

COAXIAL DYNAMICS, INC.

SPECIALISTS IN RF TEST EQUIPMENT AND COMPONENTS



The Expediter™ Model 83550 Digital Wattmeter RF AnaDigit System™



INSTRUCTION MANUAL

PRECAUTIONS

HIGH VOLTAGE WARNING

When operating this equipment in conjunction with RF power of 200 Watts or higher, the potential of the RF line section center conductor will be 100 Volts or higher. **DO NOT** contact the center conductor. **DO NOT** attempt any maintenance without first disconnecting all RF power. Failure to do so may result in serious or fatal electrical shock.

CAUTION

During maintenance using any cleaning solvents or solutions, assure that there is adequate ventilation to protect personnel from breathing any irritable or possibly toxic fumes.

SPECIFICATIONS

Model 83550 RF AnaDigit System

POWER RANGE:	100 mW to 10 KW, CW or Peak
FREQUENCY RANGE:	0.45 MHz to 2300 MHz
INSERTION VSWR:	1.05:1 Max, with Type "N" Connectors
IMPEDANCE:	50 ohms
ACCURACY:	Average Mode: $\pm 5\%$ of Full Scale Peak-Pulse or Envelope-Power Mode: $\pm 7\%$ of Full Scale
OVER RANGE MEASUREMENTS:	130% of Full Scale
DISPLAY UPDATING:	Normal: 2/Second Fast: 4/Second
POWER SUPPLY:	Rechargeable Nickel Cadmium Battery Pack 4.8 VDC 1.3 AH
BATTERY CHARGER:	Input: 110/220 VAC 50/60 Hz Output: 5.8 VDC 125 MA
TEMPERATURE RANGE:	Operating: -20°C to $+50^{\circ}\text{C}$ Storage: -50°C to $+80^{\circ}\text{C}$
NOMINAL DIMENSIONS:	$8\frac{3}{4}$ (22.23 cm) L x $7\frac{5}{8}$ (19.37 cm) W x $3\frac{1}{4}$ (8.26 cm) H
WEIGHT:	$4\frac{1}{2}$ lbs (2.04 kg)
FINISH:	Textured Blue & Tan Polane® T Polyurethane Enamel

INTRODUCTION

The Coaxial Dynamics RF AnaDigit System is designed to be an integral component in RF transmitter systems. It is designed to be used with 50 ohm dual socket line sections (supplied with Model 83550). The frequencies and power levels are determined by the elements used. Refer to Section 1.3 for more information on element and line sections. Table 1 lists the specifications for the unit.

This manual is supplied for use as an aid in understanding and performing installation, operation and maintenance procedures for the RF AnaDigit System.

The Coaxial Dynamics RF AnaDigit System is made with high quality, dependable components and workmanship. Used and maintained properly, it should provide years of dependable service.

SECTION 1 - GENERAL INFORMATION

1.1 DESCRIPTION

The portable Model 83550 RF AnaDigit System is a microprocessor controlled directional RF wattmeter with numerous quick responding features for examination of power transfer measurements from transmitter to load. Applications include investigating radio transmission facilities using 50 ohm output networks for Continuous Wave (CW), Amplitude Modulated (AM), Frequency Modulated (FM), and television signals. A low insertion Voltage Standing Wave Ratio (VSWR) is essential to measurement accuracy for these facilities. The Model 83550 maintains a VSWR less than 1.05:1 over its operating frequency range, 0.45 MHZ to 2300 MHZ.

This multi-function wattmeter, line section ($\frac{7}{8}$ inch supplied), and a set of frequency/power discriminating plug-in elements form an analytical RF power measuring system. Capabilities include measurement of absolute or relative power (Average or Peak) in coaxial transmission line and selection of VSWR or Return Loss (RL). Transmitter tuning can be done utilizing the instrument's quasi-analog mode. Also, while tuning, the wattmeter can store a consequent maximum or minimum power value and display it on demand.

NOTE: Model 83550 will measure either average or peak power depending upon the switch selection.

