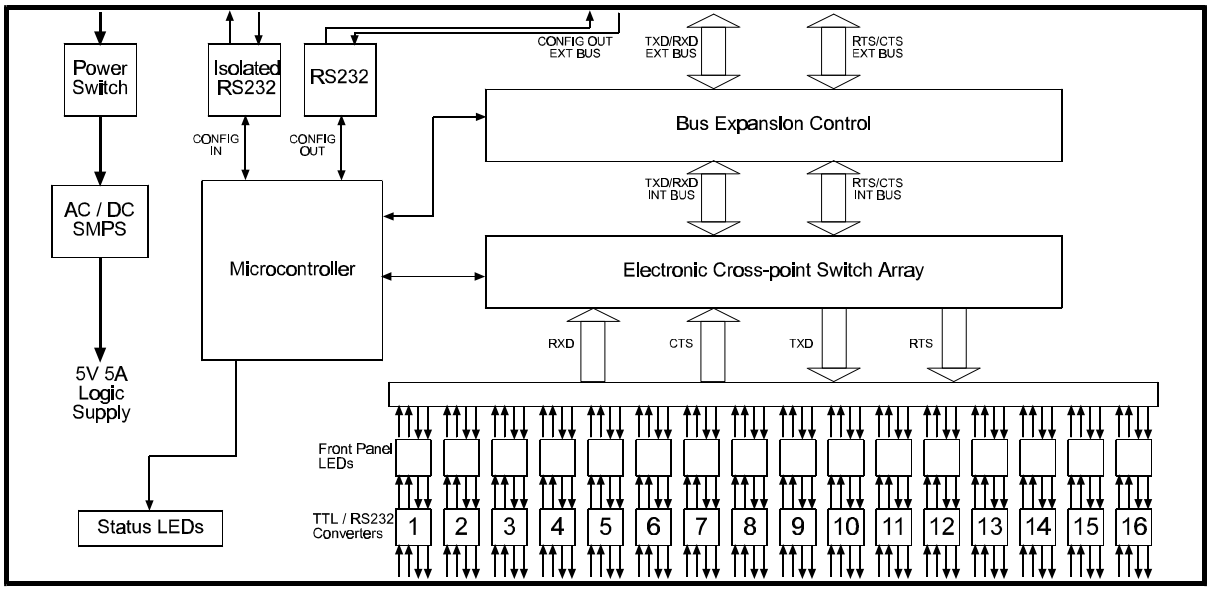


Figure 4-2 Internal Representation of the ePatch Panel Unit

5. Specifications

5.1 Power Supply

5.1.1 AC Supply Option

110 - 240VAC 50 - 60Hz universal AC input, 15W maximum.

The AC Supply option uses an IEC style 3 pin socket as the power supply input, and a compatible plug with 2 metre lead and 3-pin GPO plug is supplied with each unit.

5.1.2 DC Supply Options

12VDC nominal	(9 - 18VDC)	15W maximum
24VDC nominal	(18 - 36VDC)	15W maximum
48VDC nominal	(36 - 72VDC)	15W maximum

The DC Supply option uses a 3 terminal phoenix socket as the power supply input, and a compatible phoenix plug is supplied with each unit.

Tracktronics Australia
Electronics Engineering & Manufacturing ABN 64 078 631 688
46 Leray Rd, Elimbah QLD 4516 ACN 078 631 688
Phone 07 5497 4384 Fax 07 5497 4656
http://www.tracktronics.com.au Email enquire@tracktronics.com.au

5.2 Communications

5.2.1 Switched Input Ports

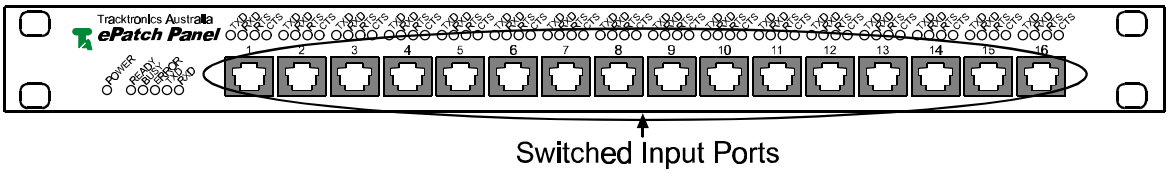


Figure 5-1 Location of Switched Input Ports

Connector

RJ45 8P8C Socket

RS232 Signal pinouts

Pin	Signal	Description	Direction for ePatch Panel unit
2	RTS	Request To Send	Input
3	CGND	Chassis Ground	
4	TXD	Transmit Data	Input
5	RXD	Receive Data	Output
6	SGND	Signal Ground	
7	CTS	Clear To Send	Output

