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INTERCEPTOR 1402S
COMMUNICATIONS ANALYZER
USER'S GUIDE

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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This section contains a functional and physical product description, a features overview, and information describing how to get started using the INTERCEPTOR 1402S Communications Analyzer from TTC. This information includes operating warnings, power requirements, self-test, operation verification, and setup procedures for straight-through operation and multiplexing operation.

1.2 FUNCTIONAL DESCRIPTION

The INTERCEPTOR 1402S is a versatile, lightweight test instrument for monitoring, analyzing, and troubleshooting digital communications systems. The INTERCEPTOR can operate as a:

- Dedicated point-to-point test instrument
- Monitor instrument
- Multiplexer/demultiplexer analyzer

Dedicated point-to-point testing allows data to be monitored or tested at one of the following fixed rates: 2.048 Mbit/s, 8.448 Mbit/s, 34.368 Mbit/s, 139.264 Mbit/s (optional), or 155.52 Mbit/s (optional). For dedicated testing, one data rate is received, analyzed, and transmitted.

Monitor operation allows one tributary from a higher data rate to be monitored in service. If testing is required, the individual tributary can be tested without disrupting traffic flow on the remaining tributaries.

With mux/demux operation selected, the input, analysis, and output data rates can all be different. Multiplex operation allows the INTERCEPTOR to generate a lower input data rate and multiplex it up to a higher output data rate. Demultiplex operation takes a higher data rate and allows one of

the four tributaries to be selected for in-service monitoring and live-data testing, while leaving the data undisturbed on all tributaries.

With the 155M option and the Nx64K option installed, it is possible to select a single 64k timeslot within a 155 Mbit/s (STM-1) signal and monitor a voice call on that timeslot.

1.3 PHYSICAL DESCRIPTION

The INTERCEPTOR 1402S front panel design groups controls and related functions in operational clusters. This allows both the first-time user and the experienced technician to easily obtain test results when time is critical. Test instrument controls consist of pushbutton and rocker switches. Results and operating messages are clearly visible on a dual line, 80-character, vacuum fluorescent display module. The display provides current test result and operating configuration information. Front panel LEDs provide a quick visual indication of the test instrument operating status, such as test mode, the analysis frequency, alarm status, frame synchronization, input status, and output level.

A modular design allows flexibility in hardware configuration. This enables simple installation and removal of circuit boards, allowing the test instrument to be user-configured or easily modified by adding options at a later date without being sent to the factory.

Connecting a PR-55 lid printer to the INTERCEPTOR front panel PRINTER connector permits hard copies of test results or the test instrument operating configuration to be generated.

1.4 INSTRUMENT IDENTIFICATION PLATES

An identification plate is attached to the back of each INTERCEPTOR 1402S. The instrument serial number and line voltage input requirements are inscribed on this plate. This serial number should be included on all correspondence with TTC concerning the particular instrument. In addition, the INTERCEPTOR 1402S has an option identification plate, which lists the factory-installed options.

1.5 FEATURES

The INTERCEPTOR 1402S provides the following key features and characteristics:

- Operates at fixed rates of 2 Mbit/s, 8 Mbit/s, 34 Mbit/s, 140 Mbit/s (optional), or 155 Mbit/s (optional)
- Performs multiplexing/demultiplexing
- Ability to test SDH circuits (with the appropriate options installed)
- Performs analysis on live data without disrupting that data (when connected to a protected monitor point)
- Performs extensive point-to-point out-of-service data analysis, providing over 100 simultaneous test results
- Allows selection of G.821 (in-service or out-of-service), M.2100 (in-service or out-of-service), or custom M.2100 performance error analysis
- Can demultiplex a single tributary from a higher data rate down to a single tributary, while not disrupting live data on the other tributaries
- Allows logic, frame, code errors, and/or SDH overhead errors to be inserted
- Generates either fixed data patterns (Mark, Space, 1:1, or 1:4) or pseudorandom patterns (2^6 -1, 2^9 -1, 2^{11}-1, 2^{15} -1, 2^{20} -1, or 2^{23}--1)

- Provides a Summary Results category to quickly view key results values without having to scan several different categories
- Provides continuous display of signal status and alarms via front panel LEDs
- Remote control capability via the V.24/RS-232C Interface or optional IEC625/IEEE-488 Interface
- Automatically selects the AC line voltage from 100 VAC to 250 VAC
- Transmit timing frequency offset (Requires Option 1402-6)
- Round trip delay measurement to 1µS accuracy.

1.6 WARNINGS

The following warnings and precautions must be observed before and during all phases of instrument operation. Failure to comply with these and other specific warnings, contained elsewhere in this manual, may cause physical harm to the operator and/or damage to the instrument. TTC assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding (earth) wire firmly connected to an electrical ground (safety ground) at the power outlet.

USE THE PROPER FUSE RATING

Line voltage selection is performed automatically. Any line voltage between 100 VAC and 250 VAC that can provide 110 volt-amperes is acceptable. The line fuses (6.3A at 250V Slow Blow) are located inside the side panel power receptacle assembly. The fuses can be accessed by removing the power cord and firmly pulling the fuse assembly out from the side. Never operate the instrument with an improperly rated fuse!

KEEP AWAY FROM LIVE VOLTAGES

Do not remove the instrument top cover or insert fingers or other objects through the side panel holes while power is applied to the test instrument.

TURN POWER OFF BEFORE INSERTING OR REMOVING MODULES

Do not insert or remove test instrument modules with power turned on. Be sure power is turned off before installing or removing modules.

DO NOT OPERATE IN AN AMBIENT TEMPERATURE ABOVE 50°C

Do not operate this test instrument in ambient temperatures that exceed 50°C. Operating this test instrument in temperatures above 50°C can cause damage.

DO NOT LOOK INTO LASER TRANSMITTER CONNECTOR WHEN ON

The laser transmitter is located on the side panel. To prevent damage to your eyes, do not look directly into the laser transmitter connector when the laser transmitter is on.

1.7 POWER REQUIREMENTS

The test instrument requires a single phase 50 or 60 Hz power source at 100-250 VAC that can deliver 110 volt-amperes (maximum).

Connect the line voltage to the INTERCEPTOR power receptacle, located on the right side of the test instrument (when viewed from the front panel). The power module accepts a 50 to 60 Hz, 100 to 250 (±10V) VAC signal. No other voltage selection is necessary.

1.8 POWER-UP

The following paragraphs describe the procedures for applying power to the INTERCEPTOR 1402S Communications Analyzer and verifying operation of the test instrument.

Press the INTERCEPTOR **POWER** switch to the ON position. The power switch is the rocker switch located toward the rear, on the right side of the test instrument (when viewed from the front panel). The switch uses symbols (1 and 0) to indicate the test instrument power status.

0 = power turned off
1 = power turned on

Press the rocker switch toward the 1 position to turn on the INTERCEPTOR power. When turned on, the INTERCEPTOR performs an automatic self-test.

1.8.1 Automatic Self-Test

The automatic self-test consists of a series of diagnostic tests that are performed each time the INTERCEPTOR is powered up. This self test ensures that the INTERCEPTOR is functioning properly. If one portion of this automatic test fails, a message appears in the front panel display window indicating what part of the test failed. Each time the test instrument is powered up, the automatic self-test verifies the operation of the following:

- All of the discrete LEDs, pushbutton switches containing LEDs, and all segments of the vacuum fluorescent display are illuminated for approximately five seconds.

- The EPROM and RAM are checked. If an error is detected, a message appears in the display window. If an error is detected in an EPROM, the test instrument may not be able to operate. If an EPROM error occurs, contact TTC or your distributor for service.

