Electromagnetic Compatibility:
For continued EMC compliance, all external cables must be shielded and three meters or less in length.

Nomenclature Statements:
In this manual, 8800 refers to the 8800 Digital Radio Test System.
In this manual, 8800S refers to the 8800S Digital Radio Test System.
In this manual, 8800SX refers to the 8800SX Digital Radio Test System.
In this manual, 8800 Series refers to the 8800 Series Digital Radio Test System.
In this manual, Test Set, Digital Radio Test System or Unit refers to the 8800 Series Digital Radio Test System.

Product Warranty:
SAFETY FIRST: TO ALL OPERATIONS PERSONNEL

REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL. THIS UNIT CONTAINS NO OPERATOR SERVICEABLE PARTS.

WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.

CASE, COVER OR PANEL REMOVAL

Opening the Case Assembly exposes the operator to electrical hazards that can result in electrical shock or equipment damage. Do not operate this Unit with the Case Assembly open.

SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards, that may exist when operating or servicing this equipment.

CAUTION: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

WARNING: THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

SAFETY SYMBOLS IN MANUALS AND ON UNITS

⚠️ CAUTION: Refer to accompanying documents. (This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.)

▌▌▌ AC OR DC TERMINAL: Terminal that may supply or be supplied with AC or DC voltage.

▌▌▌ DC TERMINAL: Terminal that may supply or be supplied with DC voltage.

▌▌▌ AC TERMINAL: Terminal that may supply or be supplied with AC or alternating voltage.

 المتعلقة במילים נוחיות: This surface may be hot to the touch.

EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

USE OF PROBES

Check the specifications for the maximum voltage, current and power ratings of any connector on the Unit before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

USE RECOMMENDED FUSES ONLY

Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

INTENDED USE

This Unit is intended for indoor use only and should not be subjected to conditions which cause water or other liquids to collect on the Touch Screen Display.

INTERNAL BATTERY

This Unit contains a Lithium Ion Battery, serviceable only by a qualified technician.

CAUTION: SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND SHOULD TAKE NECESSARY PRECAUTIONS TO AVOID POTENTIAL COMMUNICATION INTERFERENCE PROBLEMS.
DECLARATION OF CONFORMITY

The Declaration of Conformity Certificate included with the Unit should remain with the Unit.

Aeroflex recommends the operator reproduce a copy of the Declaration of Conformity Certificate to be stored with the Operation Manual for future reference.
# RoHS Product Information for People’s Republic of China

## Toxic or Hazardous Substance Content Table

The table provided below lists information as required by People’s Republic of China Electronic Industry Standard SJ/T11364-2006, Marking for Control of Pollution Caused by Electronic Information Products. The table lists toxic or hazardous substances contained in Aeroflex products that exceed limits in SJ/T11363-2006.

Table 1. Toxic or Hazardous Substances in Product

<table>
<thead>
<tr>
<th>部件名称</th>
<th>部件名称</th>
<th>Toxic or Hazardous Substances</th>
<th>有毒有害物质或元素</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts</td>
<td>Parts</td>
<td>Lead (Pb)</td>
<td>Mercury (Hg)</td>
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<tr>
<td>部件名称</td>
<td>部件名称</td>
<td>铅</td>
<td>汞</td>
</tr>
<tr>
<td>Printed Board Assemblies</td>
<td>印刷板组件</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Chassis subassembly</td>
<td>机箱子组件</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Power Supply</td>
<td>电源</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Cables &amp; Cable Assemblies</td>
<td>电缆及电缆组件</td>
<td>X</td>
<td>O</td>
</tr>
</tbody>
</table>

O: Indicates that the toxic or hazardous substance contained in all of the homogenous materials for this component is below the limit requirement in SJ/T11363-2006.

X: Indicates that the toxic or hazardous substance contained in at least one of the homogeneous materials for this component is above the limit requirement in SJ/T11363-2006.
Pollution Control Marking

The following marking is located on all Aeroflex products sold in China. The number in the center indicates the Environmental Protection Use Period. This indicates the period in years during which the hazardous substances described in Table 1 will not leak or mutate under normal operating conditions so that the use of the product will not result in any severe environmental problem, any bodily injury, or damage to assets. The Environmental Protection Use period is valid only when the product is operated under the conditions defined in the product manual.
PREFACE

SCOPE
This Manual contains Instructions for operating the Digital Radio Test System. It is strongly recommended that the Operator be thoroughly familiar with this manual before attempting to operate the equipment.

ORGANIZATION
The Manual is composed of the following Chapters:

CHAPTER 1 - INTRODUCTION
Provides an Introduction and a Brief Overview of Functions and Features. Principles of Operation are also included.

CHAPTER 2 - OPERATING INSTRUCTIONS
Identifies and functionally describes all Controls, Indicators and Connectors.
Provides UI interaction.
Provides a Turn-On Procedure and Initial Adjustments.
Provides Operation Procedures.
Provides Applications.

CHAPTER 3 - OPERATOR MAINTENANCE
Identifies and explains Routine Service, Maintenance and Storage Procedures.
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<td>2-4-2 Install/Remove License</td>
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</tr>
<tr>
<td>USB Connector Pin-Out Table</td>
<td>A-6</td>
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</table>
SERVICE UPON RECEIPT OF MATERIAL

Unpacking

Special-design packing material inside the shipping container provides maximum protection for the Digital Radio Test System. Avoid damaging the shipping container and packing material during equipment unpacking.

Use the following steps for unpacking the Digital Radio Test System.

- Cut and remove the sealing tape on top of the shipping container and open the shipping container.
- Remove the top packing mold.
- Remove the Digital Radio Test System and packing material from the bottom packing mold.
- Remove the protective plastic bag from the Digital Radio Test System and inspect the contents.
- Place the protective plastic bag and packing material inside the shipping container.
- Store the shipping container for future use should the Digital Radio Test System need to be returned/shipped.

Checking Unpacked Equipment

Check the equipment for damage incurred during shipment. If the equipment has been damaged or if items seem to be absent from the shipment, report the damage and/or discrepancies to Aeroflex Customer Service.

CONTACT: Aeroflex

Telephone: (800) 835-2350 (U.S. only)
(316) 522-4981
FAX: (316) 524-2623
E-Mail: americas.service@aeroflex.com
Checking Unpacked Equipment (cont)
### Checking Unpacked Equipment (cont)

#### STANDARD ITEMS

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Checking Unpacked Equipment (cont)

**STANDARD ITEMS**

8800 / 8800S / 8800SX
112581 / 138803 / 139942

Battery, Spare
67076

External DC Power Supply
67374

Front Cover
138167

Fuse, Spare (5 A, 32 Vdc, Mini-Blade)
56080

Manual, Getting Started (Paper)
139254

Manual, Operation (CD)
139274

Power Cable (AC) (China)
91803
Checking Unpacked Equipment (cont)

**STANDARD ITEMS**

- **Power Cable (AC) (Continental Europe)**
  - 27480

- **Power Cable (AC) (North America)**
  - 27478

- **Power Cable (AC) (UK)**
  - 27477
### Checking Unpacked Equipment (cont)

**OPTIONAL ITEMS**

(These optional items may be included if ordered)

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<td>Attenuator (20 dB / 150 W)</td>
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<td>Battery Charger, External</td>
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<td>Case, Soft-Sided Carrying Case</td>
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<td>Case, Transit</td>
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<td>DMM Test Leads</td>
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<td>Handset (Microphone)</td>
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<td>Manual, Maintenance (CD)</td>
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<td>Power Cable (DC Cigarette Lighter)</td>
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<td>Power Sensor (Bird 5017B)</td>
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<td>Precision DTF / VSWR Accessory Kit</td>
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<td>Rackmount Kit</td>
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### OPTIONAL ITEMS
(These optional items may be included if ordered)

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<td>8800 Series Opt04</td>
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<td>8800 Series Opt05</td>
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</table>
Checking Unpacked Equipment (cont)

**OPTIONAL ITEMS**
(These optional items may be included if ordered)

- **Antenna Kit**
  - 114475

- **Attenuator (20 dB / 150 W)**
  - 38242

- **Battery Charger, External**
  - 114479

- **Battery, Spare**
  - 67076

- **Case, Soft-Sided Carrying Case**
  - 114478

- **Case, Transit**
  - 114477

- **DMM Test Leads**
  - 63936

- **Handset (Microphone)**
  - 112861
Checking Unpacked Equipment (cont)

**OPTIONAL ITEMS**
(These optional items may be included if ordered)

- Manual, Maintenance (CD) 113614
- Power Sensor (Bird 5017B) 113309
- Power Cable (DC Cigarette Lighter) 62404
- Precision DTF / VSWR Accessory Kit 114348
- Rackmount Kit 114312
CHAPTER 1 - INTRODUCTION

1-1. GENERAL INFORMATION

A. Scope

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<td></td>
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<tr>
<td>Unit</td>
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B. Nomenclature Cross-Reference List

Type of Manual: Operation Manual
Equipment Name and Model Number: 8800 Series Digital Radio Test System
Purpose of Equipment: The 8800 Series Digital Radio Test System is used for testing radios and related equipment.
1-2. EQUIPMENT CAPABILITIES AND FEATURES

The 8800 Series Digital Radio Test System, used for Radio installation testing, designed for ease of use, portability, reliability and long service life, is capable of measuring high power, up to 50 W, as well as fault finding for antennas, power amplifiers and interconnects, meeting the needs of a variety of vehicular radios as well as commercial radio applications.

Power is derived from an optional internal battery. When using as a portable Test Set, the DC IN Connector is provided for battery charging, bench operation or servicing.

A. Capabilities

Capabilities

- RF Receiver Testing - Up to 1 GHz bandwidth; AM, FM, frequency and level measurements.
- RF Transmitter Testing - Up to 1 GHz bandwidth; AM, FM, 1 kHz / 150 Hz and external modulation sources.
- RF Power Meter - Up to 50 W continuous; 200 W with an external attenuator.
- VSWR measurements.
- Simple operation with few key strokes and textual displays.
- Large Touch Screen Display with user adjustable Backlight Brightness.
- Self Test for internal validation and testing.
- Optional Battery allows 2.5 hours typical continuous use before recharge.
- Automatic power shutdown after approximately 5 to 20 minutes (selectable) of non-use when AC power is not connected.
- Compact and lightweight enough to allow for one person operation.
B. Features

Functions and Tiles - LMR

(Optional Functions are shown for display purposes only.)
B. Features (cont)

Functions and Tiles - Extended - LMR

(Optional Functions are shown for display purposes only.)
B. Features (cont)

Functions and Tiles - PTC

( Optional Functions are shown for display purposes only. )
B. Features (cont)

Functions and Tiles - Extended - PTC

(Optional Functions are shown for display purposes only.)
B. Features (cont)

Functions and Tiles - Advanced Digital

( Optional Functions are shown for display purposes only. )
B. Features (cont)

Functions and Tiles - Extended - Advanced Digital

(Optional Functions are shown for display purposes only.)
1-3. **EQUIPMENT DATA**

**NOTE**
- Where specified resolution exceeds specified accuracy, the specified resolution takes precedence.
- Accuracy and resolution stated in percentages are referenced to the measured or selected value.
- All RF characteristics are referenced to 50 Ω.
- Allow warm-up period of at least 10 minutes.
- Received (input) signal modulation bandwidth does not exceed selected receiver IF bandwidth.
- ANT and GEN Connector’s VSWR specification only applies when the connector is selected.
- Specifications are subject to change without notice.

