2946A
Avionics Communications Service Monitor

Communication and ramp testing of military and commercial aircraft in one instrument

- Comprehensive Radio Communication Test Set
- Full span spectrum analyzer with offset tracking generator
- Avionics modes for ILS, VOR, marker beacons and SELCAL
- Displays in avionics terms: SDM, DDM, Bearing and TO and FROM
- Extensive pre-sets for avionics functions DDM and Bearing
- Auto increment of VOR Bearing for aircraft display testing
- DC operation from aircraft power supplies or internal batteries
- Avionics testing in both Direct and 'Off Air' configurations

The 2946A Communications Service Monitor is the lightest, most rugged service monitor available with a full performance spectrum analyzer as standard. For field work, the 2946A provides an excellent combination of instruments for all types of maintenance work. In the workshop, it provides all of the performance you would expect for exacting measurements.

Avionics Systems Test Facility

The 2946A provides an impressive range of features for the aircraft and avionics maintenance industry.

In addition to the features provided by the general purpose 2945A, the dedicated 2946A Avionics Comminucations Service Monitor provides signals for testing the following: ILS receivers for localizer, including identification, glidescope and markers; VOR beacon receivers, with identification; SELCAL selective calling receivers.

The 2946A screen gives a representation of the aircraft's display in each mode, with the effective test signal parameters clearly indicated both diagramatically and numerically. Parameters can be altered in steps or continuously.

Field Operation

At under 12 kg, the 2946A lightens the load to remote sites. The shape of the 2946A is ideal for carrying. The side handle ensures that the instrument is clear of the stairs when ascending buildings and the depth is suitable for the 2946A to be operated comfortably when it is placed on the floor.

An optional bail arm is also available. This option allows a stowage cover to be fitted over the front panel for storage of adapters and further protection to the instrument's front panel. Full operation is possible from the protective "ever-ready" case so that your investment is protected from transit damage.

Battery - carry a spare

The battery fits neatly into the "ever-ready" case and is easily replaced with a spare when discharged. There is no memory effect associated with the battery, even when partially discharged.

Fast Warm Up - fast results

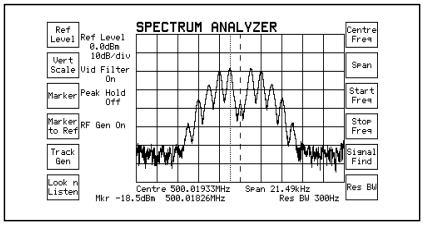
The standard TCXO allows results to be made reliably within a minute of switch on. (Where even better stability is required, an optional OCXO is available)

Stored settings may be recalled from internal memory or from a memory card, allowing fast and straightforward setting up.

Can be operated from 'ever-ready' case

Fast Full Performance Spectrum Analyzer - provided as standard

The spectrum analyzer provides spans from 100 Hz per division to full span and also has a fully adjustable reference level. Speed is comparable with analog analyzers, allowing real time adjustments over a full 80 dB dynamic range. With the tracking generator provided as standard, duplexers and filters can be aligned quickly and easily. An offset facility provides testing of equipment with frequency translation. Channel stepping can be performed by defining an increment and then using the FREQ ↑↓ keys. This is particularly useful when testing multi-channel systems.



Live Look and Listen

This feature puts the 2946A above all of its peers with the ability to examine signals on the screen and demodulate them simultaneously. Intermittent interference can be isolated quickly and the signals then easily identified. The trace can be saved to memory card along with the time and date, providing factual evidence that can be recalled later. This feature is particularly useful when looking for rogue transmissions, especially on busy base station sites.

From 2 µV to 150 Watts

The 2946A will measure the power of low level signals such as those encountered when monitoring off-air signals or those found when probing a circuit. 150 Watts measurement is provided without the need for external attenuators, so high power base stations can be measured directly. Measurement accuracy of better than 10% is guaranteed all the way down to 5 mW on the N-Type connector, allowing cellular radios to be qualified at low power levels.

Accurate RF Signals

The signal generator provides coverage from 400 kHz to 1.05 GHz with +5 dBm output (+7 dBm overrange) and fast switching speed. Level accuracy is ±2 dB at all levels above -127 dBm.

Duplex - provided as standard

Full duplex operation is provided by the 2946A. This allows testing of duplex radios as well as simultaneous testing of repeater transmit and receive paths. There are no restrictions to the duplex offset.

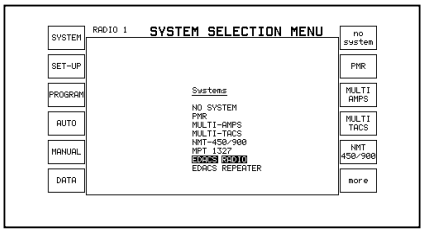
Cellular and Trunking - built in

AMPS, TACS and NMT analog cellular standards are available internally, with all country variants provided in each package. MPT 1327/1343 trunking system and variants of it are also available.

