T-1/E-1 Protection Switch

Model T-APS-R

Firmware 2.75

1. General Description

Dataprobe's Model T-APS-R Automatic Protection Switch allows for protection of T1 or E1 circuits. It can be used for protecting switch full or fractional services, as well as single ended applications and can be configured for use in Framed or unframed network protocol applications. It is designed for use with redundant circuits and automatically switches paths in order to maintain service. The T-APS provides both serial and Ethernet connectivity for remote access and is SNMP compatible. Local and remote alarm notifications are provided for circuit failures.

2. Features

- T1 or E1 interface selectable
- 1+1 or 1:1 automatic switching.
- End to end or end to C.O. auto-switching capability.
- Redundant CPE switching to single T1/E1 line.
- Selectable alarm threshold and switching activation thresholds.
- Configurable via RS-232 serial port or Ethernet Network.
- SNMP Management.
- Both active and standby line status monitoring.
- Power fail – card service bypass circuit.
- Alarm status and history via serial interface.
- T1/E1 circuit failure master alarm relay output.
- Nest expansion capability using single IP address.
- Dual -48 VDC Power Inputs, also optional 90 – 240 VAC

Dataprobe Inc
1 Pearl Court, Suite B
Allendale New Jersey 07401

dataprobe.com/support
201-934-5111
tech@dataprobe.com

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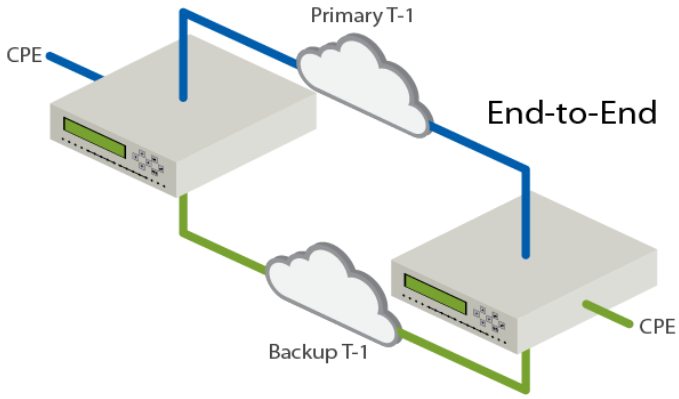
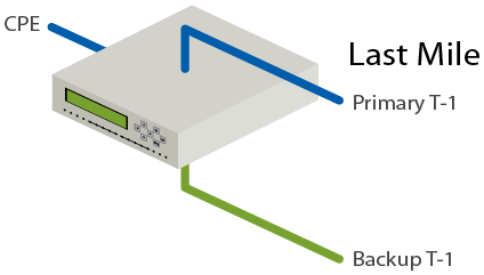
4. Typical Applications

The T-APS can be used in end-to-end or customer premise to C.O. configurations.

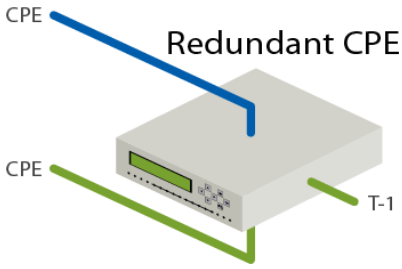
Use two T-APS cards or standalone units to provide end-to-end redundancy.



Use a single line card or standalone unit to provide redundancy at a single location.



Use redundant CPE (router, PBX, Switch, etc) to switch between a single T-1/E-1 circuit.



5. LED Indicators

5.1. MCU card LEDs

+5V: It will be on when power on.
Run: While running properly, the RUN display light should be blinking.
ALM: It will be on when the INF card fails.
LNK: It will be on when network link connected.
DUP: It will be on in Full Duplex, and off in Half Duplex.
10M: It will be on in 10Mb network speed.
100M: It will be on in 100Mb network speed.
COL: It will be on when Network Collision.
Fail: It will be on when MCU card fails.

5.2. Line Card LEDs

RUN LED: While running properly, the RUN display light should be blinking (.5 sec cadence).

1:1 LED:	ON	1:1 Mode Set
	Off	1+1 Mode Set
	Blink .25 sec	Blind Mode 1
	Blink .5 sec	Blind Mode 2

E1 LED: It will be on in the E1 setting.

T1 LED: It will be on in the T1 setting.

L1 LED: It will be on if L1 is on active path.

L2 LED: It will be on if L2 is on active path.

5.3. Blinking events:

First setting the L1 as the active and L2 as protection path, the L1 light will be on and L2 light will be off. In the event of automatic switch to L2, the L2 light will flash quickly before L1 light turns off. The L2 light will then be on and L1 light off if switching succeeds.

In the event of fault from CPE side in L1 active and L2 protection path setting, the LOOK IN Function will apply (see Setup, Selection B LOOK IN).

In the event of L2 protection path fault, the fault is also indicated as L1 light on and L2 light blinking. The fault from CPE failure or L2 fault can be easily distinguished by MEASURE ERROR RATIO function.

LOS LED: Loss Of Signal light will be on if the connection is lost of signals.

OOF LED: Out of Frame light will be on if the connection is out of frame.

AIS LED: Alarm Indication Signal light will be on when alarm signal received.

RAI LED: Remote Alarm Indication light will be on when remote unit fault received

Fail LED: Failure Light will be on if a system fault or a circuit failure occurs.

6. Installation – Card Nest

Turn off power source until all connections are completed.

Card Nest T-APS-R-15 mounts in standard 19" equipment cabinets.

The Model T-APS-R-15 includes the Card Nest with proper Power Supply and Control Card

6.1. Power

Connect -48VDC from A source and B source (if available) to terminal block positions marked -48A and -48B located on the upper left rear of the chassis. Connect the +48VDC return for each source to the terminals marked GND (A) and GND (B) respectively. Connect the frame ground to position marked FGND.

6.2. Network

Connect the 10Base-T Ethernet using CAT 5 cable to the 8 Wire modular jack marked LAN.

6.3. Serial

The 6 Wire Modular Jack marked COM is used for RS-232 serial data It is configured as a DCE for direct connection to a terminal device.

6.3.1. RS232 Serial Port (DCE)

RJ11Pin		Assignment	D9 DTE	D25 DTE
1		---		
2	⇦	**Transmit Data**	**3**	**2**
3		---		
4	⇨	**Receive Data**	**2**	**3**
5		**Signal Ground**	**5**	**7**
6		---		

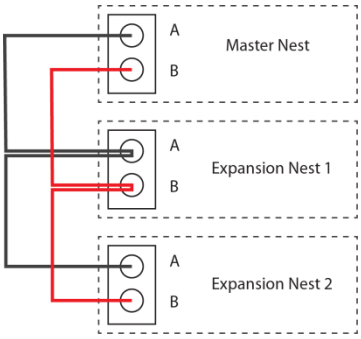
The Serial Port can be used to set the parameters of the T-APS-R. You can access the Serial Port using a VT100 terminal, or PC running terminal emulation software (like Hyperterminal).

The RS-232 port settings are: 9600bps, 8 Data Bits, 1 Stop Bit, No Parity (9600 N 8 1) Once you connect to the T-APS-R, press the Escape Key (Esc) to display the password prompt. Enter the Password and press Enter. The main system configuration menu is displayed. See section 7 for complete setup instructions.

Factory preset password: PASS

6.4. Expansion

An RS-485 BUS is provided for expanded the communication bus to multiple nests. Marked JP31. Be sure to connect point A to point A, point B to point B, from HOST / MASTER to each Expansion SHELF .



Configure each nest with a unique address, using the DIP switches adjacent to the Expansion Connectors.

SW1	Master Nest	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7
4	0	0	0	0	0	0	0	0
3	0	0	0	0	**1**	**1**	**1**	**1**
2	0	0	**1**	**1**	0	0	**1**	**1**
1	0	**1**	0	**1**	0	**1**	0	**1**

6.5. Alarm Contacts

Three sets of Alarm contacts are provided
JP 32 and JP 33 Provide Normally Closed and Normally Open Contacts, respectively. They move to the Alarm position on any system failure:

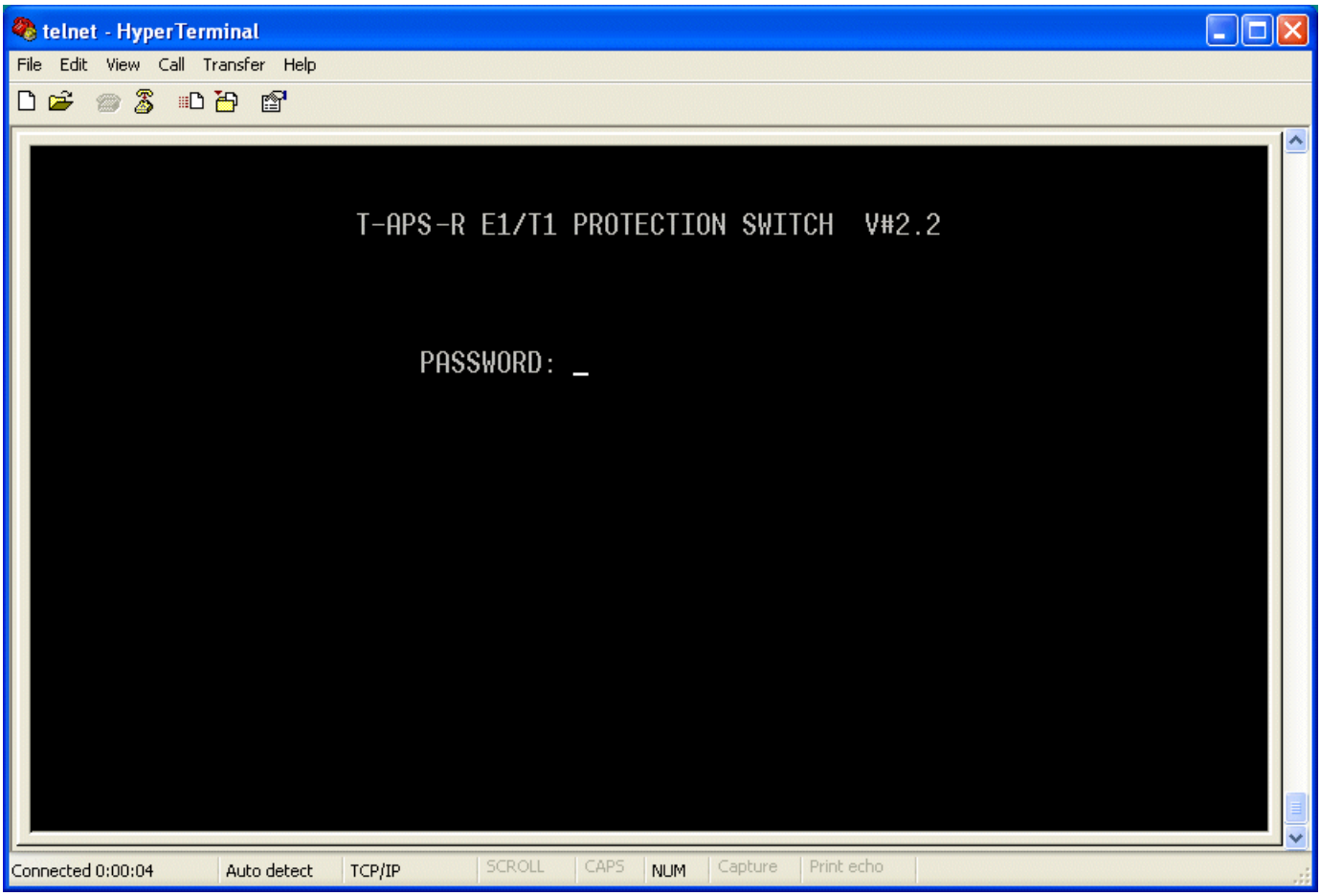
Status	JP 32	JP33
All OK	Closed	Open
Power Supply A Fail Power Supply B Fail MCU Fail	Open	Closed

7. Setup & Operation

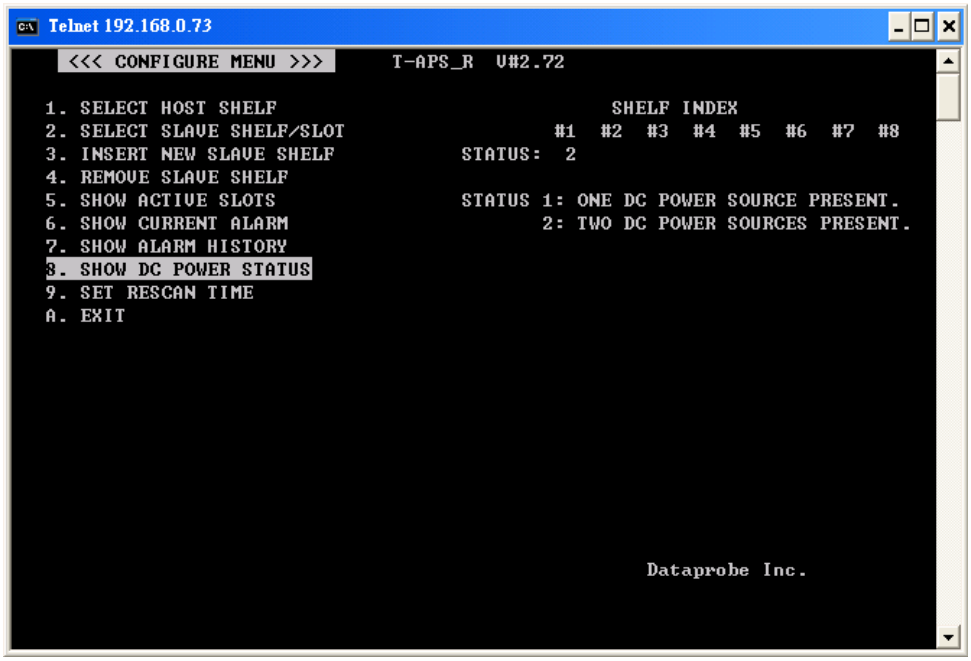
7.1. Terminal or Telnet

T-APS-R provides RS-232 and LAN interfaces to support VT100, Telnet, and SNMP for remote access. This provides access to both master host nest shelf and any additional slave nest shelves connected. Programmable setting includes: Set TX and RX monitoring threshold values, manual or automatic switch, date, time, IP Address, and change Password.

Enter Password – Factory Default = PASS

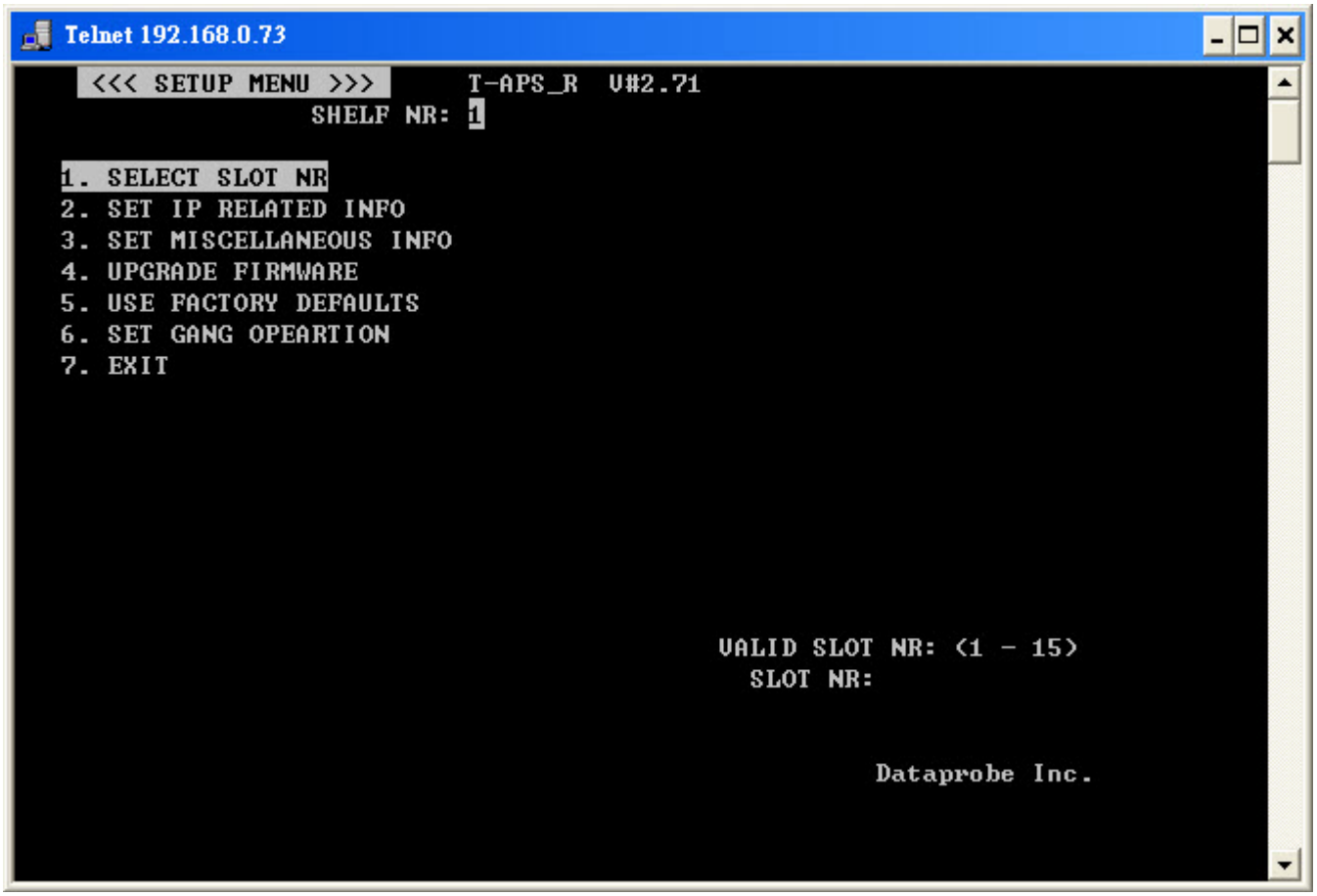


7.2. Configuration Menu



Select Host Shelf Menu	Selects the Master Host Shelf Nest for Configuration and Setup
Select Slave Shelf/Slot	For stacking multiple T-APS-R T1/E1 protection switch units, Select Number range 2~8, and Slot Number 1~15. Example: “2, 15” means Shelf 2 Slot 15.
Insert New Slave Shelf	To stack multiple T-APS-R T1/E1 protection switch units, Insert new slave shelf address range from 2~8 as slave shelf.
Remove Slave Shelf	For stacking multiple T-APS-R T1/E1 protection switch units, Remove slave address range from 2~8.
Show Active Slave Shelf	Display and Show Active Slave Shelf.
Show Current Alarm	Show Current Alarm status.
Show Alarm History	Show Alarm History. Clear All Alarm History
Show DC Power Status	Show the status of the two DC power inputs.
Set Rescan Time	Master T-APS-R will use the set rescan time to scan its slave units if the slave units had been removed or replaced, the scan result will be displayed in Show Active Slave Shelf. Default setting is 5 Minutes.
Exit	Exit the current menu level.

