

TSI-1524 DS-1 MULTI-CHANNEL BERTS

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The Model TSI-1524 fills the need for testing multiple DS-1's simultaneously. It is a modular system with plug-ins. A unit can be configured with up to four DS-1 Receiver Modules, a Transmitter Module and an Analyzer Module to provide signal analysis - all in a single chassis. Three chassis configurations are available - Six Module 23" rack mount (-48Vdc), Five Module 19" rack mount (-48Vdc) and Six Module Portable (110Vac). The TSI-1524 allows testing of all current T carrier, fiber optics T1 facilities and D4 or ESF channel banks.

A minimum configuration chassis has one DS-1 Receiver Module, and either a DS-1 Transmitter Module or an Analyzer Module. A fully loaded chassis contains four DS-1 Receiver Modules, a DS-1 Transmitter Module and an Analyzer Module. An optional 1200/2400 baud modem permits remote control with auto call to a programmed number when a DS-1 Receiver alarm condition is detected.

MODEL TSI-1524-2 (TSI-1524-8) DS-1 RECEIVER MODULE

- ▶ 1 to 4 DS-1 Receivers
- ▶ Status Indicators Including History
- ▶ Measurement Alphanumeric Display
- ▶ SF/ESF/SLC/Off Framing
- ▶ Bit, F-Bit, CRC-6, BPV, LOS, LOF, SES, CSEC Measurements
- ▶ ESF Far End Error Reports (PRM's)
- ▶ AMI/B8ZS Coding
- ▶ QRSS/3 in 24/1:7/All 1's/All 0's/55 Octet/2K Byte Repeating Patterns
- ▶ Input Connectors Bantam, 310 or Rear Panel Wirewrap

MODEL TSI-1524-5 DS-1 TRANSMITTER MODULE

- ▶ Four independent DS-1 outputs
- ▶ SF/ESF/SLC/OFF Framing
- ▶ AMI/B8ZS Code
- ▶ QRSS/3 in 24/1:7/55 Octet/All Ones/16 User Programmable 1K Byte Patterns
- ▶ ESF Data Link
- ▶ Programmable Loop Up/Loop Down Codes
- ▶ Error Insert

MODEL TSI-1524-3 ANALYZER MODULE

- ▶ Measure DS-1 Slips/Frequency/Amplitude
- ▶ DS0 Drop to Audio Speaker With Volume Control
- ▶ 96 Hours, 15 Minute Increment Measurement Storage
- ▶ Signal Bit Display
- ▶ RS-232C Interface
- ▶ Auxiliary RS-232C Interface
- ▶ Real-Time Clock
- ▶ Capture and readout of Repeating Patterns

TSI-1524 CHASSIS CONFIGURATIONS

The Model TSI-1524 is available in three chassis configurations:

- ▶ Five Module Chassis for mounting in a 19" or 23" rack.
- ▶ Six Module Chassis for mounting in a 23" rack.
- ▶ Portable Chassis



Six Module Chassis with TSI-1524-5 Transmitter Module, four TSI-1524-2 Receiver Modules and a TSI-1524-3 Analyzer Module.



Portable Configuration with four TSI-1524-8 Receivers, TSI-1524-3 Analyzer and a TSI-1524-5 Transmitter.

MODEL TSI-1524-2 DS-1 RECEIVER MODULE

The TSI-1524-2 Receiver module provides full function DS-1 measurements. When an input signal is applied, the Receiver automatically determines framing for SF, ESF, SLC or OFF (unframed), coding for AMI or B8ZS, and pattern: QRSS, 3 in 24, 1:7, all ones, all zeros, 55 Octet or repeating pattern. The repeating pattern capability automatically synchronizes to unique, repeating patterns up to 2K bytes, 16K bits long. The front panel LEDs indicate history by blinking once per second and illuminate to indicate the current condition. ESF performance report messages (PRM) and codes are also displayed. Up to four Receiver Modules can be accommodated in a single chassis.

MODEL TSI-1524-5 DS-1 TRANSMITTER MODULE

The Model TSI-1524-5 DS-1 Transmitter provides four independent front panel DSX-1 outputs or rear panel wirewrap pins in the TSI-1524-6 Six Module Chassis. Set-up is accomplished through front panel switches or remotely through the RS-232 interface. The unit can also output QRSS, 3 in 24, 1:7, 55 OCTET, ALL ONE's, ALL 0's, THRU from Model TSI-1524-3 Receiver, and up to 16 1K Byte User Programmable Patterns. LOOP UP/LOOP DOWN patterns consisting of DL (ESF Data Link) Line, DL Payload, DL Network, CSU, Facility and up to 16, 1K Byte

User Programmable Loop Up and Loop Down Patterns. The TSI-1524-6 contains the power supply for the TSI-1524-2 DS-1 Receivers when the TSI-1524-3 Analyzer is not used.