**RF GENERATOR**

**PORT INPUT PROTECTION**

ANT Port: ................................................................. +20 dBm (Input Power Alarm Typical)
T/R Port (8800): ................................................................. +49 dBm CW (Input Power Alarm Typical)
                       >+90°C (Temperature Alarm Typical)
T/R Port (8800S / 8800SX): ............................................. +52 dBm CW (Input Power Alarm Typical)
                       >+90°C (Temperature Alarm Typical)

**FREQUENCY**

Range: ......................................................................................................... 2 to 1000 MHz
Usable Range: ..................................................................................................... 100 kHz to 2 MHz
Accuracy: ........................................................................................................... Same as Timebase
Resolution: ......................................................................................................... 1 Hz

**OUTPUT LEVEL RANGE**

T/R Connector: ................................................................. -50 to -125 dBm
ANT Connector: ................................................................. -30 to -90 dBm
GEN Connector: ................................................................. -5 to -65 dBm
Level Accuracy: ..........................................................................................................
   ±2 dB
   ±3 dB (<-100 dBm)
   ±3 dB (<-110 dBm Hold Atten Mode)

**NOTE**
- ANT Connector Generator output level only applies when Receiver port is selected to ANT.
- Generator ANT Port level accuracy is valid >0°C.

Level Resolution: .............................................................................................. 1 dB
Level Resolution (Hold Atten Mode): ................................................................. 0.1 dB (0 to -6 dB)

**NOTE**
- Level Accuracy is not specified over Temperature in “Hold Atten Mode.”
1-3. EQUIPMENT DATA (cont)

RF GENERATOR (cont)

PTT Operation (w/ provided Handset): ...PTT ON/OFF (when PTT activated RF Generator is enabled)

CONNECTOR VSWR

ANT Connector: .................................................................<1.5:1 Typical
GEN Connector: .................................................................<1.5:1 Typical
T/R Connector: .................................................................<1.2:1

SSB PHASE NOISE: .................................................................<-89 dBc/Hz at 20 kHz offset
<-93 dBc/Hz at 20 kHz offset (Typical)

SPURIOUS

Harmonics: .................................................................-30 dBc, -42 dBc typical
Non-Harmonics: -40 dBc, -50 dBc typical (>±20 kHz Offset from Carrier) 0 to 1 GHz
Internal Clock Harmonics: Spurious signals related to harmonics of internal clock
frequencies of 25.6, 50 and 80 MHz shall not exceed -95 dBm. Performance of Generator and Receiver
functions below -100 dBm are degraded when the Unit
is tuned to frequency of spurious signal.

RESIDUAL FM: .................................................................<20 Hz rms in 300 Hz to 3 kHz BW
<4 Hz rms, Typical <100 MHz
<6 Hz rms, Typical <800 MHz
<11 Hz rms, Typical >800 MHz

RESIDUAL AM: .................................................................<5% rms in 300 Hz to 3 kHz BW

MODULATION TYPES

Analog: .................................................................None, FM and AM
Digital: .................................................................P25, DMR, dPMR, ARIBT98 and NXDN
DTMF: .................................................................None, FM and AM
DCS: .................................................................None, FM and AM
Two Tone Sequence: .................................................................None, FM and AM
Tone Remote: .................................................................None, FM and AM
Tone Sequential: .................................................................None, FM and AM

MODULATION - FM

Interval: .................................................................Gen 1, Gen 2
Frequency Rate:

Range: .................................................................0 Hz to 20 kHz
Resolution: .................................................................0.1 Hz
Accuracy: .................................................................Timebase ±2 Hz

FM Deviation Range: .................................................................Off, 0 Hz to 100 kHz (GEN1 and GEN2 selectable)
Total Harmonic Distortion: 3% (1000 Hz Rate, >2 kHz Deviation, 300 Hz to 3 kHz BPF)
FM Deviation Resolution: .................................................................1 Hz
FM Deviation Accuracy: ±5% at 1 kHz rate, 2 to 50 kHz deviation (±1% typical)
±10% at 3 kHz rate, 2 to 50 kHz deviation
1-3. EQUIPMENT DATA (cont)

RF GENERATOR (cont)

External: ........................................................................................................... MIC, Audio In

MIC FM:

Microphone Input:

<table>
<thead>
<tr>
<th>Alternate Microphone Configurations</th>
<th>MIC Connector Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1: 2 to 15 mVrms (8 mVrms Typical)</td>
<td>Pin 2-OPEN, Pin 6-GND</td>
</tr>
<tr>
<td>Range 2: 35 to 350 mVrms (100 mVrms Typical)</td>
<td>Pin 2-GND, Pin 6-OPEN</td>
</tr>
<tr>
<td>Range 3: 2 to 32 mVrms (20 mVrms Typical)</td>
<td>Pin 2-OPEN, Pin 6-OPEN</td>
</tr>
</tbody>
</table>

NOTE

Range 2 turns ON a nominal 3 Vdc bias voltage.

FM Frequency Range: .............................................................. 300 Hz to 3 kHz
FM Level: ................................................................................ Off, 0 Hz to 80 kHz
FM Modulation Accuracy: ...................................................... ±20% (300 Hz to 1.2 kHz)
                                                             ±30% (>1.2 kHz)
FM Input Slope: ....................................................................... Positive voltage yields positive deviation

AUD IN:

Input Range: .................................................................................. 3 V, 30 V
Switchable Loads:
- 3 V Range: ........................................................................ 150 Ω, 600 Ω, 1 kΩ, High Z
- 30 V Range: ............................................................................... High Z
Input Levels:
- 3 V Range: ........................................................................... 0.05 to 3.2 Vrms
- 30 V Range: ............................................................................ 3 to 30 Vrms
FM Input Frequency Range: ...................................................... 300 Hz to 5 kHz
FM Input Level Sensitivity:
- 3 V Range: ........................................................................... 1 kHz / 35 mVrms Typical
- 30 V Range: ............................................................................ 1 kHz / 350 mVrms Typical
FM Input Slope: ....................................................................... Positive voltage yields positive deviation

MODULATION - AM

Internal: ...................................................................................... Gen 1, Gen 2

Frequency Rate:
Range: ...................................................................................... 10 Hz to 20 kHz
Resolution: ................................................................................ 0.1 Hz
Accuracy: ................................................................................... Timebase ±2 Hz
Range: ...................................................................................... OFF, 0% to 100% (GEN1 and GEN2 selectable)
Resolution: ................................................................................ 0.1%
1-3. EQUIPMENT DATA (cont)

RF GENERATOR (cont)

Total Harmonic Distortion: ........................................... 3% (20% to 90% mod, 1000 Hz rate, 300 Hz to 3 kHz BPF)

Accuracy: ................................................................. 10% of setting, 150 Hz to 5 kHz rate, 10% to 90% Modulation

External: .............................................................................................................. MIC, Audio In

MIC AM

Microphone Input:

<table>
<thead>
<tr>
<th>Alternate Microphone Configurations</th>
<th>MIC Connector Pins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range 1: 2 to 15 mVrms (8 mVrms Typical)</td>
<td>Pin 2-OPEN, Pin 6-GND</td>
</tr>
<tr>
<td>Range 2: 35 to 350 mVrms (100 mVrms Typical)</td>
<td>Pin 2-GND, Pin 6-OPEN</td>
</tr>
<tr>
<td>Range 3: 2 to 32 mVrms (20 mVrms Typical)</td>
<td>Pin 2-OPEN, Pin 6-OPEN</td>
</tr>
</tbody>
</table>

NOTE

Range 2 turns ON a nominal 3 Vdc bias voltage.

Input Frequency Range: ............................................................... 300 Hz to 3 kHz

Modulation: .................................................................................. 0% to 80%

Modulation Accuracy: .......................................................... ±20% (300 Hz to 1.2 kHz)

.......................................................... ±30% (>1.2 kHz)

AUD IN:

Input Range: .......................................................................................... 3 V, 30 V

Switchable Loads:

| 3 V Range: 150 Ω, 600 Ω, 1 kΩ, High Z |
| 30 V Range: High Z |

Input Levels:

| 3 V Range: 0.05 to 3.2 Vrms |
| 30 V Range: 3 to 30 Vrms |

FM Input Frequency Range: .......................................................... 300 Hz to 5 kHz

FM Input Level Sensitivity:

| 3 V Range: 1% / 35 mVrms Typical (High Z Load) |
| 30 V Range: 1% / 350 mVrms Typical (High Z Load) |

AUDIO GENERATORS (AFGEN1 AND AFGEN2)

NOTE

When GEN1 and GEN2 sources are selected, they are summed together.

Specifications are for each AFGEN individually routed out the AUD OUT Connector only.

Frequency Range: ........................................................................... 0 to 20 kHz

Frequency Resolution: ....................................................................... 0.1 kHz
1-3.  EQUIPMENT DATA (cont)

RF GENERATOR (cont)

Frequency Accuracy: .................................................... Timebase ±2 Hz
Output Level:
  Audio Out Load Impedance: ........................................... <1 Ω
  Audio Level Out: .......................................................... 0 to 1.57 Vrms
  Resolution: .................................................................... 0.001 Vrms
  Accuracy: ................................................................. ±10%, >100 Vrms, 30 Hz to 5 kHz
Distortion: ................................................................. <3% (1 kHz rate, sine 300 Hz to 3 kHz)
1-3. EQUIPMENT DATA (cont)

RF RECEIVER
PORT INPUT PROTECTION

ANT Port: +20 dBm (Input Power Alarm Typical)
T/R Port (8800): +49 dBm CW (Input Power Alarm Typical)
          >+90°C (Temperature Alarm Typical)
T/R Port (8800S / 8800SX): +52 dBm CW (Input Power Alarm Typical)
          >+90°C (Temperature Alarm Typical)

FREQUENCY:
Range: 2 to 1000 MHz
Usable Range: <100 kHz to <2 MHz

ACCURACY: Timebase
RESOLUTION: 1 Hz

INPUT AMPLITUDE

Sensitivity:
ANT Connector: -80 dBm Typical, 10 dB SINAD (-110 dBm with Preamp)
T/R Connector: -40 dBm Typical, 10 dB SINAD

Minimum Input Level Receiver Measurements:
ANT Connector: -60 dBm Preamp OFF, -80 dBm Preamp ON
                  (RF Error Meter, DEMOD Meters: Distortion, SINAD, Modulation, AF Counter)
T/R Connector: -20 dBm Preamp OFF, -40 dBm Preamp ON
                  (RF Error Meter, DEMOD Meters: Distortion, SINAD, Modulation, AF Counter)

Maximum Input Level Receiver Measurements:
ANT Connector: +10 dBm (Auto, Preamp OFF)
T/R Connector: +41 dBm (AM)
                 +47 dBm (CW, FM)

