TR-220

Multi-Function Test Set

Datasheet

Tel Instrument ELECTRONICS CORP.

Álava Ingenieros GRUPO ÁLAVA

Description

The TR-220 Multi Function Test Set completely covers all your ramp testing needs in one small and easy to use package. Test capability for Traffic and Collision Avoidance Systems (TCAS), Distance Measuring Equipment (DME) and Transponders Modes A, C, Elementary, Enhanced Surveillance and now ADS-B Transmit and Receive capability including DO-260A/B requirements. The TR-220 features state of the art design. Microprocessor control and simple switch layout resulting in an easy-to-use single person operation requiring minimal training.

P/N 90 000 088

Features

- Transponder Mode A, C, S, Elementary, Enhanced (automatically determined)
- Performs all transponder Tests IAW FAR 43 Appendix F and Euro Control Mode S test criteria
- DF-17 Extended Squitter ADS-B compliant with DO-260 A/B and AMC 2-24
- Full control of TCAS I and II intruder tests and validation. Storable intruder/scenario simulations
- Provides complete DME validation and customizable simulations
- TIS-B (Traffic Information Broadcast) DF17/18 Air and Surface simulation with 4 intruder aircraft
- Hand- Held directional antenna included and Optional Antenna Coupler Cap available (TAP-200)
- Compliant with European CE requirements
- 2 year limited warranty; Extended warranties available

Transponder

- Test Set automatically determines capability of transponder being tested (ATCRBS or Mode S)
- Testing can be done over-the-air and in Direct Connect for better control and tolerance
- Test Set configured for automatic sequencing based on stored criteria or manual control of individual transponder tests
- Full display of test results decoded and measurements performed
- RS-232 connection for download of results to a PC

DME

- Allows testing on all channels (108.00 to 117.95 MHz)
- Measures DME power, frequency, and PRF. Hand-Held Antenna and Direct Connect methods available
- Transmits DME Morse-Code I.D.
- User selection and complete control of DME simulated scenarios

TCAS

- The TR-220 performs testing of TCAS I, TCAS II and Traffic Advisory Systems
- Allows simulation of ATCRBS or Mode S intruder aircraft
- permanent storage of 10 intruder scenarios, to simplify TCAS testing and local procedures
- User selection of velocity, starting distance, starting altitude, and vertical speed.
- Measures Relative UUT power and frequency
- Start, Stop and Hold selections allow technicians to perform bearing/relative heading tests with ease

Transponder Test Specifications *

The TR-220 performs the following tests based on the capabilities of the transponder:

- Mode A - 4096 code, IDENT, percent reply, pulse spacing, pulse width
- Mode C - Altitude (feet and grey code), percent reply, pulse spacing, pulse width
- Side-lobe suppression (SLS)
- Mode A/S and C/S All Call - Mode S address, percent reply
- Mode A Only and Mode C Only
- Mode S Surveillance I.D. (DF5) – Mode S address, percent reply, flight status (Air, Ground, Alert, SPI), Mode S/Mode A 4096 code compare (automatic mode)
- Mode S Surveillance Altitude (DF4) – Mode S altitude, percent reply, Mode S/Mode C altitude compare (automatic mode)
- Mode S Surveillance Short (DF0) – Mode S address, vertical status (Air, ground), percent reply, decoded country code, decoded tail number (if applicable)
- Mode S Comm. I.D. (UF5/DF21) – Mode S ID code, percent reply
- Mode S Comm. Altitude (UF4DF20) – Mode S altitude, percent reply
- Undesired replies (UF11) – Checks for reply to incorrect Mode S interrogation
- Acquisition squitter – Pass/Fail indication of squitter duration, decoded Mode S address, interrogator code
- Extended squitter – Pass/Fail indication of squitter duration, decoded Mode S address
- Max Airspeed – Decodes and displays maximum airspeed
- Diversity – Displays Pass/Fail indication and measured value of RF leakage through Mode S transponder antenna ports
- Sensitivity (MTL) – Measures and displays MTL for Modes A, C, and S
- Measures and displays transponder power (dBm or watts), frequency, and receiver sensitivity (dBm)
- Decodes and displays Flight I.D.

