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Frequency:

5.730 to 5.774 GHz Rx/Tx

5.801 to 5.845 GHz Tx/Rx

Bit Rate:

4 x 2.048 Mbps (8.192 Mbps), E1

4 x 1.544 Mbps (6.176 Mbps), DS1

Voice Channel Capacity:

Pulse code modulation (PCM) 120, E1; 96, DS1

Adaptive delta pulse code modulation (ADPCM) 240, E1; 192, DS1

Applicable standards ITU-T G.703, FCC Part 15.247, RSS-210

Frequency Reference:

Type Crystal locked loop

Frequency stability ± 20 ppm

Transmitter Output Power:

+27 dBm (520 Mw)

6.06 Transmitter Intermediate Frequency:
140 MHz

Receiver Intermediate Frequency:

70 MHz

Modem:

Modulation 16QAM, spread spectrum

Interface Line Code HDB3, E1; alternate mark inversion (AMI) or bipolar eight zero substitution (B8ZS), DS1

Bit error rate (BER) 10^{-6} @ -82.5 dBm

Modulation Spreading > 10.0 dB

Power Requirements:

-20 to -60 Vdc @ 100 watts (typical)

Maximum Allowable Noise on Power Supply:

Complies with Bellcore TR-TSY-000752, Issue 1, October 1989.

6.11 Environment:

Operating Temperature	-40° C to +75° C
Storage Temperature	-55° C to +85° C
Operating Relative Humidity	0 to 95 %, noncondensing
Storage Relative Humidity	100 %

Diagnostics:

Alarms	Tx RF/Rx RF summary, automatic gain control (AGC) mux, Tx/Rx data, power supply, BER threshold, alarm indication signal (AIS), Tx/Rx summary
Status Points	AGC volts, volts DC, Data I/O
Loopbacks	Data local/remote, individual E1/DS1s and 8 Mbps
EIA-232D	Maintenance Interface, 1200, 2400, 4800, or 9600 bps

6.13 Mechanical:

Dimensions	16"W x 11"D x 7"H
Weight	35 lbs typical

Operation of the Model 9000 radio system consists of interpreting visual indicators of system status and, as necessary, reconfiguring operating parameters. This section describes the system's panel indicators and features. It also contains procedures for reconfiguring and testing the system and for putting a radio system into service.

7.1 Controls and Displays

The Model 9000 Control Module has indicators on its front panel that provide status information both for normal operation and to assist in failure analysis. Maintenance ports are also located on the unit. Refer to Figure 7-1. Controls and indicators include the following:

- Maintenance port DB-9S connector (craft interface to a terminal)
- Digital signal crossconnect (DSX) line buildout (LBO)
- E1/DS1 alarm notification
- Maintenance data port baud rates
- Bit error rate (BER) tolerance
- Alarm cutoff (ACO) pushbutton switch for current audible alarm relay closures (major and minor)
- Indicators for Normal operation (green), Major Alarm (red), Minor Alarm (yellow), Near End fault (yellow), Far End fault (yellow), ACO (yellow), and Power (green)
- Built-in modem dial-up

7.102 A second maintenance port DB-9S connector on the controller's rear panel (Figure 7-2) offers a remote maintenance connection to the Model 9000.

Option Settings

7.111 The configurable options of the radio system are accessible through the local and remote RS-232D maintenance ports.

