

**ANALOG MULTIPLEX TERMINAL EQUIPMENT
COMMON EQUIPMENT
TRANSMISSION TESTING
TEST EQUIPMENT**

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1. GENERAL

1.01 This section provides condensed descriptions of transmission test equipment that may be used in testing and maintaining L-type carrier and multiplex transmission equipment. Comparison charts are also included so that characteristics of various models of equipment may be compared.

1.02 This section is reissued to include newer models of test equipment and to revise the text. Since this issue covers a general revision, arrows are not used to indicate changes.

1.03 L-type transmission equipment is capable of operating within very close tolerances. Consistent adherence to such close tolerances can only be realized by appropriate application of certain measuring techniques. The accuracy of these techniques, in turn, is dependent upon the precision of the test equipment used. Recently introduced

test equipment will generally perform tests better than some of the equipment of older design. Equipment of newer design may also simplify testing procedures.

2. TEST METHODS

A. Bridging Versus Terminated Measurements

2.01 A bridging measurement may be used to determine the power output of a circuit or unit that is terminated in its characteristic impedance. However, the error in measurement at bridged test points may be as great as 0.5 dB. Therefore, the use of this type of measurement is limited to locating the source of an irregularity. Terminated measurements at hybrid-derived test points are basically more accurate. Consequently, terminated measurements are used to align transmission equipment on an in-service as well as on an out-of-service basis.

B. Direct Method of Measurement

2.02 The direct method of measurement is generally used for both in-service and out-of-service tests with the exceptions stated in 2.03 and 2.04. The input signal of a unit under test is obtained from a pilot frequency or from another precise frequency source that has its output power constantly monitored. The output of the unit under test is measured with a transmission measuring set (TMS) that has been previously calibrated against the frequency source. The output power of the unit under test is determined directly from the TMS meter indication. Fig. 1 shows the use of the 27A and 27B consoles for direct measurement of an LMX unit on an out-of-service basis. Various combinations of available sending and receiving test equipment may be substituted.

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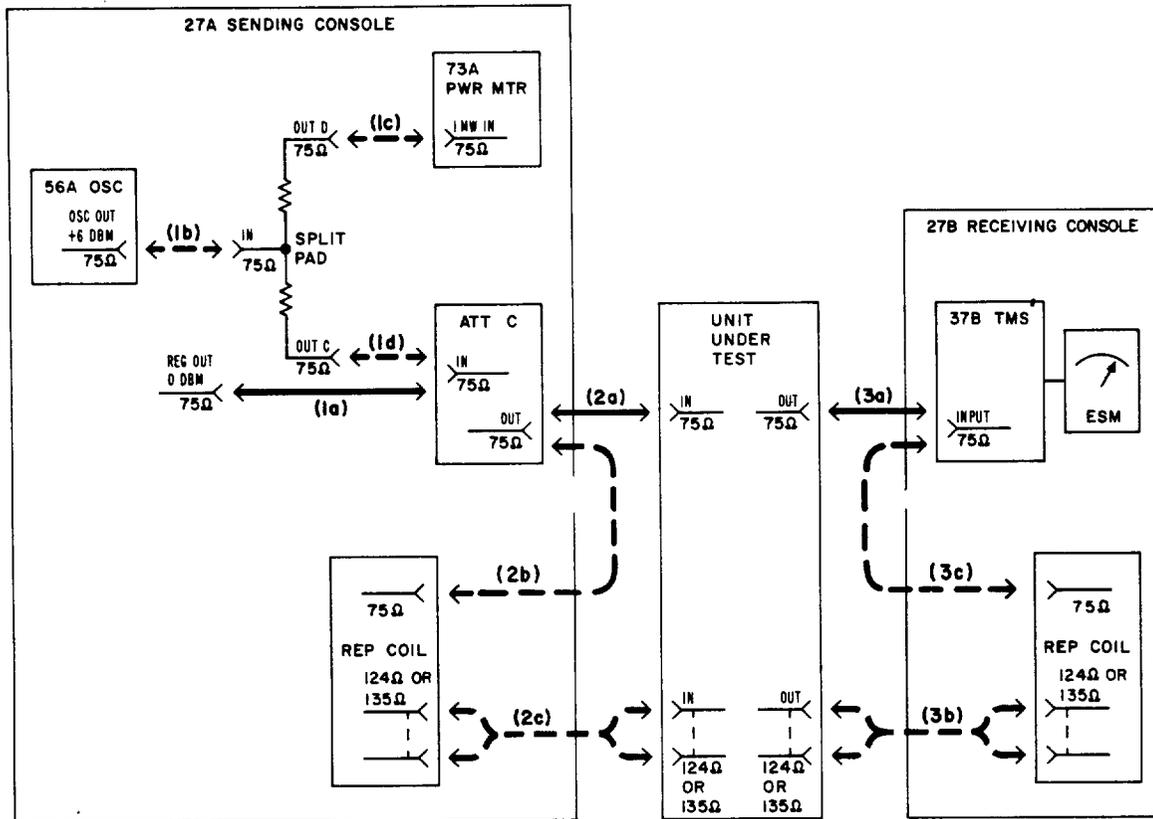


Fig. 1—Direct Method of Measurement—Typical Arrangement

C. Comparison Method of Measurement

2.03 The comparison method is recommended for increased accuracy when in-service tests and adjustments must be maintained within ± 0.5 dB of requirement and is suitable for use with the 27B console, the Siemens-Halske 3D 335, and the Sierra 128A.

2.04 Fig. 2 illustrates the use of the 27A and 27B consoles for comparison measurement of an LMX unit on an in-service basis. The output of the unit under test is connected to a TMS which is adjusted to function as a null meter. A comparison measurement is then made by connecting the TMS to an attenuator in series with an oscillator whose output is maintained at 0 dBm. The loss in the attenuator is varied until the measuring set meter indicates zero or near zero. The measured power is the negative of the algebraic sum of the attenuator settings (considered positive) and any residual

reading on the measuring set meter. The BSPs in Division 103 describe the comparison test arrangements for the Siemens 3D 335 and the Sierra 128A. It should be noted that this test method is not recommended for bridging measurements.

D. Insertion Loss Corrections

2.05 All new and revised sections specify design test requirements. Therefore, when measuring power, the actual power at the test point is equal to the power indicated on the instrument, plus the insertion loss introduced by the test cord. Since insertion loss varies with frequency and cord length, insertion loss must be determined for the cord in use at the frequency of interest. Cord loss must also be included when a test signal source is adjusted to deliver a specific power.

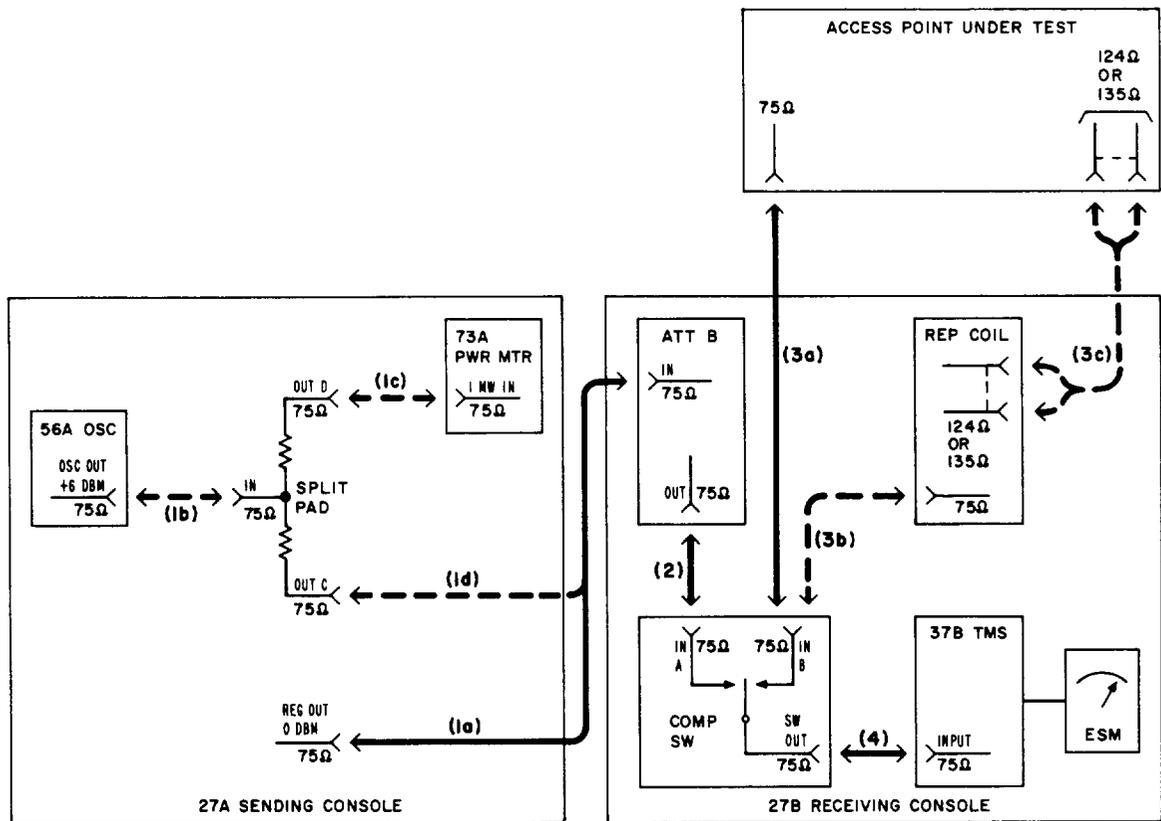


Fig. 2—Comparison Method of Measurement—Typical Arrangement

3. TEST EQUIPMENT

3.01 The significant characteristics of the test units covered in this section are summarized in Fig. 3 through 6. In addition, individual data sheets on each test unit are included to illustrate

pertinent features and capabilities. The data sheets also provide reference to appropriate descriptive sections should additional information be required. An index of the test equipment covered and the page location of the data sheets follow:

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TEST EQUIPMENT	FREQUENCY						AMPLITUDE LEVEL RANGE (DBM)				IMPEDANCE (OHMS)															
SENDING UNITS																										
CODE NO.	1 KHZ	10 KHZ	100 KHZ	1 MHZ	10 MHZ	100 MHZ	-100	-50	0	+50	50	60	65	75	124	135	140	150	600	2372	3700	0	8			
3M 518			10 KHZ TO 17 MHZ					-75 TO +10						0	0		•	•	•							
K1023		2 KHZ TO 25 MHZ						-70 TO +10							0	•	•									
K1073			100 KHZ TO 100 MHZ					-50 TO +10							0	X	X									
M2021T		2 KHZ TO 25 MHZ						-70 TO +10							0	•	•									
M2021TR3/4		2 KHZ TO 25 MHZ						-120 TO +10							0	•	•									
W2006 L2		2 KHZ TO 17 MHZ						-10 TO +10							0	•	•									
W2007		2 KHZ TO 18.6 MHZ						-60 TO +10							0	•	•		•							
W2057	200 HZ TO 1.6 MHZ							-110 TO +30							0	•	•	•	•	•				•		
W2072			100 KHZ TO 100 MHZ					-60 TO 0							0											
RECEIVING UNITS																										
3D 335		10 KHZ TO 17 MHZ						-100 TO +30						0	0		•	•	•							
D2006 L5		2 KHZ TO 17 MHZ						-120 TO 0							0	•	•							•	•	
D2007		2 KHZ TO 18.6 MHZ						-120 TO +20							0	•	•									
D2057	200 KHZ TO 1.6 MHZ							-110 TO +30							0	•	•	•	•	•				•		
D2072			100 KHZ TO 100 MHZ					-110 TO 0							0											
D20738		50 KHZ TO 100 MHZ						-118 TO +10							0									•	•	
K1023		2 KHZ TO 25 MHZ						-120 TO +10							0	X	X									
K1073			100 KHZ TO 100 MHZ					-118 TO +10							0									•	•	
M2021		2 KHZ TO 25 MHZ						-120 TO +10							0	•	•							•	•	
M2021TR3/4		2 KHZ TO 25 MHZ						-120 TO +10							0	•	•							•	•	

IMPEDANCE (OHMS): • BALANCED, 0 UNBALANCED, X OPTIONAL IMPEDANCE, Δ WITH PROBE

Fig. 3—Test Equipment (Siemens Corporation)—Comparison of Electrical Characteristics

TEST EQUIPMENT	FREQUENCY						AMPLITUDE LEVEL RANGE (DBM)				IMPEDANCE (OHMS)												
	SENDING UNITS						-100	-50	0	+50	50	60	65	75	124	135	140	150	600	2372	3700	0	8
	1 KHZ	10 KHZ	100 KHZ	1 MHZ	10 MHZ	100 MHZ																	
351A			10 KHZ TO 15 MHZ				-90 TO +10			0			0		0			0					
3052A		1 KHZ TO 32.1 MHZ						-90 TO +1					0	●	●								
3053A		1 KHZ TO 32.1 MHZ						-90 TO +1					0	●	●								
3054A		1 KHZ TO 32.1 MHZ						-90 TO +1					0	●	●								
RECEIVING UNITS																							
125A		10 KHZ TO 15.1 MHZ						-90 TO +32					0		0			0					
3051A		1 KHZ OR 60 KHZ TO 32.1 MHZ						-89 TO +20					0	●	●								
3053A		1 KHZ OR 60 KHZ TO 32.1 MHZ						-89 TO +22					0	●	●								
3054A		1 KHZ OR 60 KHZ TO 32.1 MHZ						-89 TO +20					0	●	●								

IMPEDANCE (OHMS): ● BALANCED, 0 UNBALANCED.

Fig. 4—Test Equipment (Sierra Electronics Company)—Comparison of Electrical Characteristics

TEST EQUIPMENT SENDING UNITS CODE NO.	FREQUENCY						AMPLITUDE LEVEL RANGE (DBM)				IMPEDANCE (OHMS)													
	1 KHZ	10 KHZ	100 KHZ	1 MHZ	10 MHZ	100 MHZ	-100	-50	0	+50	50	60	65	75	124	135	140	150	600	2372	3700	0	8	
17A	50 HZ TO 150 KHZ						0 TO +18 →									●			●					
17B	50 HZ TO 150 KHZ						0 TO +30 →									●			●					
27A				50 KHZ TO 10 MHZ			-59 TO +6							0	●	●								
49A	*						*							0										
53A				50 KHZ TO 3.6 MHZ			-91 TO 0							0	●									
56A				50 KHZ TO 10 MHZ			-12 TO +6 →							0										
57A	*						*							0										
90A				10 KHZ TO 60 MHZ			-99.9 TO 0							0	●	●								
90E				20 KHZ TO 100 MHZ			-99.9 TO 0							0	●	●								
90G				10 KHZ TO 100 MHZ			-99.9 TO 0							0	●	●								
91DP				10 KHZ TO 100 MHZ			-99.9 TO 0							0	●	●								
91GP				10 KHZ TO 100 MHZ			-99.9 TO 0							0	●	●								
RECEIVING UNITS																								
27B				50 KHZ TO 11 MHZ			-120 TO 0							0	●	●				●				
30A	UP TO 150 KHZ						-10 TO +90									●			●					
34A	35 HZ TO 3.5 MHZ						-10 TO +30 →							0	●									
37B				50 KHZ TO 11 MHZ			-110 TO 0							0										
44A				50 KHZ TO 3.5 MHZ			-110 TO +20							0					0					
49A	*						*							0	●									
70A	DC TO 10 MHZ						-10 TO +3 →							0	●									
70B	DC TO 20 MHZ						-10 TO +3 →							0	●									
74A	DC TO 240 MHZ						-2 TO +1 →							0										
90B				10 KHZ TO 60 MHZ			-109 TO 0							0	●	●								
90E				20 KHZ TO 100 MHZ			-109 TO 0							0	●	●								
90H				10 KHZ TO 100 MHZ			-129 TO 0							0	●	●								
91DP				10 KHZ TO 100 MHZ			-109 TO 0							0	●	●								
91GP				10 KHZ TO 100 MHZ			-109 TO 0							0	●	●								

IMPEDANCE (OHMS): ● BALANCED, 0 UNBALANCED, * SPECIALIZED DESIGN

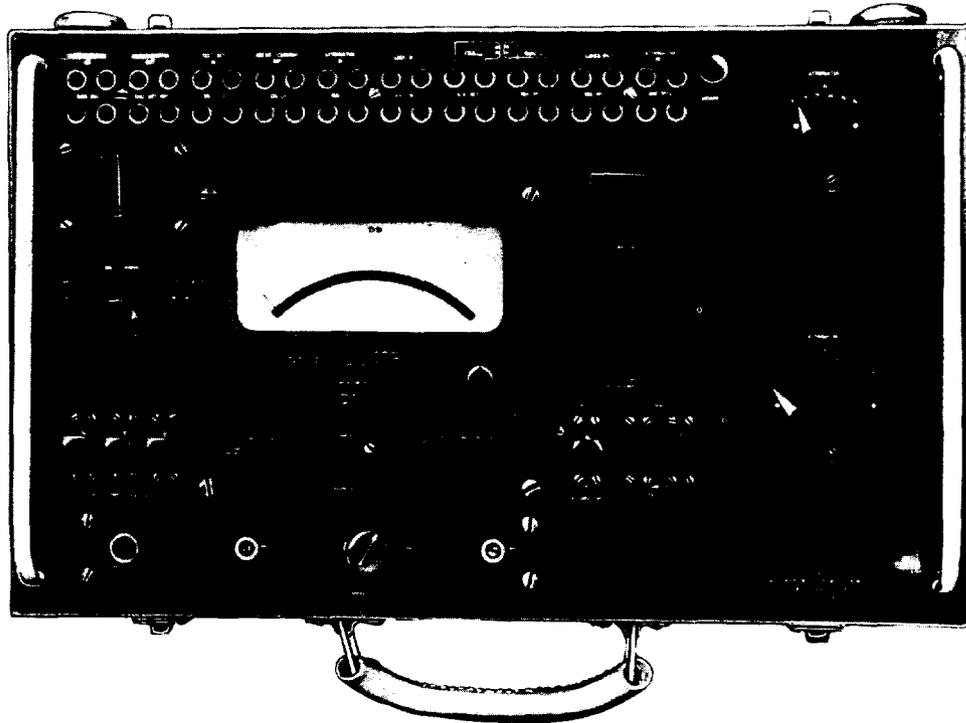
Fig. 5—Test Equipment (Western Electric Company)—Comparison of Electrical Characteristics

TEST EQUIPMENT	FREQUENCY						AMPLITUDE LEVEL RANGE (DBM)				IMPEDANCE (OHMS)													
	1 KHZ	10 KHZ	100 KHZ	1 MHZ	10 MHZ	100 MHZ	-100	-50	0	+50	50	60	65	75	124	135	140	150	600	2372	3700	0	∞	
SENDING UNITS																								
CODE NO.																								
AT 442A			10 KHZ TO 36 MHZ					-75 TO +12				0	0	0	0	0	●	●	0					
AT 444A			10 KHZ TO 36 MHZ					-75 TO +12				0	0	0	0	0	0	0						
RK5/RS5			6 KHZ TO 30 MHZ (EXPANDABLE TO 60 MHZ)					WHITE NOISE GENERATOR							0									
RECEIVING UNITS																								
AT 443A			10 KHZ TO 36 MHZ					-130 TO +32				0	0	0	0	●	●	0						
AT 444A			10 KHZ TO 36 MHZ					-130 TO +32				0	0	0	0	●	●	0						
AT 463			6 KHZ TO 18.6 MHZ					-80 TO +26							0	●	●							
EPM-1			10 HZ TO 300 MHZ					0 TO +2 →							0									
PSM-7			10 KHZ TO 100 MHZ					-120 TO +20							0									
RK5/RE5			6 KHZ TO 60 MHZ					-50 TO +10							0									

IMPEDANCE (OHMS): ● BALANCED, 0 UNBALANCED

Fig. 6—Test Equipment (Wandel-Goltermann Company)—Comparison of Electrical Characteristics

WESTERN ELECTRIC J64030A (30A) TMS



The 30A TMS is a passive device consisting of a thermocouple, a meter, keys and jacks, and attenuator assembled in a portable case. External power is not required and batteries are supplied only for calibration of the set. The 30A TMS was initially designed for maintenance of type J, K, and C Carrier Systems.

