



AT-800 ANTENNA TESTER

OPERATION MANUAL

Safety Precautions

The following are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and apply to all phases of operation and maintenance.

WARNING

Keep Away From Live Circuits

Operating Personnel must at all times observe general safety precautions. Do not replace components or make adjustments to the inside of the test equipment with the high voltage supply turned on. To avoid casualties, always remove power.

WARNING

Shock Hazard

Do not attempt to remove the RF transmission line while RF power is present.

WARNING

Do Not Service Or Adjust Alone

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

WARNING

Safety Earth Ground

An uninterruptible earth safety ground must be supplied from the main power source to test instruments. Grounding one conductor of a two conductor power cable is not sufficient protection. Serious injury or death can occur if this grounding is not properly supplied.

WARNING

Resuscitation

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

Safety Symbols

WARNING

Warning notes call attention to a procedure, which if not correctly performed, could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed, could result in damage to the instrument.



The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area

Note: *Calls attention to supplemental information.*

Warning Statements

The following safety warnings appear in the text where there is danger to operating and maintenance personnel, and are repeated here for emphasis.

WARNING

Care should be taken when handling batteries.
Do not heat or dispose of batteries in fire. May burst or release toxic materials.
Avoid forced discharge.
Do not short circuit.
Restrict charging current and time to the recommended value.
Do not solder the battery directly.
Do not disassemble, apply excessive pressure or deform.
Avoid placing the battery in reverse polarity.
Battery disposal method should be in accordance with local and state regulations.

See page 30.

WARNING

Replace with **ONLY** Nickel-Metal hydride (NiMH) rechargeable AA batteries with a nominal voltage of 1.2V and minimum capacity of 2000mAh. **DO NOT** install any type of battery such as alkaline or other type of secondary (chargeable) batteries.

On page 34.

WARNING

Charging batteries installed in reverse polarity can cause the battery to swell or rupture.

On page 34.

Caution Statements

The following equipment cautions appear in the text whenever the equipment is in danger of damage and are repeated here for emphasis.

CAUTION

Follow guidelines for battery charging.
Avoid constant charging of batteries for long periods of time.
Overcharging can result in reduced battery efficiency, service life,
and possible permanent damage.

On page 12 and 30.

CAUTION

Required input is 11 to 16 VDC @ 250mA. Connector is wired outside
positive, inside negative.

On page 12.

CAUTION

AVOID STATIC DISCHARGE

Use proper Electrostatic Discharge (ESD) precautions to avoid static
discharge when making connections to the test port. Equipment
failure can occur if the test port is subjected to ESD.

On page 14.

CAUTION

250mW max. input

Exceeding the maximum input will cause damage to internal
components. Do not connect transmitter output to the AT-800.
Damage can also be caused by testing antennas near other
transmitting antennas. If testing base station antennas, first
measure the power at the coax end to be sure it does not exceed
250mW.

On page 14.

CAUTION

Harsh or abrasive detergents and some solvents can damage the
display unit and information on labels.

On page 29.

CAUTION

Replace with only the same type and rating fuse. 315mA 250V

On page 35.

Safety Statements

USAGE

ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENT'S SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIE GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

SERVICE

SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERLO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL.

ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRETIEN

L'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ÊTRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PRÉVENIR UN CHOC ÉLECTRIQUE DANGEREUX, NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A PAS ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

UNITS ARE EQUIPPED WITH RECHAREABLE BATTERIES.

THESE ARE TO BE REPLACED BY AUTHORIZED SERVICE PERSONNEL ONLY!!!

LAS UNIDADES VIENEN EQUIPADAS CON BATERIAS RECARGABLES.

¡¡¡Y SOLAMENTE EL PERSONAL DE SERVICIO AUTORIZADO PUEDE REEMPLAZARLAS!!!

GERÄTE SIND MIT WIEDER AUFLADBAREN BATTERIEN BESTÜCKT.

BATTERIEN SIND NUR VON QUALIFIZIERTEM SERICE PERSONAL AUSZUWECHSELN!!!

CES DISPOSITIFS SONT ÉQUIPÉS DE BATTERIES RECHARGEABLES.

SEUL LE PERSONNEL D'ENTRETIEN AUTORISÉ EST HABILITÉ À LES REMPLACER !

LE UNITÀ SONO DOTATE DI BATTERIE RICARICABILI,

CHE DEVONO DA COME SPECIFICATO DAL PRODUTTORE LA PROTEZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.

RF VOLTAGE MAY BE PRESENT IN RF ELEMENT SOCKET - KEEP ELEMENT IN SOCKET DURING OPERATION.

DE LA TENSION H.F. PEAT ÊTRE PRÉSENTE DANS LA PRISE DE L'ÉLÉMENT H.F. - CONSERVER L'ÉLÉMENT DANS LA PRISE LORS DE L'EMPLOI.

HF-SPANNUNG KANN IN DER HF-ELEMENT-BUCHSE ANSTEHEN - ELEMENT WÄHREND DES BETRIEBS EINGESTÖPSELT LASSEN.

PUEDE HABER VOLTAJE RF EN EL ENCHUFE DEL ELEMENTO RF - MANTENGA EL ELEMENTO EN EL ENCHUFE DURANTE LA OPERACION.

IL PORTAELEMENTO RF PUÒ PRESENTARE VOLTAGGIO RF - TENERE L'ELEMENTO NELLA PRESA DURANTE IL FUNZIONAMENTO.

About This Manual

This manual covers the operating and maintenance instructions for the following models:

AT-800

Changes to this Manual

We have made every effort to ensure this manual is accurate. If you discover any errors, or if you have suggestions for improving this manual, please send your comments to our Solon, Ohio factory. This manual may be periodically updated. When inquiring about updates to this manual refer to the part number and revision on the title page.

Typography

There are two types of keys on the Antenna Tester. A *Hard Key* is a key that has a particular function and it is indicated on the key. These key names are set in a bold typeface, e.g. Press the **MENU** key.

A *Menu Select Key*, (there are five under the display), will have a different label, or name, depending on the selected function. The name will be at the bottom of the display located directly above the corresponding key. These key names are set in a bold Italic typeface, e.g. Press the ***MEAS MATCH*** key.

Chapter Layout

Introduction — Will help you become familiar with the parts of the Antenna Tester, Features Available, and Optional Equipment.

Basic Operation — Everyone should read this section! This section provides information to get the Antenna Tester powered up, helpful information about how to operate the Antenna Tester, and time saving hints for alternate operating methods.

Installation — This chapter contains information on how to connect the AT-800 to antenna systems, and to power sources to charge and operate the unit.

Measure Match — Since the AT-800 Antenna Tester offers a unique method of measuring Antenna Systems we have included the section, "Understanding the Operating Modes." Even if you already know the basics of antenna match testing you might find this section useful. The remainder of the chapter provides step by step instructions for measuring match.

Field Strength — This chapter provides step by step instructions for measuring relative field strength of fixed cellular antennas.

Maintenance — This chapter contains the information required to keep the AT-800 working for you. This includes battery and fuse information, troubleshooting information, parts lists, and specifications.