DEMODULATION TYPES: AM, FM, DMR, dPMR, ARIBT98, NXDN and P25

FM DEMOD
IF BW: 5, 6.25, 8.33, 10, 12.5, 25, 30, 100 and 300 kHz
Audio Filters BW: C-Wt BP, CCITT BP, NONE, 15 kHz LP, 300 Hz LP,
                  300 Hz HP, 5 kHz LP, 300 Hz to 5 kHz BP, 300 Hz to 3 kHz BP,
                  300 Hz to 20 kHz BP and 3 kHz LP
Level Sensitivity (AUD OUT Connector): 3 Vrms per kHz Dev / IF BW (kHz) ±15%

AM DEMOD
AM Demod:
IF BW: 5, 6.25, 8.33, 10, 12.5, 25 and 30 kHz
Audio Filters BW: C-Wt BP, CCITT BP, NONE, 15 kHz LP, 300 Hz LP,
                  300 Hz HP, 5 kHz LP, 300 Hz to 5 kHz BP, 300 Hz to 3 kHz BP,
                  300 Hz to 20 kHz BP and 3 kHz LP
Level Sensitivity (AUD OUT Connector): 7 mVrms per %AM ±15%

LO EMISSIONS: <-50 dBc
1-3. EQUIPMENT DATA (cont)

RECEIVER METERS

RF ERROR METER

Units: ................................................................................................................... Hz, PPM
Range: ........................................................................................................... ±200 kHz / ±1000 ppm
Resolution: ............................................................................................................. 1 Hz
Accuracy: .................................................................................................. ±1 Hz

RSSI METER (RF Power within Receiver IF BW)

Units: ............................................................................................. dBm, Watts, microWatts
Range (3 Connectors): ................................................................................ -120 to +60 dBm
Useable RF Level Range:
   ANT Connector (Preamp OFF): .............................................................. -90 to +10 dBm
   ANT Connector (Preamp ON): .............................................................. -110 to -10 dBm
   T/R Connector: ........................................................................................ -50 to +47 dBm
Resolution: .......................................................................................................... 0.01 dBm
Accuracy: ................................................................................................±3 dB, ±1.5 dB Typical (Normalize function completed)
Ext Attenuation: ........................................................................................ 0 to 30 dB, 0.01 dB resolution

RF POWER METER (CW Only) (Broadband RF Power into T/R Connector)

Range: ....................................................................................................... +20 to +53 dBm
Meter Floor: .................................................................................................... 0.10 W / +20 dBm
Maximum T/R Port Input Level (8800):...................................................... 50 W continuous, +25°C, +10°C
Maximum T/R Port Input Level (8800S / 8800SX): .................................... 125 W, +25°C, +10°C
   50 W continuous
Max ON of 30 sec and Min OFF of 90 sec for power levels >50 W
Averaging Range: ............................................................................................ 1 to 99
Display Units: .................................................................................................... dBm, Watts
Resolution: ...................................................................................................... 0.01 W, 0.1 dBm
Accuracy: .................................................................................................. 10% of reading (6% Typical)
   Zero function completed
   Receiver set to desired Frequency
Ext Attenuation: ........................................................................................ 0 to 50 dB, 0.01 dB resolution
1-3. EQUIPMENT DATA (cont)

RECEIVER METERS (cont)

FM DEVIATION METER

- Meter Deviation Range: 500 Hz to ±100 kHz
- Meter Type: Peak+, Peak-, (Peak-Peak)/2, RMS
- Resolution: 0.1 Hz
- Accuracy: ±10% of reading (500 Hz to 100 kHz Deviation)
  ±5% of Reading (1 to 10 kHz Deviation)
  ±3% of reading (1 to 10 kHz Deviation)
- Flatness: <0.5 dB (20 Hz to 6 kHz Rate)

AM PERCENT MODULATION METER

- Meter Range: 5% to 100%
- Meter Modes: Peak+, Peak-, (Peak-Peak)/2, RMS
- Resolution: 0.001%
- Accuracy: ±5% of reading, 1 kHz rate, 30% to 90% modulation, 3 kHz LPF
1-3.  EQUIPMENT DATA (cont)

AUDIO METERS

SINAD METER

Measurement Sources: ................................................................. AUD IN, DEMOD

DEMOD:

FM: .................................>2 kHz Deviation (IF BW set appropriately for received modulation BW)
AM: .................................>25% Modulation (IF BW set appropriately for received modulation BW)

AUD IN:

Frequency Range: ........................................................................... 300 Hz to 10 kHz
Input Level:

3 V (Audio Config Setup): ................................................................. 0.9 Vp-p to 8 Vp-p
30 V (Audio Config Setup): ................................................................. 9 Vp-p to 80 Vp-p

Audio Frequency Notch: ................................................................. 1 to 1.8 kHz (Usable to 5 kHz.)

Reading Range: ............................................................................. 0 to 60 dB
Resolution: .................................................................................. 0.001 dB
Accuracy: .................................................................................. ±1.5 dB, reading >8 dB, <40 dB

SNR Meter

Weighting: ............................................................... User defined from C-WT BP, CCITT BP, NONE, 15 kHz LP, 0.3 kHz LP, 0.3 kHz HP, 5 kHz LP, 300 Hz to 5 kHz BP, 300 Hz to 3 kHz BP, 0.3 kHz to 20 kHz BP, 3 kHz LP

Display Range: ............................................................................. 0 to 100 dB
Accuracy: .................................................................................. ±1 dB, reading >8 dB, <50 dB

DISTORTION METER

Measurement Sources: ................................................................. AUD IN, DEMOD

DEMOD:

FM: .................................>2 kHz Deviation (IF BW set appropriately for received modulation BW)
AM: .................................>25% Modulation (IF BW set appropriately for received modulation BW)

AUD IN:

Frequency Range: ........................................................................... 300 Hz to 10 kHz
Input Level:

3 V (Audio Config Setup): ................................................................. 0.9 Vp-p to 9 Vp-p
30 V (Audio Config Setup): ................................................................. 9 Vp-p to 90 Vp-p

Audio Frequency Notch: ................................................................. 1 to 1.8 kHz (Usable to 5 kHz.)

Reading Range: ............................................................................. 0% to 100%
Resolution: .................................................................................. 0.001%
Accuracy: .................................................................................. ±10% of reading + 0.1% Distortion, >1% to <20%
1-3. EQUIPMENT DATA (cont)

AUDIO METERS (cont)

AF COUNTER

Measurement Sources: ................................................................. AUD IN, DEMOD

DEMOD:

FM: ..................... 15 Hz to 20 kHz Rate (IF BW set appropriately for received modulation BW)
AM: ..................... 100 Hz to 10 kHz Rate (IF BW set appropriately for received modulation BW)

AUD IN:

FM: ..................... 15 Hz to 20 kHz Rate (IF BW set appropriately for received modulation BW)
AM: ..................... 100 Hz to 10 kHz Rate (IF BW set appropriately for received modulation BW)

AUD IN:

Frequency Range: ................................................................. 300 Hz to 20 kHz
Input Level:

3 V (Audio Config Setup): ............................................................. 28 mVp-p to 9 Vp-p
30 V (Audio Config Setup): ............................................................ 280 mVp-p to 90 Vp-p

Audio Frequency Level Meter

Measurement Sources: ........................................................ AUD IN, SCOPE

Input Ranges:

AUD IN: ................................................................. 3 V, 30 V
SCOPE: ................................................................. 2 Vdc, 40 Vdc

Frequency Range: ................................................................. 200 Hz to <5 kHz
Load Selection:

AUD IN:

3 V Input Range: ................................................................. High Z, 150 Ω, 600 Ω, 1 kΩ
30 V Input Range: ................................................................. 10 kΩ

SCOPE: ................................................................. High Z

Input Level:

AUD IN Connector:

3 V Range: ................................................................. 10 mVrms to 3 Vrms
30 V Range: ................................................................. 1 to 30 Vrms

SCOPE Connector:

2.0 Vdc Range: ................................................................. 10 mVrms to 1 Vrms
40 Vdc Range: ................................................................. 1 to 28.28 Vrms

Display Unit Resolution: .................................................. 0.001 V, 0.001 mV, 0.001 dBμV, 0.001 dBm, 0.001 W
Accuracy: ................................................................. ±5% (AUD IN Connector)
1-3. EQUIPMENT DATA (cont)

OSCILLOSCOPE

Source: ................................................................. SCOPE, DEMOD, AUD IN

Bandwidth: ......................................................... 5 kHz

Input Impedance:

SCOPE Input:
  2.0 V Range: ...................................................... 53 kΩ
  40 V Range: ..................................................... 1 MΩ

Audio I/O Input:
  3 V Range: ........................................ 150 Ω, 600 Ω, 1 kΩ, High Z
  30 V Range: ........................................ 10 kΩ

Coupling:

SCOPE: .......................................................... AC, DC and GND

AUD IN: .............................................................. AC Only

FM Internal Demod: .................................................. DC

AC Internal Demod: .................................................. AC

Vertical Range:

Scope and AUD IN: ............................................ 10 mV/Div to 10 V/Div in a 1,2,5 sequence

FM Internal Demodulation: ............................... 0.1 kHz/Div to 50 kHz/Div in a 1,2,5 sequence

AM Internal Demodulation: ................................ 5%, 10%, 20%, 50%/Div

Vertical Accuracy: .................................................. 10% of Full Scale (DC to 5 kHz)

Horizontal Sweep: ............................................. 0.5 ms/Div to 0.1 sec/Div

Horizontal Accuracy: ........................................... 3% of Full Scale

Trigger Source: .................................................. Auto or Normal (Internal)

Trigger Adjustment: ............................................ Variable on Vertical Scale

Markers: ............................................................ Two Markers

Displays Vertical Measurement (Voltage, kHz, % Modulation)
Displays Delta in Time between Markers

SPECTRUM ANALYZER

Frequency Range: .................................................. 0 to 1000 MHz

Frequency Span: ................................................. 10 kHz to 5 MHz (1,2,5 Steps)

Windows: ............................................................. Hanning, Flat Top, Rectangle

Vertical Scale: ..................................................... 2, 5, 10, 15, 20 dB/Div

Marker Bandwidth: ............................................... 1 kHz to 5 MHz (1,2,5 Steps)

Marker Offset: .................................................... ±1 kHz to 1/2 Span (1,2,5 Steps)

Power Bandwidth Accuracy: ................................ ±3 dB Typical (30 dB Signal to Noise)

Noise Floor: .......................................................... -123 dB (Preamp OFF)

  -140 dB (Preamp ON) (100 kHz Span), Typical
1-3. EQUIPMENT DATA (cont)

OPTIONS

SWR

Frequency: .................................................. 2 to 1000 MHz (Calibration and Sweep Bandwidth)
Resolution: ........................................................................................................ 0.1 MHz

SWR Reading:
Range: ........................................................................................................... 1.00 to 20.00
Resolution: .............................................................................................................. 0.01
Accuracy: ................................................................................................................. ±20% of SWR readings (Calibrate) <300 MHz (Typical)
±30% of SWR readings (Calibrate) >300 MHz (Typical)

DTF READING

Test Range: ........................................................................................................... 3 to 328 ft (1 to 100 m)
Display Range: ..................................................................................................... 40 to 400 ft
(Range is function of Frequency Span and Cable Velocity and Cable Loss.)
Accuracy: .................................................................................................................. ±3 ft

DIGITAL MULTIMETER (DMM)

