TR-36
NAV/COMM Test Set

Navigation, Communication, ELT (EPIRB)
Operational Manual

REVISION

A	B	C	D	E	F	G	H	J	K	L	M	N
P	R	S	T	U	V	W	X	Y	Z			

25 March 2016

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INTIAL RELEASE

NOTICE:

The information contained in this manual is subject to change without notice.

Tel-Instrument Electronics Corp. makes no warranty of any kind to this material, nor shall be liable including but not limited to, errors contained herein or for incidental or consequential damages in connection with the furnishings, performance, or use of this material.

INTIAL RELEASE

Safety Precautions

The following are general safety precautions that are not related to a particular test or procedure. These are recommended procedures that all personnel must apply during many phases of operation and maintenance. It is assumed that the operator has general knowledge of electrical theory and the dangers associated with it.

1. When performing any of the preceding; thoroughly read and understand all procedures before actually performing them.

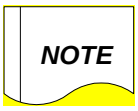
2. The various front panel connectors, switches, and controls specified can be located by referring to Figure 2-1 on page 2-3.

3. Take the time to learn the proper operation and function of the Test Set as outlined in Chapters 1, 2, and 3. Complete knowledge of the Test Set and its capabilities greatly improves the time it takes to complete the tests.

4. Pay particular attention to **NOTES** and **WARNINGS** that may accompany some test and operational procedures.

WARNINGS

Alerts the operator to potential dangers associated with a particular test. Thoroughly understand the warning before proceeding to prevent a potentially dangerous situation or damage to the Test Set.



NOTES

Provides supplemental information that enhances the procedure or further explains in detail additional information to ensure understanding or proper operation.

5. Observe all standard safety procedures when working with live voltages. The potential for electric shock exists any time the Test Set is removed from its case.

6. DO-NOT service the unit or make adjustments alone. Always be in the presence of another person when working with live voltages.

7. Thoroughly inspect the equipment and the local area for potential hazards. Loose clothing and jewelry should be removed anytime the test set is being utilized or being serviced.

8. Be familiar with general first aid procedures and CPR (Cardiopulmonary Resuscitation). Contact your local Red Cross for more information.

9. Ensure the test equipment and the tools you utilize are in good operational condition and not damaged in any way.

10. Use only specified replacement parts as listed in the IPB. Failure to utilize factory approved parts may cause damage to personnel; the test set, and possibly void the warranty.

ESD Safety and Protection

Many parts contained in the Test Set are sensitive to ESD (Electro-Static Discharge) damage. ESD can damage integrated circuits or semiconductors located within the Test Set. Only qualified personnel should service the Test Set to prevent damage. The following are guidelines to avoid ESD damage while still performing tests and or maintenance. These guidelines are meant only as a reminder, consult local directives and follow standard operating procedures before servicing, or repairing the Test Set.

- Wear a properly grounded wrist strap and remain in contact with an approved grounding point.
- Do not touch the connector pins or backplanes of ESD Sensitive circuits or parts.
- Ensure soldering irons are grounded before use.
- Do not remove any components or disconnect any connectors located in the Test Set with the power “ON”.
- Properly ground all test equipment being utilized. Refer to the test equipment operating manual for information.
- Place all removed components or parts in or on an approved conductive package.

Most ESD devices or circuits and common points are readily identified utilizing several different methods. Below are some examples.

CE (IEC) Marking

The Following Symbols may be utilized in different locations throughout the Manual and are also located on and in the Test Set. Observe these warnings and markings and follow standard electrical safety anytime you utilize live circuits.

CE	Alternating Current	Protective Conductor Terminal	Caution, risk of electrical shock

INTIAL RELEASE

TR-36 TABLE OF CHANGES

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CHAPTER I

INTRODUCTION

SECTION A

1.1 Scope of Manual

This manual is intended to familiarize the operator with the operating procedures necessary to utilize the TR-36 NAV/COMM/ELT Test Set. Here-in after known as the T/S, Test Set, or TR-36.

Figure 1-1

TR-36 Test Set

1.2 Purpose and Function of the Equipment

The TR-36 Test Set is designed to provide comprehensive ramp testing in an user-friendly, light weight high-precision instrument for rapid functional testing of VOR, LOC/GS, MB, and VHF COMM (AM/FM), HF COMM (Upper/Lower SSB) ELT and EPIRB avionic equipment all in a weather resistant package with color display. Intuitive and EASY to use and simple menu navigation allows the user to quickly access all available menus with little or no training.

Main Capabilities include airborne Navigation, Communication and ELT/EPIRB systems including but not limited to: VOR, ILS, GS, MB, 121.5/243 ELT, 406 MHz EPIRB, VSWR, and SELCAL. It is self-contained and battery operated that requires no direct hardware connection to the Unit Under Test (UUT).

1.2.1 Main Features

The Following features and test capabilities are standard:

- Highly intuitive and EASY TO USE front panel controls and navigation.
- Easy to see large 5.1" COLOR display.
- Industry Leading light weight package.
- Long life Lithium Ion battery.
- Complete simulation of VOR and Bearing.
- Simulation of LOC/GS with variable DDM and Auto Sweep function.
- Simulation of MB (Marker Beacon) and auto sweep of each tone.
- Accurate Measurement of EPIRB 406, SARSAT/COSPAS including power, frequency. Decodes and displays all user protocols stored.
- Accurate measurement of ELT 121.5/243 MHz including power, frequency and amplitude modulation (AM). Confirm and monitor directly from TR-36 Headset connection.
- Complete generation of Selective Calling Tones (SELCAL).
- Measure and Display of VHF/UHF Power, Frequency, Modulation, Deviation and Receiver Sensitivity.
- Accurate measurement of VSWR (vertical Standing Wave Ratio) for VHF/UHF.
- All Accessories and Options included, nothing extra to purchase.

1.3 CE Compliance (Pending)

This Product Meets or Exceeds the essential requirements of applicable European Directives as follow:

- EN 55022 B
- EN 61000-4-2 L2&3.B
- EN 61000-4-4 L2&3.B
- EN 61000-3-2,A
- EN 61000-4-3,L3,A
- EN 61000-4-6,L3,A

CE

1.4 Warranty

The Tel-Instrument Electronics Corporation warrants that each product it manufactures is free from defective material and workmanship for a period of two (2) years subject to the following terms and conditions. Tel-Instrument Electronics Corp. will remedy any such warranted defect subject to the following:

This warranty requires the unit to be delivered by the owner to Tel-Instrument intact for examination, with all transportation charges prepaid to the factory, within two (2) years from the date of sale to original purchaser. Tel-Instrument will solely determine when such defect exists.

This warranty does not extend to any of Tel products which have been subject to misuse, neglect, accident, improper installation, or used in violation of operating instructions. This warranty does not extend to units which have been repaired, calibrated, or altered in any way by a facility that is not approved, in writing, by Tel-Instrument Electronics Corp. to perform such work. This warranty does not apply to any product where the seals or serial number thereof has been removed, defaced or changed, nor to accessories not of our own manufacture.

This warranty is in lieu of all other warranties expressed or implied and all such other warranties are hereby expressly excluded. No representative or person is authorized to assume for us any other liability or warranty in connection with the sale of Tel's products.

This warranty does not cover or include batteries (batteries have a separate 90 day warranty).

Additional information with regard to the applications and maintenance of this equipment will be available from time to time.

1.4.1 Obtaining Warranty Service

In the event the Test Set may require service or repair that is included under the warranty provided with the Test Set; the following is necessary to ensure proper handling:

1. Contact Tel-Instrument Customer Support before shipping any Test Set back under a warranty condition.

   Tel-Instrument Electronics Corp. Customer Support can be reached by calling:

   - (201) 933-1600 (telephone)
   - (201) 933-7340 (fax)
   - https://www.telinstrument.com

2. The Customer Support Department will discuss the matter and if validated, issue an RMA (Return Material Authorization) number and form. Do not return any product without first receiving this authorization.
3. The Test Set must be returned with the completed RMA form. This will ensure prompt handling and expedited service.
4. Products must be returned in the Original Shipping Container (see Paragraph 1.4.1). If the original container is no longer available, please contact Tel-Instrument for guidance. Include in or on the shipping container the following information:

   - RMA Form on top of the product

- The assigned RMA number written in bold letters on the outside of the shipping container
- Model, Serial Number, and specific details regarding the problem
- POC name, return address, telephone number, and email address

5. Freight Charges to the factory are the responsibility of the owner/operator.

   Tel-Instrument will provide return shipping if the problem is determined to be warranty covered.

1.4.2 Shipping and Packing the Test Set

1. Repackage the Test Set in the Original container utilizing the provided packing material. Do Not Ship the Test Set with out using a shipping container, this will prevent damage to the case and or finish during transit.

2. Wrap the Test set within plastic sheeting and firmly seat the Test Set in the original corner molds. Place all necessary documentation (RMA Form, POC, etc…), on top of the Test Set.

3. Utilize Package Tape and seal all seams. If the use of an industrial box stapler is used, be sure that they do not protrude through the box to prevent injury to personnel handling the package.

4. Firmly affix a shipping label and mail the Test Set to the following:

Tel-Instrument Electronics Corp.
One Branca Road
East Rutherford, NJ 07073

Attn: Repair Department

www.telinstrument.com

SECTION B

EQUIPMENT SPECIFICATIONS AND DESCRIPTION

RF FREQUENCIES		FREQUENCY RANGE		
FUNCTION		FROM	TO	RESOLUTION
VOR Channels	VOR	108.000 MHz	117.950 MHz	50 kHz Steps
Variable VOR		108.000 MHz	117.950 MHz	1 kHz Steps
LOC Channels*	LOC	108.1000 MHz	111.950 MHz	50 kHz Steps
GS Channels*	GS	329.1500 MHz	335.000 MHz	50 kHz Steps
COMM AM	COMM AM	10.00 MHz	511.900 MHz	100 kHz Steps
AM Variable		10.00 MHz	511.900 MHz	1 kHz Steps
COMM FM	COMM FM	10.00 MHz	511.900 MHz	100 kHz Steps
FM Variable		10.00 MHz	511.900 MHz	100 kHz Steps
SELCAL	SELCAL	10.00 MHz	511.900 MHz	100 kHz Steps
Variable		10.00 MHz	511.900 MHz	1 kHz Steps
Marker	MB	75.0000 MHz	N/A	N/A
* Localizer and Glideslope Frequencies are Automatically Paired				

RF ACCURACY	FREQUENCY RANGE	RF OUTPUT RANGE, ACCURACY		
@ Antenna Connector	10.00 to 75.00 MHz	0 to -69.9 dBm	1.0 dB Steps	± 2 dB
(same as Time Base)	75.00 to 335 MHz	0 to -69.9 dBm	1.0 dB Steps	± 2 dB
	335 to 511.999 MHz	0 to -69.9 dBm	1.0 dB Steps	± 3 dB
Dual Mode LOC		0 to -69.9 dBm	1.0 dB Steps	± 2 dB
Dual Mode GS		0 to -69.9 dBm	1.0 dB Steps	± 2 dB
Tri- Mode LOC		0 to -69.9 dBm	1.0 dB Steps	± 2 dB
Tri-Mode GS		0 to -69.9 dBm	1.0 dB Steps	± 2 dB
Marker Beacon		0 to -69.9 dBm	1.0 dB Steps	± 2 dB
Tri-Mode MB		-20 dBm (FIXED)	N/A	± 2 dB
Note – All Modes Variable 0.1 dB				
@ RF Direct Connect	10.00 to 75 MHz	-40 to -110 dBm	1.0 dB Steps	± 2 dB
	75.00 to 335.00 MHz	-40 to -110 dBm	1.0 dB Steps	± 2 dB
	335 to 511.999 MHz	-40 to -110 dBm	1.0 dB Steps	± 3 dB
Dual Mode LOC		-40 to -110 dBm	1.0 dB Steps	± 2 dB
Dual Mode GS		-40 to -110 dBm	1.0 dB Steps	± 2 dB
Tri- Mode LOC		-40 to -110 dBm	1.0 dB Steps	± 2 dB
Tri-Mode GS		-40 to -110 dBm	1.0 dB Steps	± 2 dB
Marker Beacon		-40 to -110 dBm	1.0 dB Steps	± 2 dB
Tri-Mode MB		-60 dBm (FIXED)	N/A	± 2 dB
Note – All Modes Variable 0.1 dB				
Spectral Purity				
	Harmonics	<-40 dBc		
	Non-Harmonics Spurious	<-40 dBc		

TIME BASE	
TCXO Temperature Stability -30 to +75C	+/- 1 ppm
Aging	+/- 1 ppm/year
Accuracy	+/- 1 ppm

Modulation Characteristics							
VOR Mode		**LOC Mode**		**GS Mode**			
30 Hz Reference	± 0.01%	90 Hz	± 0.01%	90 Hz	± 0.01%		
30 Hz Variable	± 0.01%	150 Hz	± 0.01%	150 Hz	± 0.01%		
1020 Hz	± 2%	1020 Hz	± 0.01%				
9960 Hz	± 0.01%						
AM MOD Fixed		*AM MOD Fixed*		*AM MOD Fixed*			
30 & 9960 Hz Tones	30% AM ± 1%	90 & 150 Hz	20% AM ± 1%	90 & 150 Hz	40% AM ± 1%		
1020 Hz	30% AM ± 2%	1020 Hz	20% AM ± 2%	1020 Hz	40% AM ± 2%		
AM Mod Variable		*AM Mod Variable*		*AM Mod Variable*			
30 & 9960 Hz Tones	0 to 55%	90 & 150 Hz	10 to 30%	90 Hz	30 to 60%		
1020 Hz	0 to 55%	1020 Hz	TBD	150 Hz	20 t0 50%		
Distortion	<1%	Distortion	<1%	Distortion	<1%		
VOR FM MOD	30 Hz reference at ± 480 Hz Peak Deviation on 9960 Hz Sub carrier						
Accuracy	± 10 Hz						
Distortion	<2% (For 30 Hz Reference)						
Variable Bearing	0.1° Increments ± 0.15°						
VOR Bearing Sweep	TBD						
PRESETS		U1/R1	U2/R2	FS	0C	FS	D2/L2	D1/L1
LOC DDM	± 0.0015 DDM	0.093	0.155	0.200	0.000	-0.200	-0.155	-0.093
GS DDM	± 0.003 DDM	0.091	0.175	0.400	0.000	-0.400	-0.175	-0.091
LOC Sweep		TBD						
GS Sweep		TBD						
Marker Beacon		Single Carrier			TRI-Mode		
400 Hz		± 0.01% (<1% distortion)			± 0.25% (<1% distortion)		
1300 Hz		± 0.01% (<1% distortion)			± 0.4% (<1% distortion)		
3000 Hz		± 0.01% (<1% distortion)			± 0.9% (<1% distortion)		
Modulation							
95% AM Fixed		± 2% Accuracy			± 2% Accuracy		
COMM AM							
Tone 1020 Hz		30% ± 1.5% Accuracy			0 to 100% in 1% steps ± 2%		
Tone 10 Hz to 10 kHz		TBD			TBD		
COMM FM							
Tone 10 to 35 Hz		± 0.2% Accuracy (<1% distortion)			0.1 kHz Steps		
35 Hz to 100 Hz		± 0.02% Accuracy (<1% distortion)			0.1 kHz Steps		
100 Hz to 10 kHz		± 0.01% Accuracy (<1% distortion)			0.1 kHz Steps		
1000 Hz Tone 5 kHz Deviation		± 1% Accuracy					
0 to 25 Hz deviation		± 0.2 kHz +1% of setting (<1% distortion)			0.1 kHz Steps		
Tone 10 Hz to 10 kHz		TBD			TBD		
SELCAL							
Tone Frequency Accuracy		± 0.01% (<1% distortion)					
		Single Transmission			Enabled		
		Continuous 7.5 sec			Enabled		
Modulation Tone		Fixed			30% AM ± 2%		
		Variable			0 to 99% in 1% Steps, ± 2%		

MEASURMENT FUNTIONS				
FREQUENCY RANGE				
@ Antenna Connector	10.00 to 515 MHz	Resolution – TBD	Accuracy – TBD	
@ RF Direct Connect	10.00 to 515 MHz	Resolution – TBD	Accuracy – TBD	
SENSITIVITY				
@ Antenna Connector	≤ - 25 dBm			
@ RF Direct Connect	≤ + 5 dBm			
@ Video/Out – Mod/In	≥ 1 Vp-p (50Ω)			
POWER RANGE				
@ RF Direct Connect	10.00 to 515 MHz	0.1 to <1 W TBD	1 to <100 W TBD	100 to 1999 W TBD
External Attenuator Required for all Measurements > 30 W				
Accuracy	< 100 MHz : ± 12% of Reading	± 1 Count (CW Only)		
	10 to 515 MHz : ± 12% of Reading	± 1 Count (CW Only)		
DUTY CYCLE				
	≤ 10 W			
	> 10 to ≤ 20 W			
	> 20 to ≤ 30 W			
MODULATION METER				
AM				
Modulation Range & Accuracy	400 Hz to 1 kHz			
	10 to 100% ± 10% of reading			
Sensitivity	@ Antenna Connector	≤ - 25 dBm		
	@ RF Direct Connect	≤ + 5 dBm		
FM				
Deviation Range & Accuracy	400 Hz & 1 kHz			
	1 to 25 kHz			
	± 0.4 kHz + 8% of reading			
Minimum Input Level	@ Antenna Connector	≤ - 25 dBm		
	@ RF Direct Connect	≤ + 5 dBm		
121.5/243 Beacon Monitor	400 Hz to 1 kHz	By Similarity AM Meter		
Modulation Range & Accuracy	10 to 100% ± 10% of reading			
406 Beacon Monitor				
Deviation Range & Accuracy	400 Hz & 1 kHz	By Similarity FM Meter		
	1 to 25 kHz			
	± 0.4 kHz + 8% of reading			
VSWR				
Range	10 to 350 MHz			
Accuracy	SWR < 3:1 of reading			

INPUT/OUTPUT Connectors	
Direct Connect	Type N
Impedance	50 Ω
Max Input	30 Watts Max.
VSWR	TNC
10.00 to ≤ 350 MHz	< 1.3:1 Ratio
> 350 to 512 MHz	< 1.3.5:1 Ratio
Antenna Connector	BNC
Impedance	50 Ω
Max Input	0.1 Watts
MIC/EXT Mod	PJ-068 (.206 " 3 conductor)
Headset	PJ-055 (.25" 2 conductor)
Intercom	U-174/U (.281" 4 conductor)

Power Specifications	
Battery	Lithium Ion
	7.4 V; 8800 mAh
Duration – fully charged	> 4.5 Hours Continuous
AC Input voltage	100 to 240VAC 50/60 & 400 Hz
DC Input voltage	12 VDC, 3.33 A (max)
Fuse Requirements	1.0 A SB (2 req.)
Operating Temperature	-40ºC to +55ºC
Storage Temperature	-40ºC to +70ºC

Physical Characteristics	
Case Style	MIL-PRF-28800F, Class 2
Height	3 3/8” (8.6 cm)
Width	12 13/16” (32.5 cm)
Depth	7 3/8” (18.7 cm)
Weight Static	8.1 lb (3.7 kg)

Standard Accessories and Options

- Standard 2 Year Limited Warranty included
- Multi-Band, Telescoping Omni Antenna
- Operational Manual
- Power Adapter Charger
- Direct Connect Cable
- Accessory Pouch
- Intercom Jack to Audio System Cable
  Options
- *Optional* Transit Case
- *Optional* External HF Antenna

1.5 Abbreviations, Acronyms and Glossary of Term[1]

A/C	aircraft
ACAS	airborne collision avoidance system
ACARS	Aircraft Communication and Addressing Reporting System
ACFT	aircraft
ACMS	aircraft condition monitoring system
AD	airworthiness directive
ADA	advisory area
ADC	air data computer
ADF	automatic direction finder
ADI	attitude direction indicator
ADS	automatic dependent surveillance
AFCS	automatic flight control system
AF/D	Airport/Facility Directory
AFDS	autopilot flight director system
AFE	above field elevation
AGL	above ground level
AMSL	above mean sea level
AOA	angle of attack
AOG	Aircraft on Ground
AP	Autopilot
APT	Airport
APU	Auxiliary power unit
ARINC	Aeronautical Radio Inc.
ARTCC	air route traffic control centers
ASI	airspeed indicator
ASL	above sea level
ATA	Air Traffic Association
ATC	air traffic control
BC	back course
CAA	Civil Aviation Authority
CDU	control/display unit
CDI	course deviation indicator
CFR	Certified Federal Regulations
CG	center of gravity
CMV	converted meteorological visibility
DG	directional gyro
DME	distance measuring equipment
DOW	Dry Operational Weight
DR	dead reckoning
EASA	European Aviation Safety Agency
ELT	emergency locator transmitter
EUROCAE	European Organization for Civil Aviation Equipment
EW	Empty Weight

[1] Further definitions may be found in the following reference books and documents: Helfrick, A.D. Principles of Avionics. Leesburg: Quality Books, 2000. RTCA/DO-181B. Minimum Operational Performance Standards for Air Traffic Control RADAR Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment. Washington D.C.: 1999. United States. Federal Aviation Administration. Federal Register Fed 3, 1987 FAA rules Part 91.