Frequency range: up to 150 kHz

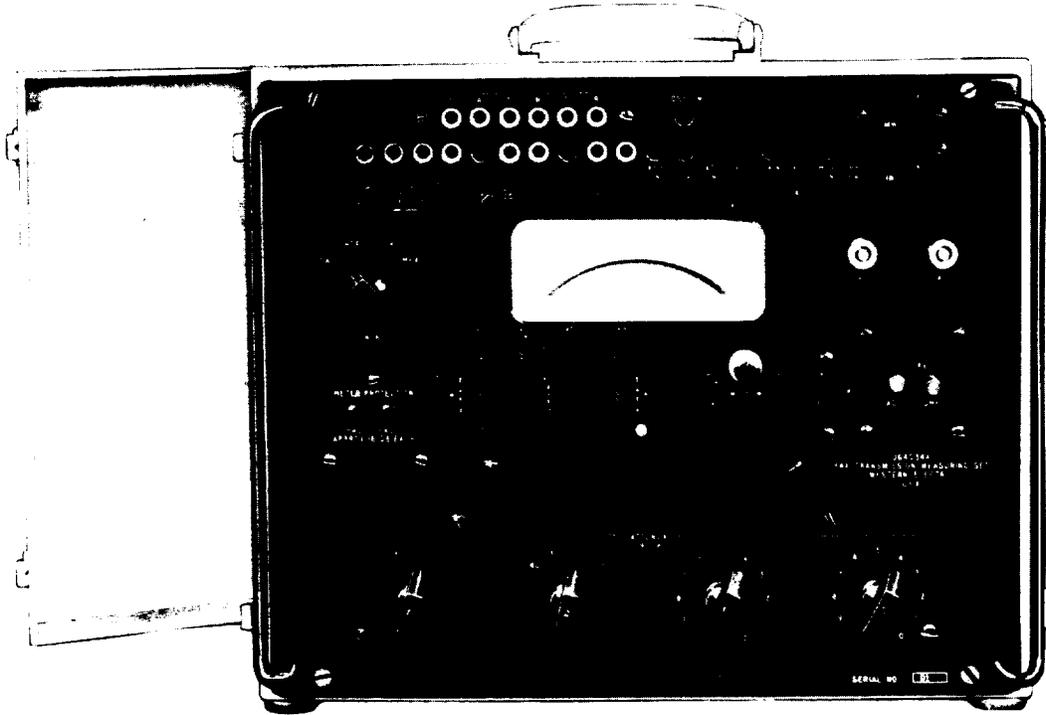
Input impedance: 135 ohms balanced (600:135 ohm coil included)

Power measuring range: -10 to +90 dBm

Accuracy of power measurement: ± 0.2 dB or better
(Varies with the range of measurement)

Reference: Section 103-408-100

WESTERN ELECTRIC J64034A (34A) TMS



The 34A TMS is a passive device consisting of a thermocouple, a meter, keys and jacks, and attenuator assembled in a portable case. External power is not required and batteries are supplied only for calibration of the set. The 34A TMS was initially designed for maintenance of the L1 Carrier System.

Frequency range: 35 Hz to 3.5 MHz

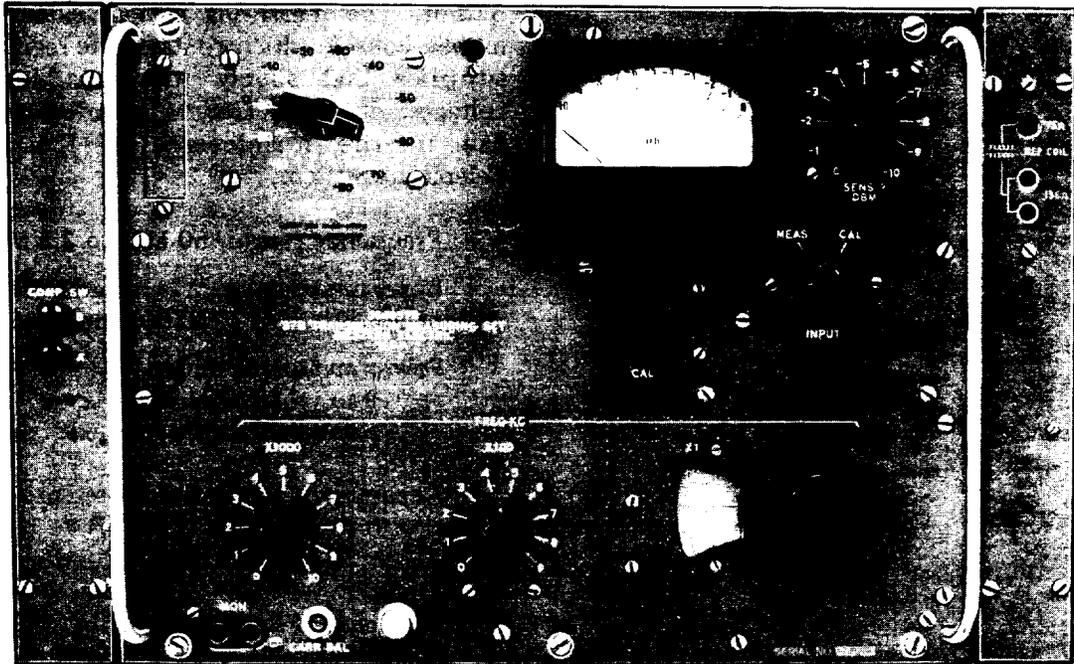
Input impedance: 75 ohms unbalanced (135:75 ohm coil included)

Power measuring range: -10 to +30 dBm.

Accuracy of power measurement: ± 0.2 dB or better
(Varies with the range of measurement.)

Reference: Section 103-412-100

WESTERN ELECTRIC J64037B (37B) TMS



The 37B TMS is a portable triple-conversion receiver consisting of highly selective decade-tuned devices with a meter for indicating the detected output. External power is provided by a portable power supply (J64001AM). The 37B TMS was designed primarily for use in maintenance of the L3 Carrier System and the TD-2 Radio System. The set is also mounted as a component part of the 27B receiving console.

Note: The 37A TMS, of which only six units were manufactured, is essentially the same as the 37B TMS except for the frequency range.

Frequency range: 50 kHz to 10 MHz (37A)
50 kHz to 11 MHz (37B)

Input impedance: 75 ohms unbalanced

Power measuring range: 0 to -120 dBm

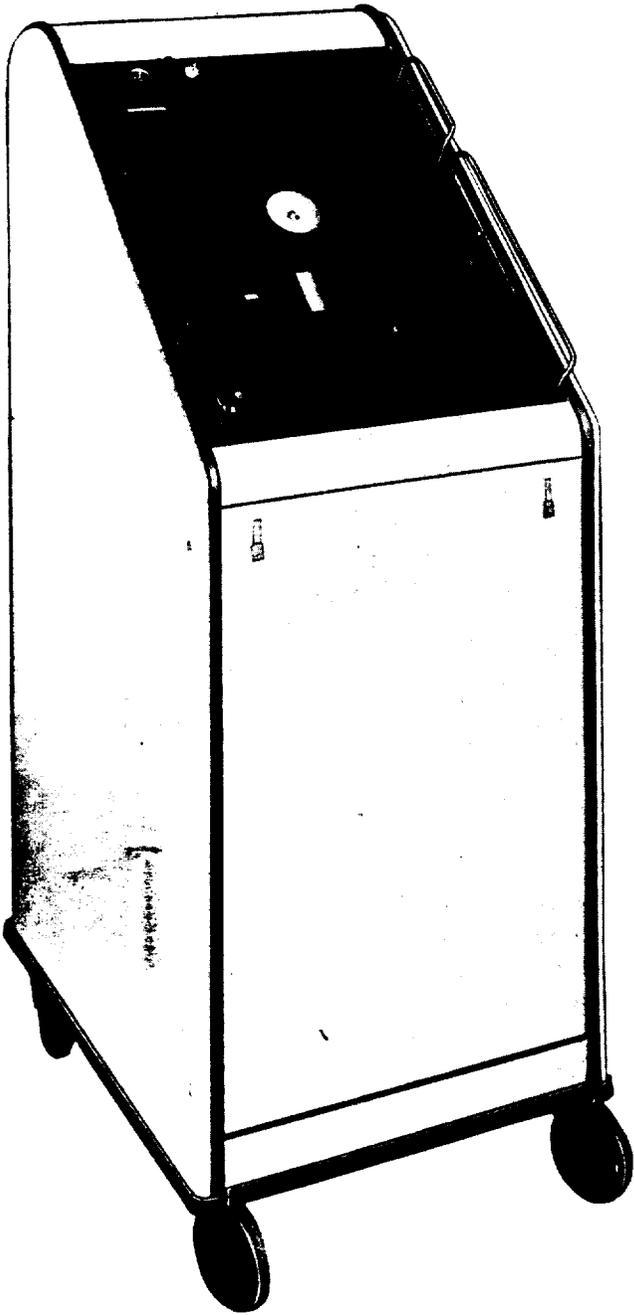
Accuracy of power measurement: ± 0.1 dB

Power requirement:

Line power (J64001AM):	117 \pm 12 volts ac, 60 Hz
or	
External:	150 volts dc (plate)
	6.3 volts (filament)

Reference: Section 103-414-100

WESTERN ELECTRIC J64044A (44A) TMS



The 44A TMS is a dual-conversion receiver consisting of highly selective circuits followed by an output meter capable of indicating the detected output. The measuring system is mounted in a mobile console which contains the regulated power supplies that supply the plate and filament voltages. The 44A TMS is intended primarily for use in the maintenance of the L1 Carrier Telephone System.

Frequency range: 50 kHz to 3.5 MHz

Input impedance: 75 ohms unbalanced
3700 ohms bridged

Power measuring range:
0 to -110 dBm terminated
+20 to -90 dBm bridged

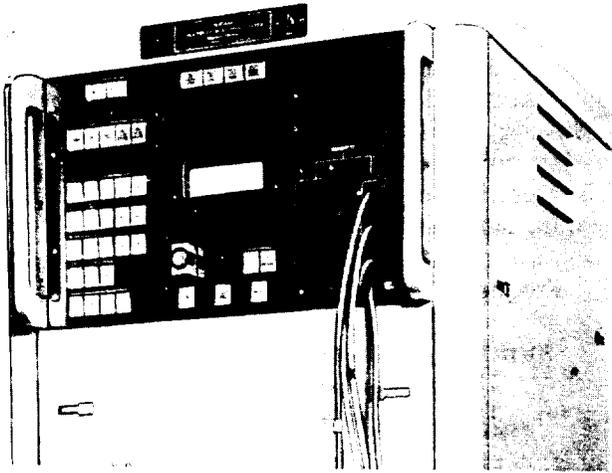
Accuracy of power measurement:
0 to -70 dBm ± 0.2 dB
-70 to -110 dBm ± 2.0 dB

Accuracy of frequency setting: ± 2 kHz

Power requirement:
Line power: 115 volts ac, 60 Hz

Reference: Section 103-421-100

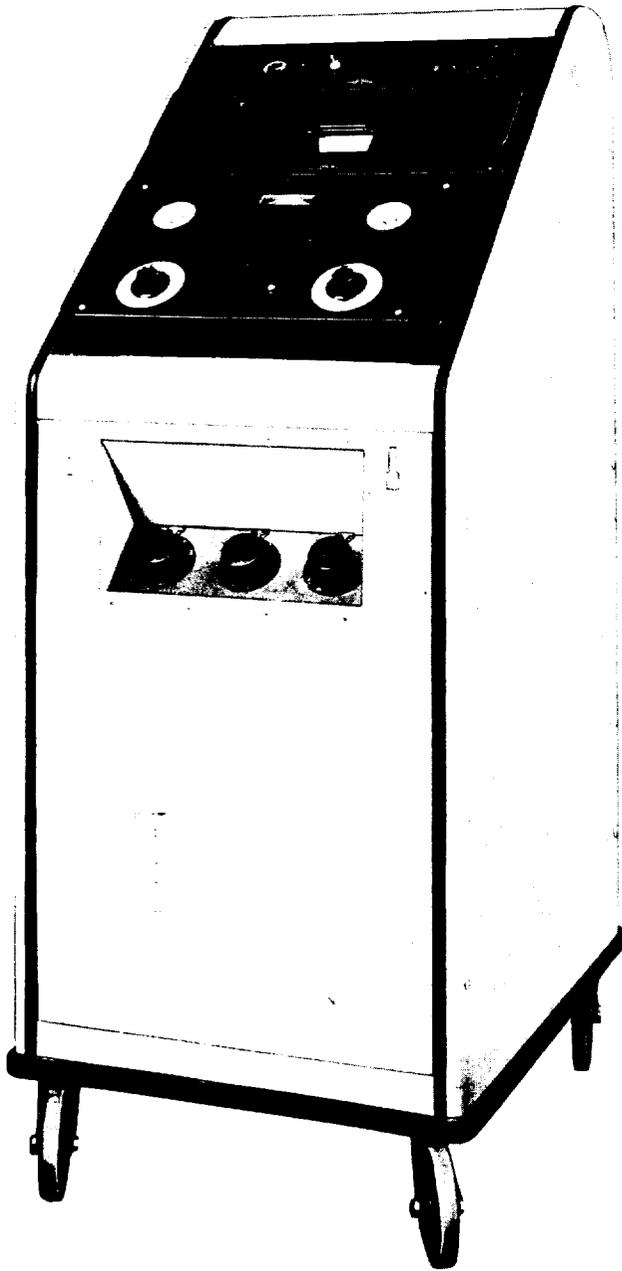
WESTERN ELECTRIC J64049A (49A) TMS



The 49A TMS is a versatile L Multiplex Transmission Measuring System designed to permit rapid, accurate measurements of power and loss at L multiplex terminals. The specialized design results in a high degree of accuracy for overall terminal maintenance. The 49A TMS and power supply panel are arranged in a mobile cabinet and require only 115-volt ac power and a source of 4 kHz for operation.

Reference: Section 103-424-100

WESTERN ELECTRIC J68827A (27A) SENDING CONSOLE



The 27A sending console is a mobile console consisting of a jack panel, a 73A milliwatt power meter, a 56A oscillator, and a regulated power supply. An internal gain control automatically holds the oscillator output power to a constant level over the entire frequency range. The 27A sending console is designed to operate with the 27B receiving console as a test group or as a separate signal generator.

Frequency range: 50 kHz to 10 MHz

Output impedance:

75 ohms unbalanced

124 and 135 ohms balanced

Power output range:

-52.9 to +6.0 dBm, single

-58.9 to 0 dBm, dual (through
6 dB split pad)

Power output accuracy:

± 0.04 dB at 0 dB fixed level

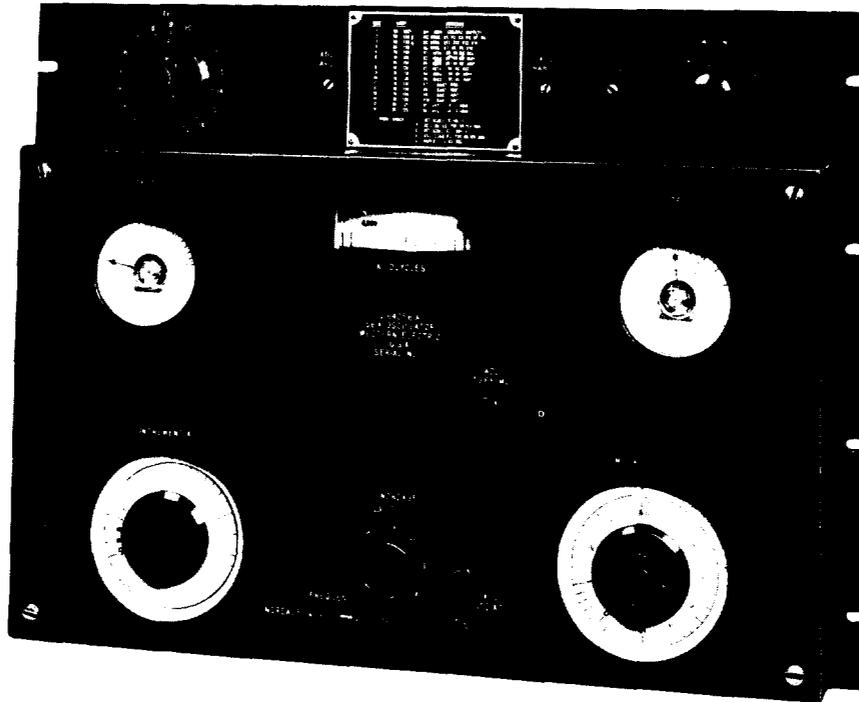
± 0.09 to ± 0.21 dB adjustable level

Power requirement:

Line power: 115 ± 10 volts ac, 60 Hz

Reference: Section 103-405-100

WESTERN ELECTRIC J64056A (56A) OSCILLATOR



The 56A oscillator is an integral part of the 27A sending console. It produces a single-frequency output, which may be controlled manually or held to a constant value by an automatic leveling circuit. The 56A oscillator is intended primarily as a source of testing power in the maintenance of the L3 Carrier System.