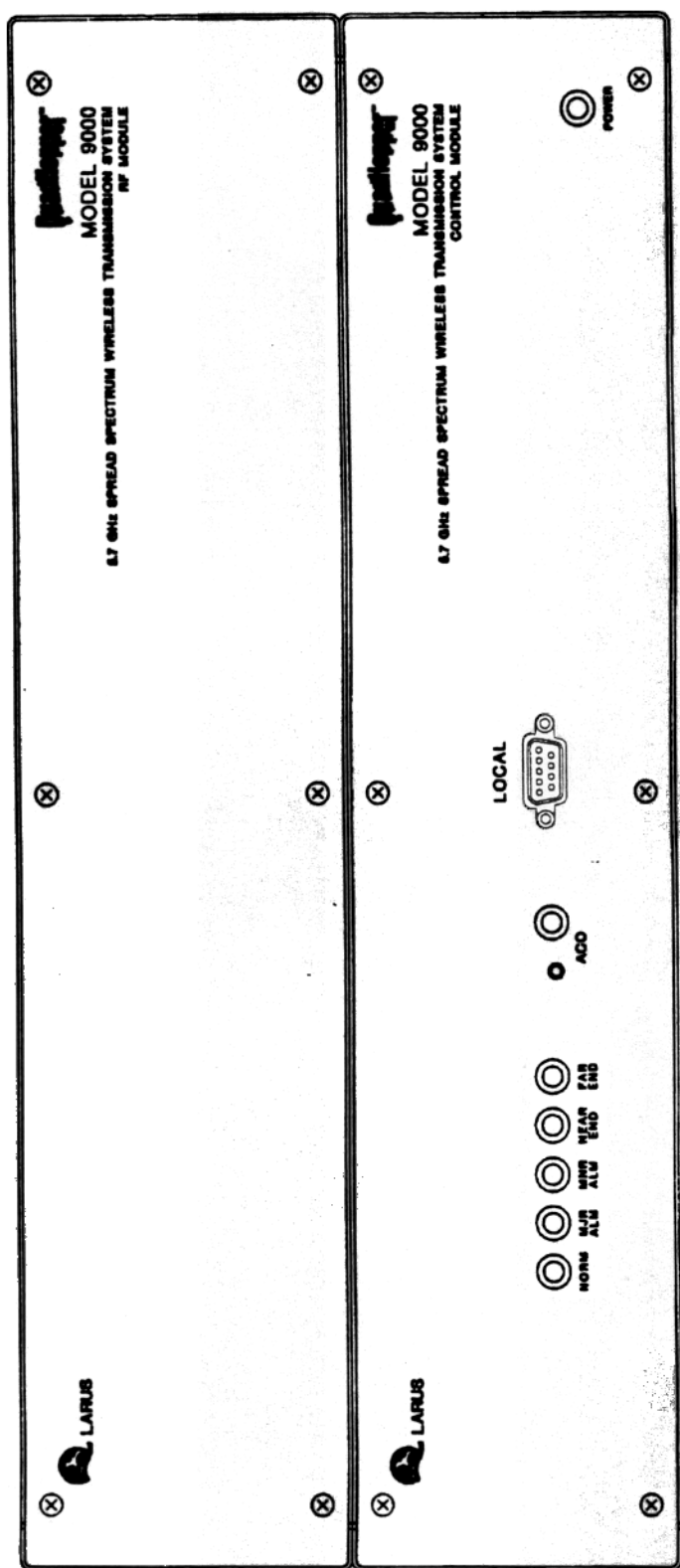


Figure 7-1. RF/Controller Assembly Front Panel



Figure 7-2. RF/Controller Assembly Rear Panel



7.12 Alarm Indicators

- 7.121** The Model 9000 generates a major alarm whenever a detectable fault occurs that affects service (i.e., interrupts traffic). It generates a minor alarm whenever a fault occurs that does not interrupt traffic.
- 7.122** In addition to the front panel alarm indicators, the Model 9000 provides Form A relay dry contact closures on the rear panel for customer use for alarm forwarding. Four sets of contacts are available, two for a major alarm (visual and audible) and two for a minor alarm (visual and audible).
- 7.123** The ACO pushbutton on the Model 9000 opens the relay contacts, turning off the current audible alarm relay only. Visual alarm indicators remain on and the visual relay contacts remain closed until the current alarm is cleared. The ACO light emitting diode (LED) remains on until the alarm condition is cleared.



NOTE:

Model 9000 operation is transparent to all information transmitted on the customer's E1 or DS1 inputs; therefore, only the loss of an input E1/DS1 signal will generate an E1 or DS1 alarm.

7.2 Reconfiguration



CAUTION:

Reconfiguring the system while live traffic is up will cause loss of traffic during the reconfiguration sequence.

- 7.201** The operational parameters for the Model 9000 can be changed by the operator at any time through the maintenance ports on the device. Procedures are described below. Note that, when changing the receive and transmit PNS codes, specific steps must be followed to prevent losing the radio data link.
- 7.202** The local and remote maintenance ports provide a traditional command line interface to the Model 9000 resident firmware. This includes several report screens detailing the system configuration, alarm history log, complete system operational status, and online help. In addition, the local port includes support for modem configuration by connecting to a far-end Model 9000. The remote port can service an incoming modem call after the security password verification procedure is completed.

7.21 Terminal Operating Instructions

- 7.211** The remote and local RS-232D ports are used with VT-100 or equivalent terminals to review all of the feature settings, make changes to the settings, and review the alarms and the status of the system.
- 7.212** Typing HELP followed by [ENTER] or carriage return displays the command choices shown below.