FAA	U.S. Department of Transportations' Federal Aviation Administration
FD	flight director
FMC	flight management computer (same as FMS)
FMS	flight management system
FSS	flight service station
GA	general aviation
G/A or GA	go-around
G/A	Ground to Air
GCA	Ground-controlled approach
GND	ground
GP	glide path. See Instrument landing system
GPS	Global Positioning System
GPWS	ground proximity warning system
G/S	glideslope
GS	groundspeed
GSE	ground support equipment
HAZMAT	Hazardous Material
HDG	Heading
HLD	hold (hold altitude or speed or something else) (same as maintain, but not maintenance!)
HSI	horizontal situation indicator
HUD	head-up display
HYD	hydraulic
IAF	initial approach fix
IAP	instrument approach procedure
IAS	indicated airspeed
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFR	instrument flight rules
ILS	instrument landing system
INS	inertial navigation system
IRS	inertial reference system
ITAR	International Traffic in Arms Regulations
IAW	In accordance with
LLZ	localizer (ILS)
LNAV	lateral navigation
LRU	line-replaceable unit
LW	Landing Weight
MLS	microwave landing system
MM	middle marker
MSDS	Material Safety Data Sheet
MSL	mean sea level
MSLW	Max. Structural Landing Weight
MSTOW	Max. Structural Take-off Weight
MTOW	maximum take-off weight
NDB	Non-directional beacon
NDT	Non-destructive testing
NOTAM	notice to airmen
OBS	omni-bearing selector
OM	outer marker
OBE	overcome by events
OEM	original equipment manufacturer
OTS	out of service

OW	operational weight
RA	radio altitude or radar altimeter
RA	resolution advisory (in the context of TCAS)
RAS	rectified air speed
RNAV	area navigation
RNP	required navigation performance
RSR	en-route surveillance radar
RT	radiotelephony
RWY	runway
RW	ramp weight
SOP	standard operating procedure
SID	standard instrument departure
SR	sunrise
SS	sunset
TA	traffic advisory (see TCAS)
TAA	terminal arrival area
TACAN	tactical air navigation
TAS	true airspeed
TAR	terminal approach radar
TAWS	terrain awareness and warning system
TCA	terminal control area
TCAS	traffic collision avoidance system
TOW	take-off weight
TOWS	take-off warning system
TRACON	terminal radar approach control
TWR	tower
TWY	taxiway
UAV	unmanned air vehicle
UHF	ultra-high frequency
UTC	Universal Coordinated Time
VASI	visual approach slope indicator
VDP	Visual descent point
VFR	visual flight rules
VHF	very high frequency
VMC	visual meteorological conditions
VNAV	vertical navigation
VOR	VHF omnidirectional range
VSI	Vertical speed indicator
VVI	Vertical velocity indicator (the same as VSI)
Y	yaw or yaw angle
Y/D	yaw damper

[1] Further definitions may be found in the following reference books and documents: Helfrick, A.D. Principles of Avionics. Leesburg: Quality Books, 2000. RTCA/DO-181B. Minimum Operational Performance Standards for Air Traffic Control RADAR Beacon System/Mode Select (ATCRBS/Mode S) Airborne Equipment. Washington D.C.: 1999. United States. Federal Aviation Administration. Federal Register Fed 3, 1987 FAA rules Part 91.

CHAPTER II

PREPARATION FOR USE AND OPERATION

SECTION A

GENERAL INFORMATION

2.1 General

This section contains all necessary information on the initial unpacking, inspection, and setup of the TR-36 Test Set. Each Test Set has already undergone a comprehensive series of tests, full calibration and Quality Assurance Checks before shipment from Tel-Instrument Corp.

2.2 Unpacking and Inspection

After receiving the Test Set for the first time, ensure there is no damage to the shipping container, before opening the box. Carefully unpack the unit and save the shipping container in a safe location for subsequent shipping or extended storage.

Examine the unit for obvious signs of damage. Carefully check each switch. Connector and display before utilizing the Test Set for the first time.

If damage is found, DO NOT use the Test Set until a determination of the Test Set's condition can be assessed. Contact Tel-Instrument Corporation as soon as possible for further instructions.

Check that all accessories that were purchased with the Test Set are accounted for. The TR-36 Test Set is equipped with the following standard and optional accessories (Table 2-1):

NOMENCLATURE	P/N	QTY
TR-36 Test Set	90 000 136	1
AC Adapter	48 040 112	1
AC Power Cord	74 000 002	1
Direct Connect Cable N to BNC	75 010 526	1
Telescoping Omni Antenna	79 040 031	1
Accessory Pouch	64 030 088	1
Termination Cap/Load	43 003 005	1
Operational Manual	90 008 136	1
Transit Case (Optional)	64 030 087	N/A

Table 2-1. TR-36 Accessories

2.3 Installation

The TR-36 Test Set is ready to use from the factory. There are no installation procedures applicable. The Test Set batteries were installed and fully charged before shipping.

SECTION B

OPERATING CONTROLS, INDICATORS, AND CONNECTORS

2.4 General

This section explains location and function of the operating controls, indicators and connectors. All controls, indicators, connectors are located on the front panel of the Test Set.

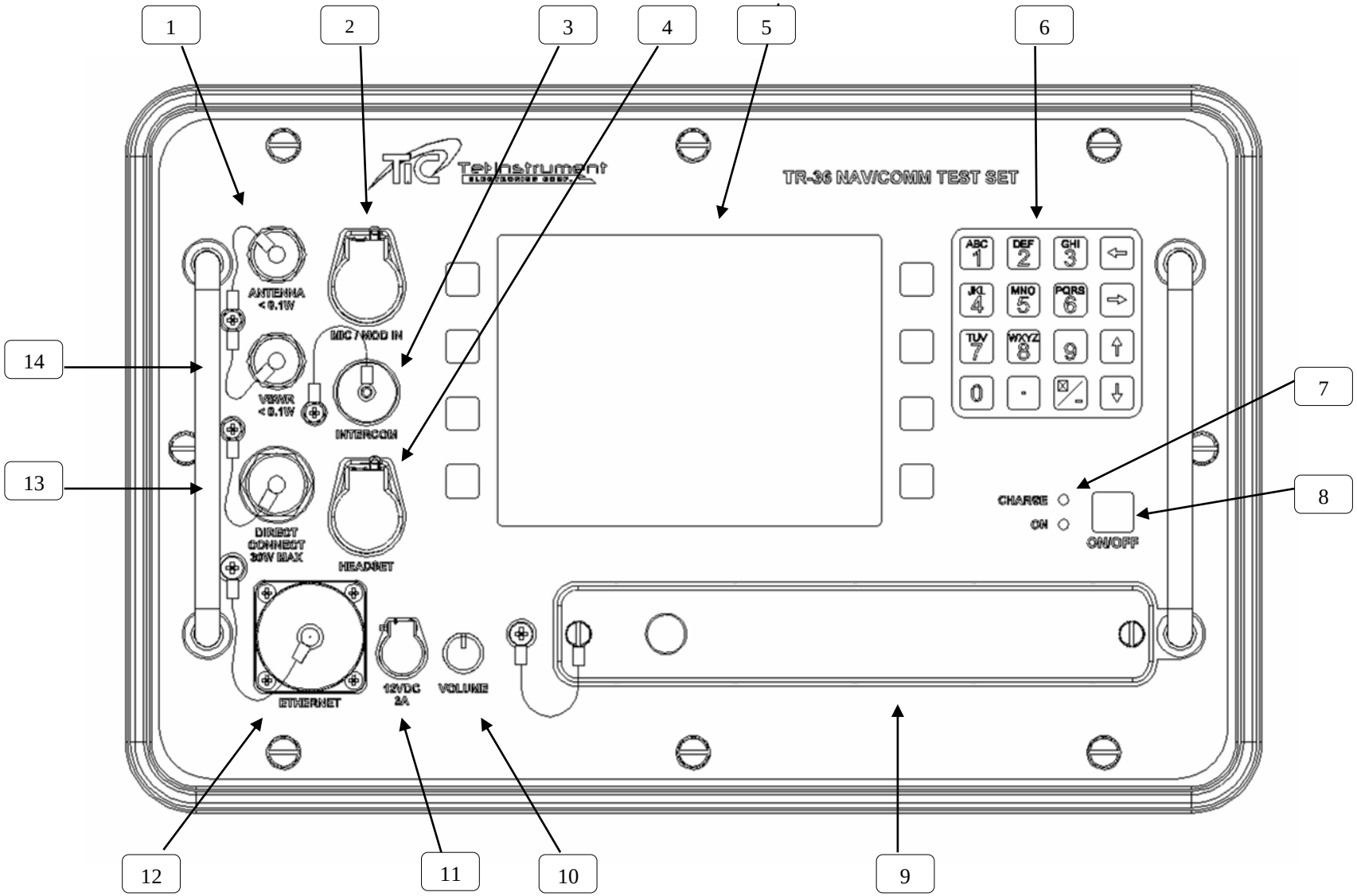
2.5 Controls, Indicator, and Connectors

Figure 2-1 and Table 2-2 describes and shows location for each of the TR-36 Test Set controls, switches and displays.

TABLE 2-2 Controls, Indicators, and Connectors

Ref	CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
1	**ANTENNA** Connector	TNC Connector for ramp mode testing utilizing Omni-Antennas
2	**MIC Mod IN** Connector	Microphone Jack for PTT Operation Voice Modulation and inserting external Tones for receiver checks.
3	**INTERCOM** Connector	Used in conjunction with the **Headset** connector (item 4). Utilized for Audio Tests of AUT ICS systems.
4	**Headset** Connector	Used in conjunction with the **INTERCOM** connector (item 3). Utilized for Audio Tests of AUT ICS systems. Also monitor Incoming signals and Tones.
5	**Color Display**	Full Color display of current test.
6	**KEYPAD**	Utilized for direct data entry.
7	**CHARGE** ON/OFF Indicator	Indicates that external power is supplied and charging internal battery
8	**ON** Indicator	Indicates Test Set power is on.
9	**BATTERY** Compartment	Front Panel access to the internal rechargeable Battery pack.
10	**VOLUME** Rotary Switch	Rotary Switch t adjust Headset Volume when utilizing Headset.
11	**12 VDC** Input Jack	Hinged cover for connecting the AC Adapter for battery charging.
12	**ETHERNET** Connector	Ethernet Connector for Downloading EPIRB results and Software upgrades
13	**DIRECT CONNECT** Connector	Allows Direct Connection of UUT R/T's.
14	**VSWR** Connector	Direct Connection connector for UUT *Voltage Standing Wave Ratio.*

Figure 2-1 TR-36 Test Set Controls, Indicators, and Connectors



SECTION C

OPERATING INSTRUCTIONS

2.6 General

The TR-36 Test Set is capable of testing VOR/LOC/MB/GS and VHF Communications by either direct connection of the UUT or remote testing by use of the supplied Omni-Directional Antenna. Preset frequencies for quick ramp checks of NAV/COMM equipment are built-in the Test Set's memory. The operator also has the capability of manually varying a variety of frequencies, bearing, and heading information.

2.7 Battery Operation

The Test Set is factory equipped with a rechargeable Li-Ion battery capable of operating the Test Set using a 20% Duty Cycle for up to 8 hours at 77 º F (25ºC), 4.5 Hours Continuous. This represents a full day of testing on a single charge. When operating the Test Set in lower temperatures, the battery life will decrease.

After 15 minutes of inactivity, the Test Set will automatically turn ***OFF*** to conserve battery strength. If the External Power Adapter is plugged in – The Test Set will not turn off.

It is strongly recommended that the Test set batteries be charged for a short time each week, regardless if the Test set has been utilized or not. A completely discharged battery will require approximately 8 hours to completely recharge. Occasional charges of 8 hours on partially depleted batteries will have no adverse affects.

2.7.1 Battery Charging

Utilize the following procedures to charge the batteries:

1. Remove the **Power Adapter Charger** from the Test Set pouch (Figure 2-2).

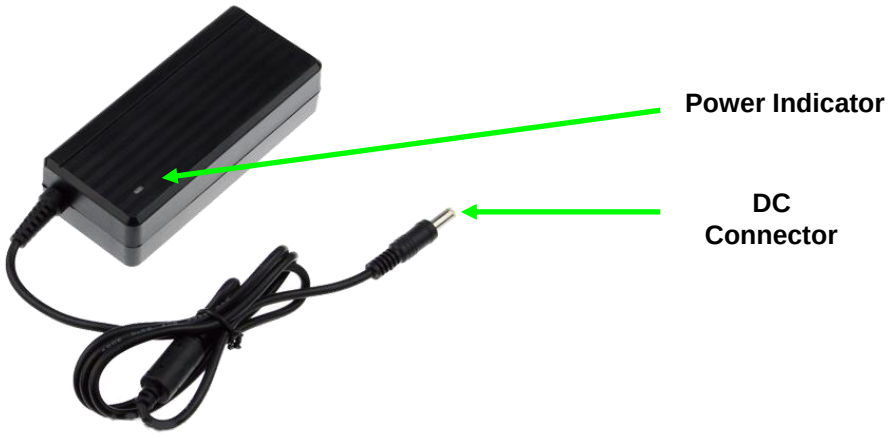


Figure 2-2. AC Power Adapter

2. Connect the DC plug into the Test Set Charging port (Figure 2-1, 11).

3. Connect the AC Power Cord plug into a suitable 100 to 240 VAC, 50/60 or 400 Hz outlet.

4. Verify the Power Indicator on the AC adapter is illuminated (Figure 2-3)

5. Connect the DC Connector to the TR-36 and ensure the **CHARGE** LED is flashing indicating that the Test set is charging.

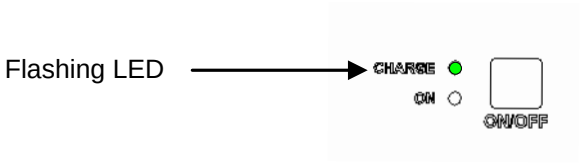


Figure 2-3. Charging Indicator

2.8 Omni-Directional Antenna

Most receiver checks will be performed over the air utilizing the supplied Omni-Antenna. The Omni-Antenna has been designed in calibrated segments for the correct bandwidth of the frequencies to be utilized. By extending or collapsing the antenna, dependent on the frequency being tested, the antenna will be properly tuned.

In order to perform ramp testing, Antenna to Antenna, perform the following steps:

1. Remove the Omni-Antenna from the Test Set accessory pouch. Connect it to the **ANTENNA** connector located on the front panel of the Test Set.

2. Use Table 2-3 and Figure 2-4 and fully extend, *then* retract the antenna to the correct length for the frequency being tested.

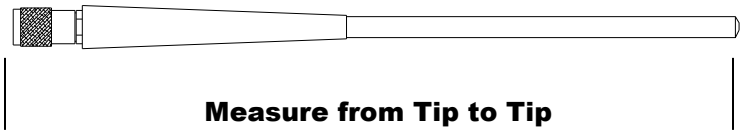


Figure 2-4. Omni Antenna

NAV FREQUENCIES	
FREQUENCY TESTED	**ANTENNA LENGTH**
MB	Fully Extended
VOR	Top three sections retracted (28½")
LOC	Top three sections retracted (28½")
GS	Top five sections retracted (9½")
ILS	Top three sections retracted (28½")

COMM FREQUENCIES	
FREQUENCY TESTED	**ANTENNA LENGTH**
29 – 88 MHz	Fully Extended
108-118 MHz	Top three sections retracted (28½")
118-156 MHz	Top four sections retracted (24")
156-174 MHz	Top five sections retracted (9½")
225 – 299 MHz	Base and ½ section (11")
300 – 400 MHz	Base Section Only

Table 2-3. Antenna Lengths

3. Place the Test Set 10 to 30 ft. from the UUT antenna. Ensure a clear view without obstructions. Nearby ramp equipment or aircraft may interfere with the results. If incorrect results are observed, relocate the Test Set to a different position and re-test. Most tests can be performed from within the aircraft.

2.9 Front Panel Navigation

BASIC TEST SET OPERATION. The Test Set is designed for ease of use and operation. Utilizing a combination of soft keys, the keypad, and the display, the operator can select pre-programmed parameters or manually enter data. The following paragraphs detail selecting and entering test parameters, viewing results, and basic setup.

2.10 Keypad Entry Instructions

Entering variable parameters utilizing the keypad (Figure 2-5) and soft keys requires only that the operator select a parameter within the Test Set normal operating range and select the appropriate function by either depressing a corresponding soft key or entering the number via keypad.

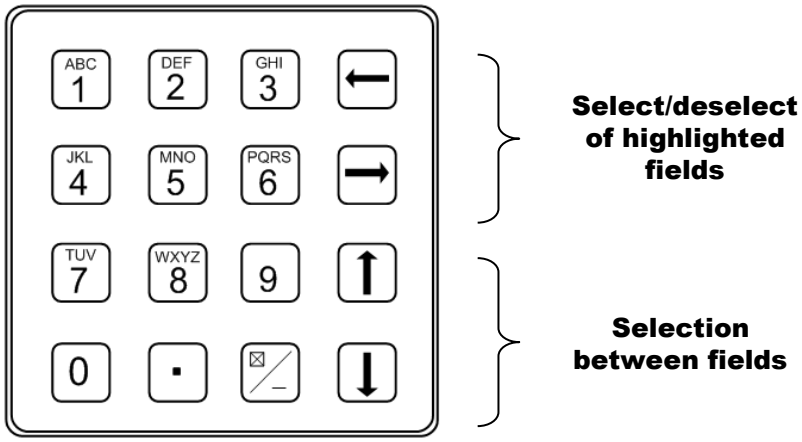
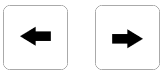
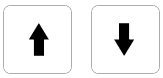


Figure 2-5. Front Panel Keypad

- Left/Right arrows can then be used to advance through preset selections or the operator can utilize the keypad and enter any value within the valid range for selected parameter.



- Selection of user modifiable parameters shown on the display is performed by using the up and down arrows and highlighting the appropriate field as shown on the display.



- A field with the following display indicates that the values can be changed with preset values or user entered values via the keypad (Figure 2-6).