- Memory is checked at power up to verify that the INTERCEPTOR's last settings (that were stored in memory, prior to powering down) were not corrupted. This allows the previous operating conditions to be restored at power up. If any changes are detected in memory, a message is displayed for approximately one second indicating what general portion of memory (ROM, RAM, or NOVRAM) failed. When a failure is detected in the NOVRAM, the original factory settings are automatically restored. Even if a portion of the NOVRAM fails, the INTERCEPTOR is still functional, but the last switch settings may not be saved when power is cycled. However, if a major error message is displayed, call TTC or the authorized service center and report the displayed message.

- All of the switches are checked for proper positioning. If a switch is stuck (e.g., pressed but not released) an error message **KEY STUCK - XXXXXXX** is displayed (where **XXXXXXX** represents the name of the stuck key) to indicate which key is stuck. For example, if the **TEST MODE** key was pressed and not released or is held pressed in during power up, the message **KEY STUCK - TEST MODE** is displayed for approximately one second. Once a key is detected as stuck, it is disabled.

1.8.2 Manual Self-Test

Pressing the **SELF LOOP** pushbutton switch initiates a manual self-test. When the **SELF LOOP** switch is pressed, the LED within the switch illuminates and the test instrument is placed in the self-loop mode. In the

self-loop mode, the test instrument operation is tested by internally looping the transmitter output to the receiver input. While performing a self-loop test, the transmitter and receiver data rates must be the same to allow the test instrument to properly synchronize. If the user selects different data rates, as is possible during the MUX TEST operating mode, the message **INVALID RCV FREQUENCY** is flashed in the display window on the right. This message is cleared when the receive and transmit data rates are the same.

Note: For manual self-test to operate properly, be sure that the RECEIVE INPUT is set to **TERM**.

1.8.3 Fuse Replacement

If the test instrument front panel LEDs fail to illuminate, verify that line voltage is present and is 50 Hz to 60 Hz within the range of 100 to 250 (±10V) VAC. Make sure the fuse is not blown. The test instrument fuse is located within the power receptacle module. The following procedure describes the steps to verify or replace the fuse.

1. Turn the test instrument power OFF.
2. Remove the power cord.
3. Apply gentle pressure to the clip on the fuse holder, and slide the fuse holder out of the test instrument.
4. Visually inspect the two fuses (one for the live and one for neutral). Verify that neither fuse has blown. If a fuse has blown, replace it with a 6.3 AT 250V SLOW BLOW fuse.
5. Reinsert the fuse holder into the power receptacle module and reset the fuse holder.
6. Reconnect the power cord to the test instrument.
7. Press the power switch to apply power to the test instrument.

SECTION 2
APPLICATIONS

2.1 INTRODUCTION

This section describes the basic steps for conducting tests with the INTERCEPTOR 1402S, as well as the steps for a number of PDH applications and SDH applications and for using a printer.

Note: This section describes only the parts of the INTERCEPTOR 1402S that are essential to test setup and analysis. For additional information about the test instrument front panel switches, refer to Section 2 of the *INTERCEPTOR 1402S Reference Manual*.

2.2 BASIC STEPS IN INTERCEPTOR 1402S TESTING

Performing a test with the INTERCEPTOR 1402S involves the basic steps listed below. (The numbers in the steps and in Figure 2-1 correspond to the numbers in the detailed explanations following.)

1. Selecting the TEST MODE.
2. Configuring the INTERCEPTOR 1402S.
3. Confirming the test setup.
4. Connecting the INTERCEPTOR 1402S.
5. Running the test.
6. Analyzing signal status.
7. Collecting test results.
8. Error insertion.
9. Printing test results.

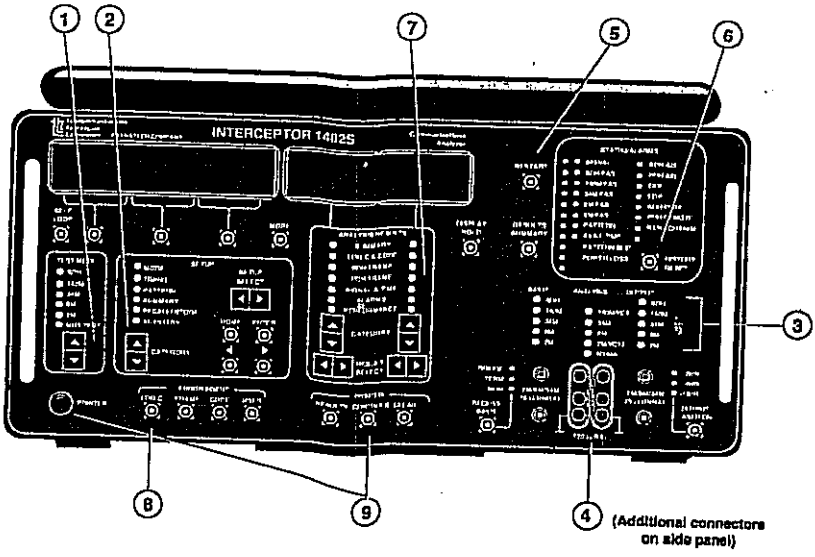

Figure 2-1
INTERCEPTOR 1402S Front Panel

1. Selecting the TEST MODE

Press the **TEST MODE** switch to determine whether the INTERCEPTOR 1402S functions as a dedicated, single-rate test instrument or as a multi-rate test instrument with a built-in multiplexer/demultiplexer.

2. Configuring the Test Setup

Visually inspect the INTERCEPTOR 1402S front panel display and indicators to verify the test instrument has been properly set for the test to be performed. The SETUP panel and display section determine the operating configuration for the selected test mode. Use the **CATEGORY** rocker switch to scroll through the categories (MODE, TIMING, PATTERN, SUMMARY, RECALL/RESTORE, and AUXILIARY) above this switch. The illuminated LED next to the selected category label indicates the category selected. Press the left or right arrow on the

SETUP SELECT rocker switch to scroll through additional menus as required. Continually pressing the left or right arrow on the **SETUP SELECT** switch scrolls through the other menus available. The INTERCEPTOR will beep if the user presses an unavailable selection.

3. Confirming the Test Setup

The Rate indicator panel displays the current INTERCEPTOR configuration (see Figure 2-2). These indicators display the currently selected INPUT, ANALYSIS, and OUTPUT rate(s). Use these indicators to confirm the INTERCEPTOR test setup.

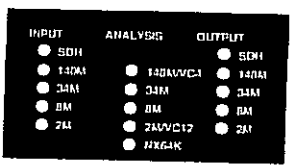

Figure 2-2
Rate Indicators

4. Connecting the INTERCEPTOR 1402S

Use the connectors and switches located in the lower right corner of the INTERCEPTOR front panel or on the right side of the test instrument (see Figure 2-3) to cable the INTERCEPTOR to the circuit under test. It is important to note that a number of connectors are located on the INTERCEPTOR right side panel. The following three steps are required to cable the INTERCEPTOR:

- Set the RECEIVE INPUT.
- Set the OUTPUT LEVEL.
- Cable the INTERCEPTOR (connect to the appropriate connector).

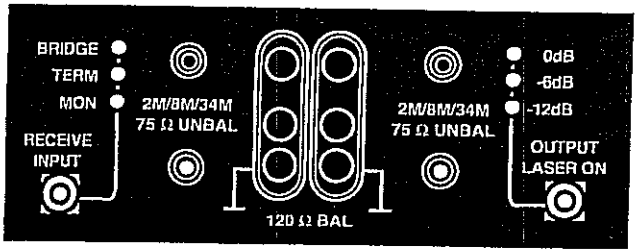

Figure 2-3
Input/Output Connectors

RECEIVE INPUT - Press the **RECEIVE INPUT** switch to select the input impedance and signal conditioning (BRIDGE, TERM, MON).

