

Performance Standards

- 5.01** The Larus *QuadHopper*™ provides performance equal to, or better than, a standard microwave radio link or cable and conforms to E1/DS1 performance standards as outlined by Bellcore.
- 5.02** A detailed site survey must be performed per Larus specification (refer to Larus Practice 80-601-281) and the system must be installed by trained, professional technicians.

QuadHopper™ Grade of Service

The Larus QuadHopper™ E1/DS1 radio system is designed to provide 99.925 % availability (64.8 seconds unavailable per day) and 98.75 % error free seconds (no more than 1080 errored seconds per day) with fewer than 4 severely errored seconds per day. (Terms are defined on page 5-3.) This assumes that the system has been installed according to the manufacturer's published specification as outlined in Larus Practices. The calculation represents the worst case limits on performance. Availability is averaged over three months and error free and severely errored seconds are averaged over one day.

Over a 3-day period there should be fewer than 3240 errored seconds, 12 severely errored seconds, and 195 seconds of unavailability, measured round trip (both ways). This would verify that the link is two times better than the objective of 99.925 % availability.

The next higher grade of service for an E1/DS1 as defined by Bellcore would affect availability only, and that would increase to 99.995 %. This would equate to fewer than 4.32 seconds of unavailability per day or fewer than 13 seconds in 72 hours.

Technical Specifications

- 6.01 Frequency:
5.730 to 5.774 GHz Rx/Tx
5.801 to 5.845 GHz Tx/Rx
- 6.02 Bit Rate:
4 x 2.048 Mbps (8.192 Mbps), E1
4 x 1.544 Mbps (6.176 Mbps), DS1
- 6.03 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
- 6.04 Frequency Reference:
Type Crystal locked loop
Frequency stability ± 20 ppm
- 6.05 Transmitter Output Power:
+ 27 dBm (520 Mw)
- 6.06 Transmitter Intermediate Frequency:
140 MHz
- 6.07 Receiver Intermediate Frequency:
70 MHz
- 6.08 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
- 6.09 Power Requirements:
-20 to -60 Vdc @ 100 watts (typical)
- 6.10 Maximum Allowable Noise on Power Supply:
Complies with Bellcore TR-TSY-000752, Issue 1, October 1989.

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.

Controls and Displays

- 7.101 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.



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.

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.