Frequency range: 50 kHz to 10 MHz

Output impedance: 75 ohms unbalanced

Power output range: -12 to +6 dBm

Power output accuracy:

(50 kHz to 10 MHz)

AVC Switch OFF Position: ± 1.0 dB

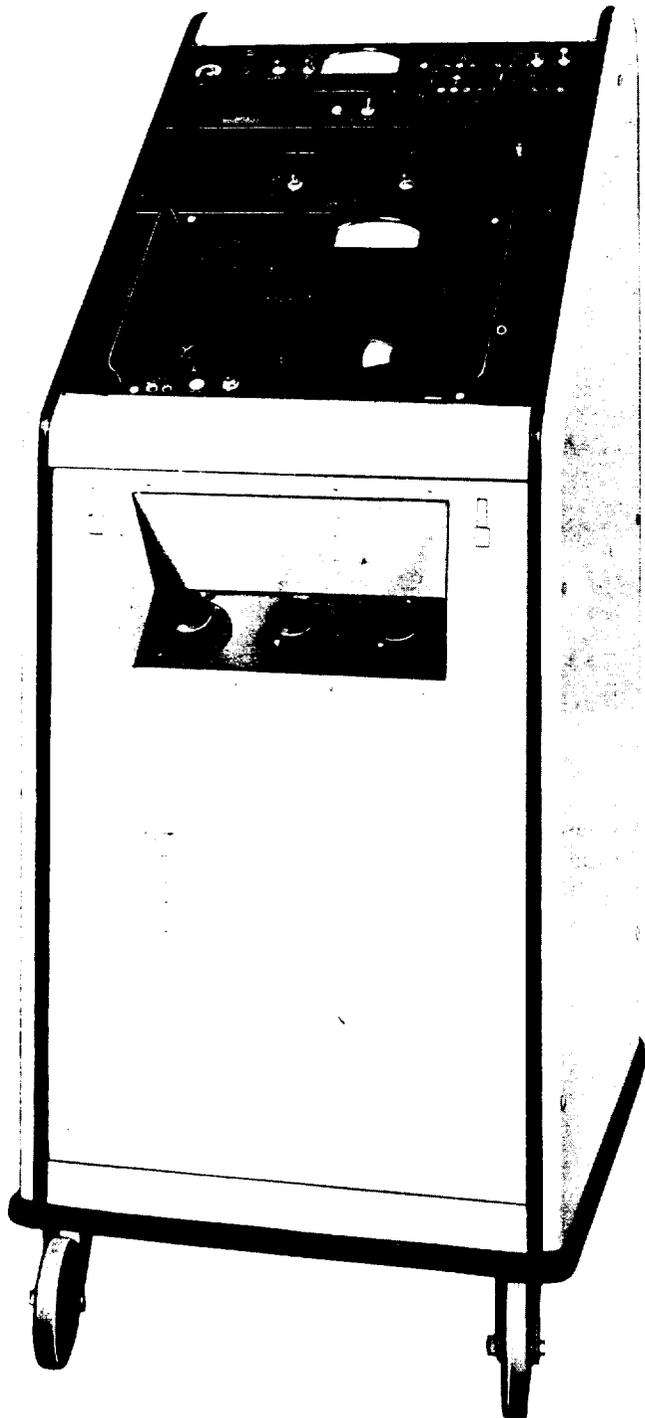
AVC Switch ON Position: ± 0.1 dB

(Single Frequency)

AVC Switch ON Position: ± 0.005 dB

Reference: Section 103-313-100

WESTERN ELECTRIC J68827B (27B) RECEIVING CONSOLE



The 27B receiving console is a mobile console consisting of a jack panel, an adjustable attenuator, a 37B transmission measuring set, and a regulated power supply. The 27B receiving console is designed to operate with the 27A sending console as a test group or as a separate transmission measuring set.

Frequency range: 50 kHz to 11 MHz

Input impedance:

Terminated: 75 ohms unbalanced
124 and 135 ohms
balanced

Bridged: 2372 ohms

(with 11B attenuator)

Power measuring range: 0 to -120 dBm

Accuracy of power measurement:

± 0.05 to 0.1 dB

(Depending on method of calibration)

Power requirement:

Line power: 115 ± 10 volts ac,
60 Hz

Reference: Section 103-405-100

WESTERN ELECTRIC J64053A (53A) MOBILE OSCILLATOR



The 53A mobile oscillator is a mobile rack-mounted assembly consisting of a miscellaneous jack panel, thermocouple measuring panel, 25A or 25B oscillator, and regulated power supply. The 53A mobile oscillator is intended primarily for use in the maintenance of the L1 Carrier System.

**J64053A MOBILE OSCILLATOR WITH
25A OSCILLATOR**

The 53A with the 25A oscillator provides a single-frequency source of power for transmission tests when operated in conjunction with a suitable receiving device. The output at any frequency can be controlled manually or held to a constant value over the complete frequency range of the instrument by means of an automatic volume control circuit.

Frequency range: 50 kHz to 3.6 MHz

Output impedance: 75 ohms unbalanced

Power range: 0 to -91 dBm

Power output accuracy: ± 0.2 dB

Reference: Section 103-312-101

**J64053A MOBILE OSCILLATOR WITH
25B OSCILLATOR**

The 53A with the 25B oscillator provides a source of signal power for transmission tests when operated in conjunction with a suitable receiving device. The output may consist of a single-frequency or a modulated, double-sideband, suppressed carrier, twin-frequency signal. In the latter case, an external modulating source must be available.

Frequency range: 50 kHz to 3.6 MHz

Output impedance: 75 ohms unbalanced

Power range: 0 to -91 dBm

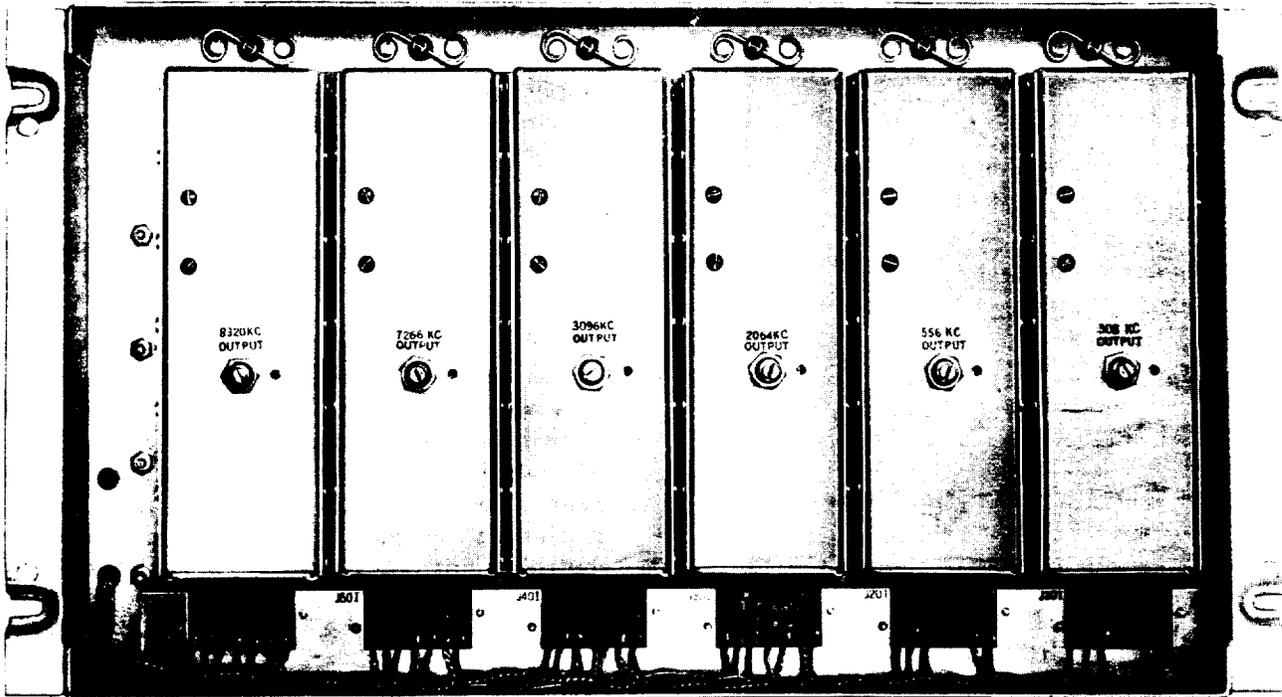
Power output accuracy: ± 0.2 dB

Power requirement:

Line power: 115 ± 10 volts ac,
50-60 Hz

Reference: Section 103-312-100

WESTERN ELECTRIC J64057A (57A) OSCILLATOR



The 57A oscillator is a relay rack-mounted unit, containing common equipment, into which individual crystal-controlled oscillators are plugged. An external source of power is required for the unit. The 57A oscillator is intended primarily for specialized testing. It will furnish six pilot signals simultaneously for testing the L3 Carrier System.

Output frequencies: 308, 556, 2064, 3096, 7266, 8320 kHz

Output impedance: 75 ohms unbalanced

Power output: 1 milliwatt

Power output accuracy: ± 0.05 dB

Power requirement:

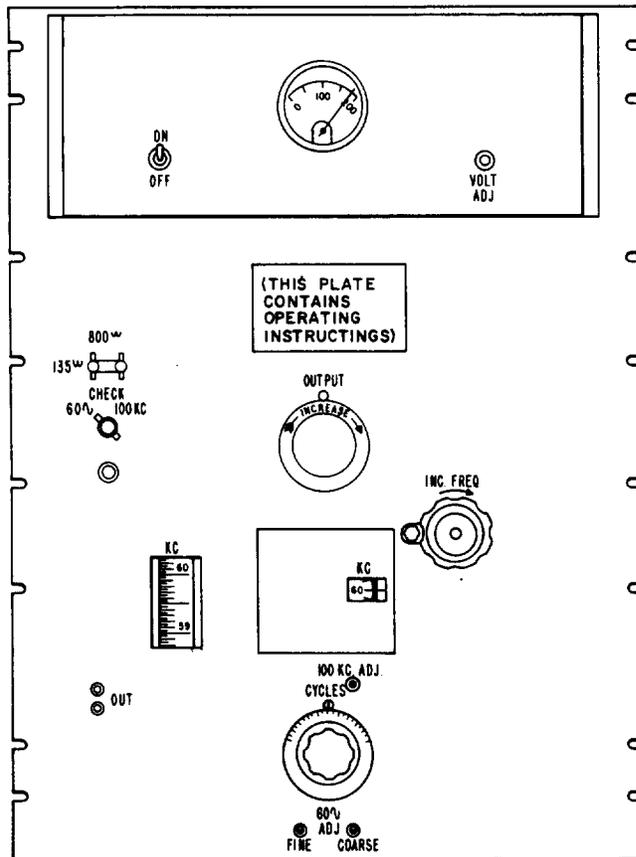
Plate: 130-150 volts dc

Filament: 18-22 volts

Oven: 6.3 volts

Reference: Section 103-314-100

WESTERN ELECTRIC 17A AND 17B OSCILLATORS



The 17A and 17B oscillators are relay rack-mounted, heterodyne-type, vacuum-tube signal generators capable of delivering any single frequency from approximately 50 Hz to 150 kHz. The output is substantially constant with frequency except in the range below 1 kHz. One control varies the frequency continuously over the full range. Only a small number of 17A oscillators were manufactured. Both 17A and 17B oscillators are substantially the same except for output power. The output is not automatically stabilized.

Frequency range: 50 Hz to 150 kHz

Output impedance: 135 or 600 ohms
balanced

Power output range:

0 to +18 dBm (17A)

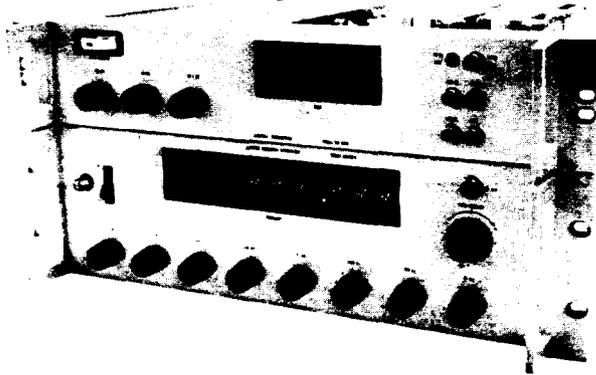
0 to +30 dBm (17B)

Power output accuracy: unregulated

Reference: Section 103-305-100

WESTERN ELECTRIC J64090A (90A) CARRIER FREQUENCY OSCILLATOR

The J64094A (90A) oscillator is a source of exceptionally pure sinusoidal test tones which are accurately adjustable in frequency and level. The 90A is used to install and maintain the L-type multiplex terminals (LMX and MMX) and the L1, L3, and L4 coaxial lines. The frequency is adjusted by a decade frequency control and displayed by a NIXIE[®]-type readout. The 90A may be frequency slaved to a J64090B (90B) selective detector. In this configuration, both the 90A and 90B will operate under control of the 90B settings. The 90A can be remotely controlled by external switch closures.



Frequency range (decade tuning): 10 kHz to 60 MHz in 1-Hz increments
(± 250 Hz search around indicated frequency)

Minimum frequency resolution: 1 Hz

Level range: -99.9 to 0 dBm in 0.1-dB increments

Frequency response at 0 dBm:

75 ohms unbalanced: ± 0.02 dB from 10 kHz to 60 MHz

124 ohms balanced: ± 0.04 dB from 50 kHz to 10 MHz
 ± 0.3 dB from 10 kHz to 20 MHz

135 ohms balanced: ± 0.04 dB from 50 kHz to 1 MHz
 ± 0.3 dB from 10 kHz to 1 MHz

Attenuator accuracy: 10 kHz to 60 MHz

10 dB per step attenuator: ± 0.01 dB

1 dB and 0.1 dB per step attenuator: ± 0.02 dB

Power requirements: 117 volts ac at 0.75 amperes

Reference: Section 103-432-100

WESTERN ELECTRIC J64090B (90B) SELECTIVE DETECTOR

The J64090B (90B) detector is a solid-state tunable, frequency selective power meter. It is used to install and maintain the L-type multiplex terminals (LMX and MMX) and the L1, L3, and L4 coaxial lines. Measurements of loss, noise, crosstalk, intermodulation, and tone levels may be made on various systems.

The 90A oscillator can be frequency slaved to the 90B. In this configuration both the 90A and 90B will operate under control of the 90B settings.



Frequency range (decade tuning): 10 kHz to 60 MHz in 1-Hz increments
(± 250 Hz search around indicated frequency)

Minimum frequency resolution: 1 Hz

Sensitivity range (for full-scale indication): -109 to 0 dBm in 1-dB increments

Meter range:

Normal: -20 to $+0.4$ dB

Expanded scale: -1.1 to $+0.1$ dBm

Frequency response at 0 dBm:

75 ohms unbalanced: ± 0.05 dB from 50 kHz to 50 MHz
 ± 0.10 dB from 10 kHz to 60 MHz

124 ohms balanced: ± 0.05 dB from 50 kHz to 10 MHz
 ± 0.3 dB from 10 kHz to 20 MHz

135 ohms balanced: ± 0.05 dB from 50 kHz to 1 MHz
 ± 0.3 dB from 10 kHz to 1 MHz

Attenuator accuracy: 10 kHz to 60 MHz

10 dB per step attenuator: ± 0.01 dB/10 dB step

1 dB per step attenuator: ± 0.02 dB at any step

Selectivity (3-dB bandwidth):

Wideband: 2500 Hz

Narrow band: 250 Hz

Single Sideband: 3400 Hz

Power requirements: 117 volts ac at 0.9 amperes

Reference: Section 103-432-100

WESTERN ELECTRIC J64070A (70A) POWER METER

The 70A power meter was designed primarily to facilitate transmission measurements on video facilities. The 70A has two separate thermocouple circuits, one for 75-ohm unbalanced measurements and the other for 124-ohm balanced measurements. Two 6-foot cords are provided, one for the 75-ohm unbalanced impedance and the other for the 110-ohm impedance. The 70A normally operates in the frequency range of from dc to 10 MHz. Above 10 MHz the reflection loss reduces the power indicated by the 75-ohm thermocouple.

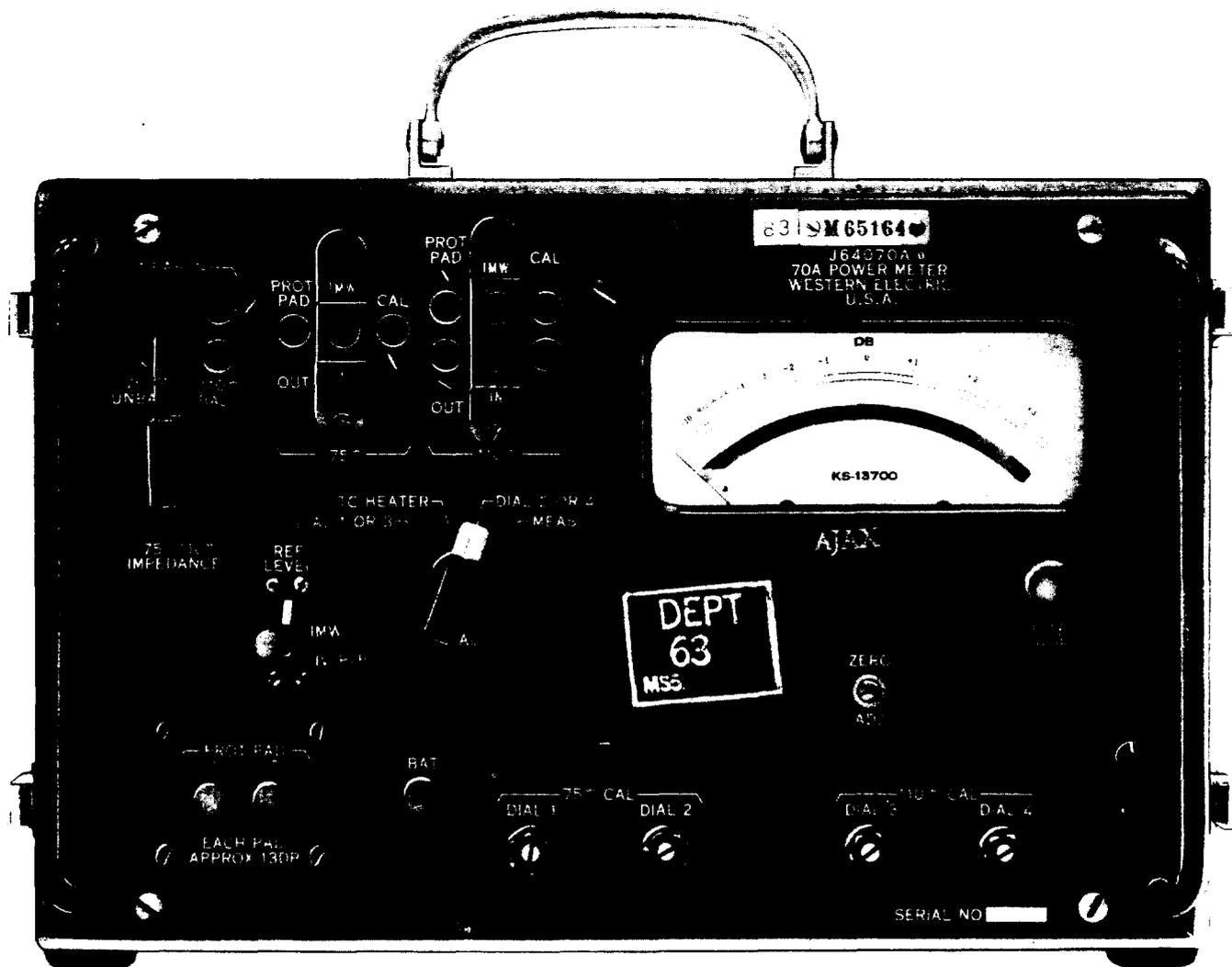
Frequency spectrum: dc to 10 MHz

Level range: -10.0 to +3.0 dB with respect to a reference level of 1 milliwatt or 1 volt peak-to-peak, as selected by a key

Impedance: 75 ohms unbalanced and 124 ohms balanced

Power requirements: KS-14711 or KS-6522, 1.5-volt dry cell for calibrating

Reference: Section 103-738-100



WESTERN ELECTRIC J64070B (70B) POWER METER

The 70B power meter was designed primarily to facilitate transmission measurements on video facilities. The 70B has two thermocouple circuits, a 75-ohm unbalanced and a 124-ohm balanced. The 70B is capable of measuring frequencies from dc to 20 MHz.