ALARMS	Update status of all Alarm Conditions
BER T=x	Set Bit Error Rate Threshold: x = OFF or 4 to 9 as in '10E-x'
CONFIG	Display current configuration
DATE [mm/dd/yy]	Display or set the date (type: 'HELP DATE' for explanation)
LIU	Configure single line interface (type: 'HELP LIU' for explanation)
FDT T=x	Start/stop a Field Diagnostic Test: x = OFF or 1 or 2)
HELP	Display (this) list of commands
HISTORY	Display log of most recent alarms
INFO [text]	Enter an information text string of up to 40 characters
PNS	Set the PNS codes (type: 'HELP PNS' for explanation)
PORT P=x B=y	Set Port Baud Rate (type: 'HELP PORT' for explanation)
RESET	Download the current configuration defaults
SID [text]	Enter a Station I.D. text string of up to 20 characters
STATUS	Display system status information
TIME [hh:mm:ss]	Display or set the internal clock: hours:minutes:seconds

- 7.213** Typing ALARM followed by [ENTER] updates the alarm status. The screen appears as follows.

-> alarms

Alarms update in progress.

7.214 The BER command sets the threshold for the bit error rate.

```
-> ber t=6
```

```
BER Threshold: 1E-6
```

7.215 Typing CONFIG displays a configuration similar to the following at the near end.

```
-> config
```

LOCAL CONFIGURATION: (* indicates default E1)

Station ID: < Use SID to set this field >
< Use INFO to set this field >

<u>E1</u>	<u>Line Code</u>	<u>Line Equalization</u>	<u>Report Alarms</u>
1 *	HDB3	1 (0 -> 133 ft.)	Yes
2	HDB3	1 (0 -> 133 ft.)	No
3	HDB3	1 (0 -> 133 ft.)	No
4	HDB3	1 (0 -> 133 ft.)	No

Baud Rates: Local = 9600 Remote = 9600
PNS Codes: Receiver = 200 Transmitter = 201
BER Threshold: 1E-3

NOTE: In this example, the far-end PNS codes would be the reverse:
Receiver = 201 and Transmitter = 200.

7.216 Both the day of the week and current date are set from the 'HELP DATE' command.

```
-> help date
```

```
Date Tue, 10-26-99 08:24:43 Enter New Date as 'Day-of-Week MM-DD-YY'
```

- 7.217** The CONFIG screen displays the current configuration. Use the LIU (line interface unit) command to set or reconfigure the E1 or DS1 features. Typing HELP LIU calls up a screen similar to the following.

-> help LIU

Configure a single E1 (DS1) channel

Format: E1 (DS1) A=w C=x E=y L=z

Where:

- w = Alarm Notification: Y or N
- x = Default E1 (DS1) channel for current and subsequent E1 (DS1) commands: 1, 2, 3 or 4
- y = Line Equalization value: 1, 2, 3, 4 or 5
- z = Line Code selection: HDB3 (AMI, B8ZS)

- 7.218** The FDT T=x command gives access to the two diagnostic tests described in subsection 7.4. A test is started by assigning the number of the test in place of the "x" (e.g. T=2). The test is stopped by typing T= * or T= -.

-> fdt T= *

Field Test: <disabled>

7.219 A historical log of alarms is retained in the system's memory. Typing HISTORY brings up a display of the most recent alarms.

-> history

Station ID: abc labs Report of: Tue, Sep 7, 1999 08:25:31

Alarm Started:	Ended:	Src:	Description:
09-7-99 07:55:56	09-7-99 07:56:21	FE:	Despreader Lock failure
09-7-99 07:11:57	09-7-99 07:12:18	NE:	Despreader Lock failure
09-7-99 02:37:36	09-7-99 02:38:08	FE:	Despreader Lock failure
09-6-99 22:22:31	09-6-99 22:22:56	FE:	Despreader Lock failure
09-6-99 18:39:03	09-6-99 18:39:28	FE:	Despreader Lock failure
09-6-99 18:19:58	09-6-99 18:20:18	NE:	Despreader Lock failure
09-6-99 17:01:30	09-6-99 17:01:37	FE:	Unframed Error
09-6-99 15:36:15	09-6-99 15:36:39	FE:	Despreader Lock failure
09-6-99 13:02:06	09-6-99 13:02:38	FE:	Despreader Lock failure
09-6-99 12:38:51	09-6-99 12:38:57	FE:	Unframed Error
09-6-99 12:37:03	09-6-99 12:37:09	FE:	Unframed Error
09-6-99 12:32:40	09-6-99 12:32:47	FE:	Unframed Error
09-6-99 12:18:21	09-6-99 12:18:27	FE:	Unframed Error
09-6-99 12:18:02	09-6-99 12:18:08	FE:	Unframed Error
09-6-99 12:11:45	09-6-99 12:11:57	FE:	Unframed Error
09-6-99 12:11:32	09-6-99 12:11:38	FE:	Unframed Error

7.2110 Text entered on the INFO screen is selected by the user to further identify or classify the installation site. It appears on each screen thereafter as the second line of the Station ID.