AC / DC Voltmeter

Full Scale Ranges: .......................................................... 200 mV, 2 V, 20 V, 200 V, 2000 V, Auto
(150 VAC RMS or VDC MAX input, Category II)
Resolution: ............................................................................................................. 3.5 Digits (2000 Counts)
Accuracy:
AC: .................................................................................................................... ±5% FS, ±1 Count + 25mV
DC: ....................................................................................................................... ±1% FS, ±1 Count

AC / DC Ammeter

Full Scale Ranges: .......................................................... 200 mA, 2 A, 20 A, Auto
(20 A Range uses Optional Shunt connected to Voltmeter)
Maximum Open Circuit Input Voltage: ................................................................. 30 Vrms
(referenced to COMMON or EARTH GROUND, Category I)
Resolution: ............................................................................................................. 3.5 Digits (2000 Counts)
Accuracy:
AC: .................................................................................................................... ±5% FS, ±1 Count
DC: ....................................................................................................................... ±5% FS, ±1 Count
AC Volts Frequency Range: ............................................................................. 50 Hz to 10 kHz

Ohmmeter

Full Scale Ranges: .......................................................... 200 Ω, 2 kΩ, 20 kΩ, 200 kΩ, 2 MΩ, 20 MΩ, Auto
Resolution: ............................................................................................................. 3.5 Digits (2000 Counts)
Accuracy: .................................................................................................................. ±5% FS, ±1 Count
### 1-3. EQUIPMENT DATA (cont)

#### OPTIONS (cont)

#### IN-LINE POWER METER

<table>
<thead>
<tr>
<th>RF Measurement Type</th>
<th>Average Power, Peak, Burst, Crest, CCDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>25 MHz to 1.0 GHz</td>
</tr>
<tr>
<td>Power Range</td>
<td>500 mW to 500 W Average, 13.3 to 1300 W peak</td>
</tr>
<tr>
<td>Insertion VSWR</td>
<td>&lt;1.05</td>
</tr>
<tr>
<td>Insertion Loss</td>
<td>&lt;0.05 dB</td>
</tr>
<tr>
<td>Directivity</td>
<td>29 dB up to 50 MHz, 30 dB from 51 to 1000 MHz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+25°C (±10°C), Internal Temperature of In-Line Power Meter Receiver set to desired Frequency</td>
</tr>
</tbody>
</table>

#### Average Power

<table>
<thead>
<tr>
<th>Average Forward Power Range</th>
<th>500 mW to 500 W Avg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak/Average Ratio Maximum</td>
<td>12 dB</td>
</tr>
<tr>
<td>Accuracy, Average Forward Power</td>
<td>±4% of reading + 166 mW</td>
</tr>
<tr>
<td>Return Loss</td>
<td>0 to 23 dB</td>
</tr>
<tr>
<td>VSWR</td>
<td>1.15 to 99.9</td>
</tr>
</tbody>
</table>

#### Burst Average Power

<table>
<thead>
<tr>
<th>Burst Average Power Range</th>
<th>13.5 to 500 W Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burst Width</td>
<td>1 µs to 5 ms</td>
</tr>
<tr>
<td>Repetitions Rate Min</td>
<td>200 Hz</td>
</tr>
<tr>
<td>Duty Cycle (D)</td>
<td>0.001 to 1.0 (D = Burst Width / Period)</td>
</tr>
<tr>
<td>Accuracy, Burst Average Power</td>
<td>±6% of reading + 0.166/D mW</td>
</tr>
</tbody>
</table>

#### Peak Envelope Power

<table>
<thead>
<tr>
<th>Peak Envelope Power Range</th>
<th>13.3 to 1300 W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Envelope Power Accuracy</td>
<td></td>
</tr>
</tbody>
</table>

| Burst Width > 200 µs | ±7% of reading, + 0.70 W |
| 1 µs < Burst Width < 200 µs | ±10% of reading, + 1.40 W |
| 0.5 µs < Burst Width < 1 µs | ±15% of reading, + 1.40 W |
| Burst Width < 0.5 µs | ±20% of reading, + 1.40 W |

#### Crest Factor

<table>
<thead>
<tr>
<th>Measurement Range</th>
<th>500 mW to 300 W, 13.3 W Minimum peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy, Crest Factor</td>
<td>Linear Sum of Peak and Average Power Accuracies</td>
</tr>
</tbody>
</table>
1-3.  EQUIPMENT DATA (cont)

OPTIONS (cont)

Complementary Cumulative Distribution Function (CCDF)
- CCDF Measurement Range: 0.1% to 100%
- Threshold Measurement Range: 13.5 to 500 W
- Measurement Uncertainty: ±0.2%
- Level Set Accuracy: As Peak Envelope, Power Accuracy + 2.0%

SPEAKER OUTPUT
- Speaker: On or Off
- Output: 75 dBA minimum at 0.5 m, 600 to 1800 Hz, maximum volume

VOLUME CONTROL
- Level Range: Scale 0 to 100

TIMEBASE
- Frequency Stability: 0.15 ppm at -20°C to 70°C
- Aging: 0.02 ppm / day, 1.0 ppm / year

NOTE

Frequency Stability is observed with a temperature variable speed of <2°C/minute.

Aging applies after 1 hr of operation.

External Reference (10 MHz IN) (8800SX only):
- Input Frequency Range: 10 MHz (±150 Hz)
- Input Level: -10 to +10 dBm
- Maximum Input Level: +15 dBm

FREQ-FLEX (EXTERNALLY REFERENCED TIMEBASE CALIBRATION)
- Input Frequency Range: 2 to 1000 MHz
- Reference Input Connector: >-20 dBm (T/R), >-40 dBm (ANT)

Freq-Flex Accuracy: <0.5 Hz from External Source Applied + Stability + Aging
(Example: 10 MHz External input after Freq Flex = ±0.5 Hz to External input. 10 MHz ±0.5 Hz = 0.05 ppm + Stability + Aging)
1-3. EQUIPMENT DATA (cont)

ENVIRONMENTAL / PHYSICAL

OVERALL DIMENSIONS: ........... 343 mm (13.50 in) (W), 293 mm (11.54 in) (L), 146 mm (5.75 in) (D)

WEIGHT: ................................................................. 17 lbs. (7.71 kg) (8800 / 8800S Only)

TEMPERATURE

Storage: .................................................................-40°C to +71°C (MIL-PRF-28800F, Class 3)

NOTE

Battery must not be subjected to temperatures below -20°C, nor above +60°C.

Operation:

AC/DC Power Supply: ......................................................... 0°C to +40°C

Battery Power: ................................................................. -20°C to +50°C

NOTE

Battery operation over temperature is based on the actual temperature rise of the Battery and instrument usage.

Battery must not be subjected to temperatures below -20°C, nor above +60°C.

RELATIVE HUMIDITY: .................................................. 5% to 95% (MIL-PRF-28800F, Class 3)

ALTITUDE:

DC Operation: .............................................................. 4600 M (MIL-PRF-28800F, Class 3)

AC Operation: ................................................................. 3048 M

SHOCK (FUNCTIONAL): ............................................... 30 G (MIL-PRF-28800F, Class 3)

VIBRATION: .................................................. 5 to 500 Hz Random Vibrations (MIL-PRF-28800F, Class 3)

BENCH HANDLING: .................................................. MIL-PRF-28800F, Class 3

COMPLIANCE / SAFETY

EMC Emissions and Immunity: .................................. MIL-PRF-28800F, Class 3

EN61326-1 Class A

EN61000-3-2

EN61000-3-3

Safety: ................................................................. UL 6101-1

UL 61010-1

CSA C22.2 No. 61010-1
1-3.  EQUIPMENT DATA (cont)

AC INPUT POWER (AC to DC Converter / Charger)

- **Voltage Range:** 100 to 250 VAC, 3 A maximum, 47 to 63 Hz
- **Voltage Fluctuation:** <10% of the nominal input voltage
- **Transient Overvoltage:** According to Installation Category II
- **Usage Environment:** Indoor Use
  - 80% Maximum Relative Humidity for temperatures up to 31°C decreasing linearly to 50% RH at +40°C
- **Operating Temperature:** 0°C to +40°C
- **Storage Temperature:** -20°C to +85°C
- **EMI:** EN55022 Class B, EN61000-3-2 Class D
- **Safety:** UL 1950, CSA 22.2 No. 234 and No.950, IEC 950/EN 60950

DC INPUT POWER

- **Voltage Range:** 11 to 24 Vdc
- **Maximum Power:** 55 W, 65 W charging with Optional Battery
- **Typical Power:** 30 W
- **DC Fuse:** Mini-Blade, 5 A, 32 Vdc, Type F

BATTERY

- **Battery Type:** Lithium Ion (Li Ion) Battery Pack

**NOTE**

Battery must not be subjected to temperatures below -20°C, nor above +60°C.

**Operation Time:**
- **Minimum Backlight (Still Viewable):** 3 hours Typical
- **100% Backlight:** 2.5 hours Typical
- **Charge Time:** 4 hours (Unit OFF) Typical, 4 hours (Unit ON) Typical

**NOTE**

Battery does not charge when Battery temperature is <0°C and >+45°C. Dead Battery (<10% capacity) is to be charged for 20 minutes before operation on External DC Power.
1-4. **PRINCIPLES OF OPERATION**

The Digital Radio Test System contains the following assemblies:
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CHAPTER 2 - OPERATING INSTRUCTIONS

2-1. OPERATOR'S CONTROLS, INDICATORS AND CONNECTORS

(Front Panel)
## 2-1. OPERATOR’S CONTROLS, INDICATORS AND CONNECTORS (cont)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 POWER Key</td>
<td>Used for powering the Unit ON and OFF.</td>
</tr>
</tbody>
</table>
| 2 BATT Indicator | Used to indicate the charging state of the Battery (if installed):
  GREEN  Battery at Full Charge
  AMBER  Battery is Charging |
| 3 SYS Indicator | Illuminates when external DC power is applied.
  WHITE  Unit is in “awake/ON” mode.
  FLASHING RED/GREEN  Battery temperature is >60°C. Warning message is displayed.
  BLUE  Unit is in “sleep” mode.
  RED  Unit is shutting down. |
<p>| 4 USB Connector | Allows connection of USB 2.0 devices (e.g. USB memory stick). |
| 5 Head Phones Connector | Used for connection to Head Phones. |
| 6 MIC Connector | Used for connection to a Handset (Microphone). |
| 7 DMM Fuse | 3 A, 250 V, Type F |
| 8 AMP Connector | Digital Multimeter External Input for AC and DC current meter input. |
| 9 COM Connector | Digital Multimeter External Input for DMM functions. |
| 10 V / Ω Connector | Digital Multimeter External Input for DMM AC or DC Voltmeter and Ohmmeter. |
| 11 HOME Key | Provides access to a screen for the selection of User controls and settings. |
| 12 AUD OUT Connector | Used to receive external modulation input, and as input for the SINAD and Distortion Meters and AF Counter. |
| 13 AUD IN Connector | Used as output for Demod and Function Generators and for Audio In signal output. |
| 14 SCOPE Connector | Provides DC coupled input for the Audio Level Meter and the Oscilloscope. |
| 15 GEN Connector | Provides the maximum RF output level from the RF Generator. |</p>
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>T/R Connector</td>
</tr>
<tr>
<td>17</td>
<td>IN LINE POWER OUT Connector</td>
</tr>
<tr>
<td>18</td>
<td>IN LINE POWER IN Connector</td>
</tr>
<tr>
<td>19</td>
<td>Arrow Keys</td>
</tr>
<tr>
<td>20</td>
<td>ANT Connector</td>
</tr>
<tr>
<td>21</td>
<td>Touch Screen Display</td>
</tr>
</tbody>
</table>
2-1. OPERATOR’S CONTROLS, INDICATORS AND CONNECTORS (cont)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ETHERNET Connector Used for software upgrades and/or Remote Operation.</td>
</tr>
<tr>
<td>2</td>
<td>USB Connector Allows connection of USB 2.0 devices (e.g. USB memory stick).</td>
</tr>
<tr>
<td>3</td>
<td>Ground Connector Used as a chassis ground point for an optional ground connection.</td>
</tr>
<tr>
<td>4</td>
<td>DC IN Connector Used for External DC operation of the Unit or battery charging.</td>
</tr>
<tr>
<td>5</td>
<td>REMOTE Connector Used for communicating with external equipment.</td>
</tr>
<tr>
<td>6</td>
<td>10 MHz IN Connector Used to connect the Unit to an external frequency standard.</td>
</tr>
</tbody>
</table>
2-2. **FUNCTIONS AND TILES**