A new trunking capability has been added with the introduction of EDACS™ Radio and Repeater test capability.

Remote control of the inbuilt tests is provided, so that measurements can be started and results logged automatically.

Network Simulation



The 2946A simulates the signaling protocol that the radio would see from the real network. This allows calls to be set up and handled enabling receiver and transmitter parametric measurements to be made.

Remote Control - RS-232 or GPIB

Remote control is provided with an RS-232 interface as standard. An IEEE488.2 interface (Option 5) can be fitted where other instruments are required to operate in a system with the 2946A.

Printing Made Easy

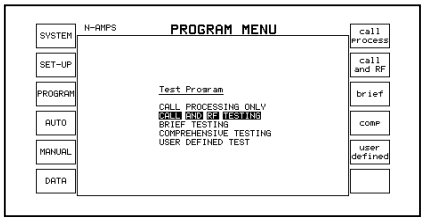
With the parallel printer port interface, screen dumps, automatic test results or previously stored results may be sent to any parallel printer. These facilities are available as standard using the serial RS-232 interface.

Autorun - internal control

With the (optional) Analog Systems Card fitted, automatic testing without an Ideal external controller is possible. Custom tests may be written and run by the operator. Four programmable relay contacts are provided with the optional parallel printer interface to allow remote control of radios or test fixtures from built-in automatic tests.

Custom Programs

Users may program the instrument to suit their own specific needs. This is possible either by configuring any of the 4 built-in programs or by using the MIBASIC interpreter to produce a customized test program that can be executed internally, without an external controller.



Memory Card - with real time clock

The Memory Card Drive meets the PCMCIA standard format for PC cards. The 2945A provides a DOS based filing system that allows transfer of information to a PC fitted with a memory card slot.

Test set ups, test results, screen dumps, spectrum analyzer co-ordinates and test sequences can all be stored on the memory card, allowing information to be easily stored and retrieved when required.

Reliability

The 2946A features high integration and a rugged chassis design to maximize mechanical protection.

Audio Analysis

A comprehensive range of filters are provided as standard, including band pass, low pass and high pass. Optional filters are available for psophometric weighting of audio signals and demodulation of signals in a simulated radio channel bandwidth.

The direct measurement of CTCSS is possible with the 300 Hz LP filter, even with speech present.

Two comprehensive audio generators are provided as standard for internal modulation or audio sources for transmitter stimulus.

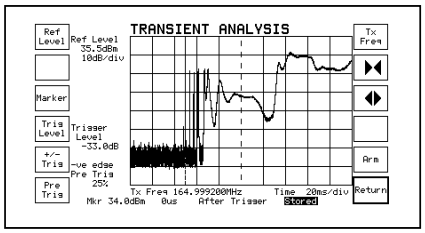
External DC coupled FM is provided.

Comprehensive Oscilloscope

Analysis of audio signals, whether from the demodulated signal or the audio input direct, can be viewed for further inspection. The oscilloscope can either be combined with the measurement screen in the Tx, Rx or AF test modes or 'zoomed' to a full screen display. Different levels of persistence can be selected to allow short or long term effects to be captured.

Transient Analysis

The ability to capture transients on the rising or falling edge of a waveform provides a valuable tool for fault finding radios and radio systems. The user has full control of the trigger level and input attenuation as well as the timebase and five fixed trigger points, making this feature simple and flexible to operate.



Harmonic Analysis

An automatic harmonic analysis function is included in the 2946A. This complements the fast spectrum analyzer and allows a rapid check that the transmitter is not producing any large harmonics.

Tones Generation and Decoding

The tones menus now include full remote control so that radio workshops can further automate their tasks. These and other improvements are in response to user feedback and allow better control of the tones from the top level screens.

POCSAG Decode - built in option

Off-air decoding of POCSAG signals is provided as an option. This allows tone, numeric and alphanumeric signals to be displayed. Signals with bit rates of up to 4800 bits/s can be automatically detected making the 2946A an ideal surveillance tool. The 2946A can be set to detect all messages, a user selectable RIC (just like a Pager), or a fixed message string.

Specification

Avionics Systems

The Avionics feature provides amplitude modulated signals suitable for testing of Instrument Landing Systems (ILS) and VHF Omnidirectional Radio range (VOR) receivers.