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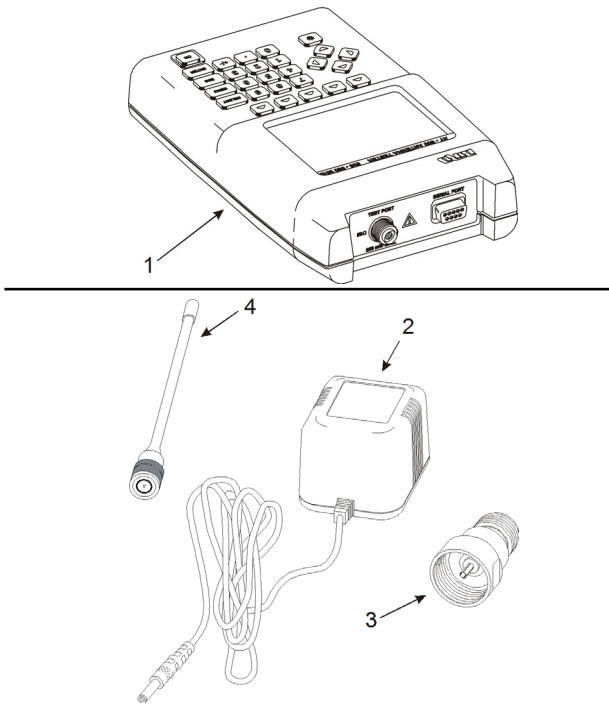
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Items Supplied

Figure 1 Supplied Items



1. Bird AT-800
2. AC Mains Adapter
3. Female TNC Connector
4. Field Strength Antenna
5. Operation Manual (not shown)

Component Description

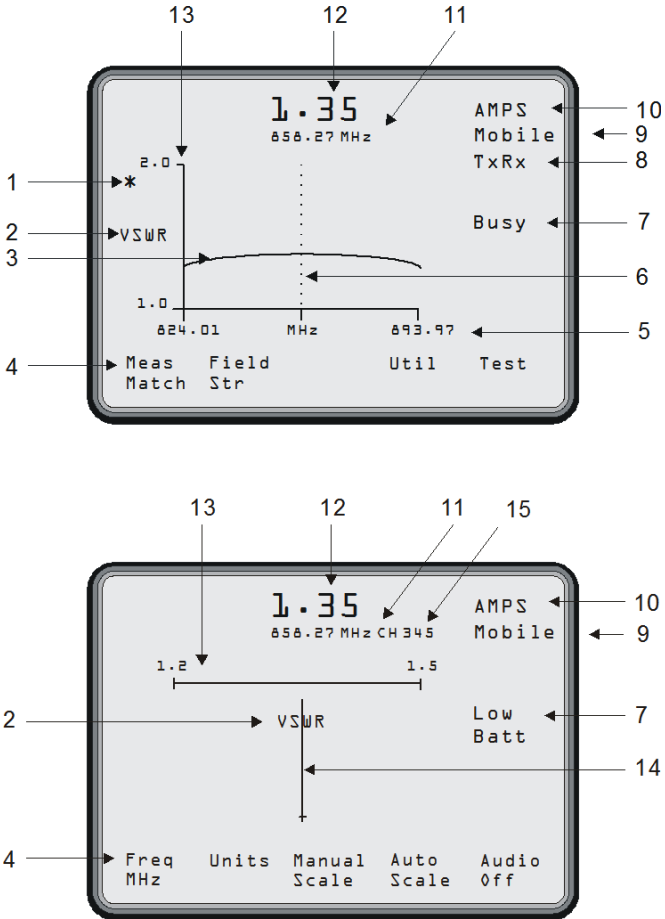
Figure 2 Component Description



1. LCD Display	Backlit liquid crystal display.
2. External DC Connector	Connect either the ac adapter or the cigarette lighter adapter cable. External supplies operate the unit and charge the internal battery.
3. Cursor Keys	
Left Arrow	Press in swept frequency mode to move the cursor to the left. Press during data entry to erase data.
Right Arrow	Press in swept frequency mode to move the cursor to the right.
Up Arrow	Moves the cursor to the maximum point on the displayed trace. Press during data entry to increase numeric data.
Down Arrow	Moves the cursor to the minimum point on the displayed trace. Press during data entry to decrease numeric data.
4. Backlight Key	Turns the backlight on or off. Backlight is on a timer to increase battery life.
5. On Key	Press to turn tester on, press and hold to turn tester off.
6. +/- Key	Toggles between positive and negative numbers.
7. Enter Key	Completes data entry.
8. ESC Key	Back up through menu structure. At the top menu level, blanks menu. Exits data entry without saving changes.
9. Menu Key	Displays software menu and enables menu select keys.
10. Select Key	Allows current parameter, indicated by flashing cursor, to be changed. Press again to enable the next parameter to be changed.
11. Numeric Keys	Input numeric values.
12. Menu Select Keys	Used to access the menu sections described directly above them. Can also be used to scroll through available settings in a particular parameter.
13. Test Port	Connect antenna or antenna lead.
14. Serial Port	Connect communication cable to allow data transfer to a PC.

Display Description

Figure 3 Display Description



1. Sweep Rate Indicator	Blinks when sweeping.
2. Measurement Units	Indicates selected measurement units.
3. Trace	Graphic display of measured results across selected frequency band.
4. Menu Select Key Labels	Defines function of menu select keys located below the display.
5. Frequency Band Scale	Displays frequency band selected.
6. Cursor	Used to select measurement position on the trace.
7. Utility Label	Area for displaying general data (Lo Batt, Busy, Hold, Noise, and test results).
8. Band	Indicates selected band for cellular system defined, (Tx, Rx, TxRx, or User).
9. Base/Mobile Indicator	Indicates Base or Mobile selection.
10. Cellular System	Indicates cellular system selected (AMPS, GSM, PDC, CT-2, CT-2 Korea).
11. Frequency	Selected Frequency (for swept mode this is frequency at the cursor position).
12. Measured Value	Numeric display of measured value (for swept mode this is the value at the cursor position).
13. Scale	Displays user defined measurement scale.
14. Pointer	Moves across scale to show analog indication of measured value.
15. Channel	Channel number corresponding to selected frequency.

Features

Swept Frequency Mode — Fast scan shows Voltage Standing Wave Ratio (VSWR); Reflection Coefficient (ρ); % Match, or Return Loss (dB) across an entire band. A movable cursor can be used to pinpoint a scan frequency and the corresponding measurement value is displayed.

Single Frequency Mode — Provides measurement information in units of VSWR, ρ , match efficiency or return loss at one frequency on a simulated meter movement. An audio generator can be enabled to produce a tone that is proportional to the match condition.

Auto Scaling — Used in either swept or single frequency modes, sets the Y axis for best measurement display.

Relative Field Strength — Verifies output of portable cellular phones with fixed antennas.

Cellular System Presets — Pre-programmed band segments for AMPS, GSM, PDC, CT-2, and CT-2 Korea cellular testing.

Limit Testing — Quick pass-fail indication; compares measurements to user selected limits.

Data Storage — Saves and recalls up to 12 traces to be used to set limit or long term monitoring of antenna performance.

Serial Communication Link — Built in serial port and optional software uploads data to a personal computer for analysis or storage.

Optional Equipment

Automobile Cigarette Lighter Adapter Cable (P/N 5A2238-1) —

Connects tester to standard 12V automotive cigarette lighter jack.

Carrying Case (P/N 5000-030) — Convenient and protective, large enough to carry the tester, AC adapter, connectors, field strength antenna and instruction book.

Verification Kit (P/N 7000A845) — Used to verify tester performance. Includes standard mismatch and connector adapter.

Interface Software (P/N 7000B840) — PC software used to upload trace data for analysis, printing or storage.