DO-260A/B General Tests Performed but not limited too:

- Decodes and displays Mode S address in Octal and Hex
- Mode S Enhanced Surveillance parameters, including Selected Altitude (BDS4); Roll Angle, True Track Angle, Ground Speed, Track Angle Rate, and True Airspeed (BDS5); Magnetic Heading, Indicated Airspeed, Mach #, Barometric Altitude Rate, and Inertial Vertical Velocity (BDS6)
- Receives and decodes 1090 MHz ADS-B data, including squitter type (airborne position, surface position, aircraft identification/category, and airborne velocity), latitude/longitude, N/S velocity, E/W velocity, Flight I.D., Mode S address, altitude (GNSS or barometric), and airspeed
- Transmits 1090 MHz ADS-B data for four intruder aircraft (airborne or surface position)
- Transmits TIS data for four intruder aircraft

DO-260A/DO240(2) specific parameters tested but not limited too:

- BDS 0,5
- BDS 0,8
- BDC 0,9 Subnet 1, 2, 3, 4
- Velocity Hex
- DF 17 MS Address
- Interrogator Identifier
- Latitude, Longitude
- Airborne Squitter Status Bits – No Info, SPI, Alerts, Mode A 4096 Code
- Squitter Period, Squitter Type (Ext Squitter Airborne Position Report)
- TYPE 28 Report
- BDS 6,1
- TYPE 29 Report
- BDS 6,2 Target State and Status
- Type 31 Report (BDS 6,3)
- Horizontal Position Integrity Information

DO-260B specific parameters tested but not limited too:

- Status Type 28, Type 1 Emergency Report & Type 2, Active RA
- Type 29 – 6,2 Squitter TCAS/ACAS Operational Status, TCAS/ACAS RA, FMC/MPC/FCU Altitude, Pressure and Heading
- Type 29 6,2 ME Field, Squitter type, Target State and Status
- Type 31 6,3 Aircraft Operational Status
- Horizontal Position Status (Nap) Navigation Integrity Category (NIC) for DO-260B
- Latitude/Longitude Compare for position, velocity and system accuracy
- ADS-B IN – Decode and display aircraft ADS-B RX capability in Type 31 Subtype 0
- GPS Antenna Offset.

Receiver	Frequency	Range	1086.5 to 1093.5 MHz
		Accuracy	± 200 kHz
	Power	Range	47 to 64 dBm
		Accuracy	± 2 dB (direct connect)
			± 3 dB (radiated)
	Sensitivity	Range	-50 to -87 dBm
		Accuracy	± 2 dB (direct connect)
			± 3 dB (radiated)
	Reply Percent	Range	0 to 100%
		Accuracy	± 1%

Transmitter	Frequency	1030 MHz ± 10 kHz
	Power	≥ 4 dBm
	Modes	A, C, S, EHS, ADS-B TX/RX and TIS

TCAS Test Specifications *

The TR-220 allows testing of TCAS I, TCAS II, and Traffic Advisory Systems by simulating either ATCRBS or Mode S intruders. The Setup menu allows operator to configure and store 10 TCAS scenarios, including Distance (1 to 50 NMI), Altitude (-1000 to +99,900 ft.), Vertical Speed (-7,500 to +7,500 fpm) and Velocity (100 to 1200 KTS.). The TR-220 provides a relative measurement of TCAS power and frequency.

Transmitter	Frequency	1090 MHz ± 100 KHz
	Power	≥ 4 dBm
	Modes	C, S

Receiver	Frequency	1026.5 to 1033.5 MHz
	Power	47 to 64 dBm

DME Test Specifications *

The TR-220 provides test capability for DME by allowing operator to select test parameters, including Channel (108.00 to 117.95 MHz) and Velocity (120 to 1200 KTS.).

The TR-220 measures and displays DME PRF (scan rate), power, and frequency. Also, the TR-220 transmits a Morse Code I.D.