ILS MODE

Sum of Depth of Modulation (SDM)
0-90% glideslope, 0-50% localizer in 0.1% steps representing the arithmetic sum of each tone depth

Selection
Keyboard entry

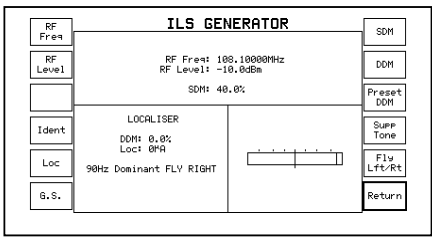
Accuracy of SDM
±5% of setting for carrier frequencies up to

400 MHz

Difference of Depth of Modulation (DDM)
0-45% glideslope, 0-25% localiser in 0.1% steps limited by SDM

Selection
Keyboard entry and variation of rotary control

Localiser Presets
0, 4.6, 9.3 and 15.5% DDM



Glideslope Presets
0, 4.5, 9.1 and 17.5% DDM

Accuracy of DDM
At 0 dBm 0.001 DDM (20% depth)

Tone Frequencies
90 Hz and 150 Hz (either tone can be suppressed)

Additional Modulation
1020 Hz ident signal available on 0 DDM on ILS from an internal modulation source

VOR MODE
9.96 kHz Sub-Carrier Range
0-99.0% in 0.1% steps

Modulation
FM by a 30 Hz tone with 480 Hz deviation

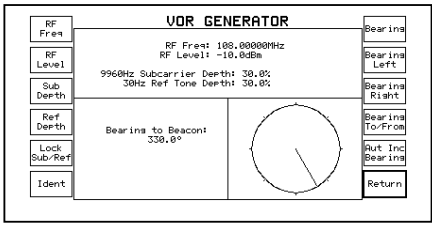
30 Hz Tone Range
0-99% in 0.1% steps

Bearing Control
Relative phase of the 30 Hz tone and sub-carrier modulation adjustable from 0 to 360° in 0.1° steps by entering VOR bearing. Bearing can be entered as TO or FROM the beacon.

Automatic VOR Test
Bearing automatically increments in 0.1° steps

Bearing Accuracy
±0.5°

Additional Modulation
Ident signal (1020 Hz). Available on 0° bearing from an internal source



SELCAL MODE
Provides amplitude modulation with SELCAL tones

Data Entry
By table selection of 2 pairs of characters labelled 'A' to 'S'

Timing
1 s tone duration, 250 ms gap

MARKER BEACON MODE
Provides default modulation of 95% AM depth on a 75 MHz carrier at the rate of 400 Hz (outer beacon), 1.3 kHz (middle beacon) or 3 kHz (inner beacon). AM depth, carrier frequency and modulation frequencies can be changed from default values.

RF Signal Generator

FREQUENCY

Frequency Range
400 kHz to 1.05 GHz

Resolution
10 Hz

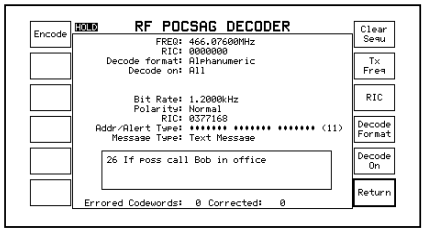
Indication
10 digit display

Setting
Keyboard entry, delta increment/decrement function and rotary control

Accuracy
As frequency standard

OUTPUT LEVEL

Output Level Range
Rx Test:
N-Type socket: -141 dBm to -21 dBm
BNC socket: -115 dBm to +5 dBm
(overrange to +7dBm)



Resolution
0.1 dB

Indication
4 digits plus sign (dBm, dBμV, μV, mV PD/EMF)

Accuracy
±2 dB for level above -127 dBm on N-Type socket up to 1 GHz

Reverse Power Protection
N-Type: 50 W continuous, normal operation. 150 W for 1 minute at 20 °C.
Overload indicated by audible and visual warning.
BNC: 5 W Overload indicated by audible and visual warning.

Output Impedance
Nominally 50 Ω

VSWR

N-Type
Better than 1.2:1 up to 500 MHz
Better than 1.35:1 up to 1.05 GHz

BNC
Better than 2.2:1 up to 1.05 GHz

SPECTRAL PURITY
(If you require even better spectral purity than that specified here, please consider the 2948)

Residual FM
Less than 15 Hz RMS (0.3 to 3.4 kHz) up to 500 MHz
Less than 20 Hz RMS (0.3 to 3.4 kHz) up to 1.0 GHz (with OCXO)

Harmonics
Better than –20 dBc

Spurious Signals
Better than –30 dBc (±10 kHz to 1.5 MHz offset from carrier frequency or over range 600 to 700 MHz).
Better than –40 dBc from 400 kHz to 1 GHz

SSB Phase Noise (20 kHz offset)
Better than -95 dBc/Hz up to 1 GHz

RF Carrier Leakage
Less than 0.5 μV PD generated in a 50 Ω load by a 2 turn loop 25 mm from the case. Output level less than –40 dBm into a sealed 50 Ω load.