RS422 Signal pinouts

Connector

RJ45 8P8C Socket

Pin	Signal	Description	Direction for ePatch Panel unit
1		Request To Send +	Input
2		Request To Send -	Input
3		Receive Data +	Output
4		Transmit Data -	Input
5		Transmit Data +	Input
6		Receive Data -	Output
7		Clear To Send +	Output
8		Clear To Send -	Output

Tracktronics Australia

Electronics Engineering & Manufacturing ABN 64 078 631 688
46 Leray Rd, Elimbah QLD 4516 ACN 078 631 688
Phone 07 5497 4384 Fax 07 5497 4656
http://www.tracktronics.com.au Email enquire@tracktronics.com.au

* Please note that these pin-outs are standard for all units manufactured after 1-Jan-2000. Any units manufactured before this date (ie. any units with serial numbers starting with 9) have a slightly different, non-standard pin-out. Please contact Tracktronics for details if required.

5.2.2 Configuration Input Port

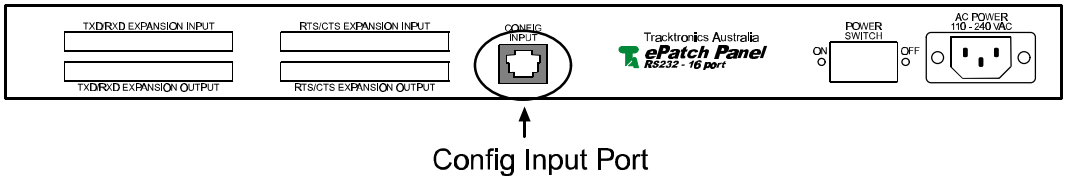


Figure 5-2 Location of Config Input Port

Connector

RJ45 8P8C Socket

RS232 Signal pinouts

Pin	Signal	Description	Direction for ePatch Panel unit
2	RTS	Request To Send	Input
3	CGND	Chassis Ground	
4	TXD	Transmit Data	Input
5	RXD	Receive Data	Output
6	SGND	Signal Ground	
7	CTS	Clear To Send	Output

* Please note that these pin-outs are standard for all units manufactured after 1-Jan-2000. Any units manufactured before this date (ie. any units with serial numbers starting with 9) have a slightly different, non-standard pin-out. Please contact Tracktronics for details if required.

5.2.3 Configuration Protocol

The configuration port parameters are fixed at RS232, 9600 bs, No parity, 8 data bits and 1 stop bit.

All commands use ASCII text for the purposes of specifying the required inter-connections. This allows both a computer application or alternatively a user with a ASCII terminal to configure the unit.

Each command starts with a 3 alpha character prefix which specifies the command type, and end with a ASCII <CR> character. The total length of each command must not exceed 256 characters in length, including the 3 character prefix and <CR> characters.

Commands which are currently supported include:

RST Force a reset of the unit, and / or the current configuration.

STS Return the current switch matrix settings.

CON Specify the port switch connections to be made.

TST Specify a factory test routine to be executed.

VER Return the current ePatch firmware version.

5.2.3.1 RST Command

Commands

RST0 Forces a hardware reset of all ePatch units

RST1 Reloads the factory default config settings. ie. all port settings cleared.

RST2 Reloads the config settings from non-volatile memory.

RST3 Saves the current config settings to non-volatile memory.

RST4 Resets the PLD hardware. (not recommended, utilise RST0 instead if required)

5.2.3.2 STS Query

Queries

STS0? Returns an ASCII representation of the 1st ePatch switch settings.