7.217 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>

7.2111 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

7.2116 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

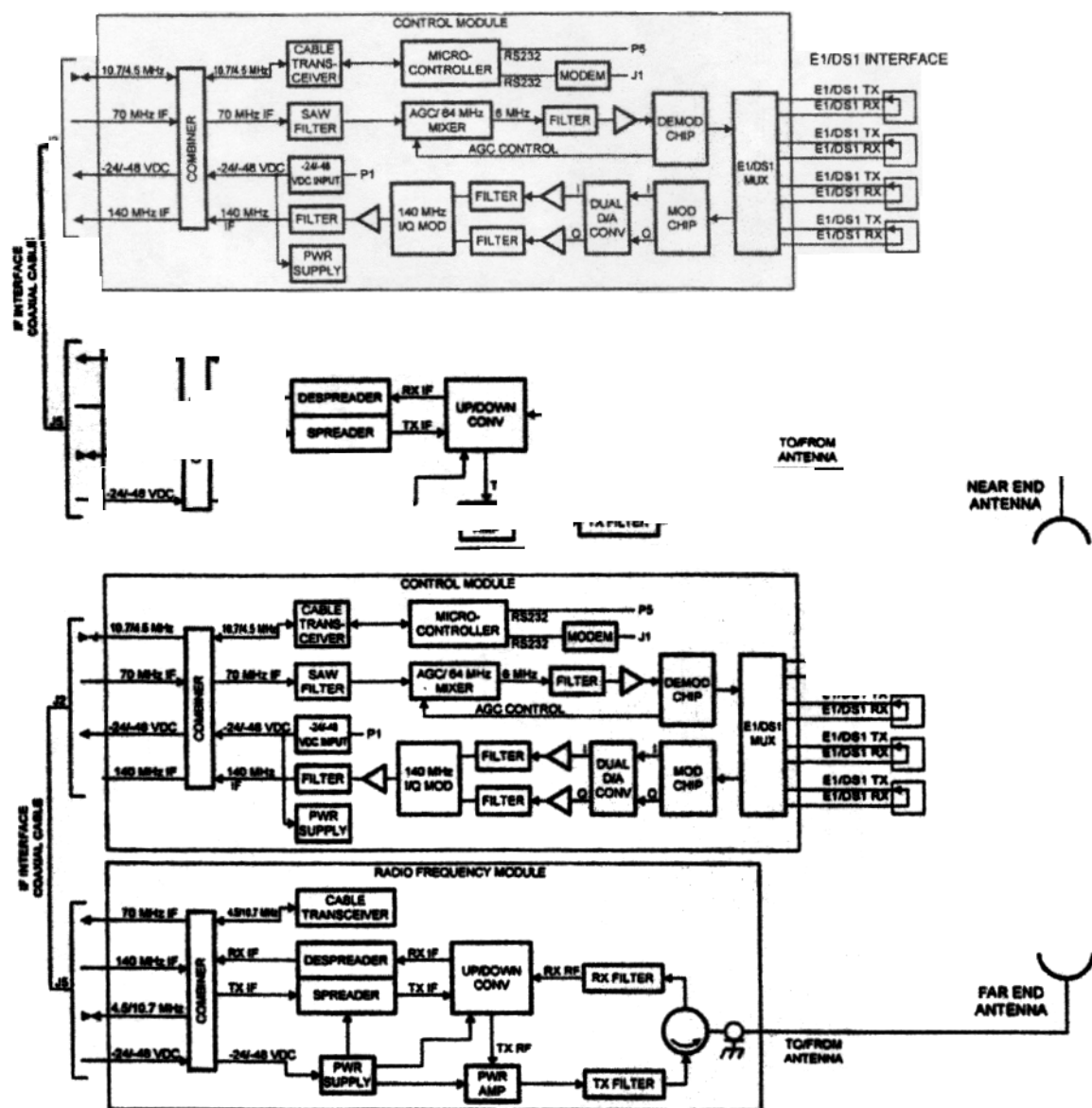
Setting Maintenance

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.

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.)



