

**ME7220A  
RADAR TEST SYSTEM  
76-77 GHz**

**OPERATION MANUAL**

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The Anritsu logo is rendered in a bold, black, sans-serif font. It is positioned centrally between two horizontal lines that extend across the width of the page. The top line is a single solid line, and the bottom line is a double solid line. The logo itself is partially overlaid by these lines.

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





## Symbols used in manuals

DANGER	This indicates a very dangerous procedure that could result in serious injury or death if not performed properly.
WARNING	This indicates a hazardous procedure that could result in serious injury or death if not performed properly.
CAUTION	This indicates a hazardous procedure or danger that could result in light-to-severe injury, or loss related to equipment malfunction, if proper precautions are not taken.

## Safety Symbols Used on Equipment and in Manuals

(Some or all of the following five symbols may or may not be used on all ANRITSU equipment. In addition, there may be other labels attached to products that are not shown in the diagrams in this manual.)

The following safety symbols are used inside or on the equipment near operation locations to provide information about safety items and operation precautions. Ensure that you clearly understand the meanings of the symbols and take the necessary precautions BEFORE operating the equipment.

	This indicates a prohibited operation. The prohibited operation is indicated symbolically in or near the barred circle.
	This indicates a compulsory safety precaution. The required operation is indicated symbolically in or near the circle.
	This indicates warning or caution. The contents are indicated symbolically in or near the triangle.
	This indicates a note. The contents are described in the box.
 	These indicate that the marked part should be recycled.

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# For Safety

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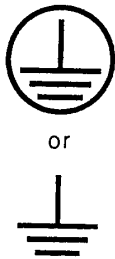
## WARNING



Always refer to the operation manual when working near locations at which the alert mark, shown on the left, is attached. If the operation, etc., is performed without heeding the advice in the operation manual, there is a risk of personal injury. In addition, the equipment performance may be reduced.

Moreover, this alert mark is sometimes used with other marks and descriptions indicating other dangers.

## WARNING



When supplying power to this equipment, connect the accessory 3-pin power cord to a 3-pin grounded power outlet. If a grounded 3-pin outlet is not available, use a conversion adapter and ground the green wire, or connect the frame ground on the rear panel of the equipment to ground. If power is supplied without grounding the equipment, there is a risk of receiving a severe or fatal electric shock.

## WARNING

Repair

WARNING

This equipment can not be repaired by the operator. DO NOT attempt to remove the equipment covers or to disassemble internal components. Only qualified service technicians with a knowledge of electrical fire and shock hazards should service this equipment. There are high-voltage parts in this equipment presenting a risk of severe injury or fatal electric shock to untrained personnel. In addition, there is a risk of damage to precision internal components.

## CAUTION



Class II Laser product. Do not stare into beam. Avoid long term viewing of direct laser radiation. Power output <math>< 1 \text{ mW}</math>, wavelength = 600-700 nm.

# Table of Contents

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## Chapter 1 - General Information

SCOPE OF THIS MANUAL . . . . . 1-1  
INTRODUCTION . . . . . 1-1  
DESCRIPTION . . . . . 1-1  
SPECIFICATIONS . . . . . 1-2  
OPTIONS . . . . . 1-5

## Chapter 2 - Installation

INTRODUCTION . . . . . 2-1  
REQUIRED EQUIPMENT . . . . . 2-1  
OPTIONAL EQUIPMENT . . . . . 2-1  
INSTALLATION . . . . . 2-2  
STANDARD EQUIPMENT . . . . . 2-3  
OPTIONAL EQUIPMENT . . . . . 2-5

## Chapter 3 - Operation

INTRODUCTION . . . . . 3-1  
DISPLAY MODULE . . . . . 3-1  
HARD KEYS . . . . . 3-2  
SOFT KEYS . . . . . 3-3  
POWER ON PROCEDURE . . . . . 3-13  
SYSTEM SETUP . . . . . 3-15  
SYSTEM CONTROL . . . . . 3-15  
POWER MEASUREMENTS (Optional) . . . . . 3-16  
SPECTRAL MEASUREMENT (Optional) . . . . . 3-17  
MEASUREMENT WITH NO RF SIGNAL . . . . . 3-17  
MAINTENANCE . . . . . 3-17

**Chapter 4 - Remote Operation**

INTRODUCTION . . . . . 4-1  
DESCRIPTION . . . . . 4-1  
CABLING . . . . . 4-1  
SERIAL COMMUNICATION PARAMETERS . . . . . 4-1  
ERROR CHECKING . . . . . 4-2  
PARAMETER VALIDATION . . . . . 4-2  
ENTERING REMOTE MODE . . . . . 4-2  
EXITING REMOTE MODE. . . . . 4-2  
CHANGES TO OPERATING PARAMETERS. . . . . 4-2  
EEPROM WRITE CYCLE LIMITATION. . . . . 4-2  
SERIAL COMMANDS. . . . . 4-3  
EXAMPLE CODE . . . . . 4-8

**Appendix A - Dimensional Drawings**

INTRODUCTION . . . . . A-1

# Chapter 1

## General Information

### **1-1** SCOPE OF THIS MANUAL

This manual contains installation, operation and maintenance information for the ME7220A Radar Test System (RTS).

### **1-2** INTRODUCTION

This chapter provides general information about the ME7220A Radar Test System, including specifications and available options.

### **1-3** DESCRIPTION

The ME7220A Radar Test System provides a simulated radar target response with one of two set target ranges (near and far) with an adjustable target Radar Cross Section (RCS). The signal response can be Doppler shifted to simulate the speed of a moving target.

The system also allows the measurement at an IF frequency of the power characteristics or Effective Isotropic Radiated Power (EIRP) of the transmitted radar signal as well as its spectral characteristics (bandwidth, spurious signals, AM/FM Noise, etc.).



**Figure 1-1.** ME7220A Radar Test System

**1-4 SPECIFICATIONS**

The ME7220A Radar Test System specifications are as follows:

**Table 1-1. System Specifications**

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**GENERAL**

Frequency Range	76 GHz to 77 GHz (other frequency range options available - contact factory)
Antenna E-Field Polarization	Horizontal standard (other polarization options available)
Alignment Laser	Class II laser, 600-700nm, Output Power <1 mW NOTE: Alignment laser shuts off above 40° C.

**RADAR SIGNAL ANALYSIS**

Received Radar Power (at RTS waveguide input flange)	0 dBm, maximum, for no damage -10 dBm, specifications below apply
Measured Radar Power	
Internal meter (displays EIRP)	range: 30 dB, minimum accuracy: $\pm 2$ dB
External meter (displays IF power, EIRP must be calculated)	range: 35 dB, minimum (50 dB typical with Option 5) accuracy: $\pm 1$ dB, including IF measurement and EIRP cal factor
Max. radar occupied frequency	Full band 76 to 77 GHz, translated to an IF band of 4.7 to 5.7 GHz
Radar transmit frequency spectrum	
External S.A. (displays IF signal)	Accuracy of 76-77 GHz frequency measurement is limited by S.A. external reference and specifications
External S.A. using RTS internal reference	Internal reference frequency accuracy 50 ppm
Internal Frequency Measurement	Accuracy of displayed frequency is $\pm 50$ MHz, maximum
Spurious Signals, In-Band	38 dBc, maximum, referenced to output signal

**RTS TARGET SIMULATION**

Received Radar Power (at RTS waveguide input flange)	0 dBm, maximum, for no damage -15 dBm, specifications below apply
Radar Signal Occupied Bandwidth	300 MHz maximum in the 76 to 77 GHz range
Number of Simultaneous Targets	1 (either near target or far target)

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**Table 1-1.** *System Specifications continued*

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Target Distance	
Near target	3.5 meters nominal (+ distance from RTS to radar)
Far target	116.5 meters nominal (+ distance from RTS to radar) (Other target distance options available - contact factory)
Distance Accuracy	
Near Target	±0.5m maximum
Far Target	±2.0m maximum
Distance from RTS to DUT Radar	1.5 m, minimum
Radar Cross Section (RCS)	
Maximum RCS	-4 dBsm, minimum (near target) 50 dBsm, minimum (far target)
RCS Adjustment Range	50 dB, 1 dB steps
RCS Accuracy	± 0.75 dB ± 5% of attenuation, maximum, measured at a single frequency of 76.5 GHz ± 2.5dB, maximum, (measured over 76-77 GHz)
Target Speed Simulation (Doppler freq.)	
Speed Range	0 to ± 250 km/h, minimum (0 to ± 35 kHz, minimum)
Speed Step Size	0.1 km/h, minimum (15 Hz minimum)
Speed Error	0.2 km/h, maximum (30 Hz maximum)
Doppler Carrier and Sideband Suppression	40 dBc, minimum
Signal Characteristics	
Spurious Signals and Responses	measured at waveguide output
In-Band Response	40 dBc, maximum
Out-of-Band	
Local Oscillator signal	-5 dBm, maximum (at 70.8 to 71.8 GHz)
Image response	-3 dBc, maximum (at 65.6 to 66.6 GHz)
RF Noise Density (CW)	
Local Oscillator Phase Noise	-80 dBc/Hz @ 100kHz offset, maximum
AM Noise for target simulation	-130 dBm/Hz @ 2MHz offset, maximum

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**Table 1-1.** *System Specifications continued*

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**DISPLAY MODULE**

Display Screen	160x128 dot matrix monochrome LCD, with backlight
Cable from main module	1 meter

**POWER REQUIREMENTS**

Primary Power	85- 240 Volts AC 50-60 Hz 200VA, maximum
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**ENVIRONMENTAL**

Operating Temperature Range	+15° C to +35° C 0° C to +50° C, with reduced performance
Operating Humidity	5% to 95% at 40° C
Warm-Up Time	30 minutes, maximum for ambient +15 to +35° C
Storage Temperature	-15° C to 75° C
EMC & Safety	Meets European community requirements for CE marking

**SIZE AND WEIGHT**

Dimensions	H x W x D
main module	197.6 x 485.6 x 553.6 mm
display module	178.8 x 228 x 76.5 mm
Weight	
main module	10 kg
display module	1 kg

**FRONT PANEL CONNECTORS**

Antenna Input/Output	WR12 Waveguide, 0 dBm maximum no damage
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**REAR PANEL CONNECTORS**

Power Meter Port	N (F), 50Ω, 10 dBm maximum output
Spectrum Analyzer Port	N (F), 50Ω, 10 dBm maximum output
10 MHz Reference Input	BNC (F), 50Ω, +15 dBm to -5 dBm, 25 VDC, max
RS-232 Serial Port	D-Sub 9-pin (M)
IF External Loop	2 SMA (F), 0 dBm maximum input/output

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**1-5 OPTIONS**

Options available for the ME7220A Radar Test System include:

- ❑ Option 1A — Rack Mount Kit with handles
- ❑ Option 2A — Antenna Polarization, Vertical
- ❑ Option 2B — Antenna Polarization, 45° slant left
- ❑ Option 2C — Antenna Polarization, 45° slant right
- ❑ Option 3A — Input/Output Port Waveguide Extensions, 5.08 cm (2.0 in.)
- ❑ Option 5 — External Bandpass Filter for a Wider Dynamic Range at the Power Meter Port

**NOTES**

If a system is ordered with Option 2x or 3x, the system will be calibrated with the external waveguides for that option installed. Operating the system without those waveguides installed will result in inaccurate Range, RCS, and Power measurements. The error will be on the order of 5 cm in Range, and 0.35 dB in RCS and Power.