AMPLITUDE MODULATION - INTERNAL

Frequency Range
400 kHz to 1.05 GHz

AM Depth Range
0 to 99%

Resolution
1%

Indication
2 digits

Setting
Keyboard entry, delta increment / decrement function and rotary control

Accuracy
For carrier frequencies from 1.5 MHz to 400 MHz
± 7% ± 1digit for modulation frequency of 1 kHz.
± 10% ± 1 digit for modulation frequencies from 50 Hz to 5 kHz.
±15% ±1 digit for modulation frequencies from 50 Hz to 15 kHz.

Distortion
Less than 2% at 1 kHz for 30% AM, CCITT weighted

Modulation Frequency
20 Hz to 20 kHz

AMPLITUDE MODULATION - EXTERNAL

Input Impedance
Nominally 10 kΩ in parallel with 40 pF

Frequency Range
As internal AM

Modulation Frequency Range
As internal AM

Sensitivity
1 V RMS for 100% AM

FREQUENCY MODULATION - INTERNAL

Frequency Range
400 kHz to 1.05 GHz

Maximum Deviation
75 kHz

Indication
3 digits

Setting
Keyboard entry, delta increment/decrement function and rotary control

Accuracy (1)
±5% ± 10 Hz at 1 kHz modulating frequency.
±10% at modulating frequencies from 50 Hz to 15 kHz.

Distortion
Less than 1% at 1 kHz for deviation of 5 kHz, CCITT weighted

Modulation Frequency Range
20 Hz to 25 kHz

Resolution
25 Hz

Pre-emphasis
750 μs selectable

FREQUENCY MODULATION - EXTERNAL

Input Impedance
Nominally 10 kΩ in parallel with 40 pF

Frequency Range
As internal FM

Modulation Frequency Range
DC to 100 kHz

Pre-emphasis
750 μs selectable

Sensitivity
1 Volt RMS for 0 to 75 kHz deviation

MICROPHONE INPUT

Input Level
2 mV to 200 mV (AGC levelled)

Input Impedance
Nominally 150 Ω

Press To Talk (PTT)
When using the optional microphone in Tx Test mode, the PTT will switch instrument to Rx Test.

Audio Voltmeter

Input Impedance
Nominally 1 MΩ in parallel with 40 pF

Frequency Range
DC and 20 Hz to 50 kHz
AC only 20 Hz to 50 kHz

Level Ranges
0 to 100 mV to 0 to 100 V RMS in a 1, 3, 10 sequence.
Digital readout also in mW (user selectable)

Resolution
1 mV or 1% of reading

Indication
3 digits and bar-chart

Accuracy
±3% ±3 mV ± resolution

Audio Frequency Meter

Frequency Range
20 Hz to 20 kHz

Resolution
0.1 Hz, less than 10 kHz
1 Hz, at 10 kHz and above

Indication
5 digits

Accuracy
As frequency standard ± 1 digit ± resolution

Sensitivity
50 mV

Audio Sinad Meter

Frequency
1 kHz

Range
0 to 18 dB and 0 to 50 dB

Resolution
0.1 dB

Indication
3 digits and bar-charts

Accuracy
± 1 dB

Sensitivity
50 mV (100 mV for 40 dB SINAD) reading suppressed if audio voltage is less than 5 mV

Audio Distortion Meter

Frequency
1 kHz

Range
0 to 10%, 0 to 30% and 0 to 100%

Resolution
0.1% distortion

Indication
3 digits and bar-charts

Accuracy
± 5% of reading ± 0.5% distortion

Sensitivity
50 mV (100 mV for 1% distortion) reading suppressed if audio voltage is less than 5 mV

Audio S/N Meter

Range
0 to 30 dB and 0 to 100 dB

Resolution
0.1 dB

Indication
3 digits and bar-chart

Accuracy
±1 dB

Sensitivity
50 mV (100 mV for 40 dB S/N) reading suppressed if audio voltage is less than 5 mV

Audio Oscilloscope

Operating Modes
Single repetitive sweep

Frequency Range
DC to 50 kHz, 3 Hz to 50 kHz AC coupled

Voltage Range
10 mV to 20 V per division in a 1, 2, 5 sequence

Voltage Accuracy
±5% of full scale

FM Ranges
±75, 30, 15, 6, 3 and 1.5 kHz deviation full scale, ±10% accuracy

AM Ranges
20, 10 and 5% per division, ±10% accuracy

Timebase
50 µs/div to 5 s/div in a 1, 2, 5 sequence

Graticule
10 Horizontal by 6 Vertical divisions

Special Features
Built in anti-aliasing circuitry

Audio Bar-Charts

Bar-Chart Displays
AF Voltage, SINAD, Distortion, S/N

Vertical Resolution
2% of full scale

Ranging
Autoranging, range hold or manual selection
1, 2, 5, sequence with hysteresis