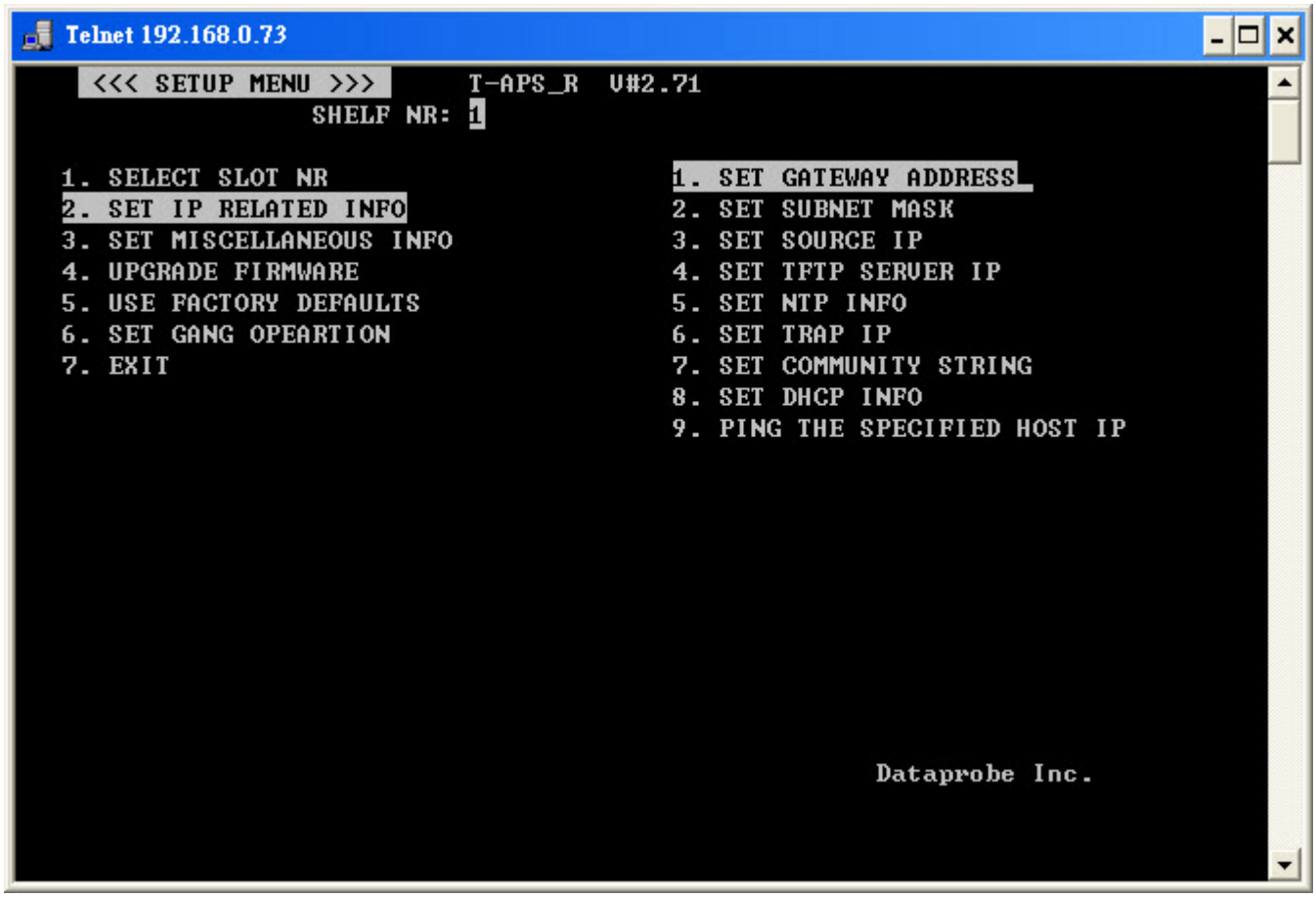
7.3. Setup Menu – Host Shelf



7.3.1. Select Slot NR

Select Card 1 – 15 to access individual card settings. See Section 8 for card specific settings.

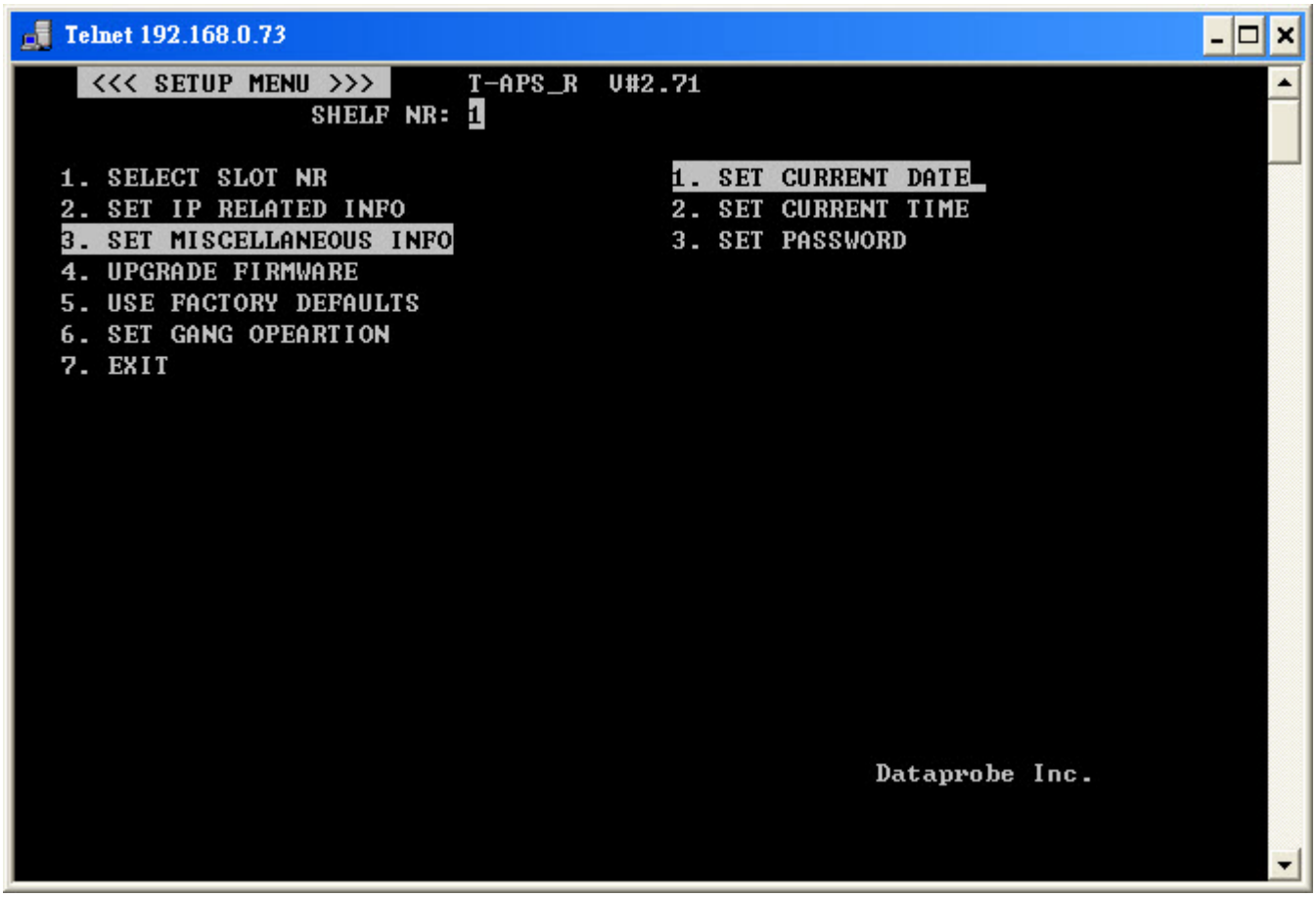
7.3.2. Set IP Related Information



Note: All IP Related Information must be set in order for SNMP to run properly.