The waveguides of Option 2A, 2B, and 2C can be substituted for each other without introducing any error into the measurement results.

Substituting the waveguides of Option 3A for any of the Option 2x waveguides, as opposed to not using any waveguides, will limit the error in the measurements to less than 1.5 cm in Range, and to less than 0.08 dB in RCS and Power.

Therefore, for systems with Option 2A, 2B, or 2C installed, if it is desired to operate the system with horizontal antenna polarization (no waveguide twist), replacing the installed waveguides with those from Option 3A will result in less error in the calibration data than if no waveguides are used at all.

# Chapter 2

## Installation

### **2-1** INTRODUCTION

This chapter provides information on the connection and installation of the ME7220A Radar Test System.

### **2-2** REQUIRED EQUIPMENT

The ME7220A Radar Test System is comprised of the following parts:

- ❑ ME7220A RTS Main module
- ❑ ME7220A RTS Display module
- ❑ Display interface cable
- ❑ Serial Interface Cable
- ❑ Horn antennas (2)
- ❑ Termination, 50 Ohm, N (M)
- ❑ Power cord

### **2-3** OPTIONAL EQUIPMENT

The following optional equipment can be used with the system:

- ❑ Anritsu Model ML2437A Power Meter or equivalent
- ❑ Anritsu Model MA2472A Power Sensor or equivalent
- ❑ Anritsu Model MS2663C Spectrum Analyzer or equivalent

**2-4 INSTALLATION**

The RTS standard and optional components connect to the front and back panels of the ME7220A Radar Test System. The front and back panels are shown in the figures below.



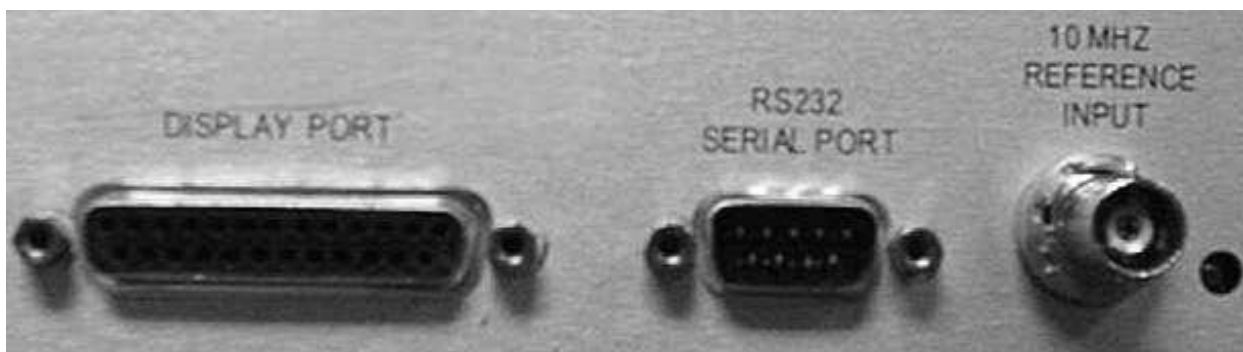
**Figure 2-1.** ME7220A Radar Test System Front Panel



**Figure 2-2.** ME7220A Radar Test System Rear Panel

**2-5 STANDARD EQUIPMENT** The following standard equipment is installed for all applications.

**Display Module** Connect the Display Interface Cable to the Display Module and then to the back panel of the RTS at the connector labeled DISPLAY PORT (see Figure 2-3). Note that if the ME7220A is to be controlled through remote operation (page 2-6) the Display Module need not be installed.



**Figure 2-3.** Display Port Connection

**Antenna Horns** Using the four screws provided, connect each antenna horn to the Front Panel of the RTS module at the connectors labeled ANTENNA PORTS (see Figure 2-4).

**NOTE**

Take care to properly align the rectangular waveguide opening in the horn with the rectangular waveguide opening in the front panel.

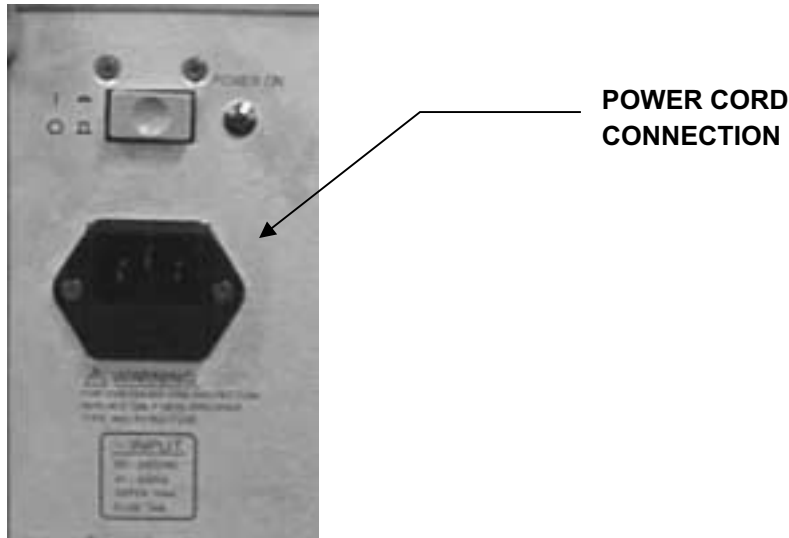
**NOTE**

For Options 2A, 2B, 2C, and 3A, connect one end of the supplied waveguide to the antenna horn and the other end to the Front Panel connector.



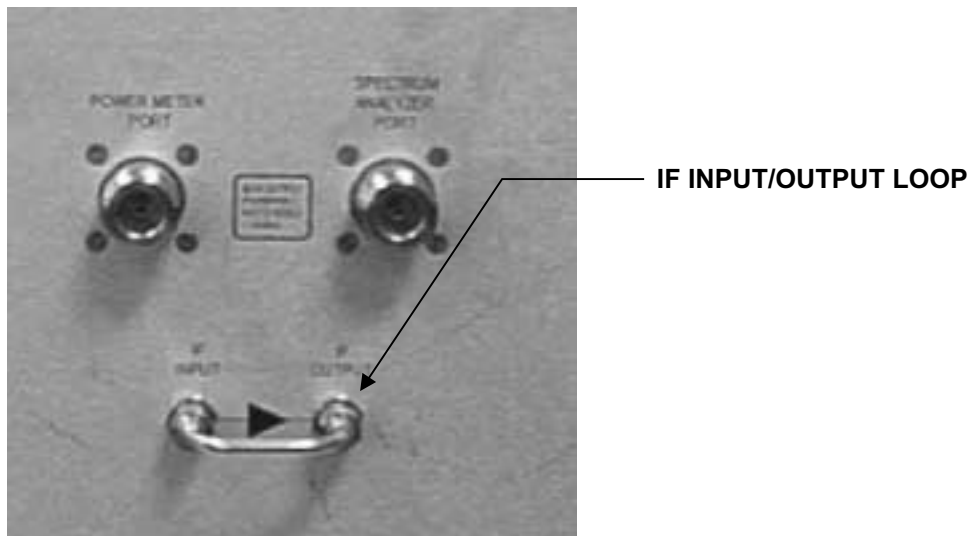
**Figure 2-4.** Antenna Horn Connection

**Power Cord** Connect the power cord to the power supply module on the back panel of the RTS and to a grounded power outlet (85-240 VAC).



**Figure 2-5.** Power Cord Connection

**IF Input/Output Loop** The loop cable must be installed for system operation.

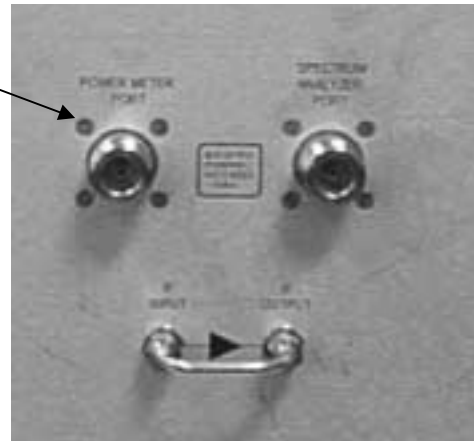


**Figure 2-6.** IF Input/Output Loop

**2-6** **OPTIONAL EQUIPMENT** The following optional equipment may be installed as needed.

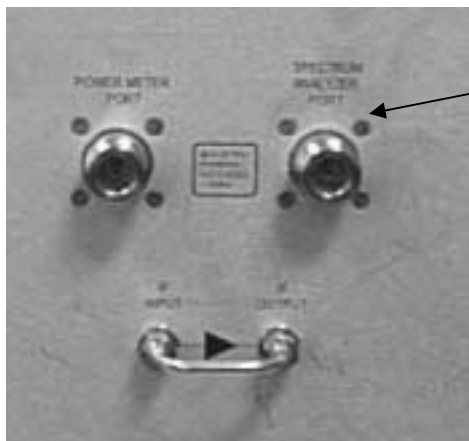
**Power Meter** Connect an Anritsu MA2472A Power Sensor (or equivalent) to an Anritsu ML2437A Power Meter (or equivalent) and then connect the sensor to the POWER METER PORT on the RTS back panel. When a power meter is connected, the SPECTRUM ANALYZER PORT must be terminated with the 50Ω load provided.