Functions and Tiles - LMR

( Optional Functions are shown for display purposes only. )
2-2. FUNCTIONS AND TILES (cont)

Functions and Tiles - PTC

( Optional Functions are shown for display purposes only. )
2-2. **FUNCTIONS AND TILES (cont)**

Functions and Tiles - Advanced Digital

( Optional Functions are shown for display purposes only. )
2-2-1. SYSTEM ICONS

The System icons are displayed in three modes at the bottom of the screen.

When the System icons are set to minimize mode (default setting), select the System icon tab to display the System icons.

NOTE: If the gray icon is not visible, the "Hide Icons" button on the System Menu has been selected.

Press the Open/Close icon to display the System icons with status window.

Press the Open/Close icon again to display the System icons in minimize mode.
### 2-2-1. SYSTEM ICONS (cont)

<table>
<thead>
<tr>
<th>ICON</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Icon" /></td>
<td>Opens and closes the Status Bar.</td>
</tr>
<tr>
<td><img src="image2.png" alt="Icon" /></td>
<td>Applies the external reference (Freq-Flex) Calibration value (if calibrated).</td>
</tr>
<tr>
<td><img src="image3.png" alt="Icon" /></td>
<td>Switches between Internal or External 10 MHz reference.</td>
</tr>
<tr>
<td><img src="image4.png" alt="Icon" /></td>
<td>Opens the Snapshot Tile Window.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Icon" /></td>
<td>Indicates touch screen functions are locked or unlocked.</td>
</tr>
<tr>
<td><img src="image6.png" alt="Icon" /></td>
<td>Captures (freezes) the readings/traces on the screen.</td>
</tr>
<tr>
<td><img src="image7.png" alt="Icon" /></td>
<td>Indicates the Unit is controlled remotely.</td>
</tr>
<tr>
<td><img src="image8.png" alt="Icon" /></td>
<td>Indicates Warnings and Error Messages.</td>
</tr>
<tr>
<td><img src="image9.png" alt="Icon" /></td>
<td>Displays the level of charge remaining in the Battery.</td>
</tr>
<tr>
<td><img src="image10.png" alt="Icon" /></td>
<td>Status window.</td>
</tr>
</tbody>
</table>
2-2-1. SYSTEM ICONS (cont)

The Function Window icons are displayed at the bottom right of the Function Windows.

<table>
<thead>
<tr>
<th>ICON</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Icon 1]</td>
<td>Switches between numeric entry pad and slider bar.</td>
</tr>
<tr>
<td>![Icon 2]</td>
<td>Sends Tile Windows to back of other Tile Windows on the screen.</td>
</tr>
<tr>
<td>![Icon 3]</td>
<td>Closes the Tile Window.</td>
</tr>
<tr>
<td>![Icon 4]</td>
<td>Alternates between the different views (if applicable) of the Tile Window.</td>
</tr>
<tr>
<td>![Icon 5]</td>
<td>Alternates between the different views (if applicable) of the Tile Window.</td>
</tr>
</tbody>
</table>
2-2-1. SYSTEM ICONS (cont)

The Marker icons are displayed on the Tile Windows.

<table>
<thead>
<tr>
<th>ICON</th>
<th>FUNCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="triangle" alt="Icon" /></td>
<td>Enables marker delta measurements for the first two enabled markers.</td>
</tr>
<tr>
<td><img src="marker_add" alt="Icon" /></td>
<td>Adds a Marker to the graph.</td>
</tr>
<tr>
<td><img src="marker_delete" alt="Icon" /></td>
<td>Deletes an active marker from the Markers Window.</td>
</tr>
<tr>
<td><img src="marker_up" alt="Icon" /></td>
<td>Moves the selected marker to the highest point on signal.</td>
</tr>
<tr>
<td><img src="marker_down" alt="Icon" /></td>
<td>Moves the selected marker to the lowest point on signal.</td>
</tr>
<tr>
<td><img src="marker_left" alt="Icon" /></td>
<td>Moves the selected marker left to the next peak. Supports press and hold functionality.</td>
</tr>
<tr>
<td><img src="marker_right" alt="Icon" /></td>
<td>Moves the selected marker right to the next peak. Supports press and hold functionality.</td>
</tr>
<tr>
<td><img src="marker_move_left" alt="Icon" /></td>
<td>Moves the selected marker left to the next data point. Supports press and hold functionality.</td>
</tr>
<tr>
<td><img src="marker_move_right" alt="Icon" /></td>
<td>Moves the selected marker right to the next data point. Supports press and hold functionality.</td>
</tr>
<tr>
<td><img src="marker_left_edge" alt="Icon" /></td>
<td>Moves the selected marker to the left side of the plot field.</td>
</tr>
<tr>
<td><img src="marker_right_edge" alt="Icon" /></td>
<td>Moves the selected marker to the right side of the plot field.</td>
</tr>
</tbody>
</table>
2-2-2. TOUCH SCREEN

The Digital Radio Test System contains a resistive Touch Screen that is responsive to the touch of a human finger. Gloves can be worn when utilizing the Touch Screen or a writing instrument (e.g. stylus) can be used on the Touch Screen.

The Digital Radio Test System UI is navigated locally using the Front Panel Touch Screen.
2-2-3. USER INTERFACE (UI) COMPONENTS

A. Launch Bar

The Digital Radio Test System UI is a touch screen control panel that provides a flexible working environment for all users. The UI is designed to allow users to open and close, drag and drop, and maximize/minimize screen components to create custom display configurations.

The Launch Bar is located at the top of the UI. The Launch Bar provides access to the Function Icons.

The Launch Bar is opened (from minimize mode) by clicking on the gray icon at the top of the screen.

NOTE: If the gray icon is not visible, the “Hide Menu” button on the System Menu has been selected.

The Launch Bar is minimized by clicking on the gray bar at the bottom of the Launch Bar.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

B. Function Icons

The Launch Bar consists of Function Icons that identify functions installed in the Digital Radio Test System. The Tiles displayed in the Function Dropdown Menus depend on the Options installed in the Digital Radio Test System.

When the Launch Bar is set to minimize mode (default setting), select the gray icon at the top of the screen to display the Launch Bar.

NOTE: If the gray icon is not visible, the “Hide Menu” button on the System Menu has been selected.

Press a Function Icon to display the Dropdown Menu for the Function.

Press the gray bar at the bottom of the Launch Bar to return to minimize mode.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

C. Tile Windows

Tile Windows provide visual access to the Digital Radio Test System’s operating parameters and measurement data.

Tile Windows are opened by selecting the Tile from the Function Dropdown Menu.

Tile Windows are closed by selecting the minimize icon at the bottom of the Tile Window.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

C. Tile Windows (cont)

Tile Windows can be displayed in multiple shapes (when applicable). Press the view icon to change the Tile Window shape.

When a Tile Window is maximized, the Tile Window occupies the full display area and provides access to Tile parameters which may not be visible when the Tile Window is in other views.

Tile Windows can be moved anywhere on the display area (except Full Screen view). To move a Tile Window, touch or click on the Tile Window’s title block or background and drag the Tile Window to a new location on the display.

Tile Windows can be minimized to the Launch Bar where the Tile Window remains active but is not visible on the screen.
Multiple Tile Windows can be displayed on the display area at any one time.

When an active Tile Window is closed and reopened, the Digital Radio Test System positions the Tile Window in the last active state and position on the screen.

When multiple Tile windows are active on the screen, the Tile windows can be switched back and forth using the switch icon.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

D. Defining Parameters

**Numeric Keypad**

When Numeric Data Fields are edited, the Numeric Keypad is displayed. The Numeric Keypad allows the user to enter a specific numeric value. A value is entered by pressing the numbers on the keypad. The value is then enabled by pressing the unit of measurement or the Enter Button on the Numeric Keypad. Press Cancel to void any un-entered changes and close the Numeric Entry Window. Pressing Cancel does not restore a changed value that has already been enabled (entered). Press Clear to reset a numeric value to zero. To reset an un-entered value to the previously defined value press Cancel. Press Backspace to delete the last number (to the right) in the numeric value.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

D. Defining Parameters (cont)

Slider Bar

The Slider Bar allows the user to select and change a defined range of values. The values to be changed are indicated by a bounding box (box with a white background). The position of the bounding box is controlled using the /10 and x10 keys to adjust the precision setting. Once the digit range is selected the value is increased or decreased using the Slider Bar or the Up and Down arrows. The Up (increase) and Down (decrease) arrows are used to adjust the last value selected in the bounding box. Values are active at the time the values are edited (“live” edits). Press Cancel to void any un-entered changes and close the Slider Bar. Pressing Cancel does not restore a changed value that is already enabled (entered). Press the Enter or Cancel Button to close the Slider Bar.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

D. Defining Parameters (cont)

Arrow Keys
The Arrow Keys allow the user to edit numeric values. The selected values are changed by using the
left/right arrows or by using the up/down arrows.

After a numeric value is changed, press the ENTER button (middle round button).
The Numeric Keypad automatically closes when using the Arrow Keys.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

D. Defining Parameters (cont)

Keyboard
The Keyboard is displayed when a Text Data Field is selected for editing. The Keyboard functions similar to an external keyboard.

The Keyboard allows the user to enter alpha-numeric content.

Data is enabled by pressing the Enter Key.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

E. Dropdown Menus

Function Icons
Dropdown Menus are used to select pre-defined Function icons. If an opened Dropdown Menu extends off of the UI, the Dropdown Menu can be moved up or down on the UI to access Dropdown Menu Function icons.

If a Dropdown Menu contains expanded Function icons, a gray arrow appears on the right side of the icon. Select the Function icon to display the expanded Function icons.
2-2-3. USER INTERFACE (UI) COMPONENTS (cont)

E. Dropdown Menus (cont)

Field Selections
Dropdown Menus are used to select pre-defined Field selections. If an opened Dropdown Menu extends off of the UI, the Dropdown Menu can be moved up or down on the UI to access Dropdown Menu Field selections.
2-2-3.  USER INTERFACE (UI) COMPONENTS (cont)

F.  Message Windows

Operator Interaction.
Message windows are displayed with information or to request user interaction.