BRIDGE Select BRIDGE to have the INTERCEPTOR provide a greater than 1kΩ termination to a correctly-terminated circuit. This selection is valid only in 2M mode, using a 120Ω connection.

TERM Select TERM to allow the INTERCEPTOR to terminate a circuit.

MON Select MON to connect the INTERCEPTOR to a monitor access point with 20 to 30 dB of resistive loss.

OUTPUT LEVEL - Press the **OUTPUT LEVEL** switch to select the cable loss for the selected rate (0dB, -6dB, or -12dB). The selected cable loss affects only the transmit data.

Cable the INTERCEPTOR - Select either the 75Ω, the 120Ω, or fiber connectors. The inputs and outputs for 2, 8, and 34M rate are on the front panel. With 140M or 155M (electrical or optical) selected, the signal is connected to the side panel connector(s).

75Ω The 75Ω connectors operate in unbalanced mode at 2M, 8M, 34M, 140M, and 155M. The BNC or 1.6/5.6mm connector shield connects to ground, and the center conductor carries the signal.

120Ω The 120Ω connectors operate in balanced mode at 2M only. The connector is a 3-prong banana plug.

Fiber The fiber connectors operate at 155M. (Options are available for Industry standard wavelengths.)

5. Running the Test

Once you have set up your test and cabled the INTERCEPTOR 1402S for the test you wish to run, the test starts automatically. It is recommended that you begin the test by pressing the **RESTART** switch, which automatically resets all results counters and alarms.

6. Analyzing Signal Status

Use the STATUS/ALARMS LEDs to observe the current and past signal conditions. If an alarm occurs, the appropriate ALARMS LED illuminates. To clear alarms that have previously occurred, press the **HISTORY RESET** switch. (See Figure 2-4.)

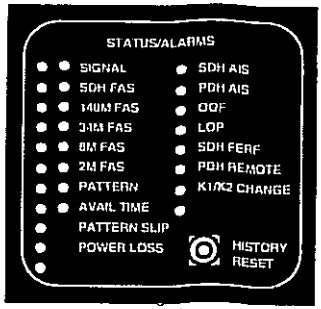

Figure 2-4
ALARMS and STATUS LEDs Panel

7. Collecting Test Results: The ANALYSIS RESULTS Panel and Display Section

The INTERCEPTOR 1402S ANALYSIS RESULTS panel and display section selects and displays two results simultaneously. (See Figure 2-5.)

The ANALYSIS RESULTS panel and display section includes the following major parts:

- **CATEGORY** switches
- **RESULT SELECT** switches
- ANALYSIS RESULTS display
- **DISPLAY HOLD** switch
- **RESULTS SUMMARY** switch

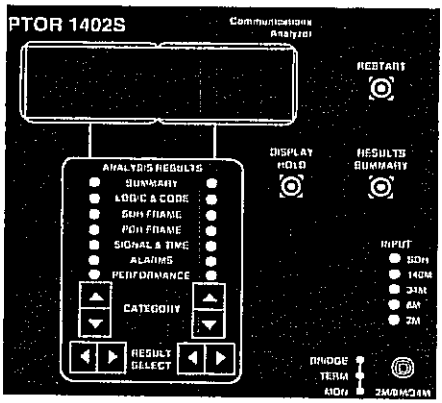

Figure 2-5
ANALYSIS RESULTS Panel and Display Section

Use the left and right **CATEGORY** switches to select and display an ANALYSIS RESULTS category. The left and right **RESULT SELECT** switches are used to scroll and select the specific analysis results available in each category. The left and right ANALYSIS RESULTS displays show

the currently selected test results. The left **CATEGORY** and **RESULT SELECT** switches control the left display; the right **CATEGORY** and **RESULT SELECT** switches control the right display.

A time-saving feature of the ANALYSIS RESULTS is the SUMMARY results category. This feature allows you to view key non-zero measurements without scrolling through the other results categories. When the SUMMARY category is selected and all summary results are error-free, the message **RESULTS OK** appears in the corresponding display; if errors are recorded, use the **CATEGORY** switch to scroll to the appropriate ANALYSIS RESULTS category (or categories) for more information.

Note: Both sides of the ANALYSIS RESULTS section are identical (i.e., both sides operate the same, and offer the same analysis categories and results).

The **DISPLAY HOLD** switch halts the displayed test results to the values at the time the switch was pressed. This allows individual result information to be frozen and examined without interrupting the test in progress. Pressing the **RESULTS** switch generates a results print (printing out the current result values, not the values visible in the display windows).

Depressing the **RESULTS SUMMARY** switch allows you to view only the errored or changing results in each category. If no errors have occurred for any result in a category, a message with the category name and OK will appear when the category is selected.

8. Error Insertion

Once you have begun the test, you can test the circuit using the ERROR INSERT controls. The ERROR INSERT switches enable the insertion of errors into the data stream. The switches may be used individually or in combination to insert logic, frame, code, and user-selected errors simultaneously. The following paragraphs describe the ERROR INSERT switches.

Press the **LOGIC** ERROR INSERT switch momentarily to insert a single logic error. Press the **LOGIC** switch for longer than a second to continuously insert logic errors at the rate selected in AUXILIARY CATEGORY.

Note: The LED in this switch illuminates when continuous error insertion is selected.

Press the **FRAME** switch momentarily to insert one to four adjacent frame errors. The number of adjacent FAS errors inserted is selected in the AUXILIARY Setup category. Press the **FRAME** switch for longer than a second to continuously insert the selected number of FAS errors at the rate selected in the AUXILIARY Setup category.

Note: The LED in this switch illuminates when continuous error insertion is selected.

Press the **CODE** switch momentarily to insert a single code error. Press the **CODE** switch for longer than a second to continuously insert code errors at the rate selected in AUXILIARY setup category.

Note: The LED in this switch illuminates when continuous error insertion is selected.

Press the **USER** switch momentarily to insert a single operator-defined error. The type of USER error is defined in the AUXILIARY Setup category. Press the **USER** switch for longer than a second to continuously insert operator-defined errors at the rate selected in AUXILIARY Setup category.

Note: The LED in this switch illuminates when continuous error insertion is selected.

9. Printing Test Results: The Printer Controls

The INTERCEPTOR 1402S PRINTER controls contain three switches that are used to generate various printouts. The following paragraphs describe the PRINTER controls and front panel PRINTER connector.

Pressing the **CLEAR** switch erases the contents of the Print Buffer.

Pressing the **CONTROLS** switch sends the current test instrument configuration to the printer.

Pressing the **RESULTS** switch sends the current test results values to the printer.

The front panel PRINTER connector is an 8-pin, RS-232, serial port that supplies power, control, and data leads to the PR-55 lid printer.

2.3 PDH APPLICATIONS

This section shows how to use the INTERCEPTOR 1402S in a variety of common test applications. Test applications and instrument setups are provided for:

- Point-to-point testing
- In-service analysis
- Testing multiplexers
- Round trip delay
- Frequency offset

2.3.1 Point-To-Point Testing

Point-to-point testing with the INTERCEPTOR 1402S verifies that the data received at one point is the exact data transmitted at another point. The INTERCEPTOR can test a single tributary from any access point, to isolate circuit sections and pinpoint problem sections. To do this, both units are connected the same. Figure 2-6 shows two INTERCEPTORs testing for bit and code errors, framing, frequency, and pattern slip measurements between two points in both directions simultaneously.

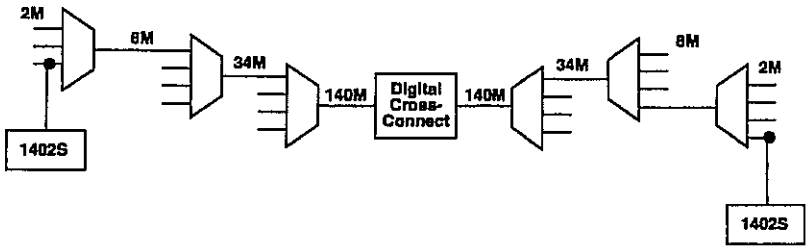

Figure 2-6
Point-to-Point Testing

The following procedure provides step-by-step instructions for performing this test with both INTERCEPTORs set the same.