1.2 SUPPLIED EQUIPMENT

The Model 83550 RF AnaDigit System is supplied with and LCD display, $\frac{7}{8}$ inch dual socket line section (CDI Model 88500-2), built-in rechargeable DC power supply, and charger. The unit's line section is normally supplied with two (2) Type "N" Female RF Quick Match connectors.

1.3 REQUIRED/OPTIONAL EQUIPMENT (NOT SUPPLIED)

The Model 83550 RF AnaDigit System is supplied complete with the exception of two (2) plug-in elements. The unit's dual socket line section requires a forward power element and a reflected power element. We suggest using a 10:1 ratio for element selection (ie., 10 KW forward and 1 KW reflected). Our 82000 Series plug-in elements cover a wide range of power levels and frequencies. These elements are designed to work with the unit's $\frac{7}{8}$ inch line section. Refer to Schedules 1 thru 4 for element selection.

The unit's line section is normally supplied with two (2) Type "N" Female RF Quick Match connectors. However, other types are available. Refer to Schedule 6 for connector selection.

Schedule 1

82000 SERIES STANDARD ELEMENTS (30 μ A) FOR 7/8" SYSTEM

Power Range (Watts)	Frequency (MHZ)							
	2-30	25-60	50-125	100-250	200-500	400-1000	950-1300	1100-1800
5		82012	82020	82028	82036	82045	82068	82079
10		82013	82021	82029	82037	82046	82069	82080
25		82014	82022	82030	82038	82047	82070	82081
50	82004	82015	82023	82031	82039	82048	82071	82082
100	82005	82016	82024	82032	82041	82049	82072	82083
250	82006	82017	82025	82033	82042	82050	82073	
500	82007	82018	82026	82034	82043	82051	82074	
1000	82008	82019	82027	82035	82044	82052	82075	
2500	82009							
5000	82010							

Schedule 2

82000 SERIES (30 μ A) HIGH POWER ELEMENTS FOR 7/8" SYSTEM (PEAK ONLY)

Power Range (Watts)	Frequency (MHZ)					
	2-30	25-60	50-125	100-250	200-500	400-1000
2500		82053	82054	82055	82056	82057
5000		82058	82059	82060	82061	82062
10000	82011	82063	82064	82065	82066	82067

Schedule 3

MILLIWATT ELEMENTS (30 μ A)

100 Milliwatt	Catalog Number	250 Milliwatt	Catalog Number	500 Milliwatt	Catalog Number
20-23 MHZ	820A022	70-80 MHZ	820B075	25-30 MHZ	820C028
44-50 MHZ	820A047	72-76 MHZ	820B074	65-90 MHZ	820C078
62-70 MHZ	820A066	105-120 MHZ	820B113	72-76 MHZ	820C074
72-76 MHZ	820A074	130-150 MHZ	820B140	105-120 MHZ	820C113
105-120 MHZ	820A113	150-180 MHZ	820B165	130-170 MHZ	820C150
125-136 MHZ	820A130	310-350 MHZ	820B330	240-290 MHZ	820C265
135-165 MHZ	820A150	416-436 MHZ	820B426	300-350 MHZ	820C325
160-175 MHZ	820A167	800-900 MHZ	820B850	450-470 MHZ	820C460
190-205 MHZ	820A198	900-950 MHZ	820B925	800-900 MHZ	820C850
310-350 MHZ	820A330			900-950 MHZ	820C925
400-420 MHZ	820A410				
450-470 MHZ	820A460				
740-760 MHZ	820A750				
800-900 MHZ	820A850				

Schedule 4

LOW POWER ELEMENTS (30 μ A)

1 Watt	Catalog Number	2.5 Watt	Catalog Number
28-44 MHZ	820D036	60-80 MHZ	820E070
40-50 MHZ	820D045	80-140 MHZ	820E110
44-70 MHZ	820D057	95-150 MHZ	820E123
70-120 MHZ	820D095	150-250 MHZ	820E200
108-118 MHZ	820D113	200-300 MHZ	820E250
108-181 MHZ	820D145	225-400 MHZ	820E313
150-250 MHZ	820D200	275-450 MHZ	820E363
200-300 MHZ	820D250	340-560 MHZ	820E450
275-450 MHZ	820D363	800-950 MHZ	820E875
310-350 MHZ	820D330		
327-543 MHZ	820D435		
425-850 MHZ	820D638		
800-950 MHZ	820D875		