The Model TSI-1524-5 DS-1 Transmitter occupies slot 1 or 5 in a Five Module Chassis or slot 1 or 6 in a Six Module Chassis. When used in place of a TSI-1524-3 Analyzer Module, RS-232 control of the Transmitter for current setup and readings is permitted. The Transmitter can output single errors on a selected output.

MODEL TSI-1524-3 ANALYZER MODULE

The Model TSI-1524-3 Analyzer Module makes slip measurements between any of the received DS-1 signals as well as amplitude and frequency measurements of a selected input. A DS-0 within a selected DS-1 may be dropped to an internal speaker with signaling bits displayed on the front panel. The Analyzer Module contains the Real Time Clock for 96 hour, 15 minute increment measurement storage bins for up to four TSI-1524-2 DS-1 Receivers, capture and read out of repeating patterns up to 200 bytes in length from the DS-1 Receivers, alarm logging capability and the Auxillary RS-232 interface which permits up to 10 chassis to be controlled through a single RS-232 interface. The TSI-1524-3 Analyzer also contains the power supply for the TSI-1524-2 Receivers. The TSI-1524-3 Analyzer occupies slot 5 in a TSI-1524-1 Five Module Chassis.

MODEL TSI-1524-4 INTERNAL MODEM

The optional TSI-1524-4 Internal Modem is a 1200/2400 Baud Auto Answer/Auto Call modem. The Internal Modem permits remote control of the RS-232 controllable functions and in addition permits a pre-programmed number to be automatically called when an alarm condition is detected by one of the TSI-1524-2 DS-1 Receivers. The TSI-1524-4 Internal Modem requires the TSI-1524-3 Analyzer Module.

REMOTE CONTROL

An RS-232 interface allows full remote control and monitoring using a terminal. An auxiliary RS-232 interface (available with the TSI-1524-3 Analyzer Module only) allows up to ten TSI-1524 DS-1 Multi-Channel BERTS Chassis or equivalent to be remotely controlled through a single RS-232 interface.

When under remote control, the Model TSI-1524 will display complete help information by simply entering an "H" from the keyboard. Complete unit control and status is provided through the RS-232 interface.

MODEL TSI-1524-8 DS-1 RECEIVER MODULE

Same as TSI-1524-2 DS-1 Receiver except for addition of front panel TERMINATE, MONITOR, BRIDGE DS-1 Input switch. Preferred receiver module for portable configuration where long cables and bridging amplifier test capability is desired.



TSI-1524-1 Five Module Chassis with three TSI-1524-2 Receivers, TSI-1524-3 Analyzer Module and a TSI-1524-5 Transmitter.



Convenient plug-in modules.

Chassis HELP screen

```
1524_0_Rx_1>H
Help on Receiver/Transmitter Commands
-----
Help on Receiver      HElp RX
Help on Transmitter  HElp TX

General Chassis Commands
-----
Select Chassis      CH <n>      (n = 0 to 9)
Select Receiver     RX <n>      (n = 1 to 4)
Select Transmitter  TX <n>      (n = 1 to 4)
Set Time            ST hh:mm:ss
Set Date            SD mm/dd/yy
Get Time            GT
Get Date            GD
Get Version         GV          Get firmware version and date
```

Complete control of the Model TSI-1524 via the RS-232 interface can be accomplished using only a terminal.

HELP screen makes using the remote RS-232 interface easy.