Audio and Modulation Filters
300 Hz, 3 kHz, 15 kHz Lowpass
300 Hz to 3.4 kHz Bandpass
300 Hz Highpass
750 μs de-emphasis
50 kHz LP (No filter selected)

Audio Analyzer General Features
Tones Mode

RF Frequency Meter

Frequency Range
100 kHz to 1.05 GHz (manual tune)
10 MHz to 1 GHz (autotune)

Resolution
1 Hz or 10 Hz, selectable

Indication
Up to 10 digits

Accuracy
As frequency standard ± resolution

Acquisition Time
Less than 1 second (manual)
Typically 3 seconds (autotune)

Sensitivity
Autotuned: 5 mW (N-Type)
0.05 mW (Antenna port)
Manual Tuned:–34 dBm (N-Type)–60 dBm (Antenna port)

VSWR
N-Type: Better than 1.2:1 up to 500 MHz
Better than 1.25:1 up to 1.0 GHz
BNC: Better than 3:1 up to 1.0 GHz

RF Power Meter (broadband)

Frequency Range
200 kHz to 1.05 GHz

Dynamic Range
5 mW to 150 W (N-Type)
0.05 mW to 250 mW (Antenna port)

Indication Units
Watts, dBm or dBW

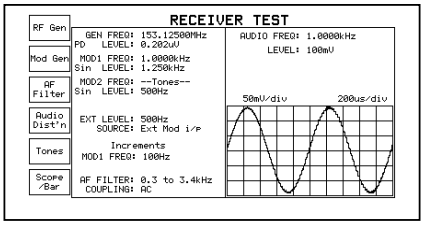
Indication
3 digits or bar-chart

Resolution
0.1 dB max, typically 1%

Accuracy (N-Type)
±10% ± resolution up to 1 GHz

Maximum Continuous Rating
N-Type: 50 W at 20 °C
Antenna port: 1 W

Intermittent Rating
N-Type: 150 W for limited periods, typically 1 minute at 20°C. Overload indicated by audible and visual warning.



Harmonic and Transient Analysis

HARMONIC MEASUREMENT
Displays 1st to 5th harmonic of the selected carrier.

Maximum Harmonic Frequency
1.05 GHz

Dynamic Range
0 to –60 dBc

TRANSIENT POWER ANALYSIS
Displays power profile against time

Frequency Range
1 to 1050 MHz

Dynamic Range
60 dB below spectrum analyzer reference level

Scale (power)
10 dB/div

Scale (time)
50 μs/division to 5 s/div

Trigger Level
Adjustable over full dynamic range +ve or –ve trigger selection

Pre-trigger
0, 25, 50, 75 or 100% of displayed period

Modulation Meter

Sensitivity
Autotuned: 5 mW (N-Type)
0.05 mW (Antenna port)
Manual Tuned:–34 dBm (N-Type)
–60 dBm (Antenna port)

Audio & Modulation Filters
300 Hz, 3 kHz, 15 kHz Lowpass
300 Hz to 3.4 kHz Bandpass
300 Hz Highpass
750 μs de-emphasis
50 kHz LP (No filter selected)

AMPLITUDE MODULATION

Frequency Range
100 kHz to 1.05 GHz

Modulation Frequency Range
10 Hz to 15 kHz

AM Depth Range
0 to 99% (manually tuned)
0 to 90% below 100 MHz
0 to 80% from 100 to 400 MHz

Resolution
1% AM

Indication
2 digits and bar-chart

Accuracy (1)
±5% ±1 digit at 1 kHz
±8.5% ±1 digit from 50 Hz to 10 kHz

Demodulation Distortion (1)
Less than 2%, at 1 kHz and 30% AM, (CCITT weighted)

Residual AM
Less than 1% (300 Hz to 3.4 kHz)

Demodulation Output
50 mV peak to peak for 1% AM

FREQUENCY MODULATION

Frequency Range
100 kHz to 1.05 GHz

Modulation Frequency Range
10 Hz to 15 kHz

Deviation Range
0 to 75 kHz

Resolution
10 Hz below 2 kHz deviation
1% above 2 kHz deviation

Indication
3 digits and bar-chart

Accuracy (1)
±5% ± resolution at 1 kHz modulation frequency
±7.5% ±1 digit for modulation frequencies 50 Hz to 10 kHz

Demodulation Distortion
Less than 2% at 1 kHz and 5 kHz FM, (CCITT weighted)

Residual FM
Less than 30 Hz (300 Hz to 3.4 kHz)