Schedule 5

STANDARD 50 OHM DUAL SOCKET LINE SECTIONS

Model Number	Description	Model Number	Description
88500-2	7/8" (CONNECTORS NOT INCLUDED)	88518	4-1/16" SWIVEL FLANGED E.I.A.
88514	1-5/8" SWIVEL FLANGED E.I.A.	88519	4-1/16" UNFLANGED
88515	1-5/8" UNFLANGED	88519-2	4-1/16" UNFLANGED RECESSED
88515-2	1-5/8" UNFLANGED RECESSED	88520	6-1/8" SWIVEL FLANGED E.I.A.
88516	3-1/8" SWIVEL FLANGED E.I.A.	88521	6-1/8" UNFLANGED
88517	3-1/8" UNFLANGED	88521-2	6-1/8" UNFLANGED RECESSED
88517-2	3-1/8" UNFLANGED RECESSED		

Schedule 6

STANDARD QUICK MATCH RF CONNECTORS

Model Number	Description	Model Number	Description
88000	N FEMALE	88012	TNC MALE
88001	N MALE	88013	HN FEMALE
88002	BNC FEMALE	88014	HN MALE
88003	BNC MALE	88020	SMA FEMALE
88004	UHF FEMALE (SO-239)	88021	SMA MALE
88005	UHF MALE (PL-259)	88022	1-5/8" SWIVEL FLANGED
88006	LC FEMALE	88023	1-5/8" FIXED FLANGED
88007	LC MALE	88024	QM CONNECTOR COUPLING BLOCK
88008	C FEMALE	88026	MINIATURE UHF FEMALE
88009	C MALE	88027	SC FEMALE
88010	7/8" SWIVEL FLANGED	88028	SC MALE
88011	TNC FEMALE		

1.4 THEORY OF OPERATION

1.4.1 Traveling Wave Concept

The operation of this wattmeter is based upon the traveling wave concept of RF transmission. As RF is applied to a transmission line, there is a forward wave traveling from the transmitter to the load, and a reflected wave traveling from the load to the transmitter. The closer the load is matched to the transmission line, the smaller the reflected wave will be. To determine RF power dissipated in the load, it is necessary to determine the RF power of the forward wave and the RF power of the reflected wave. The difference between the two will indicate power absorbed by the load.

1.4.2 Voltage Standing Wave Ratio (VSWR)

VSWR is an index of the magnitude of the mismatch between the power source and the load. The interference between forward and reflected waves produces a standing wave in the system. VSWR is a widely used tool. There is a simple relation between forward power, reflected power and VSWR:

$$\text{VSWR} = \frac{1 + \sqrt{\frac{\text{RFL POWER}}{\text{FWD POWER}}}}{1 - \sqrt{\frac{\text{RFL POWER}}{\text{FWD POWER}}}}$$

The RF AnaDigit System performs this calculation when **VSWR** is pressed. For example, 1% reflected power is about 1.2:1 VSWR and 10% is about 2.0:1 VSWR.

1.4.3 Sensing Power

When the RF AnaDigit System is inserted in a transmission line, the RF power flows through a precision 50 ohm air line section. The two (2) sensing elements installed in the dual socket line section couple capacitively and inductively to the main line. Voltages proportional to the RF power in the main line are therefore induced in the element's circuitry. The elements have been designed with high DIRECTIVITY - the ability to differentiate between forward and reflected power flow. The orientation of the element in the line section determines its direction of sensitivity. By inserting two (2) elements with their position indicating arrows in opposite directions, both forward and reflected power are simultaneously sensed. The consequently induced voltages are rectified and the resulting DC currents become the data input to the RF AnaDigit System.

SECTION 2 - INSTALLATION

2.1 UNPACKING AND VISUAL INSPECTION

The unit should be handled and unpacked with care. Inspect outer carton for evidence of damage during shipment. *Claims for damage in shipment must be filed promptly with the transportation company involved.*

After unpacking the instrument, conduct a thorough inspection of the unit, paying particular attention to the glass-faced Liquid Crystal Display. Please report equipment shortages or any damages to your dealer or to the factory immediately.