Note: *System requirements: IBM PC or equivalent; Windows 95 or later, 6 MB free hard disk space; VGA monitor, open com port. Includes interface cable.*

Getting Started

This section describes initial quick steps to get started. For detailed information regarding connecting the Antenna Tester refer to "[Connecting the Antenna](#)" on page 14

Note: *This unit is shipped with the batteries not charged. Charge batteries for at least 8 hours before use.*



Power On/Off

- To turn the Antenna Tester on, momentarily press the **ON** key. The results of a self test will be displayed if a failure is present. For more information about the self test or a failure, refer to "[Maintenance](#)" on page 29.
- To turn the Antenna Tester off, press and hold the **ON** key for 1 second.



Backlight

- To turn the backlight on, press the **BACKLIGHT** key.
- To increase or decrease display contrast, press and hold the **BACKLIGHT** key while pressing either the **UP** or **DOWN** arrow key.
- To turn the backlight off, press the **BACKLIGHT** key.



Software Menu

- Press the **MENU** key to display the software menu.

Blinking Cursor (black square)

The cursor will be blinking in the selected area, indicating that the parameter for that area can be changed.



Enter Key

All data entry, and mode changes accessed using select key, require the enter key to be pressed before they are initiated.



Up/Down Arrow Keys

When a function is enabled for change, the **UP** or **DOWN** arrow keys can be used to either scroll through choices or increase/decrease the numerical value. The actual increments depend on the function.



Left Arrow Key

The **LEFT** arrow key can be used to backspace, erasing one character at a time, during data entry.



Escape (ESC)

Returns to previous menu without initiating a change.



Select Key

The instructions in this manual are based on stepping through the software menu using the keys below the display. Once comfortable operating the AT-800, it may be faster to use the **SELECT** key to access some functions. These include: Units, Scale, Start and Stop Frequencies in swept frequency mode and Units, Scale, Frequency and Channel in single frequency mode.

Press the **SELECT** key until the cursor is blinking at the desired function. The first function enabled depends on the last function selected through the menu.

Messages

There are five messages that are displayed to inform of equipment, or procedural, conditions.

“Lo Batt”

Displayed when battery voltage is less than 6.6V, refer to "[Charging Batteries](#)" on [page 30](#).

“Busy”

Displayed during mode changes indicating the measurement information is being updated.

“Hold”

Displayed when in the Swept Frequency mode, and Single Hold is the selected sweep type.

“Pass” or “Fail”

Displayed indicating the appropriate results of a limit test.

“Noise”

Displayed if there is excessive background noise measured.

Note: *The measurement may not be accurate. See "[Troubleshooting](#)" on [page 36](#) if this condition is persistent.*

Out of Range Values

When entering numeric data, it is possible to enter a value out of range. Depending on the function, the Antenna Tester will either enter the minimum or maximum value, or the cursor will continue to blink on the function out of range waiting for the correct entry.

Selecting the Cellular System

Select the appropriate cellular system.

1. Press the **MENU** key.
2. Press the **UTIL** key.
3. Press the **CELL SYS** key.
4. Press the appropriate key for the cellular system in use.
5. Press either **BASE** or **MOBILE** depending on the band to be tested.

Setting the Auto Shut-Off Timer

In order to preserve battery life, the Antenna Tester will automatically shut off after 5,15,30 or 60 minutes without any keystrokes.

Follow the steps below to select the length of time, before auto shut-off occurs.

1. Press the **MENU** key.
2. Press the **UTIL** key.
3. Press the **TIMER** key until the desired interval is displayed.

Return to Factory Presets

When the Antenna Tester is turned on, the various software parameters will be set to the condition they were at when the tester was turned off. To return the parameters to the factory setting follow the steps below.

Note: *The parameters will return to these settings:*

Software Parameter	Factory Setting
Cellular System	AMPS Mobile
Frequency Band	User; 806MHz -960MHz
Measurement Units	VSWR
Scale	min. 1.0; max. 5.0
Mode	Swept Frequency
Sweep Type	Continuous
Baud Rate	9600
Auto Shut-off Timer	5
Audio	Off

1. Press the **MENU** key.
2. Press the **UTIL** key.
3. Press the **PRESET** key.

Set Serial Baud Rate

Measurement data can be transferred between the AT-800 and a personal computer using the serial port and optional interface software. The data can then be used for analysis, printed, or stored.

The data transfer rate (baud rate) between the Antenna Tester and computer must be identical and set to 9600. To change the baud rate for the serial port on the Antenna Tester, follow the steps below.

Complete interface software instructions are included with the software.

1. Press the **MENU** key.
2. Press the **UTIL** key.
3. Press the **SERIAL** key.
4. Repeatedly press the **SERIAL** key until the 9600 is displayed.

The following paragraphs will explain how to connect the Bird Antenna Tester for various operations. See "[Component Description](#)" on [page 2](#) if needed.

Power Supply

The AT-800 can use an external power source. Using the ac adapter or the 12V cigarette lighter adapter cable will also charge the battery. Using the ac adapter, charge time is about 8 hours. Using the cigarette lighter adapter cable, charge time will depend on the car battery charge. Battery life is 2 hours continuous operation, minimum, with the backlight on. "Lo Batt" is displayed when the batteries require charging.

Note: *This unit is shipped with the batteries not charged. Charge batteries for at least 8 hours before use.*

CAUTION

Follow guidelines for battery charging. Avoid constant charging of batteries for long periods of time. Overcharging can result in reduced battery efficiency, service life, and possible permanent damage.

Note: *For optimum battery life, only charge the batteries after the low battery indicator is displayed.*

CAUTION

Only use the AC adapter provided with the AT. Do not use the adapter with the batteries removed.

AC Mains Adapter

1. Insert the adapter's barrel connector into the Antenna Tester's DC jack.
2. Insert the adapter plug into a wall receptacle.

CAUTION

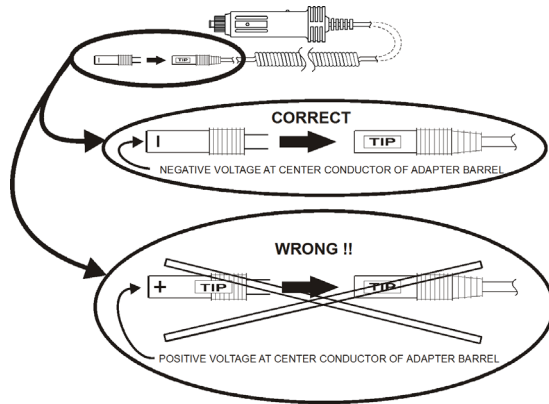
Required input is 11 to 16 VDC @ 250mA. Connector is wired outside positive, inside negative.

Automobile Cigarette Lighter Adapter Cable

Note: Before inserting the adapter's barrel connector into the Antenna Tester's DC jack (Figure 4), verify that the polarity of the adapter barrel is correct (Figure 4). The negative (–) symbol must be adjacent to the word TIP as the center is negative and the outside is positive.

Insert the adapter plug into a cigarette lighter.

Figure 4 Cigarette Lighter Adapter Cable
Tip Connection



Connecting the Antenna



CAUTION
AVOID STATIC DISCHARGE
Use proper Electrostatic Discharge (ESD) precautions to avoid static discharge when making connections to the test port. Equipment failure can occur if the test port is subjected to ESD.



CAUTION
250mW max. input
Exceeding the maximum input will damage the unit. Do not connect transmitter output to the AT-800. Damage can also be caused by testing antennas near other transmitting antennas. If testing base station antennas, first measure the power at the coax end to be sure it does not exceed 250mW.

Antenna leads and the Field Strength Antenna are connected to the test port. A known good RF cable can be used to connect the antenna tester directly to a coupler box, bypassing the antenna system lead. A female TNC connector is provided. Other connectors are available, see Parts List in the maintenance section for more information.