-> info

Information: hi tx

Re-enter the command followed by a text string of up to 40 characters for general information.

7.2111 The PNS screen displays the PNS codes as they are currently set. The HELP PNS command, which calls up the screen below, explains how the codes can be changed.

-> help pns

Set the PNS codes for Receiver and Transmitter

Format: PNS R=x T=y

Where: x = Receiver PNS code: integer from 1 to 256
 y = Transmitter PNS code: " " " " "

Or: PNS SWAP Swap the current PNS codes

7.2112 The current settings for the port baud rate are shown on the PORT screen. These parameters can be changed from the HELP PORT screen below.

-> help port

Set the Local or Remote Console port baud rate

Format: PORT P=x B=y

Where: x = port: L(ocal) or R(emote) [optional]
 y = baud: 1 = 1200, 2 = 2400, 4 = 4800, 9 = 9600, 19 = 19.2K

7.2113 The POWER screen displays the dates and times when the system's power was turned on and off.

-> history power

Station ID: abc labs

Report of: Tue, Sep 7, 1999 08:27:05

Power On:

Power Off:

Tue, Aug 31, 1999 15:31:31

Mon, Aug 30, 1999 17:26:20

Mon, Aug 30, 1999 17:21:45

Tue, Aug 31, 1999 15:31:19

Mon, Aug 30, 1999 17:26:11

7.2114 The RESET command downloads data as the system is currently configured.

-> reset

Downloading configuration ... done.

7.2115 The installation site or Station ID is entered from the SID command. The text then appears on the report screens as the first line of the Station ID.

-> sid

Station ID: abc labs

Re-enter the command followed by a text string of up to 20 characters to uniquely identify this station.

7.2116 The current condition of the system is displayed on the STATUS screen.

-> status

Field Test in progress: <none>

Outstanding Near-End Alarms: <none>

	Near-End	Far-End
Despreader C/N:	+ 1.26	+ 1.40
Demodulator AGC:	+ 0.62	+ 0.57
Receive IF AGC:	+ 1.12	+ 1.76
+ 5 volt power supply:	+ 5.02	+ 5.00
+ 15 volt power supply:	+ 15.00	+ 15.00
- 15 volt power supply:	- 14.87	- 14.98
Estimated BER:	< 1E9	< 1E9

Station power-on: Tue, Aug 31, 1999 15:31:31

7.2117 The system's internal clock is set from the TIME command.

-> time

Tue, Sep 7, 1999 08:27:26 Enter New Time as 'HH:MM:SS' in 24hr format

7.22 Setting Maintenance

7.221 All settings are maintained in nonvolatile memory where they are not affected by power failure.

7.222 Units shipped from the factory have default settings that must be changed upon installation to the required settings for that site. A record should be kept of these settings so that they may be restored if they are changed by mistake or a piece of equipment is replaced.

Field Diagnostic Tests

- 7.301 During operation, the Model 9000 continually runs built-in tests approximately once a second to monitor its 'health.' If faults are detected during these tests, alarm circuits light the appropriate panel indicators.
- 7.302 Diagnostic tests are started and stopped manually from the FDT T=x command described in paragraph 7.218.



CAUTION:

Running the field diagnostic tests with live traffic in operation will cause loss of traffic during the test sequence.

Radio System Turnup and Acceptance

- 7.401 A terminal connected to one of the maintenance ports on the Model 9000 allows for post-installation checkout and acceptance testing without additional test equipment.
- 7.402 The following paragraphs describe each test and the procedure for running it. Refer to subsection 7.2 for terminal operating instructions.

Test 1: E1/DS1 Loopback

- 7.411 Test 1 verifies the E1 or DS1 connections to the Model 9000 by sending a signal through the circuit to the near-end E1/DS1 interface and monitoring the return path for the same signal. Refer to Figures 7-3a and 7-3b. For this test to operate, the E1/DS1 signal at the near end must be looped back to the Model 9000 at the customer's E1 or DS1 equipment.