2.2 POWER REQUIREMENTS

The RF AnaDigit System has been supplied with a built-in rechargeable DC power supply. The unit has been fully charged at the factory prior to shipment. Before attempting operation of the unit, the charge status of the battery pack should be checked in accordance with the instructions given in Section 3.1.

2.3 INTERCONNECTIONS

The RF AnaDigit System, a line section, and a pair of elements make up the measurement system. Either a local or remote line section must be connected to the wattmeter in order to make measurements.

With the Model 83550 connections may be made directly to the RF Quick Match connectors mounted on the supplied $\frac{7}{8}$ inch line section. Make connections with any suitable coaxial cable of 50 ohm impedance. Use of cables other than those of 50 ohm impedance for interconnections causes an impedance mismatch which consequently introduces inaccuracies in measurements.

Supplied with the RF AnaDigit System is an AC line-operated battery charger. The charger conveniently plugs into the "Micro-Jack" connector on the rear of the instrument.

2.4 ENVIRONMENTAL CONDITIONS

The operation of the RF AnaDigit System should be kept within the temperature range of -20°C to $+50^{\circ}\text{C}$. The may be stored within a temperature range of -50°C to $+80^{\circ}\text{C}$.

SECTION 3 - OPERATION

3.1 KEYPAD LAYOUT

The keypad (Figure 1) consists of three (3) main sections - RANGE, MULTIPLIER and FUNCTIONS. The RANGE allows for both forward and reflected power scales to be entered. MULTIPLIERS may or may not be used depending on whether or not your full scale range is a multiple of the power scale you designated. After building your full scale ranges, the FUNCTIONS keys will be activated for your use.

At the same time, the functions of the dual-purpose MULTIPLIER keys are activated:

BAT✓ Battery voltage check and display
RNG✓ Full scale range check and display
ANLG Analog mode
FST Fast mode

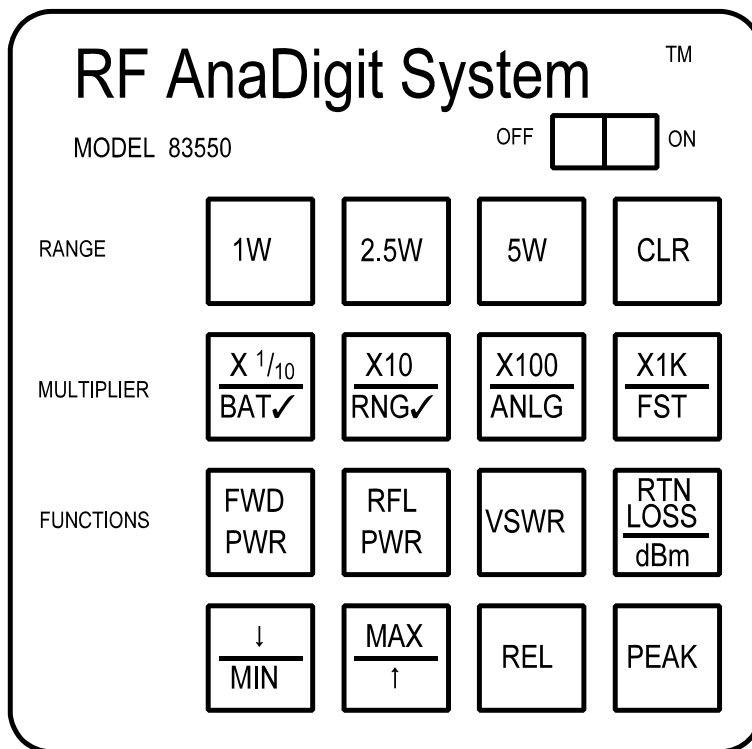


Figure 1 - Keypad

3.2 POWER UP SEQUENCE

After switching the power on the RF AnaDigit System autodiagnoses the keypad, RAM, voltages, and then displays all of its annunciators, digit segments and decimals for review (See Figure 2).