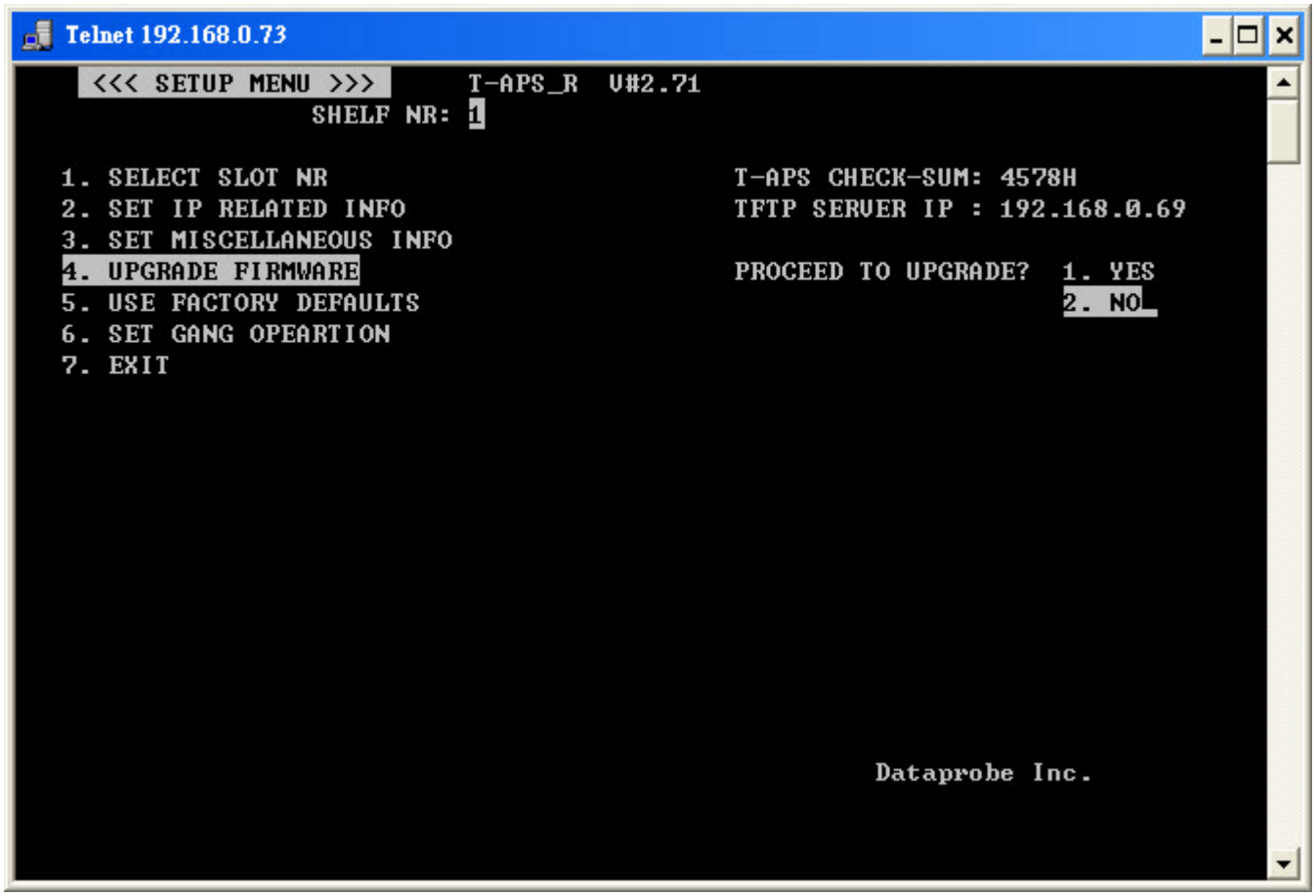
Set Gateway Address	Set the gateway in xxx.xxx.xxx.xxx format
Set Subnet Mask	Set the subnet mask in xxx.xxx.xxx.xxx format
Set Source IP	Set the IP address in xxx.xxx.xxx.xxx format
Set TFTP Server IP	(Future Firmware Upgrades)
Set NTP Information	Enter the Clock Server in xxx.xxx.xxx.xxx format
Set Trap IP	Insert up to two Trap IP address for alarm trap reporting. Default IP address, “0.0.0.0” for disable.
Set Community String	Set Community String for SNMP SET, SNMP GET, and SNMP TRAP password.
Set DHCP Info	Enable/Disable DHCP Set Client Name Show DHCP Given Information.
Ping Specified Host IP	

7.3.3. Set Miscellaneous Information



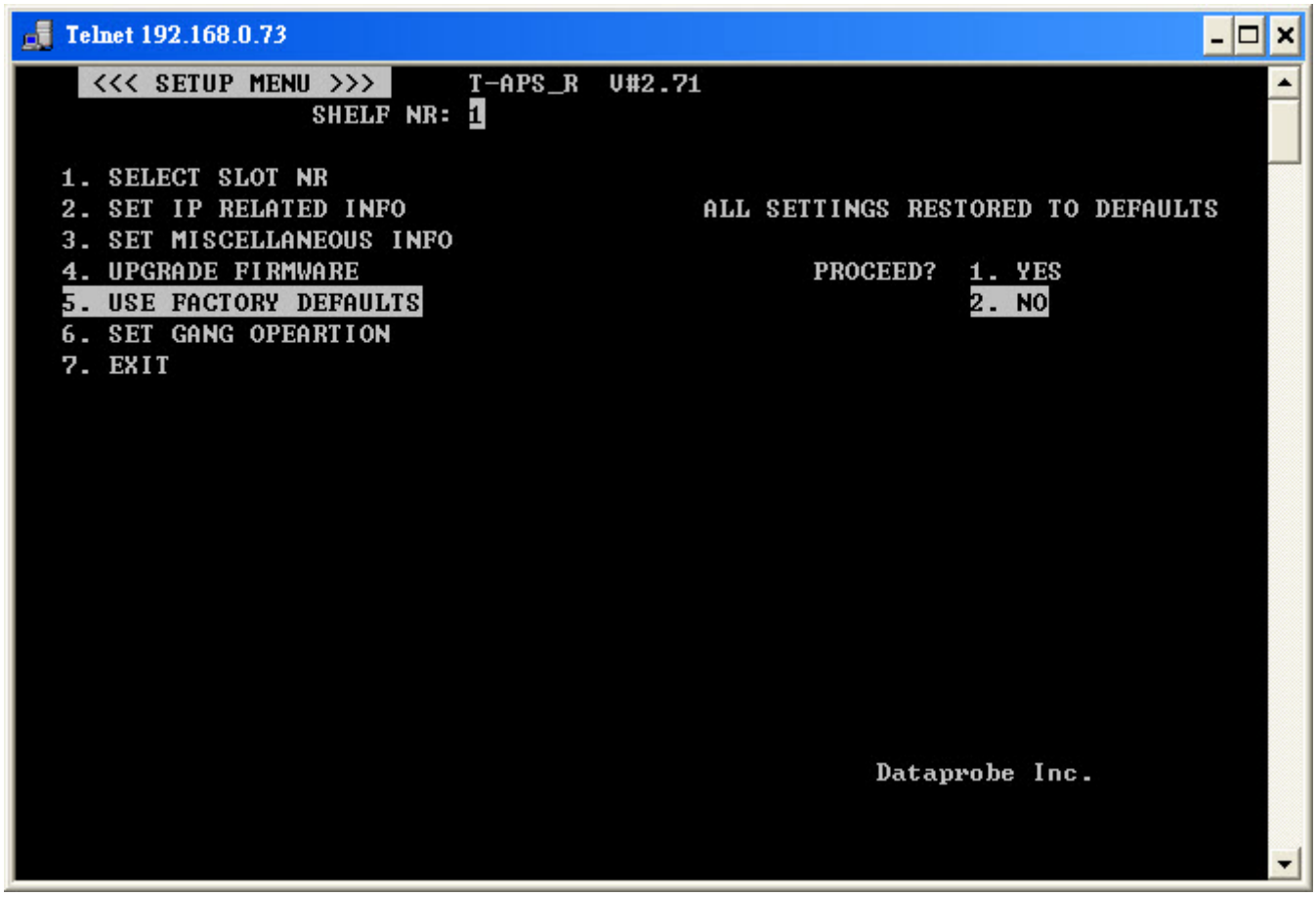
Set Current Date	Set the Date
Set Current Time	Set the Time
Set Password	Change the Password **Factory Default password: PASS**