Transmitter	Frequency	962 to 1213 MHz ± 100 KHz
	Power	≥ 4 dBm
Receiver	Freq. Range	Channel Freq. ± 3.5 MHz
	Freq. Accuracy	± 200 KHz
	Sensitivity Range	≤ -35 dBm

Antenna

- Directional antenna can be hand-held, Tripod Mounted or mounted on side of case
- Antenna gains marked on attached decal
- Range – 10 to 170 feet

Accessories

- Directional antenna (hand-held or mounted on side of case)
- AC Power Cord
- Direct Connect Cable
- Directional Antenna Cable
- Operators Manual (CD-Rom)
- TAP-200 Anti-Radiation Coupler (Optional)
- All Accessories Store in Transit case

Physical

- Packaging – MIL-PRF-28800, Style C
- Size – 14.5x9.4x6.5 in. (36.8x23.9x16.5 cm.)
- Weight: 20 lbs. (9.1 kg.)
- Operating Temperature: -28 to +55 C
- Battery Operation; 8 hours at 20% Duty Cycle – Front Panel Replaceable
- AC Operation/Charging: 100-240 VAC, 50-400 Hz

Capab Comm AB EHS AIR Press A/M II:14	Auto Transponder Detection Capability
M S Long Air / 20000' A07008 100%	Decodes and Displays Binary, Hexadecimal and Octal parameters
MS Ampl Var. PASS MS Pulse Width PASS	Displays PASS or FAIL based on Stored Criteria
M A 1234 IDENT 100% 0.45 — 20.35 — 0.45	Measures and Displays Pulse Width, spacing & timing intervals
Velocity: 180 nmi/h Chg:Up/Dn Cont: AUTO	Numerous user variable parameters for TCAS and DME testing
BDS5 True Trk Angle An E120 D Rt + 8 D/s	Easy to understand and interpret Enhanced Surveillance results
AC OPST BDS6,3 10.0s F8220008002928 TYP31	Comprehensive and full DO-260 A/B Testing
4 DF17 Targets A00001 Airborne	DF17/DF18 TIS Traffic Information System validation

Tel-Instrument Electronics Corporation

One Branca Road
East Rutherford, NJ 07073
Tel. +1(201) 933-1600
Fax +1(201) 933-7340
sales@telinst.com
www.telinstrument.com

TB-2100

ATC/DME/MODE S Test Set

Datasheet

Description

The TB-2100 is a modern, easy to use bench test set designed for testing Mode A, C, and S transponders and distance measuring equipment (DME).

The TB-2100 allows testing of Mode S transponders with new capabilities including, Extended Squitter, ADS-B, TIS, Elementary (ES) and Enhanced Surveillance (EHS), and including evolving European requirements.

The TB-2100 with IEEE-488 option uses the same IEEE-488 commands as older generation ATC/DME and Mode S test sets used in current generation ATE.

P/N – 90 000 106

Features

- Two independent, non-coherent, RF channels for Mode S testing
- Tests the latest Mode S Capabilities
  - Automatic Dependent Surveillance Broadcast (ADS-B)
  - Extended Squitter
  - Elementary (ES) and Enhanced Surveillance (EHS)
  - Traffic Information Systems (TIS)
- Easy to Use
  - Modern front-panel provides simple, intuitive, interface
  - Multiple, variable rate slew knobs control pulse width, power, repetition rates, and position
  - Keypad supports direct test parameter entry
  - Large color, touch-pad display, which continuously presents critical measurement information and permits immediate test parameter selection
  - Quick recall of standard test conditions using CAL button
- Additional Benefits
  - Provides video and RF signal feeds plus scope triggers
  - Can be connected to spectrum analyzers and other bench equipment
  - Flash memory provides easy update/upgrade path
  - Standard 2 year limited warranty; extended warranty available

Product Specifications

The TB-2100 features test capability for DME and transponders ATCRBS and Mode S).