Special consideration must be given to the RF energy present at the feed line of site antennas. At active sites, RF energy from transmitters can be coupled to the antenna under test. If large enough, these signals will cause inaccurate measurements. For best results, the AT-800 should be used with all transmit antennas powered down.

Understanding the Operating Modes

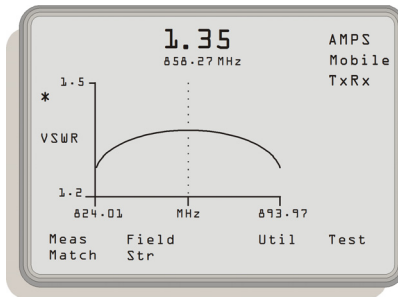
The Antenna Tester is connected and the cellular system is selected (see basic operation). User selections are customized, the power is on, and the top level menu is displayed (also in basic operation).

Since the AT-800 changes the way antennas are tested, take some time to explore the different operating modes and find what is best for individual applications.

Swept Frequency vs. Single Frequency

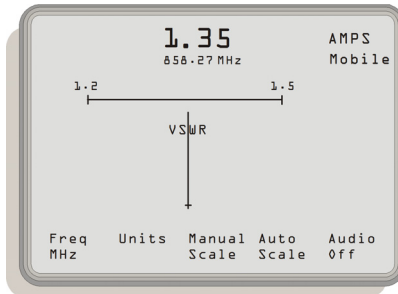
Swept frequency graphically displays the measurement over a band of frequencies. The cursor, a vertical dotted line, can be moved with the arrow keys to pinpoint a particular frequency. The frequency and match value at the cursor position are shown at the top of the display.

Figure 5 Swept Frequency



Single Frequency mode displays the measurement on a simulated analog meter. This mode is useful when tuning an antenna, especially with audio on.

Figure 6 Single Frequency



Band Selection Presets vs. User Defined

In swept frequency mode, band presets ensure the antenna system is tested at the correct frequencies. Selecting transmit (Tx), receive (Rx), or both (TxRx) automatically sets start and stop frequencies for the cellular system and base or mobile selections in the utility menu.

Measurement Units

Rho (Reflection Coefficient), VSWR (Voltage Standing Wave Ratio), Match Efficiency (%), and Return Loss (dB), are different units that present the same information. (Similarly, Celsius and Fahrenheit are different units of measurement for the same temperature). They describe the match quality between an antenna system and a transceiver.

Rho

The ratio of reflected wave voltage to forward wave voltage.

Note: *A perfect antenna would not have any reflected waves and a 0.00 reflection coefficient.*

VSWR

The ratio of maximum and minimum voltages on a transmission line caused by the combination of a forward and reflected wave.

Note: *For a perfect antenna the VSWR would be 1:1 and shown as 1.00.*

Match Efficiency (%)

Indicates how much of the transmitted power is being used and how much is wasted.

Note: *A perfect antenna has a Match Efficiency of 100%.*

Return Loss (dB)

The ratio of the reflected and forward signal in decibels. If the antenna system is perfectly matched, the Return Loss would be negative infinity dB.

Note: *Cellular systems and antenna manufacturers often use VSWR in specs.*

Note: *Match Efficiency is popular for testing because it is easy to determine a good match versus a bad match.*

Example - *A system with a VSWR of 1.50 would show -13.98 dB Return Loss and 96% Match Efficiency.*

Auto Scale vs. Manual Scale

In swept mode Auto Scaling sets the measurement unit scale to make the trace easier to read. However, for quick comparisons of the size or shape of traces, it might be more meaningful to set a standard scale.

Note: *It is possible to set the scale manually so the information is not on the display at all.*

Figure 7 Auto Scaling Swept Frequency Mode

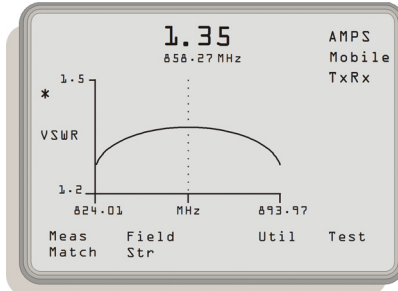
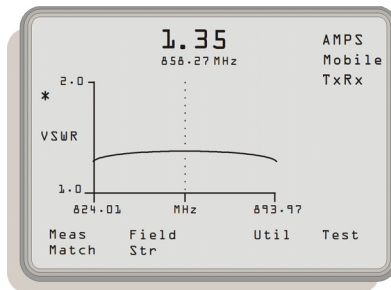


Figure 8 Manual Scaling Swept Frequency Mode



In single frequency mode Auto Scaling sets the scale so the pointer is midrange of the previous reading. The maximum and minimum scale values are approximately 10% higher or lower than the measured value. This setting is an operator preference based on the mode that best presents the desired information.

Figure 9 Auto Scaling Single Frequency Mode

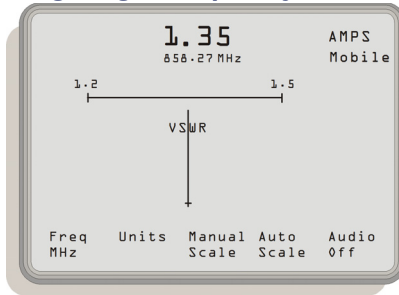
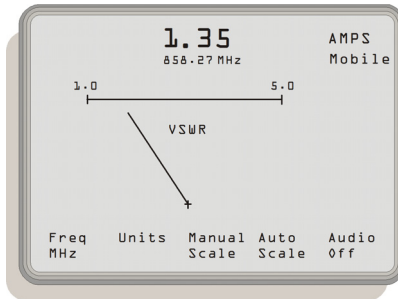


Figure 10 Manual Scaling Single Frequency Mode



Sweep Type – Single Hold vs. Continuous

Continuous sweep continually sweeps the frequency band and updates the value after each sweep. An asterisk (*) blinks on the left side of the display to indicate sweep rate. Single hold mode will freeze a trace on the display and show hold on the right. Holding a trace before saving it is helpful.

Swept Frequency

Select Frequency Band - Presets

With the cellular system selected, the start and stop frequencies can be automatically selected for transmit (Tx), receive (Rx), or both (TxRx).

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **BAND** key.
5. Press **TX** to select transmit band, **RX** for receive band and **TXRX** for both.

Note: *The start and stop frequencies will change and the tester will begin sweeping.*

Select Frequency Band - User Defined

There are two options for selecting the frequency band manually.

- The first is simply to enter the start and stop frequencies.
- The second is to enter a span frequency, which is the desired width of the band, and a center frequency, that will be used as the center of the band.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **BAND** key.
5. Press the **USER** key.
6. Depending on desired method press either **Start Stop MHz** or **Center MHz**:

Start Stop MHz

The cursor will blink on the start frequency and Start Stop MHz will be highlighted.

- a. Enter the frequency using the numeric keypad or change the frequency using the **UP/DOWN** arrow keys.
- b. Press the **ENTER** key.

Note: *The cursor will blink on the stop frequency.*

- c. Enter the frequency using the numeric keypad or change the frequency using the **UP/DOWN** arrow keys.
- d. Press the **ENTER** key.

Note: *The tester will begin sweeping.*

Center MHz

The cursor will blink on the Center frequency and Center MHz will be highlighted.

- a. Enter the frequency using the numeric keypad or change the frequency using the **UP/DOWN** arrow keys.
- b. Press the **ENTER** key.