1. Turn the power switch ON.

2. Press the **TEST MODE** switch to select the desired data rate.

3. Set the Setup **CATEGORY** switch to select the MODE category.

4. Use the **SETUP SELECT** switch and the softkeys below the SETUP display, to configure the MODE menu as follows:

   A. Set Coding to HDB3, AMI, RZ, NRZ, or CMI (140M - note the connector is on the right side).
   B. Press the right half of the **SETUP SELECT** switch.
   C. Select Framed or Unframed.
   D. Press the right half of the **SETUP SELECT** switch.
   E. If operating at 2M, set TS16 and CRC4 On or Off.
   F. Press the right half of the **SETUP SELECT** switch.
   G. Set 2M I/O Format to 75Ω or 120Ω (if receiving at 2M).
   H. Press the right half of the **SETUP SELECT** switch.
   I. If operating at 2M, set the International bit in 2M FAS to either 1 or 0 (displayed only if CRC4 is set Off).
   J. Press the right half of the **SETUP SELECT** switch.
   K. If operating at 2M, set the 5 least significant bits of the 2M NFAS to 1 or 0 (the default is 11a11111).
   L. Press the right half of the **SETUP SELECT** switch.
   M. Set the Tx Alarm status On or Off.
   N. Press the right half of the **SETUP SELECT** switch to return to the HOME menu.

5. Use the Setup **CATEGORY** switch to select the TIMING category.

6. Using the softkeys below the SETUP display, set the TIMING menu to Int, Rec, or Ext. Note that if both INTERCEPTORs are using Rec timing, there must be a timing source in the network. If Ext is selected, there must be a clock provided on the BNC connector labeled EXT CLK IN on the right side of the test instrument.

7. Set the Setup **CATEGORY** switch to PATTERN.

8. Using the **MORE** switch and the corresponding softkey below the SETUP display, select the desired data pattern.

9. Set the **RECEIVE INPUT** switch to TERM.

10. Set the **OUTPUT LEVEL** switch to the desired level (0dB, -6dB, or -12dB).

11. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. For 140M mode, the I/O connectors are located on the right side of the INTERCEPTOR test instrument.

12. Press the **RESTART** switch to begin the test.

13. Verify that:
    - The SIGNAL PRESENT green LED is illuminated.
    - The appropriate FAS SYNC green LED is illuminated if framing is selected.
    - PATTERN SYNC green LED is illuminated.

14. Set the ANALYSIS RESULTS **CATEGORY** switch to SUMMARY and verify the results.

15. If a hard copy of the test results is desired, press the **RESULTS** switch. Status, error, and timed print events can be customized using the AUXILIARY category.

2.3.2 In-Service Analysis

Monitoring live data is the first step in fault isolation. Use the INTERCEPTOR 1402S to monitor live data at any access point along the network to obtain information on code errors, FAS errors, CRC errors, REBEs, network alarms, frequency, and to perform an in-service M.2100 performance analysis. Figure 2-7 shows the INTERCEPTOR 1402S performing M.2100 in-service analysis.

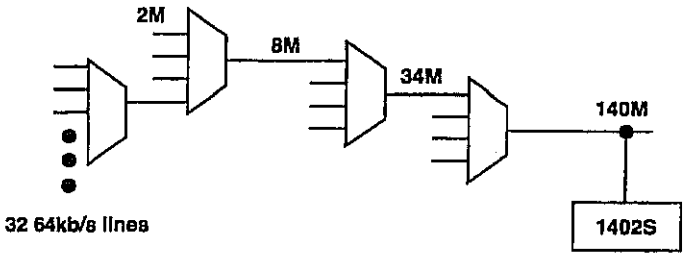

Figure 2-7
In-Service Analysis

The following procedure provides step-by-step instructions for performing in-service analysis with the INTERCEPTOR 1402.

1. Turn the power switch ON.

2. If testing one rate at a time, set the **TEST MODE** switch to MUX TEST.

3. Set the **SELF LOOP** switch to OFF.

4. Set the **SETUP CATEGORY** switch to MODE.

5. Using the **SETUP SELECT** switch and the softkeys below the SETUP display, configure the MODE menu as follows:

   Select:

   A. Set Input equal to the receive rate (2M, 8M, 34M, or 140M).
   B. Set Analysis Rate equal to Nx64.
   C. Set Output to 140M (since you are monitoring and not transmitting, this value need not be set).
   D. Press the **ENTER** switch.
   E. Press the right half of the **SETUP SELECT** switch.
   F. Set 140M Coding to CMI or NRZ. If Input is other than 140M, the Coding choices are: HDB3, AMI, RZ, or NRZ.
   G. Press the right half of the **SETUP SELECT** switch.
   H. Set 140M→34M RxTrib equal to 2.
   I. Press the right half of the **SETUP SELECT** switch.

J. Set 34M→8M RxTrib equal to 3.
K. Press the right half of the **SETUP SELECT** switch.
L. Set 8M→2M RxTrib equal to 4.
M. Press the right half of the **SETUP SELECT** switch.
N. Set TS16 and CRC4 On or Off.
O. Press the right half of the **SETUP SELECT** switch.
P. Set the International bit in 2M FAS to 1 or 0.
Q. Press the right half of the **SETUP SELECT** switch.
R. Set the 2M NFAS bits to 1 or 0. Press the ENTER switch after changing any bit value.
S. Press the right half of the **SETUP SELECT** switch.
T. Set the Analysis mode to Nx64.
U. Press the right half of the **SETUP SELECT** switch.
V. Set the Rx/Tx TS Coupling to On.
W. Press the right half of the **SETUP SELECT** switch.
X. Set the 1stTS as desired. Press the MORE softkey and set Fill to 1's.
Y. Press the right half of the **SETUP SELECT** switch.
Z. Set the 2M→8M TxTrib equal to 4 and set Fill to 1's.
AA. Press the right half of the **SETUP SELECT** switch.
BB. Set 8M→34M TxTrib equal to 1 and set Fill to 1's.
CC. Press the right half of the **SETUP SELECT** switch.
DD. Set 34M→140M TxTrib equal to 2 and set Fill to 1's.
EE. Press the right half of the **SETUP SELECT** switch to return to the HOME menu.
FF. Press the right half of the **SETUP SELECT** switch.
GG. Set all the Tx Alarms to Off.

6. Set the Setup **CATEGORY** switch to AUXILIARY.

7. Press the **SETUP SELECT** switch to display the Performance menu.

8. Press the softkey below Select to select M.2100 In Service performance analysis.

9. Set the **RECEIVE INPUT** switch to MON.

10. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Since the RECEIVE

INPUT is set to MON, be sure that the INTERCEPTOR is connected to a monitor point with between 20 and 30 dB of resistive loss. Note that the connectors for the 140M option are on the right side of the INTERCEPTOR.

11. Press the **RESTART** switch to begin the test.

12. If a hard copy of the test results is desired, press the **RESULTS** switch to generate a results printout. Customize status, error, and timed print events using the AUXILIARY category.

2.3.3 Testing Multiplexers

Multiplexer testing with the INTERCEPTOR 1402S enables sections of the network to be isolated for testing. Only the tributaries under test are removed from service. Figure 2-8 depicts the equipment connection for multiplexer testing.