Specifications

Signal Generator

Frequency Range	952.00 to 1223.00 MHz
Frequency Accuracy	± 0.001%
Frequency vs. Level Flatness	<1.0 dB
Signal Level Range	0 to -100 dBm into 50 Ω, 1 dB resolution
Signal Level Accuracy	0 to -50 dBm ± 0.75 dB -51 to -79 dBm ± 1.0 dB -80 to -89 dBm ± 1.1 dB -90 to -100 dBm ± 1.2 dB
On/Off Ratio	> 60 dB
Suppressor Pulse Amplitude	Variable from 9 to 28 V
Suppressor Pulse Width	35 ± 5 µs

UUT Measurements

Frequency	1020 to 1155 MHz; ± 20 kHz for ATC; ± 50 kHz for DME
Power	0 to 4000 W pk; ± 0.7 dB 1 to 99 W; ± 0.5 dB 100 to 4000 W

Transponder Modes

Mode	ATCRBS and Mode S

Pulse Characteristics

Rise time (P1)	75 ± 25 ns
Fall time (P1)	150 ± 50 ns

ATCRBS Mode A/C

Pulse Width (P1/P2/P3)	0.80 ± .05 µs, variable -0.3 to 1.4 µs in 50 ns steps
P2 Position (Relative to P1)	2.00 ± .05 µs, variable ± 1.00 µs in 50 ns steps
Mode C P3 Position (Relative to P1)	21.00 ± .05 µs, variable ± 1.00 µs in 50 ns steps
Interference Pulse Width	0.30 to 3.00 µs ± 1%, variable in 50 ns steps
Interference Pulse Position (Relative to P1)	-5 to +45 ± .05 µs , variable in 50 ns steps
Interference Pulse RF source	Selectable for coherent or non-coherent
Interference Pulse/SLS Level (relative to P1)	-15 to +3 dB ± 0.25 dB, variable in 1 dB steps
PRF	0.1 to 2500 Hz
Scope Sync Width	0.8 to 1.2 µs
Scope Sync Position (Relative to P1)	0 to 175 µs in 1 µs steps
A/C Interlace Mode Interrogation Spacing	1.00 ± 0.20 ms
Double Mode Interrogation Interrogation Spacing	3 to 500 µs

Mode S

Pulse Width (P1/P2/P3)	0.80 ± .05 µs, variable -0.3 to 1.4 µs in 50 ns steps
P2 Position (Relative to P1)	2.00 ± .05 µs, variable ± 1.00 µs in 50 ns steps
Mode A P3 Position (Relative to P1)	8.00 ± .05 µs, variable ± 1.00 µs in 50 ns steps
Mode C P3 Position (Relative to P1)	21.00 ± .05 µs, variable ± 1.00 µs in 50 ns steps
P4 Position (Relative to P3)	2.00 ± 0.5 µs, variable ± 1.00 µs in 50 ns steps
P4 Width	0.80 or 1.60 ± 0.5 µs, variable -0.50 to 1.00 µs
Sync Phase Reversal (SPR relative to P2)	2.75 ± 0.05 µs, variable -0.50 to +0.50 µs
P5 Position (Relative to SPR)	0.40 ± 0.05 µs before SPR, variable -1.00 to +1.00 µs
P6 Position (Relative to SPR)	1.25 ± 0.50 µs before SPR, variable -0.40 to +3.00 µs
Interference Pulse Position (Relative to P1)	-1.40 to +45 ± .05 µs , variable in 50 ns steps
Interference Pulse Width	0.30 to 3.00 µs ± 1%, variable in 50 ns steps
Interference Pulse/P5 Level (relative to P1)	-15 to +3 dB ± 0.25 dB, variable in 1 dB steps