If the battery is low, the "BAT" annunciator will come on - steady, not flashing. There is approximately one-half (½) hour of charge left, but it should be recharged at your earliest convenience. A flashing "BAT" annunciator means a battery voltage too low to reliably drive the microprocessor - recharge the battery as soon as possible. This autodiagnosis is continuously performed whenever the unit is on. The actual battery voltage be displayed at your request by pressing the "BAT✓" key.

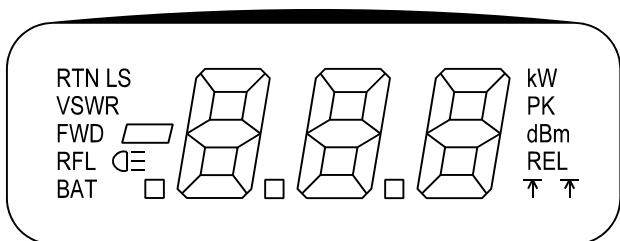


Figure 2 - Liquid Crystal Display

3.3 KEYPAD FUNCTIONS

3.3.1 The First Row - **Range**

Following the above power up sequence, the "FWD" annunciator will begin to flash indicating that the forward power scale can now be entered. The power scale of the forward element is entered by pressing one of the three range keys - "1W", "2.5W" or "5W". The "FWD" and "RFL" annunciators will now alternately flash. Complete entering the forward full scale range by going to the MULTIPLIERS. Or, if a multiplier is not needed to build the forward full scale range, the reflected power scale can be entered just by pressing another range key.

Pressing the "CLR" key will remove all previous entries from the unit's memory and take you back to the beginning.

3.3.2 The Second Row - **MULTIPLIER**

Pressing a multiplier key programs the full scale range for one of the fifteen (15) scales available from 100 mW to 5 KW. If the "X1/10" or "X1K" key is pressed, the "FWD" annunciator will extinguish and only "RFL" will flash. This indicates that the reflected full scale range be built to a value that matches any element you have. If you happen to have an element that is 1/10 your forward full scale range, just go on to the FUNCTIONS. The RF AnaDigit System programs itself automatically to the 1/10 value.

There are also three (3) more scales available from 10 KW to 50 KW. These are programmed by pressing the "X10" or "X100" keys first (the "FWD" and "RFL" annunciators will continue alternating) and then the "X1K" key. At this point, only the "RFL" annunciator will flash indicating that the reflected full scale range can be programmed.

3.3.3 The Second Row - **FUNCTIONS**

Pressing the "BAT✓" key measures and displays the battery voltage on demand. Battery voltage is normally monitored automatically, and the "BAT" annunciator used to give its status. The "BAT✓" key can be used at any time, regardless of the function or mode being used.

The "RNG✓" key calls up the forward and reflected full scale ranges that you programmed and displays each - no matter what function or mode you're in. The unit goes right back to work after the battery check or range check as though the check never happened.

The "ANLG" key sets up the display, using digit segments and decimals, for a quasi-analog presentation in place of the normal LCD display. More details regarding the "ANLG" mode are discussed in Section 3.6.

Pressing the "FST" key puts you in the fast mode for critical tuning where frequent updates are required. The unit will give you four (4) updates per second instead of the usual two (2) per second in order to catch that optimum peak.

3.3.4 The Third Row - **FUNCTIONS**

Pressing any key in this row puts you in that function automatically, cancels the multiplier function, and activates the other functions on these keys. Forward and reflected power is displayed in watts with the units shown on the display. These values can be converted to dBm by pressing the dual function "RTN LOSS-dBm" key.

3.3.5 The Fourth Row - **FUNCTIONS**

Pressing the "MIN" key activates the minimum mode which constantly monitors the Third Row Function and remembers the lowest value measured. The "↓" annunciator in the display will flash while in this search mode. To recall the value from memory, press the key again. The value will be displayed, the "↓" annunciator will stop flashing, and the lowest value measured will be displayed.

The "MAX" key works just the opposite way. The highest value the unit sees will be stored in memory while "↓" is flashing. Press key again to display that value and the "↓" annunciator will stop flashing. Press the Third Row Function and tune for the absolute value or enter the "REL" mode.

To exit either "MIN" or "MAX", just press another function.