STS1? Returns an ASCII representation of the 2nd ePatch switch settings.

STS2? Returns an ASCII representation of the 3rd ePatch switch settings.

STS3? Returns an ASCII representation of the 4th ePatch switch settings.

STS4? Returns <total number of ports>, <total number of ePatch units>

5.2.3.3 CON Command

Commands

The CON command will always be followed by a configuration string which will specify the required port interconnections. A example listing of the connection types are shown below:

* Note that the examples are using Ports 1 and 4 for the purpose of the demonstration.

A full duplex port-to-port connection - both TXD/RXD and RTS/CTS lines interconnected

CONP1=P4

A full duplex port-to-port connection - only TXD/RXD

CONRXD1=TXD4

CONRXD4=TXD1

A full duplex handshaking port-to-port connection - only RTS/CTS

CONCTS1=RTS4

CONCTS4=RTS1

A half duplex port-to-port connection - only Port 4 RXD equals Port 1 TXD

CONRXD4=TXD1

A half duplex port-to-port connection - only Port 4 CTS equals Port 1 RTS

CONCTS4=RTS1

Multi-drop connections may be specified by using comma delimiters between each port number.

A full duplex multi-drop port-to-port connection - both TXD/RXD and RTS/CTS lines interconnected - Port 4 equals Port 1 + Port 2

CONP4=P1,P2

A half duplex multi-drop connection - Port 4 RXD equals Port 1 TXD + Port 2 TXD

CONRXD4=TXD1,2

A half duplex multi-drop connection - Port 4 CTS equals Port 1 RTS + Port 2 RTS

CONCTS4=RTS1,2

Constant On connections may be specified using the 'ON' tag as follows:

A constant on connection - Port 1 RXD/CTS line is constantly asserted high.

CONP1=ON

A constant on connection - Port 1 RXD line is constantly asserted high.

CONRXD1=ON

A constant on connection - Port 1 CTS line is constantly asserted high.

CONCTS1=ON

Disconnections may be specified using the 'OFF' tag as follows:

A constant off connection - Port 1 TXD/RXD/RTS/CTS lines are disconnected

CONP1=OFF

A constant off connection - Port 1 TXD line is disconnected

CONTXD1=OFF

A constant off connection - Port 1 RTS line is disconnected

CONRTS1=OFF

A constant off connection - Port 1 RXD line is disconnected

CONRXD1=OFF

A constant off connection - Port 1 CTS line is disconnected

CONCTS1=OFF

5.2.3.4 TST Command

Commands

TST0 Disable any current Test Mode routines and return to Normal operation

TST1 Sequentially turn on all RXD / CTS lines starting at Port 1, progressing to Port 16, and return to Port 1.

TST2 Perform a local loopback test on all ports ie. RXD = TXD in, and CTS = RTS in for each port.

TST3 Activate all RXD and CTS output lines.

5.2.3.5 VER Query

Queries

VER? Returns the current firmware version.

5.3 Trouble-shooting / Acceptance Tests

5.3.1 Single Unit Test procedure - RS232 unit

The following is a suggested unit acceptance test procedure to ensure each unit is operating correctly before each unit is connected together in a daisy chain.