Frequency spectrum: dc to 20 MHz

Level range: -10.0 to $+3.0$ dB with respect to a reference level of 1 milliwatt or 1 volt peak-to-peak, as selected by a key

Impedance: 75 ohms unbalanced or 124 ohms balanced

Power requirements: KS-14711 or KS-6522 1.5 volts dry cell for calibrating

Reference: Section 103-738-100



WESTERN ELECTRIC J64074A (74A) WIDEBAND POWER METER

The 74A wideband power meter is a portable, ac-operated instrument for measuring the true rms power that a signal source will deliver into a 75-ohm impedance. The 74A power meter is intended for calibration of general test equipment used for maintenance of L-multiplex terminals and L-carrier lines. The 74A may also be used at CATV frequencies.

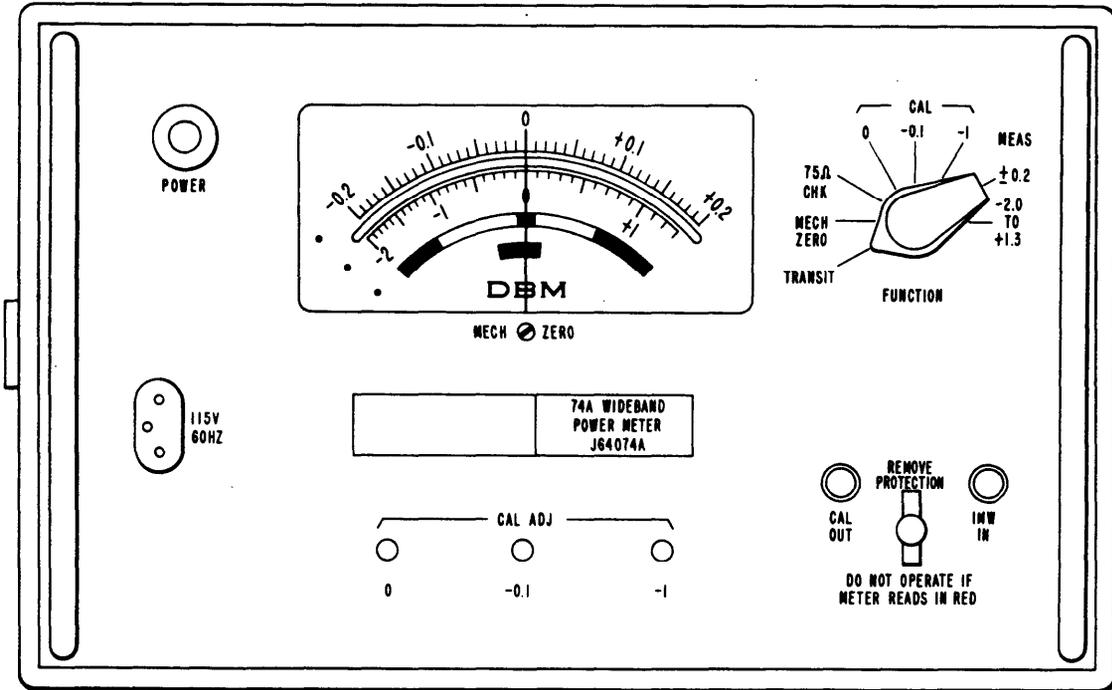
Input impedance: 75 ohms unbalanced

Power requirements: 115 volts, 60 Hz

Meter scales: -0.2 to +0.2 dBm
-2.0 to +1.0 dBm

Frequency range: dc to 240 MHz

Reference: Section 103-433-000



WESTERN ELECTRIC J64090E (90E) TRANSMISSION MEASURING SET

The 90E is a specific combination of 90-type carrier frequency test equipment (CFTE) for generating and detecting test tones in the range of 20 kHz to 100 MHz. An amplifier is optionally available to provide a +10-dB output.

The 90E TMS consists of a 90GA transmitter, a 90HA detector, a 90HB frequency synthesizer, and a 90AE baseband generator. When a 90E TMS is mounted in a 90C console, it is designated 91D carrier frequency measuring system.

Frequency range (oscillator and selective detector): 20 kHz to 100 MHz

Oscillator output power range:
0 to -99.9 dBm in
0.1-dB steps

Controls: decade

Display: digital, with 0.1-dB resolution

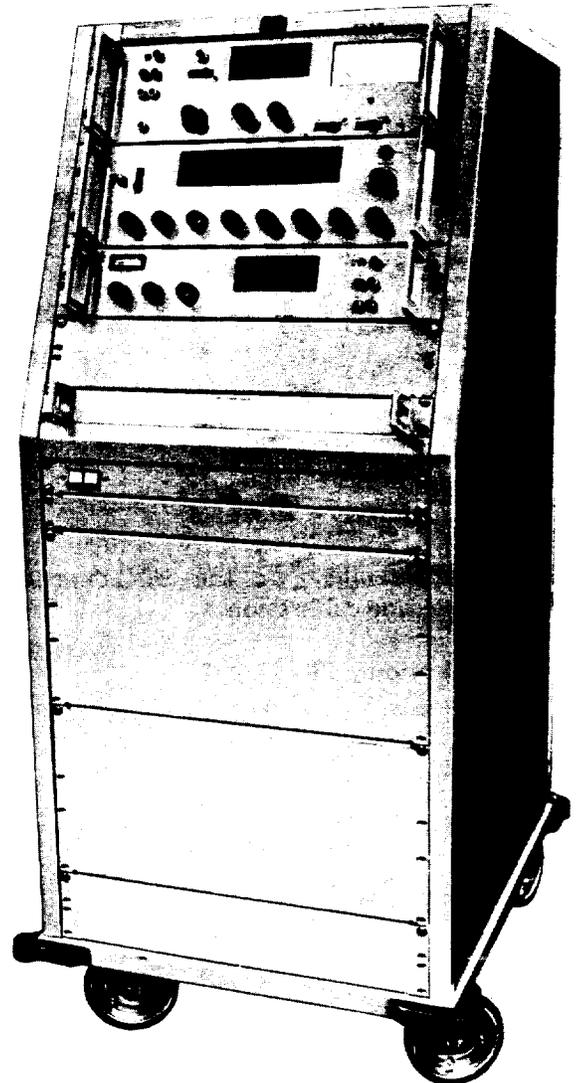
Oscillator output impedance:
75 ohms unbalanced
(standard & miniature)
124 ohms balanced,
135 ohms balanced

Selective detector:
Sensitivity range:
0 to -109 dBm in 1-dB steps

Meter range: +0.4 to -20.0 dBm

Input impedance:
75 ohms unbalanced
(standard & miniature)
124 ohms balanced, 135 ohms balanced

Reference: Section 103-432-105



WESTERN ELECTRIC J64090G (90G) OSCILLATOR

The 90G oscillator is a portable ac-operated test set for generating signals in the frequency range of 10 kHz to 100 MHz. A signal level from 0 to -99.9 dBm is available at the output jacks. An amplifier is optionally available to provide a +10 dB output.

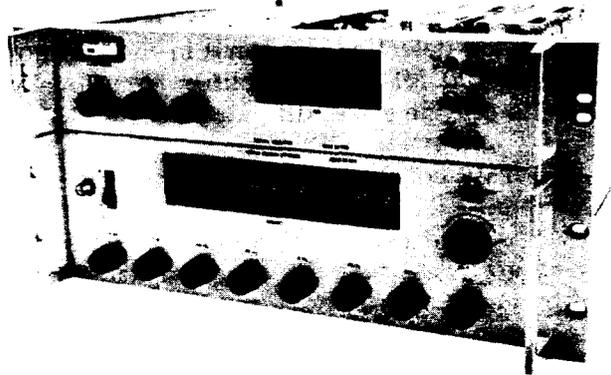
Output impedance: 75 ohms unbalanced
(Standard and miniature)
135 ohms balanced,
124 ohms balanced

Note: Only one jack or set of jacks may be used at any one time.

Output Stability:
Short term: $< \pm 0.01$ dB
Long term: $< \pm 0.01$ dB*

* Long term stability of the 90G depends on quarterly routine calibration.

Reference: Section 103-432-107



WESTERN ELECTRIC J64090H (90H) SELECTIVE DETECTOR

The 90H selective detector is a general purpose ac-powered transmission measuring set with high selectivity and dynamic range. The 90H can be used for measurements of noise, crosstalk, modulation, and test-tone power. A signal power from 0 to -129 dBm can be measured at any frequency from 10 kHz to 100 MHz.

Input impedance:
 75 ohms unbalanced
 (standard and miniature)
 124 ohms balanced
 135 ohms balanced

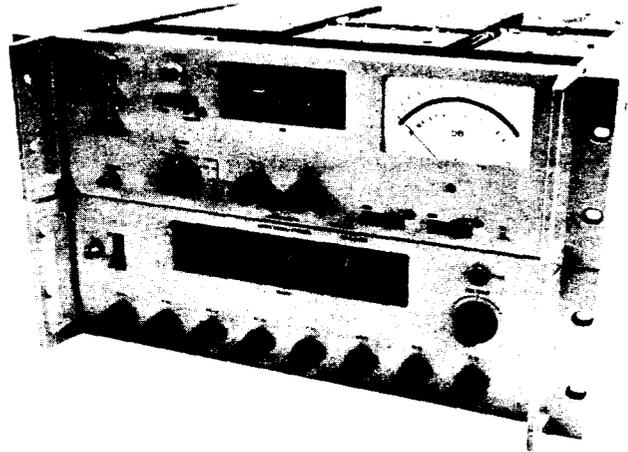
Note: Only one set of jacks may be used at any one time.

Selectivity: 200 Hz if narrow bandwidth is required
 2500 Hz if wide bandwidth is required
 LSB and USB with a 3300-Hz bandwidth

Meter scale: Normal: -20 dBm to $+0.4$ dBm
 Expanded scale: -1.1 dBm to $+0.1$ dBm

Decade tuning: in 1-Hz increments

Reference: Section 103-432-108



WESTERN ELECTRIC J64091DP and J64091GP (91) TYPE CARRIER
FREQUENCY MEASURING SYSTEM

The 91DP and 91GP are identical, except that the 91DP has a common frequency control for its test-tone generator and detector; whereas, the 91GP has independent frequency controls for its test-tone generator and detector. The 91DP is illustrated in Fig. 1 and the 91GP in Fig. 2. The 91DP and 91GP are arranged for making locally and remotely controlled (programmed control by a computer) transmission, noise, and crosstalk tests on long-haul carrier systems.

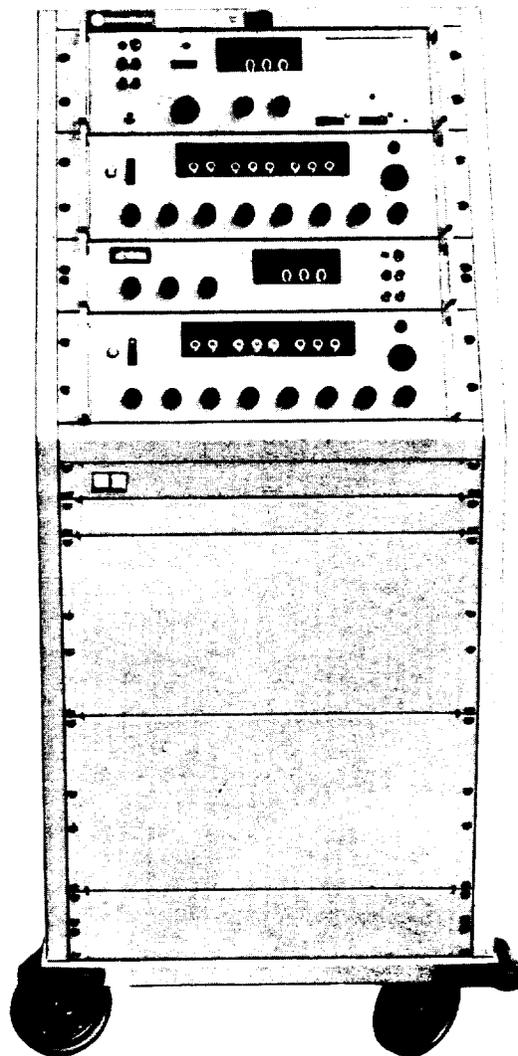
The electrical specifications and accuracy limitations are covered in Tables A and B.

Both the 91DP and 91GP are equipped with the 90F (J64090F) digital control unit (DCU) mounted in the rear of the 90C console. The 90F is used to interface the 90-type carrier frequency test equipment (CFTE) to an external control device (ECD). Digital information in standard word format is accepted by the DCU and translated into information to control the CFTE. The DCU is also needed to convert information from the CFTE to the standard word format to be returned to the ECD which might be a minicomputer.

Reference: Section 103-432-120



91DP



91GP

TABLE A

**91DP AND 91GP TRANSMITTER
ELECTRICAL CHARACTERISTICS AND ACCURACY LIMITATIONS**

FEATURE	CHARACTERISTIC OR LIMITATION
Frequency Range	10 kHz to 100 MHz
Decade Tuning	1-Hz steps
Vernier Tuning	Indicated frequency ± 250 Hz
Minimum Frequency Resolution	1 Hz
Frequency Accuracy	± 2 ppm ± 50 Hz
Frequency Stability: Variation due to temperature (0° to 50° C) Variation due to line voltage ($\pm 10\%$)	Included above Negligible
Output Level	0 to -99.9 dBm in 0.1-dB steps
Output Level Stability: Long Term (See Note 1) Short Term	$< \pm 0.01$ dB $< \pm 0.01$ dB
Level Accuracy	See Note 2
Frequency Response at 0 dBm: 75 ohms 124 ohms balanced 135 ohms balanced	± 0.02 dB at 10 kHz to 59.999 MHz ± 0.1 dB at 60 to 84.999 MHz ± 0.25 dB at 85 to 100 MHz ± 0.04 dB at 50 kHz to 10 MHz ± 0.3 dB at 10 kHz to 20 MHz ± 0.04 dB at 50 kHz to 1 MHz ± 0.3 dB at 10 kHz to 1 MHz
Level Stability: Variation due to temperature (0° to 50° C) Variation due to line voltage ($\pm 10\%$)	± 0.05 dB (± 0.02 dB typical) Negligible

TABLE A (Cont)

**91DP AND 91GP TRANSMITTER
ELECTRICAL CHARACTERISTICS AND ACCURACY LIMITATIONS**

FEATURE	CHARACTERISTIC OR LIMITATION
Attenuator Accuracy: 10 dB per step attenuator: 10 kHz to 60 MHz 60 MHz to 100 MHz 1 dB per step attenuator: 10 kHz to 60 MHz 60 MHz to 100 MHz 0.1 dB per step attenuator: 10 kHz to 60 MHz 60 MHz to 100 MHz	 ±0.01 dB at any step ±0.03 dB at any step ±0.02 dB at any step ±0.05 dB at any step ±0.02 dB at any step ±0.05 dB at any step
Output Return Loss (at level < -10 dBm): 75 ohms unbalanced 124 ohms balanced 135 ohms balanced	 <26 dB at 10 kHz to 100 MHz <26 dB at 30 kHz to 12 MHz <26 dB at 30 kHz to 1 MHz
Connectors: 75 ohms unbalanced 124 ohms balanced 135 ohms balanced	WECO: 470B, 558A 475B 223A
Harmonic Distortion: 10 kHz to 9.999 MHz fundamental 10 MHz to 99.99 MHz fundamental	 50 dB below fundamental 35 dB below fundamental
Spurious Signals (Nonharmonic)	60 dB below fundamental
Operating Temperature	10° to 50°C
Power Requirements	115 Vac ±10% at 0.75 ampere

Note 1: Long-term stability applies between routine calibrations (3-month interval anticipated).

Note 2: Absolute level accuracy is determined by that of the calibration standard. Using a 74A power meter as a standard will produce ±0.02 dB absolute accuracy.

TABLE B

**91DP AND 91GP DETECTOR
ELECTRICAL CHARACTERISTICS AND ACCURACY LIMITATIONS**

FEATURE	CHARACTERISTIC OR LIMITATION
Frequency Range	10 kHz to 100 MHz
Decade Tuning	1-Hz steps
Vernier Tuning	Indicated frequency ± 250 Hz
Minimum Frequency Resolution	1 Hz
Frequency Accuracy	± 2 ppm ± 50 Hz
Frequency Stability: Variation due to temperature (0° to 50° C) Variation due to line voltage ($\pm 10\%$)	Included above Negligible
Sensitivity Range (For full-scale indication)	-109 to 0 dBm in 1-dB steps
Meter Range: Normal Range Expanded Scale	-20 to +0.4 dBm -1.1 to +0.1 dBm
Noise Figure	<19 dB at 50 kHz to 100 MHz
Absolute Accuracy	± 0.02 dB at 5 MHz*
Frequency Response at 0-dBm Sensitivity: 75 ohms 124 ohms balanced 135 ohms balanced	± 0.05 dB at 50 kHz to 50 MHz ± 0.10 dB at 10 kHz to 60 MHz ± 0.25 dB at 60 to 96 MHz ± 0.40 dB at 96 to 100 MHz ± 0.05 dB at 50 kHz to 10 MHz ± 0.3 dB at 20 kHz to 20 MHz (0 to 0.7 dB @ 10 kHz) ± 0.05 dB at 50 kHz to 1 MHz ± 0.3 dB at 20 kHz to 1 MHz (0 to 0.7 dB @ 10 kHz)
Attenuator Accuracy: 10 dB per step attenuator: 10 kHz to 60 MHz 60 MHz to 100 MHz 1 dB per step attenuator: 10 kHz to 60 MHz 60 MHz to 100 MHz	± 0.01 dB at any step ± 0.03 dB at any step ± 0.02 dB at any step ± 0.05 dB at any step

*After front-panel calibration.