Demodulation Output Socket
200 mV peak to peak ±10% per 1 kHz deviation

2946A

RF Spectrum Analyzer

Frequency Range
100 kHz to 1.0 GHz

Spans
1 kHz/division to 100 MHz/division in a 1, 2, 5 sequence or continuously variable
Start - stop facility allows selection of infinitely variable span width

Resolution Bandwidth
300 Hz, 3, 30, 300 kHz, 3 MHz

Reference Level (top of screen)
–50 dBm to +52 dBm 0.7 mV to 71 V

On Screen Dynamic Range
80 dB

On Screen Linearity
Typically ±2 dB ±1 resolution (10 dB/div) >10 dB above noise floor

Vertical Resolution
0.1 dB on 2 dB/division
0.5 dB on 10 dB/division

Level Flatness
±1 dB ± resolution over 50 MHz span

Intermodulation Distortion
Better than 70 dB for two signals at –30 dBm into first mixer

Sweep Speeds
10 ms/div to 200 ms/div in a 1, 2, 5 sequence (optimum sweep speed and bandwidth selected according to span or user selectable)

Span	*Resolution Bandwidth*	*Update (Sweeps/sec)*
10 kHz	300 Hz	5
100 kHz	3 kHz	9
1 MHz	30 kHz	9
10 MHz	300 kHz	9
100 MHz	300 kHz	5
1000 MHz	3 MHz	5

Marker Indication
Level and frequency or delta marker from centre line of screen
Single marker for frequency and level display.
Marker to centre frequency.
Δ marker

Features
Simultaneous 'Look and Listen' spans 100 kHz, 200 kHz, 500 kHz, 1 MHz
Start/stop frequency entry

Sensitivity
2 μV

Tracking Generator Offset
0 to 999 MHz

Audio Generators

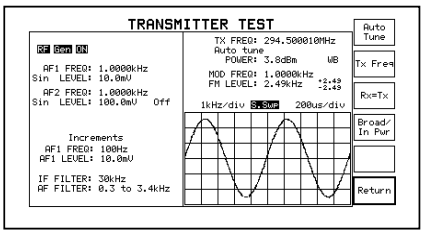
FREQUENCY

Frequency Range
10 Hz to 25 kHz (sine or square)

Setting
Keyboard entry, delta increment / decrement function and rotary control

Indication
5 digits

Resolution
0.1 Hz below 3.25 kHz
1 Hz above 3.25 kHz



Accuracy
0.01 Hz below 180 Hz, 0.1 Hz above 180 Hz

LEVEL

Level Range
0.1 mV to 4 V RMS

Setting
Keyboard entry, delta increment / decrement function and rotary control

Indication
4 digits

Resolution
0.1 mV below 409 mV
1 mV above 409 mV

Accuracy
± 5% + resolution 50 Hz to 15 kHz

Output Impedance
Nominally 5 Ω (minimum load 25 Ω)

Distortion
Less than 0.5% at 1 kHz
Less than 1% from 50 Hz to 15 kHz

Signaling Encoder/Decoder
Sequential tones functions including revert
User defined tones
Encodes and decodes up to 40 tones.
CCIR, ZVEI, DZVEI, EEA, EIA or user defined.
Any of the tones may be extended.
Continuous, burst and single step modes available.
Up to two frequency plans may be defined and stored within the 2945A for sequential tones.
Any of the standard tone frequency plans may be copied to user defined and modified.
Tone length 20 ms to 1 s.
Standard tone frequencies may be selected from a menu.
Generation and decoding of DTMF tones.
Generation and decoding of DCS (Digitally Coded Squelch).
Generation of POCSAG code CCIR No.1 Rec 584.
Bit rates from 400 to 4800 bit/s. Inversion available.

AUDIO MONITOR
Demodulated signals and audio signals may be monitored via the internal loudspeaker and the accessory socket output on the front panel.

Cellular and Trunking

Test Modes
Auto test/manual test

Auto Test Programs
Call processing only
Call and RF testing
Brief testing
Comprehensive testing

Parametric Auto Test Routines

AF Frequency	AF Level
FM Deviation	Mod frequency
Rx Distortion	Rx expansion
Rx sensitivity	Rx SINAD
Rx S/N	Tx Compression
Tx Distortion	Tx frequency
Tx Level	Tx Power Level
Tx Limiting	Tx Mod Level
Tx Noise	Tx SINAD
Tx S/N	

Signaling Auto Test Routines
Registration/Roaming Update
Place Call
Page Mobile
Clear from Land
Clear from Mobile
Handoff
Hook Flash
DTMF Decode
Data Performance
PTT On
PTT Off
SAT Deviation
SAT Frequency
ST Duration
ST Frequency
ST Deviation
DSAT Deviation

Frequency Standard

Internal Frequency Standard (TCXO)