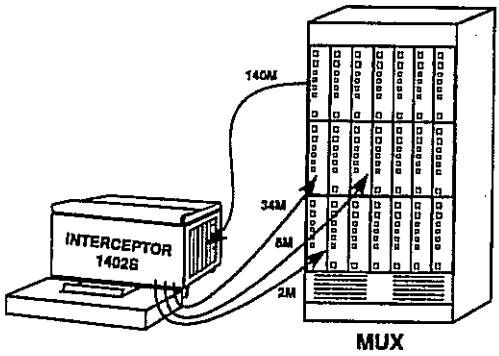

Figure 2-8
Testing More Than One Multiplexer

The INTERCEPTOR generates test data and analyzes the received data for errors and is able to obtain information on the multiplexing equipment, bit errors, G.821 analysis, framing, and frequency. The following procedure is detailed instructions for performing this test with the INTERCEPTOR. Note that the following procedure requires the 140M and Nx64K options.

1. Turn the power switch ON.

2. Press the **TEST MODE** switch to select MUX TEST.

3. Press the Setup **CATEGORY** switch to select the MODE category.

4. Use the **SETUP SELECT** switch and the softkeys below the SETUP display to configure the MODE menu as follows:

   A. Set Input equal to 140M.
   B. Set Analysis Result equal to Nx64.
   C. Set Output equal to 34M.
   D. Press the **ENTER** switch.
   E. Press the right half of the **SETUP SELECT** switch.
   F. Set 140M Coding to CMI or NRZ. If Input is other than 140M, the Coding choices are: HDB3, AMI, RZ, or NRZ.
   G. Press the right half of the **SETUP SELECT** switch.
   H. Set 140M→34M RxTrib equal to 1, 2, 3, or 4.
   I. Press the right half of the **SETUP SELECT** switch.
   J. Set 34M→8M RxTrib equal to 1, 2, 3, or 4.
   K. Press the right half of the **SETUP SELECT** switch.
   L. Set 8M→2M RxTrib equal to 1, 2, 3, or 4.
   M. Press the right half of the **SETUP SELECT** switch.
   N. Set TS16 and CRC4 On or Off.
   O. Press the right half of the **SETUP SELECT** switch.
   P. Set the International bit in 2M FAS to 1 or 0.
   Q. Press the right half of the **SETUP SELECT** switch.
   R. Set the 2M NFAS bits to 1 or 0. Press the **ENTER** switch after changing any bit value.
   S. Press the right half of the **SETUP SELECT** switch.
   T. Set the Analysis mode to Nx64.
   U. Press the right half of the **SETUP SELECT** switch.

V. Set the Rx/Tx TS Coupling to On.
W. Press the right half of the **SETUP SELECT** switch.
X. Set the 1stTS as desired. Press the **MORE** switch and set Fill to 1's.
Y. Press the right half of the **SETUP SELECT** switch.
Z. Set the 2M→8M TxTrib equal to 1, 2, 3, or 4 and set the Fill pattern to 1's or Rnd.
AA. Press the right half of the **SETUP SELECT** switch.
BB. Set 8M→34M TxTrib equal to 1, 2, 3, or 4 and set the Fill pattern to 1's or Rnd.
CC. Press the right half of the **SETUP SELECT** switch.
DD. Press the right half of the **SETUP SELECT** switch.
EE. Set the Tx Alarms as desired.
FF. Press the right half of the **SETUP SELECT** switch to return to the HOME menu.

5. Set the Setup **CATEGORY** switch to TIMING.

6. Using the softkeys below the SETUP display, set the TIMING menu to Int.

7. Set the Setup **CATEGORY** switch to PATTERN.

8. Using the **MORE** switch and the appropriate softkey below the SETUP display, select the desired data pattern.

9. Set the **RECEIVE INPUT** switch to TERM.

10. Set the **OUTPUT LEVEL** to the desired level (0dB, -6dB, or -12dB).

11. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Keep in mind that the connectors for the 140M option are on the side of the test instrument.

12. Press the **RESTART** switch to begin the test.

13. Verify that:
    - The SIGNAL PRESENT green LED is illuminated.
    - The 34M and 8M FAS SYNC green LEDs are illuminated.
    - The 2M FAS SYNC green LED is illuminated, if 2M framing is selected.
    - The PATTERN SYNC green LED is illuminated.

14. Set the ANALYSIS RESULTS **CATEGORY** switch to SUMMARY. Verify the results.

15. If a hard copy of the test results is desired, press the **RESULTS** switch. Status, error, and timed print events can be customized using the AUXILIARY category.

2.3.4 Round Trip Delay

Round Trip Delay testing can be useful in fault isolation. Figure 2-9 is an example of a network in which the INTERCEPTOR 1402S can be used to measure round trip delay. Connecting the INTERCEPTOR 1402S at one end of the network and looping back the far end allows the INTERCEPTOR 1402S to measure the round trip delay through the entire network. However, in real testing applications, users can connect the INTERCEPTOR 1402S at one end and measure the round trip delay to determine where the loop is in the network.

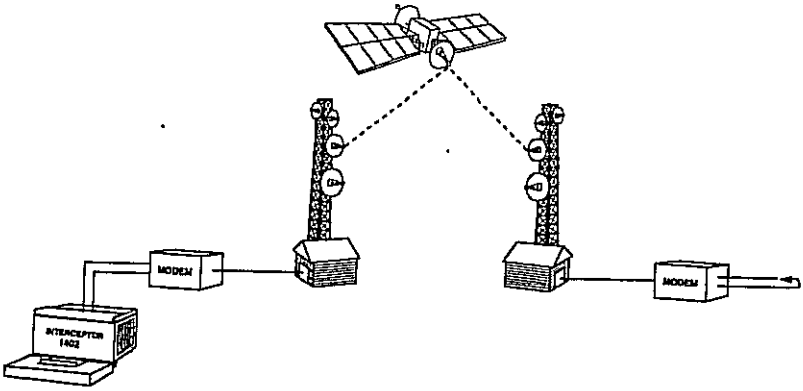

Figure 2-9
Round Trip Delay Testing

The following procedure provides step-by-step instructions for performing round trip delay testing with the INTERCEPTOR 1402S.

1. Turn the power switch ON.
2. Set the **TEST MODE** switch to 2M, 8M, 34M, or 140M.
3. Set the **SELF LOOP** switch to OFF.
4. Set the Setup **CATEGORY** switch to MODE.
5. Configure the items in the MODE category as follows:

   A. Set Coding as appropriate.
   B. Set Framing to Framed.
   C. Set the 2M I/O to 75Ω or 120Ω.
   D. Set TS16 and CRC4 On or Off.
   E. Set the International Bit in 2M FAS to 1 or 0.
   F. If operating at 2M, set the 2M NFAS bits to 1 or 0. Press the **ENTER** switch after changing any bit value.
   G. Set all the Tx Alarms to Off.

6. In the PATTERN setup category, set Pattern to Delay.

7. Set the **RECEIVE INPUT** switch to TERM.

8. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test.

9. Ensure that the distant end is looped.

10. Press the **RESTART** switch to begin the test.

11. In the SIGNAL & TIME Results category, observe the Delay result.

12. If a hard copy of the test results is desired, press the **RESULTS** switch. Customize status, error, and timed print events using the AUXILIARY category.

2.3.5 Frequency Offset

Frequency Offset testing can be useful in fault isolation. To perform a frequency offset test, access the network at any level, set the offset to be used, and check for proper signal reception.

1. Turn the power switch ON.

2. Set the **TEST MODE** switch to the desired dedicated test rate.

3. Set the Setup **CATEGORY** switch to MODE.

4. Configure the items in the MODE setup category as follows:

   A. Set the Coding to CMI, HDB3, AMI, RZ, or NRZ, depending on the rate.
   B. Set the Framing to Framed.
   C. If testing at 2M Framed, set TS16 and CRC4 On or Off.
   D. Set 2M I/O to 75Ω or 120Ω.
   E. Set the International Bits in 2M FAS to 1 or 0.
   F. Set the 2M NFAS bit to 1 or 0.
   G. Set all the Tx Alarms to Off.