TABLE B (Cont)

**91DP AND 91GP DETECTOR
ELECTRICAL CHARACTERISTICS AND ACCURACY LIMITATIONS**

FEATURE	CHARACTERISTIC OR LIMITATION
Input Return Loss (at sensitivity < -69 dBm): 75 ohms unbalanced 124 ohms balanced 135 ohms balanced	< 26 dB at 10 kHz to 100 MHz < 26 dB at 50 kHz to 10 MHz < 26 dB at 50 kHz to 1 MHz
Connectors: 75 ohms unbalanced 124 ohms balanced 135 ohms balanced	WECO: 470B, 558A 475B 223A
Harmonic Distortion (Sensitivity increased for full-scale indication of harmonic)	> 52 dB below fundamental > 62 dB below fundamental (Low-distortion mode)
Spurious Signals (Nonharmonic)	< -100 dBm
Selectivity (3-dB bandwidth): Wideband Narrowband SSB	2500 Hz 200 Hz 3300 Hz
Image Frequency Rejection: At $f_{\text{tuned}} + 170.2$ MHz At $f_{\text{tuned}} + 10.2$ MHz At $f_{\text{tuned}} + 0.2$ MHz	70 dB 70 dB 80 dB
Dynamic Range: Normal Low Distortion	65 dB (0.1-dB compression) 85 dB (0.1-dB compression)
Audio Detection	LSB, USB
Audio Output (600 ohms)	-20 dBm at full-scale meter deflection
Temperature Range	0° to 50° C
Power Requirements	115 Vac $\pm 10\%$ at 0.9 ampere

WANDEL-GOLTERMANN MILLIWATT TEST SET EPM-1

The Wandel-Goltermann EPM-1 is a nonselective wideband test set for precise measurements of total power. Two dc outputs are provided for connection to a chart recorder, and another one is provided for connection to a signal generator to maintain a constant output power. A protective probe houses a relay, which will operate if the power of the signal being measured is too high or if the dc component is too high.

Frequency range: 10 Hz to 300 MHz

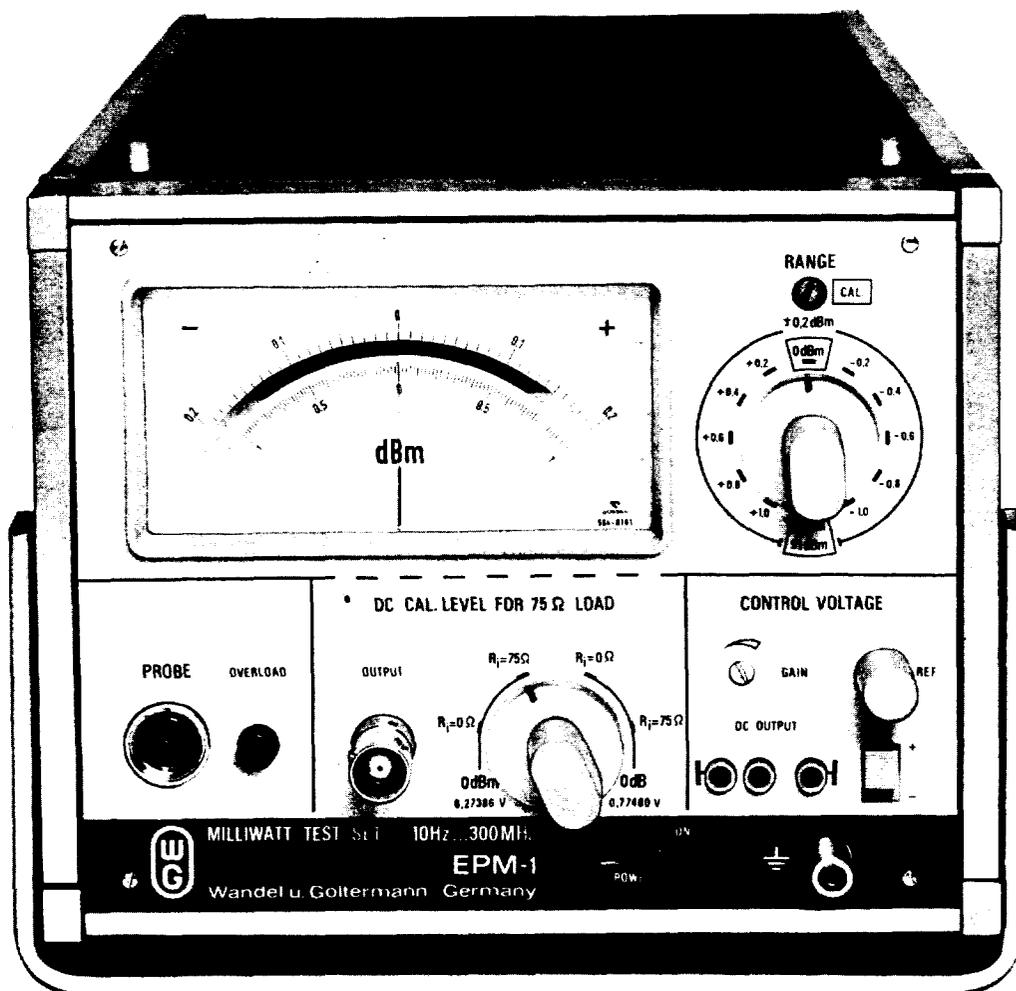
Input impedance: (to probe protector) 75 ohms unbalanced

Power requirements: voltage selector switch has positions for 110, 117, 127, 220, 227, and 235 volts ac.

Meter scales: -0.2 dBm to $+0.2 \text{ dBm}$
 -1.0 dBm to $+1.0 \text{ dBm}$

Input power limitation: $0.0 \text{ dBm} \pm 2.0 \text{ dB}$

Reference: Section 103-422-000



WANDEL-GOLTERMANN PSM-7 LEVEL MEASURING SET

The PSM-7 level measuring set consists of three units: the frequency control unit (OP-7), level generator (PS-7), and level meter (PM-7). A program control unit (PRA-30) may be provided to permit automatic measurements. Accessory equipment is also available for sweep measurements and for recording measured values.

Frequency range: 10 kHz to 100 MHz

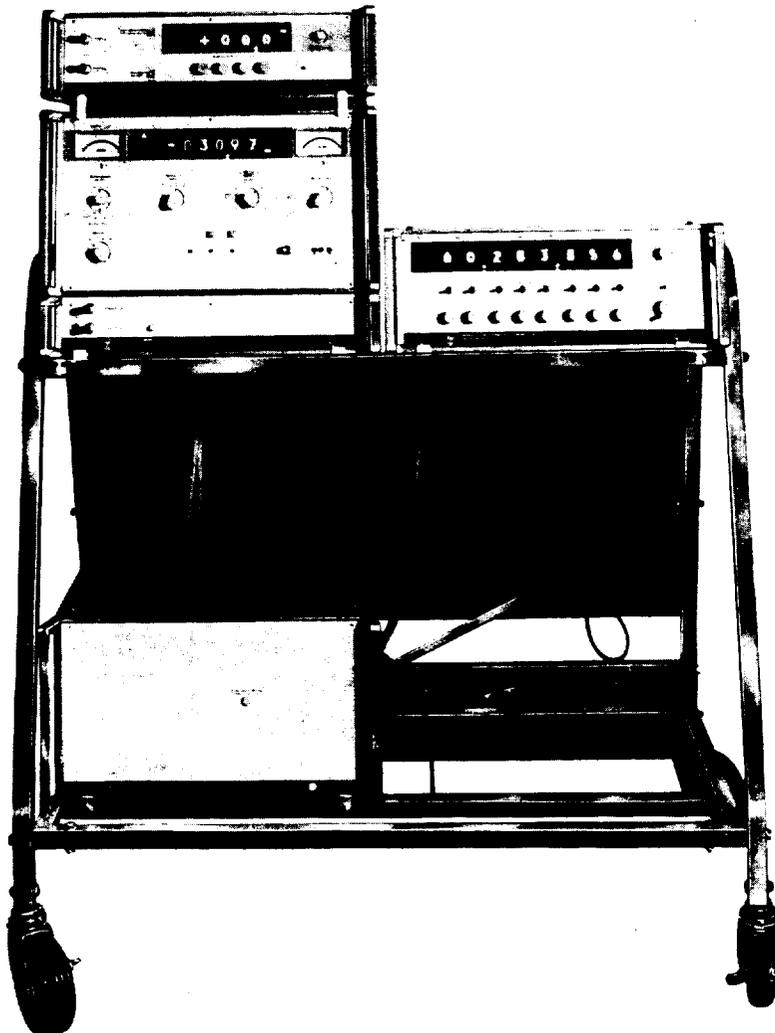
Level meter input impedance: 75 ohms unbalanced

Level meter input power: -120 to +20 dBm

Readout of level meter: digital with sign, last place 0.01 dB

Receive bandwidth: switchable 50-Hz, 400 Hz, 2300 Hz
Equivalent noise bandwidth of level
meter setting "2300 . . ." is 1.74 kHz

Reference: Section 103-419-000



WANDEL-GOLTERMANN RK5 NOISE LOADING SET

The W-G RK5 noise loading set consists of an RS-5 white noise generator and an RE-5 white noise receiver. The RS-5 white noise generator is used at the transmitting end of the carrier system being tested and is equipped with an RSA-5 unit to contain plug-in bandstop and limit filters to eliminate any noise being transmitted at frequencies where pilots and switch tone are assigned.

The RE-5 white noise receiver is used at the receiving end of the carrier system being tested and is (optionally) equipped with an REB-5 wideband meter. The noise measurements made with the RE-5 are a summation of (a) the thermal noise introduced by the line section, and (b) the intermodulation (or cross-modulation) that falls in the measuring slots. The RE-5 is equipped with bandpass filters which pass the noise being measured within the measuring slots.

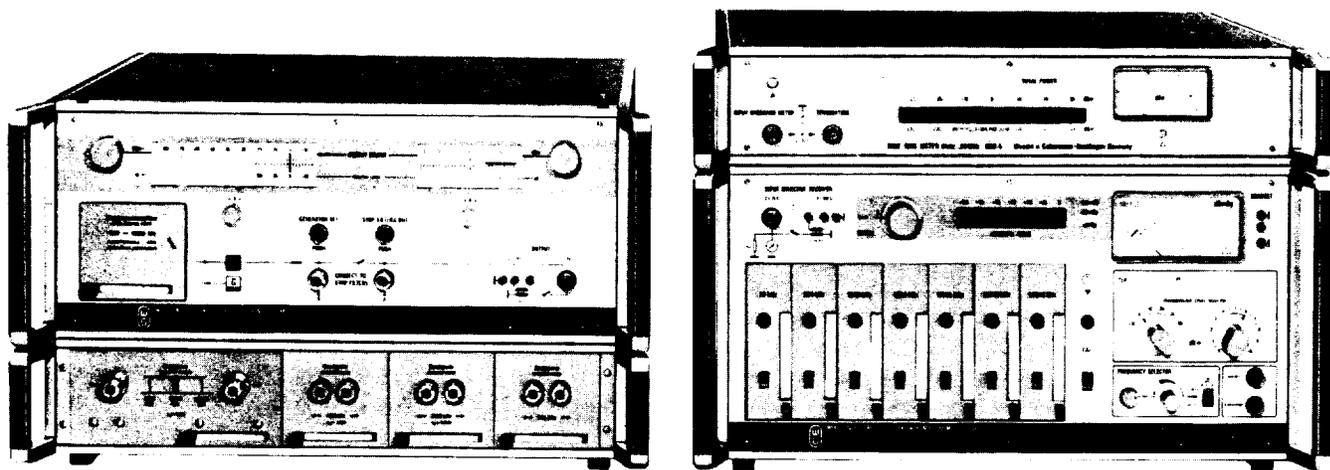
Power requirements: RS-5 117 volts ac 60 Hz
RE-5 —117 volts ac 60 Hz

RE-5 level selector sensitivity: +10.0 to -50.0 dBm

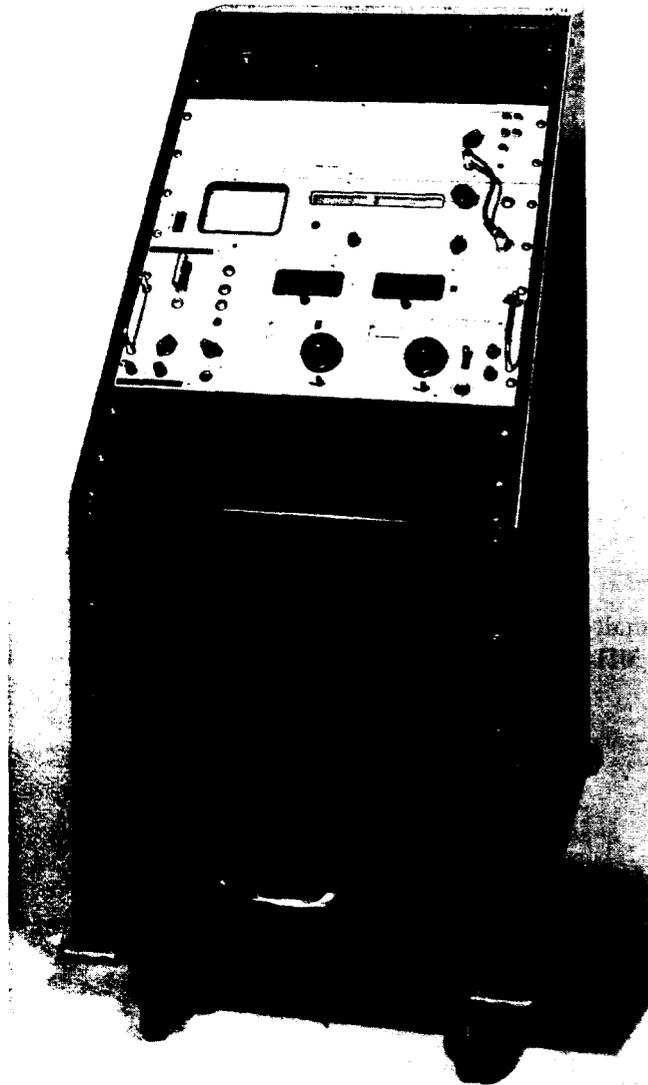
Impedance: (output) RS-5 75 ohms unbalanced
(input) RE-5 75 ohms unbalanced

Frequency spectrum: RE-5 6 kHz to 60 MHz
RS-5 6 kHz to 30 MHz, normally
but can be extended to 60 MHz

Reference: Section 359-200-506



WANDEL-GOLTERMANN AT 442A GENERATOR (SENDING CONSOLE)



The Wandel-Goltermann test consoles are designed as universal test equipment and are suitable for making transmission measurements on wideband, multichannel, carrier telephone systems for coaxial cable and radio links. The transmission range includes groups, supergroups, mastergroups, and L1, L3, and L4 line frequencies. The AT 442A sending console consists of an RWO-5 control oscillator, a PS-5 generator, and a generator-connector panel. The AT 442A sending console is intended to function with the AT 443A receiving console as a test group. The two consoles may be interconnected to form a universal test instrument with synchronous tuning. The sending console may be powered from a wide range of ac primary line voltages or an external battery source.

Frequency range: 10 kHz to 36 MHz

Output impedance: 50, 60, 65, and 75 ohms
unbalanced

124, 135, and 150 ohms
balanced

Output power: -75 to +12 dBm

Output power accuracy: ± 0.2 dB or better

Power requirement:

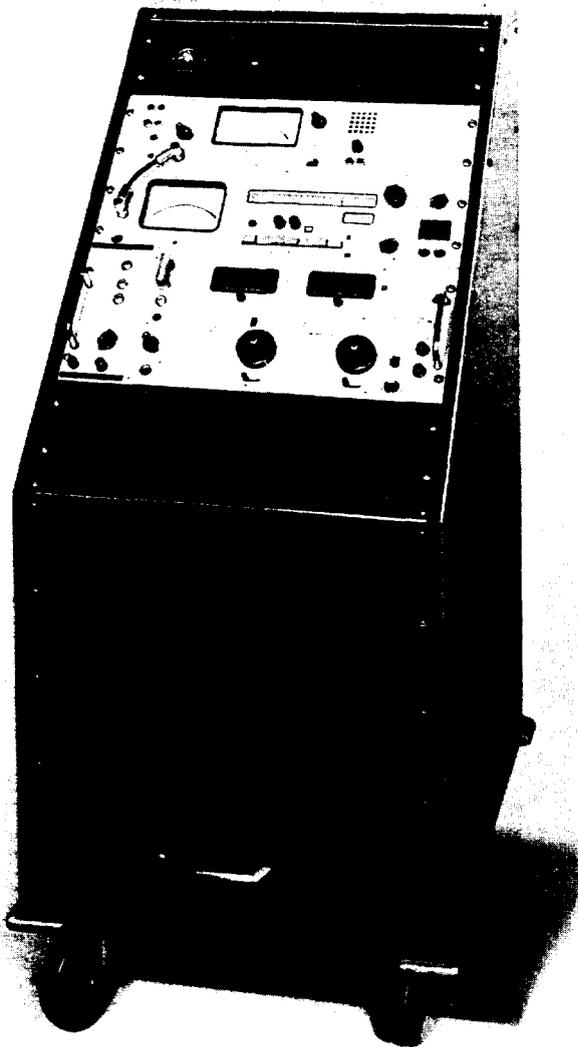
Line power: 99 to 132 volts or
198 to 264 volts ac,
45-65 Hz

or

External battery: 23-30 volts

Reference: Section 103-401-100

WANDEL-GOLTERMANN AT 443A RECEIVER (RECEIVING CONSOLE)



The Wandel-Goltermann test consoles are designed as universal test equipment and are suitable for making transmission measurements on wideband, multichannel, carrier telephone systems for coaxial cable and radio links. The transmission range includes groups, supergroups, mastergroups, and L1, L3, and L4 line frequencies. The AT 443A receiving console consists of an RWO-5 control oscillator, a PM-5 receiver and a receiver-connector panel. The AT 443A receiving console is intended to function with the AT 442A sending console as a test group. The two consoles may be interconnected to form a universal test instrument with synchronous tuning. The receiving console may be powered from a wide range of ac primary line voltages or an external battery source.