1. Remove all ribbon cables from the rear of the unit, and all RJ45 connections from the front of the unit.
2. Apply power to the unit, and ensure the power switch at the rear of the unit is switched on (up position). The green Power LED should light first followed by a single sequence of the Status LEDs starting from the Ready LED through to the RXD LED.
3. Setup a terminal program such as Hyperterminal with 9600bps, no parity, 8 data bits, 1 stop bit, and no flow control and connect via a suitable cable to the Config port on the rear of the unit. Pressing Enter on the keyboard a few times should result in "ERROR" being displayed on the terminal. This is a normal response for an un-recognised command such as enter being pressed by itself.
4. Type TST3 followed by Enter, and the Busy status LED should briefly flash followed by all RXD and CTS LEDs for all 16 ports being lit. A RS232 or RS422 LED monitor (depending on epatch type) can be used to check that all ports are transmitting with RXD and CTS signal lines being asserted on.
5. Type TST1 followed by Enter, and the RXD / CTS leds will start a led chaser effect commencing from Port 1, stopping at Port16, and then sequentially back through the Ports to Port 1 again. This sequence will repeat indefinitely. Ensure that all RXD / CTS leds do light up, and only one LED is lit at a time.
6. Type TST2 followed by Enter, and move the serial connection from the Config port to the front panel Port 1. If possible, change the serial rate to 19200bps for a more thorough test. Type 2 different keys, and check that typed keys are echoed on the terminal screen. If the terminal program is setup for 'local echo', then character duplicates will be observed. When the serial cable is connected, the CTS led should mimic the status of the RTS led. The RXD LED will also mimic the status of the TXD LED, but this may be hard to distinguish unless the serial rate is changed to a lower rate such as 300 or 1200bps, or a serial break is sent via the terminal program.
7. Reconnect the serial cable to the rear config port and type TST1. The RXD/CTS LEDs will now cycle as noted in step 4. Connect a 40-way IDC ribbon cable between the TXD/RXD expansion input and the RTS/CTS expansion input. The RXD/CTS LEDs for each port will now be simultaneously lit. Allow the LEDs to cycle from Port 1 to 16 and back to 1 again before repeating the test for the TXD/RXD expansion output port and RXD/CTS expansion input port.
8. Type TST0, and press Enter. Connect the 40-way IDC ribbon cable between the TXD/RXD expansion input and TXD/RXD expansion output port. The response should be "1,16", "1,16", "2,32" "3,48", "4, 64", "4,96" etc should appear on the terminal screen. The strings will continue to appear indefinitely with the first number stopping at 4, and the second number continuing to count up in multiples of 16. Testing of the single unit is now finished.

5.3.2 Single Unit Test procedure - RS422 unit

The following is a suggested unit acceptance test procedure to ensure each unit is operating correctly before each unit is connected together in a daisy chain.

1. Remove all ribbon cables from the rear of the unit, and all RJ45 connections from the front of the unit.
2. Apply power to the unit, and ensure the power switch at the rear of the unit is switched on (up position). The green Power LED should light first followed by a single sequence of the Status LEDs starting from the Ready LED through to the RXD LED.
3. Setup a terminal program such as Hyperterminal with 9600bps, no parity, 8 data bits, 1 stop bit, and no flow control and connect via a suitable cable to the Config port on the rear of the unit. Pressing Enter on the keyboard a few times should result in "ERROR" being displayed on the terminal. This is a normal response for an un-recognised command such as enter being pressed by itself.
4. Type TST3 followed by Enter, and the Busy status LED should briefly flash followed by all RXD and CTS LEDs for all 16 ports being lit. A RS422 LED monitor can be used to check that all ports are transmitting with RXD and CTS signal lines being asserted on. No other port LEDs should be lit.
5. Type TST1 followed by Enter, and the RXD / CTS leds will start a led chaser effect commencing from Port 1, stopping at Port16, and then sequentially back through the Ports to Port 1 again. This sequence will repeat indefinitely. Ensure that all RXD / CTS leds do light up, and only one LED is lit at a time.
6. Type TST2 followed by Enter. Fabricate a RS422 RJ45 loopback connector (pin 1 to pin 8, pin 2 to pin 7, pin 3 to pin 4, pin 5 to pin 6). When the loopback connector is inserted into each port, all 4 LEDs (TXD / RXD / RTS / CTS) for the respective port should be lit.
7. Type TST1. The RXD/CTS LEDs will now cycle as noted in step 4. Connect a 40-way IDC ribbon cable between the TXD/RXD expansion input and the RTS/CTS expansion input. A pair of RXD/CTS LEDs for each port will now be sequentially lit. Allow the LEDs to cycle from Port 1 to 16 and back to 1 again before repeating the test for the TXD/RXD expansion output port and RXD/CTS expansion input port.
8. Type TST0, and press Enter. Connect the 40-way IDC ribbon cable between the TXD/RXD expansion input and TXD/RXD expansion output port. The response should be "1,16", "1,16", "2,32" "3,48", "4, 64", "4,96" etc should appear on the terminal screen. The strings will continue to appear indefinitely with the first number stopping at 4, and the second number continuing to count up in multiples of 16.
9. Testing of the RS422 single unit is now finished.

