

# Wireless

## 2945A Communications Service Monitor

**AEROFLEX**  
A passion for performance.



A compact, lightweight and rugged instrument that allows laboratory standard measurements to be conducted in the field

- Rugged lightweight package
- Full span spectrum analyzer with 'live' look and listen
- Tracking generator with full offset tracking
- Accurate power measurement to 150 W
- 5 W protection on all RF ports as standard
- Superfast LCD with rapid refresh rate for easy monitoring and real time adjustment
- 50 kHz DSO (Digital Storage Oscilloscope) with anti-aliasing
- Transient and Harmonic analysis

*The 2945A Communications Service Monitor is the lightest, most rugged service monitor available with a full performance spectrum analyzer as standard. For field work the 2945A 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.*

### Field Operation

At under 12 kg (25 Ib), the 2945A lightens the load to remote sites. The shape of the 2945A 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 2945A 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 instrument 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.



*Can be operated from 'ever-ready' case*

### Fast Warm Up - fast results

The standard TCXO allows results to be made reliably within a

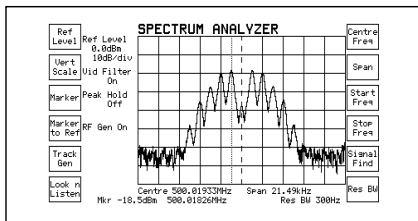
For the very latest specifications visit [www.aeroflex.com](http://www.aeroflex.com)

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.

**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 the displayed 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  $\uparrow\downarrow$  keys. This is particularly useful when testing multi-channel systems.



**Live Look and Listen**

This feature puts the 2945A above all 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 basestation sites.

**From 2  $\mu$ V to 150 Watts**

The 2945A 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 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  $\pm 2$  dB at all levels above -127 dBm.

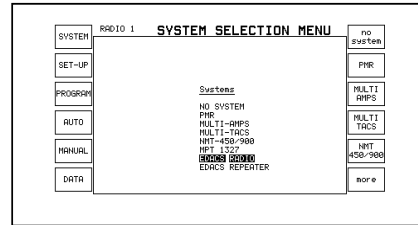
**Duplex - provided as standard**

Full duplex operation is provided by the 2945A. 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.

**PMR, Trunking and Cellular**

The 2945 provides extensive support for the various tone signaling systems used in Land Mobile Communications such as DTMF, DCS, CTCSS and other user defined formats.

Additionally trunked networks are supported with network signaling protocol simulations for MPT-1327/1343 and EDACS radio / repeater measurements. Analog cellular standards are also available internally and include AMPS, TACS and NMT with all country variants provided.



**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 2945A.

**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.

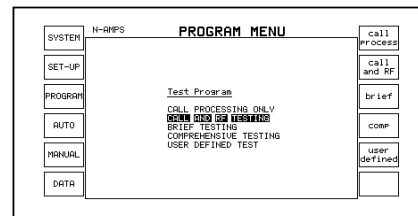
A screen capture facility is available so any screen displayed on the 2945A Communications Service Monitor can be saved direct to a PC, via the serial port, as a bit map file.

**Autorun - internal control**

With the (optional) 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 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 four built-in programs or by using the MI-BASIC 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 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 2945A features high integration with a rugged chassis design to maximize mechanical protection.

## Audio Analysis

A comprehensive range of filters is provided as standard, including band pass, lowpass 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.

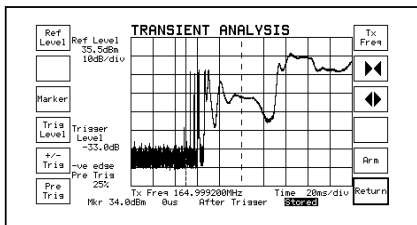
External DC coupled FM is provided.

## 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

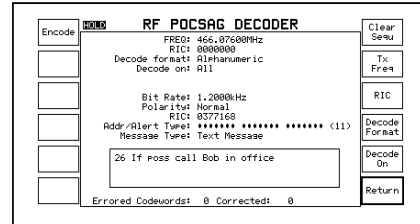
An automatic harmonic analysis function is included in the 2945A. This complements the fast spectrum analyzer and allows a rapid check that the transmitter is not producing any large harmonics.

## 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 2945A an ideal surveillance tool. The 2945A can be set to detect all messages, a user selectable RIC (just like a Pager), or a fixed message string.



## SPECIFICATION

### GENERAL INFORMATION

Certain characteristics are shown as typical. These provide additional information for applying the instrument, but are unwarranted.

### 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

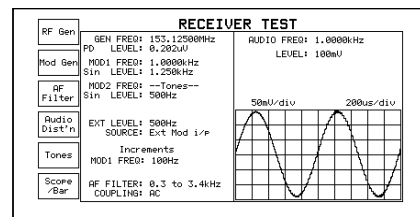
##### Output Level Range

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 levels 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  $\Omega$

#### **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 ( $\pm 10$  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  $\mu$ V PD generated in a 50  $\Omega$  load by a 2 turn loop 25 mm from the case. Output level less than -40 dBm into a sealed 50  $\Omega$  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

$\pm 7\% \pm 1$  digit for modulation frequency of 1 kHz.