Locked Fields
An editable field updates to the Locked state when the Digital Radio Test System experiences a condition which makes the field un-editable.
A locked field cannot be edited until the lock-out condition is resolved.
### 2-2-4. SYSTEM MENU

The System Menu contains field selections for the overall operation of the Digital Radio Test System. Press the HOME Key to display the System Menu.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Selects different systems.</td>
</tr>
<tr>
<td>Audio Volume</td>
<td>Volume control for speaker and headphones.</td>
</tr>
<tr>
<td>Speaker</td>
<td>Sets speaker to ON or OFF.</td>
</tr>
<tr>
<td>Audio Squelch</td>
<td>Adjusts Audio Squelch level.</td>
</tr>
<tr>
<td>Squelch Value</td>
<td>Selects Audio Squelch level display.</td>
</tr>
<tr>
<td>Menu Timeout Delay</td>
<td>Adjust for timeout on Launch Bar for Menu to remain displayed.</td>
</tr>
<tr>
<td>Backlight</td>
<td>Adjust for Backlight brightness.</td>
</tr>
<tr>
<td>System Reset</td>
<td>Resets Digital Radio Test System to factory settings.</td>
</tr>
<tr>
<td>Suspend</td>
<td>Select to place Digital Radio Test System in Suspend (Sleep) Mode.</td>
</tr>
<tr>
<td>Hide Menu</td>
<td>Launch Bar is not displayed on top of Touch Screen.</td>
</tr>
<tr>
<td>Hide Icons</td>
<td>Icons are not displayed on bottom of Touch Screen.</td>
</tr>
</tbody>
</table>

Subject to Export Control, see Cover Page for details.
2-2-5. **SUSPEND (SLEEP) MODE**

The Digital Radio Test System can be placed in “suspend (sleep)” mode which decreases battery usage and increases the amount of time the Unit can operate on battery power.

Follow these instructions to place the Digital Radio Test System into “suspend (sleep)” mode:

1. With the Unit running in “active (awake)” mode (SYS Indicator is White), press the HOME Key to display the System Menu.

![System Menu](image)
2-2-5. **SUSPEND (SLEEP) MODE (cont)**

2. Press the Suspend Button on the System Menu to place the Digital Radio Test System into “suspend (sleep)” mode.

The Touch Screen Display is blank and the internal RF hardware systems are shut OFF.

**NOTE:** The Digital Hardware systems retain active status and no information or screen settings are lost in “suspend (sleep)” mode.

3. When the Unit is in “suspend (sleep)” mode, press the HOME Key once to display the current time and battery life remaining. Press the HOME Key a second time to restore the system to “active (awake)” mode.
2-2-6. MULTI-LANGUAGE SUPPORT

The Digital Radio Test System can be configured to display the function tiles, tabs and windows in several different languages. The languages available are:

- العربية
- 简体中文
- 繁体中文
- English
- Français
- Deutsch
- 日本語
- 한국의
- Melayu
- Polski
- Português
- русский
- Español
- Italiano

To change the Unit to a different language, select the Utilities function tab. Select the Language drop down item to display the Language Extended Icons. Choose the desired language tab.

(Optional Languages are shown for display purposes only.)
2-2-6. MULTI-LANGUAGE SUPPORT (cont)

EXAMPLE

English Language

Chinese (Simplified) Language

English Language

Chinese (Simplified) Language
2-3. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

2-3-1. GENERAL

When doing any Preventive Maintenance or routine checks, keep in mind the WARNINGS and CAUTIONS about electrical shock and bodily harm.

2-3-2. PREVENTIVE MAINTENANCE PROCEDURES

A. Tools, Materials and Equipment Required

No tools or equipment are required for operator preventive maintenance. Cleaning materials required are a lint free cloth and mild liquid detergent.

B. Routine Checks

Preventive Maintenance is limited to routine checks such as shown below:

- Cleaning
- Dusting
- Wiping
- Checking for frayed cables
- Storing items not in use
- Covering unused receptacles
- Checking for loose nuts, bolts or screws

C. Schedule of Checks

Perform routine checks whenever required.
2-4. OPERATION UNDER USUAL CONDITIONS

2-4-1. TURN-ON PROCEDURE

Follow these instructions to initialize the Digital Radio Test System:

1. Press the POWER Key to initialize the Unit and verify the SYS Indicator illuminates.

2. The Opening Screen is displayed. The operator can now choose the desired screen.

   NOTE: The Unit displays the last screen(s) accessed when the Unit was powered down.
2-4-2. INSTALL/REMOVE LICENSE

A License can be installed or removed from the Digital Radio Test System. The Options Function Window displays the Options installed in the Unit associated with the License.

Install License

Follow these instructions to install a License in the Unit:

1. Select the Utilities Function Icon to display the Utilities Dropdown Menu. Select the Software icon to display the Software extended icons. Select the Options icon to display the Options Tile Window.

(Options are shown for display purposes only.)
2-4-2. INSTALL/REMOVE LICENSE (cont)

Install License (cont)

2. Verify the Unit displays a Serial Number. If the Serial Number field is blank, contact Aeroflex Customer Service. This procedure can only be completed with a Serial Number installed in the Unit.

3. Unzip the License file to the PC then copy the License file (options.new) to the following directory on a USB Flash Drive: Aeroflex\License.

4. Install the USB Flash Drive in the USB Connector and wait for the Unit to recognize the USB Flash Drive (approximately 15 seconds).

5. Select Copy from USB Button and verify the Status Field displays “Copying from USB Drive.” When the copy process is completed, the Status Field displays “Copying from USB Done.”

6. Select Install License Button. When License file installation is complete the Status Field displays “Installing License Done.”

7. The Unit prompts to cycle power.
2-4-2. INSTALL/REMOVE LICENSE (cont)

Remove License

Follow these instructions to remove the License from the Unit:

1. Select the Utilities Function Icon to display the Utilities Dropdown Menu. Select the Software icon to display the Software extended icons. Select the Options icon to display the Options Tile Window.

(Options are shown for display purposes only.)
2-4-2.  INSTALL/REMOVE LICENSE (cont)

Remove License (cont)

2.  Select the Remove License button. The following prompt is displayed:

3.  Enter the password and select the OK Button to remove the License. Select the Cancel Button to cancel the License removal.
2-4-3. **INSTALL SOFTWARE**

System Software can be installed in the Digital Radio Test System. The System Update Function Window displays the System Software version installed in the Unit.

**NOTE:** When loading Software into the Unit, the Calibration Values are not affected.

Follow these instructions to install System Software in the Unit:

1. Select the Utilities Function Icon to display the Utilities Dropdown Menu. Select the Software icon to display the Software extended icons. Select the Update icon to display the Update Tile Window.

2. Using a PC, access the following website: aeroflex.com/8800. Download the zip file containing the System Software to the PC.

3. After removing all files from a USB Flash Drive, unzip the System Software files to the root directory of the USB Flash Drive.

4. Confirm the “Aeroflex” folder is created in the root directory of the USB Flash Drive and the system rpm files are located under the “Aeroflex/Common” directory on the USB Flash Drive.

5. Plug in the USB Flash Drive in the USB Connector and wait for the Unit to recognize the USB Flash Drive (approximately 15 seconds).
2-4-3. INSTALL SOFTWARE (cont)

6. Select Copy from USB Button and verify Status Field displays “Copying Software” then “Refreshing List.” Items are displayed on the RPM List.

7. When the Status Field displays “Files are ready to install” select the Install Software Button. Select the OK Button to continue. Press the Cancel Button to abort the Software Load.

8. When the Software load is completed, the Unit prompts to cycle power.
   NOTE: Progress Bars are displayed showing the software installation progress.

9. Cycle power and repeat Steps 6 to 8 until all displayed items have been installed in the Unit.
2-4-4.  SAVE/RECALL FUNCTION WINDOWS

Save Function Window

Follow these instructions to save a Function Window in the Unit:

1.  Select the Utilities Function Tab to display the Utilities Dropdown selections. Select “Store/Recall” to display the Store/Recall Tile Window.

   2. Select the File Name field, use the Keyboard to select the file name and press Enter.

   3. Select the Store button.

      NOTE: Up to 100 setups can be saved.

Recall Function Window

Follow these instructions to save a Function Window in the Unit:

1.  Select the Utilities Function Tab to display the Utilities Dropdown selections. Select “Store/Recall” to display the Store/Recall Tile Window.

   2. Highlight the file name in the displayed list and select the Recall Button.
2-4-5. **SNAPSHOT**

Select the Snapshot icon to display the Snapshot Tile Window.

---

**Save Snapshot**

Select the Save button to save the Snapshot with the file name shown in the File field.

--

Press the OK button to save the file name.
2-4-5.  SNAPSHOT (cont)

Create New Folder

To create a new folder, select the New Folder button.

Select the New Folder Name field and use the Keyboard to select the folder name. Press the OK button to save the folder name.

Create New File

To create a new file name, select the File Name field, use the Keyboard to select the file name and press Enter.

Select the Save button and press the OK button to save the file name.

(File Names are shown for display purposes only.)
2-4-5.  SNAPSHOT (cont)

Delete File

To delete a file, use the Delete button.

(File Names are shown for display purposes only.)

Select the file to be deleted (file name shown in the File field). Press the Delete button to display the Delete Confirmation Window. Press the Delete button to delete the file or the Cancel button to escape from the Delete action.
2-4-6. CLONE UNIT

Follow these instructions to clone a Unit:

1. Connect Units to Network.
2. Select the Utilities Function Tab to display the Utilities Dropdown selections. Select the Software icon to display the Software extended icons. Select the System icon to display the System Tile Window. Select the Clone Me icon.

3. Enter the IP Address of the Base Unit into the Unit IP Field.
4. Enter the IP Address of the Target Unit into the Target IP Field.
5. Select the Screen Settings Clear and Copy Button to clear all saved screens in the Target Unit and copy the saved screens from the Base Unit to the Target Unit.
6. Select the Screen Settings Copy Button to copy the saved screens from the Base Unit to the Target Unit.
7. Select the Scripts Clear and Copy Button to clear all Scripts in the Target Unit and copy the Scripts from the Base Unit to the Target Unit.
8. Select the Scripts Copy Button to copy the Scripts from the Base Unit to the Target Unit.
2-4-7. DIGITAL MULTIMETER (DMM)

The DMM (Digital Multimeter) displays the results of resistance, AC current, DC current and voltage measurements. Additional parameters are available on the Configuration Window.

DMM Measurement Modes

**AC/DC Volts**
When Volts AC or Volts DC Mode is selected the DMM Meter functions as a Voltage Meter and displays the measurement of the voltage in the circuit being tested.

**AC/DC AMPs**
When AMPs AC or AMPs DC Mode is selected the DMM Meter functions as an Ampere (AMP) Meter and displays measurement of electric current in the circuit being tested.

**Ohms**
When Ohms Mode is selected the DMM functions as a Resistance (Ohm) Meter and displays the measurement of resistance found in the circuit being tested.

DMM Configuration Window

The DMM Configuration Window contains parameters for defining DMM measurements.