5.3.3 Multiple unit test procedure

Testing of multiple units connected in a daisy-chain is severely limited by the fact that the TXD/RXD/RTS/CTS expansion lines are hardware wired to daisy-chain as a common connection for ePatch units.

However, a simple test is to connect all units together, and check that the RXD and TXD status LEDs for the 2nd and all subsequent units are periodically flashing. The Error LED should never flash unless an attempt is made to configure the units with more than 16 inter-connections, or the Config port is utilising incorrect baud rate settings.

Connecting a terminal program to the Config port on the first unit and typing STS4? should result in 2 numbers being returned. The first is the total number of ePatch units in the system, and second is the total number of serial ports capacity within the ePatch system. Each ePatch has 16 serial ports available, so a set of 3 ePatch units should result in "3,48" being returned in response to the STS4? Command. Earlier firmware versions of the ePatch utilised the STS3? instead of STS4? Query string, so try STS3? if STS4? Results in an ERROR response.

Typing TST3 will result in RXD/CTS LEDs on all units being lit.

Typing TST2 will result on all units echoing any data received on any ePatch port to be re-transmitted out the same respective port on all other ePatch units.

Typing TST1 will result in a led chaser pattern occurring on all ePatch units which will gradually lose sequence with each other, resulting in multiple led chaser patterns on each ePatch unit.

While the epatch units are operating in test mode, all ePatch units excluding the first unit may occasionally flash the red error LED. This is normal for test mode operation and shows that the ePatch units are rejecting normal configuration commands from preceding ePatch units.

5.4 Layout & Size

5.4.1 Size

1U high by 19” rack mount, approx 250 mm in depth.

5.4.2 Front Panel Layout

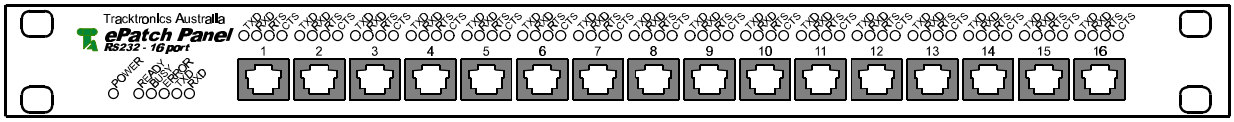


Figure 5-3 Front Panel Layout

5.4.3 Rear Panel Layout

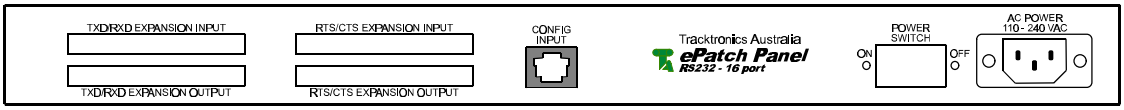


Figure 5-4 Rear Panel Layout

5.5 Connectors

5.5.1 Switched Ports

16	RJ-45 8P8C Sockets	RS232 or RS422 Switched Input, DCE	Front mount

5.5.2 Power

1	IEC Male Socket	110 - 240Vac Power Input	Rear mount

5.5.3 Config Port

1	RJ-45 8P8C Sockets	RS232 Config Input, DCE	Rear mount

5.5.4 Expansion Ports

4	IDC 40 Male sockets	TTL inter-unit bus extension	Rear mount

6. Product Part Numbers

6.1 Serial Interface Options

TA Part Number	Unit Description
0100-000-xxx	16 ports - RS232 DCE Interface
0100-010-xxx	16 ports - RS422 DCE Interface

6.2 Power Supply Options

The part number suffix refers to the power supply option required.

TA Part Number	Unit Description
0100-xxx-12D	12VDC nominal (9 - 18Vdc input) 15W max.
0100-xxx-24D	24VDC nominal (18 - 36Vdc input) 15W max.
0100-xxx-48D	48VDC nominal (36 - 72Vdc input) 15W max.
0100-xxx-240A	110-240VAC nominal (90 - 250Vac input) 15W max. (std)