

2955A

A relay then opens the signal path if the input power exceeds 1.0 W thus protecting the instrument.

A built-in self test facility identifies faulty sections either to major module level or group of components, so reducing the mean time to repair. Instrument down-time is further reduced by 2955A's modular construction, which simplifies the service of faulty modules. The Test Set has only six p.c.b.'s plugging into a mother board, a plug-in RF tray, an attenuator block and a power load. These are easily removed for replacement or further test.

Routine calibration needs have been kept to a minimum, and calibration factors stored in non-volatile memory may be accessed with a secure access code from the front panel key buttons, or via the GPIB, permitting rapid recalibration.

VERSIONS AND ACCESSORIES

French and Spanish language versions can be supplied with complete front panel and software translations.

A further version of 2955A is available fitted with a GPIB interface for automatic testing applications.

Accessories for the 2955A are available to provide comprehensive cellular radio test facilities for the 450/900 MHz Nordic Mobile Telephone (NMT) systems, Advanced Mobile Phone Service (AMPS), Radiocomm 2000 and the Total Access Communication System (TACS). Band III trunked radio system test facilities are also available.

Other accessories available for use with 2955A include two directional power heads, covering the frequency ranges 1–50 MHz and 25–1000 MHz, a sophisticated battery pack with built-in fast charge circuit, a 600 ohm balanced input/output interface, CCITT and CMESS psophometric filters, a 24 column ticket printer, a GPIB interface, IF injector probes, a 20 dB AF attenuator and a rugged transit case.

Recently introduced accessories include an impedance matching unit, a microphone interface unit and microphone, a wideband RF Amplifier and a 150 Hz Bandstop filter.

RF SIGNAL GENERATOR

FREQUENCY

Range	0.4 MHz to 1000 MHz.
Resolution	50 Hz up to 530 MHz. 100 Hz up to 1000 MHz.
Indication	8 digits display.
Setting	Via keyboard entry. Step change variation by INC/DEC keys and rotary control.
Accuracy	As internal standard.

OUTPUT LEVEL

Range	Rx Mode: –135 dBm to –15 dBm (0.04 μ V to 40 mV) N-type socket selected. –115 dBm to +5 dBm (0.4 μ V to 400 mV). BNC socket selected. One Port Duplex Mode: –140 dBm to –21.5 dBm (0.0224 μ V to 18.85 mV). Two Port Duplex Mode: –115 dBm to –15 dBm (0.04 μ V to 40 mV)
Resolution	0.1 dB.
Indication	4 digits with units μ V, mV, dBm, dB μ V. p.d.f.e.m.f. selection as appropriate.

Setting	Via keyboard entry. Step change variation by INC/DEC keys and rotary control.
Accuracy	± 2 dB for levels above –127 dBm.

SPECTRAL PURITY

Residual f.m.	Less than 30 Hz up to 520 MHz, typ. 15 Hz. less than 60 Hz up to 1000 MHz, typ. 30 Hz. Measured in 300 Hz to 3.4 kHz bandwidth.
Residual AM	<0.5%, 0.3 – 3.4 kHz 8 W.
Harmonics	Less than –20 dBc up to 1.5 MHz –25 dBc up to 250 MHz –20 dBc up to 1000 MHz.
Sub-harmonics	None up to 530 MHz. less than –25 dBc to 1000 MHz.
Spurious signals	For carrier frequencies up to 88 MHz: Less than –45 dBc up to 110 MHz. Less than –35 dBc above 110 MHz. For carrier frequencies up to 1000 MHz: Less than –60 dBc.