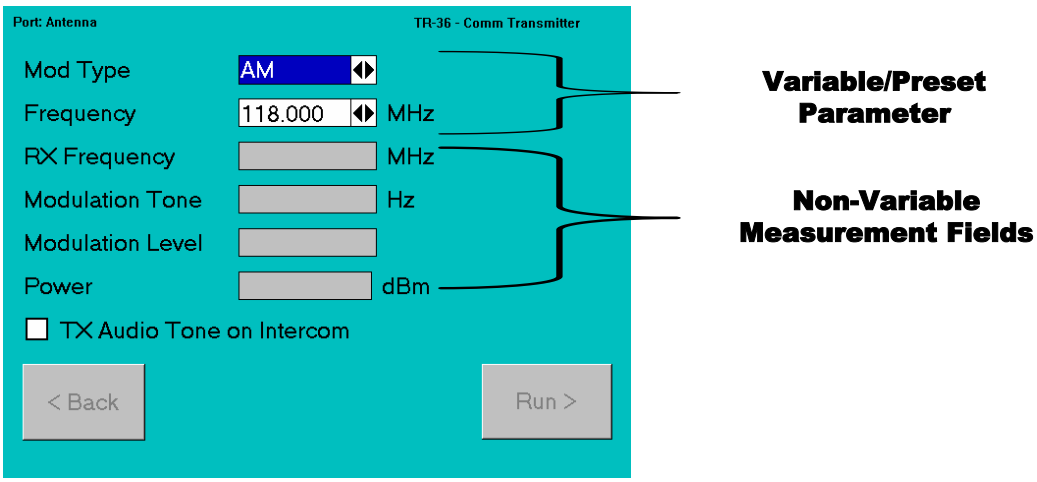


Figure 2-6. Variable Fields

- Check boxes are similarly utilized by advancing to the appropriate selection using the up/down arrows to highlight the selection. Select **Enter** on the keypad to activate a selection (Figure 2-7). A subsequent **Enter** selection will deactivate the parameter.

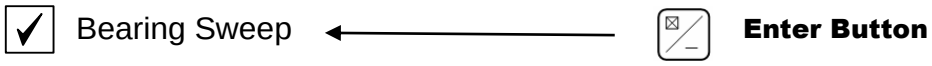
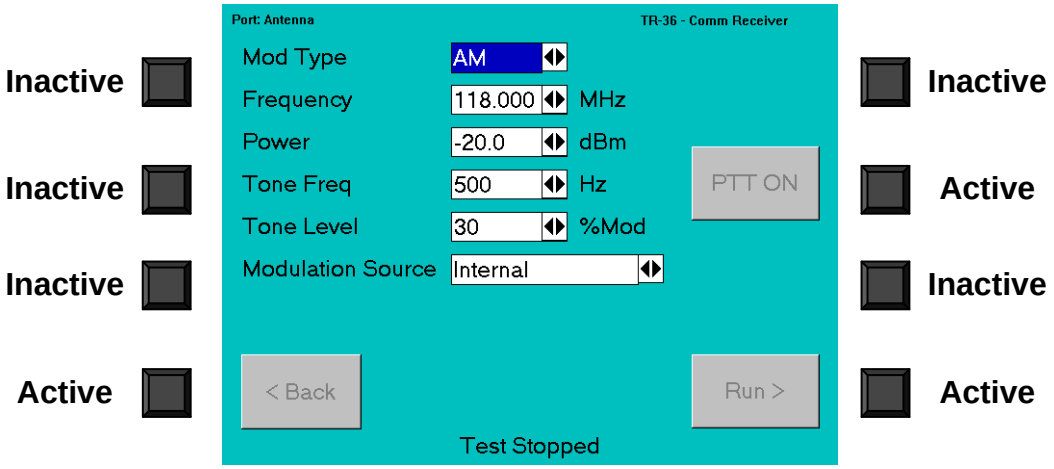


Figure 2-7. Check Box Entry

2.11 Soft Keys

Soft keys (Figure 2-8) are utilized in conjunction with the Test Set display for quick access to menu pages. Soft keys are located on the outside of the display and are lined up directly with selections on the display. When there is no corresponding selection in direct line with the soft key on the display, the soft key is inactive.



. Figure 2-8. Test Set Soft Keys

2.12 HOME Page and ABOUT

The Test Set menu structure is designed to prompt the user through individual setup screens essential to conduct the selected tests with a minimum of knowledge. By using the keypad and soft keys, the operator can quickly advance to the necessary menu pages and conduct preset and preprogrammed tests.

2.12.1 Powering ON

Turn the Test Set on by depressing the **ON/OFF** button on the Front panel. The "*GREEN"* LED should illuminate (Figure 2-9) and the Test Set will perform a Self-Test of the Hardware and Software. Any failure of the BIT test will result in a fail shown on the Status window at the bottom of the Screen.

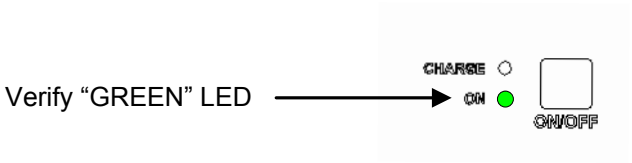


Figure 2-9. Powering On Test Set

2.12.2 Home Screen

At the Home Screen Figure 2-10) the operator can view:

a. Battery Condition
b. Enter Cable Loss
c. Access the **ABOUT** page for current Software release information
d. Select Direct or Antenna for the upcoming Test

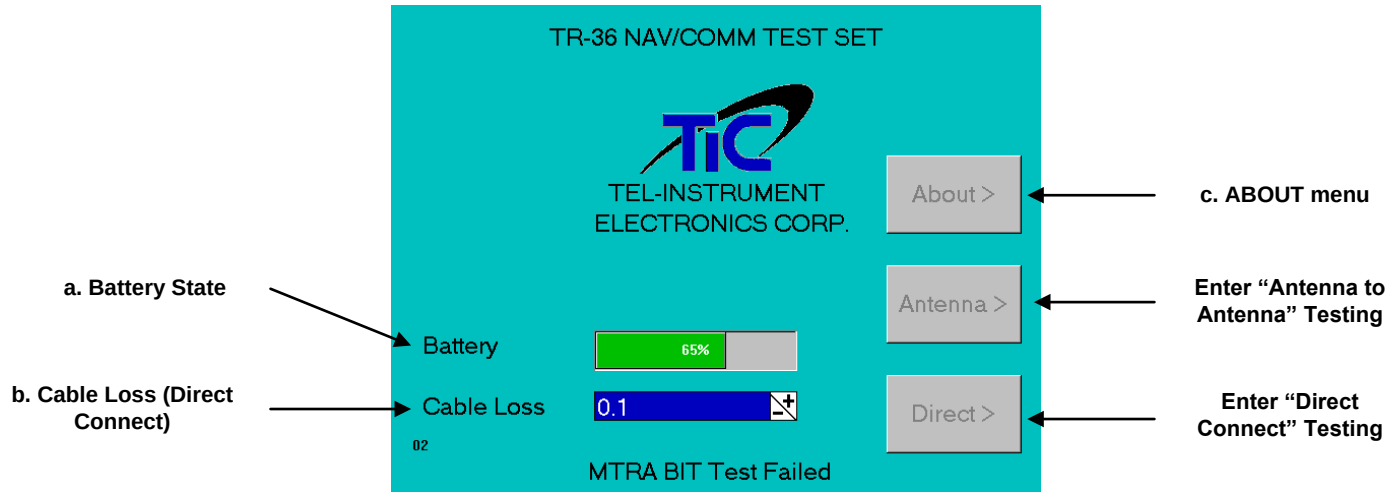


Figure 2-10. Home Page

2.12.3 Test Set Software Revisions

To view the current Test Set software, Select the **ABOUT >** Soft Key. The About Menu page (Figure 2-11) will display the following:

a. Software release
b. Server Build
c. GUI Build (Graphical User Interface)
d. RF-FPGA Version (Field-programmable Gate Array)
e. Kernel Version
f. IP Address of the Test Set (Internet Protocol)
g. Operating Hours (Total)
h. Date of last MTRA Adjustment (Modified Tree Routing Algorithm)

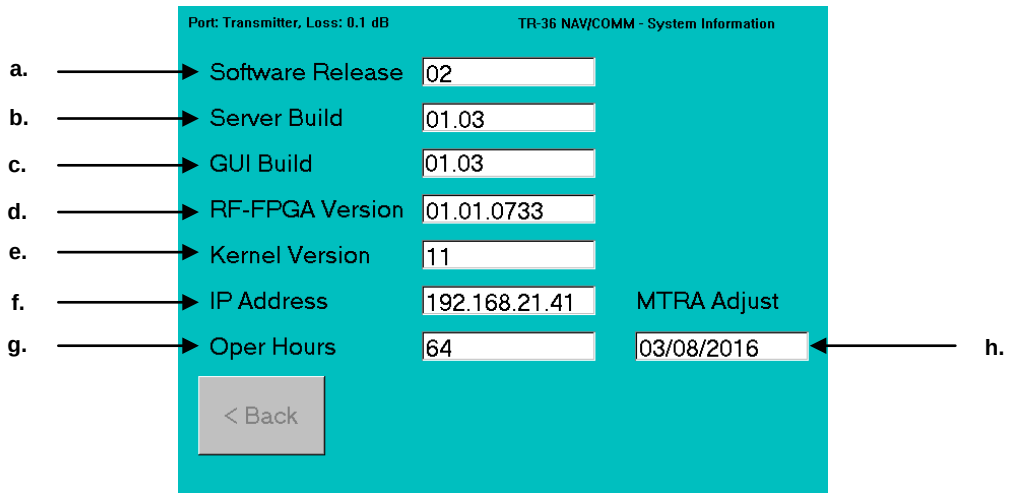


Figure 2-11. About Page

Select the **BACK <** Soft key to return to the Home Page.

To continue to the Tests Main Menu page, select either the ***DIRECT*** or ***ANTENNA*** Soft-Key.

NOTE

Both selections, DIRECT and ANTENNA, are identical in operation with the exception of the OUTPUT power capability and utilization of the correct port during active testing.

2.13 SETUP Menus

Once selecting the method in which you desire to Test, either **DIRECT** or **ANTENNA** you will advance to the **MAIN** Menu. Select the **SETUP>** soft-key to enter the Set up menus (Figure 2-12).

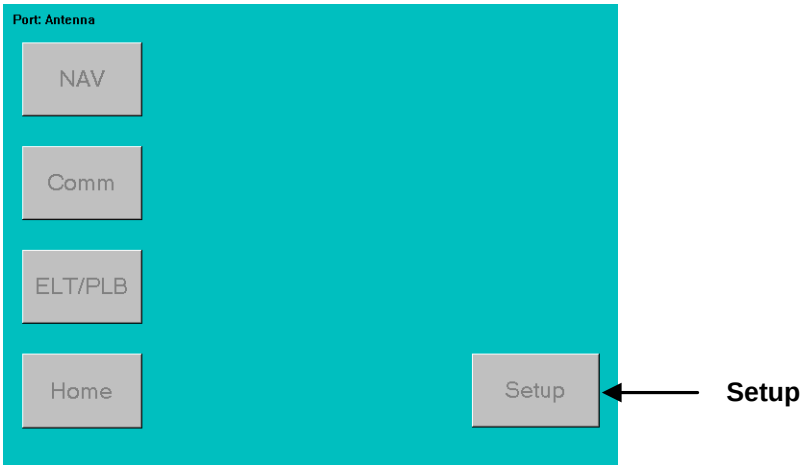


Figure 2-12. Setup Menu Selection

2.13.1 Initial Setup Parameters

Utilize the Arrow keys to select the desired power display in Watts or in dBm. The operator may also select for communications either 25 kHz spacing or 8.33 kHz spacing communication frequency spacing (Figure 2-13.

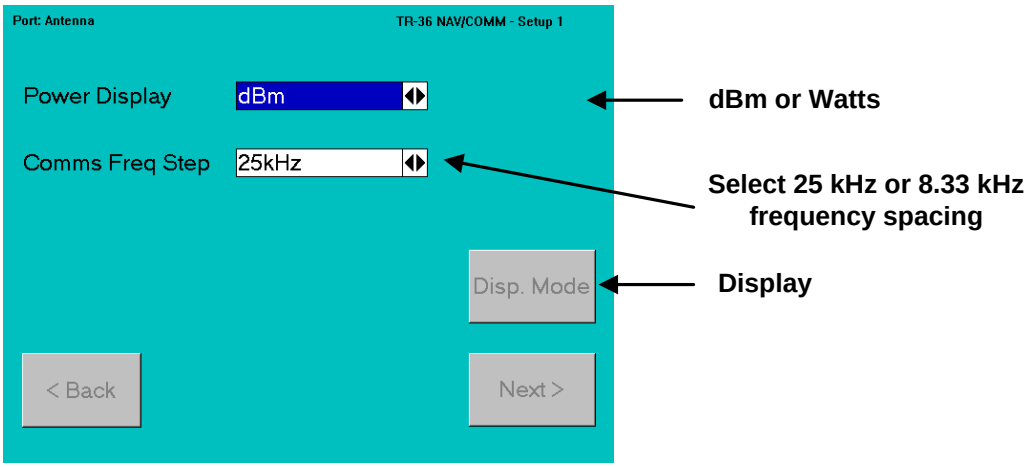


Figure 2-13. Setup Menu

NOTE

By selecting 25 kHz or 8.33 kHz the operator is only setting the preset Comm frequencies. The operator will continue to be able to select any Comm frequency available manually.

2.13.2 Display Modes

By selecting the **Disp. Mode >** Soft-Key, the operator may choose from several display types depending on outdoor conditions (Figure 2-14).

a. **Normal –** Standard Color Display
b. **Outdoor –** Black and White Display
c. **Nightvision –** Nightvision mode allows the operator to use the Test Set while wearing Nightvision goggles

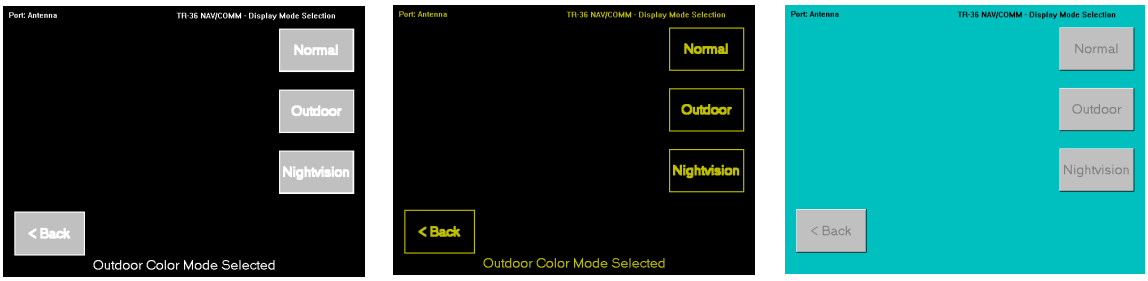


Figure 2-14. Display Modes (Simulated)

2.13.3 Time of Day

Return to the **Setup** Menu and select **Next>** to advance to the **Time of Day** (TOD) Menu. Enter the Time of Day by utilizing the Arrow and Keypad (Figure 2-15). TOD is required to reflect the proper date for EPIRB/ELT downloadable results.

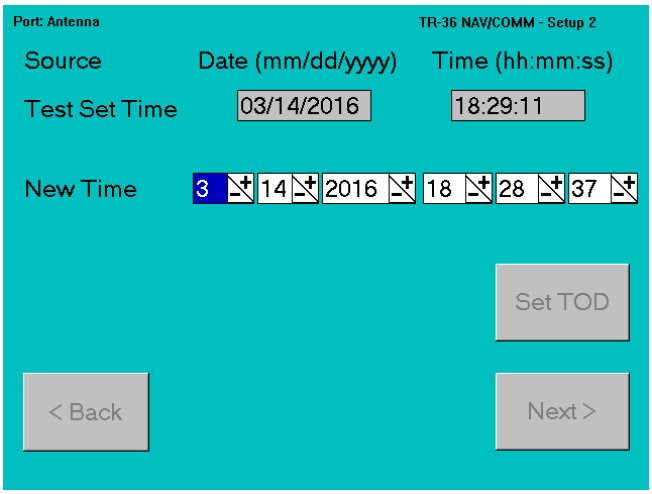


Figure 2-15. Time of Day (TOD)

. If selecting the **User** option, the operator must enter data in the correct format:

- Two (2) digit month (utilize a zero (0) for less than 10)
- Two (2) digit day (utilize a zero (0) for less than 10)
- Four (4) digit year, e.g. 2016
- Two (2) digit hour, utilize 24 hour clock e.g. 1 PM is 13 (utilize a zero (0) for less than 10)
- Two (2) digit minutes (utilize a zero (0) for less than 10)
- Two (2) digit seconds (utilize a zero (0) for less than 10)

Once Complete - Select **Set TOD** to save the Time of Day to the Test Set memory.

2.13.4 IP (Internet Protocol) Menu

Select **Next>** to advance to the IP Menu (Figure 2-16).

NOTE

It is NOT recommended that operator configure and reset the IP settings without the assistance of an IT administrator.

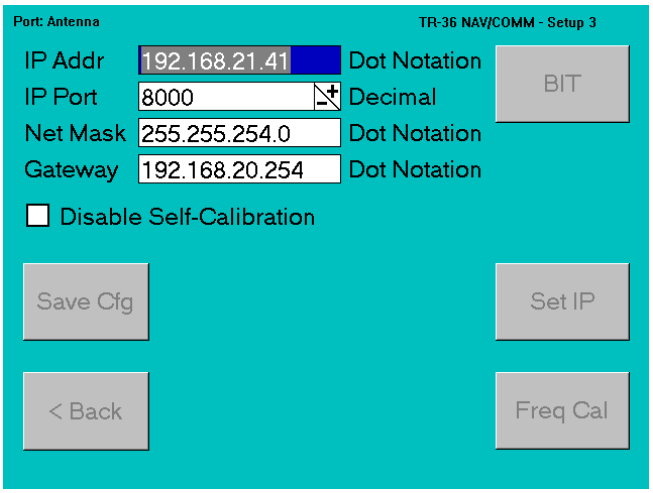


Figure 2-16. IP Address

2.13.5 Built In Test (BIT) Test

Select **BIT** to advance to the Manual BIT test page. The operator can manually run the BIT test. Normally the BIT Test is run upon each power up and at any time the operator enters a different Mode. The BIT test is useful when contacting Support with an error.

Select **Run** to start the BIT test manually. The Test Set shall display "*PASS*" (Figure 2-17) in all modes signifying that the Test Set is operating with in manufacturers' specifications.

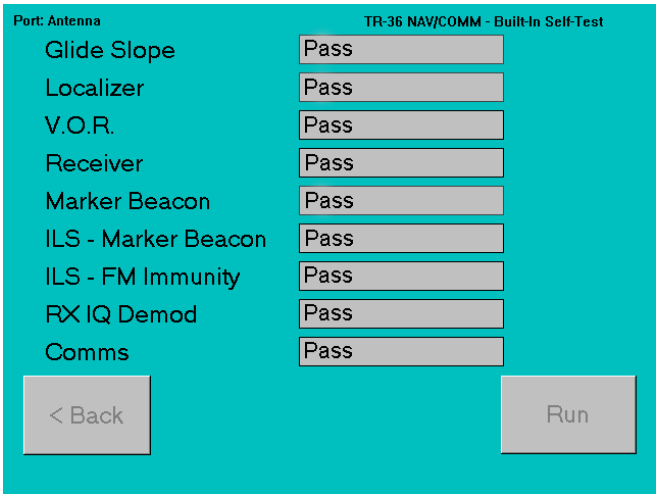


Figure 2-17. BIT Test

2.13.6 Frequency Calibration

The operator can choose to utilize the **Frequency Calibration** menu (Figure 2-18) to manually offset the Test Set frequency measurement receiver utilizing a high quality reference generator.

By transmitting an unmodulated RF signal into the Test Set Antenna Input connector, less than < 0.1 w, the test set will measure the frequency and determine the offset from the expected signal. The operator can then enter that offset and when conducting COMM transmitter checks, the Test Set will show the measured frequency with the offset included.

NOTE

When entering an offset into the Test Set, The offset will remain in the Test Set memory until such time the operator removes the offset or returns it to 0.00000 ppm

2.13.6.1 To enter a Calibrated Offset Select the **Freq Cal >** Soft-Key. Connect the RF Source to the **ANTENNA** connector. Ensure the source has no modulation and RF power less than < 0.1 watts.