**POWER METER  
CONNECTOR**



**Figure 2-7.** Power Meter Connection

**Spectrum Analyzer** Connect the Anritsu MS2663C Spectrum Analyzer (or equivalent) to the SPECTRUM ANALYZER PORT on the RTS back panel. When a spectrum analyzer is connected, the POWER METER PORT must be terminated with the 50Ω load provided.

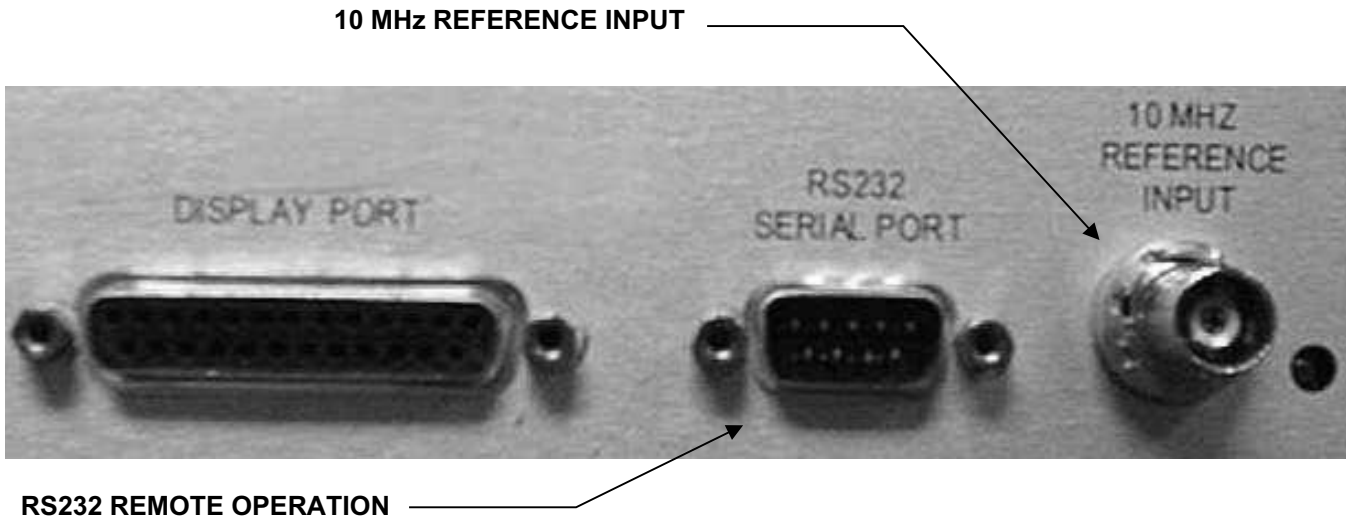


**SPECTRUM  
ANALYZER  
CONNECTION**

**Figure 2-8.** Spectrum Analyzer Connection



Although the RTS can supply an internal 10 MHz reference, for maximum accuracy connect the Anritsu MS2663C (or equivalent) Spectrum Analyzer 10 MHz Reference Output to the 10 MHz REFERENCE INPUT on the RTS back panel. When a valid 10 MHz input signal is detected, the green LED next to the connector will be illuminated.



**Figure 2-9.** Spectrum Analyzer 10 MHz Reference Input and RS232 Remote Operation Connections

**Remote Operation**

The ME7220A Radar Test System can be controlled by an external computer via the RS232 serial port. Connect the serial cable provided with the system to the RS232 SERIAL PORT connector on the RTS back panel, and to the external computer serial port.

**NOTE**

If the ME7220A is to be controlled through remote operation, the Display Module (page 2-3) need not be installed.

The display module (if installed) indicates when the Radar Test System is in remote operation mode. The keys on the display module will not function while in remote operation mode.

Refer to Chapter 4, *Remote Operation*, for commands and programming information.

# Chapter 3 Operation

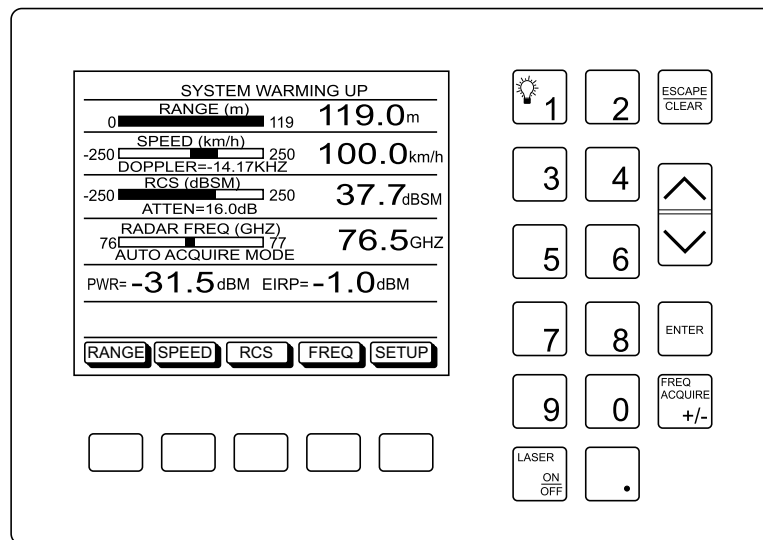
## 3-1 INTRODUCTION

This chapter provides instructions for operation and test setup of the ME7220A Radar Test System.

## 3-2 DISPLAY MODULE

The ME7220A Radar Test System display module menu-driven user interface is easy to use and requires little training. Five function softkeys are located just below the display. The selection of a soft key brings up other soft key selection options for that function.

The keypad hard labeled keys adjacent to the display provide input for various menu options, and control system functions.



**Figure 3-1.** ME7220A Radar Test System Display Module

The following sections explain the operation of the hard and soft keys.

**3-3 HARD KEYS**

The keypad keys adjacent to the display provide input for various menu options, and control system functions. The following keypad hard key functions are printed in **black** on the keypad keys.

- 0 - 9** These keys are used to enter numerical data as required to setup or perform measurements.
- +/-** The plus/minus key is used to enter positive or negative values as required to setup or perform measurements.
- The decimal point is used to enter decimal values as required to setup or perform measurements.

**ESCAPE CLEAR** Exits the present operation or clears the display. If a parameter is being edited, pressing this key will clear the value currently being entered and restore the last valid entry. Pressing this key again will close the parameter. During normal operation, pressing this key will move up one menu level.

**UP/DOWN ARROWS** The arrow keys can be used to move a selection indicator up or down, to step through selection values, or increment a selection.

**ENTER** Implements the current action or parameter selection.

The following keypad hard key functions are printed in **blue** on the keypad keys.

**SAVE SETUP** Saves the current system setup to 1 of 9 internal non-volatile memory locations. When the key is pressed, Save Setup appears on the display. Use the number keys or the Up/Down arrow key to select a setup location and press the ENTER key to implement.

**RECALL SETUP** Recalls a previously saved setup from memory location 0 through 9. When the key is pressed, Recall Setup appears on the display. Select a setup using the number keys or the Up/Down arrow key and press the ENTER key to implement. Setup location 0 recalls the factory preset state.



Turns the liquid crystal display (LCD) backlight ON or OFF for use in low-level lighting environments.

**FREQ CAPTURE** Activates immediate capture of the frequency, rather than waiting for the preset interval when the system is in automatic capture mode.

**LASER ON/OFF** When the laser is enabled through the SETUP function, this key turns the laser on or off.

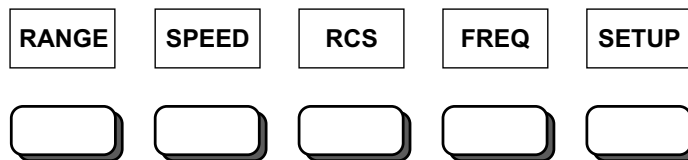
**NOTE**

At turn on, before any other key is pressed, the Up/Down arrow keys can be used to adjust the display contrast. Press **ENTER** to save the setting.

**3-4** SOFT KEYS

The following figures show the various soft keys and provides information on their operation.

Selecting a function soft key causes the key labels to change to the menu of options for that function. Selecting a soft key option implements that option, or brings up another menu of soft key selections specific to that option. Pressing the BACK soft key returns to the previous menu.

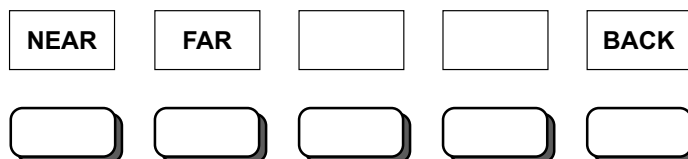


*Figure 3-2. Main Soft Key Labels*



Set the simulated target range.

Selecting the RANGE soft key brings up the following options:



*Figure 3-3. RANGE Soft Key Options*

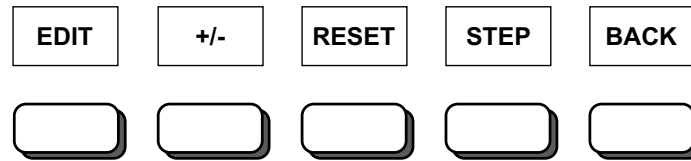
- NEAR** Set the simulated target range to the NEAR target. The exact range value of the near target is indicated on the display.
- FAR** Set the simulated target range to the FAR target. The exact range value of the far target is indicated on the display.
- BACK** Return to the main menu.

**SPEED****NOTE**

A positive speed corresponds to a negative Doppler frequency offset.

Set the speed and direction of the simulated target.