Signal/noise at 20 kHz offset	Less than –106 dBc/Hz up to 500 MHz. less than –100 dBc/Hz to 1000 MHz.
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RF leakage	Less than 0.2 μ V p.d. generated in a 50 Ω load by a 2-turn 25 mm loop as near as 25 mm to the case of the instrument with the output set to less than –20 dBm and the output terminated in a 50 Ω sealed load.
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Protection	50 W reverse power trip, automatically resets on removal of power input (BNC socket). Visual alarm warning (REMOVE RF INPUT) and audible alarm provided for added protection.
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OUTPUT IMPEDANCE	50 Ω nominal.
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VSWR	Less than 1.2 to 500 MHz, less than 1.35 to 1000 MHz (N-type). Less than 2.2 to 1000 MHz (BNC).
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MODULATION

INTERNAL AMPLITUDE MODULATION

CW range	1.5 to 400 MHz. usable from 400 kHz to 500 MHz.
Mod. depth range	0 to 99%.
Resolution	1%.
Indication	2 digits
Mod. frequency range	20 Hz to 20 kHz.
Setting	Via keyboard entry. Step change variation by INC/DEC keys and rotary control.
Accuracy	$\pm 7\%$ of setting ± 1 digit at 1 kHz +10% of setting ± 1 digit, 50 Hz to 5 kHz up to 70% AM. $\pm 15\%$ of setting ± 1 digit, 50 Hz to 15 kHz up to 85% AM

EXTERNAL

Input impedance	As internal plus: 1 M Ω in parallel with approximately 40pF.
Sensitivity	1.0 V p-p for 30% AM at 1 kHz $\pm 15\%$ reading $\pm 1\%$ AM
AM distortion	Less than 2% distortion at 1 kHz with 30% AM (300 Hz to 3.4 kHz bandwidth)

FREQUENCY MODULATION INTERNAL

CW range	0.4 to 1000 MHz.
Mod. deviation range	0 to 25 kHz.
Resolution	25 Hz (<6.25 kHz dev.) 100 Hz (<25 kHz dev.).
Indication	4 digits.
Mod. frequency range	20 Hz to 20 kHz.
Setting	Via keyboard entry. Step change variation by INC/DEC keys and rotary control.

Accuracy	±7% +10 Hz (at 1 kHz). ±10% (50 Hz to 15 kHz).
EXTERNAL	As internal plus:
Input impedance	1 MΩ in parallel with approximately 40pF.
Mod. deviation range	0 to 30 kHz.
Sensitivity	1 V p-p for 5 kHz deviation; ±10% at 1 kHz.
Mod. frequency range	1 Hz to 50 kHz.
FM distortion	Less than 1% distortion at 1 kHz with 5 kHz deviation (300 Hz to 3.4 kHz bandwidth).

PHASE MODULATION INTERNAL

CW range	0.4 to 1000 MHz.
Modulation range	0 to 10 rads.
Resolution	0.02/0.03 rads. up to 6.3 rads.
Indication	3 digits.
Mod. frequency range	300 Hz to 3.4 kHz.
Setting	Via keyboard entry. Step change variation by INC/DEC keys and rotary control.
Accuracy	±8% at 1 kHz, ±11% from 300 Hz to 3.4 kHz.
ΦM distortion	Less than 2% at 1 kHz with 5 rads (measured in a 300 Hz to 3.4 kHz bandwidth).

EXTERNAL

Input impedance	As internal plus:
Sensitivity	1 MΩ in parallel with approximately 40pF. 1 V p-p for 5 rads. ±12% at 12 kHz.

DUAL AUDIO GENERATOR

OUTPUT IMPEDANCE	Less than 5 ohms nominal.
WAVEFORM SHAPE	Sine, square, triangle, sawtooth.
FREQUENCY	
Range	10 Hz to 20 kHz.
Resolution	0.1 Hz (10 Hz to 9.999 kHz). 1 Hz (10 kHz to 20 kHz).
Indication	5 digits.
Setting	Via keyboard, and with rotary control for step change variation.
Accuracy	±0.01 Hz from 10 Hz to 100 Hz. ±0.1 Hz from 100 Hz to 20 kHz.
Distortion	Less than 1% from 50 Hz to 15 kHz (sine). Less than 0.5% at 1 kHz.
Residual noise	Less than 0.1 mV r.m.s. in a psophometric bandwidth.
DC offset	Less than 10 mV DC.
OUTPUT LEVEL (e.m.f.)	
Range	0.1 mV to 4.095 V r.m.s. (sine and square). 0.1 mV to 4.095 V peak (triangle and sawtooth).
Accuracy	±5% ±1 digit, 50 Hz to 15 kHz.
Setting	0.1 mV steps (0.1 mV to 409.5 mV). 1 mV steps (409.5 mV to 4.095 V).