Enter the Expected Frequency into the **Reference Frequency** ± 25 kHz window.

Select the **RF On>** Soft-Key; the Test Set will measure the RF Source frequency and the measured correction in ppm (parts per million).

To enter the correction, Select **Measured**. The offset correction is now taken into account for any COMM RF measurement activities.

The user can also manually enter a desired correction by using the keypad to enter the correction and then select the **Manual >** Soft-Key.

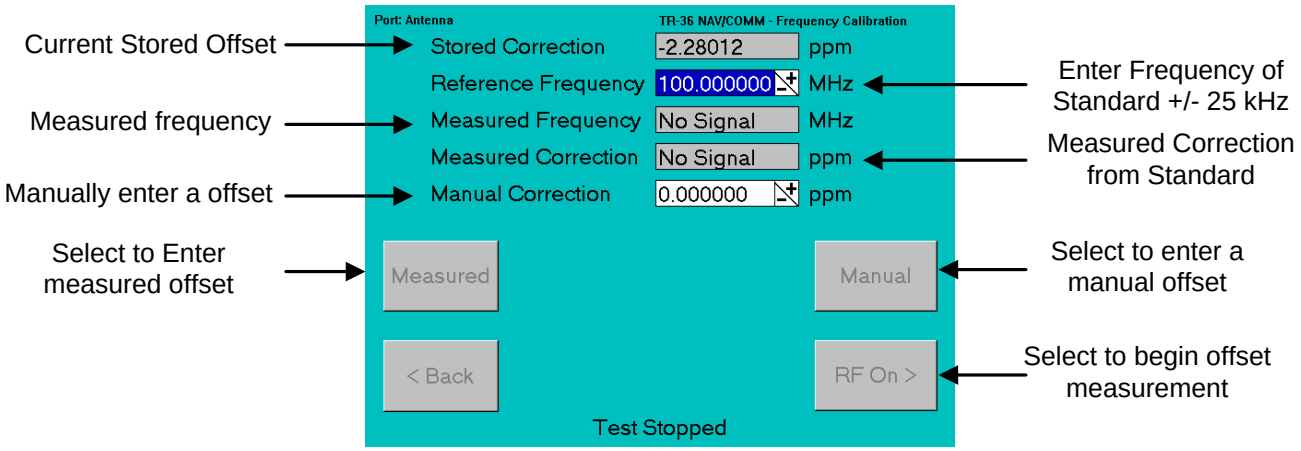


Figure 2-18. BIT Test

2.14 General NAV Test Procedures

All of the following tests are described utilizing the TR-36 Test Set. It is assumed the operator has a detailed knowledge of Avionics Systems and the UUT test requirements. Refer to Table 2-3 for correct antenna lengths for each test performed. Figure 2-19 illustrates a typical HSI/CDI indicator. Utilize for reference when conducting VOR/LOC/ILS and GS Tests.

NOTE

The following tests are not meant to replace the testing criteria required for your particular model of equipment. They are general testing procedures to assist the operator in properly utilizing the TR-36 Test Set.

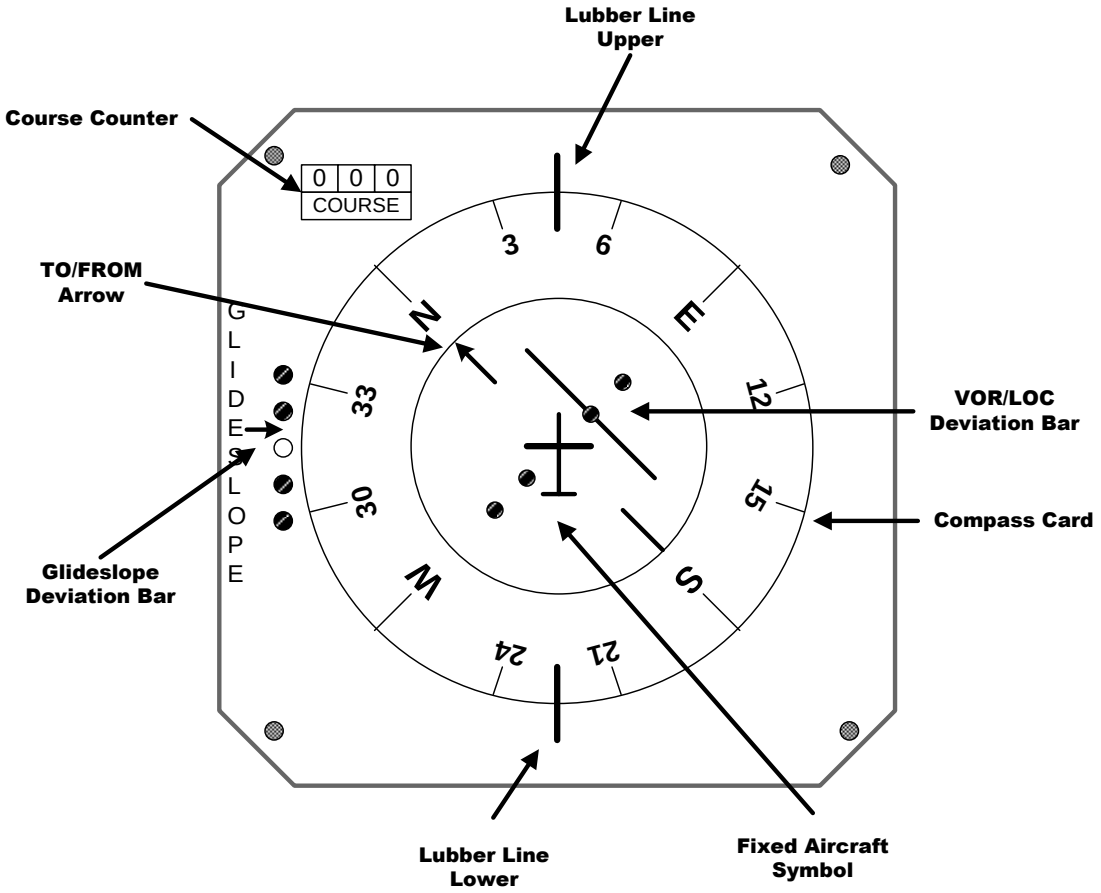


Figure 2-19. Typical HSI/CDI Indicator

The tests can be performed in both Direct Connect or in Antenna. The following procedures reflect a Standard Antenna to Antenna aircraft test. Utilizing Direct Connect will have no effect on the procedures with the exception of entering the Test Set output power.

2.14.1 VOR Procedures

WARNING
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Turn the Test Set **ON** and select the method, Antenna or Direct Connect) to perform the Test. Select the **NAV** Soft-Key.

2. Select **< VOR** Soft Key.

3. Extend the antenna to 28½" (Top three sections retracted) and connect to the **ANTENNA** connector located on the front panel of the Test Set.

4. Place the Test Set approximately 15' to 25' away with a clear Line-of-Sight to the Aircraft VOR Antennas.

5. Select the Power, Frequency Radial, TO/FROM and ID Tone for your Test IAW with the available parameters (Table 2-4 & Figure 2-20/21).

VOR SELECTIONS		
a	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
b	**Frequency**	108.000 MHz to 117.950 MHz in 0.050 Steps
c	**Radial**	0.0º to 359º in 0.1º Steps Preset in 30º Steps
d	**To/From**	Selects 180º reciprocal course
e	**ID Tone**	TST (Morse Code), OFF, 1020 Constant
f	**30 Hz Ref**	30 Hz reference Tone ON/OFF
g	**Sweep**	Automatically sweeps ± 10º from selected Radial
h	**30 Hz Var**	30 Hz Variable Tone ON/OFF
i	**FM Immunity**	Injects FM noise to ensure VOR receiver frequency stability
j	**RF On >**	RF ON/OFF Selection
k	**Indicator**	Representation of the output signal

Table 2-4. VOR Menu

6. Ensure the Aircraft VOR Receiver is **O**N and the same frequency selected as on the Test Set.

7. Select **RF On >** to begin transmitting the selected VOR signal.

8. The **RF On >** shall change to **RF Off >** and a Transmit Icon shall show on the Top Left of the menu signifying that the Test Set is transmitting.

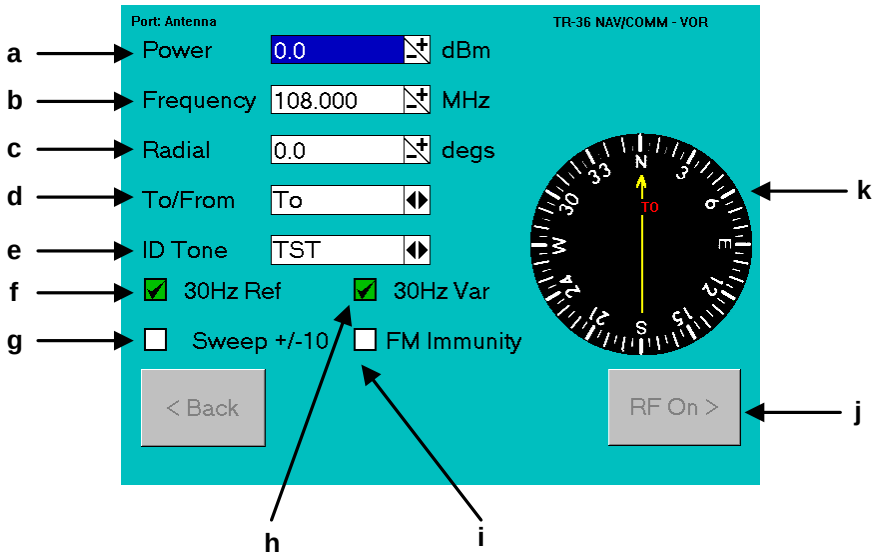


Figure 2--20. VOR Set Up

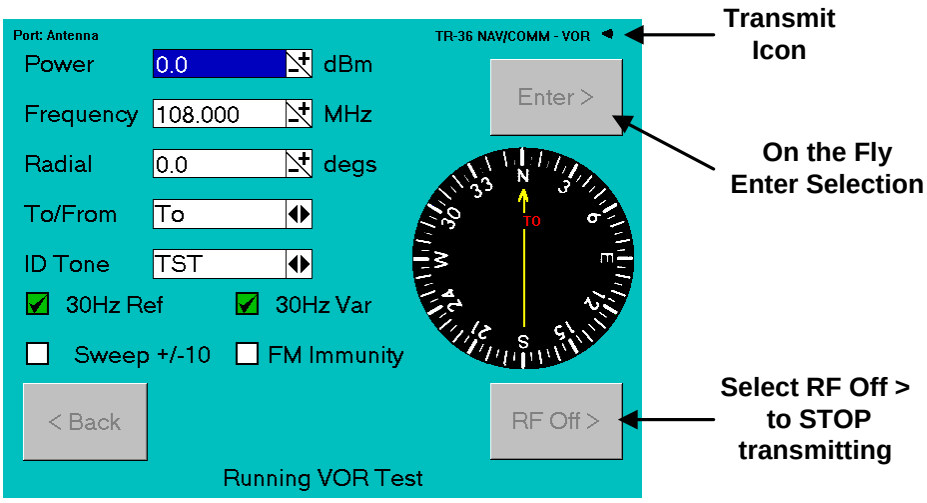


Figure 2-21. VOR Set Up 2

9. To change any parameter “On the FLY”, utilize the arrow key to the selected parameter, enter the change using the keypad and select **Enter >** to immediately update the selected parameter without stopping the in-progress test.

10. Verify that the aircraft under test matches the same settings as the Test Set and also as shown on the Test Set graphical representation (Figure 2-22). The operator may need to adjust the OBS (Omni Bearing Selector) dial to align the course deviation bar with the correct radial.

    - Bearing: 0.0 º
    - ID Tone: Present
    - To/From: To

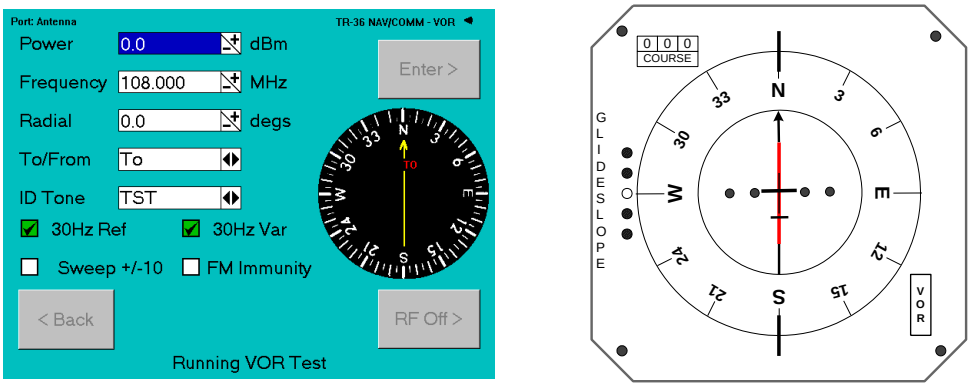


Figure 2-22. VOR ON Course

11. Select the Radial and cycle through each bearing position using the arrow keys and observe that the corresponding bearings (0º, 30º, 60º, 90º, 120º, 150º, 180º, 210º, 240º, 270º, 300º and 330º) are displayed on the VOR indicator (Figure 2-23).

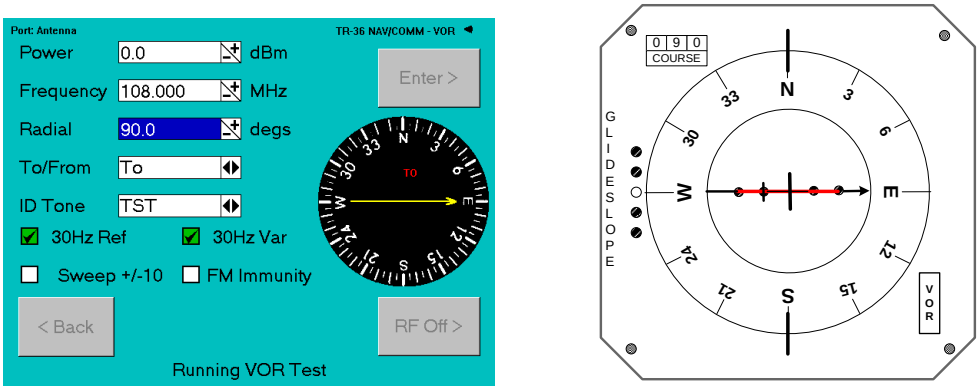


Figure 2-23. VOR Radial Verification

12. Select the **Sweep +/-** and verify the Deviation Bar tracks smoothly left and right of the centered position.

13. Deselect/Select either the **30 Hz Ref** or **30 Hz Var** component, The Deviation Bar should deflect full scale when either deselected from the center and a warning flag should appear.

14. Change the **To/From** and verify the Aircraft under Test indicates either a 180º Course Change or the To/From Indicator shows FROM (Figure 2-24).

15. Select **FM Immunity** and verify the Aircraft under test does not show a flag or erroneous results.

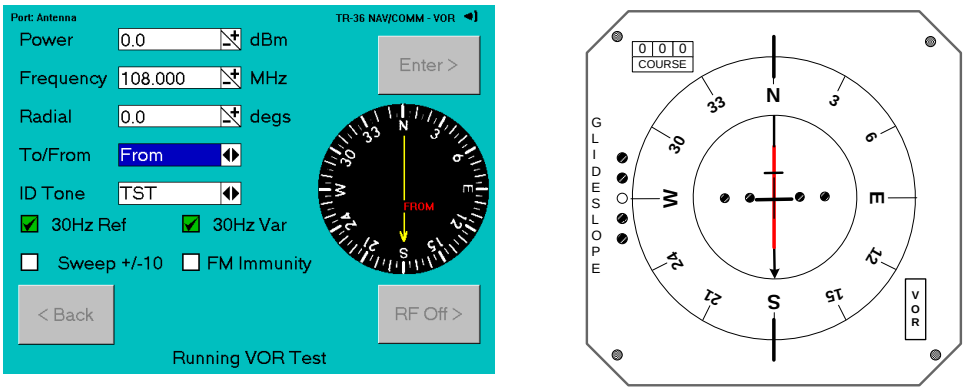


Figure 2-24. VOR To/From

2.14.2 Localizer Procedures

WARNING

When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Turn the Test Set **ON** and select the method, Antenna or Direct Connect) to perform the Test. Select the **NAV** Soft-Key.

2. Select **< LOC** Soft Key.

3. If direct connect method is used, ensure cable loss of direct connect cable, supplied with the Test Set, is entered and any other cable loss dependent where the Test Set is connected is also entered.

4. Connect the telescoping antenna (if utilized) to **ANTENNA < 0.1W Connector** on the front panel of the Test Set.

5. The Test allows the operator to select the following settings (Table 2-5 and Figure 2-25).

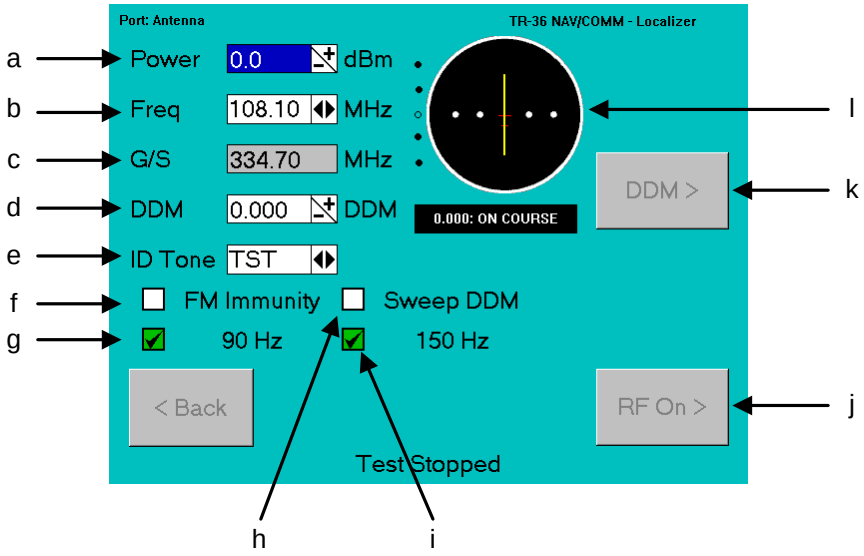


Figure 2-25. LOC Menu

LOC SELECTIONS		
a	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
b	**Frequency**	108.100 MHz to 117.950 MHz in 0.050 Steps
c	**G/S**	Glideslope Frequency is automatically Paired
d	**DDM (Depth of Modulation)**	-400 DDM to +400 DDM in .001 DDM Steps
e	**ID Tone**	TST (Morse Code), OFF, 1020 Constant
f	**FM Immunity**	Injects FM noise to ensure VOR receiver frequency stability Default OFF
g	**90 Hz**	90 Hz Modulation ON/OFF Default ON
h	**Sweep DDM**	Automatically sweeps ± 200 DDM in .005 DDM steps from On Course Default OFF
i	**150 Hz**	150 Hz Modulation ON/OFF Default ON
j	**RF On >**	RF ON/OFF Selection Default OFF
k	**DDM**	Preset cycle selection of OC, 1 Dot, 2 Dot Left OC, 1 Dot, 2 Dot Right
l	**Indicator**	Representation of the output signal

Table 2-5. LOC Menu

6. Select the Following (Table 2-6):

POWER Antenna	0.0 dBm
POWER Direct Connect	-40 dBm
Frequency	108.100 MHz
G/S	Glideslope frequency is automatically paired
DDM (Depth of Modulation)	0.000 DDM (On Course)
ID Tone	TST (Morse Code)
FM Immunity, 90 Hz, 150Hz, and Sweep DDM	Default

Table 2-6. LOC Test Setup

7. Ensure the Aircraft Under Test Localizer system is powered ON and 108.10 MHz is selected.

8. Select the **RF On >** Soft-Key.

9. Verify that the aircraft under test matches the same settings as the Test Set and also as shown on the Test Set graphical representation (Figure 2-26).