To run Test 1 from the VT-100 or compatible terminal connected to one of the local virtual data circuit ports, perform these steps:

1. At the DSX, loop back each of the receive E1/DS1 lines from the 9000 to the transmit lines to the 9000.
2. Run Test 1. If an error is indicated, check wiring from the Model 9000 unit to the DSX.

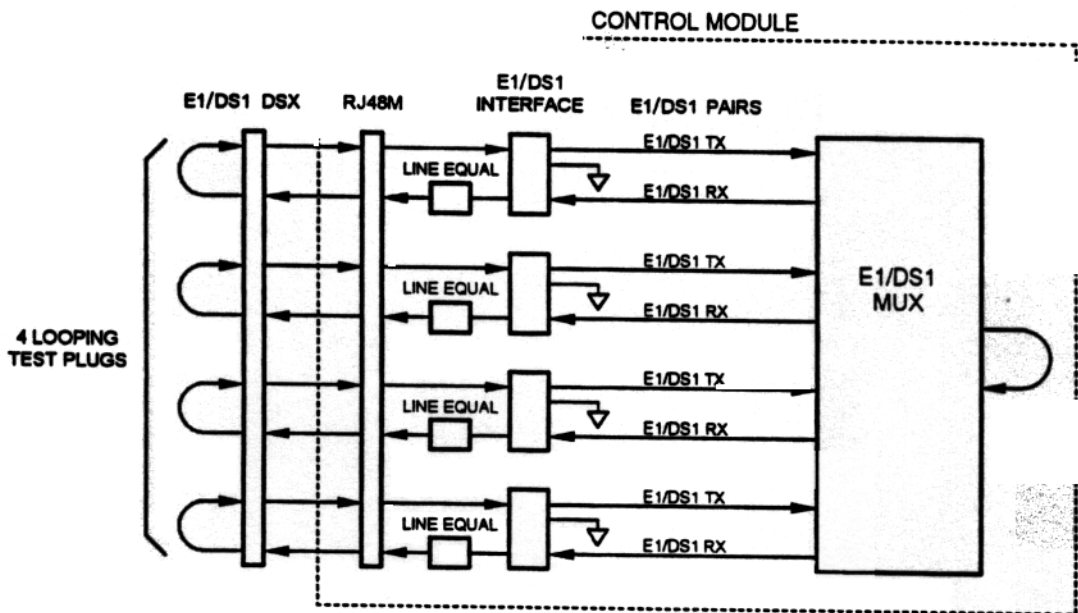
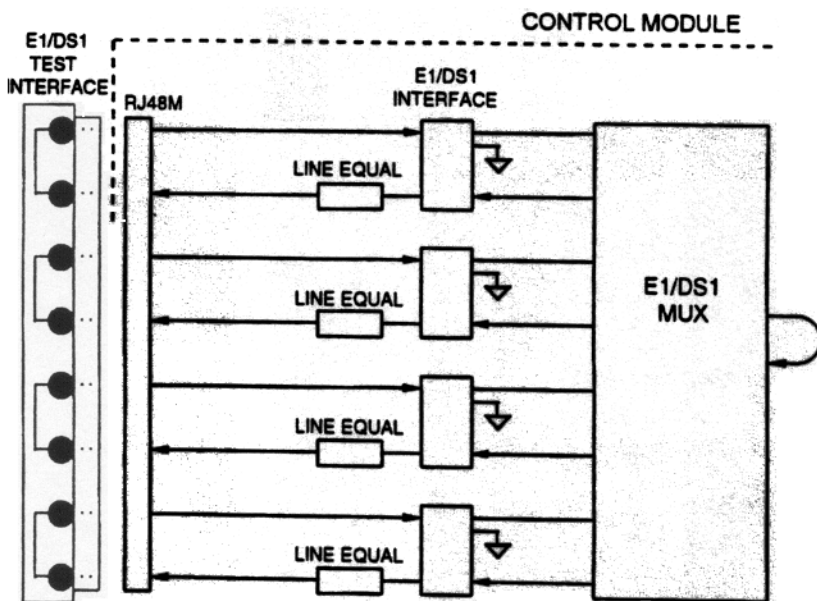


Figure 7-3a. Model 9000 Radio Field Test #1



NOTE: The optional E1 or DS1 Test Interface plugs into the RJ48M connector to facilitate E1/DS1 testing. It features "cut jacks" for E1 or DS1 inputs and outputs plus a "normal through" connection which loops back all E1/DS1 signals into the controller.