Note: *The tester will begin sweeping.*

- c. Press the **SPAN** key.
- d. Enter the frequency using the numeric keypad or change the frequency using the **UP/DOWN** arrow keys.
- e. Press the **ENTER** key.

Note: *The tester will begin sweeping.*

Select Measurement Units

Antenna match information can be presented using four different measurement units. Depending on the application, follow the steps below to select Rho, VSWR, %Match or Return Loss.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **MEAS UNITS** key.
5. Press the **UNITS** key.
6. Press either the **RHO**, **VSWR**, **%MATCH** or **RETURN LOSS** key.

Note: *The selected unit will be shown on the left side of the display.*

7. Press **RETURN** to go back one menu level or **MENU** to return to the top menu level.

Select Auto or Manual Scale

Selecting the scale simply sets up how the information will look on the display.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **MEAS UNITS** key.
5. Depending on desired mode press either **AUTO** or **MANUAL SCALE**:

Auto Scale

The units scale changes and the Antenna Tester begins sweeping.

Manual Scale

The cursor will blink on the minimum scale value and Manual Scale will be highlighted.

- a. Enter the desired value using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys.
- b. Press the **ENTER** key. The cursor will blink on the maximum scale value.
- c. Enter the desired value using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys.
- d. Press the **ENTER** key. The tester will begin sweeping.

Note: *If out-of-range values are entered, the minimum (if under-range) or maximum (if over-range) value will be substituted. If the maximum value is lower than the minimum value, the cursor will blink again on the minimum value waiting for a correct entry. The actual range depends on the units selected.*

Note: *Using the arrow keys will keep the acceptable range. If it is unknown if the larger value should be at the top or bottom of the scale, press the auto scale key to see where the software puts it.*

Selecting the Sweep Type

Sweep types are continuous or single hold. Continuous will sweep and update the trace automatically. Single hold will sweep once and the trace will remain in the display. Each time single hold is pressed, the trace is updated.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **SWEEP TYPE** key.
5. Depending on desired mode press either **SINGLE HOLD** or **CONT** key.

Note: *HOLD will be displayed if single hold is selected.*

Note: *The tester begins sweeping if continuous is selected.*

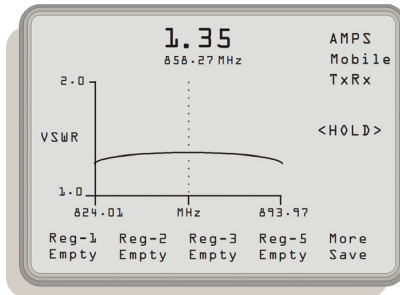
Saving a Trace

The AT-800 can store up to 12 traces. A saved trace can be used to evaluate long term antenna performance, to compare performance under different conditions or to compare to another antenna. A saved trace is also a powerful tool in limit testing. The trace can be uploaded to a PC using optional interface software and the serial port. Traces are stored in nonvolatile memory so they are not lost when the Antenna Tester is turned off.

The reflection coefficient is the data actually saved when saving a trace, and everything else is calculated from that. This allows flexibility when comparing traces.

Example - If a trace is displayed in VSWR, it can be compared to a trace displayed in %Match. The frequency band of the new trace can be changed, to effectively zoom in on a particular section of the saved trace. This may be helpful in pinpointing a problem area in a failed limit test.

Figure 11 Save a Trace



The desired units, band, and scale should be selected. This will enter the single hold mode and the trace to be stored should be displayed.

If continuous sweep type is selected, the trace displayed when saved will be stored.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **TRACE** key.
5. Press the **SAVE TRACE** key.
6. Press a **REG-n** key that has empty displayed.

Note: If a full register is selected, the new trace will overwrite the old trace.

Note: If registers 1-4 are full press the **MORE SAVE** key to access 5-8 and again to access 9-12. If needed, use the **ESC** key to back up.

Note: It is a good idea to keep a record of which traces are in which register as they are identified by register number only.

Recalling a Trace

Follow the steps below to recall a saved trace.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **TRACE** key.
5. Press the **RECALL TRACE** key.
6. Press the **REG-n** key for the desired trace, press the **MORE RECALL** key to access 5-8 and again to access 9-12.

Note: If needed, use the **ESC** key to back up. The saved trace will be displayed and the corresponding register number will be shown at the bottom of the display. The arrow keys will move the cursor as normal.

7. Press the **RETURN** key to return to register selection.
8. Press the **ESC** key to return to trace menu.

Clearing a Trace

When a trace is no longer needed or registers need to be cleared for space, follow the steps below.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **TRACE** key.
5. Press the **CLEAR TRACE** key.
6. Press the **REG-n** key for the desired trace
7. Press the **MORE CLEAR** key to access 5-8 and again to access 9-12.

Note: If needed, use the **ESC** key to back up. The word full will be replaced by empty at the selected register.

8. Press the **ESC** key to return to the trace menu.

Limit Testing

Limit testing is a quick pass-fail test using operator defined limits or a stored trace as a minimum for acceptability. Pass or fail will be displayed at the top of the display and an audible tone can be enabled to indicate a fail situation.

Limit testing is probably the most labor-efficient mode for operating the AT-800. Since all the software settings are retained when the tester is turned off, once the limit test is set up its simply a matter of connecting the next antenna system, turning on the power and reading pass or fail.

Turn Audio On/Off

Audio tone for fail indication.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **LIMIT** key.
5. Pressing the **AUDIO** key will toggle between on and off.

Selecting Limit Values

Valid limit values depend on measurement units selected. Valid entries are:

- VSWR

Note: *Between 1.0 and 100.0*

- % Match

Note: *Between 0 and 100%*

- Return Loss

Note: *Between -32 and 0 dB*

- RHO

Note: *Between 0.000 and 1.000*

To set the limits:

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SWEPT FREQ** key.
4. Press the **LIMIT** key.
5. Press the **VALUE** key.

Note: *The cursor will blink next to off.*

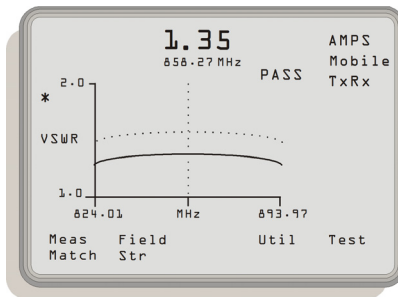
- Enter the desired value using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys.
- Press the **ENTER** key.

Note: *Pass or Fail will be displayed, a tone will be heard for fail if audio is enabled.*

Using a Trace as the Limit

The trace used for the limit must be saved. The current antenna test can be running or start it after the limit test is set up.

Figure 12 *Dotted Outline of Limit Trace*



- Press the **MENU** key.
- Press the **MEAS MATCH** key.
- Press the **SWEPT FREQ** key.
- Press the **LIMIT** key.
- Press the **TRACE - > LIMIT** key.
- Press the **REG-n** key where the trace is stored.

Note: *A dotted outline of the limit trace will be displayed with the new trace displayed over it.*

Note: *Pass or Fail will be displayed.*

Note: *The cursor can still be used, measurement units, frequency band and scale can be changed. The dotted outline of the limit trace will be automatically adjusted to provide a direct comparison with the antenna system under test.*

Clearing a Limit

Follow the steps below to clear either an operator defined limit value or a trace limit. The trace will still be stored in memory, the limit value will be erased.

- Press the **MENU** key.
- Press the **MEAS MATCH** key.