Selecting the **SPEED** soft key brings up the following options:



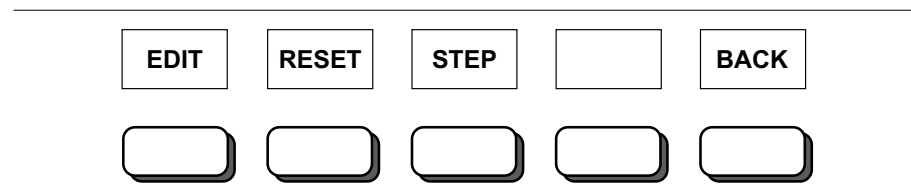
**Figure 3-4.** SPEED Soft Key Options

- |              |  |
|--------------|--|
| <b>EDIT</b>  | Press to edit the value of the speed using the keypad numbers or the up/down arrow keys. Speed can be varied from -250 km/h to +250 km/h in steps of at least 0.1 km/h. The Doppler corresponding to the speed is also displayed. The value of the speed can be positive (target moving away) or negative (target moving towards). The value of the speed set is indicated in the display. The corresponding value of the Doppler frequency offset is also indicated in the display. Press ENTER to implement the selection. |
| <b>+/-</b>   | Toggles the set value of the speed between positive (target moving away from the RTS) and negative (target moving towards the RTS).  |
| <b>RESET</b> | Press to reset the value and sign of the speed to the factory default.   |
| <b>STEP</b>  | Press to change the default setting of the size that the up/down arrow keys use to adjust the speed.   |
| <b>BACK</b>  | Return to the main menu.   |

**RCS**

Set the Radar Cross Section (RCS) of the simulated target.

Selecting the **RCS** soft key brings up the following options:



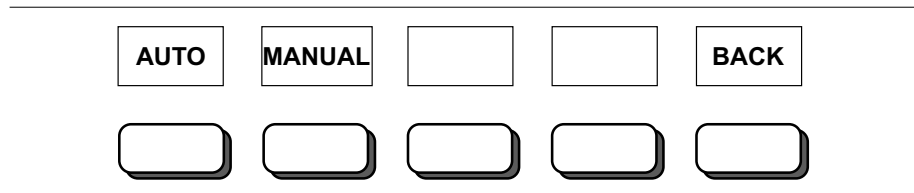
**Figure 3-5.** RCS Soft Key Options

- EDIT** Press to edit the value of the attenuator that determines the value of the RCS, using the keypad numbers or the up/down arrow keys. For 0 dB attenuation, the target has a fixed maximum RCS value. The RCS attenuator can be varied from 0 to 50 dB to simulate different size targets.  
  
The RCS is displayed in dBsm in the RCS display area, and in sqm (or sqft) in the edit display area. The attenuator adjusts in nominal 1 dB steps. The value of the RCS is dependent on the simulated target range as well as on the distance between the radar and the RTS.
- RESET** Reset the value of the attenuator (and RCS) to the factory default.
- STEP** Press to change the step value of the Up/Down Arrow key. Select 1 to 50 dB per step in steps of 1 dB. The default value is 1 dB.
- BACK** Return to the main menu.

**FREQ**

Sets the mode the RTS uses to capture the signal frequency of the radar under test.

Selecting the **FREQ** soft key brings up the following options:



**Figure 3-6.** FREQ Soft Key Options

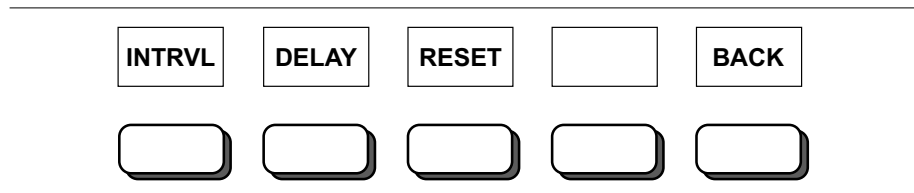
**AUTO**

Automatic Capture Mode. In this mode, the RTS will automatically capture the center frequency of the radar transmitted signal and set the RTS to operate at that frequency. This automatic capture will repeat every set interval or whenever the FREQ CAPTURE button (page 3-2) is pressed. The message FREQUENCY ACQUISITION IN PROGRESS will display at the top of the screen when a frequency capture is occurring.

**NOTE**

The FREQ CAPTURE key will initiate an immediate capture of the frequency, rather than waiting for the preset interval when the system is in automatic capture mode.

Selecting the **AUTO** soft key from the **FREQ** menu brings up the following options:

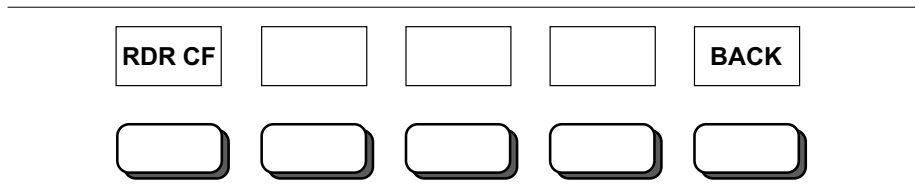


**Figure 3-7.** AUTO Soft Key Options

- INTRVL** Press to set the interval time between every automatic capture scan. Use the number keys or the Up/Down arrow key to enter 1 to 9999 seconds. Press the ENTER key to implement. The default is 60 seconds.
- DELAY** Adjust the time delay (or dwelling time at each frequency point) that is used during the automatic capture scan. A longer delay is equivalent to higher averaging of the signal. Use the number keys or the Up/Down arrow key to enter 1 to 800 ms. Press the ENTER key to implement. The default is 10 ms.
- RESET** Press to reset the INTERVAL and DELAY parameters to their factory default values.
- BACK** Press to go back to the FREQ menu.

**MANUAL** Sets the mode to Manual Frequency Setting. In this mode, the user manually inputs the value of the radar signal frequency.

Selecting the **MANUAL** soft key from the **FREQ** menu brings up the following options:



**Figure 3-8.** *MANUAL Soft Key Options*

**RDR CF** Press to adjust the value of the radar signal Center Frequency

**BACK** Press to go back to the FREQ menu.

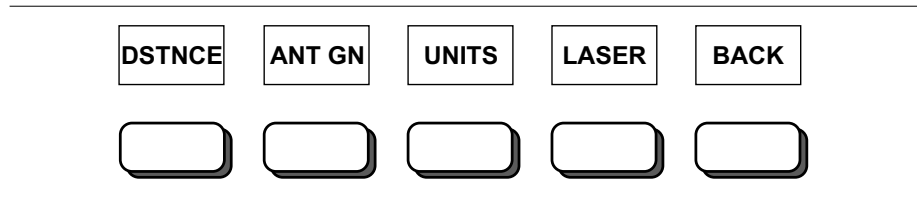


**SETUP**

**NOTE**  
Correct setting of the distance (DSTNCE) and antenna gain (ANT GN) parameters is critical for accurate system RCS and power readouts.

Press to enter the Setup menu for adjusting parameters used by the RTS

Selecting the **SETUP** soft key brings up the following options:

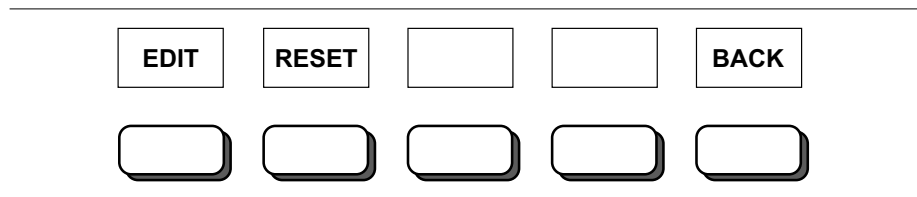


**Figure 3-9.** *SETUP Soft Key Options*

**DSTNCE**

Adjusts the value that represents the physical distance between the antenna aperture of the radar and the antenna aperture of the RTS (Figure 3-12).

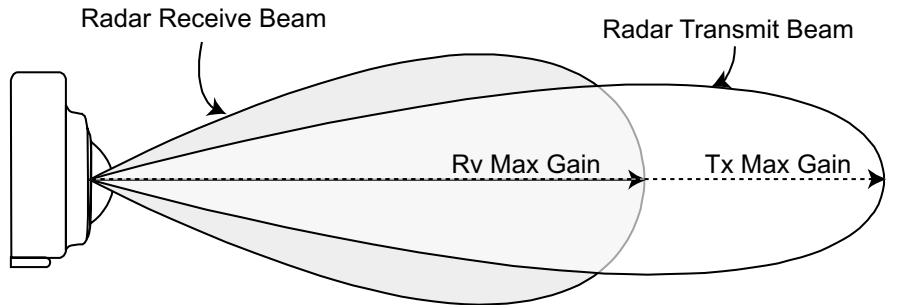
Selecting the **DSTNCE** soft key from the **SETUP** menu brings up the following options:



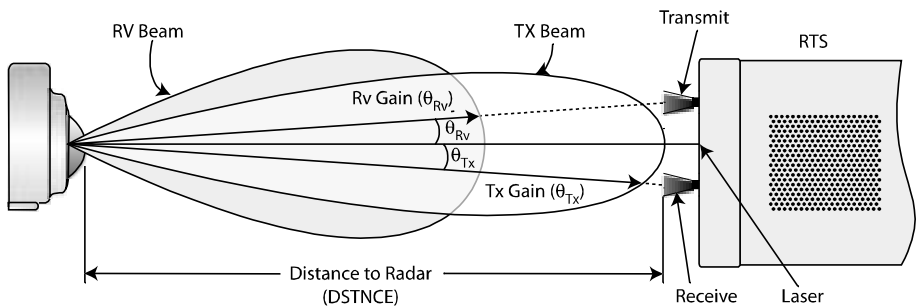
**Figure 3-10.** *DSTNCE Soft Key Options*

- EDIT** Press to edit the Distance value using the keypad numbers or the up/down arrow keys. Select 1.5 to 30 meters and press ENTER to implement.
- RESET** Press to reset the Distance value to the factory default (2m).
- BACK** Press to go back to the SETUP menu.

**ANT GN** Adjusts the antenna gain value of the radar under test. This value is used to calculate the power transmitted by the radar. Figures 3-11 and 3-12 illustrate the different parameters.