Receiver HELP screen.

```
1524_0_Rx_1>H RX
Commands for Selected Receiver
-----
Alarm Level      AL <OFF, LOS, LOF, CSES, SES, AIS, or YEL>
AL              AL      Display Selected Alarm Level
Bin Report       BR      Report of 15 Min Bins for Receiver
Current Reports  CR      Current Receiver
                 FR      Far End report (ESF PRMs)
                 PR      Pattern Report (Repeating Patterns)
DS0 Info         DSO     Display Signaling Bits
Restart Test     RR      Restart Receiver

Commands for All Receivers
-----
Alarm Logging    AE      Enabled,           AD      Disabled
Bin Logging      ME      Midnite Rpt Enable, MD      Midnite Rpt Disable
Bin Squelch      BS      Squelch Zero Bins,  BZ      Zero Bins Printed
Bins Clear       BC      Clear ALL Bins
Restart Tests    RA      Restart ALL Modules (Bins Unaffected)
Slips            SR      <n> Select Ref DS0
                 SL      Display Slips
```

```
1524_0_Rx_1>H TX
Commands for Selected Transmitter
-----
Framing          FRAME <SF, ESF, SLC, OFF>
Coding           CODE <B8ZS, AMI>
Error Insert     EI
ESF Codeword     CW      Get current codeword
                 CW      OFF      Do not transmit codeword
                 CW      bbbbbb  Continually send binary = bbbbbb
                 (bbbbbb = 000000 is Yellow)

Get Version      GV
Data Patt       DATA <name>  Get available Data Pattern names
                DATA <name>  Activate Data Pattern
Loop Up Patt     LU      <name>  Get available Loop Up names
                LU      <name>  Activate Loop Up
Loop Down Patt   LD      <name>  Get available Loop Dn names
                LD      <name>  Activate Loop Dn
Start Prog Patt PROG <DATA, LU, LD> <name>
End Prog Patt   END
Delete Prog Patt DEL <DATA, LU, LD> <name>
```

Transmitter HELP screen.

1524_0_Rx_1>FR

Receiver 1
Far End Statistics

Total Secs = 57829
Total PRM's = 58015

PRM Event Counts:

SE (Sev Error'd Framing Event) : 0
FE (Frame Sync Bit Error Event) : 1
G1 (1 CRC Error Event) : 11
G2 (2 to 5 CRC Error Events) : 12
G3 (6 to 10 CRC Error Events) : 0
G4 (11 to 100 CRC Error Events) : 1
G5 (101 to 319 CRC Error Events) : 99
G6 (Over 319 CRC Error Events) : 0
SL (Slip Event) : 0
LV (Line Code Violation Event) : 0

The **CURRENT REPORT** shows the status of the received signal for selected receivers.

1524_0_Rx_1>BR

Report for Receiver 1
15 Minute Error'd Second Bins
From 16:17:09 on 06/26/92 to 10:16:38 on 06/27/92

Bins with all zeroes WILL be printed

Start Time	LOS	LOF	SES	CSES	Bit ES	Fbit ES	BPV	Poff	CRC6	Far End ES	SES	PRMs
16:30 06/30	0	0	0	0	0	0	0	0	0	1	0	899
07:30 07/01	0	2	4	0	0	2	10	0	0	122	0	852

Example of the performance monitoring **BIN REPORT** for a DS-1 signal. Performance monitoring bins are accumulated in 15-minute increments over a 96 hour period..

1524_0_Rx_1>CR

Receiver 1
Framing is ESF
Live Traffic
Coding is B8ZS
YELLOW Alarm since RESTART
ERROR EVENT since RESTART

Frequency = 1544012 hz
Amplitude = -18.2dBx, 0.73 Vpp
Total Secs = 57299
Total Far End PRM's received = 57483

	ES	% ES	Tot Errs	Err Rate
LOS	0	0.000	-	-
LOF	2	0.003	-	-
SES	2	0.003	-	-
Fbit	2	0.003	12	1.05 e-7
CRC6	0	0.000	10	1.13 e-10
BPV	2	0.003	5	5.65 e-11
	123	0.214	-	-
	0	0.000	-	-

ESF Far-End performance report messages.

1524_0_Rx_4>PR

Receiver 4
Repeating pattern captured at 07:59:25 on 07/01/92
Pattern Length = 440 bits

Byte Hex Data (Rightmost bit first)

0: 01 01 01 01 01 01 03 01 01 01 01 07 01 01 01 01 55 55 55 55 AA
20: AA AA AA 01 01 01 01 01 01 FF FF FF FF FF FF 80 01 80 01 80
40: 01 80 01 80 01 80 01 01 01 01 01 01 01 80 01

Repeating patterns up to 200 bytes in length can be captured and displayed..

1524_0_Rx_2>SL

Slip Reference is DS1 1
DS1 2
Slips = -76
Rate = - 2.05Hz
DS1 3
Slips = +15
Rate = + 0.41Hz
DS1 4
Slips = -88
Rate = - 2.35Hz

Slip measurements allow detection of synchronization problems.

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SPECIFICATIONS

TSI-1524-2 RECEIVER MODULE

INPUT:

DS-1, DSX-1 or DSX-1 Monitor Level, front panel 310 Plug compatible, Bantam or Rear Panel Wirewrap

FRONT PANEL SWITCHES/LEDS:

LEDs and Indicators blink once per second to indicate history.