7.3.4. Upgrade Firmware

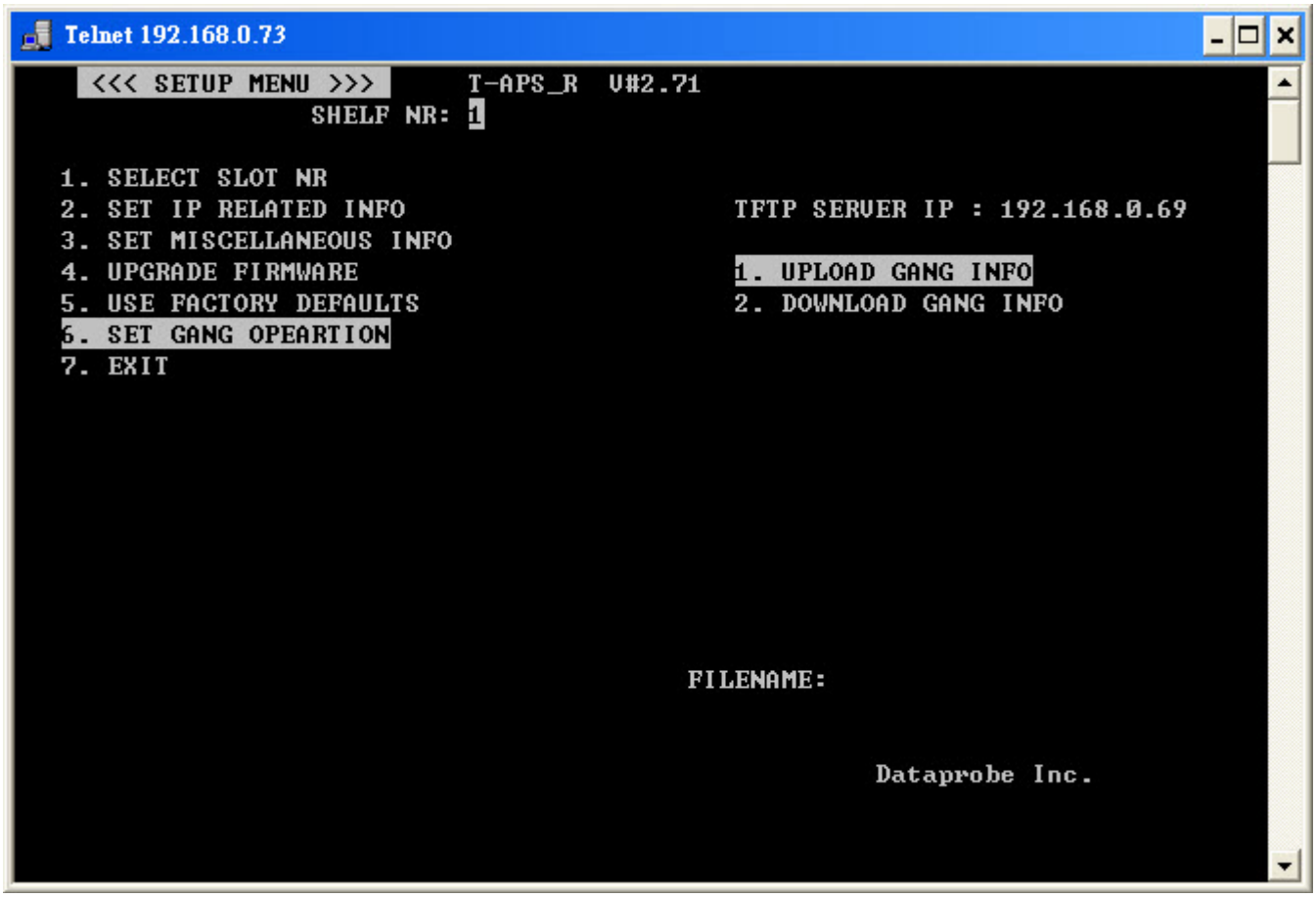


This feature provides the ability to download the latest firmware for T-APS-R.