DME Mode

Mode	VOR Pair, TACAN Channel, MHz

Pulse Characteristics

P1 Rise time	2.0 +/- 0.5 us
P1 Fall time	2.5 +/- 0.5 us
P1 Width	3.5 +/- 0.2 us
P2 Rise time	2.0 +/- 0.5 us
P2 Fall time	2.5 +/- 0.5 us
P2 Width	3.5 +/- 0.2 us
P2 Position (Relative to P1)	X Mode – 12.0 ± 0.2 µs, variable -6.00 to +6.00 in 0.1 µs steps Y Mode – 30.0 ± 0.2 µs, variable -6.00 to +6.00 in 0.1 µs steps
Echo Position (30 nmi)	426.65 +/- .25 us
Scope Sync Width	0.8 to 1.2 µs
PRF	1 to 5000 Hz
15/135 Hz Modulation	
Percent Modulation	30 to 50 %
15 Hz Modulation	15 +/-1 Hz
135 Hz Modulation	135 +/-2 Hz
Reply Efficiency	0 to 100% ± 5%, selectable in 10% increments
Range	0 to 998 nmi. ± 0.02 nmi. Plus ± 0.005% of selected range
Velocity	0 to 9990 kts. ± 0.05%, selectable in 0.01 nmi. Increments
Echo Level	-12 to +3 dB ± 0.25 dB, variable in 1 dB steps
Front Panel BNC Connectors	Spectrum Analyzer (Top and Main) UUT Video (Top and Main) Test Set Video (Top and Main) Scope Sync Suppressor Pulse (ATC and DME)
Rear Panel BNC Connectors	RS-232 (Calibration and Software Update) IEEE-488 Connector DPSK Modulation Input External SLS Video Input for Mode S Interrogation Low Power Input External Trigger Calibration Marks

General

Power	100 to 120 VAC, 60 Hz; 220 to 240 VAC, 50 Hz
Dimensions	14.5 in. W x 11.0 in. H x 14.25 in. D 368 mm W x 279 mm H x 362 mm D
Weight	28 lbs. (12.7 kg.)
Temperature	5 to 40°C

Tel-Instrument Electronics Corp.
728 Garden Street
Carlstadt, NJ 07072
(201) 933-1600
www.telinstrument.com

TR-36

NAV/COMM TEST SET

Datasheet

Description

The **TR-36** NAV/COMM Test Set is a modern precision test instrument that provides comprehensive avionics ramp test capability for rapid functional testing of VOR, LOC/GS, ILS, MB, VHF-UHF COMM (AM/FM), ELT and EPIRB equipment. It is conveniently packaged in a rugged, yet lightweight weather-proof case with a highly visible color LCD display. The Test Set was designed to be simple and easy to use as your one source for COMM/NAV ramp testing.

The new TR-36 features several new advancements:

- Test capability for ELT and 406 MHz EPIRB
- High resolution LCD COLOR display with intuitive user interface
- Audio measurement capability for (S+N) N testing and Audio/Intercom system testing

P/N – 90 000 136

Tel-Instrument Electronics Corp.
One Branca Road
East Rutherford, NJ 07073
(201) 933-1600
Sales – Extension - 368

Features

- ❖ VOR, LOC, GS, ILS and MB receiver testing
- ❖ ELT (121.5 / 243 MHz) EPIRB/PLB (406 MHz) testing
- ❖ SELCAL tone generation
- ❖ VHF, and UHF COMM AM/FM Transmit/Receive testing
- ❖ High Resolution graphical displays of aircraft simulated results
- ❖ Large easy to read 5.1" COLOR display
- ❖ Simple intuitive interface and menu structure
- ❖ High capacity long life Li-ion batteries
- ❖ Rugged 8 lb. MIL-PRF-28800F, Class 2 case
- ❖ Remote software updates via Ethernet interface

VOR

Provides RF signal generation across the entire VOR band. Complete simulation of VOR bearing in 0.1º increments.