5. Configure the items in the TIMING setup category as follows:

   A. Set Tx Timing to Offset.
   B. Set Offset to the desired offset value.

6. In the PATTERN setup category , set Pattern to one of the pseudorandom patterns.

7. Set the **RECEIVE INPUT** switch to TERM.

8. Set the **OUTPUT LEVEL** switch to 0 dB.

9. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Keep in mind that the connectors for the 140M mode are on the right side of the test instrument.

10. Press the **RESTART** switch to begin the test.

11. Verify that:

    - SIGNAL PRESENT green LED is illuminated.
    - FAS SYNC green LED is illuminated for the level being tested.
    - PATTERN SYNC green LED is illuminated.

12. Set the ANALYSIS RESULTS **CATEGORY** switch to SUMMARY. Verify the results.

13. If a hard copy of the test results is desired, press the **RESULTS** switch. Both the error and timed print events can be customized using the AUXILIARY category.

2.4 SDH APPLICATIONS

The INTERCEPTOR 1402S can be used in a number of testing scenarios in the Synchronous Digital Hierarchy (SDH). A few of the SDH applications are described below.

2.4.1 Overhead Analysis

With the INTERCEPTOR 1402S, you can conduct Overhead Analysis to ensure that overhead information is properly reporting what is happening on the network. To conduct the test, transmit a signal that should trigger error conditions in overhead information, and check to ensure that the overhead information properly reflects the errored conditions. (For example, transmit all ones and check to ensure that AIS is reported on the received signal.)

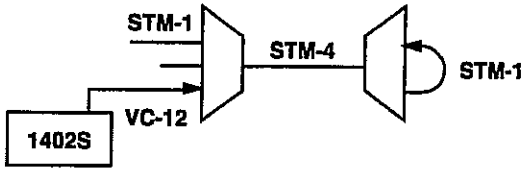

Figure 2-10
Overhead Analysis

The following procedure provides step-by-step instructions for performing overhead analysis with the INTERCEPTOR 1402S.

1. Turn the power switch ON.
2. Set the **TEST MODE** switch to SDH.
3. Set the **SELF LOOP** switch to OFF.
4. Set the Setup **CATEGORY** switch to MODE.

5. Configure the items in the MODE category as appropriate, including:

   A. Set Coding to CMI.
   B. Set Mapping to 2M/VC12.
   C. Set 2M Mapping to ASYNC.
   D. Set the TUG3, TUG2, and TU12 Trib selections as appropriate.
   E. Set 2M Framing to Framed.
   F. Set TS16 and CRC to Off.
   G. Set REBE to Off.
   H. Set the AU and TU Pointers to any appropriate value.

6. Set the **RECEIVE INPUT** switch to TERM.

7. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Note that the connectors for the SDH options are on the right side of the INTERCEPTOR 1402S.

8. Ensure that the distant end is looped up (unless you are using a second INTERCEPTOR 1402S to return the signal to the INTERCEPTOR 1402S conducting the test).

9. Press the **OUTPUT** switch to select 0 dB.

10. On successive tests, set one of the following items, and verify the effects on the received signal.

Set	Verify
MS AIS	SDH AIS
AU or TU Pointer to LOP	LOP alarm
AU or TU Pointer to NDF	AU or TU NDF and 2M FAS Alarm
MS FERF	SDH FERF

11. Press the **RESTART** switch to begin the test.

12. Observe the STATUS LEDs to verify proper reception of the signal. (Check the SIGNAL and appropriate FAS Sync LEDs.)

13. If, at any time, a hard copy of the test results is desired, press the **RESULTS** switch. Customize status, error, and timed print events using the AUXILIARY category.

14. Repeat steps 10 through 13 until all the items have been checked.

2.4.2 Tributary Mapping

With the INTERCEPTOR 1402S, you can conduct tests to ensure the correct mapping of signals. For example, routing information may indicate that the signal being transmitted over TU12 tributary 3 will be received over TU12 tributary 1. You can use the INTERCEPTOR 1402S to verify that is the mapping being used.

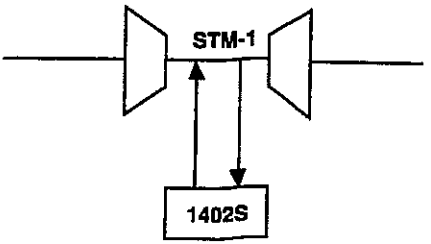

Figure 2-11
Tributary Mapping

The following procedure provides step-by-step instructions for verifying tributary mapping using the INTERCEPTOR 1402S.

1. Turn the power switch ON.

2. Set the **TEST MODE** switch to MUX TEST.

3. Set the **SELF LOOP** switch to OFF.

4. Set the Setup **CATEGORY** switch to MODE.

5. Configure the items in the MODE category as appropriate, including:

   A. Set Rx/An/Tx to 155M/2M/155M.
   B. Set 155M Mapping to 2M/VC12.
   C. Set the demux/mux tributary selections as appropriate for the desired mapping.
   D. Do not change the Pointer values.
   E. Set all the Tx Alarms to Off.

6. Press the Setup **CATEGORY** switch to select PATTERN.

7. Set the Pattern as appropriate.

8. Set the **RECEIVE INPUT** switch to MON or BRIDGE as appropriate.

9. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Note that the connectors for SDH options are on the right side of the INTERCEPTOR 1402S.

10. Press the **RESTART** switch to begin the test.

11. Verify that the PATTERN SYNC LED illuminates to indicate the received signal on the selected tributaries is correct.

12. If a hard copy of the test results is desired, press the **RESULTS** switch. Customize status, error and timed print events using the AUXILIARY category.

2.4.3 SDH/PDH Alarm Generation/Detection

Use the INTERCEPTOR 1402S to transmit a 155 Mbit/s signal and generate alarms, and to receive a 2 Mbit/s signal (within a structured 140M signal) and detect the alarms.

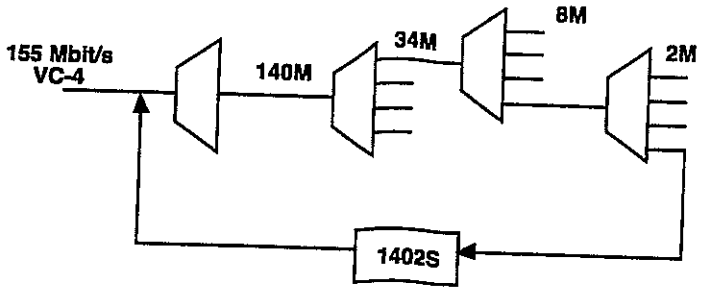

Figure 2-12
Alarm Generation/Detection

The following procedure provides step-by-step instructions for performing SDH/PDH alarm generation/detection with the INTERCEPTOR 1402S.

1. Turn the power switch ON.
2. Set the **TEST MODE** switch to MUX TEST.
3. Set the **SELF LOOP** switch to OFF.
4. Set the Setup **CATEGORY** switch to MODE.
5. Configure the items in the MODE category as appropriate, including:

   A. Set Rx/An/Tx to 2M/2M/155M.
   B. Set 1555M Tx Coding to CMI.
   C. Set Mapping to 140M/VC4.
   D. Set 140M→34M Tx Trib equal to 1, 2, 3, or 4.
   E. Set 34M→8M Tx Trib equal to 1, 2, 3, or 4.

F. Set 8M→2M Tx Trib equal to 1, 2, 3, or 4.
G. Set 2M Receive Coding to HDB3.
H. Set 2M Framing to Framed.
I. Set TS16 and CRC to Off.
J. Set the International Bit to 0 or 1.
K. Set the 2M NFAS bits to 1 or 0.
L. Set the 2M I/O to 75Ω or 120Ω.
M. Set the demux tributary selections as appropriate for the desired mapping.
N. Do not change the Pointer values.
O. Set all the Tx Alarms to Off.