$\pm 10\% \pm 1$  digit for modulation frequencies from 50 Hz to 5 kHz.

$\pm 15\% \pm 1$  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 k $\Omega$  in parallel with 40 pF

##### **Frequency Range**

As internal AM

##### **Modulation Frequency Range**

As internal AM

##### **Sensitivity**

1 V RMS for 0 to 100% AM

#### **FREQUENCY MODULATION - INTERNAL**

##### **Frequency Range**

400 kHz to 1.05 GHz

##### **Maximum Deviation**

0 to 75 kHz

##### **Indication**

3 digits

##### **Setting**

Keyboard entry, delta increment/decrement function and rotary control

##### **Accuracy<sup>(a)</sup>**

$\pm 5\% \pm 10$  Hz at 1 kHz modulating frequency

$\pm 10\%$  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  $\mu$ s selectable

#### **FREQUENCY MODULATION - EXTERNAL**

##### **Input Impedance**

Nominally 10 k $\Omega$  in parallel with 40 pF

##### **Frequency Range**

As internal FM

##### **Modulation Frequency Range**

DC to 100 kHz

##### **Pre-emphasis**

750  $\mu$ s 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  $\Omega$

**Press To Talk (PTT)**

When using the optional microphone in Tx Test mode, the PTT will switch instrument to Rx Test

**AUDIO VOLTMETER**

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**Input Impedance**

Nominally 1 M $\Omega$  in parallel with 40 pF

**Frequency Range**

DC and 50 Hz to 50 kHz

AC only 50 Hz to 50 kHz

Polarized DC (below 1 Hz)

**Maximum input voltage**

30 VRMS, 50 Vdc

**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**

$\pm 3\% \pm 3 \text{ mV} \pm 1 \text{ digit}$

**AUDIO FREQUENCY METER**

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**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  $\pm 1 \text{ digit} \pm \text{resolution}$

**Sensitivity**

50 mV

**AUDIO SINAD METER**

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**Frequency**

1 kHz

**Range**

0 to 18 dB and 0 to 50 dB

**Resolution**

0.1 dB

**Indication**

3 digits and bar-charts

**Accuracy**

$\pm 1 \text{ dB}$

**Sensitivity**

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

**AUDIO DISTORTION METER**

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**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**

$\pm 5\%$  of reading  $\pm 0.5\%$  distortion

**Sensitivity**

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

**AUDIO S/N METER**

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**Range**

0 to 30 dB and 0 to 100 dB

**Resolution**

0.1 dB

**Indication**

3 digits and bar-chart

**Accuracy**

$\pm 1 \text{ dB}$

**Sensitivity**

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

**AUDIO OSCILLOSCOPE**

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**Operating Modes**

Single with digital storage on screen 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**

$\pm 5\%$  of full scale

**FM Ranges**

$\pm 75, 30, 15, 6, 3$  and 1.5 kHz deviation full scale,  $\pm 10\%$  accuracy

**AM Ranges**

20, 10 and 5% per division,  $\pm 10\%$  accuracy

## Timebase

50  $\mu$ s/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 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  $\mu$ s de-emphasis

50 kHz Lowpass (No filters applied)

### 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, up to 1050 MHz, selectable

0.1 Hz, 1 Hz or 10 Hz up to 999 MHz, selectable

### Indication

Up to 10 digits

### Accuracy

As frequency standard  $\pm$  resolution

### Acquisition Time

Less than 1 second (manual tune)

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)

$\pm$ 10%  $\pm$  resolution up to 1 GHz

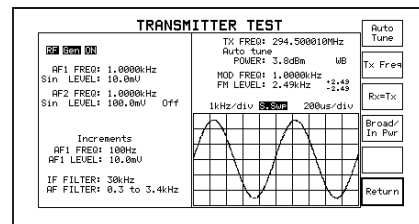
### Maximum Continuous Rating

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  $\mu$ s/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  $\mu$ s de-emphasis

50 kHz Lowpass (No filters applied)

**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 <sup>(1)</sup>**

$\pm 5\% \pm 1$  digit at 1 kHz

$\pm 8.5\% \pm 1$  digit from 50 Hz to 10 kHz

**Demodulation Distortion <sup>(1)</sup>**

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

**Residual AM**

Less than 1% (300 Hz to 3.4 kHz)

**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 <sup>(1)</sup>**

$\pm 5\% \pm 1$  digit at 1 kHz modulation frequency

$\pm 7.5\% \pm 1$  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  $\pm 10\%$  per 1 kHz deviation

**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

**Displayed Dynamic Range**

80 dB

**Noise Floor**

Typically 75 dB below top of screen.