Pressing the "REL" key activates the relative mode of the Third Row Function. This mode, when entered, takes the value in the display, stores it in memory, subtracts the measured value from it, and displays the difference. "REL" can be entered from any of the Third Row Functions or from the minimum or maximum modes. In the latter case, just call the stored minimum or maximum value to the display by pressing "MIN" or "MAX" and then hit "REL". Now tune for a zero display and automatically peak your gear.

Pressing the "PEAK" key activates the peak mode. In the peak mode the RF AnaDigit System will measure peak power in most amplitude and pulse modulated systems. To determine peak power, first enter the forward power scale as indicated in the beginning of Section 3.3. Next, press the "PEAK" key. The "PK" annunciator will come on and the unit is now in the peak mode. Energize the transmitter and read peak power directly from the display. All of the unit's functions may be used in the peak mode. To return to the average mode, press the "PEAK" button again.

NOTE: In full carrier systems (CW and FM) peak power and average power will be the same.

3.4 OVER RANGE CAPABILITY

The Coaxial Dynamics elements are accurate power detecting devices considerably beyond the range analog meters can show. The RF AnaDigit System is programmed to extend your elements to 130% of rated power and give you accurate measurements. Between 100% and 130% over range the display is flashed indicating accurate readings but at an over range condition. The need for higher power elements is indicated by displaying *FrdHLP* or *rFLHLP* for forward high level power or reflected high level power respectively.

3.5 DISPLAYED UNITS AND FLOATING DECIMAL POINT

In order to provide you with the most meaningful accuracy, a floating point package is added to the system. So, even if you're using a 1 KW element and RF power drops down to 10 W, the RF AnaDigit System automatically compensates for you. It drops the "KW" unit, uses W, and moves the decimal as required to maintain full display accuracy. This gives you 3 digit accuracy over 6 orders of magnitude computed internally with 5 digits over 27 orders of magnitude.

3.6 ANALOG MODE OPERATION

The analog mode works with "MIN", "MAX" and "REL" and gives you a quasi-analog presentation of the function in use. The display still shows all the function, mode and unit annunciators, but the digit segments are used differently.

After selecting a function and minimum, maximum or relative mode, press the "ANLG" key for fast tuning with the analog display. Forward and reflected functions set each segment equal to 5% of the full scale ranges that you entered. VSWR sets each segment equal to .05; return loss uses 3 dB steps.

If you're tweaking your final for maximum power, you will be in the "FWD" function, with either "W" or "KW" for units and the "↑" annunciator flashing indicating a search for maximum. Press the "ANLG" key and the value in the display is stored in memory, the digits disappear, and the first digit segment on the left comes on and is set to equal the value that was displayed.

As you increase your output power, additional segments will come on in proportion to the full scale range you programmed earlier. This snake-like line will continue to grow until you pass the peak. As your power decreases, the snake will shrink. At this point, tune for "max snake" and

- 1) press "ANLG" to continue the search with digits
OR
- 2) press "MAX" to see the maximum value achieved
OR
- 3) consider the job done and press another function.

If, while tuning in the analog mode, the measured value goes below the value used for that first segment, the decimal farthest to the left will begin flashing. This indicates that your output power is producing minimum values rather anything in the maximum direction. On the other hand, the segment farthest to the right will flash when the snake uses all segments and outgrows the display. Reset the snake by pressing "ANLG". This displays the measured value. Press "ANLG" again, and the left segment now represents the value that was displayed.

"MIN" works just the opposite of this. Analog mode sets the second segment equal to the displayed value and the snake grows to the left as the measurements become smaller.

"REL" sets the top segment of the center digit equal to the displayed value. As the measured value increases, the snake grows to the right. Smaller values grow it to the left.

Both "MIN" and "REL" can be reset as was done "MAX" when the displayed range is exceeded. An absolute analog display can also be established in these three analog modes. Just make sure the displayed value is zero when entering "ANLG". This sets the reference segment to represent values between 0 and 5% of full scale. The second segment would be between 5% and 10%. If a 100 W element is used, only the first segment would be on for levels up to 5 W. The second segment would then come on with power levels from 5 W to 10 W and so on through the snake.