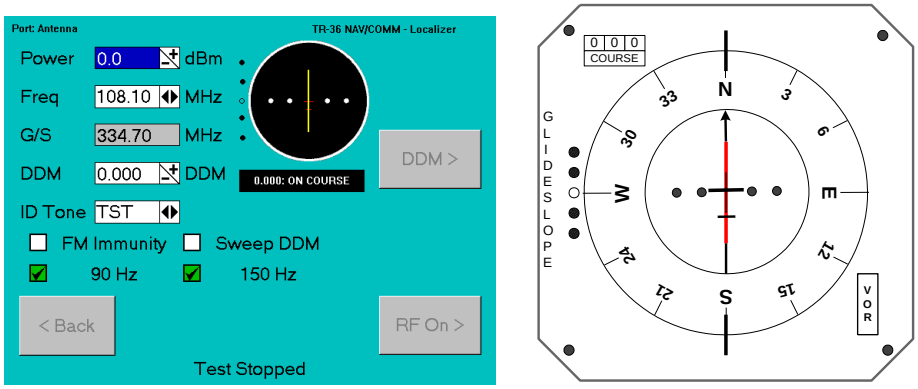


Figure 2-26. LOC Default

10. Select the **DDM >** Soft Key to cycle through the Preset "DOT Selections" and verify the Aircraft Under Test follows suit (Figure 2-27/28):

    - -0.093 DDM LEFT 1 DOT
    - -0.155 DDM LEFT 2 DOTS
    - -0.200 DDM FULL LEFT
    - 0.200 DDM FULL RIGHT
    - 0.155 DDM RIGHT 2 DOTS
    - 0.093 DDM RIGHT 1 DOT
    - ON COURSE

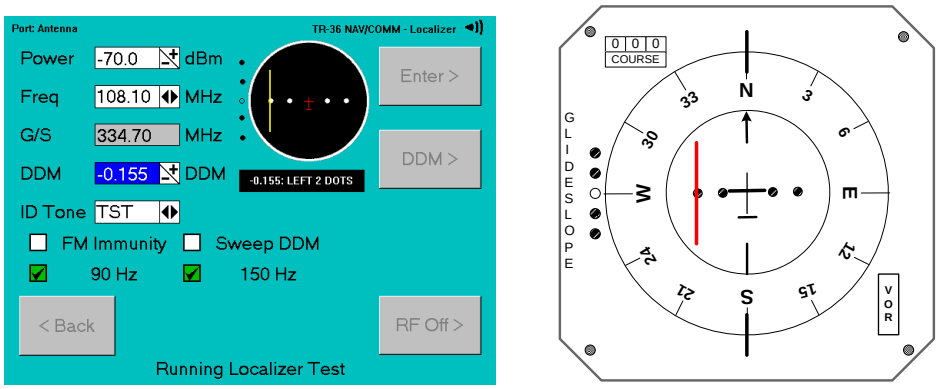


Figure 2-27. LOC 2 DOTS Left

11. Verify the ID tone is heard through the Aircraft Under Test audio system

12. Deselect the **90 Hz** and **150 Hz** Modulation tones one at a time and verify a full Left or a full right deflection of the deviation bar and a WARNING FLAG present on the Aircraft indicator.

Verify indicator Full Left Deflection (or Full Right) and Flag visible. LOC **90 Hz or 150 Hz ~** deselected.

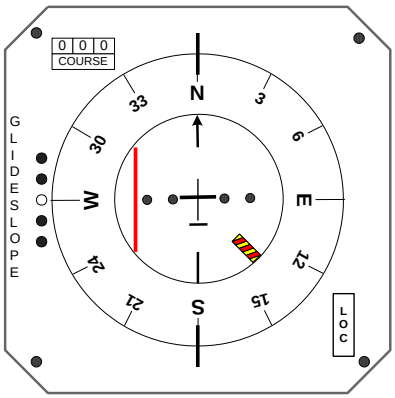


Figure 2-28. LOC 2 DOTS Left

13. Select the **Sweep DDM** and view the LOC deviation bar slowly cycles from full scale left to full scale right.

14. Select **FM Immunity** and ensure the LOC continues to track properly.

2.14.3 Glideslope Procedures

WARNING
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Turn the Test Set **ON** and select the method, Antenna or Direct Connect) to perform the Test. Select the **NAV** Soft-Key.

2. Select **< GS** Soft Key.

3. If direct connect method is used, ensure cable loss of direct connect cable, supplied with the Test Set, is entered and any other cable loss dependent where the Test Set is connected is also entered.

4. Connect the telescoping antenna (if utilized) to **ANTENNA < 0.1W Connector** on the front panel of the Test Set.

5. The Test allows the operator to select the following settings (Table 2-7 and Figure 2-29).

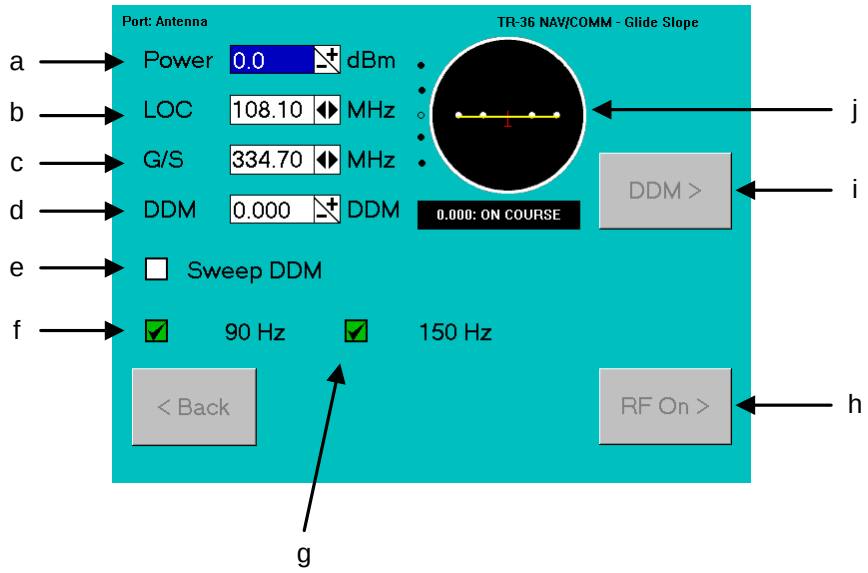


Figure 2-29. Glideslope Menu

GLIDESLOPESELECTIONS		
a	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
b	**Frequency**	108.100 MHz to 117.950 MHz in 0.050 Steps
c	**G/S**	Glideslope Frequency is automatically Paired 329.15 MHz to 335.00 MHz in 0.015 MHz Steps
d	**DDM (Depth of Modulation)**	-400 DDM to +400 DDM in .001 DDM Steps
e	**Sweep DDM**	Automatically sweeps ± 200 DDM in .005 DDM steps from On Course Default OFF
f	**90 Hz**	90 Hz Modulation ON/OFF Default ON
g	**150 Hz**	150 Hz Modulation ON/OFF Default ON
h	**RF On >**	RF ON/OFF Selection Default OFF
i	**DDM**	Preset cycle selection of OC, 1 Dot, 2 Dot UP, Full Up OC, 1 Dot, 2 Dot Down, Full Down
j	**Indicator**	Representation of the output signal

6.
7.

Table 2-7. Glideslope Menu

6. Select the Following Default Settings (Table 2-8). Table 2-9 is a list of Glideslope/LOC paired frequencies:

POWER Antenna	0.0 dBm
POWER Direct Connect	-40 dBm
Frequency	108.100 MHz
G/S	334.70 MHz
DDM (Depth of Modulation)	0.000 DDM (On Course)
90 Hz, 150Hz, and Sweep DDM	Default

Table 2-8. Glideslope Default Menu

7 Ensure the Aircraft Under Test Glideslope system is powered ON and 108.100/334.70 MHz is selected.

8. Select the **RF On >** Soft-Key.

9. Verify that the aircraft under test matches the same settings as the Test Set and also as shown on the Test Set graphical representation (Figure 2-30).

LOCALIZER (MHz)	GLIDE SLOPE (MHz)		LOCALIZER (MHz)	GLIDE SLOPE (MHz)
108.10	334.70		110.10	334.40
108.15	334.55		110.15	334.25
108.30	334.10		110.30	335.00
108.35	333.95		110.35	334.85
108.50	329.90		110.50	329.60
108.55	329.75		110.55	329.45
108.70	330.50		110.70	330.20
108.75	330.35		110.75	330.05
108.90	329.30		110.90	330.80
108.95	329.15		110.95	330.65
109.10	331.40		111.10	331.70
109.15	331.25		111.15	331.55
109.30	332.00		111.30	332.30
109.35	331.85		111.35	332.15
109.50	332.60		111.50	332.90
109.55	332.45		111.55	332.75
109.70	333.20		111.70	333.50
109.75	333.05		111.75	333.35
109.90	333.80		111.90	331.10
109.95	333.65		111.95	330.95

Table 2-9. Glideslope Localizer Pairing Chart

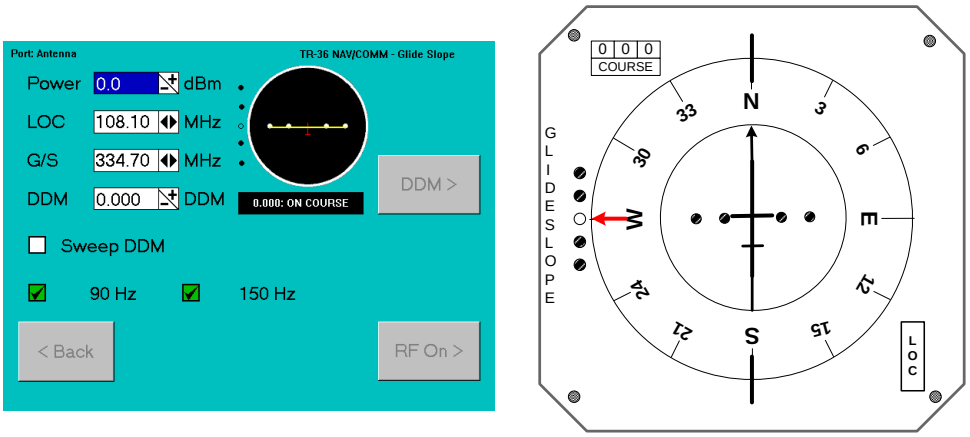


Figure 2-30. Glideslope ON COURSE centered

10. Select the **DDM >** Soft Key to cycle through the Preset “UP/DOWN DOT Selections” and verify the Aircraft Under Test follows suit (Figure 2-31):

    - -0.091 DDM DOWN 1 DOT
    - -0.175 DDM DOWN 2 DOTS
    - -0.200 DDM FULL DOWN LEFT
    - 0.200 DDM FULL UP
    - 0.175 DDM DOWN 2 DOTS
    - 0.091 DDM DOWN 1 DOT
    - ON COURSE/LEVEL

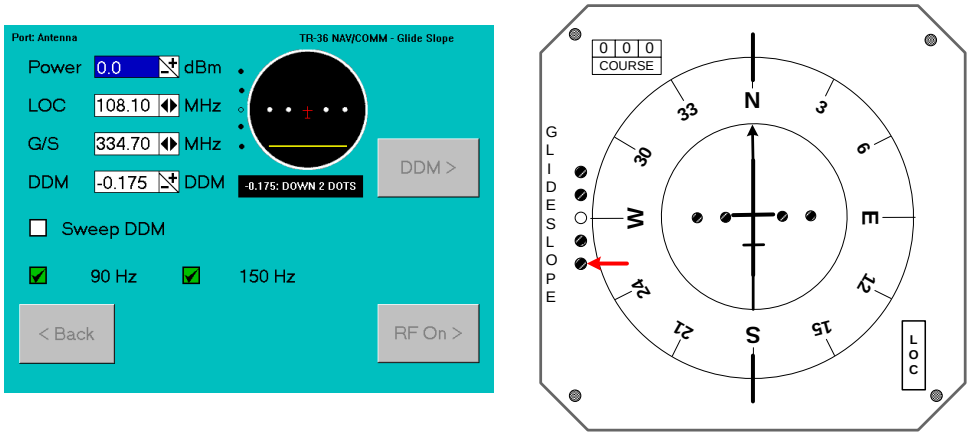


Figure 2-31. Glideslope 2 DOTS Down

11. Deselect the **90 Hz** or **150 Hz** one at a time and verify that the GS Indicator goes Full Scale with a warning flag on the HSI.

12. Select **Sweep DDM** and verify the HIS Glideslope indicator tracks UP/DOWN smoothly.

2.14.4 Marker Beacon Procedures

1. Turn the Test Set **ON** and select the method, Antenna or Direct Connect) to perform the Test. Select the **NAV** Soft-Key.

2. Select **MB >** Soft Key.

3. If direct connect method is used, ensure cable loss of direct connect cable, supplied with the Test Set, is entered and any other cable loss dependent where the Test Set is connected is also entered.

4. Connect the telescoping antenna (if utilized) to **ANTENNA < 0.1W Connector** on the front panel of the Test Set.

5. The Test allows the operator to select the following settings (Table 2-10 and Figure 2-32).

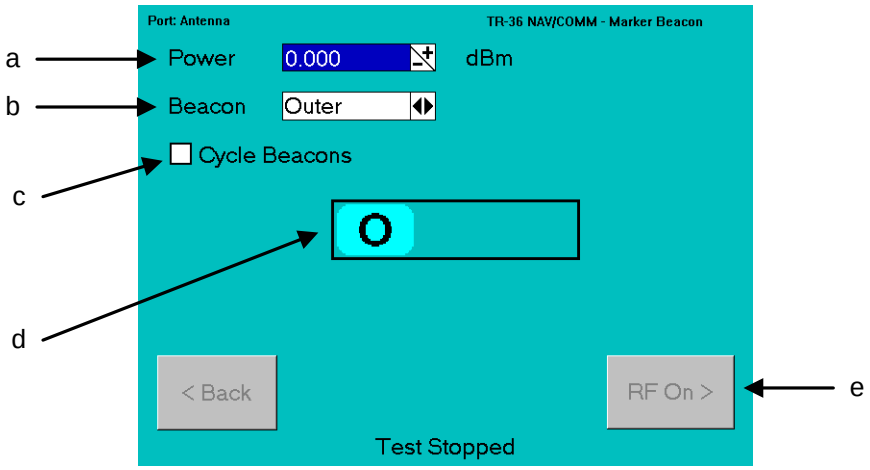


Figure 2-32. Marker Beacon Menu

MARKER BEACON SELECTIONS		
a	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
b	**Beacon**	INNER – 75 MHZ @ 3000 Hz MIDDLE – 75 MHz @ 1300 Hz OUTER – 75 MHz @ 400 Hz
c	**Cycle Beacons**	Automatically cycles through each tone at 20 Sec intervals
d	**Indicator**	Representation of the output signal
e	**RF On >**	RF ON/OFF Selection Default OFF

Table 2-10. Marker Beacon Menu

6. Select the following default settings (Table 2-11):

POWER Antenna	0.0 dBm
POWER Direct Connect	-40 dBm
Beacon	Outer
Cycle Beacons	Deselected

Table 2-11. Default Marker Beacon Settings

7. Ensure the Aircraft Under Test Marker Beacon system is powered ON and the Audio system is powered/

8. Select the **RF On >** Soft-Key.

9. Verify that the aircraft under test OUTER BLUE Marker Beacon Indicator is illuminated and you can hear a 400 Hz tone in the in the aircraft audio headset.

10. Using the arrow keys, select the INNER and MIDDLE markers respectfully and verify the correct Tone and Lights in the aircraft under test (Figure 2-33). You must select **ENTER** each time you change the marker.

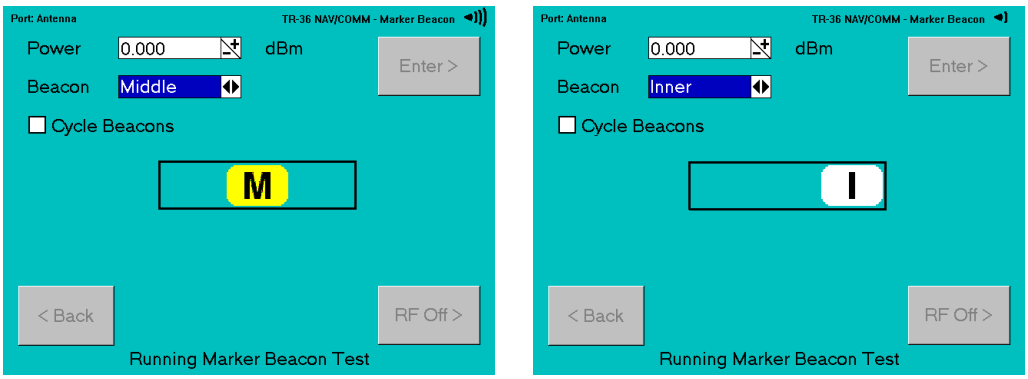


Figure 2-33. Marker Beacon Middle and Inner Beacons

11. The operator may also select **Cycle Beacons**. This will automatically alternate between the three beacons, INNER, MIDDLE, OUTER in 20 second intervals.

2.14.5 ILS Procedures

WARNING
When conducting tests with the aircrafts autopilot engaged, any variation of the aircrafts controls may move the associated control services. Use caution to ensure that all personnel and ground support equipment are clear of the control services.

1. Turn the Test Set **ON** and select the method, Antenna or Direct Connect) to perform the Test. Select the **NAV** Soft-Key.

2. Select **> ILS** Soft Key.

3. If direct connect method is used, ensure cable loss of direct connect cable, supplied with the Test Set, is entered and any other cable loss dependent where the Test Set is connected is also entered.

4. Connect the telescoping antenna (if utilized) to **ANTENNA < 0.1W Connector** on the front panel of the Test Set.

5. The Test allows the operator to select the following settings (Table 2-12 and Figure 2-34).

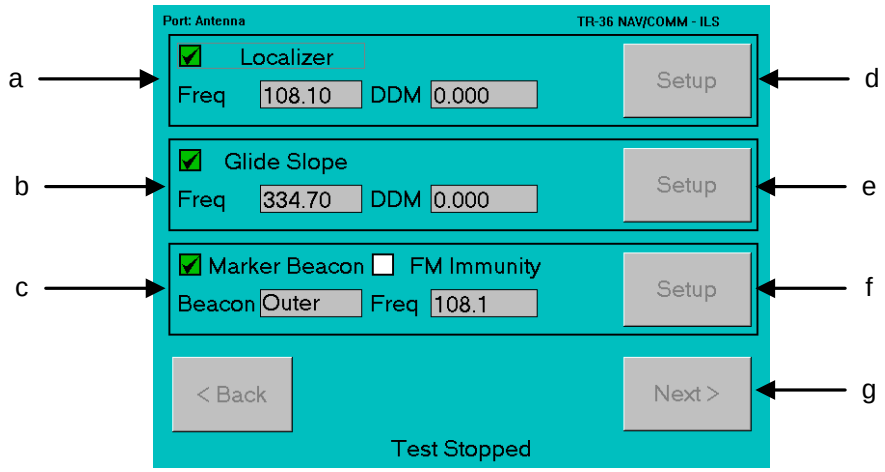


Figure 2-34. ILS Main Menu

ILS AVAILABLE SELECTIONS		
a	**Localizer**	Current Default Localizer Settings
b	**Glideslope**	Current default Glideslope Settings
c	**Marker Beacon**	Current default Marker Beacon Settings
d	**Setup (1)**	Access to the Localizer Setup Menu
e	**Setup (2)**	Access to the Glideslope Setup Menu
f	**Setup (3)**	Access to the marker Beacon Setup Menu
e	**NEXT >**	To the ILS Start page

Table 2-12. ILS Main Menu Selections

6. Select the **NEXT >** Soft-Key to advance to the ILS Start Page.

7. From the ILS Start Page (Figure 2-35), Select the **RF On >** Soft Key to begin the test. Based on the settings in the previous menu – All three components of the ILS System will transmit simultaneously, Localizer, Glideslope and Marker Beacon.

