2948

Low Phase-Noise Communications Service Monitor

All the benefits of the 2945A but with a low phase noise signal generator, for the more critical receiver testing

- Low phase noise signal generator
- High stability reference oscillator (OCXO) as standard
- Accurate power measurement to 150 W
- Transient and harmonic analysis
- Fast response high resolution bar charts for peaking and nulling
- Tracking generator with full offset tracking
- Full span spectrum analyzer with 'live' look and listen

The 2948 Communications Service Monitor is the lightest, most rugged service monitor available with low phase-noise signal generation. For field work, the 2948 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.

Low Phase-Noise Signal Generator

The 2948 differs from its 2945A cousin by providing a low phase-noise signal generator as standard. This enhanced capability allows accurate measurement of the noise characteristics of all FM receivers and is especially beneficial when making accurate measurement of narrow band receivers. The performance of the 2948 enables signal-to-noise measurements of better than 46 dB to be made on receivers with 12.5 kHz channel spacing.

Field Operation

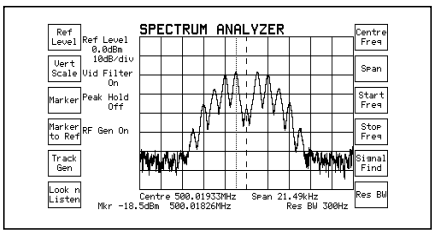
At under 12 kg the 2948 lightens the load to remote sites. The shape of the 2948 is ideal for carrying; the side handle ensures that the instrument is clear of the stairs when ascending buildings and the 2948's depth is suitable for the instrument to be operated comfortably when it is placed on the floor.

An optional bail arm handle is also available. This option allows a stowage cover to be fitted over the front panel for storage of adaptors 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.

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

Fast Full Performance Spectrum Analyzer - provided as standard

The spectrum analyzer provides spans from 100 Hz per division to 100 MHz per division 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 2948 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 2948 measures 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 the high power of 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 2948. This allows testing of duplex radios as well as simultaneous testing of repeater transmit and receive paths. There are no

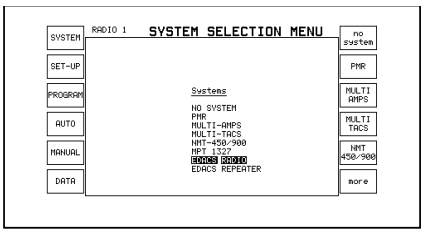
restrictions to the duplex offset.

Cellular and Trunking - built in

AMPS, TACS and NMT analog cellular standards are available internally, with all country variants provided in each package. Trunking for MPT 1327/1343 and variants of them is also available.

A new trunking capability has been added with the introduction of EDACSä 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 2948 simulates the signalling 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 IEEE-488.2 interface (option 5) can be fitted where other instruments are required to operate in a system with the 2948.

Printing Made Easy

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

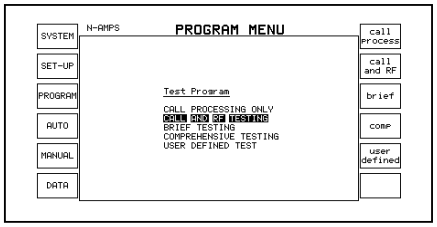
A screen capture facility is available so any screen displayed on the 2948 can be saved direct to a PC via the serial port as a bit map file.

Autorun - internal control

With the Analog Systems Card fitted, automatic testing without an 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. This allows 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 MI-BASIC interpreter to produce a customised 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 2948 provides a DOS based filing system that allows transfer of information to a PC fitted with a memory card slot.

Test setups, 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 2948 features high integration and a chassis designed to maximise 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.

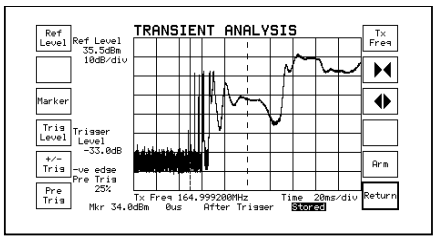
The direct measurement of CTCSS is possible with the 300 Hz LP filter, even with speech present.

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 2948. This complements the fast spectrum analyzer and allows a rapid check that the transmitter under test is not producing any excessive harmonics.

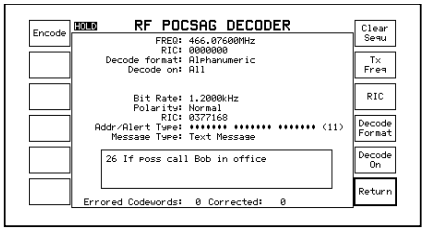
Tones Generation and Decoding

The tones menus include full remote control so that radio workshops can further automate their tasks and better control 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 messages to be displayed. Signals with bit rates of up to 4800 bits/s can be automatically decoded making the 2948 an ideal surveillance tool. The 2948 can be set to detect all messages, a user selectable RIC (just like a pager), or a fixed message string.