**On Screen Linearity**

Typically  $\pm 2$  dB  $\pm 1$  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**

$\pm 1$  dB  $\pm$  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

## Sensitivity

2 μV

## Tracking Generator Offset/Frequency Range

0 to 999 MHz/400 kHz to 1000 MHz

## AUDIO GENERATORS

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### 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 4V 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

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### 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

FM Deviation

Rx Distortion

Rx Sensitivity

Rx S/N

Tx Distortion

Tx Level

Tx Limiting

Tx Noise

Tx S/N

AF Level

Mod frequency

Rx Expansion

Rx SINAD

Tx Compression

Tx Frequency

Tx Power Level

Tx Mod Level

Tx SINAD

### 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

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### Internal Frequency Standard (TCXO)

#### Frequency

10 MHz

#### Temperature Stability

0.5 ppm, 0 to 40°C

0.6 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 k $\Omega$

## GENERAL

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### Keyboard and Display

Logical color 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

100 - 240 V~ / 108 - 118 V~ (Limit 90 - 264 V~/98 - 132 V~)

### AC Supply Frequency

50 - 60 Hz / 50 - 400 Hz (Limit 45 - 66 Hz / 45 - 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

## CALIBRATION INTERVAL

2 years

## ELECTROMAGNETIC COMPATIBILITY

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

IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criteria B

## SAFETY

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC / EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for Class 1 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 supply.

## ENVIRONMENTAL

### Rated Range of Use

0 to 50°C and up to 95% relative humidity at 40°C

### Storage and Transport

### Temperature

-40°C to +71°C

### Altitude

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

## DIMENSIONS AND WEIGHT

### Standard dimensions

185 mm (7.3 in) height, 400 mm (15.7 in) width, 460 mm (18.1 in) deep (including handle, feet and covers)

### Option 30 dimensions

185 mm (7.3 in) height, 420 mm (16.5 in) width, 565 mm (22.2 in) deep (including handle, feet and covers)

### Weight

Typically less than 11.4 kg, (<25 lb)

10.5 kg (No options) Less than 13 kg (fully equipped)

## OPTIONS AND ACCESSORIES

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### 600 $\Omega$ MATCHING UNIT (OPTION 1)

## INPUT CIRCUIT

### Impedance

600  $\Omega$

### Return Loss

>21 dB at 1 kHz

### Frequency Response

$\pm 0.5$  dB at 200 Hz to 5 kHz,

$\pm 2$  dB at 100 Hz to 20 kHz

### Accuracy of 1:1 input:output ratio

$\pm 1\%$  at 1 kHz  $\pm$  accuracy of 2945A or 2948

### Maximum Input

5 V RMS maximum at 200 Hz to 5 kHz

3 V RMS maximum at 100 Hz to 20 kHz

## OUTPUT CIRCUIT

### Impedance

600  $\Omega$

### Return Loss

>21 dB at 1 kHz

### Frequency response

$\pm 0.5$  dB at 200 Hz to 5 kHz

$\pm 2$  dB at 100 Hz to 20 kHz

### Level Accuracy

$\pm 2\%$  at 1 kHz  $\pm$  accuracy of 2945A or 2948

### Output Level

1 mV to 2.5 V RMS across 600  $\Omega$

## ANALOG SYSTEMS CARD (OPTION 2)

This option provides automatic testing for cellular, trunked and FM radios and a BASIC Interpreter for customized 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 four 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

IEEE-488:- SH1, AH1, T6, L4, SR1, RL1, DTO, 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  $\mu$ V to 150 W

## Features

Automatic detection of USB or LSB. BFO can be used for tuning of carrier for AM and FM radios.

## OCCUPIED BANDWIDTH MEASUREMENT (OPTION 9)

Calculates the bandwidth of a signal displayed on the spectrum analyzer.

### Frequency Range

1 MHz to 1 GHz

### Display Resolution

3 digits

### Accuracy

20%

### Bandwidth Measurement Range

3 kHz minimum

Ratio range 90% - 99% selectable in 0.1% steps

## 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 radios

## 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 four 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

Notes

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

## VERSIONS AND ACCESSORIES

When ordering please quote full ordering number information

### Ordering Numbers

#### Versions

2945A	Communications Service Monitor
2948	Low Phase-Noise Communications Service Monitor

#### Options

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
Option 9	Occupied Bandwidth Measurement

**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 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)
59000/375	Memory Card (2 M)
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)
59999/170	RF Directional Bridge
54421/002	(1 to 50 MHz) RF Directional Power Head
54421/003	(25 to 1000 MHz) RF Directional Power Head
54432/012	(50 to 1000 MHz) Wideband Amplifier
46880/079	Service Manual

† Options 4 and 5 cannot be fitted together.

†† Options 23 and 24 cannot be fitted together.

‡ Battery Pack for previous model 2945 is still available under code 43113/018

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