Figure 7-3b. DSX Loopback Test (Test #1)

7.42 Test 2: End-to-End Path Continuity

7.421 Test 2 verifies end-to-end performance of the Model 9000 radios. See Figure 7-4. This test loops the signal through the E1/DS1 multiplexers in both the near-end and far-end radios. This procedure does not test the E1 or DS1 interface at either end. (Refer to Test 1.)

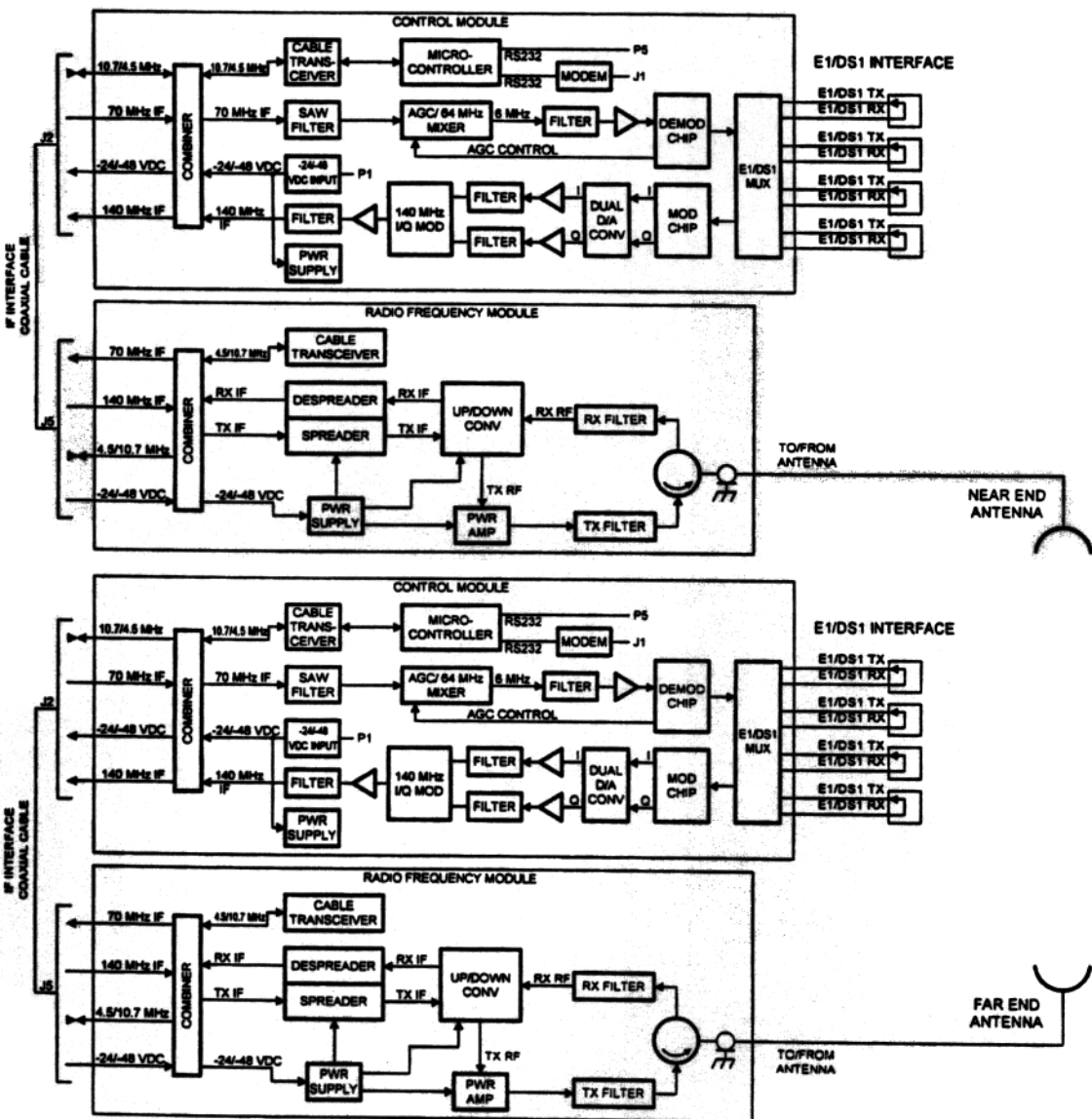


Figure 7-4. Model 9000 Radio Field Test #2

7.422 To run Test 2 from a VT-100 or compatible terminal connected to one of the virtual data circuit ports, perform these steps:

1. At the DSX, loop back each of the receive E1 or DS1 lines from the 9000 to the transmit lines to the 9000.
2. Run Test 2. If any errors are reported, check each E1/DS1 line. If lines are reporting errors, check for interference or other problems.