3.7 TYPICAL MEASUREMENT PROCEDURE (EXAMPLE)

Assume a 100 W maximum power source at 50 MHz. Select two (2) elements for the 25 to 60 MHz frequency range (100 W forward element and 10 W reflected element). Begin building the forward full scale power range by first pressing the "1W" key and then the "X100" multiplier key. Similarly, build the reflected full scale power range by first pressing the "1W" key and then the "X10" multiplier key. Alternatively, the 10 W reflected power range could have been entered automatically by simply pressing the "FWD PWR" key immediately after building the forward power range. NOTE: This is possibly because of the 10:1 sensitivity difference between the two selected elements. If the reflected power element was 5 W, then the reflected full scale power range would have to be built as done above. Pressing "FWD PWR" yields an immediate forward power reading. Reflected power may be displayed by pressing "RFL PWR".

To obtain the systems VSWR simply press "VSWR". Some operators prefer using Return Loss for the indication of match between power source and load. To display Return Loss in dB, first press "VSWR", then press "RTN LOSS".

3.8 BATTERY CHARGING

A flashing "BAT" annunciator on the display indicates that the battery pack's charge is near depletion. To reach full capacity, 12-14 hours of charging time is required. The provided battery charger operates 110/220 VAC 50/60 Hz line source. The charger's output is connected to the battery pack via a "Micro-Jack" connector on the rear of the unit.

The RF AnaDigit System may be operated while charging. However, it may be necessary to wait a few minutes for a "surface charge" to build up on the battery pack before operating the unit. For maximum battery life, it is recommended that the battery pack be allowed to fully discharge periodically before recharging. This is standard operating procedure for nickel cadmium batteries.

SECTION 4 - MAINTENANCE

HIGH VOLTAGE WARNING

When operating this equipment in conjunction with RF power of 200 Watts or higher, the potential of the RF line section center conductor will be 100 Volts or higher. **DO NOT** contact the center conductor. **DO NOT** attempt any maintenance without first disconnecting all RF power. Failure to do so may result in serious or fatal electrical shock.

CAUTION

During maintenance using any cleaning solvents or solutions, assure that there is adequate ventilation to protect personnel from breathing any irritable or possibly toxic fumes.

4.1 SCOPE OF MAINTENANCE

Maintenance of the RF AnaDigit System is normally limited to cleaning. The amount of cleaning necessary can be minimized by keeping the plug-in elements in the line section sockets as much as possible. This serves as an effective seal against the entry of dust and dirt. Cover the socket openings when the elements are removed. Also, protect the RF connectors on the line section against the entry of dust and dirt by keeping them connected to the line section or by covering them when the line is disconnected.

4.2 CLEANING

Clean the inside of the line section socket bore and the entire circumference of the plug-in element with a cotton swab dampened with alcohol. Pay particular attention to the cleaning of the bottom rim of the element body and to the seat of the line section socket. When cleaning the socket bore, take care not to disturb the DC contacts.

Check the inside of the line section for dirt and contamination. Clean the reachable portions of the line section with a cotton swab. Blow out the remaining dirt with low-pressure, dry, compressed air. **DO NOT** attempt to remove the RF center conductor from the line section. Any attempt to remove it will ruin the assembly.

4.3 TROUBLE SHOOTING

Refer to Table 2 for a listing of troubles that might occur during operation of the unit. Probable causes and remedies for the troubles are also listed.

TROUBLE SHOOTING CHART

Model 83550 RF AnaDigit System

TROUBLE	PROBABLE CAUSE	REMEDY
BLANK DISPLAY	Battery pack charge depleted	Recharge battery pack
"000" POWER DISPLAYED	Element not seated properly No RF power No pick-up from DC contact in line section	Reposition element Check transmitter for faults Check alignment of contact
INTERMITTENT OR INCONSISTENT ME- TER READINGS	Faulty load Faulty transmission line Dirty DC contacts	Correct fault in load Correct fault in transmission line Clean DC contacts
HIGH PERCENTAGE OF RFL POWER	Faulty load Poor connectors Shorted or open transmission line Foreign matter in line section	Correct fault in load Check for high resistance connectors Correct fault in transmission line Clean line section thoroughly

Table 2