LOS SEC

Loss of Signal Seconds

LOF SEC

Loss of Frame Seconds

CSES

Consecutive Severely Error Seconds

SES

Severely Error Seconds

BIT

Data Pattern Bit Errors/Error Seconds/Bit Error Rate/%Error Seconds

F-BIT

Framing Bit Errors/Error Seconds/Error Rate/%Error Seconds

CRC-6

ESF CRC-6 Errors/Error Seconds/Error Rate/%Error Seconds

BPV

BiPolar Violation Errors/Error Seconds/Error Rate/%Error Seconds

TOT ERR

Accumulation of LOS SEC, LOF SEC, BIT, F-Bit, CRC-6, and BPV errors

PTRN

Indicates input pattern type

DISP SEL

View menu items including measurement elapsed time, ESF PRM messages and ESF CODES

RESET/ENTER

Reset history indicators and restart measurement

DISPLAY

Alphanumeric 8 Character LED Display

STATUS INDICATORS:

SIG LOS

Loss of Signal

FRM LOS

Loss of Framing

SF

Indicates SF Framed Data

ESF

Indicates ESF Framed Data

SF AND ESF

Indicates SLC Framing

B8ZS

Indicates B8ZS Coding

>0

Indicates Excess 0 Detected

AIS

Indicates Unframed all ones

YEL

Indicates Input Yellow Alarm

ERR EVNT

Blinks once for each error second

PTRN SYNC

Indicates TSI-1524 is synchronized to the incoming data pattern

DSX-1 LEVEL

+6 to -5 dB

DSX-1 MONITOR

-15 to -25 dB resistive

IMPEDANCE

100 ohms

TSI-1524-3 ANALYZER MODULE

FRONT PANEL SWITCHES:

SELECT

Select TSI-1524 Receiver module 1, 2, 3 or 4 for analysis.

FREQ

Display frequency of selected DS-1, 1 Hz resolution, ± 5 Hz max error.

AMPL

Display selected DS-1 input level in dBx (0dBx=6Vpp) or Vpp (press switch twice). Accuracy $\pm 5\%$ at DSX, $\pm 10\%$ Monitor level. Pass for $V_{pp} 7.5 > V_{pp} > 4.5$ (DSX range) or $.78 > V_{pp} > .42$ (DSX Monitor). FAIL indicated for Vpp out of DSX or DSX Monitor ranges.

SLIP TOTAL/RATE

Display total slips or slip rate between reference DS-1 and selected DS-1.

DISP SEL, UP, DOWN, ENTER

Switches to select user setup modes: Reference DS-1 for slips, DS0 for signalling and audio output, display real time, etc.

VOL

Adjusts volume of audio output to speaker.

TSI-1524-5 TRANSMITTER MODULE

OUTPUTS:

Four independent DSX-1 outputs, 6.0 Vpp nominal, 100 ohm balanced, 1.544 MHz ± 30 ppm, front panel BANTAM connectors, and rear panel wirewrap on TSI-1524-6 Six Module Chassis.

FRONT PANEL SWITCHES:

FRAME

Selects output framing type for displayed output only. Frame type SF, ESF, SLC and OFF. If THRU data pattern is selected for an output, no framing is indicated since the recovered input from a Receiver module is regenerated and output.

LOOP UP

Selects Loop Up (loop back activate) pattern to be transmitted on selected for an output by pressing ENABLE or modified/programmed by pressing PROG.

LOOP DOWN

Select Loop Down (loop back deactivate) pattern to be transmitted on selected for an output by pressing ENABLE or modified/programmed by pressing PROG.

SPECIFICATIONS

TSI-1524-5 TRANSMITTER MODULE (CONT.)

PATTERN

Selects data pattern to be sent on displayed DS-1 output. Each press of the switch scrolls through the available pattern choices, QRSS, 3 in 24, 1:7, 55 octet, all ones, all zero and up to 16 1K Byte user programmed and THRU. For THRU patterns, OUTPUT 1 outputs recovered data from Receiver 1, OUTPUT 2 from Receiver 2, OUTPUT 3 from Receiver 3 and OUTPUT 4 from Receiver 4. When THRU is selected the Receiver/Transmitter act like a bridging amplifier. Although AMI/B8ZS coding can be controlled on THRU data, framing indication is disabled and there is no error insert.

CODE

Switch and LED's select AMI or B8ZS coding for the displayed output.

UP/DOWN/LEFT/RIGHT

Select and alter programmable data and loop patterns. Pressing LEFT and RIGHT simultaneously deletes the currently selected pattern. Left arrow in non-program pattern modes insert 1 bit error in unframed and SF mode and 1 bit error and 1 CRC-6 error in ESF mode. Right arrow in non-program mode selects operator set-up menu.