Frequency range: 10 kHz to 36 MHz

Input impedance:

Terminated: 50, 60, 65, 75, and
150 ohms unbalanced

124 and 135 ohms
balanced

Bridged: 10 kilohms unbalanced

Power measuring range: -130 to +32 dBm

Accuracy of power measurement:
 ± 0.3 dB at 100 kHz

Power requirement:

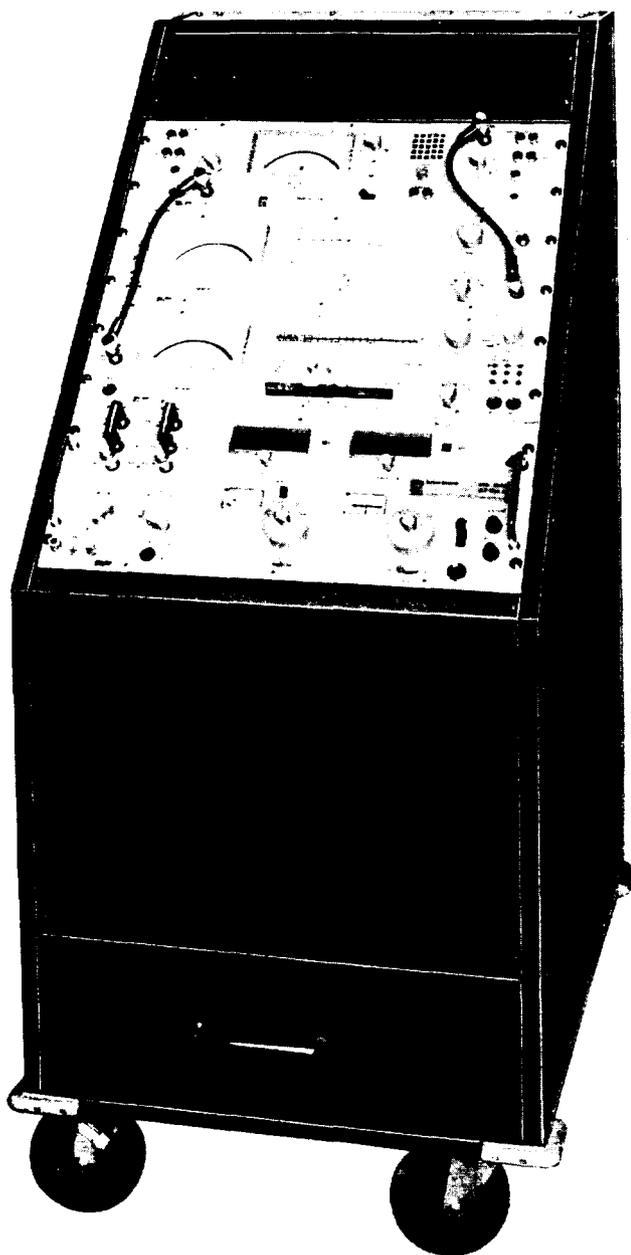
Line power: 99 to 132 volts or
198 to 264 volts ac,
45-65 Hz

or

External battery: 23-30 volts

Reference: Section 103-401-100

WANDEL-GOLTERMANN AT 444A RECEIVER-GENERATOR
(RECEIVING AND SENDING CONSOLE)



The Wandel-Goltermann test consoles are designed as universal test equipment and are suitable for making transmission measurements on wideband, multichannel, carrier telephone systems for coaxial cable and radio links. The transmission range includes groups, supergroups, mastergroups, and L1, L3, and L4 line frequencies. The AT 444A receiving and sending console consists of a PM-5 receiver, PS-5 generator, RWO-5 control oscillator, and a receiver-connector panel. The AT 444A receiving and sending console is intended to function as a complete measuring system in a single-console arrangement. Synchronous tuning of the receiver and generator is possible from a common control oscillator. The receiving and sending console may be powered from a wide range of ac primary line voltages or an external battery supply.

Frequency range: 10 kHz to 36 MHz

Receiver input impedances:

Terminated: 50, 60, 75, and 150 ohms
unbalanced
124 and 135 ohms
balanced

Bridged: 10 kilohms unbalanced

Power measuring range: -130 to +32 dBm

Accuracy of power measurement:

± 0.3 dB at 100 kHz

Generator output impedance:

50, 60, 65, 75, 135, and 150 ohms
unbalanced

Generator output power: -75 to +12 dBm

Accuracy of power output: ± 0.2 dB

Frequency accuracy at 68°F:

For intervals of Hz: 2 PPM ± 10 CPS

For any frequency: 2 PPM ± 100 CPS

Power requirement:

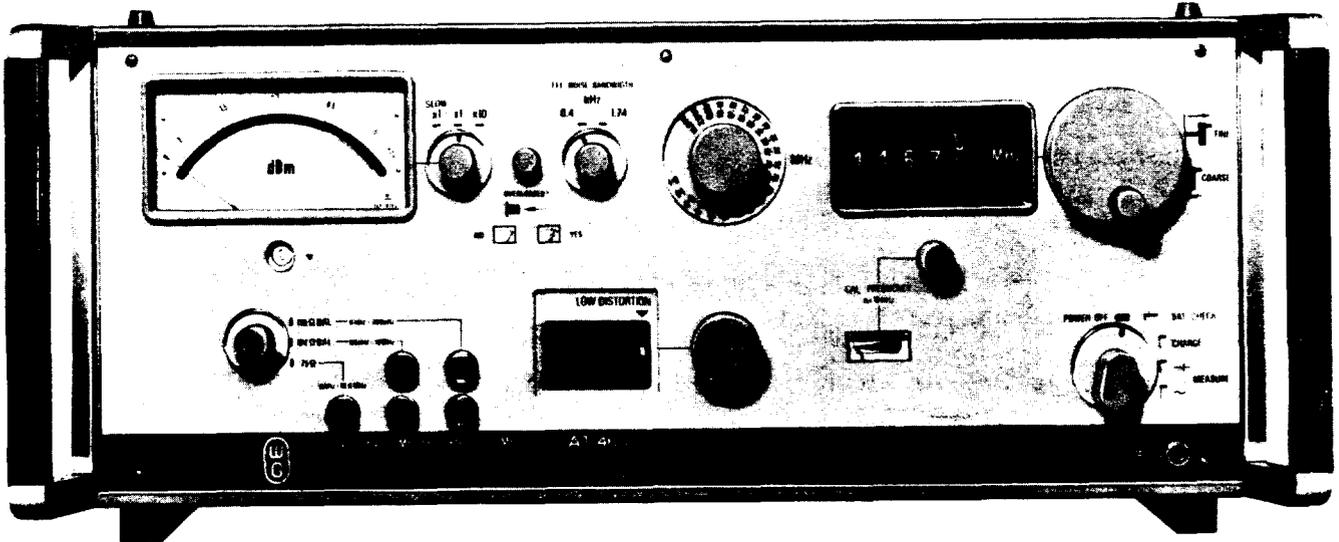
Line power: 99 to 132 volts or
198 to 264 volts ac,
45-65 Hz

or

External battery: 23-30 volts

Reference: Section 103-401-100

WANDEL-GOLTERMANN AT463 LEVEL METER



The AT463 selective level meter is a portable, solid-state receiver-type level meter which may be used for measurement of crosstalk, pilot tones, and carrier level. The self-calibration feature eliminates the need for manual calibration. The AT9 bridging probe is optionally available for making bridged measurements. The WE ED-51073-30 (SD-50676) power isolation probe is used for making bridged measurements on L3 and L4 carrier systems where high voltages are present. The self-contained rechargeable battery will permit up to six hours of operation. The level meter has four possible modes of operation:

- (a) Internal battery
- (b) Line operation with simultaneous battery charging
- (c) Line operation without battery
- (d) Battery charging.

When operated with the AT462 level generator, the two units may be interconnected to track directly in frequency.

Frequency range (continuously tunable): 75 ohms unbalanced, 2 kHz to 18.6 MHz
 124 ohms balanced, 60 kHz to 10 MHz
 135 ohms balanced, 6 kHz to 300 kHz

Power measuring range: -80.0 to +26.0 dBm

Accuracy of power measurement (unbalanced): ± 0.25 dB at reference frequency of 1 MHz and 0-dBm level

Input impedance: 75 ohms unbalanced
 124 and 135 ohms balanced

Power requirement: 110 and 20 volts ac, 50 to 60 Hz or internal batteries

Reference: Section 103-406-000

SIERRA 351A SIGNAL GENERATOR

The 351A signal generator is a portable unit that produces a highly stable, low-distortion test signal over the specified frequency range. The signal generator (oscillator) is fully transistorized and was designed to operate with the Sierra 128A selective voltmeter (receiver) as a test group. Synchronous tuning between the signal generator and the selective voltmeter is possible when the two units are placed at the same location during testing.

Frequency range: 10 kHz to 15 MHz

Output impedance: 50, 75, 135, and 600 ohms unbalanced

Output power: 50, 75, and 135 ohms, -80 to ± 10 dBm
600 ohms, -90 to 0 dBm

Output power accuracy: ± 0.2 dB at reference frequency of 1 MHz and 0 dBm level

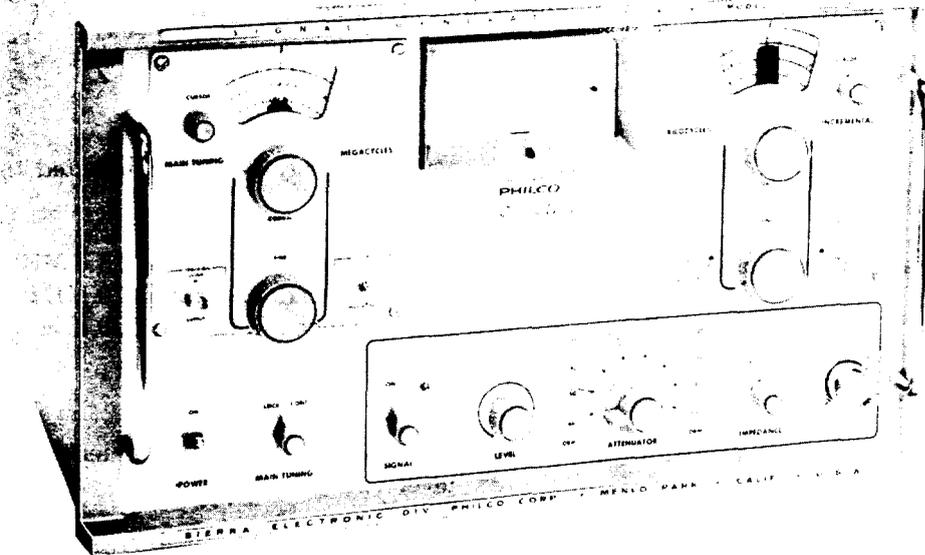
Power requirement:

Line power: 115 volts ac $\pm 10\%$,
50 to 1000 Hz

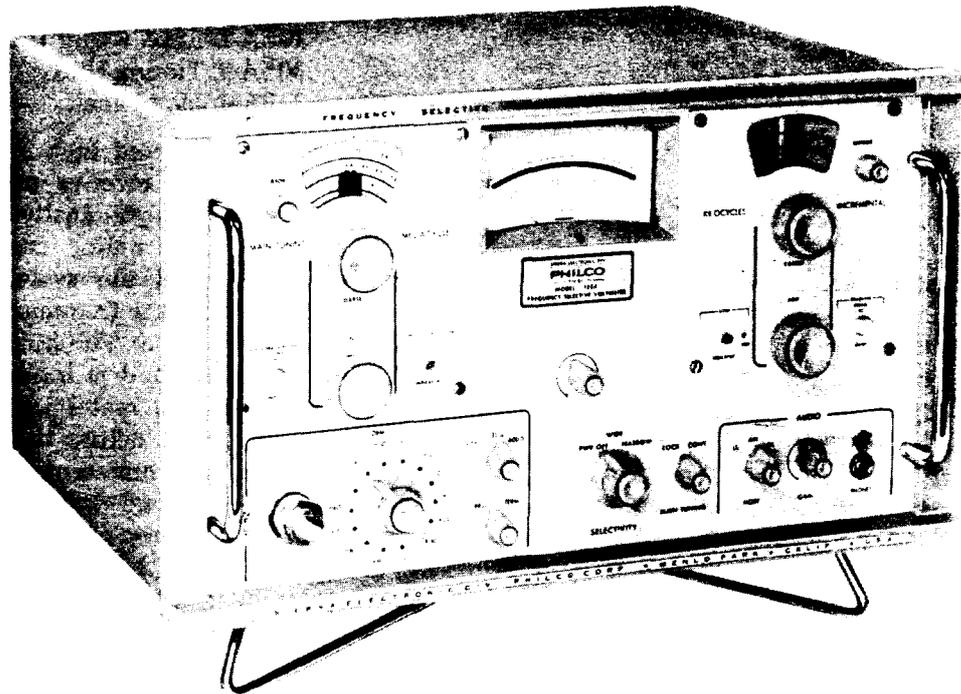
or

External battery: 28 volts

Reference: Section 103-403-100



SIERRA 128A FREQUENCY SELECTIVE VOLTMETER



The 128A frequency selective voltmeter is a highly selective portable receiver which may be used for measurements of level, attenuation, and gain in the range of frequencies within the capability of the unit. The 128A selective voltmeter (receiver) is fully transistorized and was designed to operate with the Sierra 351A signal generator (oscillator) as a test group. Synchronous tuning between the selective voltmeter and the signal generator is possible when the two units are placed at the same location during testing.

Frequency range: 10 kHz to 15.1 MHz

Input impedance:

Terminated: 75, 135, and 600 ohms unbalanced

Bridged: Over 10 kilohms

Power measuring range: -90 to +32 dBm

Accuracy of power measurement: ± 0.2 dBm at reference frequency of 1 MHz and 0 dBm level

Power requirement:

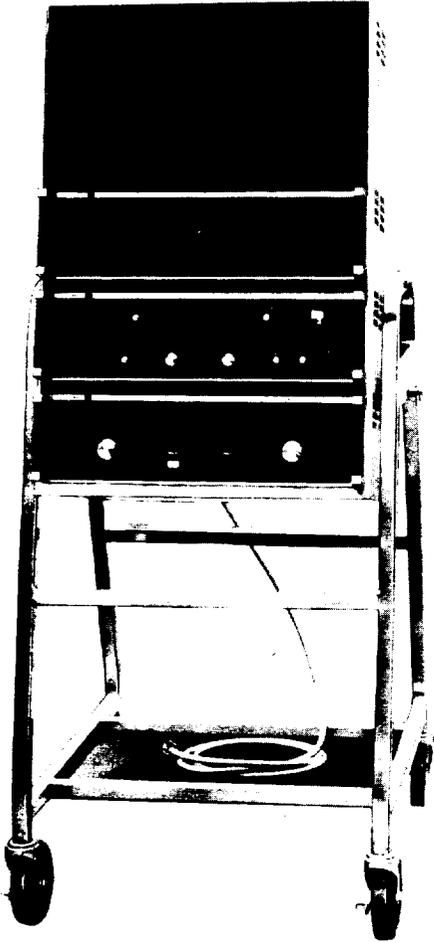
Line power: 105 to 125 volts ac,
50 to 1000 Hz

or

External battery: 48 volts

Reference: Section 103-403-100

SIERRA 3051A RECEIVER (RECEIVING CONSOLE)



The Sierra 3051A receiver contains the following units:

- 305A-L Level Meter Unit
- 305A-T Tuning Unit
- 249A-1 Jack Panel.

These units are mounted in a 220A-5 equipment console. The 3051A receiver measures the gains and levels found in high-density telephone carrier systems, microwave radio, and the multiplex terminals which feed the systems. The 305A-T tuning unit contains the frequency readout display and the tuning controls. The 305A-L level meter is used simultaneously and is interconnected to the tuning unit. The level meter automatically tracks with the tuning unit across the frequency band. Perform final measurements with the meter indicating as near 0 as possible. The expanded scale permits greater accuracy of adjustment (± 2 dB for full scale; -25 dB to $+2$ dB for normal scale).

The 249A-1 jack panel provides a connecting interface between various carrier systems and the units of the 3051A test set.

Input impedance: 75 ohms unbalanced
125 and 135 ohms balanced

Accuracy of power measurement: ± 0.2 dB at reference frequency of 1 MHz and 0 dBm level

Power requirement: 115/230 volts ac, 60 Hz

	SENSITIVITY SWITCH POSITION	RANGE
Frequency:	NORM	1 kHz to 32.1 MHz
	HIGH	60 kHz to 32.1 MHz
Power measurement:	NORM	-69 to $+20$ dBm (0-dBm meter reading)
		-89 to $+22.0$ dBm (including dBm meter range)
	HIGH	-89 to 0 dBm (0-dBm meter reading)
		-109 to 2.0 dBm (including dBm meter range)

Reference: Section 103-404-000

SIERRA 3052A GENERATOR (SENDING CONSOLE)

The Sierra 3052A signal generator contains the following units:

- 305A-T Tuning Unit
- 305A-G Signal Generator Unit
- 249A-1 Jack Panel.

These units are mounted in a 220A-5 equipment console. The 305A-T tuning unit contains the digital readout frequency display and tuning controls. The 305A-G signal generator utilizes the RF output and digital readout of the tuning unit and must be used in conjunction with it.

Frequency range: 1 kHz to 32.1 MHz

Output impedance: 75 ohms unbalanced
124 and 135 ohms
balanced

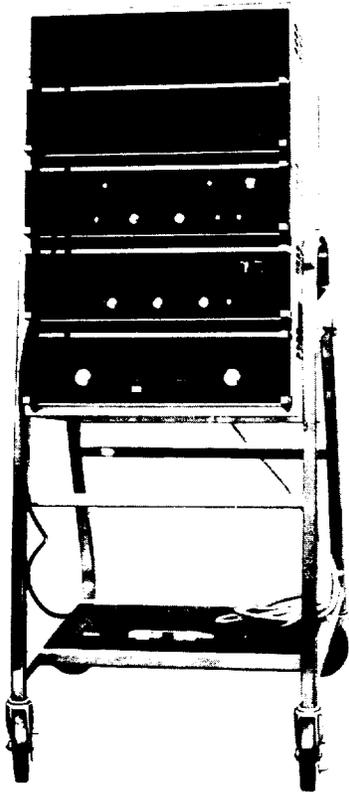
Power output range: +1 dBm to -90 dBm

Power output accuracy: +0.1 dB at reference
frequency of 1 MHz and 0-dBm level

Power requirement: 115/230 volts ac, 60 Hz

Reference: Section 103-404-000

SIERRA 3053A RECEIVER-GENERATOR (RECEIVING AND SENDING CONSOLE)



The Sierra 3053A receiver-generator contains the following units:

- 305A-T Tuning Unit
- 305A-G Tracking Signal Generator
- 305A-L Frequency Selective Level Meter
- 249A-2 Jack Panel.

These units are mounted in a 220A equipment console. The 3053A receiver-generator is used with high-density telephone carrier systems, high-frequency radio equipment, and microwave equipment. The configuration of the units permits singular use of the level meter or the signal generator functions. Only one function may be used when the frequencies are not the same. The simultaneous operation mode permits the units to track automatically across the band. Perform final measurements with the meter indicating as near 0 as possible. The expanded scale permits greater accuracy of adjustment (± 2 dB for full scale; -25 dB to $+2$ dB for normal scale).

The frequency is displayed by the counter readout on the 305A-T tuning unit.