Model 9000 Radio Field Test #2

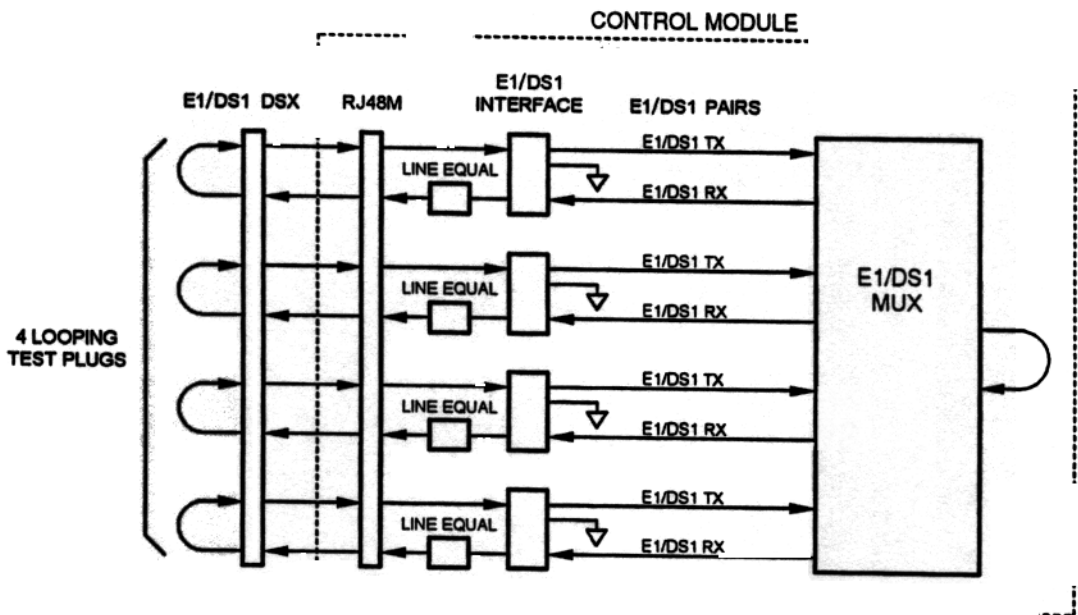
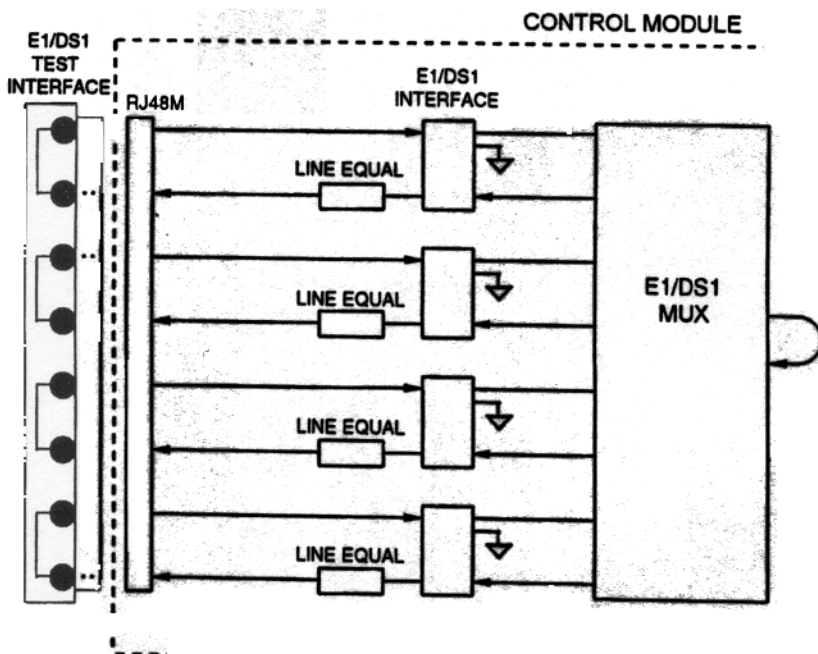


Figure 7-3a. Model 9000 Radio Field Test #1



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)

7.422 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 all 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.

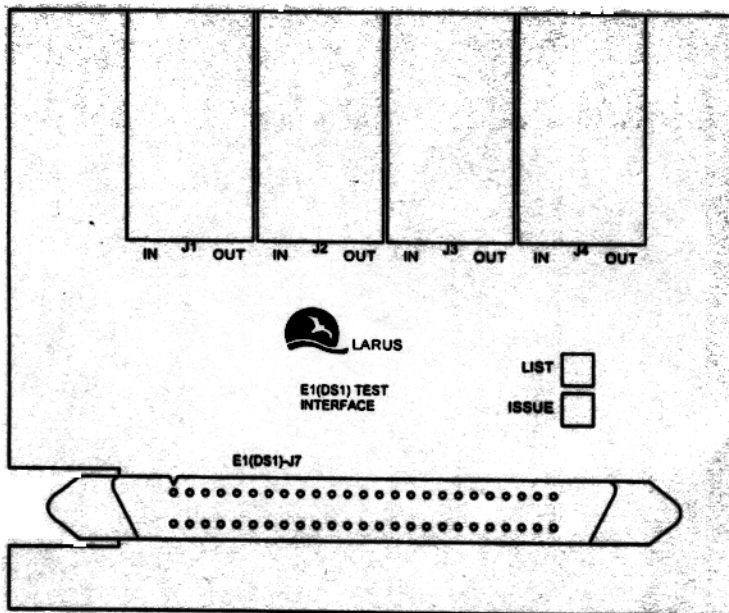


Figure 7-5. Model 9021 E1/DS1 Test Interface

8.03 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

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

(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.

10.01 (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	
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