3. Press the **SWEPT FREQ** key.
4. Press the **LIMIT** key.
5. Press the **CLEAR LIMIT** key.

Note: *The value field will change to off if an operator value was being used, the dotted outline of the limit trace will be removed if a trace was being used.*

Single Frequency

This mode is useful for tuning antennas, particularly with the audio on. The frequency can be selected manually or by selecting the channel. The correct cellular system and base or mobile should be selected and shown in the top right corner of the display.

Selecting the Frequency - User Defined

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SINGLE FREQ** key.
4. Press the **FREQ MHZ** key.

Note: *The cursor will be blinking at the frequency and Freq MHz will be highlighted.*

5. Enter the desired frequency using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys.
6. Press the **ENTER** key.

Note: *The measured value and the frequency will be shown at the top of the display.*

Selecting the Frequency - Automatically

1. Repeatedly press the **SELECT** key until the cursor is blinking on CH (channel).
2. Use the **numeric keypad** or **UP/DOWN** arrow keys to change the value.
3. Press the **ENTER** key. The frequency will change to correspond to the selected channel.

Select Measurement Units

Antenna match information can be presented in Rho, VSWR, %Match or Return Loss units.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.

3. Press the **SINGLE FREQ** key.
4. Press the **UNITS** key.
5. Press either the **RHO**, **VSWR**, **%MATCH** or **RETURN LOSS** key.

Note: *The selected unit will be shown in the center of the display.*

6. Press the **RETURN** key to go back one menu level.

Select Auto or Manual Scale

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key from the top level menu.
3. Press the **SINGLE FREQ** key.
4. Depending on desired method press either **AUTO** or **MANUAL SCALE**:

Auto Scale

The units scale changes.

Manual Scale

The cursor will blink on the maximum scale value and Manual Scale will be highlighted.

1. Enter the desired value using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys.
2. Press the **ENTER** key. The cursor will blink on the minimum scale value.
3. Enter the desired value using the numeric keypad or change the value using the **UP/DOWN** arrow keys.
4. Press the **ENTER** key.

Note: *If out-of-range values are entered, the minimum (if under-range) or maximum (if over-range) value will be substituted. If the maximum value is lower than the minimum value, the cursor will blink again on the minimum value waiting for a correct entry. The actual range depends on the units selected.*

Note: *Using the arrow keys will keep the acceptable range. If it is unknown if the larger value should be at the top or bottom of the scale, press the auto scale key to see where the software puts it.*

Turn Audio On/Off

The pitch varies with the match condition allowing an antenna to be tuned without having to look at the display.

1. Press the **MENU** key.
2. Press the **MEAS MATCH** key.
3. Press the **SINGLE FREQ** key.
4. Pressing the **AUDIO** key toggles between on and off.

Field Strength Measurement

With the field strength antenna installed, the Antenna Tester can be used to verify the output of portable cellular phones with fixed antennas. This is a relative measurement. The measurement sensitivity is such that a full scale deflection will occur at about three meters from a source that is radiating 12.6 watts effective radiated power (ERP). The gain factor can be adjusted to increase the measurement sensitivity.

Turn Audio On/Off

The pitch varies with the field strength.

1. Press the **MENU** key.
2. Press the **FIELD STR** key.
3. Pressing the **AUDIO** key toggles between on and off.

Enter Gain Factor / Select Auto Gain

Increasing the gain factor increases the measurement sensitivity. Setting the gain to auto will set a gain factor so that the pointer is in the middle of the scale.

1. Press the **MENU** key.
2. Press the **FIELD STR** key.
3. Press either:

Auto Gain

The pointer moves to the approximate middle of the scale.

Gain

The cursor will blink on the gain value. Enter the desired value using the **numeric keypad** or change the value using the **UP/DOWN** arrow keys. Press the **ENTER** key.

Cleaning

CAUTION

Harsh or abrasive detergents and some solvents can damage the display unit and information on labels.

Clean the antenna tester and the display with a soft cloth dampened with mild detergent and water only.

Calibration

For best performance and accuracy, the Antenna Tester should be calibrated once every 12 months. Return the unit to an authorized Bird Service Center.

Charging Batteries

WARNING

Care should be taken when handling batteries.
Do not heat or dispose of batteries in fire. May burst or release toxic materials.
Avoid forced discharge.
Do not short circuit.
Restrict charging current and time to the recommended value.
Do not solder the battery directly.
Do not disassemble, apply excessive pressure or deform.
Avoid placing the battery in reverse polarity.
Battery disposal method should be in accordance with local and state regulations.

Fully charged batteries will provide a minimum of 2 hours continuous operation with the backlight on. Charging time is typically 8 hours. The batteries are being charged when the Antenna Tester is connected to AC, with the AC mains adapter, or DC, with the automobile cigarette lighter adapter cable. The unit does not have to be on to charge the batteries.

Note: *For optimum battery life, charge the batteries only after the low battery indication is displayed.*

CAUTION

Follow guidelines for battery charging.
Avoid constant charging of batteries for long periods of time. Overcharging can result in reduced battery efficiency, service life, and possible permanent damage

Batteries and Long Term Storage

Do not store the instrument for long periods of time without recharging the batteries. When the instrument is stored for long periods of time without use, the batteries will lose their charge and also lose the ability to reach full charge when put into service. To restore the battery charge, perform a full charge for 8 hours. If the batteries are not fully charged after eight hours, completely discharge the batteries then perform a full charge again. If necessary, repeat this discharge and charge cycle up to three times. If the batteries do not remain charged after three discharge-charge cycles, replace the batteries.

CAUTION

If subjected to an ESD spike directly to the metal portion of the case the unit may go into an interrogative state. A power cycle of the unit may be required to return to normal operation. See "[Power On/Off](#)" on [page 7](#).

Operational Tests

Power-up

Several tests run at power up. Results are displayed only if a test fails. The results are displayed to the right of the test as shown in [Figure 13](#). To display test screen regardless of results, press any key while pressing the ON key at initial power up. If any test fails, check the troubleshooting section for possible correction. When displaying the tests as described above, a stuck key will be indicated.

“Firmware Rev” checks the rev date of the installed firmware. NVRam, ROM, EEprom, and RAM check the memory for valid contents. A/D, Tempr, and PLL check for proper circuit operation. Stuck_keys checks for any keys that are pressed at power up.

Figure 13 Power-up Test

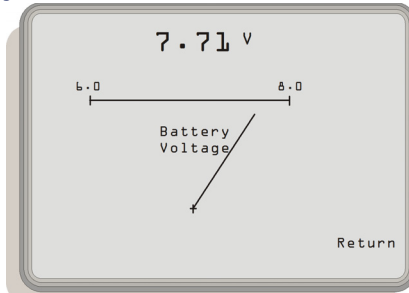


Battery Test

The battery test checks the output voltage of the batteries. The result is displayed in a simulated analog meter with the value at the top of the display. The scale is set from 6-8V. If the voltage is less than 7V, the batteries should be changed.

Note: *The AT-800 will shut off if the battery is low, but it will maintain full accuracy at any battery voltage.*

Figure 14 Battery Test



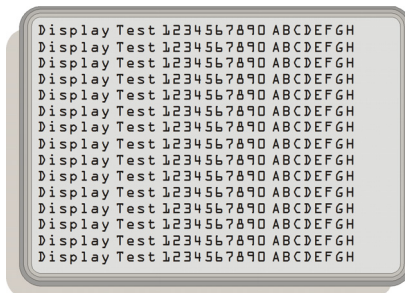
Note: Ensure the AC mains adapter is not connected.

1. Press the **MENU** key.
2. Press the **TEST** key.
3. Press the **BATT TEST** key.
4. Press the **RETURN** key to end the test.