6. Press the Setup **CATEGORY** switch to select PATTERN.

7. Set the Pattern as appropriate.

8. Set the **RECEIVE INPUT** switch to TERM.

9. Using the appropriate cables, connect the input (2M) signal to the connectors on the front panel.
Connect the output (155M) signal to the appropriate output connector on the 155M TX card on the side panel of the INTERCEPTOR1402S.

10. Press the **RESTART** switch to begin the test.

11. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Note that the connectors for the 140M and SDH options are on the right side of the INTERCEPTOR 1402S.

12. Press the **OUTPUT** switch to select 0 dB. (Or, if transmitting a laser signal, hold down the **OUTPUT** switch until the switch illuminates to indicate LASER ON.)

13. On successive tests, set one of the following items, and verify the effects on the received signal.

Setup	Verify
In the AUXILIARY Setup category, choose the B1, B2, BIP2, or HP/LP FEBE User Error.	The corresponding result is incremented.
AU AIS	PDH Alarms and Available Time
2M AIS	2M FAS Alarm
FAS DIS	SDH Remote

14. Press the **RESTART** switch to begin the test.

15. If, at any time, a hard copy of the test results is desired, press the **RESULTS** switch. Customize status, error, and timed print events using the AUXILIARY category.

16. Repeat steps 13 through 15 until all alarms have been checked.

2.4.4 Signal Recovery Tests (Line Build-Out)

With the INTERCEPTOR 1402S, you can conduct Signal Recovery Tests to determine whether or not weakened signals can still be properly received. To conduct the test, transmit a signal at normal strength, and then at -6 dB, and finally at -12 dB (the weakest signal strength that, according to ITU-T standards, should still be receivable).

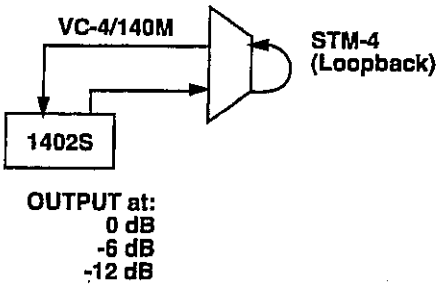

Figure 2-13
Signal Recovery Testing

The following procedure provides step-by-step instructions for performing signal recovery testing with the INTERCEPTOR 1402S.

1. Turn the power switch ON.

2. Set the **TEST MODE** switch to SDH. (For the setup shown in Figure 2-13, set TEST MODE to SDH.)

3. Set the **SELF LOOP** switch to OFF.

4. Set the Setup **CATEGORY** switch to MODE.

5. Configure the items in the MODE category as appropriate, including:

   A. Set Coding to CMI or NRZ.
   B. Set 155M Mapping to 140M/VC4.
   C. Set 140M Framing to Framed if appropriate.
   D. Set the AU and TU Pointers to any valid mode to select NDF or LOP.
   E. Set all the Tx Alarms to Off.

6. In the PATTERN setup category, set Pattern to one of the pseudorandom patterns (2^N-1). ITU is recommended.

7. Set the **RECEIVE INPUT** switch to TERM.

8. Using the appropriate cables, connect the INTERCEPTOR 1402S to the equipment under test. Note that the connectors for the 140M and SDH options are on the right side of the INTERCEPTOR 1402S.

9. Ensure that the multiplexer line side is looped.

10. Press the **OUTPUT** switch to select 0 dB.

11. Press the **RESTART** switch to begin the test.

12. Observe the STATUS LEDs to verify proper reception of the signal. (Check the SIGNAL and appropriate FAS Sync LEDs.)

13. If a hard copy of the test results is desired, press the **RESULTS** switch. Customize status, error, and timed print events using the AUXILIARY CATEGORY.

14. Press the **OUTPUT** switch to select -6 dB, and repeat steps 11 through 13.

15. Press the **OUTPUT** switch to select -12 dB, and repeat steps 11 through 13.

2.5 CONFIGURING THE INTERCEPTOR 1402S WITH THE PR-55 PRINTER

This section describes how the INTERCEPTOR 1402S can be configured with the PR-55.

Encased in the lid of the INTERCEPTOR 1402S, the PR-55 printer is a thermal printer that provides 40-column printouts of test results. Although any serial ASCII printer can be used with the INTERCEPTOR 1402S, the PR-55 is highly recommended for its convenience and ease of use.

The following provides step-by-step instructions to configure the INTERCEPTOR 1402S for operation with the PR-55 printer.

1. With the power to the INTERCEPTOR 1402S turned OFF, plug the PR-55 connector into the INTERCEPTOR 1402S front panel connector labeled PRINTER.

2. Turn the power switch ON.

3. Set the Setup **CATEGORY** switch to the AUXILIARY position.

4. Use the **SETUP SELECT** switch to scroll to the RS232 auxiliary function.

   A. Press the **MORE** switch.

   B. Press the PR-55 softkey to automatically configure the baud rate, data bits, and parity (9600, 8, and None, respectively).

      Note: PR-55 is the 1402S factory-default setting for the printer configuration.

5. Press the right half of the **SETUP SELECT** switch to scroll to the Printer auxiliary function.

   A. Set Width to 40.

   B. Set Term (line termination) to CRLF (carriage return/linefeed).

6. If not illuminated, press the **ON LINE** switch on the PR-55 printer to illuminate the green LED within the switch.

The INTERCEPTOR 1402S is now configured for operation with the PR-55 printer.

2.5.1 Serial Printer Connector

When using a printer other than the PR-55, it connects to the 25-pin, RS-232 printer/controller interface connector, located on the side panel. Table2-1 lists the RS-232 printer/connector interface connector pin assignments.

Table 2-1
RS-232 Printer/Connector Interface
Connector Pin Assignments

Pin No.	Designation EIA/CCITT	Signal Description	Status
1	AA ——	Protective Ground	Connected to chassis ground.
2	BA 103	Transmitted Data (TD)	Data transmitted to the INTERCEPTOR (from the printer).
3	BB 104	Receive Data (RD)	Data received from the INTERCEPTOR (to the printer).
5	CB 106	Clear to Send (CTS)	Output HIGH when the INTERCEPTOR is ready to receive.
6	CC 107	Data Set Ready (DSR)	Output HIGH when the INTERCEPTOR power is on.
7	AB 102	Signal Ground	Connected to signal ground.
8	CF 109	Received Line Signal Detector (RLSD)	Output HIGH when the INTERCEPTOR power is on.
20	CD 108/2	Data Terminal Ready (DTR)	Input must be HIGH before the INTERCEPTOR can send data.

Data is communicated across the RS-232 connector in asynchronous, serial format, using standard ASCII (American Standard Code for Information Interchange) format characters. The printer interface can operate at baud rates of: 300, 1200, 2400, 4800, or 9600. The INTERCEPTOR sends two stop bits, and expects received data to have one or more stop bits.

This connector is wired in parallel with the front panel PRINTER connector. Therefore, connect only one printer at a time to the INTERCEPTOR. Connecting two printers at a time can cause partial printouts to be generated.

Use the RS232 and Printer auxiliary menus to select the number of data bits, parity, and line termination. These two auxiliary menus determine the data format for data transferred across the interface.