Specification

RF Signal Generator

FREQUENCY

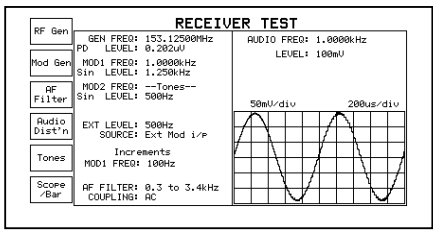
Frequency Range
400 kHz to 1.05 GHz

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 10 minutes, 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

Residual FM
Less than 6 Hz RMS (0.3 to 3.4 kHz) up to 500 MHz
Less than 12 Hz RMS (0.3 to 3.4 kHz) up to 1.05 GHz

Harmonics
-25 dBc

Spurious Signals
Better than -50 dBc

SSB Phase Noise (20 kHz offset)
Better than -112 dBc/Hz up to 500 MHz
Better than -108 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 1 GHz
±5% at 50% for modulation frequency of 1 kHz.
For carrier frequencies from 1.5 MHz to 400 MHz
±7% ± 1 digit 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)
±7% 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 VRMS 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 - 100 mV to 0 - 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 AC
±3% ±3 mV ± resolution up to 30 V RMS

Accuracy DC
±1% +50 mV up to 40 V

Audio Frequency Meter

Frequency Range
20 Hz to 50 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% and 0 to 30%

Resolution
0.1% distortion

Indication
3 digits and bar-charts

Accuracy
±1 dB 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 or 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 antialiasing circuitry and variable decode trigger level

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 Lowpass (No filters applied)

Audio Analyzer General Features
Tones Mode

RF Frequency Meter

Frequency Range
400 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 1.05 GHz
BNC: Better than 3:1 up to 1.05 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

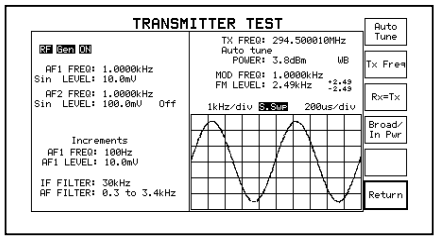
Indication
3 digits or bar-chart

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
BNC output: 5 W
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 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 Lowpass (No filters applied)

AMPLITUDE MODULATION

Frequency Range
400 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
400 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% ± resolution 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

RF Spectrum Analyzer

Frequency Range
400 kHz to 1.05 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
±2 dB ± resolution (10 dB/div)

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 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
0-999 MHz

Audio Generators

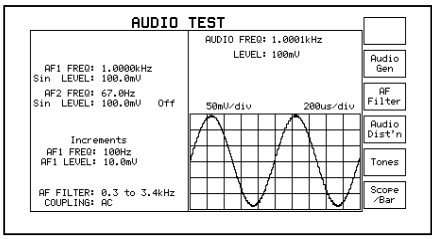
FREQUENCY

Frequency Range
10 Hz to 20 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 VRMS

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 - 15 kHz

Output Impedance
Nominally 5 Ω (minimum load 25 W)

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 2948 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 (OCXO)

Frequency
10 MHz

Temperature Stability
Better than 5 parts in 10^8, 0 to 55°C

Ageing Rate
Better than 1 part in 10^7, per year, after 1 month continous use

Warm up
Less than 10 minutes to within 2 parts in 10^7 at 20°C

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 & Frequency

90 V to 264 V	45 Hz to 67 Hz
90 V to 132 V	45 Hz to 44 Hz

Maximum AC Power
190 VA

DC Supply Voltage
11 to 32 V

Maximum DC Power
100 W

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 (pressurised 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 12 kg (standard version)

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 radios and a BASIC Interpreter for customised tests.

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. +5V 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 by 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 1 kHz (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)

E-AMPS	N-AMPS

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.

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 is an EDACS trunking licensee.

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.

Notes

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

Versions and Accessories

When ordering please quote the full ordering number information.

Ordering numbers	***Versions***
2948	Low-Noise Communications Service Monitor
	Options
Option 1	600 Ω Matching Unit
Option 2	Analog Systems Card
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	EDACS™ Repeater Test
Option 22	POCSAG Decode
Option 23	CCITT Filter†
Option 24	CMESS Filter†
Option 30	Bail Arm and Front Panel Stowage
	Supplied Accessories
	AC Supply lead
	DC Supply lead
	Operating Manual
	Optional Accessories
44991/145	Microphone with PTT
59000/189	Memory Card (128k)
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 adaptor
59999/170	RF Directional Bridge
54421/002	RF Directional Power Head (1 to 50 MHz)
54421/003	RF Directional Power Head (25 to 1000 MHz)
54432/012	Wideband Amplifier (100 Hz to 500 MHz)
46880/082	Service Manual

† Options 4 and 5 can not be fitted together.
† Options 23 and 24 can not be fitted together.

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