**Figure 3-11.** Antenna Gain Parameters

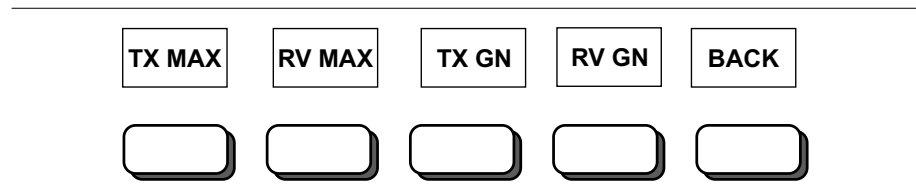


**Figure 3-12.** Antenna Alignment

Selecting the **ANT GN** soft key from the **SETUP** menu brings up the following options:

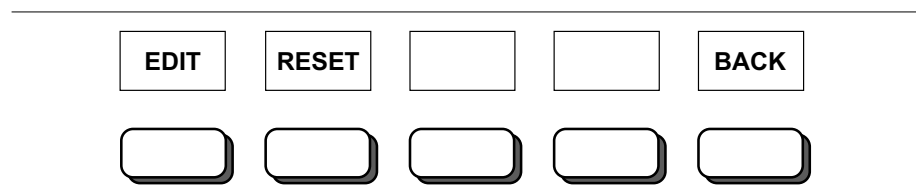
- TX MAX** Maximum transmit antenna gain of the radar under test.
- RV MAX** Maximum receive antenna gain of the radar under test.
- TX GN** Transmit antenna gain of the radar under test in the direction of the RTS RECEIVE antenna.
- RV GN** Receive antenna gain of the radar under test in the direction of the RTS TRANSMIT antenna.

Selection of any of the above soft keys brings up the following menu:



**Figure 3-13.** ANT GN Soft Key Options

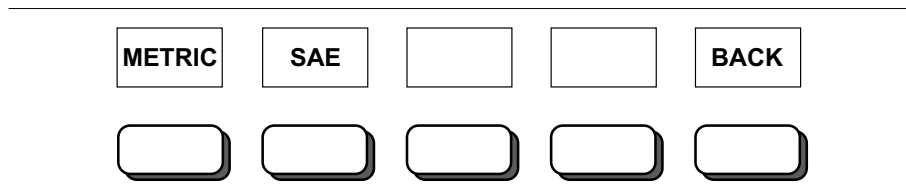
- EDIT** Press to edit the parameter value using the keypad numbers or the up/down arrow keys.



**Figure 3-14.** Antenna Gain Edit Menu

- RESET** Press to reset the parameter value to the factory default.
- BACK** Press to go back to the SETUP menu.
- UNITS** Select the units used by the RTS to display the parameters.

Selecting the **UNITS** soft key from the **SETUP** menu brings up the following options:



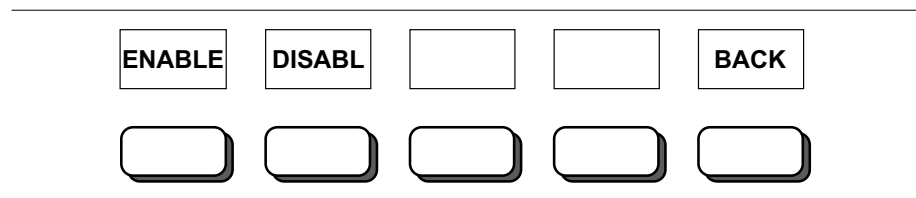
**Figure 3-15.** *UNITS Soft Key Options*

- METRIC** Set the units to the METRIC standard.
- SAE** Set the units to the SAE (English) standards.
- BACK** Go back to the SETUP menu.

**LASER**

Enable or disable the internal RTS alignment laser. The laser ON/OFF switch on the keypad will turn the laser on or off only when the laser is enabled through this key sequence. The alignment laser is used to position the RTS relative to the radar under test. With the laser enabled, press the LASER ON/OFF key to turn the laser on and off.

Selecting the **LASER** soft key from the **SETUP** menu brings up the following options:



**Figure 3-16.** *LASER Soft Key Options*

---

**ENABLE** Press to Enable the alignment laser function.

**DISABL** Press to Disable the alignment laser function.

**BACK** Press to go back to the SETUP menu.

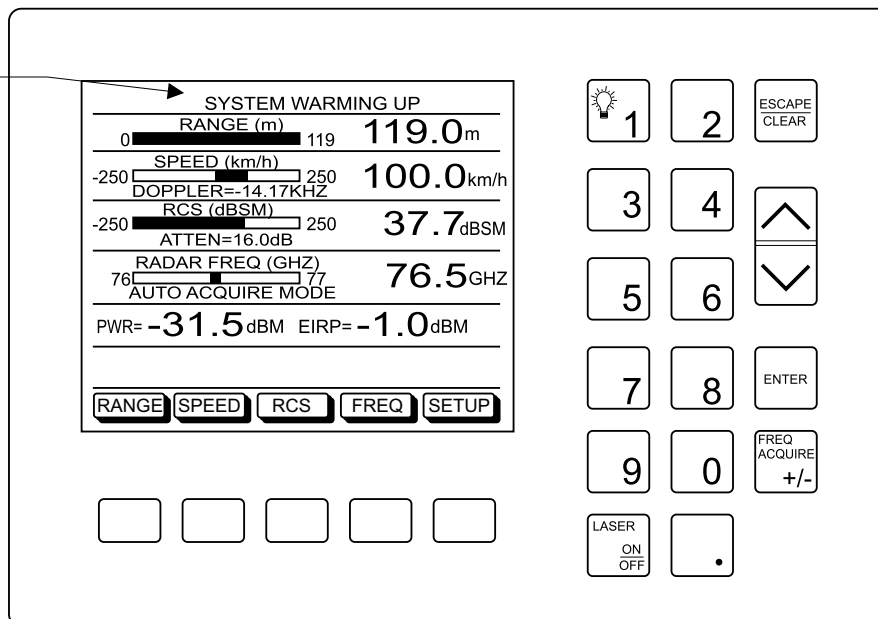
**BACK** Press to go back to the MAIN menu.

**3-5 POWER ON PROCEDURE** After making the necessary connections as described in Chapter 2, Installation, follow the procedure below to apply power to the system.

**NOTE**  
The DC power supply voltage will be displayed in the lower left corner of the display module as the self test is taking place.

- Step 1.** Using the power switch on the back panel of the RTS, turn the power on for the main module. The “POWER ON” LED indicator on the RTS module will turn green when the power is on.  
The RTS will run through a series of self checks to ensure the system is functioning properly.
- Step 2.** Allow time for the system to warm up. A “SYSTEM WARMING UP” indicator appears at the top of the display module and will remain on until the system reaches operating temperature. The time it takes to reach that temperature will vary depending on the ambient temperature, and may be as long as 30 minutes at an ambient temperature of 15 to 35°C .

**SYSTEM WARMING UP MESSAGE**



**Figure 3-17.** Display Module Message “System Warming Up”

**Self Test Errors** During the power-on self test, the following error indicators may appear on the display:

ERROR MESSAGE	MEANING AND SOLUTION
EXTERNAL POWER LOW	The DC power supply voltage is low. Contact your nearest Anritsu Service Center for assistance.
LOCK FAILED	The phase-locked loops failed to lock. Restart the system. If the error message reappears, contact your nearest Anritsu Service Center for assistance.
EEPROM R/W FAILED	The non-volatile memory system has failed. Contact your nearest Anritsu Service Center for assistance.

**Symbols** The following symbols may appear on the display reflecting the current state of the system:



**Lock Fail Indicator** — This symbol will appear in the upper left corner of the display if the phase-locked loops failed to lock. Restart the system. If the symbol reappears, contact your nearest Anritsu Service Center for assistance.



**Laser On** — This symbol will appear in the upper right corner of the display and indicates that the alignment laser is on. The laser must be enabled (page 3-12) and turned on using the LASER ON/OFF key (page 3-2).

### 3-6 SYSTEM SETUP

**NOTE**

The distance between the RTS and the radar antenna will depend on the gain of the radar antenna necessary to insure far-field operation. The minimum distance should be 1.5 meters.

After making the necessary connections as described in Chapter 2, Installation, proceed with the following steps to set up the system.

- Step 1.** Use the alignment laser to position the main module so that the aperture of the TRANSMIT and RECEIVE antenna horns on the RTS and the radar antenna aperture are parallel and a set distance apart. The RTS laser should point to the center of the radar antenna. Refer to Figure 3-12, page 3-9.
- Step 2.** Input the set distance between the RTS and the radar antenna and the gain of the radar antenna under the SETUP menu (see Section 3-4, page 3-3).

### 3-7 SYSTEM CONTROL

Use the softkeys in the main menu of the display to control the Range, Radar Cross Section (RCS), and Speed of the simulated target.

**Target Simulation Parameters**

Three target simulation parameters are displayed on the screen: Range, Speed, and RCS.

**NOTE**

Before performing target simulation measurements, the radar signal center frequency parameter in the RTS must be set, either manually or automatically. The accuracy of the target simulation measurement depends upon the accuracy of this frequency setting.

Range can be either NEAR or FAR. In addition to the simulated target, reflections from the RTS antennas and chassis will appear as stationary targets. Reflections from the chassis can be reduced, if necessary, by using microwave absorbing shielding. Reflections from the antennas will always be present as a zero-Doppler target, with an RCS on the order of the simulated NEAR target RCS, and at a range equal to the set distance between the radar and the RTS.

The RCS for each simulated target is displayed corresponding to the target range set. For 0 dB attenuation, the target has a fixed maximum RCS value. The RCS attenuator can be varied from 0 to 50 dB to simulate different size targets. The RCS is displayed in dBsm in the RCS display area, and in sqm (or sqft) in the edit display area.

Speed can be varied from -250 km/h to +250 km/h in steps of at least 0.1 km/h. The Doppler corresponding to the speed is also displayed. For a given value of speed, the Doppler shift depends on, and will vary with, the radar center frequency.

**Radar Signal Center Frequency**

The RTS default mode uses a tracking frequency algorithm to capture the center frequency of the transmitted radar signal. The RTS then centers its response at that frequency. The user can also manually set the radar center frequency. These functions can be controlled via the softkey (FREQ) in the main menu of the display.

The tracking algorithm should work accurately for most radar signal modulation. For signals with low duty cycles, the DELAY parameter can be increased to give the RTS detector longer processing times and improve the accuracy of the detection.



**NOTE**

For improved accuracy, set the target range to FAR when reading the internal power detector.

For MANUAL mode, locate the radar center frequency using the external spectrum analyzer and set the RTS to that center frequency. To locate the frequency, first set the RTS to 76.5 GHz and then look for the signal in the IF band of 4.7 to 5.7 GHz on the spectrum analyzer. The IF band of 4.7 to 5.7 GHz corresponds to the radar signal band of 76 to 77 GHz. Once the center frequency is located, input the frequency value into the RTS.

**Power Readouts**

The ME7220A Radar Test System contains an internal power detector. The system is calibrated such that the readout from this detector (which appears on the screen) is the actual power transmitted by the radar. The Effective Isotropic Radiated Power (EIRP) of the radar at the radar antenna aperture is also displayed on the screen.