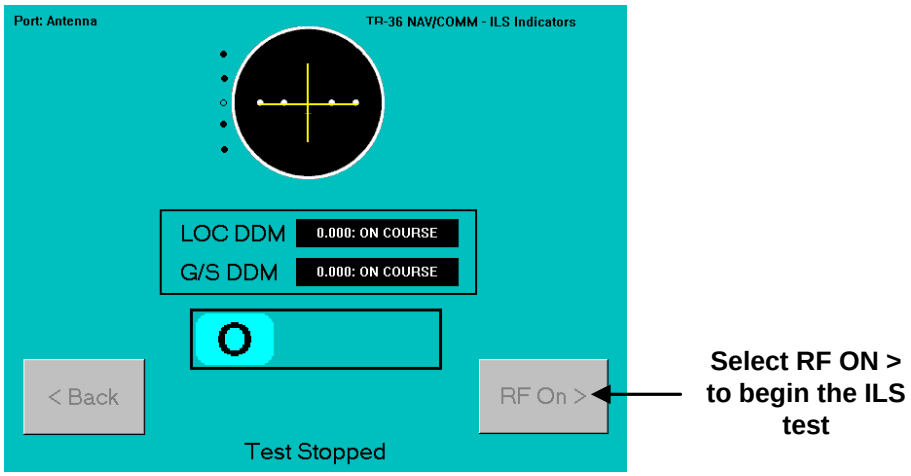
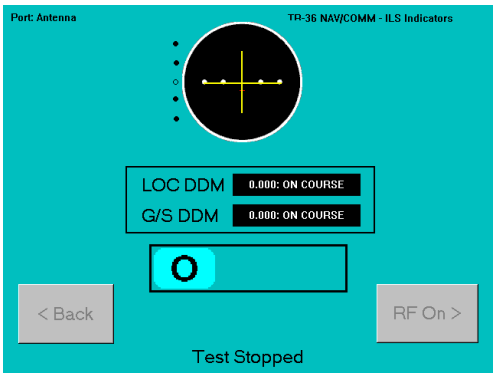


Figure 2-35. ILS Start Page

8. Observe the settings shown on the test set display match the Aircraft under Test indicators (Figure 2-36).



ILS Showing Centered (No DDM Variance) Glideslope,
Localizer and Outer Beacon selected

Figure 2-36. ILS Display

9. The operator can choose to vary any of the individual components by selecting **RF OFF >**, returning to the ILS Home Page and then select the desired **Setup** Soft-Key to component (Figure 2-37).

10. Modify the parameter and return to the ILS Start page to observe the results.

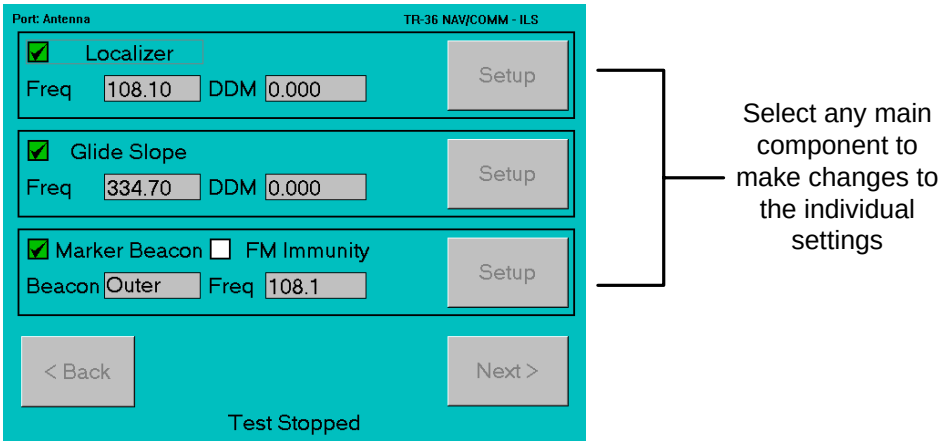


Figure 2-37. ILS Setup Selection

11. Figure 2-38 indicates LOC setting of LEFT 1 Dot, Glideslope DOWN 1 Dot and INNER Marker Beacon selected.

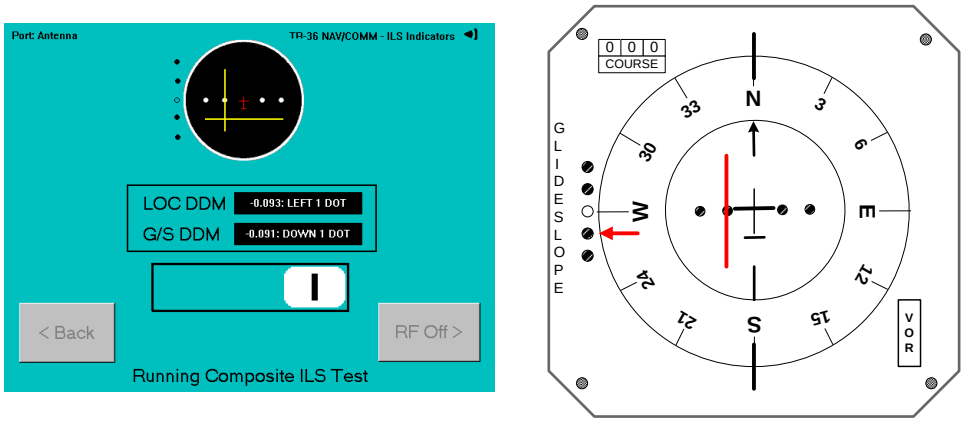


Figure 2-38. ILS Custom Setup

2.14.6 Basic Principles of VOR, LOC, GS and MB

2.14.6.1 Basic ILS Principles

ILS (Instrument Landing System) was introduced in the 1930's. The system consists of antennas and transmitters located at the end of the runway at centerline, providing horizontal, vertical, and distance guidance. The system is broken down into: LOC- horizontal control (left & right), GS- vertical control (up & down), and MB- distance control.

The localizer transmitter utilizing the VHF navigation band from 108.10 – 111.95 MHz provides horizontal guidance (LOC), using every odd 100 KHz position.

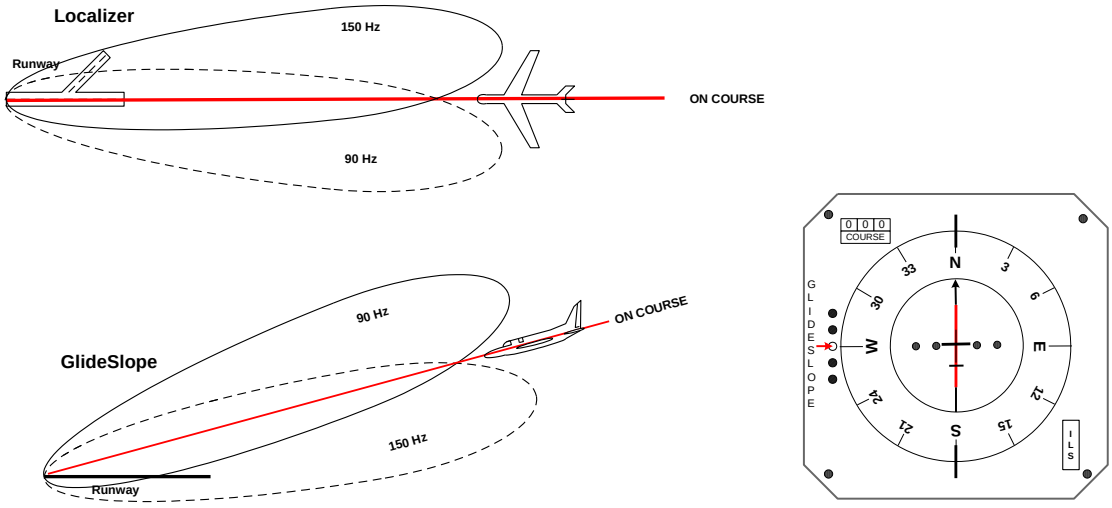
The vertical transmitter utilizing the UHF navigation band from 329.15 – 335.00 MHz provides the vertical guidance (GS).

The LOC and GS Frequencies are typically paired; where as- when you select the appropriate LOC frequency, the ILS receiver will automatically select the paired GS frequency.

MB transmitters, transmit on a frequency of 75 MHz, and are not paired with the ILS receiver.

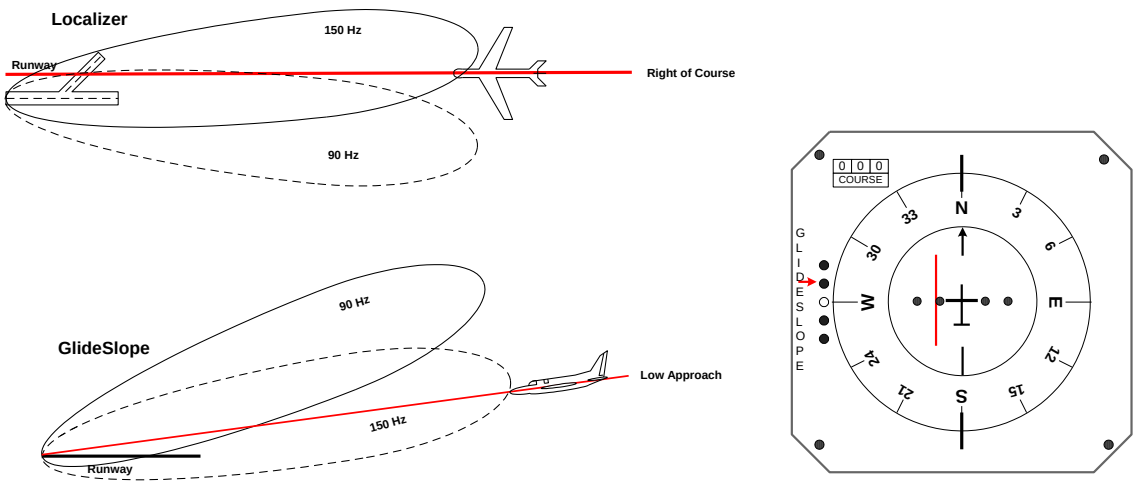
Both the LOC and GS Transmitters transmit a carrier modulated RF with 90 and 150 Hz signals. When an aircraft is receiving the signals and is receiving equal amounts of the 90 and 150 Hz modulation, the aircraft is "On Course", as depicted in Figure 2-39.

If the aircraft is receiving a percentage of modulation greater than the other, the receiver will display an offset either Left/Right or Above/Below "On Course", as shown in Figure 2-40.



Illustrates an "On Course" aircraft that is receiving equal amounts of 90 and 150 Hz modulation.

Figure 2-39. ILS 1



Illustrates an aircraft receiving a higher percentage of LOC 150 Hz modulation, and GS 90 Hz modulation. The Indicator will reflect left and above “On Course” when flying “TO” the VOR station.

Figure 2-40. ILS-2

2.14.6.2 Marker Beacon

The MB provides distance to the airport runway. There are normally three transmitters, Outer Marker, Middle Marker and Inner Marker. All three transmit at 75 MHz, modulated at different frequencies for identification. The Inner marker is modulated at 3000 Hz, Middle at 1300 Hz, and the Outer at 400 Hz. As the aircraft flies over the transmitters, located at the approach end of the runway, the MB receiver will receive the signal and dependent on the modulation (Figure 2-41/42), illuminate the appropriate light on the panel.

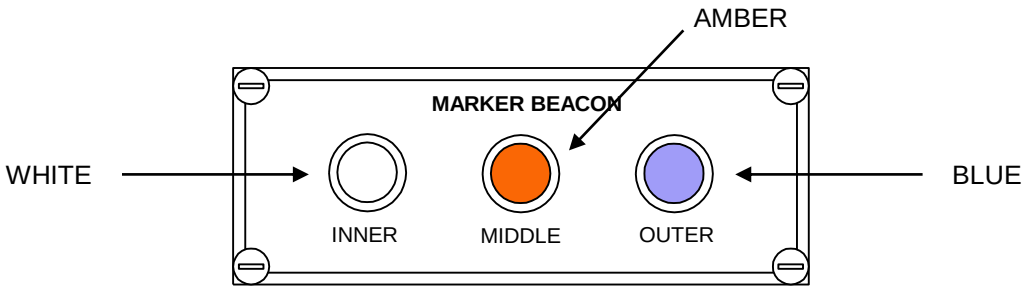


Figure 2-41. Typical MB Display

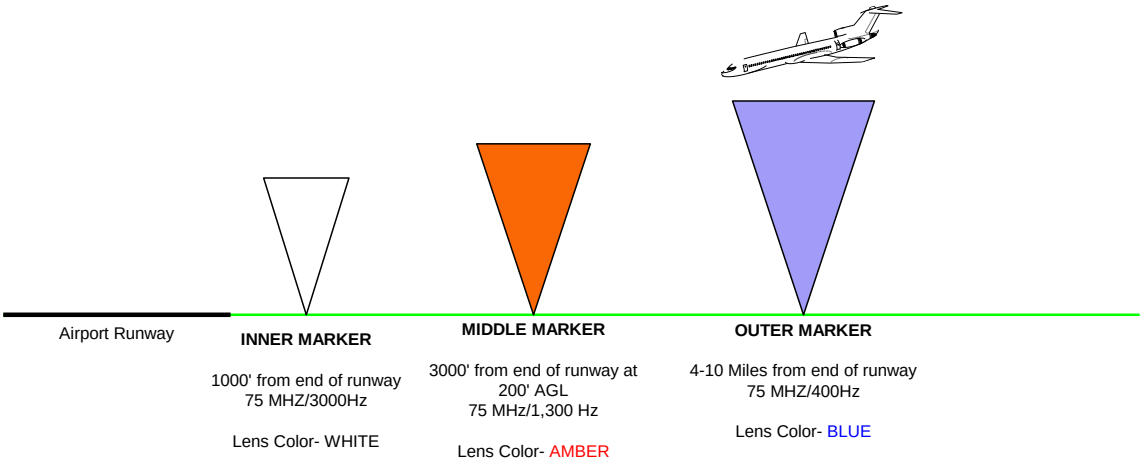


Figure 2-42. Typical MB Approach Parameters

2.14.6.3 Basic VOR Principles

VOR (Variable Omni Range) is a VHF navigational aid utilized to determine the bearing of an aircraft to a designated point. The system comprises of a fixed ground station and the airborne receiver. The ground station transmits two signals, a reference and a variable signal. Within line of sight of a VOR ground station, the aircraft receiver will detect, then compare the phase relationship between the *reference* and *variable signals* and translate it to a bearing from the ground station.

The basic principle of VOR is the measurement of time (phase) difference between the two signals.

The *reference signal* is a 30 Hz signal which frequency modulates (FM) a 9960Hz subcarrier. The frequency modulated signal is then used to amplitude modulate (AM) the RF carrier.

The *variable signal* uses the same carrier frequency but no modulation from the transmitter. The signal is modulated at 30 Hz by the rotation of the antenna.

The *variable* 30 Hz AM signal and the 30 Hz FM *reference* signal are timed (by the rotation of the antenna) to be in phase at a relative position of due north of the VOR station (see Figure 2-43).

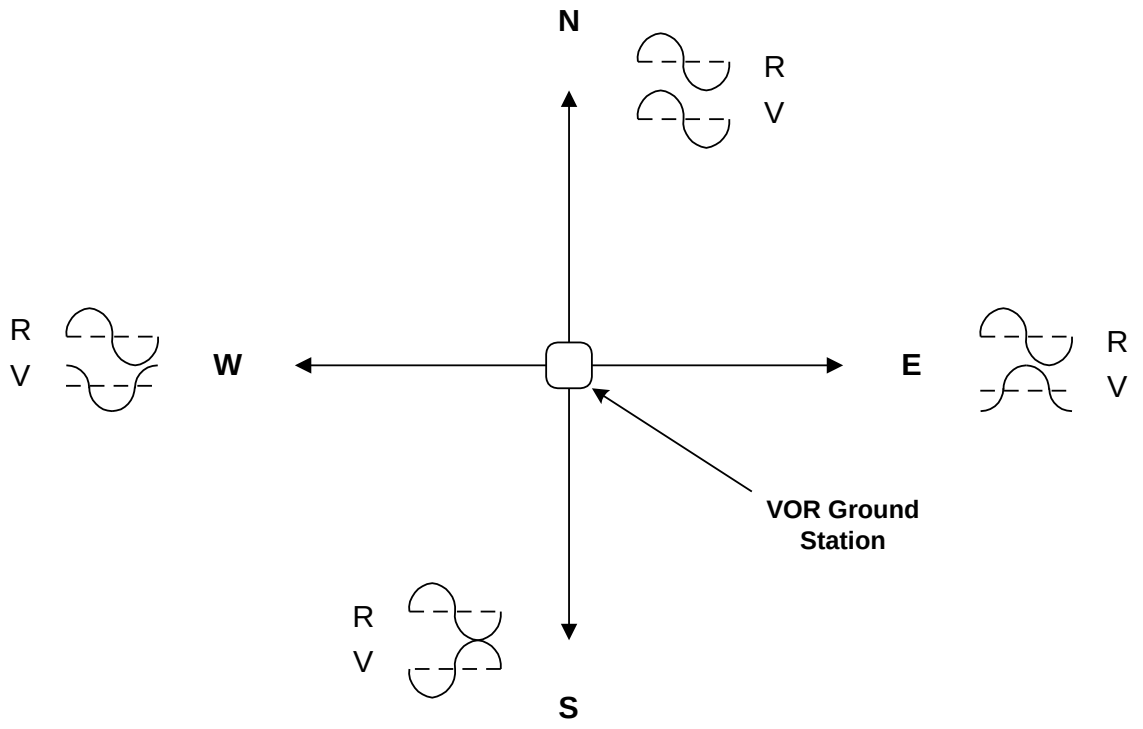


Figure 2-43. Phase Relationship between Variable and Reference Signals

Using Figure 2-43, Note at due North, the signals are *IN* phase. At due East - the signals are 90° out of phase, due South - 180° out of phase, due West – 270° out of phase. The VOR receiver in the aircraft measures this phase difference and displays the information as the correct bearing TO or FROM the ground station.

2.15 ELT and EPIRB Test Procedures

The tests are described utilizing the TR-36 Test Set. It is assumed the operator has a detailed knowledge of Avionics Systems and the UUT test requirements.

WARNING
Activating a 406MHz beacon for reasons other than to indicate a life-threatening distress situation or without the prior authorization from a Cospas-Sarsat MCC is considered an offence in many countries of the world, and could result in prosecution.

NOTE

Testing a 121.5 MHz or 243 MHz ELT can be performed typically 5 Minutes before the hour or half hour. Check with your local FAA and/or Coast Guard before testing.

1. Turn the Test Set **ON** and before selecting Direct Connect, enter the Cable loss from the Test Set to the ELT/EPIRB under Test. Select the **NAV** Soft-Key.