RF FREQUENCY METER

FREQUENCY	
Range	1.5 MHz to 1000 MHz.
Resolution	1 Hz or 10 Hz to 200 MHz. 10 Hz from 200 MHz to 1000 MHz.
Typ. acquisition	Up to 200 MHz, 100 ms, with 10 Hz resolution; 1 s with 1 Hz resolution. Up to 1000 MHz, 400 ms, 10 Hz resolution only.
INPUT	
Sensitivity	Input to type-N socket: 5 mW (0.5 V), TX mode selected. 20 mW (1 V), one/two port duplex. 0.05 mW (50 mV), BNC input.

RF POWER METER

INPUT

Range	0.05 mW to 150 W. Input to type-N socket; 50 mW to 75 W continuous, TX Mode selected. 100 mW to 75 W continuous in single port duplex mode. (150 W max. for typically 2 minutes at 25°C continuous). End of safe working is indicated by screen warning "REMOVE RF INPUT" and audible alarm. Input to BNC socket. Usable 0.05 mW to 1.0 W.
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Frequency range	As RF Frequency Meter.
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Resolution	1% full-scale.
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Indication	2/3 digits and analog display.
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Setting	Automatic ranging on scales 0 to 30, 0 to 100, 0 to 300 mW, 0 to 1, 0 to 3, 0 to 10, 0 to 30, 0 to 100 W and 0 to 300 W.
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Accuracy	±10% ±1 digit up to 500 MHz. ±15% ±1 digit up to 960 MHz. ±20% ±1 digit up to 1000 MHz. ±20% typ. BNC socket.
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VSWR

	Less than 1:2 to 500 MHz, less than 1:35 to 1000 MHz (N-type). Less than 2:2 to 1000 MHz (BNC).
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MODULATION METER

Manual-tune	Provides frequency offset indication from carrier. 3 Digits and decimal point indicate most significant positive or negative error.
Auto-tune	Provides Measurement and simultaneous display of RF frequency, power, modulation frequency and level, and 1 kHz demod. distortion.
Acquisition	Less than 3 seconds at 10 Hz resolution.

INPUT

Frequency range	As RF Frequency Meter.
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Sensitivity	As RF Frequency Meter.
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AF filters	The following filters are available: Bandpass – 300 Hz to 3.4 kHz. Low pass – 300 Hz. Low pass – 15 kHz.
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AMPLITUDE MODULATION

CW range	1.5 MHz to 400 MHz.
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Modulation range	0 to 90% up to 100 MHz. 0 to 80% up to 400 MHz, in auto-tune mode. 0 to 100% up to 400 MHz in manual-tune mode. Automatic ranging (bar chart), 0 to 10, 0 to 30, 0 to 100% depth.
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Mod. frequency range	50 Hz to 10 kHz (usable 10 Hz to 15 kHz).
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Resolution	1% AM.
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Indication	2 digits and +/- peak analog display.
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Accuracy	±5% ±1 digit at 1 kHz, ±8.5% ±1 digit from 50 Hz to 10 kHz.
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Demod. distortion	Less than 5% below 21 MHz and less than 2% above. Measured with 300 Hz to 3.4 kHz filter and 30% AM at 1 kHz modulation frequency.
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Residual AM	< 1% at frequency meter sensitivities +6 dB.
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FREQUENCY MODULATION

Modulation range	0 to 25 kHz. Automatic ranging (bar chart), 0 to 1, 0 to 3, 0 to 10, 0 to 30 kHz.
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Mod. frequency range	50 Hz to 10 kHz (typically 10 Hz to 15 kHz).
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Resolution	10 Hz up to 2.5 kHz deviation; 1% up to 25 kHz deviation.
Indication	3 digits and \pm peak analog display.
Accuracy	$\pm 5\%$ ± 1 digit at 1 kHz; $\pm 7.5\%$ over range 50 Hz to 10 kHz.
Demod. distortion	Less than 1.5% at 5 kHz deviation and 1 kHz modulation frequency in a 300 Hz to 3.4 kHz bandwidth.
Residual FM	Less than 30 Hz r.m.s. up to 500 MHz; typ. 15 Hz. Less than 60 Hz r.m.s. up to 1000 MHz; typ. 30 Hz. For inputs above 20 mW/0.2 mW (N/BNC), measured in a 300 Hz to 3.4 kHz bandwidth.