<table>
<thead>
<tr>
<th>FIELD</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>Displays meter measurement. The type of measurement being displayed (Live, Average, Maximum or Minimum) is selected from the Reading Type Drop-down Menu.</td>
</tr>
<tr>
<td>Range</td>
<td>Defines the vertical scale of the meter bar graph. Range and unit of measurement vary according to the selected Mode.</td>
</tr>
<tr>
<td>Type</td>
<td>Selects type of reading being displayed in the Reading field.</td>
</tr>
<tr>
<td>Average</td>
<td>Defines the number of signal traces used to calculate average measurements.</td>
</tr>
<tr>
<td>Peak Hold</td>
<td>Sets peak and average measurements.</td>
</tr>
<tr>
<td>Peak Hold Clear</td>
<td>Clears peak and average measurements.</td>
</tr>
<tr>
<td>Peak Hold Value</td>
<td>Displays the Peak Hold measurement.</td>
</tr>
<tr>
<td>Enable (On/Off)</td>
<td>Enables or disables the DMM measurement.</td>
</tr>
</tbody>
</table>
2-4-8  CONFIGURATION MODES

The Digital Radio Test System offers three configuration modes depending on the options purchased with the system. These modes include:

- LMR
- Advanced Digital
- PTC

LMR Configuration

The LMR configuration is the standard mode and offers access to analog, digital, Auto-Test and cable/antenna sweep testing. Analog tests include CW, AM, FM, DTFM, DCS, Two Tone Sequential, Tone Remote and Tone Sequential. Digital tests include P25 Phase 1, DMR, NXDN, dPMR, ARIB-T98 and PDR-C.

Advanced Digital Configuration

The Advanced Digital configuration provides access to advanced digital test modes. These modes include: P25 Phase 2 (HCPM and HDQPSK) and DMR Repeater (Sync). For simplicity, the Advanced Digital configuration also contains P25 Phase 1 and DMR test parameters, which allows users to provide complete P25 (Phase 1 and Phase 2) tests and DMR (mobile and repeater) tests from a single location.

PTC Configuration

PTC (Positive Train Control) testing is located under the PTC configuration.

Verifying Configuration

Press the Home Key to display the System Menu. The Configuration field displays the current configuration mode of the Unit.
Selecting Configuration Modes
Press the Home Key to display the System Menu. Select the Configuration field to display a selection menu of configuration modes (LMR, PTC or Advanced Digital). Select the desired configuration mode to change the configuration mode of the Unit.
2-4-9  TIME BASE REFERENCE MODES

The Digital Radio Test System offers different time base reference mode selections depending on the base model number of the system: 8800, 8800S or 8800SX. These mode selections include:

- Internal Reference
- External Reference
- Frequency Flex (Freq Flex)

Definitions

The “Internal” reference selection refers to the standard internal time base within the Digital Radio Test System. The “External” reference refers to an external time base connected to the 10 MHz IN Connector (8800SX only). The Freq Flex reference allows the user to calibrate the Digital Radio Test System to a clean external frequency reference and store that calibration reference within the Unit.

8800 / 8800S

The 8800 / 8800S offers the Internal reference and Freq Flex selections.

8800SX

The 8800SX offers the Internal reference, External reference and Freq Flex selections.

Selecting the Reference Mode (8800SX)

Contact the Aeroflex Customer Service Dept.
2-5. **BASIC LMR CONFIGURATION SETUPS**

2-5-1. **ANALOG DEMOD**

1. Select the Generators icon to display the Generators Dropdown Menu. Select the Generator Function icon to display the Generator Tile Window.

2. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Receiver Function icon to display the Receiver Tile Window.

3. Select the Generators icon to display the Generators Dropdown Menu. Select the Modulation Function icon to display the Modulation Tile Window.

4. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Analog Function icon to display the Analog Demod Tile Window.

5. Select the Analyzers icon to display the Analyzers Dropdown Menu. Select the Oscilloscope Function icon to display the Oscilloscope Tile Window.

6. Select the Config icon to display the Config Dropdown Menu. Select the Audio Function icon to display the Audio Config Tile Window.

7. The Oscilloscope Tile Window and the Audio Config Tile Window can be alternately moved to the front of the screen using the switch icon.
2-5-2. ANALOG SINAD

1. Select the Generators icon to display the Generators Dropdown Menu. Select the Generator Function icon to display the Generator Tile Window.
2. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Receiver Function icon to display the Receiver Tile Window.
3. Select the Generators icon to display the Generators Dropdown Menu. Select the Modulation Function icon to display the Modulation Tile Window.
4. Select the View icon to expand the Modulation Tile Window.
5. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Analog Function icon to display the Analog Demod Tile Window.
6. Select the Analyzers icon to display the Analyzers Dropdown Menu. Select the Oscilloscope Function icon to display the Oscilloscope Tile Window.
7. The Oscilloscope Tile Window and the Analog Demod Tile Window can be alternately moved to the front of the screen using the switch icon.
8. Select the Config icon to display the Config Dropdown Menu. Select the Audio Function icon to display the Audio Config Tile Window.
2-5-3.  **DIGITAL DMR**

1. Select the Generators icon to display the Generators Dropdown Menu. Select the Generator Function icon to display the Generator Tile Window.

2. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Receiver Function icon to display the Receiver Tile Window.

3. Select the Generators icon to display the Generators Dropdown Menu. Select the Modulation Function icon to display the Modulation Tile Window.

4. Select the Receivers icon to display the Receivers Dropdown Menu. Select the Digital Function icon to display the Digital Demod Tile Window.

5. Select the Analyzers icon to display the Analyzers Dropdown Menu. Select the Digital Plots Function icon to display the Digital Plots Tile Window.

6. Select the Analyzers icon to display the Analyzers Dropdown Menu. Select the Power Profile Function icon to display the Power Profile Tile Window.

7. The Digital Plots Tile Window and the Power Profile Tile Window can be alternately moved to the front of the screen using the switch icon.
2-6. ADVANCED DIGITAL CONFIGURATION SETUPS

2-6-1. P25 PHASE 2
2-6-2. **DMR REPEATER**

![DMR Repeater Display](image-url)

Subject to Export Control, see Cover Page for details.
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3-1. PRELIMINARY SERVICING AND ADJUSTMENT OF EQUIPMENT

Place the Digital Radio Test System on a work bench or table and perform the Turn-On Procedure (para 2-4-1).

BATTERY PRECAUTIONS

The Digital Radio Test System is powered by an internal Lithium Ion battery pack. The Digital Radio Test System is supplied with an External DC Power Supply which allows the operator to recharge the battery using AC power. The Unit can operate continuously on AC power via the External DC Power Supply, for servicing and/or bench tests.

The internal battery is equipped to power the Unit for 2.5 hours of continuous use, after which time, the Unit battery needs recharging. When the BAT Indicator is GREEN, the battery is at 100% full charge. When the BAT Indicator is AMBER, the battery is charging.

If the battery level, shown in the BAT Icon, is ≤5%, a “Low Battery” warning message is displayed.

The battery charger operates whenever the supplied External DC Power Supply or a suitable (11 to 24 Vdc) DC Power source is applied to the Unit. When charging, the battery reaches a 100% charge in approximately four hours. The internal battery charger allows the battery to charge between the temperature range of 0° to 45°C. Allow 20 minutes for the battery to charge when turning the Unit ON from a dead battery condition.

The battery should be charged every three months (minimum) or disconnected for long term inactive storage periods of more than six months. The Battery must be removed when conditions surrounding the Unit are < -20°C and > 60°C.
3-2. **SELF TEST**

The Digital Radio Test System is equipped with a Self Test for quick performance evaluation. Test results are shown next to the tests in the Pass/Fail Counters.

1. Select the Utilities icon to display the Utilities Dropdown Menu. Select the Self Test Function icon to display the Self Test Tile Window.

2. Select the Run button to initiate the Self Test.
3-3. MAINTENANCE PROCEDURES

3-3-1. BATTERY RECHARGING

The battery charger operates whenever the supplied External DC Power Supply or a suitable (11 to 24 Vdc) DC Power source is applied to the Unit. When charging, the battery reaches a 100% charge in approximately four hours. The internal battery charger allows the battery to charge between the temperature range of 0° to 45°C. Allow 20 minutes for the battery to charge when turning the Unit ON from a dead battery condition.

The battery should be charged every three months (minimum) or disconnected for long term inactive storage periods of more than six months. The Battery must be removed when conditions surrounding the Unit are <-20°C and >60°C).

DESCRIPTION

This procedure is used to recharge the Battery in the Unit with an External DC Power Supply.

1. Connect the External DC Power Supply to the DC IN Connector on the Unit.
2. Connect the AC Power Cable to the AC PWR Connector on the External DC Power Supply and an appropriate AC power source.
3. Verify the Indicator on the External DC Power Supply is GREEN.
4. Allow four hours (Typical) for Battery charge or until the BAT Indicator is GREEN.
   If the BAT Indicator is AMBER and/or the Battery fails to accept a charge and the Unit does not operate on Battery power, the battery requires replacement.
3-3-2. BATTERY REPLACEMENT

DESCRIPTION
This procedure is used to replace the Battery in the Unit.

⚠️ CAUTION
REPLACE ONLY WITH THE BATTERY SPECIFIED. DO NOT ATTEMPT TO INSTALL A NON-RECHARGEABLE BATTERY.

⚠️ WARNING
- DISPOSE OF THE LITHIUM ION BATTERY PACK ACCORDING TO LOCAL STANDARD SAFETY PROCEDURES. DO NOT CRUSH, INCINERATE OR DISPOSE OF THE LITHIUM ION BATTERY PACK IN NORMAL WASTE.
- DO NOT SHORT CIRCUIT OR FORCE DISCHARGE OF THE LITHIUM ION BATTERY PACK AS THIS MIGHT CAUSE THE LITHIUM ION BATTERY PACK TO VENT, OVERHEAT OR EXPLODE.

REMOVE
1. Verify the Unit is OFF and is not connected to AC power.
2. Unlatch the Battery Cover to expose the Battery.
3. Disconnect the Battery Wire Harness (connecting the Battery to the Unit) and remove the Battery.

INSTALL
1. Install the Battery in the Unit and connect the Battery Wire Harness.
2. Relatch the Battery Cover on the Unit.

![Diagram showing Battery Wire Harness, Battery, and Battery Cover](image-url)
3-3-3.  FUSE REPLACEMENT

DESCRIPTION
This procedure is used to replace the internal fuse in the Unit.

CAUTION
FOR CONTINUOUS PROTECTION AGAINST FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS. (5 A, 32 VDC, MINI-BLADE FUSE)

REMOVE
1. Verify the Unit is OFF and is not connected to AC power.
2. Unlatch the Battery Cover to expose the Fuse.
3. Locate and remove the Fuse.

INSTALL
1. Install the Fuse.
2. Relatch the Battery Cover on the Unit.
3-3-4. DMM FUSE REPLACEMENT

DESCRIPTION
This procedure is used to replace the DMM fuse in the Unit.

CAUTION
FOR CONTINUOUS PROTECTION AGAINST FIRE, REPLACE ONLY WITH FUSES OF THE SPECIFIED VOLTAGE AND CURRENT RATINGS. (3 A, 250 V, TYPE F FUSE)

REMOVE
Remove the DMM fuse cover and DMM fuse from the Unit and replace the DMM fuse.