Display Test

The display test checks that each area of the display is functional. When the test is started the display is filled with characters. Each pixel then changes state, either from black to white or white to black. If part of the display is not functional return the tester to Bird Electronic for repair.

Figure 15 Display Test

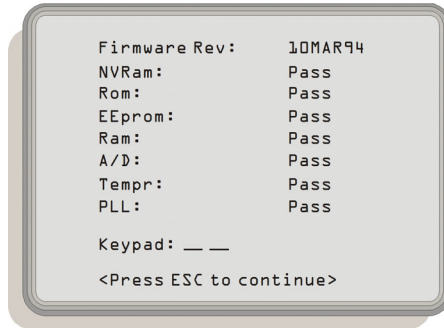


1. Press the **MENU** key.
2. Press the **TEST** key.
3. Press the **DISP TEST** key.
4. The test is started.
5. Press the **ESC** key to end the test.

Self Test

The self test is similar to the operational tests run at power up described on "[Power-up](#)" on [page 31](#), except for the keypad test.

Figure 16 Self Test



1. Press the **MENU** key.
2. Press the **TEST** key.
3. Press the **SELF TEST** key.
4. To test the keypad, press each key (except ESC and ON).

Note: *The hexadecimal value next to Keypad corresponds to the key pressed. If the value does not change for each key, refer to [Troubleshooting](#) in this section.*

5. Press the **ESC** key to stop the test.

If the Self Test fails, then perform the following:

1. Press the **ESC** key.
2. Press the **MENU** key.
3. Press the **Util** key.
4. Press **Preset**.
5. Rerun the Self Test. See "[Self Test](#)" on [page 33](#).

Note: *If the unit still fails, return the unit for service.*

Battery Replacement

The batteries need to be replaced when fully charged batteries provide less than 2 hours operation. Carefully follow the instructions below to replace the batteries.

For models equipped with 700 mAh Nickel-Cadium batteries (p/n 5A2230):

Note: *Unit may contain six 700 mAh Nickel-Cadium (NiCAD) batteries. Replace these batteries with six Nickel-Metal Hydride NiMH (p/n 5B2230).*

For models equipped with minimum 2000 mAh Nickel-Metal Hydride (NiMH) batteries (p/n 5B2230):



WARNING

Replace with ONLY Nickel-Metal hydride (NiMH) rechargeable AA batteries with a nominal voltage of 1.2V and minimum capacity of 2000mAh. DO NOT install any type of battery such as alkaline or other type of secondary (chargeable) batteries.

Note: *To retain trace data stored in nonvolatile RAM, leave the AC mains adapter connected during battery replacement.*

1. Lay the Antenna Tester, display side down, on a clean surface.
2. Using a small standard screwdriver, remove six screws from the back cover.
3. Lift the back cover approximately two inches above the front cover.
4. Flip the back cover in the direction of the arrow shown below. To avoid disconnecting P2, (battery connector), lay the back cover next to the front.
5. Remove the old batteries.
6. Install the new batteries checking the orientation of the positive and negative terminals. Polarity is indicated on the case, and in [Figure 17](#).



WARNING

Charging batteries installed in reverse polarity can cause the battery to swell or rupture.

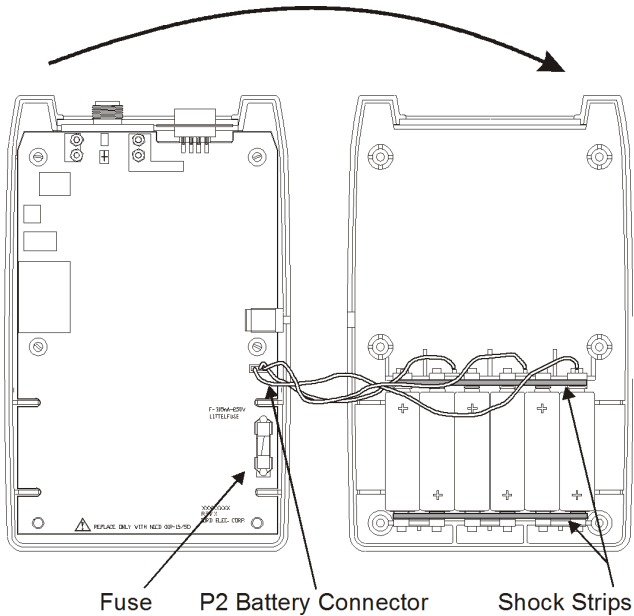
7. Be sure P2 is connected and the shock strips are still in place.
8. Place the back cover over the front cover making sure it is properly seated.
9. Replace the six screws.
10. Run the "[Battery Test](#)" on [page 31](#) of this section.

Fuse Replacement

CAUTION
Replace with only the same type and rating fuse. 315mA
250V

Follow the steps outlined in Battery Replacement replacing the fuse where replacing the batteries is indicated.

Figure 17 Battery / Fuse Replacement



Troubleshooting

Operator maintenance or service is limited to battery and fuse replacement. Any other required service must be performed at an authorized Bird Service Center. Refer to the following paragraphs for help in isolating error conditions.

The Antenna Tester will not power up

Power for the Antenna Tester can be provided in three ways—the internal batteries, an AC mains adapter or an optional automobile cigarette lighter adapter cable. Try to power the tester using each available means. The internal batteries may need charged, or if recently replaced, are installed incorrectly. The AC mains adapter may not be securely connected, may be damaged, or there is no power supplied at the wall receptacle. The internal fuse may have opened and requires replacement.

Note: *If the unit was recently opened, recheck P2, the battery connector, be sure it is securely connected. Follow the instructions for battery and fuse replacement when opening the unit.*

NVRAM Test Fails

An NVRAM error indicates the information in nonvolatile memory is not valid. The probable cause is power loss. When the unit is off, the batteries, if charged and present, or power from the AC mains adapter, if connected, supply power to retain stored trace data and software settings. This information is lost if all power is removed. Clear the error by pressing the ESC key. Be sure to read battery charging and replacement sections if the problem persists.

ROM, EEPROM, RAM, A/D, TEMPR, PLL Test Fails

Ensure the results are valid by repeating the self test or turning the unit off then back on. If the problem persists return the unit for service.

Stuck Keys Test Fails

If any characters other than 0 are displayed next to stuck keys during power up test, perform the keypad test in "[Self Test](#)" on page 33. Remember, if a key is depressed during power up to display the power up test results it is normal for other characters to be displayed. If the key remains stuck return the unit for service.

“Noise” is Displayed During Testing

The Antenna Tester measures background noise to determine if nearby signals could cause an erroneous match measurement. Power down all nearby transmitters. All interferers must be removed before resuming measurement.

Antenna Tester indicates a Perfect Match

When measuring the match of an antenna in a high RF environment, the Antenna Tester indicates a perfect match (i.e. VSWR = 1.00, Return Loss = -32 dB, or Match Efficiency = 100%). This is caused by the coupling of interfering signals into the Antenna-Under-Test. If sufficiently strong, the interfering signals can over-power the measurement signal inside the Antenna Tester. Normally, this results in degraded measurement accuracy. Bird Antenna Testers minimize this effect by measuring the interfering signal during the time between match measurements. The interferer magnitude is subtracted from the magnitude of the measurement signal. For relatively small interferers (i.e. interfering signal smaller than the measurement signal), this technique yields approximately 10 dB better rejection. If the interfering signal becomes larger than the measurement signal, the correction output approaches zero, corresponding to a perfect match. Measurement results are not accurate under these circumstances. The remedy is to disable the interfering source, if possible, or postpone the measurement to a time when the interfering source is not operating.