7.43 E1/DS1 Test Interface

7.431 If near-end and far-end DSX loopback is not possible, an E1 or DS1 Test Interface, Model 9021, is available. (Refer to Figures 7-3b and 7-5).



NOTE:

If no errors are reported, or reported errors have been cleared, the equipment is ready to carry traffic.

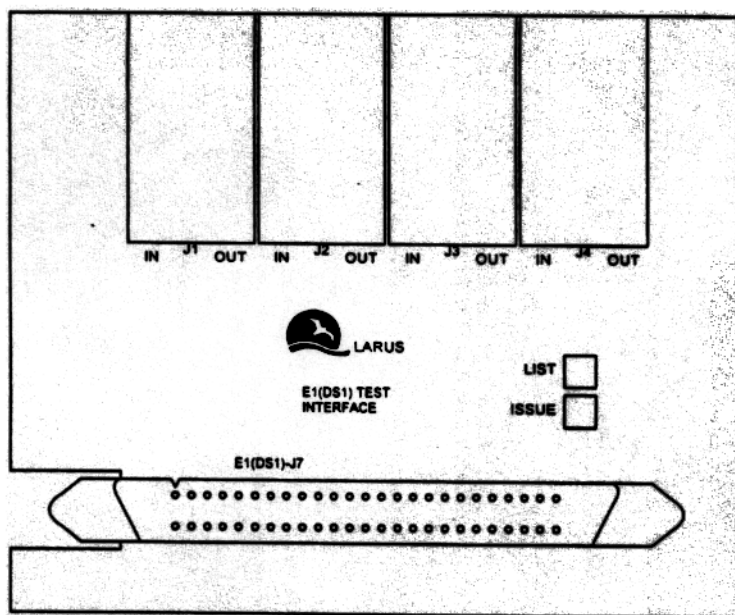


Figure 7-5. Model 9021 E1/DS1 Test Interface

8.01 There is no routine maintenance required.

8.02 If a unit is suspected of being faulty, replace the suspected unit with a spare serviceable unit. If the problem is resolved by this substitution, call the Larus Corporation Customer Service Department to obtain a return merchandise authorization (RMA) number. If the problem is not resolved by the substitution, call the Customer Service Department for assistance (refer to paragraph 8.03).



CAUTION:

When handling or returning electrostatic discharge (ESD) sensitive products, all standard ESD precautions should be followed. ESD sensitive equipment is considered to be any electrical equipment aside from sheet metal products. Standard ESD precautions include, but are not limited to, the following:

- All personnel handling equipment should be properly grounded (prior to removal of equipment from the housing/shelf). This will preclude ESD through the equipment.
- Once the equipment has been removed from the housing/shelf, it should immediately be placed in an ESD protective bag.

All returned equipment should be packaged as originally received (i.e., placed in an ESD conductive or antistatic bag and put back in the original box with foam packaging). Individual equipment boxes should be placed into a master container box with appropriate fill to ensure safe transportation.

Any ESD or transportation related damage to equipment will void the equipment warranty.

- 8.03 All returned equipment and requests for assistance should be directed to:

Larus Corporation
Customer Service Department
1560 Berger Drive
San Jose, CA 95112 - 2703

(408) 494-1500	Telephone
(800) 999-9946	Toll-free
(408) 494-0735	FAX

- 8.04 All returned shipments must be prepaid and bear the RMA number on the exterior of the carton.

9.01 Products Manufactured by Larus Corporation

Limited Warranty:

- a. Larus products, except as stated otherwise in an applicable price list, are warranted against defects in workmanship and material for a period of 1 (one) year from date of delivery as evidenced by Larus' packing slip or other transportation receipt. Warranty under contract may differ. Components in Larus products manufactured by others shall be assigned the original manufacturer's warranty. Refer to paragraph 9.03.
- b. Larus' sole responsibility under this warranty shall be either to repair or replace, at its option, any component which fails during the applicable warranty period because of a defect in workmanship and material, provided purchaser has promptly reported same to Larus in writing. All replaced products or parts shall become Larus' property.
- c. Larus will only honor the warranty at its repair facility in San Jose, California, unless stipulated differently under contract. It is the purchaser's responsibility to return, at its expense, the allegedly defective product to Larus. The purchaser must obtain a return merchandise authorization (RMA) number and shipping instructions from Larus prior to returning any product under warranty. Transportation charges for the return of the product to the purchaser shall be paid by Larus within the United States. For all other locations, the warranty excludes all costs of shipping, customs clearance, and other related charges. If Larus determines that the product is not defective within the terms of this warranty, the purchaser shall pay Larus all costs of handling, transportation, and repairs at the then prevailing repair rates.
- d. All the above warranties are contingent upon proper use of the product. These warranties will not apply (i) if adjustment, repair, or parts replacement is required because of accident, unusual physical, electrical, or electromagnetic stress, neglect, misuse, failure of electric power, environmental controls, transportation, not maintained in accordance with Larus specifications, or abuses other than ordinary use; (ii) if the product has been modified by the purchaser or has been repaired or altered outside Larus' factory, unless Larus specifically authorizes such repairs or alterations; (iii) where Larus serial number, warranty data, or quality assurance decals have been removed or altered.

(continued)

- e. Larus also reserves the right to make product improvements without incurring any obligation or liability to make the same changes in products previously manufactured or purchased. In no event shall Larus be liable for any breach of warranty in an amount exceeding the net selling price of any defective product. No person, including any dealer, agent, or representative of Larus, is authorized to assume for Larus any other liability on its behalf except as set forth herein. Non-payment of any invoice rendered within the stated payment terms automatically cancels any warranty or guarantee stated or implied. If any payment is due Larus for services performed hereunder, it shall be subject to the same payment terms as the original purchase.
- f. Except for the express warranties stated herein, Larus disclaims all warranties on products furnished hereunder, including, without limitation, all implied warranties of merchantability and fitness, and the stated express warranties are in lieu of all obligations or liabilities on the part of Larus arising out of or in connection with the performance of the products.

Repaired Products and Repair Parts

Products repaired within the warranty period continue to be warranted to the end of that period or for 90 (ninety) days, whichever is longer. Repair work done on products repaired outside the warranty period is warranted against defects in workmanship and material for a period of 90 (ninety) days.

9.03 Products and Components Manufactured by Others

For products or components not manufactured by Larus, the original manufacturer's warranty shall be assigned to the purchaser to the extent permitted and is in lieu of any other warranty, expressed or implied. For warranty information on a specific product, a written request should be made to Larus.

NOTE: Features and specifications are subject to change without notice.

Equipment Issue Information

10.01 Practice 80-100-281, Issue 1, applies to the following equipment:

<u>Description</u>	<u>Part Number</u>	<u>Equipment Issue</u>
RF Module, High Freq Xmt and Low Freq Rcv, plus 4 x E1 Control Module	020-02106-000	(N/A)
RF Module, Low Freq Xmt and High Freq Rcv, plus 4 x E1 Control Module	020-02107-000	(N/A)
RF Module, High Freq Xmt and Low Freq Rcv, plus 4 x DS1 Control Module	020-02106-001	(N/A)
RF Module, Low Freq Xmt and High Freq Rcv, plus 4 x DS1 Control Module	020-02107-001	(N/A)
Spare RF Module, High Freq Xmt and Low Freq Rcv	007-02078-000	1
Spare RF Module, Low Freq Xmt and High Freq Rcv	007-02078-001	1
Modem Board, 4 x E1	007-01794-000	1
Modem Board, 4 x DS1	007-01794-001	1
Power Supply Board	007-02068-000	1
Control Module, 4 x E1	007-02079-000	1
Control Module, 4 x DS1	007-02079-001	1

(continued)

(continued)

<u>Description</u>	<u>Part/Model Number</u>	<u>Equipment Issue</u>
Installation Kit, RF/Controller Assembly mounted in 19" or 23" rack	007-02109-000	1
Antenna Jumper Cable	041-02110-XXX	1
DS1 Single-ended Route Diversity Switch Circuit Pack	5702 List 1	1,2,3,4
RouteSwitch™ 12-slot, 19" shelf	5702 List 3	2
Cable with N-type Connectors, RF Module to Waveguide, 3 feet	7509 List 3	1
Frequency Translator, 5.7 GHz	9020 List 0	1
DS1 Test Interface (Test Adapter)	9021 List 0	1
E1 Test Interface (Test Adapter)	9021 List 1	1

NOTE: Contact Larus Sales for special antenna mounting arrangements, lightning protection, and custom installation.

Extended Service Agreements:

Larus SmartService	7100 List 0
Larus SmartService Plus	7100 List 1
Larus On-Site SmartService	7100 List 2
Larus SmartService Training	7100 List 3