Frequency
10 MHz

Temperature Stability
Better than 0.5 ppm, 0 to 50°C

Ageing Rate
Better than 1 ppm per year

Warm up
1 minute to specified accuracy

External Frequency Standard Input

Frequency
1, 2, 5 and 10 MHz

Input Level
Greater than 1 V peak to peak

Input Impedance
Nominally 1 kΩ

General

Keyboard and Display
Logical colour coded keyboard with bright high resolution fast LCD

Display Size
160 x 85 mm

RS-232C
RS-232C interface is provided for printing and remote instrument control

Connector
9 way female 'D' Type

POWER REQUIREMENTS

AC Supply Voltage
90 to 265 V

AC Supply Frequency

90 - 264 V	45 Hz to 67 Hz
90 - 132 V	45 Hz to 440 Hz

Maximum AC Power
190 VA

DC Supply Voltage
11 to 32 V

Maximum DC Power
100 W

Charge Output
13.8 V at 6 A max to charge a 12 V sealed lead acid battery.

Electromagnetic Compatibility
Conforms with the protection requirements of Council directive 89/336/EEC.
Complies with the limits specified in the following standards:

EN55011 Class B	CISPR 11
EN50082-1	IEC 801-2, 3, 4
EN60555-2	IEC 555-2

Safety
Complies with IEC 1010-1, BS EN61010-1 for class 1 portable equipment and is for use in a pollution degree 2 environment. The instrument is designed to operate from an installation category 1 or 2 supply.
Approved to UL3111-1

ENVIRONMENTAL

Rated Range of Use
0 to 50°C and up to 95% relative humidity at 40°C

Storage and Transport

Temperature
–40 to +71°C

Altitude
Up to 2500 m (pressurized freight at 27 kPa differential)

DIMENSIONS AND WEIGHT

Height
178 mm (7 in)

Width
380 mm (15 in)

Depth
457 mm (18 in)
(including handle, feet and covers)

Weight
Less than 11.4 kg (<25 lb)

Options and Accessories

600 Ω MATCHING UNIT (OPTION 1)
Switchable 600 Ω balanced audio input and output
Switchable 20 dB attenuator on AF generator output

ANALOG SYSTEMS CARD (OPTION 2)
This option provides automatic testing for cellular,trunked and FM radio's and a BASIC Interpreter for customised tests.

HIGH STABILITY INTERNAL FREQUENCY (OCXO) STANDARD (OPTION 3)

Frequency
10 MHz

Temperature Stability
Better than 0.05 ppm, 5 to 55°C

Ageing Rate
Better than 0.1 ppm, per year, after 1 month continuous use

Warm-up Time
Less than 10 minutes to within 0.2 ppm at 20°C

PARALLEL INTERFACE (OPTION 4)
Allows direct connection of a parallel printer. Additionally provides 4 software programmable output lines.

Printer Port

Connector
25 way female D type

Printers Supported
75, 100, 150 dots per inch laser printers, FX 80, FX 100 Epson format

Accessory Port

Connector
9 way female D type

Outputs
4 independently programmable output lines, each one configurable as a logic line or as a relay contact closure. +5 V supply available.

GPIB (OPTION 5)

Capability
For printing, remote instrument control or for programming of user defined test sequences. Complies with the following subsets defined IEEE488:-
SH1, AH1, T6, L4, SR1, RL1, DT0, EI, DC1

MEMORY CARD DRIVE AND REAL TIME CLOCK (OPTION 6)
The memory card facility allows the storage of results, set-ups screen dumps and user programs with SRAM cards. Meets PCMCIA 2 standard. Allows the current date and time to be stored with results to the memory card and/or printed with a screen dump.

SSB DEMODULATOR (OPTION 8)
The SSB demodulator allows signals to be demodulated either via the internal loudspeaker or via the accessory socket. Provides demodulation of SSB signals(upper and lower sideband)

Frequency Range
400 kHz to 1 GHz

AF Demodulation Range
10 Hz to 15 kHz

Distortion
Typically less than 3% at 1kHz (300 to 3.4 kHz)

Detection Range
2 μV to 150 W

Features
Automatic detection of USB or LSB. BFO can be used for tuning of carrier for AM and FM radio's.