PHASE MODULATION

Modulation range	0 to 10 radians; Automatic ranging (bar chart): 0 to 1, 0 to 3 and 0 to 10 radians.
Mod. frequency range	300 Hz to 3.4 kHz. Phase de-modulation is obtained using 750 μ s de-emphasis.
Resolution	1% or 0.01 radians.
Indication	3 digits and \pm peak analog display.
Accuracy	$\pm 5\%$ ± 1 digit at 1 kHz; $\pm 7.5\%$ ± 1 digit from 0.3 to 3.4 kHz with 750 μ s de-emphasis.
Demod. distortion	Less than 2% at 5 rads. modulated by 1 kHz measured in 300 Hz to 3.4 kHz bandwidth.

SINAD METER/S/N METER

Frequency	1 KHz.
Range	0 to 18 dB, 0 to 50 dB (SINAD); 0 to 30, 0 to 100 dB (S/N).
Resolution	0.1 dB.
Indication	3 digits plus analog display.
Accuracy	± 1 dB.
Sensitivity	50 mV (100 mV for 40 dB SINAD/S/N).

DISTORTION METER

Frequency	1 kHz
Range	0 to 10%, 0 to 30% distortion.
Resolution	0.1% distortion.
Indication	3 digits plus analog display.
Accuracy	$\pm 5\%$ of reading $\pm 0.5\%$ distortion.
Sensitivity	50 mV/100 mV (100 mV for 1% distortion).

AF LEVEL METER

Features	AC + DC or AC measurements
Input impedance	1 M Ω in parallel with approximately 40 pF.
Frequency range	50 Hz to 20 kHz (or d.c.); usable 20 Hz to 50 kHz.
Level range	0 to 100 mV, 0 to 300 mV, 0 to 1, 0 to 3, 0 to 10, 0 to 30 and 0 to 100 V.
Resolution	1 mV on 1% dependent on range.
Indication	3 digits plus analog display.
Accuracy	$\pm 3\%$ ± 3 mV ± 1 digit.
Frequency response	Switchable bandpass 0.3 to 3.4 kHz, low pass 300 Hz or 50 kHz.

AF FREQUENCY METER

Range	20 Hz to 20 kHz.
Resolution	0.1 Hz/1 Hz.
Indication	3, 4 or 5 digits.

Accuracy	As internal standard ± 1 digit ± 0.1 Hz or 0.02% (whichever is greater).
Sensitivity	50 mV.

INTERNAL FREQUENCY STANDARD

OCXO	Oven controlled crystal oscillator; nominal frequency 10 MHz.
Temperature coefficient	Less than ± 5 parts in 10^6 from 0 to 50°C; Less than 4 parts in 10^6 /deg C from 50 to 70°C.
Ageing rate	Less than ± 1 part in 10^6 /month; ± 5 part in 10^6 /year after 1 month's continuous use.
Short-term stability	Less than ± 1 part in 10^6 r.m.s. frequency error over a 1 s period.
Retrace error	Less than ± 2 parts in 10^6 over 24 hours, at constant temperature and after 25 minutes warm-up.

EXTERNAL FREQUENCY STANDARD INPUT

Frequency	1 MHz.
Level	100 mV to 3 V r.m.s.
Impedance	10 k Ω in parallel with 100 pF approximately.