Accuracy of frequency: ± 60 Hz

Accuracy of power measurement: ± 0.2 dB at reference frequency of 1 MHz and 0-dBm level

Accuracy of output level: ± 0.1 dB at reference frequency of 1 MHz and 0-dBm level

Minimum frequency reading increment:
 Locked Mode: 10 Hz
 Continuous mode: 100 Hz

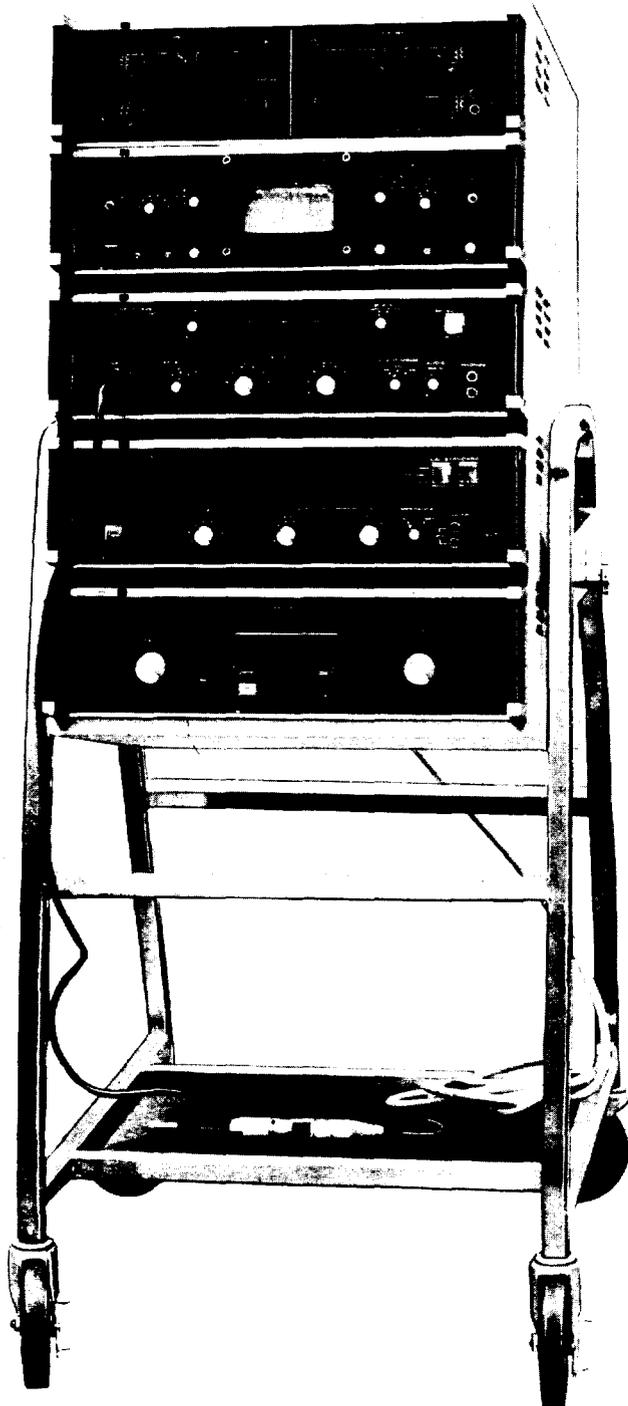
Input and output impedances: 75 ohms unbalanced
 124 and 135 ohms balanced

Power requirement: 115/230 volts ac, 60 Hz

	SENSITIVITY SWITCH POSITION	RANGE
Frequency:	NORM	1 kHz to 32.1 MHz
	HIGH	60 kHz to 32.1 MHz
Power measurement:	NORM	-69 to $+20$ dBm (0-dBm meter reading)
		-89 to $+22.0$ dBm (including dBm meter range)
	HIGH	-89 to 0 dBm (0-dBm meter reading)
		-109 to 2.0 dBm (including dBm meter range)

Reference: Section 103-404-000

SIERRA 3054A RECEIVER-GENERATOR (RECEIVING AND SENDING CONSOLE)



The Sierra 3054A receiver-generator contains the following units:

- 305A-T Tuning Unit
- 305A-G Tracking Signal Generator
- 305A-L Frequency Selective Level Meter
- 360A Spectrum Display Unit
- 249A-2 Jack Panel.

These units are mounted in a 220A equipment console. The 3054A receiver-generator is used with high-density telephone carrier systems, high-frequency radio equipment, and microwave equipment. The configuration of the units permits singular use of the level meter or the signal generator functions. Only one function may be used when the frequencies are not the same. The simultaneous operation mode permits the units to track automatically across the band. The frequency is displayed by the counter readout on the 305A-T tuning unit. The 360A spectrum display unit provides a display on a magnitude-versus-frequency basis. Perform final measurements with the meter indicating as near 0 as possible. The expanded scale permits greater accuracy of adjustment (± 2 dB for full scale; -25 dB to $+2$ dB for normal scale).

Accuracy of frequency: ± 60 Hz

Accuracy of power measurement: ± 0.2 dB at reference frequency of 1 MHz and 0-dBm level

Accuracy of output level: ± 0.1 dB at reference frequency of 1 MHz and 0-dBm level

Minimum frequency reading increment:
 Locked mode: 10 Hz
 Continuous mode: 100 kHz

Input and output impedance: 75 ohms unbalanced; 124 and 135 ohms balanced

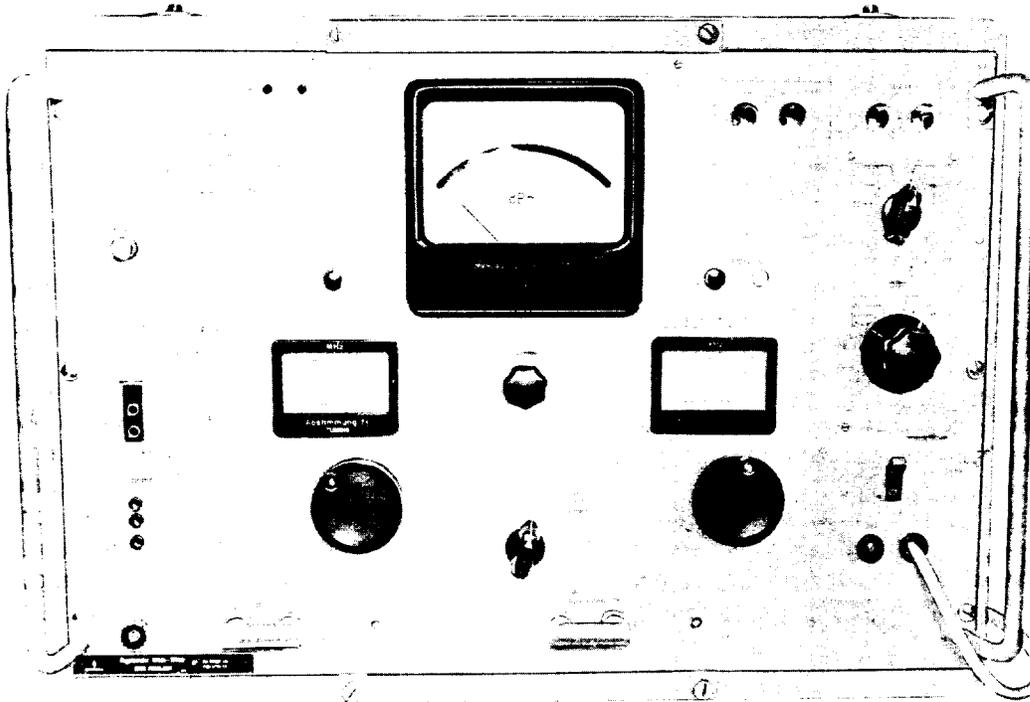
Power requirement: 115/230 volts ac, 60 Hz

	SENSITIVITY SWITCH POSITION
Frequency:	NORM HIGH
Power measurment:	NORM HIGH

RANGE
1 kHz to 32.1 MHz
60 kHz to 32.1 MHz
-69 to $+20$ dBm (0-dBm meter reading)
-89 to $+22.0$ dBm (including dBm meter range)
-89 to 0 dBm (0-dBm meter reading)
-109 to 2.0 dBm (including dBm meter range)

Reference: Section 103-404-000

SIEMENS 3W 518 OSCILLATOR



The 3W 518 oscillator is a portable signal generator that produces a continuously variable test signal throughout the specified frequency range. The 3W 518 oscillator was designed to operate with the Siemens 3D 335 selective analyzer (receiver) as a test group. Synchronous tuning between the oscillator and the selective analyzer is possible when the two units are located in near proximity to each other during testing. The test group is compatible with the transmission bands for LMX terminals as well as L1 and L3 line frequencies.

Frequency range: 10 kHz to 17 MHz

Output impedance: 65 and 75 ohms unbalanced
135, 140, and 150 ohms balanced

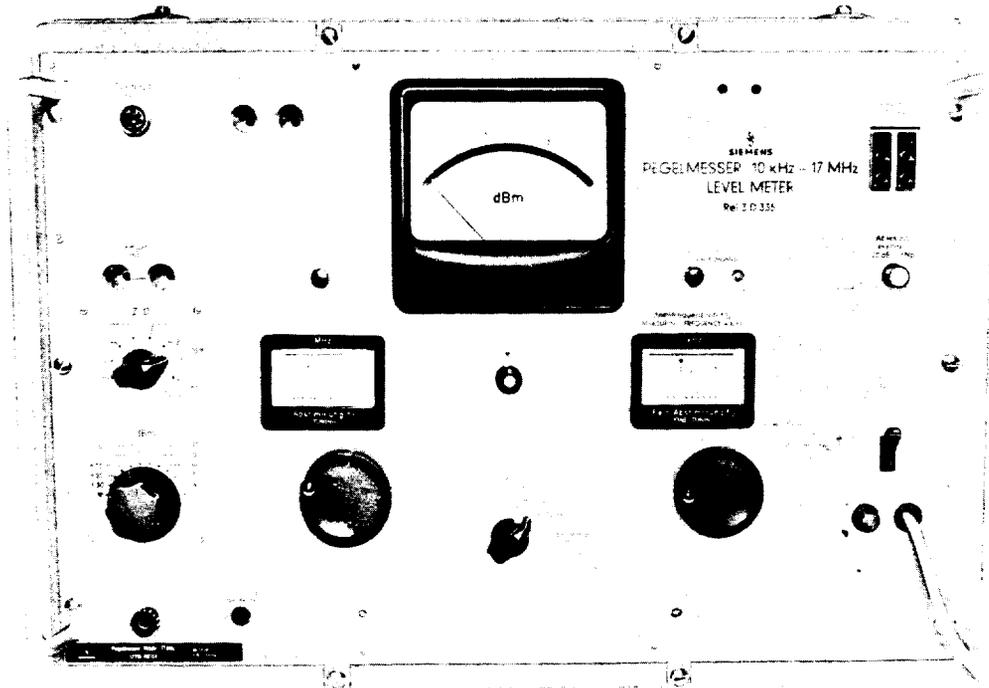
Power range: -75 to +10 dBm

Power output accuracy: ± 0.2 dB at reference frequency of 1 MHz and 0 dBm level

Power requirement: 110-120 volts ac, 50-60 Hz

Reference: Section 103-402-100

SIEMENS 3D 335 SELECTIVE ANALYZER



The 3D 335 selective analyzer is a portable receiving unit which may be used for measurements of level, attenuation, and gain over the specified frequency range. The 3D 335 selective analyzer (receiver) was designed to operate with the Siemens 3W 518 oscillator as a test group. Synchronous tuning between the selective analyzer and the oscillator is possible when the two units are located in near proximity to each other during testing. The test group is compatible with the transmission bands for LMX terminals as well as L1 and L3 line frequencies.

Frequency range: 10 kHz to 17 MHz

Input impedance

Terminated: 65 and 75 ohms unbalanced
135, 140, and 150 ohms balanced

Bridged: over 10 kilohms

Power measuring range: -100 to +30 dBm

Accuracy of power measurement: ± 0.2 dB 30 kHz to 10 MHz
 ± 0.3 dB 10 kHz to 15 MHz

Power requirement: 110-120 volts ac,
50-60 Hz

Reference: Section 103-402-100

SIEMENS D2073B LEVEL METER

The D2073B Siemens level meter is designed for use as a portable selective detector to be used primarily at L5 line repeater stations. Measurements for loss, gain, crosstalk, intermodulation, and tone levels may be made with this instrument. The D2073B is powered by a rechargeable power pack (C2073) which has three power cables (a 6-foot cable for use in recharging the power pack, a 4-foot and a 20-foot cable for dc connections to the power pack) available for connection to the D2073B.

Frequency range: 100 kHz to 100 MHz

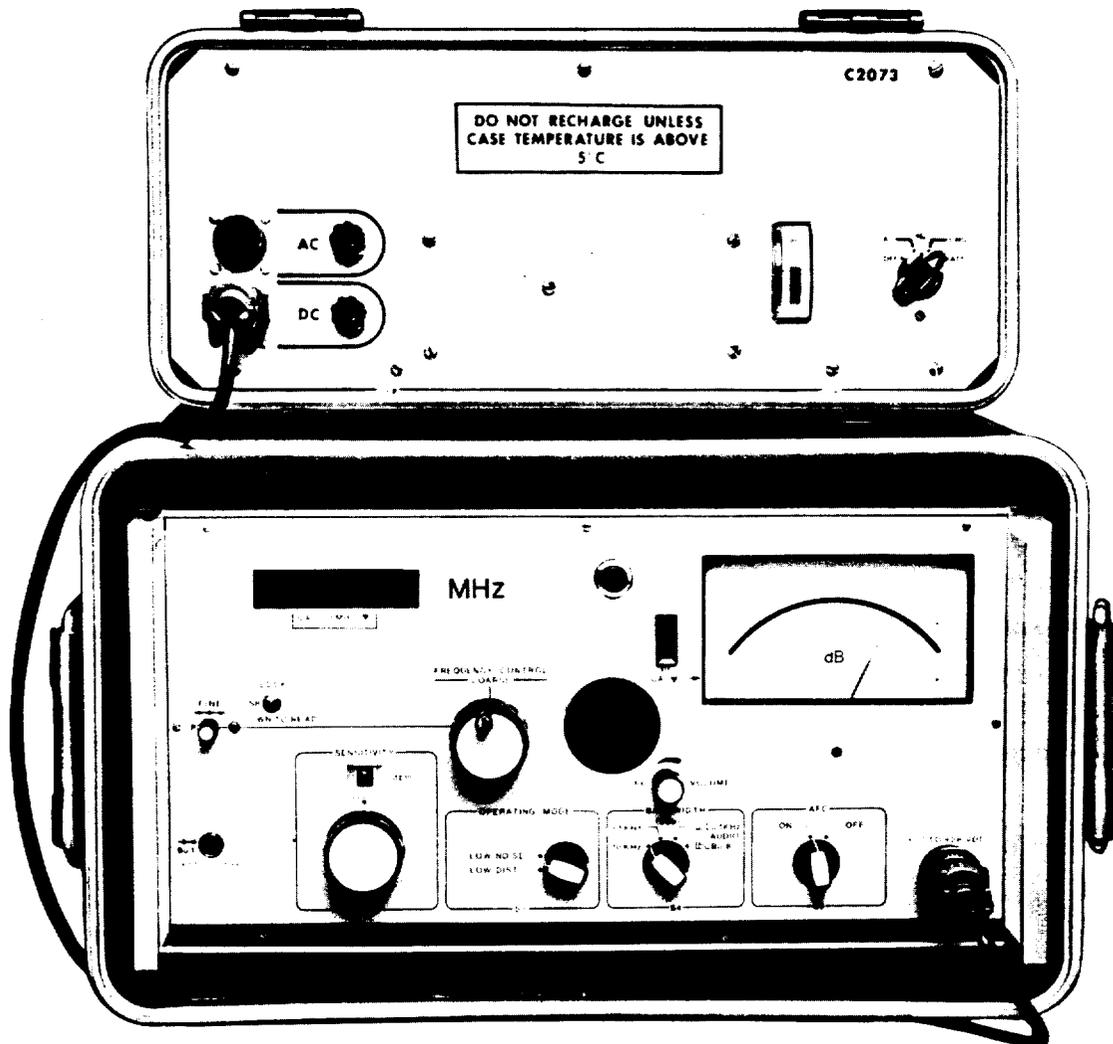
Input impedance: 75 ohms unbalanced

Monitoring capability: (speaker and volume control)

Meter scale: +2.0 to -20.0 dBm

Input sensitivity: -100 to +dBm

Reference: Section 103-416-100

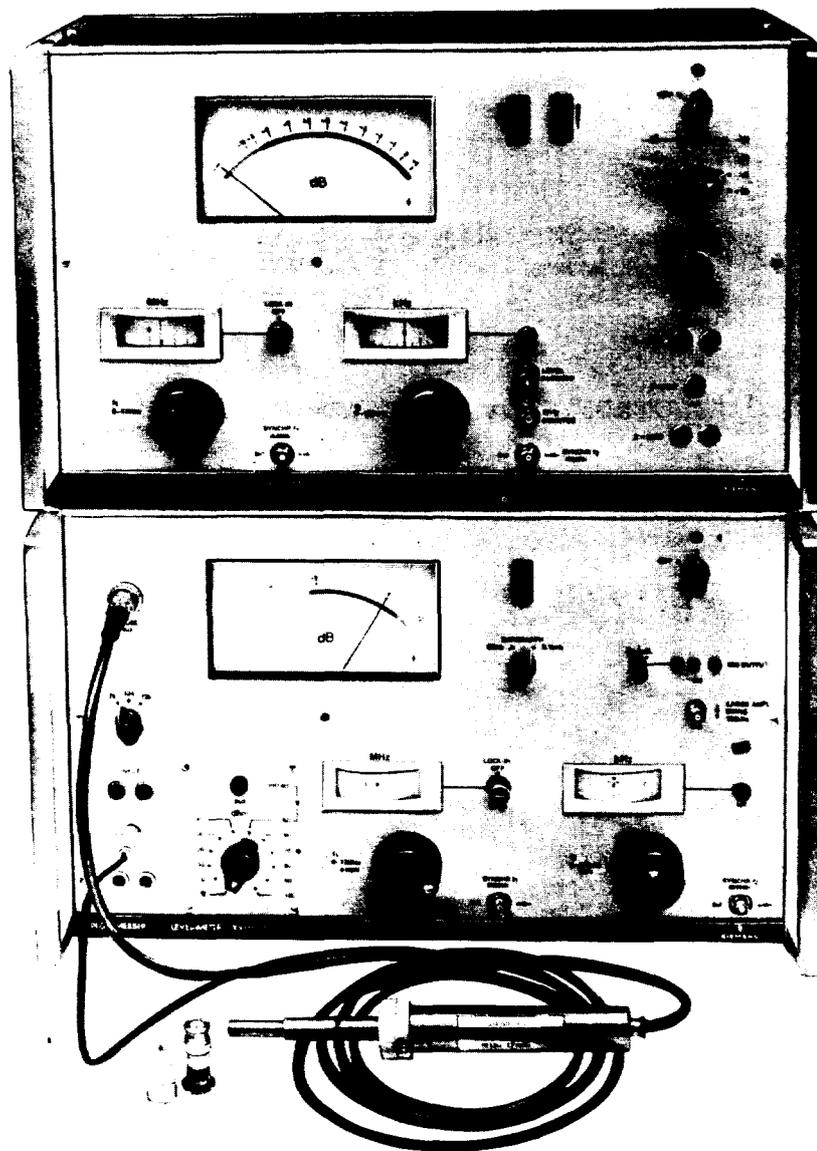


SIEMENS D/W2006 PRECISION TRANSMISSION MEASURING SYSTEM 10 KHZ TO 17 MHZ

The D2006 L5 is a precision transmission measuring set for central office and field use. (For field use, the D2006 L5 must be equipped with a Ni-Cad battery pack.) Fast and accurate measurements of transmission gain and loss, frequency response, crosstalk, and signal-to-noise ratios are a few of the many parameters which may be measured. By using the single sideband demodulator output, and the selective level meter as a down converter, phase jitter and impulse noise may also be measured externally. Because of the extremely good frequency response and oscillator stability, the instrument is also recommended for digital under voice measurements, under ED-52317-10.