NMT CELLULAR SOFTWARE (OPTION 10)

NMT 450	NMT 900
Benelux	NMTF
Austria	Spain
Malaysia	Indonesia
Saudi 1	Saudi 2
Thailand	Oman
Tunisia	Hungary
Poland	Russia
Czech	Bulgaria
Slovenia	Turkey

USER DEFINED NMT

AMPS CELLULAR SOFTWARE (OPTION 11)
USER DEFINED AMPS

TACS CELLULAR SOFTWARE (OPTION 12)

E-TACS	TACS 2
C-TACS I	C-TACS II
J-TACS	N-TACS

USER DEFINED TACS

MPT 1327 TRUNKING SOFTWARE (OPTION 13)

BAND III	JRC
UK WATER	HONG KONG
AUTONET	AMT
MADEIRA	NL-TRAXIS
NZ MPT1327	PH-INDO

USER DEFINED MPT

PMRTEST SOFTWARE (OPTION 14)
USER DEFINED PMR for FM radio's

EDACS™ RADIO TEST SOFTWARE (OPTION 15)
Provides Auto/ Manual test capability for EDACS™ radios. Up to 4 User defined variants can be created and stored, each with up to 24 spot channel frequencies.
Performs bit error rate tests to check performance of receiver and transmitter.

EDACS™ REPEATER TEST SOFTWARE (OPTION 16)
Provides Auto/Manual test capability for EDACS™ repeaters. Up to 4 User defined variants can be created and stored, each with up to 24 spot channel frequencies. A data logging facility is also available to continuously decode and display data messages from the repeater under test.

EDACS is an Ericsson GE registered trademark.
IFR Ltd is an EDACS trunking licensee.

DEMODULATION FILTERS (OPTION 21)
Provides a range of high selectivity channel filters in Spectrum Analyzer Look and Listen mode. Shape factor approximates to ETSI requirements.

Bandwidths
5 kHz, 12.5 kHz, 25 kHz, 50 kHz and 300 kHz

POCSAG DECODE (OPTION 22)
Allows off-air decoding of POCSAG messages. Can decode a message as it is received, or decoding can be triggered from a user selectable RIC code or fixed message pattern.

Bit Rate
Automatically decodes any standard bit rate up to 4800 bits/s. Numeric or alphanumeric decoding is provided.
Number of received errors is displayed.

CCITT FILTER (OPTION 23)
Allows a CCITT filter to be inserted into either the demodulated audio path or the audio input path.

CMESS FILTER (OPTION 24)
Allows a CMESS filter to be inserted into either the demodulated audio path or the audio input path.

BAIL ARM/FRONT COVER (OPTION 30)
Provides a Bail arm carrying handle and front panel cover and storage area. The Bail arm will also provide additional viewing angles when mounted on a bench.

BATTERY PACK

Type
12 V Sealed lead-acid
Connector XLR Type

Capacity
7 AH (30 minutes operation)

Weight
3 kg (6.6 lb)

Charge time from instrument
16 hours
Certain characteristics are shown as typical. These provide additional information for applying the instrument, but are unwarranted.

Versions and Accessories

When ordering please quote the full ordering number information.

Ordering numbers	*Versions*
2945A	Communications Service Monitor
2946A	Avionics Service Monitor
2948	Low Phase-Noise Communications Service Monitor
Option 1	600 Ω Matching Unit
Option 2	Analog Systems Card
Option 3	High Stability OCXO
Option 4	Parallel Interface †
Option 5	GPIB Interface †
Option 6	Memory Card Drive with real time clock
Option 8	SSB demodulator
Note Option 2 required when ordering any of the following options 10 to 16	
Option 10	NMT Cellular
Option 11	AMPS Cellular
Option 12	TACS Cellular
Option 13	MPT 1327 trunking
Option 14	PMRTEST
Option 15	EDACS™ Radio Test
Option 16	EDACSä Repeater Test
Option 21	Demodulation Filters
Option 22	POCSAG Decode
Option 23	CCITT Filter †
Option 24	CMESS Filter †
Option 30	Bail Arm and Front Panel Stowage cover
	Supplied Accessories
	AC Supply lead
	DC Supply lead
	Operating Manual
	Optional Accessories
44991/145	Microphone with PTT
59000/189	Memory Card (128 k)
43113/021	Battery Pack for 2945A‡
46662/571	'Ever-Ready' Case
46662/616	'Ever-Ready' Case for use with Option 30
54112/163	Hard Transit case
54431/023	20 dB AF attenuator (BNC)
46884/728	Rack Mounting Kit
54421/001	BNC Telescopic Antenna
46884/650	Serial port to PC control cable (9 way)
46884/649	Serial port to PC control cable (25 way)
46884/648	RS-232 Printer cable (25 way)
54421/016	Fit Fast Installation Tester (70-1000 MHz) with adapter
59999/170	RF Directional Bridge
54421/002	RF Directional Power Head
54421/003	(1 to 50 MHz) RF Directional Power Head
54432/012	(25 to 1000 MHz) Wideband Amplifier
46880/079	(100 Hz to 500 MHz) Service Manual

† Options 4 and 5 can not be fitted together.
† Options 23 and 24 can not be fitted together.
‡ Battery Pack for previous model 2945A is still available under code 43113/018.

(1) At low modulation levels the residual AM/FM may become significant.

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