7.3.5. Use Factory Defaults



7.3.6. Set Gang Operation

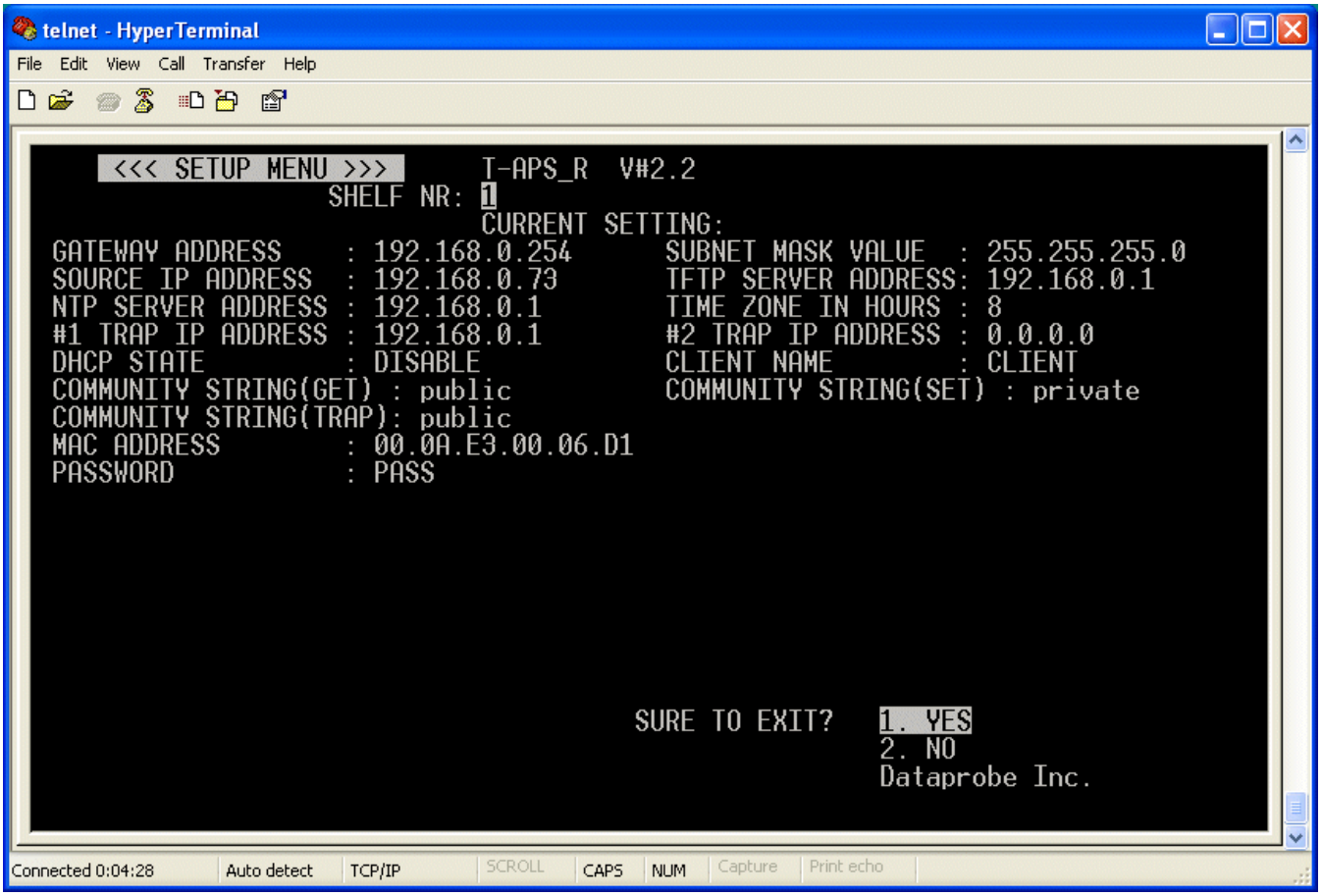


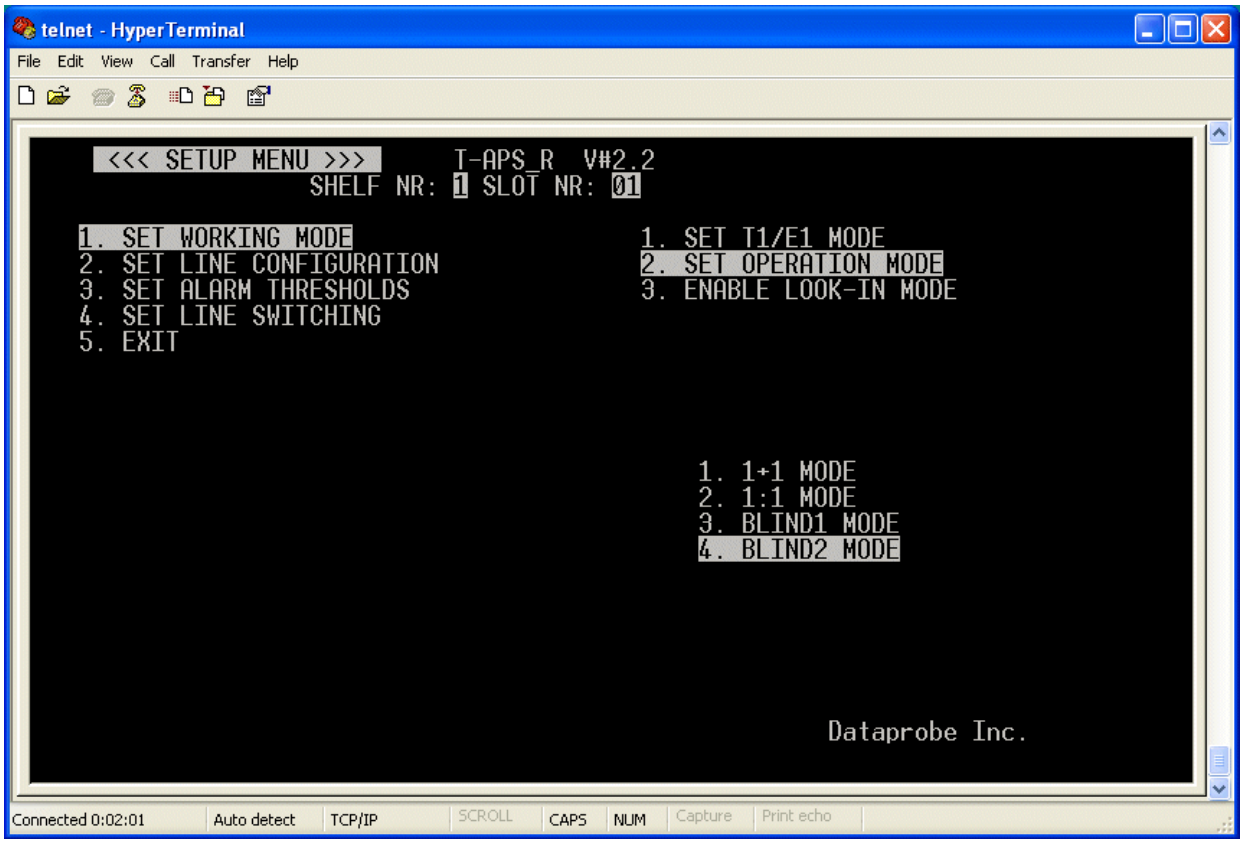
T-APS-R has gang operation feature that the user can save all Line Card configurations as a file, and use the file to restore back to the previous setting.

Also, the user can configure all line cards using line 1 as active path, and save it as a file. When the user wants to switch all lines to line 1 manually, he can simply load the file using gang operation. Once file loaded from TFTP server, T-APS-R will switch all lines to line 1.

7.3.7. Exit & Save Host Shelf Setting

This will display the current setting for the card nest just accessed and then confirm your intent to exit the system.





8.1. Set Working Mode

Set T1/E1 Mode	**Select T1 or E1.**
Set Operation Mode	**1+1** End to End Full T Service application. Data sent on both Active and Protection Path. T-APS duplicates CPE Tx data on both lines and the better quality signal is selected from end to end. **1:1** Single Ended, or Fractional T Service application. Data sent on Active Path. Protection Path used for circuit performance and communication between T-APS units. **Blind 1** Independent operation. T-APS communicates to remote site on unused path. Can be used with other APS type devices. Monitors for loss or degradation of CO signals on Active line and transfers to Protection Path. **Blind 2** Independent operation. No communication between T-APS unit or equipment at remote site. Can be used with other APS type devices. Monitors for loss or degradation of CO signals on Active line and transfers to Protection Path. Does not monitor condition of Protective Path when not in use. Will hunt for working path every 6-99 seconds, as set by Set Recovery function.

8.1.1. Mode Comparison Chart.

Function	1:1	1+1	Blind 1	Blind 2
Switching Time (within)	25ms	12ms	12ms	12ms
Ability to retrieve protection path status (Good or Bad) from CO or CPE.	Yes	No	No	No
Ability to provide protection path status (Good or Bad) from LOS only	Yes	Yes	Yes	No
Manual switching to working path on both ends (CO or CPE)	Yes	No	No	No
Single Ended Application	No	Yes	Yes	Yes
Duplicate CPE Signal in both Active and Protection Path	No	Yes	Yes	No

Note: Referring T-APS installed in both CO to CPE sides

CO: Central Office

CPE: Customer Premises Equipment

8.1.2. Redundant CPE Applications

The T-APS can be used for switching a T1/EI circuit between two sets of CPE for redundant equipment operation. The Working Mode selection can be either 1+1, 1:1, Blind 1, or Blind 2.

In the 1+1 and Blind 1 modes, TX signals from the CO will be present at each of the two CPE devices. In Blind 2 mode only the current selected working path will see the TX signals. The alternate path will not provide TX to it associated CPE while the Protective Path is working.

8.1.3. Enable Look-In Mode

T-APS-R units will do a checking function to the CPE signal before switching from active path to the protection path.

Enable: T-APS-R will be enabled to check CPE signals. In the event of excessive bit errors from the CPE side to T-APS-R, T-APS-R will not perform switching. Enable Look-In may increase a few mili-second to the switching time.

Disable: T-APS-R will be disabled to check CPE signals. In the event of excessive bit errors from the CPE to T-APS-R, T-APS-R will perform switching in all events including excessive bit errors from CPE side

8.2. Set Line Configuration

8.2.1. Set Line Format

T1 Setting Selections
UNFRAMD: Unframe
SF: SuperFrame
ESF: Extended SuperFrame

E1 Setting Selections
CAS: Channel Associated Signaling (for voice)
CCS: Common Channel Signaling (for data)
CAS&C: Channel Associated Signaling & CRC-4 (Cyclic Redundancy Check 4)
CCS&C: Common Channel Signaling & CRC-4

8.2.2. Set Line Code

T1 Setting Selections
B8ZS: Bipolar 8-zero substitution or Binary 8-zero substitution.
AMI: Alternate Mark Inversion

E1 Setting Selections
HDB3: High-Density Bipolar order 3 encoding.
AMI: Alternate Mark Inversion

8.2.3. Set Receive Sensitivity (Network)

LONG : T1 Setting Sensitivity is –36 dB
E1 Setting Sensitivity is –43 dB

SHORT: T1 Setting Sensitivity is –15 dB
E1 Setting Sensitivity is –10 dB

8.2.4. Set Buildout (Network)

T1 Setting Selection

(A) DSX1-1: 0 to 133 feet
(B) DSX1-2: 133 to 266 feet
(C) DSX1-3: 266 to 399 feet
(D) DSX1-4: 399 to 533 feet
(E) DSX1-5: 533 to 655 feet
(F) -7.5dB CSU
(G) -15dB CSU
(H) -22dB CSU

E1 Setting Selection

(A) 120 Nor:120 ohm Normal Return Loss.
Recommended setting for (1) stable T1/E1 circuits or (2) short distance between T-APS-R and the connected next equipment. For example, T-APS-R to HDSL. (In general, set 120Nor)

(B) 120 Hi:120 ohm High Return Loss.
Recommended setting for (1) unstable T1/E1 circuits or (2) long distance between T-APS-R and the next connected equipment. (200 meters or more)