**NOTE**

For the power reading and the RCS value to be accurate, the user must input the correct distance between the radar and the RTS and the correct radar antenna gains (under the SETUP menu). Refer to Figure 3-12.

**3-8 POWER MEASUREMENTS**  
(Optional)

**NOTE**

When making power measurements at the POWER port, the SPECTRUM port must remain terminated.

Connect the power meter sensor to the POWER METER PORT on the back panel of the RTS. Use the external power meter to read the power level of the radar signal (at IF frequencies 4.7-5.7 GHz corresponding to the RF frequency range of 76-77 GHz). The RTS should be set to MANUAL FREQ MODE with a radar center frequency of 76.5 GHz during this measurement. Use the calibration data provided and the power meter port measured data to calculate the radar EIRP and transmitted power.

To calculate the EIRP at the radar aperture:

$$\text{EIRP (dBm)} = \text{power meter reading (dB)} - \text{RTS cal factor (dB)} -$$

$$10 \times \text{Log}_{10} \left( \frac{\lambda}{4\pi R} \right)^2$$

$$\text{where } \lambda \text{ (m)} = \text{signal wavelength} = \frac{c \text{ (ms)}}{f \text{ (Hz)}} = \frac{\text{speed of light in ms}}{\text{signal frequency in Hz}}$$

and R (m) = the distance between the RTS and the radar in meters.

**NOTE**

The use of an external filter at the power meter port, to limit the bandwidth to 1 GHz or less, may increase the measurement range by lowering the noise floor.

$$\text{Radar Transmit Power (dBm)} = \text{EIRP (dBm)} - G_{\text{RADAR Tx}}$$

where  $G_{\text{RADAR Tx}}$  = Transmit antenna gain of the radar in the direction of the RTS receive antenna (see Tx Gain ( $\theta_{\text{Tx}}$ ) in Figure 3-12, page 3-9).

**3-9 SPECTRAL MEASUREMENT**  
*(Optional)*

**NOTE**

When making spectral measurements at the SPECTRUM port, the POWER port must remain terminated.

Connect a spectrum analyzer to the SPECTRUM ANALYZER PORT on the back panel of the RTS. Use the external spectrum analyzer to measure the spectral characteristics of the radar signal (at IF of 4.7-5.7 GHz corresponding to the RF frequency range of 76-77 GHz). The RTS should be set to MANUAL FREQ MODE with a radar center frequency of 76.5 GHz during this measurement.

For the most accurate frequency measurements, connect the 10 MHz external reference from the spectrum analyzer to the 10 MHz REFERENCE INPUT on the RTS rear panel. When a valid 10 MHz input signal is detected, the green LED next to the connector will be illuminated.

**3-10 MEASUREMENT WITH NO RF SIGNAL**

In some cases, it may be desirable to perform measurements on the radar under test (noise measurements, for example) without an RF signal being transmitted from the RTS. Rather than turning the RTS system completely off, use serial command #8, SET TRANSMIT RF SIGNAL OFF (page 4-5) to turn the RF signal off while the RTS system remains powered up. This practice allows the RF signal to be turned back on faster and eliminates the need to wait for the system to warm up to operating temperature (page 3-13) before continuing with further measurements.

**3-11 MAINTENANCE**

The system as provided does not require any operator maintenance.

# Chapter 4

## Remote Operation

### 4-1 INTRODUCTION

This chapter provides information on controlling the ME7220A Radar Test System from a remote PC using programming commands sent via the provided serial port cable (see Section 2-6, page 2-6). The programming overview is followed by a list of commands separated into functional groups.

### 4-2 DESCRIPTION

#### NOTE

If the ME7220A is to be controlled through remote operation, the Display Module (page 2-3) need not be installed.

The Radar Test System must first be set into “remote” mode for communication with a computer. Remote mode differs from normal repetitive modes. During remote mode, the Radar Test System suspends normal operations and attends to the serial port. The display module (if installed) indicates when the Radar Test System is in remote operation mode. The keys on the display module will not function while in remote operation mode.

Once in remote mode, you can send control bytes and associated data to the Radar Test System via the serial port. These control byte sequences command the Radar Test System to perform various functions and activities. The serial port supports virtually all features accessible from the keypad.

To complete the communication session, send the control byte to exit remote mode. Radar Test System resumes normal operations. You may also exit the remote mode by using the escape key.

### 4-3 CABLING

Serial communications take place via the 9-pin connector on the back of the Radar Test System (see Section 2-6, page 2-6). The Radar Test System is a DTE-type serial device and therefore requires a “null modem” cable for communication with a computer, which is also a DTE device. A null modem cable is supplied with the Radar Test System.

### 4-4 SERIAL COMMUNICATION PARAMETERS

The Radar Test System communicates at a baud rate of 9600. It uses no parity bits, 8 data bits, and 1 stop bit (N-8-1). No hardware handshaking is used.

**4-5 ERROR CHECKING**

Since there is no hardware handshaking, byte level error handling must be done by the controlling program. The expected number of response bytes for each control byte works well for responses coming from the Radar Test System. For data streams going to the Radar Test System, the “watch dog timer” protects against interrupted transmissions by aborting a control byte sequence if the inter-byte time limit is exceeded.

**4-6 PARAMETER VALIDATION**

The Radar Test System validates input parameters for each control byte sequence. If there are no errors, the instrument sends an operation complete byte of #255 (FFh). If the input parameters are out of range or invalid, the Radar Test System notifies the computer by sending Parameter Error Byte #224 (E0h). The Radar Test System discards the received data and waits for the next control byte. If there is a time-out error, the instrument returns a response byte of #238 (EEh). When the instrument is queried for data, the instrument response is comprised of the data sequence followed by an operation complete byte of #255 (FFh).

**4-7 ENTERING REMOTE MODE**

Send the Enter Remote Mode Byte #69 (45h) to the Radar Test System. The Radar Test System serial port buffer is one byte wide. No internal buffer exists, so waiting is essential. If the Radar Test System is not in remote, sending a second byte overwrites the original byte commanding it to go into remote.

Once the response string is received from the from Radar Test System, the unit is in remote mode.

**4-8 EXITING REMOTE MODE** Send the Exit Remote control byte #255 (FFh) to the Radar Test System. The Radar Test System sends a response byte of 255 (FFh) then exits remote mode.

**4-9 CHANGES TO OPERATING PARAMETERS**

System parameters changed during remote mode remain changed for normal operation. They are not automatically written to the non-volatile EEPROM. Turning off power erases the changed settings.

To save the changes, save the change to one of the setup memories. Use either the run-time setup (location 0, which holds the power-on defaults) or one of the nine saved setups. See control byte #18 (12h) for details.

**4-10 EEPROM WRITE CYCLE LIMITATION**

The EEPROM, used to store setups, has a guaranteed lifetime of at least 100,000 write cycles and an unlimited number of read cycles. The write cycle limitation is for a specific location. For this reason, changed system parameters are not automatically stored to the EEPROM. Be aware of the EEPROM write cycle limitation when programming the Radar Test System. Keep the number of write cycles to a minimum.

**4-11 SERIAL COMMANDS** The following commands provide for setting values, getting values and saving and recalling setups.

**Setting Values** The following commands are used for setting values.

**SET TARGET RANGE** Command Value = #2 (02h)

This command requires an 8-bit value following the command. The 8-bit value can either be 0 (Near) or 1 (Far).

**SET TARGET SPEED** Command Value = #3 (03h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Speed parameter. This value must be positive (polarity can be set via the SET TARGET DIRECTION function). The command requires that the value be in milli-km/h or milli-mph, depending on the current units setting (for example, 10 km/h should be sent as 10000).

**SET TARGET DIRECTION** Command Value = #4 (04h)

This command requires an 8-bit value following the command. The 8-bit value can either be 1 (away) or -1 (towards).

**SET RCS ATTENUATION** Command Value = #5 (05h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the RCS Nominal Attenuation parameter.

**SET RADAR CENTER FREQUENCY** Command Value = #17 (11h)

This command requires a 32-bit values following the command. The 32-bit value will be assigned to the Radar CF parameter. The command requires that the values be in MHz. This command will also set the unit into MANUAL FREQ MODE.

**PERFORM FREQUENCY ACQUIRE** Command Value = #64 (40h)

This command will execute an AUTO FREQUENCY ACQUIRE Tracking routine. This command will also set the unit into AUTO FREQ MODE.

**SET FREQUENCY ACQUIRE INTERVAL** Command Value = #7 (07h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Auto Frequency Acquire Interval parameter. The command requires that the value be in seconds.

**SET DETECTOR AVERAGE DELAY** Command Value = #16 (10h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Detector Averaging Delay parameter. The command requires that the values be in milli-seconds.

**SET DISTANCE TO RADAR** Command Value = #6 (06h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Distance to Radar parameter. The command requires that the value be in 10 micrometers or 10 micro-feet, depending on the current units setting. (e.g. 2.5 feet should be sent as 250000, 8.23 meters should be sent as 823000.)

**SET RADAR ANTENNA MAX TRANSMIT GAIN** Command Value = #25 (19h)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Radar Antenna Max Transmit Gain parameter. The command requires that the value be in milli-dB.

**SET RADAR ANTENNA MAX RECEIVE GAIN** Command Value = #26 (1Ah)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Radar Antenna Max Receive Gain parameter. The command requires that the value be in milli-dB.

**SET RADAR ANTENNA TRANSMIT GAIN** Command Value = #27 (1Bh)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Radar Antenna Transmit Gain parameter in the direction of the RTS receive antenna. The command requires that the value be in milli-dB.

**SET RADAR ANTENNA RECEIVE GAIN** Command Value = #28 (1Ch)

This command requires a 32-bit value following the command. The 32-bit value will be assigned to the Radar Antenna Receive Gain parameter in the direction of the RTS transmit antenna. The command requires that the value be in milli-dB.

**SET UNITS**

Command Value = #9 (09h)

This command requires an 8-bit value following the command. The 8-bit value can either be 0 (SAE units) or 1 (metric units).

**SET LASER ENABLE**

Command Value = #15 (0Fh)

This command requires an 8-bit value following the command. The 8-bit value should be a '1' to turn on the laser and a '0' to turn off the laser.