DIGITAL STORAGE OSCILLOSCOPE

Features	Single or repetitive sweep, available in TX, RX and Audio Test modes; calibrated for AM, FM and Φ M.
Frequency range	DC to 50 kHz (from 3 Hz on AC).
Voltage range	10 mV/div to 20 V/div in a 1-2-5 sequence.
Accuracy	$\pm 5\%$.
FM ranges	+30, -15, 6, 3, 1.5 kHz deviation at >10% accuracy.
ΦM ranges	± 15 , 7.5, 3, 1.5 rad at $\pm 10\%$ accuracy.
AM ranges	20, 10, 5%/div, at $\pm 10\%$ accuracy.
Sweep rates	100 μ s/div to 5 s/div in 1-2-5 sequence; accuracy locked to internal standard.
Trigger	Repetitive or single-shot storage.

SELCALL ENCODER/DECODER

Functions	Encodes 33 tones, decodes up to 33 tones in a CCIR, ZVEI, DZVEI, EEA, FIA or USER DEFINED tone sequence.
Tone encoder facilities	Send continuous, burst, single stop extend any tone, null, repeat or frequency shift up to $\pm 9\%$ in 1% steps.
Tone decoder facilities	Displays tone number, frequency and percentage error. Screen indicates null tones (using CRT) and annotates out of limit frequencies with for ease of identification.
User define	Allows definition of up to 15 tones. Frequency range 300 Hz to 3.4 kHz; duration 20 ms to 1.2 s (decode); 20 Hz to 20 kHz; duration 10 ms to 999 ms (encode). Frequencies are stored in non-volatile memory.
Tones in audio mode	Tones encode and decode facility available using AFGEN output and AF input BNC sockets.
Revertive tones	Available in Receive Test Mode; tones are sent to the radio and the 2955A awaits a response.

ADDITIONAL FEATURES

IF OUTPUT SOCKET

Frequency	110 kHz nominal.
Level	Minimum 180 mV.

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Impedance	50Ω, minimum load 5kΩ
Bandwidth	50 kHz to 350 kHz.
DEMODULATION OUTPUT SOCKET	
Level	400 mV p-p for ± 1 kHz deviation $\pm 10\%$.
Impedance	10kΩ nominal.
Bandwidth	Either 300 Hz ± 3.4 kHz, 15 kHz LP or 300 Hz LP set via front panel filter switch.
EXTERNAL MODULATION	In RX MOD, the 2955A can be configured to measure the modulation at the EXT MOD INPUT. Adjustment will provide the desired modulation level.
ACCESSORY SOCKET	Pins 3, 4, 5, 6 accessory control Pin 2: +12 V, 100 mA max. Pin 7: AF output: 1 W into 8 ohms. Pin 1: pulse output available under GPIB control, approximately 600 ns.
DTMF ENCODE/DECODER	Provides DTMF encoder and decoder under Tones menu. Tone duration and intertone gaps may be varied from 10 to 999 ms in 1 ms steps. Sequences of up to 28 tones may be stored and decoded.
PAGER TESTER	Encoding of POCSAG code CCIR No. 1, Rec. 584. Bit rate 400 – 1500 bits/s, deviation 0 – 25 kHz. Allows entry of Radio Identity Code (RIC): 4 addresses, 2 preset numeric messages, 4 alphanumeric messages and insertion of bit errors.
DCS ENCODER	Digitally Coded Squelch encoder, allows entry of Bit rate 100 – 200 bits/s, deviation 0 – 25 kHz, Polarity, normal or inverted, RIC 3 digit code.
DCS DECODER	Displays bit rate, deviation, polarity and all possible codes.
SPECIAL KEY FUNCTIONS	
RX = TX FREQ	Presets the RF signal generator frequency for receiver test mode to that shown in TX mode.
Hold Display	Freezes instrument settings and readings, facilitating high RF power measurements and hard copy printout of TX, RX, Duplex or AF test screens.
INC/DEC	Available in TX, RX, Duplex and AF test modes for defining frequency or level increments of the AF and RF signal generators. Any step size setting within the range and resolution of the test set is permissible.
Store/Recall	26 non-volatile stores (01 to 26) are provided, each capable of retaining all front panel settings for up to 10 years. An additional store (00) is provided to retain the last test set-up, in the event of a power fail.