8.2.5. Set Receive Sensitivity (User)

LONG: T1 Setting Sensitivity is –36 dB
E1 Setting Sensitivity is –43 dB

SHORT: T1 Setting Sensitivity is –15 dB
E1 Setting Sensitivity is –12 dB

8.2.6. Set Buildout (User)

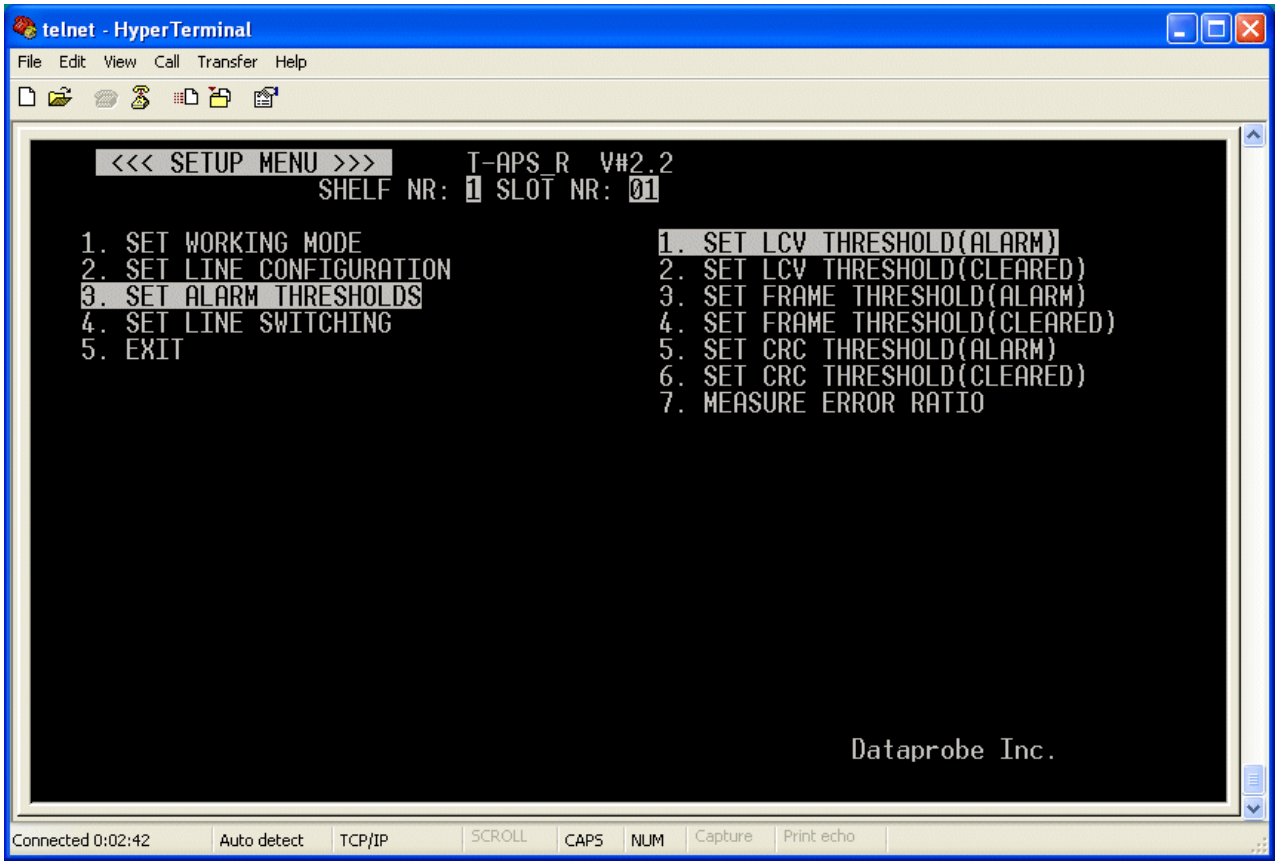
T1Setting

(A) DSX1-1: 0 to 133 feet
(B) DSX1-2: 133 to 266 feet
(C) DSX1-3: 266 to 399 feet
(D) DSX1-4: 399 to 533 feet
(E) DSX1-5: 533 to 655 feet
(F) -7.5dB CSU
(G) -15dB CSU
(H) -22dB CSU

E1 Setting

(A) 120 Nor:120 ohm Normal Return Loss
(B) 120 Hi¡G120 ohm High Return Loss

8.3. Set Alarm Thresholds



8.3.1. Set LCV Threshold (Alarm)

Set Line Code Violation Error Ratio

1E-7 = 1×10^{-7}

5E-6 = 5×10^{-6}

1E-5 = 1×10^{-5}

1E-4 = 1×10^{-4}

1E-3 = 1×10^{-3}

Once the Line Code Violation Error Ratio exceeds the preset threshold value, it will then switch the ACTIVE PATH to the PROTECTION PATH.

8.3.2. Set LCV Threshold (Cleared)

Set Line Code Violation Alarm Clear Ratio

1E-9 = 1×10^{-9}

1E-8 = 1×10^{-8}

1E-7 = 1×10^{-7}

1E-6 = 1×10^{-6}

1E-5 = 1×10^{-5}

Once the Line Code Violation Clear Ratio achieves the preset threshold value, it will then switch back from PROTECTION PATH to the ACTIVE PATH.

8.3.3. Set Frame Threshold Alarm

1E-5 = 1 x 10^{-5}

1E-4 = 1 x 10^{-4}

1E-3 = 1 x 10^{-3}

1E-2 = 1 x 10^{-2}

1E-1 = 1 x 10^{-1}

Once the Frame Error Ratio exceeds the preset threshold value, it will then switch the ACTIVE PATH to the PROTECTION PATH.

8.3.4. Set Frame Threshold (Cleared)

1E-7 = 1 x 10^{-7}

5E-6 = 5 x 10^{-6}

1E-5 = 1 x 10^{-5}

1E-4 = 1 x 10^{-4}

1E-3 = 1 x 10^{-3}

Once the Frame Clear Ratio achieves the preset threshold value, it will then switch back from PROTECTION PATH to the ACTIVE PATH.

8.3.5. Set CRC Threshold Alarm

Set Cyclic Redundancy Check error ratio

1E-5 = 1 x 10^{-5}

1E-4 = 1 x 10^{-4}

1E-3 = 1 x 10^{-3}

1E-2 = 1 x 10^{-2}

1E-1 = 1 x 10^{-1}

Once the Cyclic Redundancy Check Error Ratio exceeds the preset threshold value, it will then switch the ACTIVE PATH to the PROTECTION PATH.

8.3.6. Set CRC Threshold (Cleared)

Set Cyclic Redundancy Check alarm clear ratio

1E-7 = 1 x 10^{-7}

5E-6 = 5 x 10^{-6}

1E-5 = 1 x 10^{-5}

1E-4 = 1 x 10^{-4}

1E-3 = 1 x 10^{-3}

Once the Cyclic Redundancy Check Clear Ratio achieves the preset threshold value, it will then switch back from PROTECTION PATH to the ACTIVE PATH.

8.3.7. Measure Error Ratio

MEARSURE ERROR RATIO will measure and display Line Code Violation (LCV), Cyclic Redundancy Check (CRC), and Frame Error (FRME).

8.4. Set Line Switching

8.4.1. Set Switching Mode

Automatic Switching
Once the bit error exceeds the preset threshold value or other connection failures, the system will automatically switch from Active path to Protection path.

Manual Switching
Once the bit error exceeds the preset value or other connection failures, the system can be switched from Active path to Protection path manually.

8.4.2. Select Active Line

Line 1 as Primary Active path.

Line 2 as Primary Active path.

8.4.3. Set Recovery Time

Starting in Firmware Version 2.5 and above, this setting has two functions.

In Most Cases:
Setting the time interval to recover from protection path to the active path. Set 0 to 99 Minutes. Default: 2 Minutes.

Setting Recovery at 00 Minute: When Active Path experiences bit errors or lost signals, it will switch to the Protection Path. The Protection Path will immediately switch back to Active Path when Active Path is in a good condition.

Setting Recovery at **1 to 98 Minutes**: When Active Path experiences bit errors or lost signals, it will switch to the Protection Path. The Protection Path will switch back to Active Path after Active Path stays in good condition for **set number of minutes**.

Setting Recovery at **99 Minutes**: When Active Path experiences bit errors or lost signals, it will switch to the Protection Path. While setting Recovery at 99 Minutes, the Protection Path **will not switch back** to Active Path. The Protection Path will only switch back to Active Path when experiencing excessive bit errors or lost of signals.

In the case where Working Mode is Blind-2. This setting switches function.

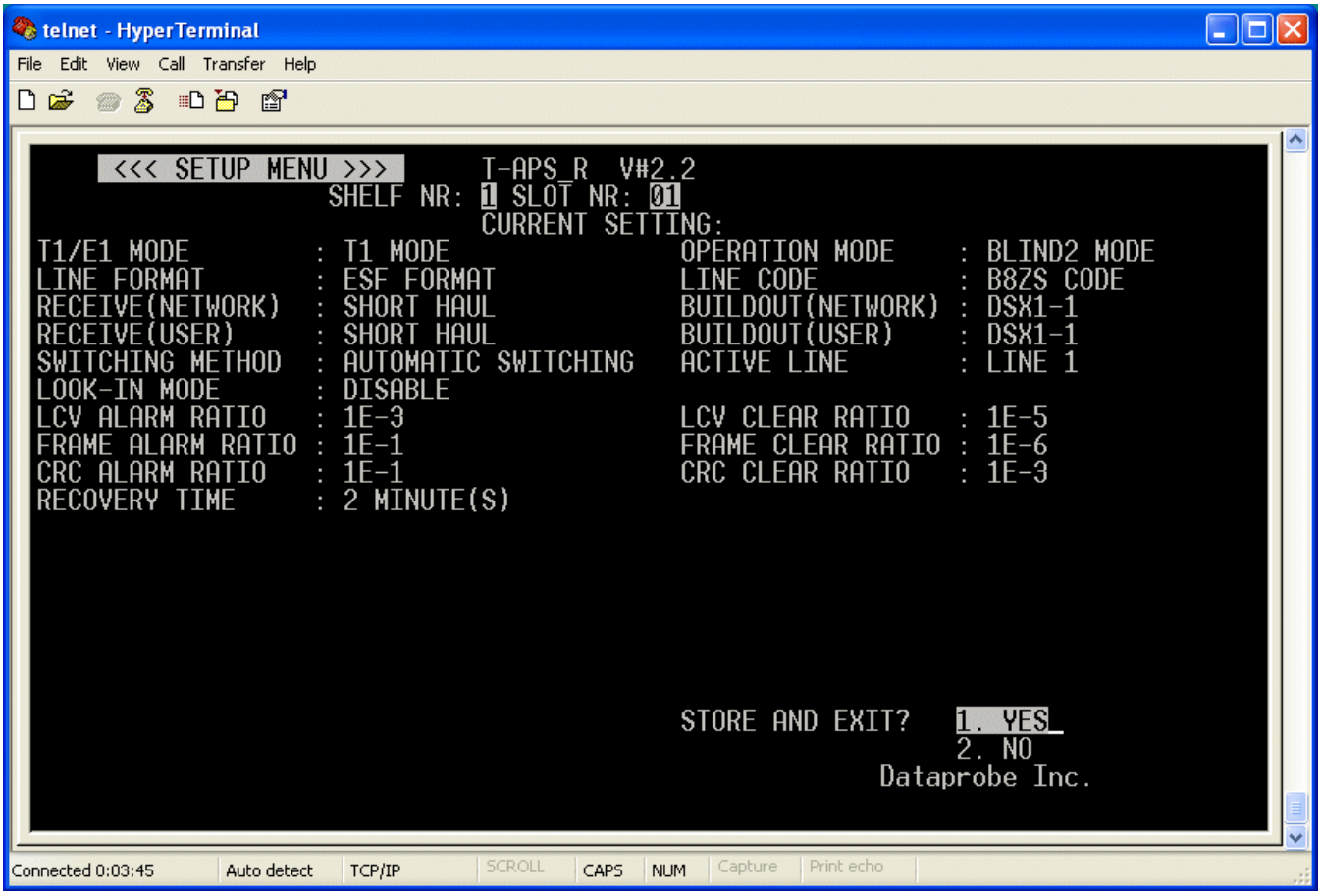
Set in Seconds 06 – 99 the hunt time (setting below 6 seconds will result in 6 seconds hunt time.) when searching for a good line. See Section 8.1 on Working Mode setting and function.