**SET TRANSMIT RF SIGNAL OFF**

Command Value = #8 (08h)

This command requires an 8-bit value following the command. The 8-bit value can be either '0' (RF SIGNAL OFF) or '1' (RF SIGNAL ON).

**Getting Values** The following commands are used for getting values.

**GET TARGET RANGE** Command Value = #48 (30h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the Distance to Target in either millimeters or milli-feet, depending on the current units setting.

**GET TARGET SPEED** Command Value = #49 (31h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the Speed of Target in milli-KPH or milli-MPH, depending on the current units setting. (e.g. 10.5 KPH will be received as 10500.)

**GET TARGET DOPPLER** Command Value = #50 (32h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the Doppler Frequency in Hz.

**GET TARGET RCS** Command Value = #51 (33h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the RCS in milli-dBsm.

**GET RADAR CENTER FREQUENCY** Command Value = #52 (34h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the Radar Frequency in MHz.

**GET RADAR POWER** Command Value = #53 (35h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the Power in milli-dBm.

**GET RADAR EIRP** Command Value = #54 (36h)

This command will send a 32-bit value back to the controller. The 32-bit value will be the EIRP in milli-dBm.



**Setup Commands** The following commands are used for saving and recalling system setup information.

**SAVE SYSTEM SETUP**

Command Value = #18 (12h)

This command requires an 8-bit value following the command. The 8-bit value can be an integer from 0 to 9 and will represent the storage location for the setup.

**RECALL SYSTEM SETUP**

Command Value = #19 (13h)

This command requires an 8-bit value following the command. The 8-bit value can be an integer from 0 to 9 and will represent the storage location for the setup.

**4-12 EXAMPLE CODE**

The following is an example of an ME7220A Radar Test System program written in Visual Basic (6).

The first step is to add the Serial Port library and to set the communication port. When using Visual Basic, add the activeX component for serial port communication. This component can be found in MSComm32.ocx. In our examples below, the component name is CommPort1.

The Serial Port can be set as follows:

```
Bits per second = 9600
Parity = N/A
Data bits = 8
top bit = 1
CommPort1.InputMode = comInputModeBinary
```

Then it can be initiated by the following command:

```
CommPort1.PortOpen = True
```

The following API functions must be globally declared:

```
Declare Function GetTickCount Lib "kernel32" () As Long
Declare Sub Sleep Lib "kernel32" (ByVal dwMilliseconds As Long)
Declare Function TransmitCommChar Lib "kernel32" _
    (ByVal nCid As Long, ByVal cChar As Byte) As Long
```

Starting and ending a communication session using the ENTER REMOTE and EXIT REMOTE functions:

```
`Enter remote mode at the beginning of the communication session
Dim Buffer As String
Dim Value As Double
Dim TempVal As Long
`set up the 8-bit command value (command #69)
Value = Val(69)
TempVal = (Value And &HFF)
If TempVal < 0 Then TempVal = TempVal + 256
Buffer = ChrB$(Value)
`get Port id
TempVal = Val(CommPort1.CommID)
`send the command to the instrument
Call send_com_string(TempVal, Buffer)

`Exit remote mode to end the communication session
`Note that the display screen of the Display Module is not
`updated until remote mode is exited
Dim Buffer As String
```

```
Dim Value As Double
Dim TempVal As Long
'set up the 8-bit command value (command #255)
Value = Val(255)
TempVal = (Value And &HFF)
If TempVal < 0 Then TempVal = TempVal + 256
Buffer = ChrB$(Value)

'get Port id

TempVal = Val(CommPort1.CommID)

'send the command to the instrument
Call send_com_string(TempVal, Buffer)
```

The following example shows how to set values in the instrument by sending it an 8-bit command followed by a 32-bit input parameter. This could be used, for example, for setting the target speed: send 8-bit command “3” and then 32-bit input parameter “10000” for 10km/h. Some “setting” commands are followed by 8-bit input parameters and some do not require any parameters to follow them. The following program can be easily modified to work for those other cases.

```
Dim Buffer As String
Dim Value As Double
Dim TempVal As Long
Dim Message$, Default$, MyValue$, Title$

'Input box for reading the value of the 8-bit command to be sent
Message = "Enter Value of command (8-bit)"
Title = "Set Command" ' Set title.
Default = "" 'Set default.
'Display message, title, and default value.
MyValue = InputBox(Message, Title, Default)
If MyValue = "" Then
    MyValue = "0"
End If

'set up the 8-bit value
Value = Val(CStr(MyValue))
TempVal = (Value And &HFF)
If TempVal < 0 Then TempVal = TempVal + 256
Buffer = ChrB$(TempVal)

'get Port id
TempVal = Val(CommPort1.CommID)

'send the command to the instrument
Call send_com_string(TempVal, Buffer)

'Input box for reading the value of the 32-bit input parameters to be sent
Message = "Enter Value of input parameter (32-bit)"
Title = "Set Command" ' Set title.
Default = "" ' Set default.
' Display message, title, and default value.
MyValue = InputBox(Message, Title, Default)
If MyValue = "" Then
    MyValue = "0"
End If
```

```
'set up the 32-bit value
Value = Val(CStr(MyValue))
Buffer = ConvertDoubleToFourSigned(Value)

'get Port id
TempVal = Val(CommPort1.CommID)

'send the input parameter to the instrument
Call send_com_string(TempVal, Buffer)
```

The following example shows how to send an 8-bit command to the instrument and then receive the 32-bit parameter that the instrument sends back. This could be used for all the “getting” commands. For example, to get the target speed: send 8-bit command “49” and then read the returned parameter, which would be “10000” for a setting of 10km/h.

```
Dim Buffer As String
Dim Value As Double
Dim TempVal As Long
Dim Message$, Default$, MyValue$, Title$, tempacp$

'Input box for reading the value of the command to be sent
Message = "Enter Command Number (in decimal)."
```

```
Title = "Get Command" ' Set title.
Default = "" ' Set default.
' Display message, title, and default value.
MyValue = InputBox(Message, Title, Default)
If MyValue = "" Then
    MyValue = "0"
End If

'clear input buffer before sending the command to ensure an empty buffer
tempacp$ = CommPort1.Input

'set up the 8-bit command value
Value = Val(MyValue)
TempVal = (Value And &HFF)
If TempVal < 0 Then TempVal = TempVal + 256
Buffer = ChrB$(Value)

'get Port id
TempVal = Val(CommPort1.CommID)

'send the command to the instrument
Call send_com_string(TempVal, Buffer)

'read the returned 32-bit parameter from the instrument
Call Read32Bit(CommPort1, CInt(Value))
```

The following three functions are used in the examples given above:

```
`SET FUNCTION
Public Function send_com_string(comm_ID As Long, send_string As String)

'This function is used in place of the CommPort1.ouput function
'and it uses a windows API call instead
'This must be done because CommPort1 doesn't support real binary
'transfer and that causes a problem in DBCS(Japanese,
'Chinese Windows) computers

Dim i As Long
Dim the_len As Long

Dim temp_byte As Byte
On Error GoTo send_com_string_handler

send_com_string = true
the_len = LenB(send_string)
If the_len = 0 Then Exit Function

For i = 1 To the_len
    'All strings should be send as BYTES(Not as Strings)
    temp_byte = CByte(AscB(MidB$(send_string, i, 1)))
    'This is the API used to send thru COMM PORT
    TransmitCommChar comm_ID, temp_byte

    Sleep (1000)
Next i
Exit Function

send_com_string_handler:
send_com_string = false
End Function
```

```
`READ FUNCTION
Public Function Read32Bit%(Commctl As Control, traceNum%)

Dim timedOut%, initialTicks&, nowTicks&, timeoutval&, ByteNum&
Dim tempacp$, tempacp1$
Dim strarrOutput(0 To 4) As String
Dim strOutput As String
Dim intLength As Integer
Dim j As Integer

On Error GoTo Read32BitHandler

timeoutval& = 1000 '1 sec 1000 is 1 seconds
timedOut% = False 'Firmware is calculating
initialTicks& = GetTickCount()
Do
    DoEvents
    nowTicks& = GetTickCount()
    If (nowTicks& - initialTicks&) > timeoutval& Then
        timedOut% = True
    End If
    ByteNum& = Commctl.InBufferCount
Loop Until (ByteNum& = 29) Or (timedOut% = True)

'input mode of the comm port is binary
tempacp$ = CStr(Commctl.Input)

'The buffer will return 5 bytes: the 4-byte parameter followed by
'the operation complete byte (#255). In the routine below, only the
'first 4 bytes are read (dropping the operation complete byte of #255)

'read the 4 bytes (or 32-bits) (if 64-bit info needs to be read, use j=0 to 7)

For j = 0 To 3
    tempacp1$ = AscB(MidB(tempacp$, j + 1, 1))
    strarrOutput(j) = Hex$(tempacp1$)
    intLength = Len(strarrOutput(j))
    If intLength < 2 Then
        strarrOutput(j) = "0" + CStr(strarrOutput(j))
    Else
        strarrOutput(j) = CStr(strarrOutput(j))
    End If
Next j
```



```
'32-bit output in hex
strOutput = CStr("&H" + strarrOutput(0) + strarrOutput(1) + strarrOutput(2) +
strarrOutput(3))

'32-bit output in decimal
strOutput = CStr(CDec(strOutput))

Read32Bit% = True

Exit Function

Read32BitHandler:
msgbox = "ERROR" + Chr(10) + "tempacp$ = " + tempacp$ + Chr(10) + Err.Number
+
Chr(10) + Err.Description
Read32Bit% = False

End Function
```

```
'CONVERSION TO SIGNED 32-BIT FUNCTION
Public Function ConvertDoubleToFourSigned(Value As Double) As String
' DSB 07242000
Dim ReturnBuffer As String
' Description : This procedure will convert a double precision floating
' point number to a string
'
' Parameters : Value Number to be converted
'
' Returns : ReturnBuffer Converted number

On Error GoTo ConvertDoubleToFourSignedHandler
ReturnBuffer = ChrB$(0) + ChrB$(0) + ChrB$(0) + ChrB$(0)
ConvertDoubleToFourSigned = ReturnBuffer
If Value# < 0 Then
' DSB
Value = Value + 2 ^ 32
' DSB
End If
' DSB
If Value# < 4294967296# Then
MidB$(ReturnBuffer, 1, 1) = ChrB$(Int(Value# / 16777216))
' 2 to the 24
Value# = Value# - 16777216# * (AscB(MidB$(ReturnBuffer, 1, 1)))

MidB$(ReturnBuffer, 2, 1) = ChrB$(Int(Value# / 65536))
' 2 to the 16
Value# = Value# - 65536# * (AscB(MidB$(ReturnBuffer, 2, 1)))
MidB$(ReturnBuffer, 3, 1) = ChrB$(Int(Value# / 256))
' 2 to the 8
Value# = Value# - 256# * (AscB(MidB$(ReturnBuffer, 3, 1)))
MidB$(ReturnBuffer, 4, 1) = ChrB$(Int(Value#))
' 2 to the 0
End If
ConvertDoubleToFourSigned = ReturnBuffer
Exit Function

ConvertDoubleToFourSignedHandler:
ConvertDoubleToFourSigned = ChrB$(0) + ChrB$(0) + ChrB$(0) + ChrB$(0)

End Function
```