Help	Provides access to SELF TEST, stores lock, RF meter resolution, SINAD or S/N default values, external attenuator offset, variable default deviation, 2955/2955A emulation, default AF filter, Rx/Tx mod. type lock, USA/Europe tone standard selection, and user help for Tx, Rx, Duplex and AF test modes.
Hold range	The displayed bar chart can be held, ie no autoranging, by use of the scope pushbuttons.
Audible output	For listening to demod output and received audio.
Two tone modulation	In transmit mode, two tones are available under tones menu. In receiver mode, external modulation inputs add to internal modulation.

GENERAL

POWER REQUIREMENTS

Rated supply voltage	105–120 V AC, 210–240 V AC, all $\pm 10\%$.
Supply frequency range	45 Hz–440 Hz.
Maximum consumption	100 VA.
DC supply voltage	11–32 V DC
DC supply consumption	Less than 60 W

GPIB INTERFACE

Capabilities	Complies with the following subsets as defined in IEEE 488-1978 and IEC Publication 625-1: SH1, AH1, T5, L4, SR1, RL1, PP0, DT1, E1.
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RADIO FREQUENCY INTERFERENCE

Conforms with the requirements of EEC Directive 76/889 as to limits of r.f. interference.

SAFETY

Complies with IEC 348.

RATED RANGE OF USE

0 to 50°C.

LIMIT RANGE OF OPERATION

0 to 55°C.

CONDITIONS OF STORAGE AND TRANSPORT

Temperature	–40 to +70°C.
Humidity	Up to 90% humidity.
Altitude	Up to 2500 m (pressurized freight at 27 kPa differential, i.e. 3.0 lbf/sq. in.).

DIMENSIONS AND WEIGHT

Height	Width	Depth	Weight
197 mm	389 mm	584 mm	15.5 kg
7.75 in	15.3 in	23.0 in	34 lb

Includes dimensions of handle, feet and front cover.

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VERSIONS AND ACCESSORIES

When ordering please quote eight digit code numbers.

Ordering numbers	Versions
52955-911J	Radio Communications Test Set
52955-910L	Radio Communications Test Set with GPIB Interface fitted.
52955-326F	Radio Communications Test Set with GPIB interface fitted (French Language Version).
52955-327G	Radio Communications Test Set with GPIB interface fitted (Spanish Language Version).
	Supplied accessories
43129-003W	AC Supply Lead.
46881-952B	Operating Manual.
46881-986A	Introductory Guide.
46881-953K	Programming Manual.
41690-411S	Front Cover (Stowage).
43130-119U	DC Supply Lead.
	Optional accessories
54415-005E	Multi-system Adapter
46884-101J	NMT 450/900 + Country Variants Cellular Software.
46884-102F	AMPS/EAMPS Cellular Software.
46884-103G	TACS/ETACS Cellular Software.
46884-104V	Radiocomm 2000 Cellular Software.
46884-105S	Band III Trunked Radio Software.
54421-003J	Directional Power Head 25 MHz-1000 MHz

	Optional accessories (continued)
54421-002L	Directional Power Head 1 MHz-50 MHz.
54462-023W	Battery Pack with built-in D.C. Input Fast Charger.
54211-001D	Printer 24 Column with Paper & Ribbon.
46883-877P	Printer Paper & Ribbon Kit.
54411-052M	600 Ohm Balanced Interface with 20 dB AF Attenuator
54499-042L	CCITT filter.
54499-043J	CMESS filter.
43129-189U	GPIB Lead (used with 24 Column Printer).
54451-163Y	IF Injector Probe 470 kHz.
54451-164N	IF Injector Probe 10.7 MHz.
54451-165L	IF Injector Probe 455 kHz.
54127-304C	Rack Mounting Kit (19").
54421-001N	BNC Telescopic Antenna.
54431-023A	20 dB AF Attenuator.
54150-022P	Viewing Hood.
46662-192W	Transit Case.
46881-954A	Service Manual.
54433-002Y	GPIB Interface.
54411-053C	Impedance Matching Unit.
54432-013E	Microphone Interface Unit.
54412-020Y	Microphone Unit.
54432-012H	Wideband RF Amplifier.
54491-325H	150 Hz Bandstop Filter.

(Contact Marconi Instruments for further information on optional accessories)

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