8.4.4. Show Current Line

Display the current path in use, L1 or L2.

8.4.5. Exit & Save Card Settings

This will display the current setting of the selected card just accessed and then confirm your intent to save and exit the system.



8.5. Current Settings

The Set up Menu screen will be display the current line card configuration. Selecting YES will store the settings for this line card to memory and exit to the main Set Up Menu screen of the nest.

9. SNMP Ethernet Port

The system can be managed by SNMP through standard management software. Dataprobe provides a private MIB which is available on our web site at: http://www.dataprobe.com/support-t-aps-series

9.1. Setting I/P Address

The T-APS comes with factory installed IP address **192.168.1.254**. In most cases this will need to be changed.

Consult your Network Administrator to determine the appropriate IP address. There are two methods to change the IP address.

- Front Panel Switches
- Serial Port

To set the IP address, the hardware (MAC) address must be known. This address is located on a label on the bottom of the unit or can be accessed thru serial port or the front panel display. The syntax for the MAC address is: nn-nn-nn-nn-nn-nn

IP Address, Subnet Mask and Gateway: Enter the appropriate information in dotted decimal format (xxx.xxx.xxx.xxx). If you are unsure of the entries, consult your network administrator.

9.2. MIB WALK

sysDescr	.0	DisplayString	Dataprobe T-APS VERSION #2.5
sysObjectID	.0	ObjectIdentifier	1.3.6.1.4.1.1418.609
sysUpTime	.0	TimeTicks	3-2:13:1.0
sysContact	.0	DisplayString	support@dataprobe.com
sysName	.0	DisplayString	T-APS_R
sysLocation	.0	DisplayString	11 Park Place / Paramus New Jersey 076552
sysServices	.0	INTEGER	72
s1t1e1apsIndex	.1	INTEGER	1
s1t1e1apsIndex	.13	INTEGER	1
s1mode	.1	Enum	t1 (1)
s1mode	.13	Enum	t1 (1)
s1workMode	.1	Enum	mode-blind2 (4)
s1workMode	.13	Enum	mode-1plus1 (1)
s1frameFormat	.1	Enum	t1-ESF (3)
s1frameFormat	.13	Enum	t1-ESF (3)
s1lineCode	.1	Enum	code-B8ZS (1)
s1lineCode	.13	Enum	code-B8ZS (1)
s1equipmentHaul	.1	Enum	shortHaul (2)
s1equipmentHaul	.13	Enum	shortHaul (2)
s1equipmentBuildOut	.1	Enum	t1-DSX1 (1)
s1equipmentBuildOut	.13	Enum	t1-DSX1 (1)
s1facilityHaul	.1	Enum	shortHaul (2)
s1facilityHaul	.13	Enum	shortHaul (2)
s1facilityBuildOut	.1	Enum	t1-DSX1 (1)
s1facilityBuildOut	.13	Enum	t1-DSX1 (1)
s1switchingMode	.1	Enum	manualMode (2)
s1switchingMode	.13	Enum	autoMode (1)
s1activePath	.1	Enum	path1 (1)
s1activePath	.13	Enum	path1 (1)
s1lookIn	.1	Enum	disable (2)
s1lookIn	.13	Enum	disable (2)
s1lcvErrorCount	.1	Enum	lcvErr1E-3 (1)
s1lcvErrorCount	.13	Enum	lcvErr1E-3 (1)
s1lcvClearCount	.1	Enum	lcvClr1E-5 (1)
s1lcvClearCount	.13	Enum	lcvClr1E-5 (1)
s1frameErrorCount	.1	Enum	frameErr1E-1 (1)
s1frameErrorCount	.13	Enum	frameErr1E-1 (1)
s1frameClearCount	.1	Enum	frameClr1E-3 (1)
s1frameClearCount	.13	Enum	frameClr1E-3 (1)
s1crcErrorCount	.1	Enum	crcErr1E-1 (1)
s1crcErrorCount	.13	Enum	crcErr1E-1 (1)
s1crcClearCount	.1	Enum	crcClr1E-3 (1)
s1crcClearCount	.13	Enum	crcClr1E-3 (1)
s1recoveryTime	.1	INTEGER	2
s1recoveryTime	.13	INTEGER	2
s1currentPath	.1	INTEGER	1
s1currentPath	.13	INTEGER	1
currentAlarm	.0	OctetString	3000000000003000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
boardStatus	.0	OctetString	1000000000001000000000000000000000000000000000000000000000000000000000000000000000000000000000000000

10. Specifications

T1 Interface

Bit Rate	1.544 M b/s
Line Code	AMI B8ZS
Frame Format	SF ESF Unframed
Bit Rate	1.544M b/s
Impedance	100 Ohms Resistive Balanced
Input Level	0-36 dB
Output Level	6V p-p
Line Build Out	0-655 feet

E1 Interface

Bit Rate	2.048 M b/s
Line Code	AMI HDB3
Frame Format	CCS CAS CCS+CRC CAS+CRC Unframed
Impedance	120 Ohms Resistive Balanced
Input Level	0-43 dB
Output Level	6V p-p
Line Build Out	0-655 feet

LED Status Display

RUN 1:1 T1 or E1, Line 1 and Line2, LOS, OOF, AIS, RAI, Fail, ACO.

ALARM Contacts

Form C relay 0.5A 30VDC MAX

Automatic Switching Parameter Programmable

Code Violation	10-3 10-6
CRC Error	10-1 10-3
Frame Error	10-1 10-3
AIS	Unframed
Loss of Signal	
Fault Duration	

Recovery Interval	0 Minute 1~98 Minutes 99 Minutes (Toggle)
Console Port	RS-232 (VT-100)
Network	10BaseT Ethernet

Environmental

Weight	1.1 KG
Dimension	482mm W × 177mm H × 267mm D, 19.0in W x 7.0in H x 10.50in D
Operating Temp.	0 – 50 Deg C.
Relative Humidity	5% 90%,Non-condensing
Regulatory Compliance	FCC Part 15 Class A
Reliability	MTBF 44,000 hrs

Power	Dual -48VDC ±5V
Line Card	85mA per card 1.275 Max for 15 Cards
MCU Card	35mA Max
Complete System	1.3A Max
External Power Supply	Model: PS-48-WRI Item 1930073 Input 110-230VAC 50-60Hz Output -48VDC 2.08 Amps

11. Technical Support and Warranty

Seller warrants this product, if used in accordance with all applicable instructions, to be free from original defects in material and workmanship for a period of **Three Years** from the date of initial purchase. If the product should prove defective within that period, Seller will repair or replace the product, at its sole discretion. Repairs may be made with new or refurbished components and replacements may be new or refurbished at the Sellers sole discretion. Repaired or replaced units shall be warranted for the balance of the original warranty, or 90 days, whichever is greater.

If Purchased from Dataprobe Inc.; Service under this Warranty is obtained by shipping the product (with all charges prepaid) to the address below. Seller will pay return shipping charges within the United States. Call Dataprobe Technical Service to receive a Return Materials Authorization (RMA) Number prior to sending any equipment back for repair. Include all cables, power supplies, accessories and proof of purchase with shipment.

If purchased from an Authorized Dataprobe Reseller; Service under this Warranty is obtained by contacting your Authorized Dataprobe Reseller.

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WARNING: The individual user should take care to determine prior to use whether this device is suitable, adequate or safe for the use intended. Since individual applications are subject to great variation, the manufacturer makes no representation or warranty as to the suitability of fitness for any specific application.

Dataprobe Inc.
Technical Support: 201-934-5111
support@dataprobe.com
www.dataprobe.com/support.html