2. Select **ELT/PLB** Soft-Key.

3. The Test allows the operator to select the following settings (Table 2-13 and Figure 2-44).

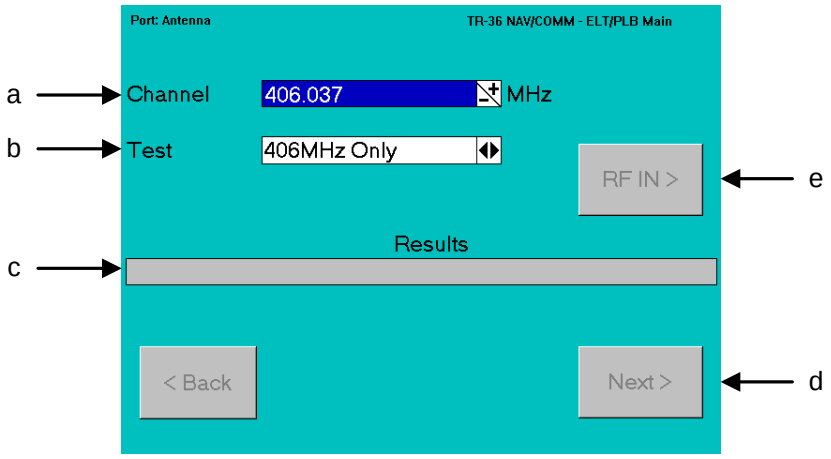


Figure 2-44. ELT/EPIRB Home Page

Table 2-13 **ELT SELECTIONS**

a	**Channel**	Frequency Selection 406.022 MHz to 406-076 MHz In 30 kHz Steps
b	**Test**	406 MHz Only 406 MHz / 243 MHz Only 406 MHz / 121.5 MHz Only
c	**Results**	Pass Fail based on Stored Criteria
d	**Next >**	Advances to the Results Pages
e	**RF IN >**	Starts the ELT Test

4. Select the Type of Test to be performed:

   - 406 MHz Only
   - 406 MHz and 243 MHz
   - 406 MHz and 121.5 MHz

   If testing only a 243 MHz or 121.5 MHz ELT, Select the 406/243 MHz for a 243 MHz test or 406/121.5 MHz for a 1215 MHz ELT.

5. Select the **RF IN >** Soft-Key to begin the automated test. The Test Set will perform a quick test (Figure 2-45) of all available data and show a PASS or FAIL result based on the received data.

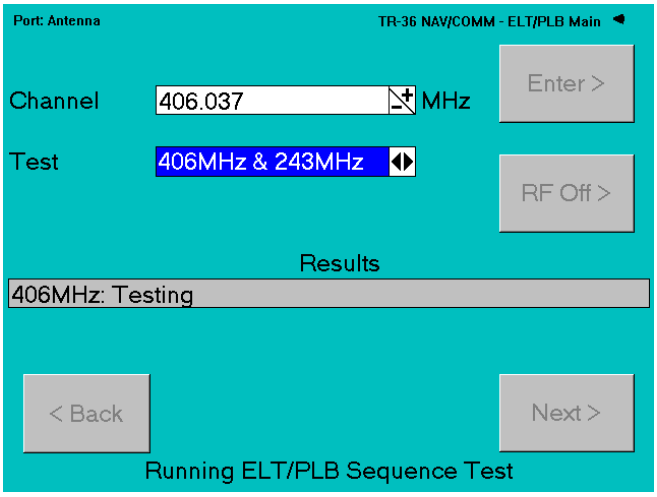


Figure 2-44. ELT Testing in Progress

6. Select **Next >** Soft-Key to advance to the Individual Results data pages (Table 2-13). The Test Set will provide the following data based on the EPIRB/ELT's capability Figures 2-45/46/47/48 and Tables 2-14, 15, 16 and 17.

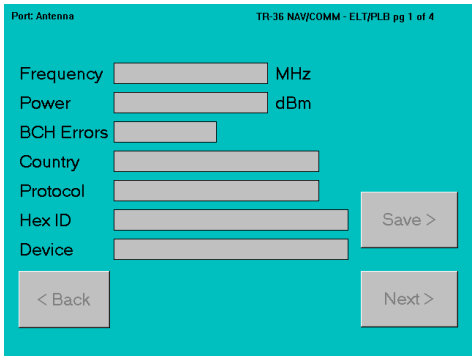


Figure 2-45. Saved Data 1

Table 2-14 ELT Data Field 1	Description
Frequency	Measured Frequency
Power	Power of the ELT/EPIRB in dBm
BCH Errors	Error-correcting code used in the first protected field of all 406 MHz messages as a shortened form of a (127,106) Bose-Chaudhuri-Hocquenghem (BCH) code
Country	Decoded Country of Origin
Protocol	User Identifiable Protocol BIT
HEX ID	The 15 hexadecimal characters that uniquely identify each 406 MHz beacon are called the beacon identification or beacon 15 Hex ID.
Device	Data Bit indicating Device Type Protocol Number

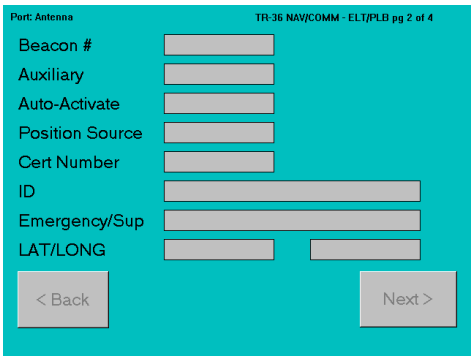


Figure 2-46. Saved Data 2

Figure 2-15 ELT Data Field 2	Description
Beacon #	Specified Beacon Protocol Number
Auxiliary	auxiliary radio-locating device type(s) Protocol Number
Auto-Activate	BIT 108 indicating Type of Activation
Position Source	User-Location Protocols Standard Location Protocols National Location Protocol Return Link Service (RLS) Location Protocol
Cert Number	Decoded received Certification Number
ID	Beacon Identification Data Bit
Emergency/Sup	Maritime Emergency Code

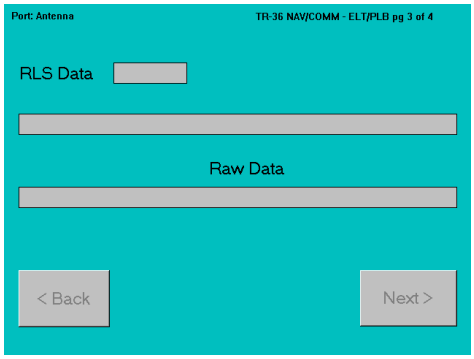


Figure 2-47. Saved Data 3

Figure 2-16 ELT Data Field 3	Description
RLS Data	Return Link Service (RLS) Location Protocol
RAW Data	Raw un-decoded received Data

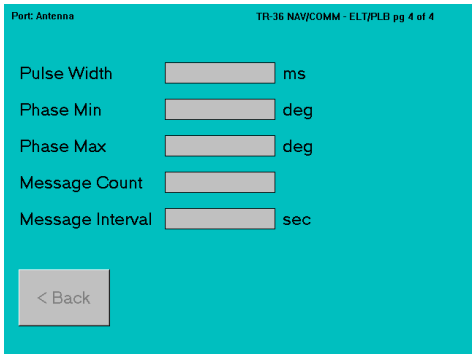


Figure 2-48. Saved Data 4

Figure 2-17 ELT Data Field 4	Description
Pulse Width	Total Transmission time in ms.
Phase Min	Minimum Measured Phase Shift of the data message
Phase Max	Maximum Measured Phase Shift of the data message
Message Count	Total count of messages received
Message Interval	Position Data Message intervals measured in seconds

7. The Operator can save the test results to the Test Set memory. This data can then be downloaded to a standard PC. To save the data, from the **ELT/PLB** Home Page and after the completion of the test; select the **Save >** Soft-Key (Figure 2-49).

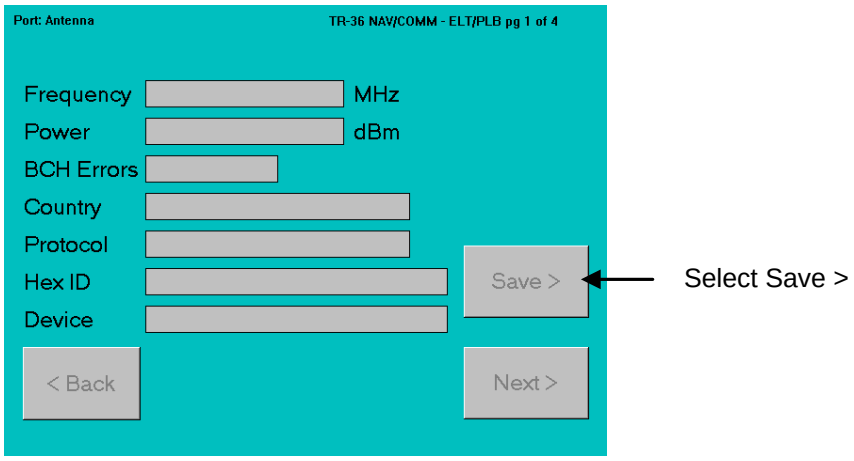


Figure 2-49. ELT Save Data

8. Using the Key Pad, enter any file name into the “File Name” window then select **Save** (Figure 2-50). The file will be saved to the Test Set memory for future download.

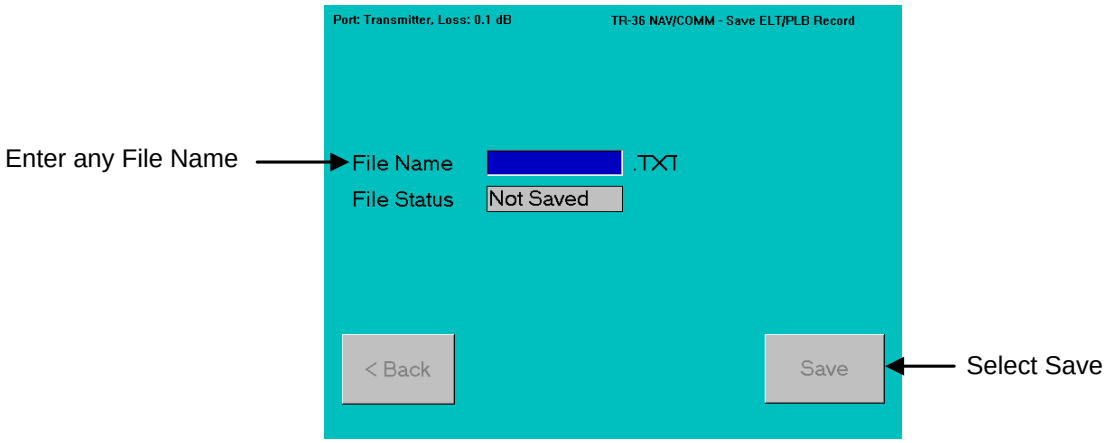


Figure 2-50. ELT File Name and Save

2.16 Communications Transceiver Tests

The following tests for Communication equipment are described with the use of the Test Set antenna or Direct Connect and include preset parameters to rapidly determine the state of the equipment being tested. When conducting antenna-to-antenna checks, ensure that you properly extend the antenna to the correct length IAW Paragraph 2-8.

Transmitter Checks can be tested utilizing either the **DIRECT CONNECT** or **ANTENNA** method. Ensure you do not exceed the input power maximums of either port or damage to the Test Set can occur.

- Direct Connect - < 30 Watts Continuous (14.8 dB)
- Antenna - < 0.1 Watt Continuous (-10 dB)

When utilizing **DIRECT CONNECT**, it is important to know the total cable loss of the cable utilized when connecting the Test Set to the transceiver under test. The Direct Connect cable provided with the Test Set has the cable loss notated on the cable. Any additional cables or connectors loss in line with the supplied cable should also be added to the total before beginning the test to ensure accurate measurements (Figure 2-51).

NOTE

Power measurements performed when utilizing the **ANTENNA** method will not be accurate. Use for reference only.

Testing Transceivers in excess of 30 Watts can also be conducted with the use of an external attenuator matched to the frequency of the radio under test.

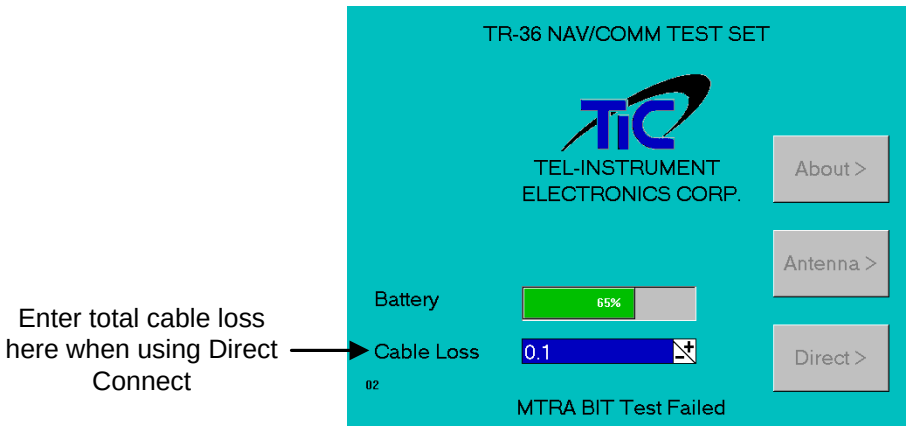


Figure 2-51. Cable Loss

The AM or FM audio of the transmitted signal can also be monitored by using a standard aviation headset plugged into the Test Set **HEADSET** connector on the front panel (Figure 2-52).

Figure 2-51. Headset Connector

2.16.1 AM Transceiver Tests

1. From the Test Set **Home** Page, select the type of test to be performed; **DIRECT CONNECT** or **ANTENNA**.

2. Select the **< Comm** Soft-Key, then **Transmitter**.

3. Select the following:

    a. Mod Type – AM
    b. Frequency – Expected frequency ± 25 kHz
    c. Frequency – 10 MHz to 512 MHz in 25 kHz or 8.33 kHz steps

4. If the transceiver under test does not have a tone generator source, the operator can select **TX Audio Tone on Intercom** (Figure 2-52) to inject a 1020 Hz tone from the Test Set **Intercom** connector to the transceiver audio input.

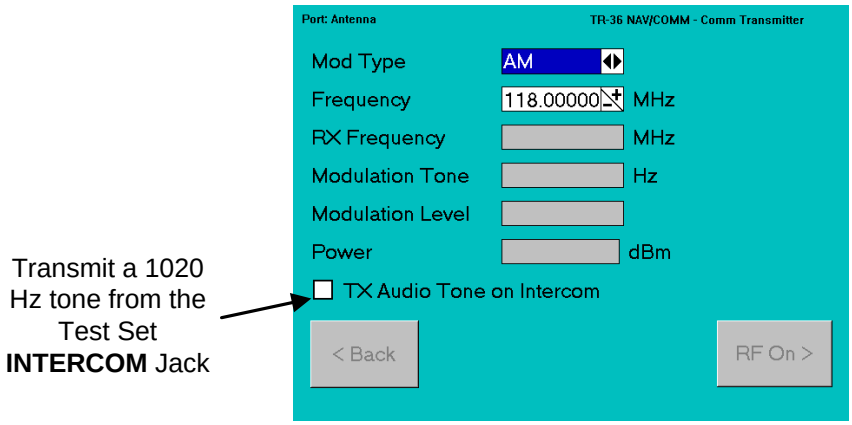


Figure 2-52. Intercom Tone Selection

5. Select the **RF On >** Soft-Key on the Test Set and then Key the transmitter.

6. The Test Set will measure the following parameters (Figure 2-53):

    a. RX Frequency
    b. Modulation Tone in Hz
    c. % (percentage) of Modulation of the tone
    d. Power of the signal in dBm or watts

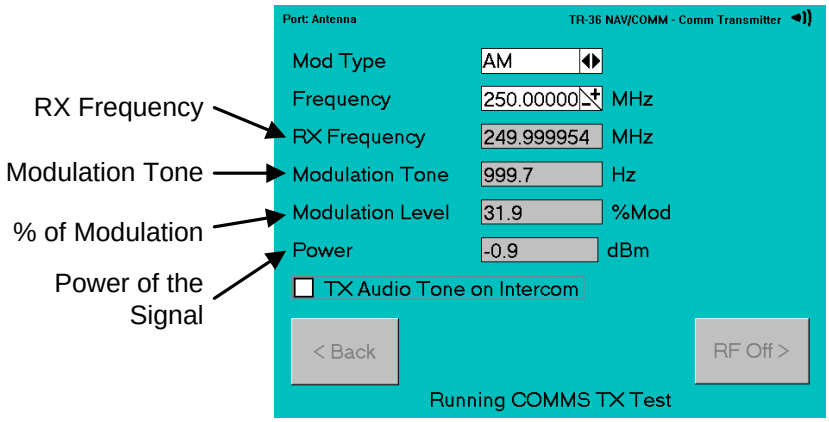


Figure 2-53. AM Received Results

7. Select **RF Off >** to end the test.

2.16.2 FM Transceiver Tests

1. From the Test Set **Home** Page, select the type of test to be performed; **DIRECT CONNECT** or **ANTENNA**.

2. Select the **< Comm** Soft-Key, then **Transmitter**.

3. Select the following:

    a. Mod Type – FM
    b. Frequency – Expected frequency ± 25 kHz

4. If the transceiver under test does not have a tone generator source, the operator can select **TX Audio Tone on Intercom** (Figure 2-52) to inject a 1020 Hz tone from the Test Set **Intercom** connector to the transceiver audio input.

5. Select the **RF On >** Soft-Key on the Test Set and then Key the transmitter.

6. The Test Set will measure the following parameters (Figure 2-53):

    a. RX Frequency

b. Modulation Tone in Hz
c. FM Deviation Level
d. Power of the signal in dBm or watts

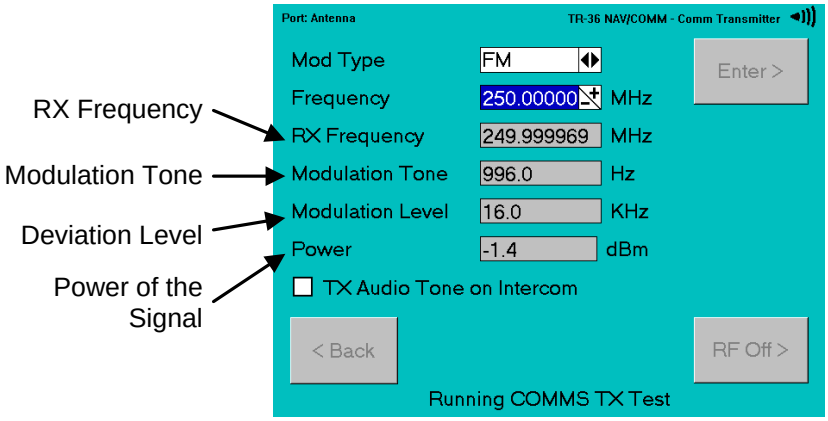


Figure 2-54. FM Received Results

7. Select **RF Off >** to end the test.

2.17 Communications Receiver Tests

The following tests for Communication receiver equipment is described with the use of the Test Set Antenna or Direct Connect and include preset parameters to rapidly determine the state of the equipment being tested. When conducting antenna-to-antenna checks, ensure that you properly extend the antenna to the correct length IAW Paragraph 2-8.

Receiver checks can be tested utilizing either the **DIRECT CONNECT** or **ANTENNA** method.

When utilizing **DIRECT CONNECT**, it is important to know the total cable loss of the cable utilized when connecting the Test Set to the transceiver under test. The Direct Connect cable provided with the Test Set has the cable loss notated on the cable. Any additional cables or connectors loss in line with the supplied cable should also be added to the total before beginning the test to ensure accurate measurements (Figure 2-51).

NOTE

Do Not Transmit or key the transceiver into the Test Set when conducting receiver checks.

2.17.1 Test Set Receiver Settings

The Test Set can provide the following output signals to the receiver under test (Table 2-18 and Figure 2-55).

RECEIVER SELECTIONS		
a	**Mod Type**	Modulation Selection: AM FM CW (Continuous Wave)
b	**Frequency**	10 MHz to 518 MHz
c	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
d	**Tone Freq**	10 Hz to 10,000 Hz
e	**Tone Level AM**	0 to 100% MOD in 1% Steps
	Tone Level FM	Deviation 0.000 to 25 KHz in 0.100 Steps
f	**Modulation Source**	Internal (Test Set Provides Source) External Sig/Gen (Via Intercom Jack) External MIC (VIA MIC Jack)
g	**RF Off**	Receiver TEST ON/OFF
h	**PTT ON**	Push to Test ON

Table 2-18 Receiver Test Selections

The Operator can choose the Test Set *INTERNAL* signal Generator or inject their own signal via an external generator or Microphone by inserting the signal at the **MIC/MOD IN** port. The **PTT** Soft-Key is needed only when there is no external Push to Talk button before beginning the test and the source of the modulation is connected to the **MIC/MOD IN** jack.