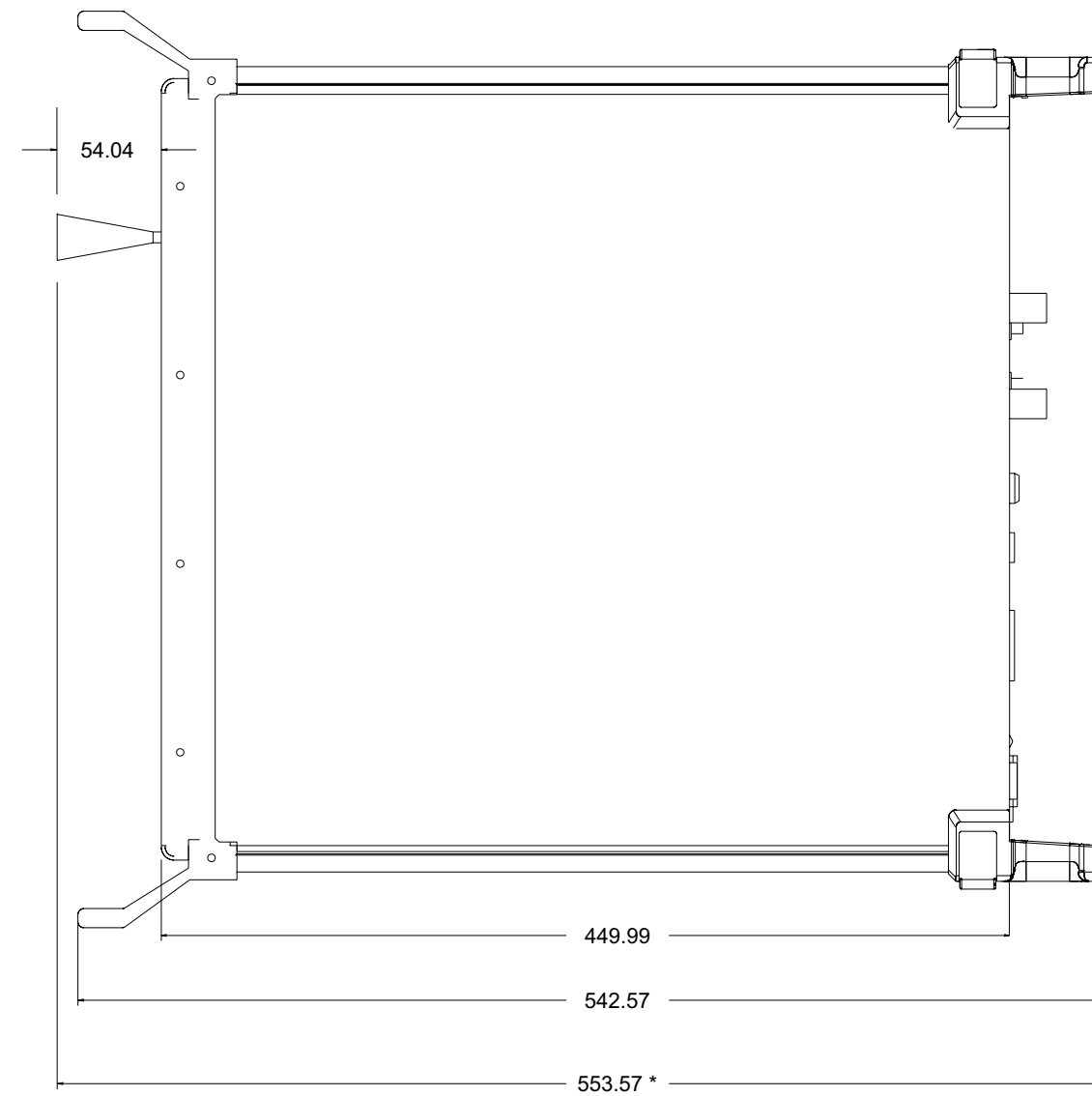
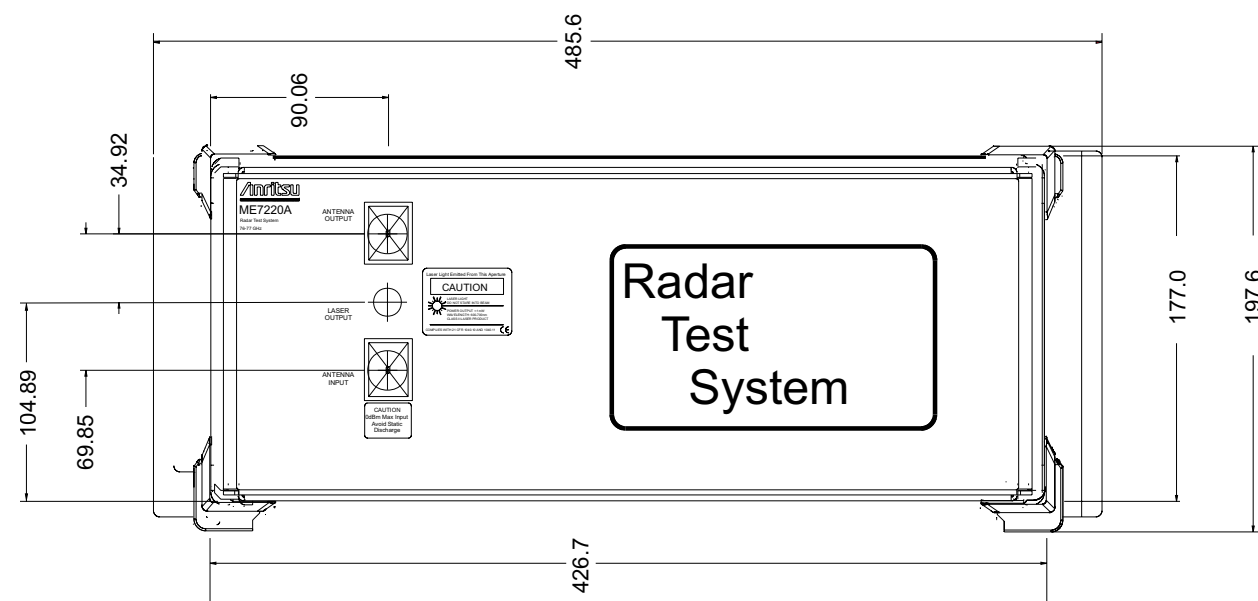
# ***Appendix A***

## ***Dimensional Drawings***

### ***A-1 INTRODUCTION***

This appendix provides dimensional drawings of the ME7220A Radar Test System main and display modules. Dimensions are noted in millimeters.





\* This dimension will increase by 38 mm with installation of Options 2A, 2B or 2C, and by 51 mm with Option 3A.

**Figure A-1.** Main Module Dimensional Drawing

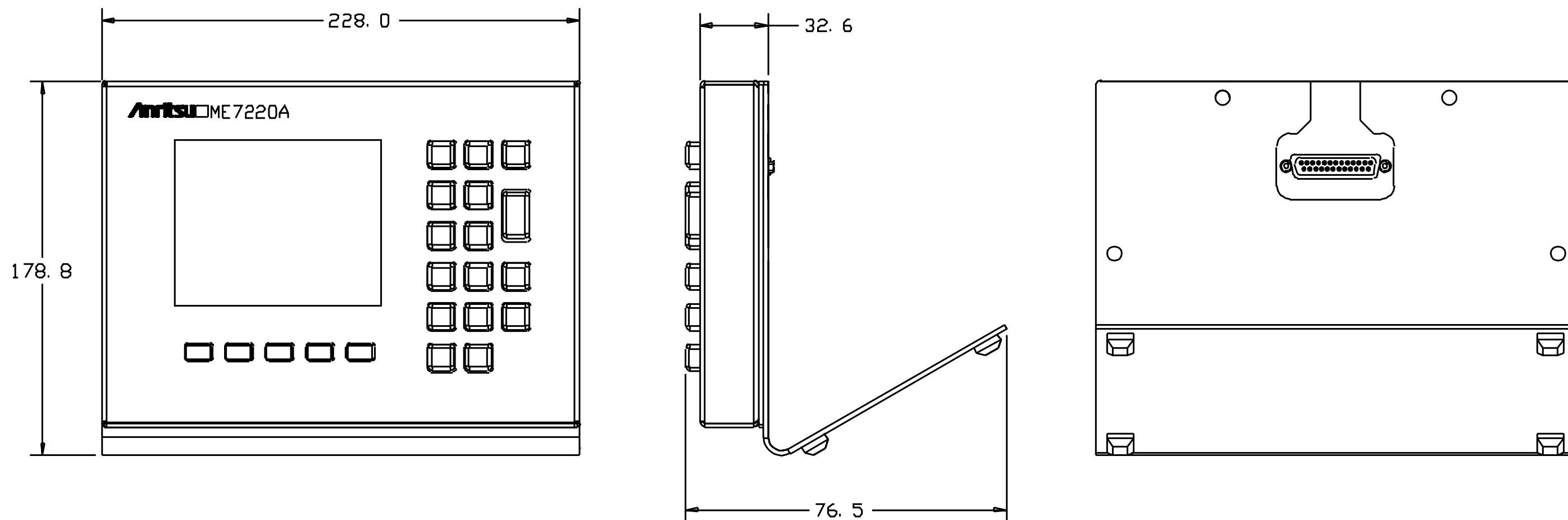


Figure A-2. Display Unit Dimensional Drawing



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