Customer Service

Any maintenance or service procedure beyond the scope of those in this chapter should be referred to a qualified service center.

If the unit needs to be returned for any reason, request an Return Material Authorization (RMA) through the Bird Technologies website. All instruments returned must be shipped prepaid and to the attention of the RMA number.

Bird Service Center

30303 Aurora Road
Cleveland (Solon), Ohio 44139-2794
Fax: (440) 248-5426
E-mail: bsc@birdrf.com

For the location of the Sales Office nearest you, visit our Web site at:

<http://www.birdrf.com>

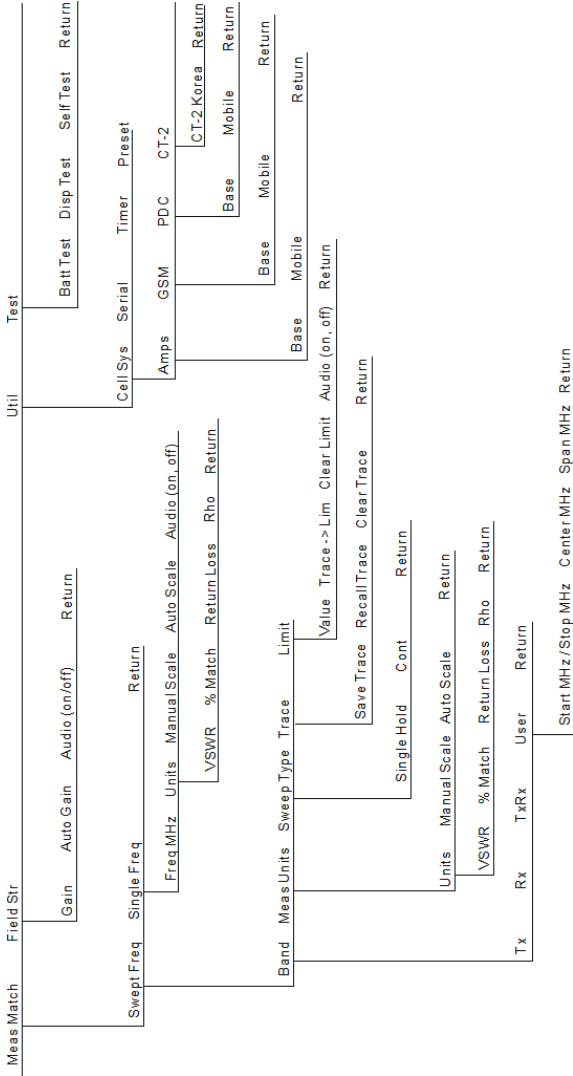
Parts List

Part Name	Part Number
AT-800 Complete	7000A801
Parts Supplied with AT-800 Complete, or installed when shipped.	
Battery (6 required)	5A2230 (in older models) or 5B2230 (in newer models)
Fuse	RP5-1976-11
AC Mains Adapter 115v or 230v	5A2229 5A2226
Female TNC Connector	4240-407
Field Strength Antenna	5A2228-1
Instruction Book	920-AT800
Foam Shock Strips (2)	5A2243-2
Optional Adapters:	
N/m	4240-402
N/f	4240-403
BNC/m	4240-404
BNC/f	4240-405
TNC/m	4240-406
UHF/m	4240-408
UHF/f	4240-409
SMA/m	4240-410
SMA/f	4240-411
Optional Parts or Accessories:	
Automobile Cigarette Lighter Adapter Cable	5A2238-1
Interface Software	7000B840
Includes Cable	5A2264-09-MF-10
Verification Kit	7000A845
Carrying Case	5000-030

Specifications

Frequency Range	806 to 960 MHz
Frequency Resolution	30 kHz
Measurement Range	
VSWR	1.00 to 100.00
Match Efficiency	0 to 100%
Return Loss	-32 to 0 dB
Rho	0.000 to 1.000
Measurement Speed	(Typical)
Single Frequency	5 Readings/second
Swept Frequency	1 Sweep/second
Test Port	
Impedance	50Ω nominal
Connector	(Field Interchangeable) Female TNC
Field Strength	
Range	0 to 100% Relative
Sensitivity	Full scale deflection at 3m @ 12.6 Watts ERP
Power Requirements	
Batteries (5A2230) (in older units)	Six 1.22V AA, 700 mAH Rechargeable NiCAD
Batteries (5B2230) (in newer units)	Six 1.2V AA (HR 15/51) Chargeable NiMH
External DC	11 to 16 VDC 250mA
External AC Adapter	108 to 132, or 207 to 253 VAC @ 48 to 63 Hz
Interface	Serial (female DB-9 connector)
Operating Temperature	0° to 50°C (32° to 122°F)
Storage Temperature	-40° to 71°C (-40° to 160°F)
Size (including connector)	8" x 4-5/8" x 1-3/4" (204mm x 118mm x 42mm)
Weight	1-3/4 lb (0.8 kg)
CE Compliance	EN 61326-1-2:2006 Electrical equipment for measurement and control use. EMC 61010-1:2001 - Safety 89/336/EEC, EMC 73/23/EEC and Amendment 93/68/EEC - Low Voltage
Electrostatic discharge (ESD)	This equipment is not specified to operate in an environment where it may be subjected to an ESD voltage spike directly on the metal portion of the enclosure.

Menu Structure



Limited Warranty

All products manufactured by Seller are warranted to be free from defects in material and workmanship for a period of one (1) year, unless otherwise specified, from date of shipment and to conform to applicable specifications, drawings, blueprints and/or samples. Seller's sole obligation under these warranties shall be to issue credit, repair or replace any item or part thereof which is proved to be other than as warranted; no allowance shall be made for any labor charges of Buyer for replacement of parts, adjustment or repairs, or any other work, unless such charges are authorized in advance by Seller.

If Seller's products are claimed to be defective in material or workmanship or not to conform to specifications, drawings, blueprints and/or samples, Seller shall, upon prompt notice thereof, either examine the products where they are located or issue shipping instructions for return to Seller (transportation-charges prepaid by Buyer). In the event any of our products are proved to be other than as warranted, transportation costs (cheapest way) to and from Seller's plant, will be borne by Seller and reimbursement or credit will be made for amounts so expended by Buyer. Every such claim for breach of these warranties shall be deemed to be waived by Buyer unless made in writing within ten (10) days from the date of discovery of the defect.

The above warranties shall not extend to any products or parts thereof which have been subjected to any misuse or neglect, damaged by accident, rendered defective by reason of improper installation or by the performance of repairs or alterations outside of our plant, and shall not apply to any goods or parts thereof furnished by Buyer or acquired from others at Buyer's request and/or to Buyer's specifications. Routine (regularly required) calibration is not covered under this limited warranty. In addition, Seller's warranties do not extend to the failure of tubes, transistors, fuses and batteries, or to other equipment and parts manufactured by others except to the extent of the original manufacturer's warranty to Seller.

The obligations under the foregoing warranties are limited to the precise terms thereof. These warranties provide exclusive remedies, expressly in lieu of all other remedies including claims for special or consequential damages. SELLER NEITHER MAKES NOR ASSUMES ANY OTHER WARRANTY WHATSOEVER, WHETHER EXPRESS, STATUTORY, OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS, AND NO PERSON IS AUTHORIZED TO ASSUME FOR SELLER ANY OBLIGATION OR LIABILITY NOT STRICTLY IN ACCORDANCE WITH THE FOREGOING.