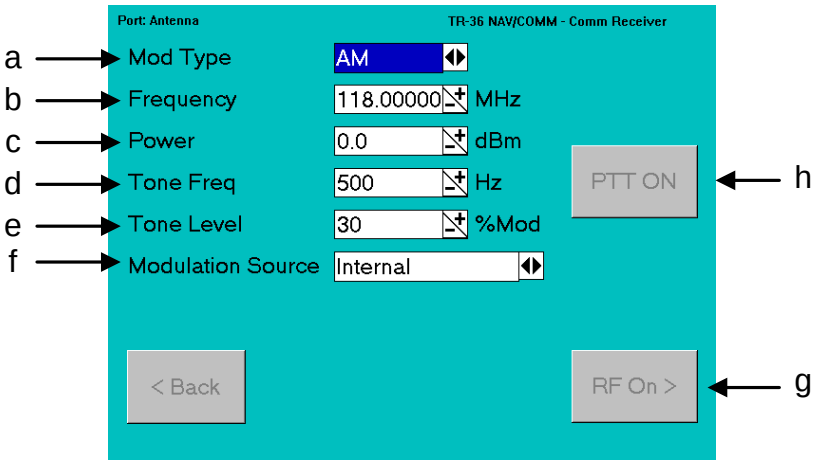


Figure 2-55. Receiver Selections

2.17.2 Conducting a Receiver Test

1. From the Test Set **Home** Page, select the type of test to be performed; **DIRECT CONNECT** or **ANTENNA**.

    a. When utilizing the Omni-antenna, ensure you extend the antenna to the correct length IAW Paragraph 2.8

2. Ensure the receiver under test is “ON” and the desired frequency and mode are selected.

3. On the Test Set, select the **< Comm** Soft-Key, then **Receiver**.

4. Select the following for a standard test:

    a. Mod Type – FM or AM
    b. Frequency – Exact Frequency on the Receiver under test
    c. The output power required
    d. The tone frequency
    e. Tone Level:
        i. AM – Percentage of Modulation
        ii. FM – FM Deviation
    f. Select Source:
        i. Internal – Utilizing the settings above in b, c, d, and e
        ii. External Sig/Gen – External source connected via the Test Set **INTERCOM Jack**.
        iii. External Mic – Utilizing an external Microphone. If the microphone does not have a PTT switch, the operator must also select the **PTT** Soft-key.

5. Select the **RF On >** Soft-Key to start the test.

6. The operator should hear the desired signal on the transceiver audio output source or aircraft audio system.

7. To change any parameter “On the Fly”, use the arrow keys, enter the new selection and then select the **Enter >** Soft-Key (Figure 2-56).

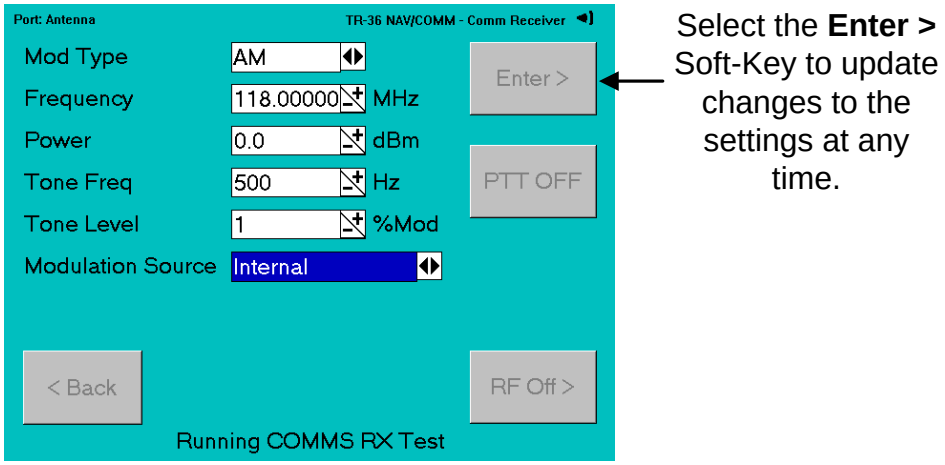


Figure 2-56. Update Parameters

8. Select the **RF Off >** Soft-Key to end the test.

2.18 SELCAL (Selective Calling) Tests

The TR-36 is capable of testing and verifying an aircraft SELCAL system. SELCAL a selective-calling radio system that can alert an aircraft's crew that a ground radio station is trying to communicate with the aircraft.

SELCAL uses a ground-based encoder and radio transmitter to broadcast an audio signal that is picked up by a decoder and radio receiver on an aircraft. SELCAL allows an aircraft crew to be notified of incoming communications even when the aircraft's radio has been muted.

An individual aircraft has its own assigned SELCAL code. To initiate a SELCAL transmission, the Test Set operator will enter the SELCAL code into the Test Set at the desired frequency to e tested. The Test Set transmit on both the VHF and HF frequency ranges.

The Test Set till convert the four-letter code into four designated audio tones. On the selected frequency in the proper sequence (Table 2-19).

A	312.6 Hz	***E***	473.2 Hz	***J***	716.1 Hz	***P***	1083.9 Hz
B	346.7 Hz	***F***	524.8 Hz	***K***	794.3 Hz	***Q***	1202.3 Hz
C	384.6 Hz	***G***	582.1 Hz	***L***	881.0 Hz	***R***	1333.5 Hz
D	426.6 Hz	***H***	645.7 Hz	***M***	977.2 Hz	***S***	1479.1 Hz

Table 2-19. SELCAL Frequency Chart

2.18.1 SELCAL Receiver Message Testing

1. The Test Set can provide the following output signals to the receiver under test (Table 2-20 and Figure 2-57).

2.	**RECEIVER SELECTIONS**	
4. 5. **a**	**Frequency**	10 MHz to 518 MHz
6. 7. **b**	**POWER Antenna**	0.0 dBm to -70.0 dBm / 0.1 dBm Steps
	POWER Direct Connect	-40 dBm to -110 dBm / 0.1 dBm Steps
8. 9. **c**	**Modulation**	0 to 99.0 % Modulation
d	**SELCAL Tone**	4 letter Selectable Code
10. **e**	**Entered Tone**	Final tone entered
11. 12. **f**	**RF On >**	ON/OFF selection for SELCAL Test Continuous
g	**Ping >**	Send a Single SELCAL Message Burst

Table 2-20. SELCAL Receiver Selections

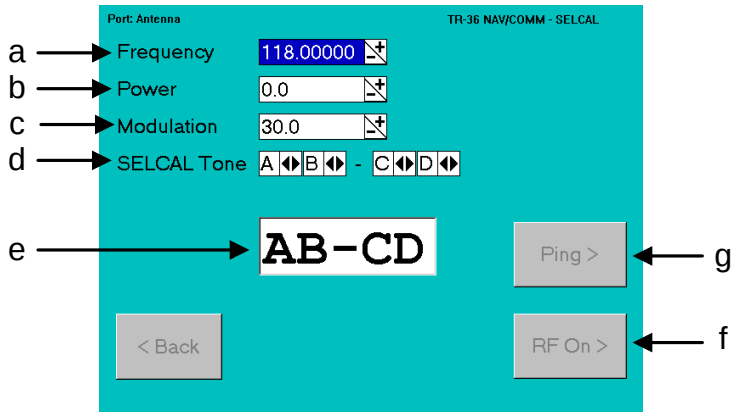


Figure 2-57. SELCAL Selections

2. From the Test Set **Home** Page, select the type of test to be performed; **DIRECT CONNECT** or **ANTENNA**.

    a. When utilizing the Omni-antenna, ensure you extend the antenna to the correct length IAW Paragraph 2.8

3. Ensure the SELCAL receiver under test is “ON” and the desired frequency and mode are selected.

4. On the Test Set, select the **< Comm** Soft-Key, then **SELCAL >**.

5. Select the following for a standard test:

    a. Frequency – Enter the correct frequency of the SELCAL receiver under test.

    b. Power – The Test Set output power required.

    c. Modulation – Default is 30% Mod, adjust as required.

    d. Enter the Tone as per the receiver registered SELCAL Code

6. Select **RF On >**, the test set will transmit the entered SELCAL code. The Code will continually transmit at 30 second intervals until **RF Off >** is selected (Figure 2-58).

7. The operator can choose to send a single SELCAL message, (one time) by selecting **Ping >** (Figure 2-58).

8. To update any selection “On the Fly” while a test is running, utilize the arrow and Key-Pad to change the desired parameter and select **Enter >**. The new parameter selected will update immediately without stopping the current test.

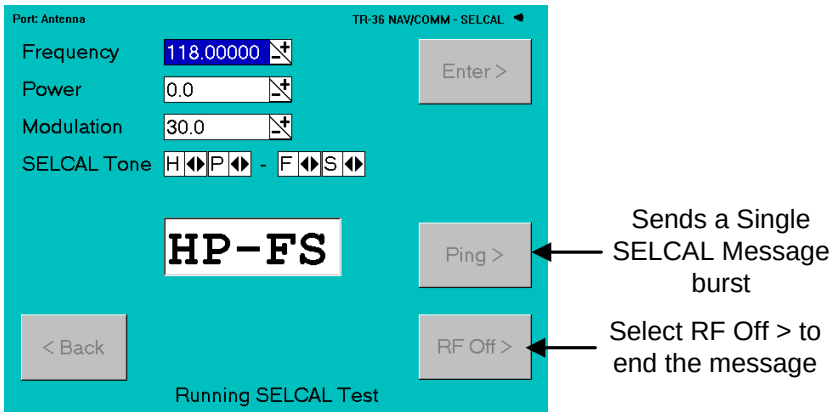


Figure 2-58. SELCAL **Ping >** and **RF Off >**

2.19 VSWR (Voltage Standing Wave Ratio) Tests

The TR-36 can perform VSWR test to help determine any transmission line imperfections in an aircraft wiring or antenna system. By injecting an AC line voltage and measuring the impedance loss and returned reflections from the source back to the Test Set, the TR-36 will then display a VSWR ratio and also graph the pattern so a determination of the impedance losses can be evaluated and then corrected.

An Ideal ratio of 1:1 is a perfect system, but with poor connectors, soldering joints and or damaged cables, the ratio can be adversely affected causing RF interference and poor performance of the transceiver.

The Test Set will conduct a sweep of a user specified frequency range and record results as a Pass/Fail and/or a detailed chart of the frequencies tested based on user defined parameters. The Test Set can display up to 30 measurements. A Pass or Fail is based on a VSWR ratio of => to 1.8 to 1. All measurements below 1.8 will indicate a Pass. All measurements across the frequency range must be below that ratio to ensure a Pass is indicated.

2.19.1 Conducting a VSWR TEST

1. The TR-36 Test Set VSWR Setup menu has the following output signals to the transceiver transmission line under test (Table 2-21 and Figure 2-59).

VSWR SELECTIONS		
a	**Freq Band**	50 MHz to 350 MHz
c	**Start Frequency**	50 MHz to 350 MHz in 1 MHz Steps
d	**Stop Frequency**	50 MHz to 350 MHz in 1 MHz Steps
e	**Step Size**	1 MHz to 50 MHz in 1 Mhz Steps

Table 2-21. VSWR Selections

NOTE

The user cannot use the Direct Connect Cable included with the test set for conducting this test as the cable loss is too high for the test set to make a proper VSWR measurement. The cable that is selected must have no more than 1 dB loss for connection between the Test Set and the cable assembly being tested.

WARNING

When conducting VSWR measurements of associated cabling, ensure the associated UUT cable is NOT powered or turned on. Damage to the Test Set or aircraft system equipment will occur.

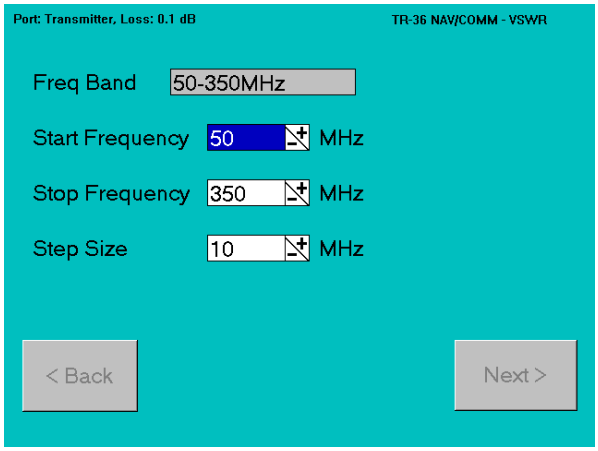


Table 2-59. VSWR Selections

2. From the Test Set **Home** Page, select either **DIRECT CONNECT** or **ANTENNA** neither section or the Cable Loss has any affect in VSWR Testing.

3. Select **NAV – VSWR > Soft-Key**. The operator can modify default settings by utilizing the arrow keys. Table 2-21 details variable parameters that operator can modify.

4. Before making any measurement, the operator will be prompted to align the associated hardware to ensure accurate results. This procedure is required only for the initial test. If during the process factors such as temperature change, the Test Set will automatically stop the current test and prompt the operator to conduct another alignment cycle to ensure results remain accurate.

5. Having advanced to the main **VSWR** menu and selecting the initial parameters; Select **Next >** (Figure 2-60).

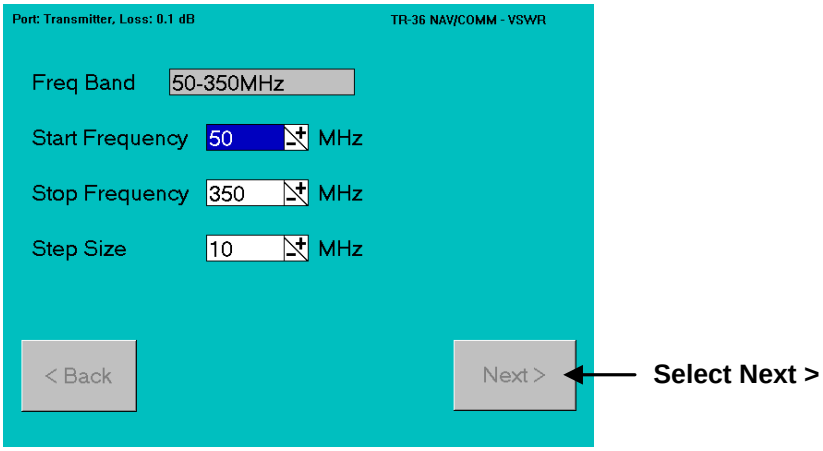


Figure 2-60. VSWR Test

6. Remove the supplied “Termination Cap Mismatch Load” (Figure 2-61) from the Test Set Accessory pouch port and install it as per the instructions on the Test Set **VSWR < 0.1W** Port (Figure 2-62). The Test Set also will prompt the operator on each step to take during the VSWR test process.

Figure 2-60. Termination Cap Mismatch Load

Figure 2-61. VSWR Connector

7. With the Termination Cap Installed, Select the **Run >** Soft-Key. The Test Set Status window will also prompt the user to the next step (figure 2-62).

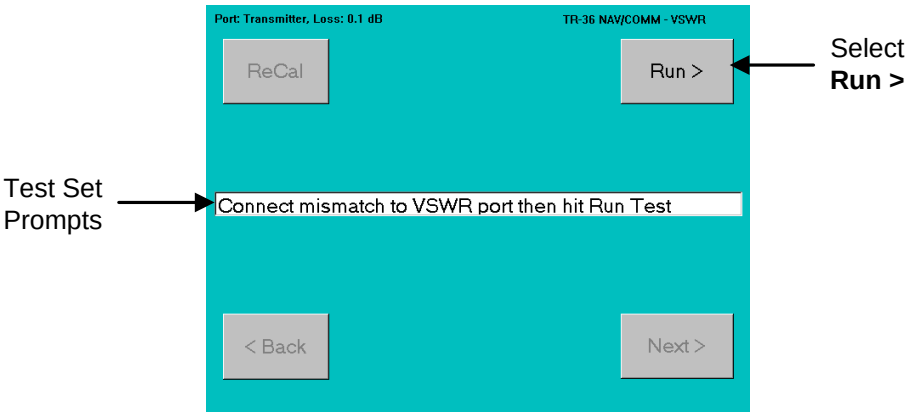


Figure 2-62. Test Set Prompts 1

8. After approximately 10-20 seconds, the Test Set will prompt the operator to remove the mismatch load. Select **Run >** a second time to complete alignment cycle (Figure 2-63).

Continue to follow Test Set Prompts

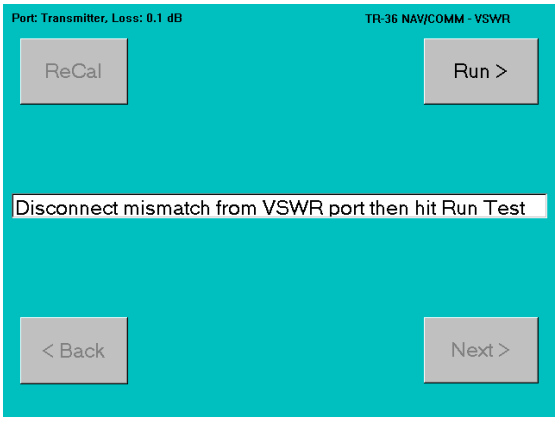


Figure 2-63. Test Set Prompts 2

9. The Test Set will complete the alignment cycle and prompt the operator (Figure 2-64) to connect UUT associated cable to the **VSWR < 0.1 W** Port on the Front Panel (Figure 2-61).

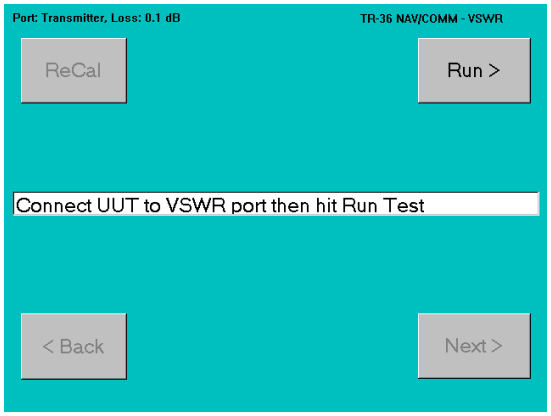
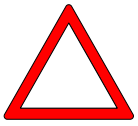


Figure 2-64. Test Set Prompts 3



WARNING

When conducting VSWR measurements of associated cabling, ensure the associated UUT cable is NOT powered or turned on. Damage to the Test Set or aircraft system equipment will occur.

10. With the Test Set aligned, user parameters set, and cable to be tested connected to the **VSWR <0.1 W** Port, select **Run >** to perform a VSWR measurement.

11. Test Set will display a Pass/Fail indication; Select **Next >** to view a detailed analysis of VSWR test performed and a graphical Display of the results (Figure 2-65). The Graph will be based on the initial settings set up in step #3.

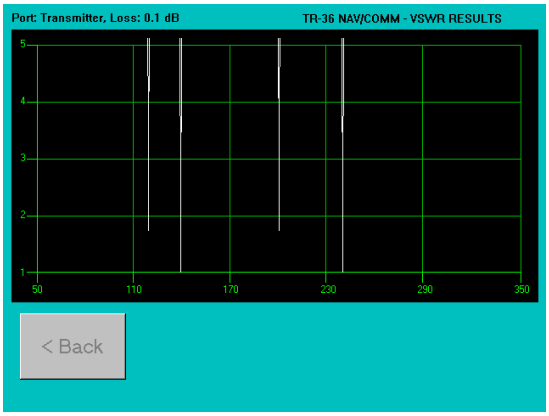


Figure 2-65. Graphic VSWR Display