- Accurate generation of 30 Hz variable, reference, and 9960 Hz sub-carrier
- Preset bearing simulation or slew in 0.1° increments
- 30 Hz REF & VAR, and 9960 Hz modulation can be deleted to check flag operation
- Covers the entire VOR band of 108.00 to 117.95 MHz.
- 1020 Hz IDENT tone Selectable ON/OFF
- FM Immunity Test
- "On the Fly" adjustments
- Precise control of RF output power in Direct Connect and Antenna operation

LOC and GS

CAT I, II, and III Simulation of GS and LOC signals. Variable DDM in .001 DDM values

- Precise RF simulation of LOC/GS ILS signals
- Allows selection of preset DDM deflections or manual slew in 0.001 increments
- 90 Hz and 150 Hz ON/OFF selection
- 1020 Hz IDENT tone Selectable ON/OFF
- FM Immunity Test
- Simultaneous LOC/GS/MB Mode for coupled autopilot testing
- Complete Auto Sweep selection
- "On the Fly" adjustments
- Precise control of RF output power in Direct Connect and Antenna operation

Marker Beacon and ILS

Simple user selection of 400 Hz, 1300 Hz, or 3000 Hz MB tones at 95% modulation of the 75 MHz carrier

- Output Power easily adjustable from +13 to -67 dBm
- *ON the FLY* changes
- Auto cycling of MB tones and carrier

SELCAL

- Continuous or Single Burst Tones
- Selectable Pulse Pairs
- Variable Modulation (Continuous)
- Monitor broadcast on headphone jack

Headset / Microphone Connections

- Headset jack for monitoring audio from UUT transmission
- Microphone (or external modulation input) for transmitting from TR-36 to aircraft receiver UUT

ELT

- Continuous monitoring of ELTs on 121.5 & 243 MHz
- Accurate Power and Frequency measurements
- Monitor broadcast on headphone jack

EPIRB (406 MHz Beacon)

- Continuous monitoring of all COSPAS/SARSAT signals
- Accurate Sensitivity and Frequency measurements
- Decoding and display of: Position(LAT/LONG), ID, Beacon Type, Type of Locating Device, Device Activation Code

COMM Receiver – Audio S+N/N System Testing

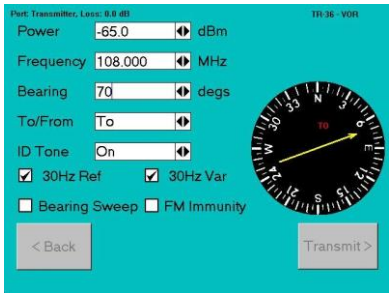
- Automatic audio S+N/N ratio detection during COMM receiver testing
- TR-36 monitors receiver UUT audio output while transmitting tone modulated signal
- Provides system testing through aircraft audio/intercom panel via Intercom connector

RF Signal Generator

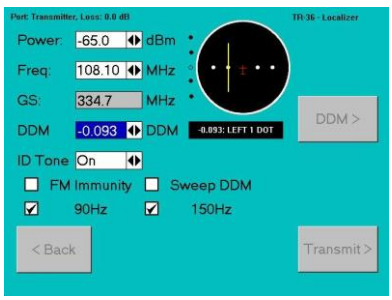
RF FREQUENCIES		FREQUENCY RANGE		
FUNCTION		FROM	TO	RESOLUTION
VOR Channels	VOR	108.000 MHz	117.950 MHz	50 kHz Steps
Variable VOR		108.000 MHz	117.950 MHz	1 kHz Steps
LOC Channels*	LOC	108.1000 MHz	111.950 MHz	50 kHz Steps
GS Channels*	GS	329.1500 MHz	335.000 MHz	50 kHz Steps
COMM AM	COMM AM	10.00 MHz	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				