INSTALL
Install the DMM fuse and fuse cover in the Unit.
3-3-5. FEET REPLACEMENT

DESCRIPTION
This procedure is used to replace the feet on the Unit.

REMOVE
Remove screw from the Unit. Remove front foot and flip foot from the Unit.
Lift Tab on Rear Foot and remove Rear Foot from the Unit.

INSTALL
Install the flip foot and front foot on the Unit. Install the screw in the Unit and tighten to 6 in/lbs.
Install Rear Foot in the Unit.
3-4. PREPARATION FOR STORAGE OR SHIPMENT

A. Packaging

Package the Unit in the original shipping container. When using packing materials other than the original, use the following guidelines:

- Wrap the Unit in plastic packing material.
- Use a double-wall cardboard shipping container.
- Protect all sides with shock-absorbing material to prevent Unit movement within the container.
- Seal the shipping container with approved sealing tape.
- Mark "FRAGILE" on the top, bottom and all sides of the shipping container.

B. Environment

The Unit should be stored in a clean, dry environment. In high humidity environments, protect the Unit from temperature variations that could cause internal condensation. The following environmental conditions apply to both shipping and storage:

- Temperature: -30°C to +71°C*
- Relative Humidity: 0% to 95%
- Altitude: 0 to 4600 m
- Vibration: <2 g
- Shock: <30 g

* The Battery must not be subjected to temperatures <-20°C or >+60°C.
A-1. I/O CONNECTORS

<table>
<thead>
<tr>
<th>CONNECTOR</th>
<th>TYPE</th>
<th>INPUT/OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMP</td>
<td>DMM Banana Plug Female</td>
<td>INPUT</td>
</tr>
<tr>
<td>ANT</td>
<td>N Female</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td>AUD IN</td>
<td>BNC Female</td>
<td>INPUT</td>
</tr>
<tr>
<td>AUD OUT</td>
<td>BNC Female</td>
<td>OUTPUT</td>
</tr>
<tr>
<td>COM</td>
<td>DMM Banana Plug Female</td>
<td>INPUT</td>
</tr>
<tr>
<td>GEN</td>
<td>N Female</td>
<td>OUTPUT</td>
</tr>
<tr>
<td>HEAD PHONES</td>
<td>2.5 mm CIRCULAR</td>
<td>OUTPUT</td>
</tr>
<tr>
<td>IN LINE POWER IN</td>
<td>N Female</td>
<td>INPUT</td>
</tr>
<tr>
<td>IN LINE POWER OUT</td>
<td>N Female</td>
<td>OUTPUT</td>
</tr>
<tr>
<td>MIC</td>
<td>6 Pin CIRCULAR Female</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td>SCOPE</td>
<td>BNC Female</td>
<td>INPUT</td>
</tr>
<tr>
<td>T/R</td>
<td>N Female</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td>USB</td>
<td>USB 2.0</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td>V / Ω</td>
<td>DMM Banana Plug Female</td>
<td>INPUT</td>
</tr>
</tbody>
</table>

Refer to Table A-3 for MIC Connector description.

Refer to Table A-6 for USB Connector description.

Table A-1. I/O Connectors (Front Panel)
### Table A-2. I/O Connectors (Rear Panel)

<table>
<thead>
<tr>
<th>CONNECTOR</th>
<th>TYPE</th>
<th>INPUT/OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC IN</td>
<td>2.5 mm CIRCULAR</td>
<td>INPUT</td>
</tr>
<tr>
<td>ETHERNET</td>
<td>RJ45</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td></td>
<td>Refer to Table A-5 for ETHERNET Connector description.</td>
<td></td>
</tr>
<tr>
<td>GROUND</td>
<td>2.5 mm CIRCULAR</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td>REMOTE</td>
<td>44-Pin D-SUB Female</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td></td>
<td>Refer to Table A-4 for REMOTE Connector description.</td>
<td></td>
</tr>
<tr>
<td>USB</td>
<td>USB 2.0</td>
<td>INPUT/OUTPUT</td>
</tr>
<tr>
<td></td>
<td>Refer to Table A-6 for USB Connector description.</td>
<td></td>
</tr>
<tr>
<td>10 MHz IN</td>
<td>BNC Female</td>
<td>INPUT</td>
</tr>
</tbody>
</table>
## A-2. MIC CONNECTOR PIN-OUT TABLE

![MIC Connector Diagram]

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GND</td>
</tr>
<tr>
<td>B</td>
<td>SPEAKER+</td>
</tr>
<tr>
<td>C</td>
<td>PTT</td>
</tr>
<tr>
<td>D</td>
<td>MIC</td>
</tr>
<tr>
<td>E</td>
<td>MICSEL1</td>
</tr>
<tr>
<td>F</td>
<td>MICSEL2</td>
</tr>
</tbody>
</table>

Table A-3. MIC Connector Pin-Out Table
### Table A-3. REMOTE Connector Pin-Out Table

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>SIGNAL NAME</th>
<th>PIN NO.</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USB3_VBUS</td>
<td>23</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>USB3_GND</td>
<td>24</td>
<td>PPC_ETX_P</td>
</tr>
<tr>
<td>3</td>
<td>+5V_ACC</td>
<td>25</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>PPCDBG TXD</td>
<td>26</td>
<td>PPCUSR_CTS</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>27</td>
<td>PPCUSR_TXD</td>
</tr>
<tr>
<td>6</td>
<td>OMAPRCI_RTS</td>
<td>28</td>
<td>REM_GPIO(5)</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>29</td>
<td>REM_GPIO(1)</td>
</tr>
<tr>
<td>8</td>
<td>PPC_ERX_N</td>
<td>30</td>
<td>REM_GPIO(3)</td>
</tr>
<tr>
<td>9</td>
<td>PPC_ETX_N</td>
<td>31</td>
<td>USB3_VBUS</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>32</td>
<td>USB3_GND</td>
</tr>
<tr>
<td>11</td>
<td>PPCUSR_RTS</td>
<td>33</td>
<td>+5V_ACC</td>
</tr>
<tr>
<td>12</td>
<td>PPCUSR_RXD</td>
<td>34</td>
<td>PPCDBG RXD</td>
</tr>
<tr>
<td>13</td>
<td>REM_GPIO(7)</td>
<td>35</td>
<td>GND</td>
</tr>
<tr>
<td>14</td>
<td>REM_GPIO(6)</td>
<td>36</td>
<td>OMAPRCI_RXD</td>
</tr>
<tr>
<td>15</td>
<td>REM_GPIO(2)</td>
<td>37</td>
<td>GND</td>
</tr>
<tr>
<td>16</td>
<td>USB3_FD_N</td>
<td>38</td>
<td>PPC_ERX_P</td>
</tr>
<tr>
<td>17</td>
<td>USB3_FD_P</td>
<td>39</td>
<td>GND</td>
</tr>
<tr>
<td>18</td>
<td>OMAPCON_TXD</td>
<td>40</td>
<td>REM_GPIO(4)</td>
</tr>
<tr>
<td>19</td>
<td>OMAPCON_RXD</td>
<td>41</td>
<td>REM_GPIO(0)</td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td>42</td>
<td>OMAPCON_RTS</td>
</tr>
<tr>
<td>21</td>
<td>OMAPRCI_TXD</td>
<td>43</td>
<td>OMAPCON_CTS</td>
</tr>
<tr>
<td>22</td>
<td>OMAPRCI_CTS</td>
<td>44</td>
<td>BKBOX#</td>
</tr>
</tbody>
</table>

Table A-4. REMOTE Connector Pin-Out Table
## A-4. ETHERNET CONNECTOR PIN-OUT TABLE

![Ethernet Connector Diagram]

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TX+</td>
</tr>
<tr>
<td>2</td>
<td>TX-</td>
</tr>
<tr>
<td>3</td>
<td>RX+</td>
</tr>
<tr>
<td>4</td>
<td>NOT USED</td>
</tr>
<tr>
<td>5</td>
<td>NOT USED</td>
</tr>
<tr>
<td>6</td>
<td>RX-</td>
</tr>
<tr>
<td>7</td>
<td>NOT USED</td>
</tr>
<tr>
<td>8</td>
<td>NOT USED</td>
</tr>
</tbody>
</table>

Table A-5. ETHERNET Connector Pin-Out Table
A-5. USB CONNECTOR PIN-OUT TABLE

Table A-6. USB Connector Pin-Out Table

<table>
<thead>
<tr>
<th>PIN NO.</th>
<th>SIGNAL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCC</td>
</tr>
<tr>
<td>2</td>
<td>D-</td>
</tr>
<tr>
<td>3</td>
<td>D+</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
</tbody>
</table>
## APPENDIX B - ABBREVIATIONS

<table>
<thead>
<tr>
<th>A</th>
<th>Gen</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Amperes</td>
<td>Generate / Generator</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
<td></td>
</tr>
<tr>
<td>AF</td>
<td>Audio Frequency</td>
<td></td>
</tr>
<tr>
<td>AFBW</td>
<td>Audio Frequency Bandwidth</td>
<td></td>
</tr>
<tr>
<td>AM</td>
<td>Amplitude Modulation</td>
<td></td>
</tr>
<tr>
<td>ANT</td>
<td>Antenna</td>
<td></td>
</tr>
<tr>
<td>Assy</td>
<td>Assembly</td>
<td></td>
</tr>
<tr>
<td>ATTN</td>
<td>Attenuation</td>
<td></td>
</tr>
<tr>
<td>Aud</td>
<td>Audio</td>
<td></td>
</tr>
<tr>
<td>Bat</td>
<td>Battery</td>
<td></td>
</tr>
<tr>
<td>Batt</td>
<td>Battery</td>
<td></td>
</tr>
<tr>
<td>BER</td>
<td>Bit Error Rate</td>
<td></td>
</tr>
<tr>
<td>BNC</td>
<td>Bayonet Neill-Concelman</td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td>Bandpass</td>
<td></td>
</tr>
<tr>
<td>BW</td>
<td>Bandwidth</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Celsius or Centigrade</td>
<td></td>
</tr>
<tr>
<td>CAL</td>
<td>Calibrate/Calibration</td>
<td></td>
</tr>
<tr>
<td>CD</td>
<td>Compact Disk (CD-ROM)</td>
<td></td>
</tr>
<tr>
<td>CFM</td>
<td>Coldfire Firmware</td>
<td></td>
</tr>
<tr>
<td>CH</td>
<td>Channel</td>
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Subject to Export Control, see Cover Page for details.
R
REC Receive
RF Radio Frequency
RSSI Received Signal Strength Indication
RX Receive

S
SWR Standing Wave Ratio
SYS System

T
TDM Time-Division Multiplexing
Tem Temperature
Temp Temperature
TNC Threaded Neill-Concelman
T/R Transmit/Receive
TX Transmit

U
UHF Ultra High Frequency
UI User Interface
USB Universal Serial Bus
UUT Unit Under Test

V
V Volt
VAC Volts, Alternating Current
Vdc Volts, Direct Current
VHF Very High Frequency
Vol Volume
Vp Volta Peak
Vrms Volts Root Mean Square
VSWR Voltage Standing Wave Ratio

W
W Watt

Y
Y Year
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