PROG

Pressing switch enters program mode to alter a selected programmable data or loop code pattern.

OUTPUT

Switch and 4 LED's. Pressing switch scrolls the output as indicated by the LED next to the DS-1 output connector. Only the currently displayed output is altered when changing coding and framing and pattern since all outputs operate independently.

ENABLE

When scrolling loop pattern or data patterns, the new pattern will blink on the display and is not transmitted until ENABLE is pressed. When ENABLE is pressed the newly selected pattern is transmitted and the display stop flashing. This prevents sending unwanted patterns while examining or altering patterns.

TSI-1524-8 RECEIVER MODULE

Same as TSI-1524-2 except for input TERMINATE, MONITOR, BRIDGE switch. Preferred Receiver for portable configurations.

TERMINATE, BRIDGE

+6 to -36 dB cable loss

MONITOR

-15 to -25 dB resistive

MONITOR, TERMINATE

100 ohms

BRIDGED

Greater than 1,000 ohms

TSI-1524-1/1524-6 CHASSIS CONNECTORS

RS-232C I/O

DB-9 Male, 8 data bits, no parity, 1 start and 1 stop bit, 1200/2400/4800/9600 baud, the RS-232 connector is disabled when the MODEM option is installed.

AUX RS-232C

DB-9 Female, 8 data bits, no parity, 1 start, 1 stop bit, 1200/2400/4800/9600 baud.

RJ11

Phone Jack for use with TSI-1524-4 Internal Modem option.

ALARM CONTACTS

3 pole quick disconnect terminal block for Common, Normally Open and Normally Closed contacts. Contact closure when present DS-1 receiver alarms are detected.

DS-1 RECEIVER WIREWRAP INPUTS

Tip, Ring, Sleeve wirewrap rear panel inputs in parallel with front panel DS-1 Receiver Inputs.

DATA LINK

DB-9, NRZ TTL Clock and Data for 4 Receiver ESF Facility Data Link and Ground.

-48VDC INPUT

3 pole quick disconnect terminal block

TSI-1524-7 PORTABLE CHASSIS CONNECTORS

RS-232C I/O

DB-9 Male, 8 data bits, no parity, 1 start and 1 stop bit, 1200/2400/4800/9600 baud, the RS-232 connector is disabled when the MODEM option is installed.

AUX RS-232C

DB-9 Female, 8 data bits, no parity, 1 start, 1 stop bit, 1200/2400/4800/9600 baud.

RJ11

Phone Jack for use with TSI-1524-4 Internal Modem option.

AC POWER

110Vac @ 0.5 Amps

GENERAL

POWER:

TSI-1524-1 Five Module Chassis and TSI-1524-6 Six Module Chassis -48Vdc, 2 Watts per card, DC-DC power modules on Analyzer and Transmitter cards. TSI-1524-7 Portable Chassis 110 Vac @ 0.5 amps

TEMP:

0°C/50°C Operating, -25°C/75°C Storage

SIZE:

TSI-1524-1 Five Module Chassis
4"H x 11"D x 17"W, 19" rack mount adapters.
TSI-1524-6 Six Module Chassis 4"H x 11" D x 21"W, 23" rack mount.
TSI-1524-7 Portable Chassis
8.25H x 10.6W x 10.4D

WEIGHT:

7 lbs plus 1 lb per module.

ORDERING INFORMATION

- ▶ TSI-1524-1 Five Module Chassis 19" rack mount -48Vdc CPR 101122
- ▶ TSI-1524-2 DS-1 Receiver Module CPR A72097
- ▶ TSI-1524-3 Analyzer Module CPR A72098
- ▶ TSI-1524-4 Internal Modem Model
- ▶ TSI-1524-5 Transmitter Module CPR A72395
- ▶ TSI-1524-6 Six Module Chassis 23" rack mount -48Vdc CPR 101299
- ▶ TSI-1524-7 Portable Chassis 110 Vac CPR 776302
- ▶ TSI-1524-8 DS-1 Receiver Module CPR A72097
- ▶ P/N 400110 Soft Carrying Case for TSI-1524-7 Portable Chassis
- ▶ P/N 300109 Blank Module Panel

TELESYNC reserves the right to update product specifications without notice.

TELESYNC®

5555 Oakbrook Parkway • Suite 110
Norcross, GA 30093
TEL: 770-246-9662 • FAX: 770-246-9733

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