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

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		



VOR



Localizer

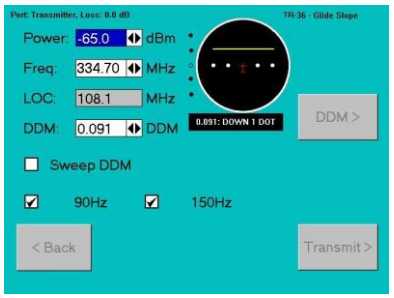
Modulation Characteristics

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%

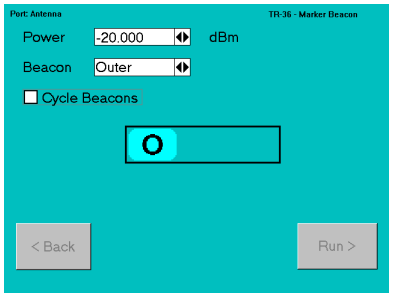
VOR FM MOD	30 Hz reference at ± 480 Hz Peak Deviation on 9960 Hz Sub carrier
Accuracy	± 10 Hz
Distortion	<2% (For 30 Hz Reference)
Variable Bearing	0.1° Increments ± 0.15°
VOR Bearing Sweep	TBD

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						

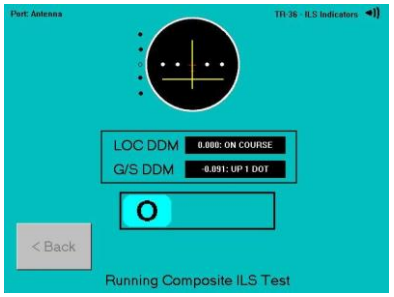
Marker Beacon	Single Carrier	TRI-Mode
400 Hz	± 0.01% (<1% distortion)	± 0.25% (<1% distortion)
1300 Hz	± 0.01% (<1% distortion)	± 0.4% (<1% distortion)
3000 Hz	± 0.01% (<1% distortion)	± 0.9% (<1% distortion)
Modulation		
95% AM Fixed	± 2% Accuracy	± 2% Accuracy
COMM AM		
Tone 1020 Hz	30% ± 1.5% Accuracy	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%



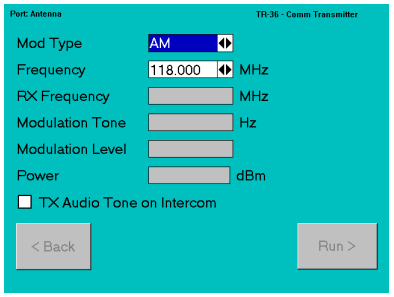
Glideslope



Marker Beacon

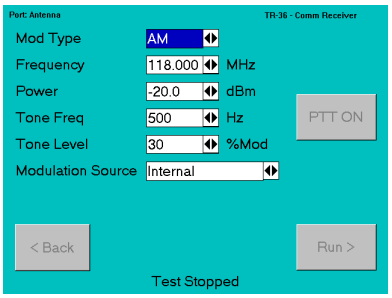


ILS Composite

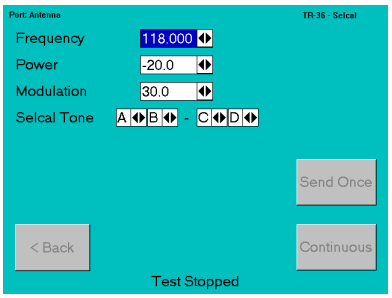


COMM TX

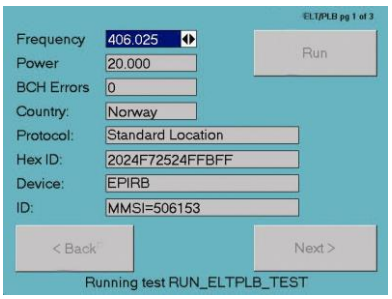
MEASURMENT FUNTIONS				
FREQUENCY RANGE				
@ Antenna Connector	10.00 to 515 MHz	Resolution – TBD	Accuracy – TBD	
@ RF Direct Connect	10.00 to 515 MHz	Resolution – TBD	Accuracy – TBD	
SENSITIVITY				
@ Antenna Connector	≤ - 25 dBm			
@ RF Direct Connect	≤ + 5 dBm			
@ Video/Out – Mod/In	≥ 1 Vp-p (50Ω)			
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			



COMM RX



SELCAL



406 EPIRB (1)

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)

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)

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

Tel-Instrument Electronics Corp.
One Branca Road
East Rutherford, NJ 07073
(201) 933-1600
www.telinstrument.com

Standard Accessories and Options

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