2.5.2 Parallel Printer Connector

With the IEEE-488 option installed, a parallel printer or controller can be used with the INTERCEPTOR. The 24-contact, IEEE-488 connector is located on the INTERCEPTOR side panel. This connector can support operation of a parallel printer or remote control device. Printer and remote control selection is determined by the Print auxiliary menu selection. Repeatedly pressing the softkey below the Prev and Next menu items scrolls through the menu selections. Selecting 488 for the printer driver sets the INTERCEPTOR in the talk-only mode. This configures the INTERCEPTOR to send all printer information to the IEEE-488 connector and does not respond to any IEEE-488 remote commands. However, setting RC (remote control) to 488 places the INTERCEPTOR in the addressable mode. The INTERCEPTOR address is indicated and controlled from the IEEE-488 Address auxiliary menu. The current 488 address (00 to 31) is indicated on the top line and is controlled by the softkeys below the Up or Down menu items on the bottom line of the menu.

The IEEE-488 connector supports either a parallel printer or remote controller, but not both simultaneously. Table 2-2 lists the IEEE-488 connector contact assignments.

Table 2-2
IEEE-488 Printer/Controller Interface Connector Contact Assignments

Contact No.	Signal Line	Contact No.	Signal Line
1	DIO1	13	DIO5
2	DIO2	14	DIO6
3	DIO3	15	DIO7
4	DIO4	16	DIO8
5	EOI	17	REN
6	DAV	18	Gnd for pin 6
7	NRFD	19	Gnd for pin 7
8	NDAC	20	Gnd for pin 8
9	IFC	21	Gnd for pin 9
10	SRQ	22	Gnd for pin 10
11	ATN	23	Gnd for pin 11
12	Shield	24	Gnd, Logic

APPENDIX A
PDH RESULTS

When operating at PDH levels, you may obtain the results that are applicable for the test setup you are using. The results that are available in each Results category (depending on the test setup) are listed below.

SUMMARY

Bit Errors
Pattern Slip
X Code Error Count
X FAS Count
REBE Count
CRC Error Count
X Remote Alarm
Receiver Frequency Deviation
X AIS
Power Loss
Pattern Loss
FAS Distant Alarm
MFAS Distant Alarm
MFAS Synchronization Indication
MFAS Error Count
Signal Loss
TS16 AIS

LOGIC & CODE

Bit Errors
Bit Error Rate
Pattern Slip
Pattern Slip Seconds
Pattern Synchronization Loss
X Code Error Count
X Code Error Rate

PDH FRAME

X FAS Count
X FAS Error Rate
X FAS Word
X FAS Sync Loss Count

CRC Error Count
CRC Error Rate
1 Second CRC Count
FAS Sync Loss Count (when CRC is on)
2 Mbit/s NFAS Word
MFAS Error Count
MFAS Error Rate
Multiframe Sync Loss Count
MFAS Word
REBE Frame Sync Loss Count
REBE Count
Timeslot ABCD Signalling Bits
Receive Byte
VF Frequency
VF Peak Code
VF Level
MFAS Synchronization Indication

SIGNAL & TIME
Signal Loss
Receiver Frequency
Receiver Frequency Deviation
Receiver Frequency of the 2 Mbit/s Reference Input
Generator Frequency
Test Seconds
Elapsed Seconds
Time
Date
Round Trip Delay Measurement
Bit Slip Count
FAS Slip Count

ALARMS
X AIS
TS16 AIS
FAS Distant Alarm
MFAS Distant Alarm
X Remote Alarm
Power Loss

PERFORMANCE

X Available Time
X Percent Available Time
X Unavailable Time
X Percent Unavailable Time
X Errored Seconds
X Percent Errored Seconds
X Errored Seconds, referred to 64 kbit/s
X Percent Errored Seconds, referred to 64 kbit/s
X Severely Errored Seconds
X Percent Severely Errored Seconds
X Defect Seconds
X Degraded Minutes
X Percent Degraded Minutes
X Error Free Seconds
X Percent Error Free Seconds
Bit Error Rate, excluding Severely Errored Seconds
Bit Error Count, excluding Severely Errored Seconds
X Mean Residual Error Rate

X represents the applicable rate.

APPENDIX B
SDH RESULTS

When operating at 155 Mbit/s Mbit/s, you may obtain the SDH results that are applicable for the test setup you are using. The SDH results that are available in each Results category (depending on the test setup) are listed below.

Note: When operating in MUX MODE, all applicable PDH and SDH results are displayed. For PDH results, see Appendix B.

SUMMARY

Bit Errors
Pattern Slip
155 Mbit/s Code
155 Mbit/s FAS
REBE Count
CRC Error Count
155 Mbit/s Receiver Frequency Deviation
Pattern Loss
MFAS Synchronization Indication
Signal Loss
B1 Error Count
B2 Error Count
B3 Error Count
BIP2 Error Count
LP FEBE
HP FEBE
XX NDF
XX PJE

LOGIC & CODE

155 Mbit/s Code
155 Mbit/s Code Error Rate

PDH FRAME
155 Mbit/s FAS
155 Mbit/s FAS Error Rate
155 Mbit/s Loss of Frame
B1 Error Count
B2 Error Count
B3 Error Count
BIP2 Error Count
B1 Error Rate
B2 Error Rate
B3 Error Rate
BIP2 Error Rate
LP FEBE
HP FEBE
AU Pointer
AU PJE
AU NDF
TU Pointer
TU PJE
TU NDF
MSP Information
MSP Channel
MSP K2 Byte
C1 Byte
C2 Byte
V5 Byte
F1 Byte
G1 Byte
155 Mbit/s FAS
155 Mbit/s FAS Error Rate
155 Mbit/s FAS Sync Loss Count
Out of Frame Conditions Count
XX Loss of Pointer Count
XX Errored Block Count

SIGNAL & TIME
155 Mbit/s Generator Frequency
155 Mbit/s Receiver Frequency
155 Mbit/s Receiver Frequency Deviation

ALARMS
Mux Section AIS
AU AIS
TU AIS
AU Loss of Pointer
TU Loss of Pointer
Mux Section FERF
LP FERF
HP FERF

PERFORMANCE
** Defect Seconds
** Degraded Minutes
** Percent Degraded Minutes
** Background Block Error Count
** Background Block Error Ratio
** Severely Errored Seconds
** Percent Severely Errored Seconds
** Available Time
** Percent Available Time
** Unavailable Time
** Errored Seconds
** Percent Errored Seconds
** Error Free Seconds
** Percent Error Free Seconds

** can be LP (Low Path), HP (High Path), MS (Mux Section), or (Regenerator Section).
XX can be AU or TU.

PDH FRAME

155 Mbit/s FAS
155 Mbit/s FAS Error Rate
155 Mbit/s Loss of Frame
B1 Error Count
B2 Error Count
B3 Error Count
BIP2 Error Count
B1 Error Rate
B2 Error Rate
B3 Error Rate
BIP2 Error Rate
LP FEBE
HP FEBE
AU Pointer
AU PJE
AU NDF
TU Pointer
TU PJE
TU NDF
MSP Information
MSP Channel
MSP K2 Byte
C1 Byte
C2 Byte
V5 Byte
F1 Byte
G1 Byte
155 Mbit/s FAS
155 Mbit/s FAS Error Rate
155 Mbit/s FAS Sync Loss Count
Out of Frame Conditions Count
XX Loss of Pointer Count
XX Errored Block Count

SIGNAL & TIME

155 Mbit/s Generator Frequency
155 Mbit/s Receiver Frequency
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GLOSSARY

AIS	Alarm Indication Signal
AU	Administrative Unit
CRC	Cyclic Redundancy Code
FAS	Frame Alignment Signal
FEBE	Far End Block Error
FERF	Far End Receive Failure
HP	High Path
LP	Low Path
MFAS	Multiframe Alignment Signal
MSP	Multiplexer Section Protection
NDF	Null Data Flag
NFAS	Not Frame Alignment Signal
PJE	Pointer Justification Event
REBE	Remote End Block Error
TS	Timeslot
TU	Tributary Unit
VF	Voice Frequency