Western Electric jacks for 75-ohm unbalanced, 124- and 135-ohm balanced inputs and an audio output are standard equipment.

Reference: Section 103-420-000



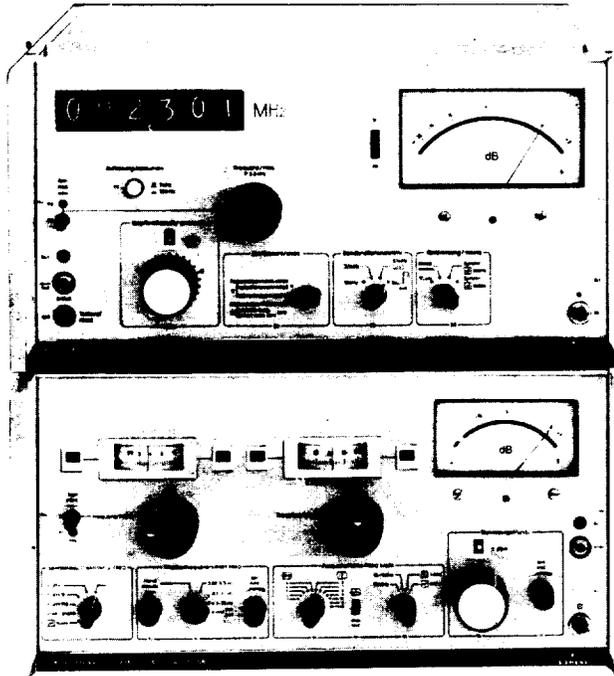
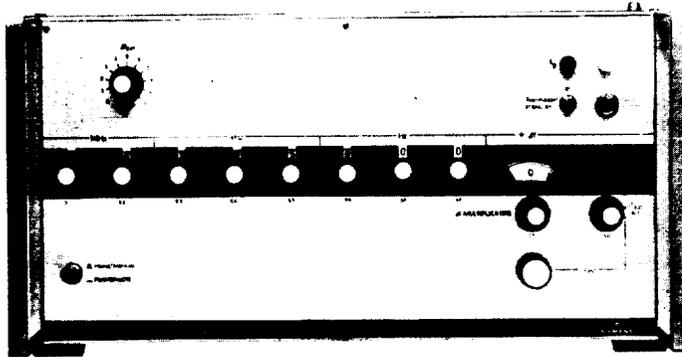
SIEMENS D2073, W2072, G2006 LEVEL MEASURING SYSTEM WITH
DIGITAL FREQUENCY SETTING 100 KHZ to 100 MHZ

This complete selective measuring system has level attenuation and gain measurement capability in the range of 100 kHz to 100 MHz with frequency accuracy and stability corresponding to the crystal standard of the G2006 with frequency setting by hand or remote to 100 Hz. The level oscillator and level meter can be synchrotuned, in the course of which the frequency is set on the level oscillator while the level meter is automatically kept in tune. In this manner, selective measurements can be made as easily and quickly as wideband measurements. This system can be expanded in many ways to obtain a 100-MHz automatic tester.

Level range receiving (D2073): -118.0 to $+10.0$ dBm

Level range transmitting (W2072): -50.0 to $+10.0$ dBm

Reference: Section 103-416-000



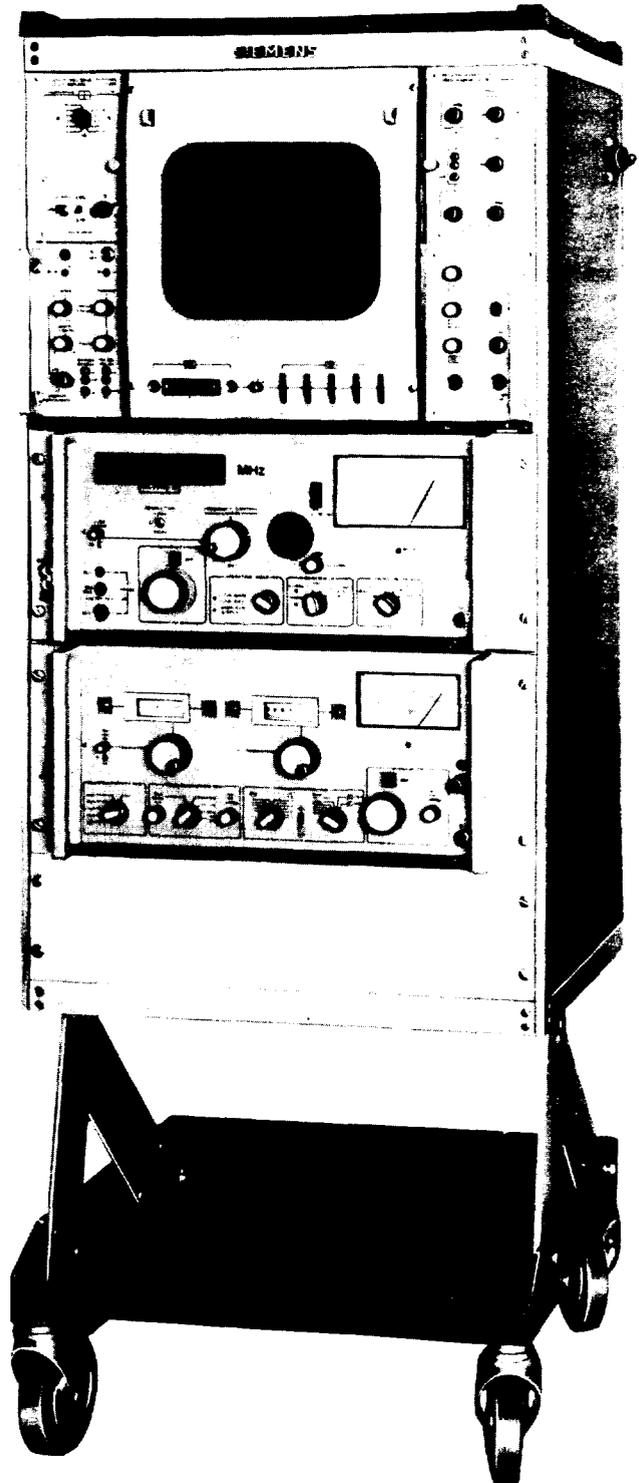
**SIEMENS K1073 SWEEP MEASURING SYSTEM AND SPECTRUM ANALYZER
100 KHZ TO 100 MHZ**

The K1073 is a complete selective sweep measuring system with a display from 100 kHz to 100 MHz for wideband sweep measurements. This system is also suitable for panoramic reception, and by using the logarithmic plug-in D920 on the D2001, a display range of 100 dB is obtained. Siemens K1073 can also be used in route sweep applications as a 100 MHz spectrum analyzer, or for equalization of transmission systems in conjunction with Siemens D2027 Wideband Level Meter.

Receiver level range:
-118.0 dBm to +10.0 dBm

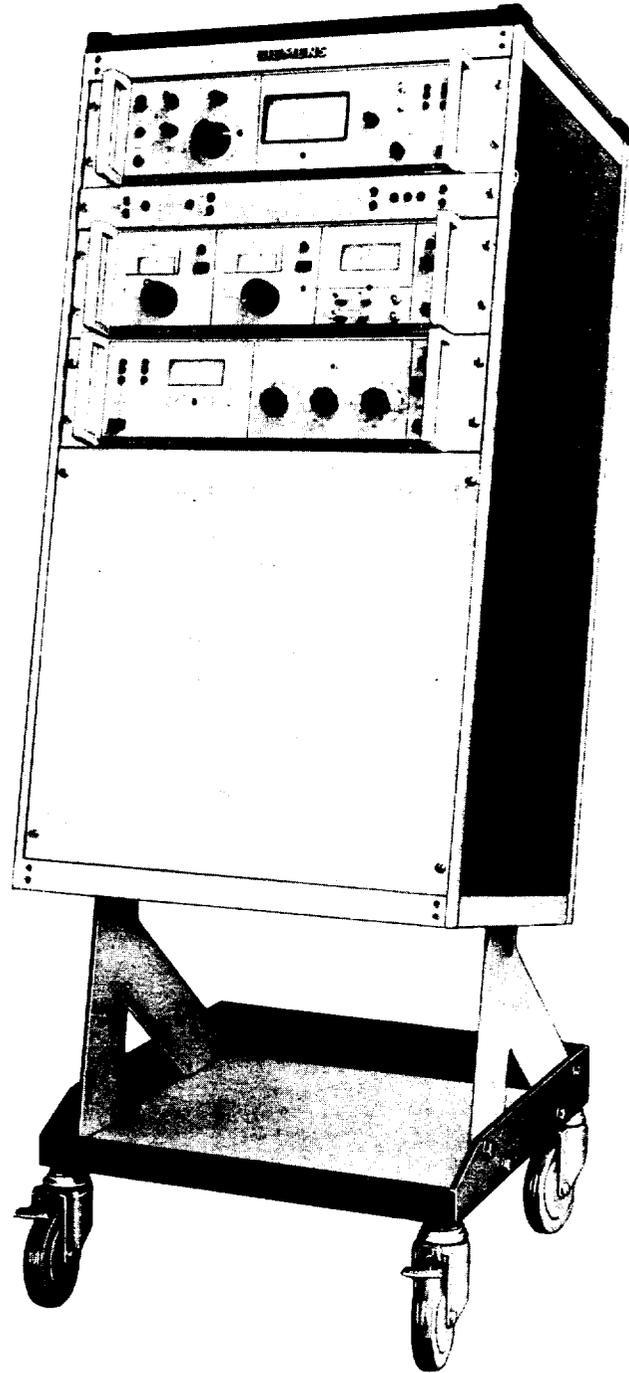
Transmitter level range:
-50.0 dBm to +10.0 dBm

Reference: Section 103-417-100



SIEMENS D/W/G2021 CARRIER FREQUENCY LEVEL MEASURING SYSTEM
OF HIGH ACCURACY 10 KHZ TO 25 MHZ

This level measuring setup has been especially designed for high channel capacity work during development, production, installation, and operation. Measurements of pilot levels, crosstalk, attenuation, harmonic distortion, and intermodulation distortion can be made quickly and accurately. The high accuracy of this system permits the elimination of time-consuming comparison measurements.



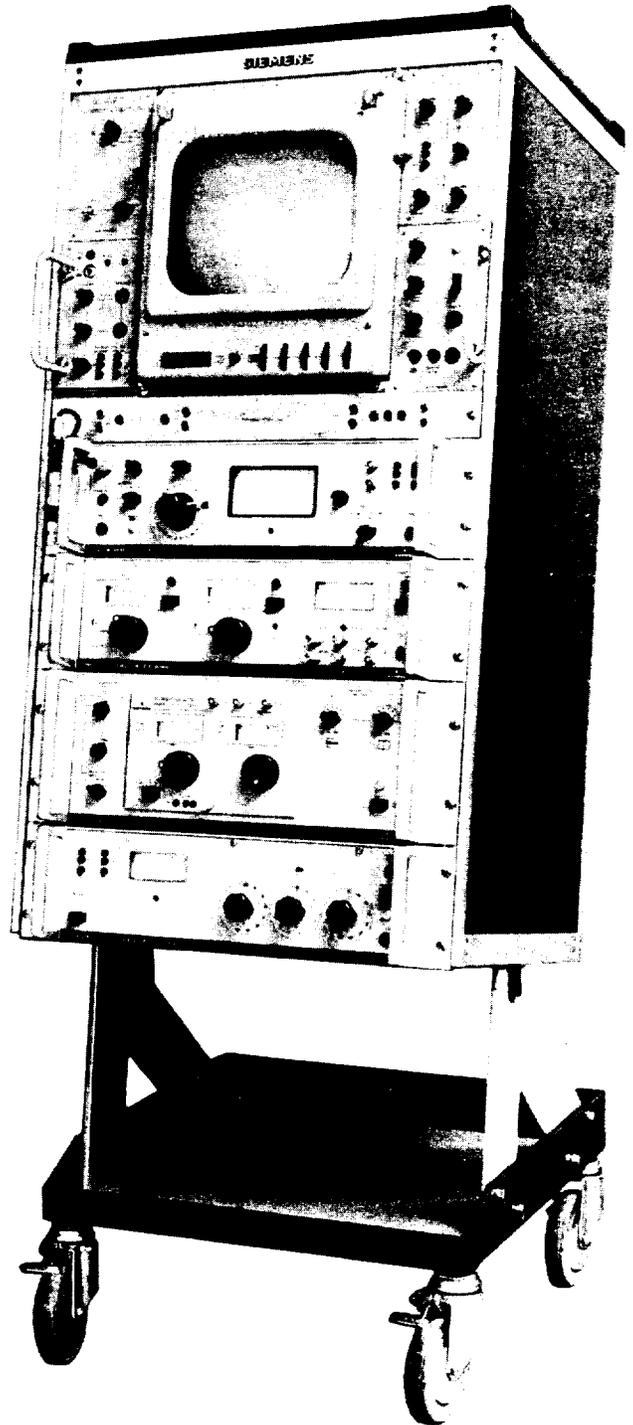
**SIEMENS K1023 TMS AND SPECTRUM ANALYZER
10 KHZ TO 25 MHZ**

The K1023 is a uniquely flexible system that provides for the display of any desired bandwidth without decadic range switching. It has a flat response of 0.1 dB from 10 kHz to 25 MHz and will provide spectrum analysis with instantaneous readout for systems over a 100-dB dynamic range at the mastergroup, supergroup, group, and channel bank frequencies. It is also ideal for route sweep measurements, equalization of broadband systems, and point-by-point transmission measurements in toll offices.

The K1023 has the following features:

- High level accuracy and stability
- 100-dB dynamic range
- 20-Hz and 1.74-kHz ENB measuring bandwidths
- Built-in expanded scale and loudspeaker
- Continuous tuning from 10 kHz to 25 MHz
- Phase lock in 100-kHz and 1-kHz increments
- Route end-to-end sweep and automatic synchronizing
- Electronically generated frequency marks and level lines.

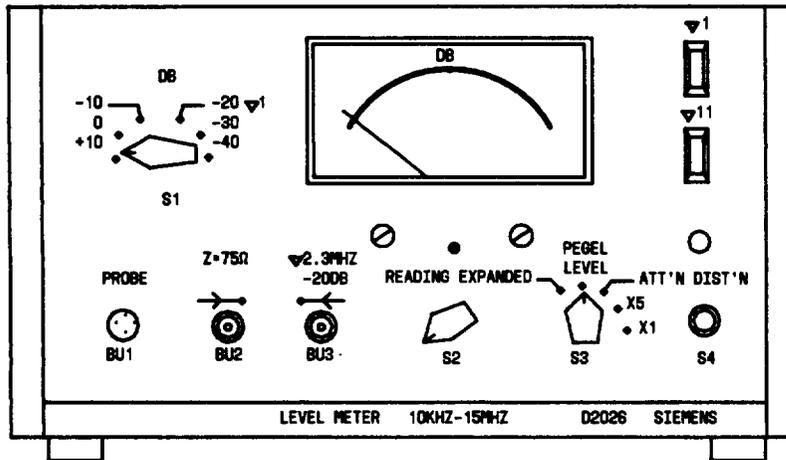
Reference: Section 103-417-000.



SIEMENS D2026 AND D2027 WIDEBAND LEVEL METERS

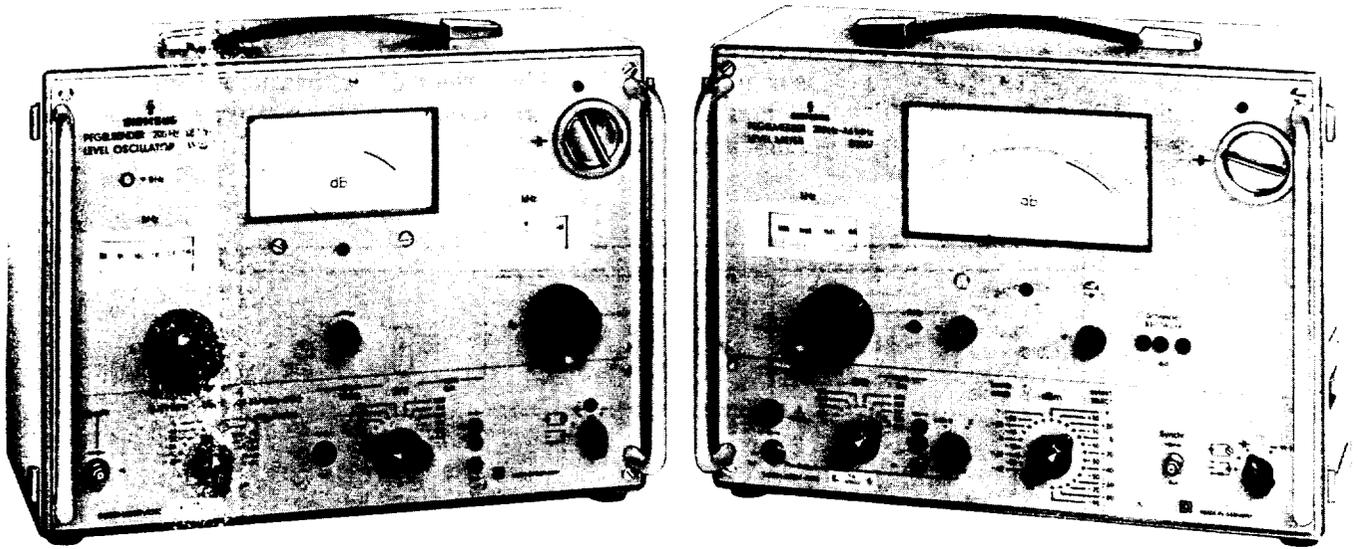
The D2026 and D2027 have the capability of making measurements on routes where the results are to be sent back to the transmitting point from the measuring point. The D2026 measures a frequency spectrum from 10 kHz to 15 kHz and levels from -50 to +20 dBm.

The D2027 frequency spectrum is from 100 kHz to 100 MHz and levels from -50 to +20 dBm. Both D2026 and D2027 have 75-ohm unbalanced inputs.



SIEMENS D/W2057 CARRIER-FREQUENCY LEVEL MEASURING SYSTEM
200 HZ TO 1620 KHZ

The D/W2057 has the capability for making selective and wideband measurements on multichannel telephone systems for a maximum of 300 voice circuits in all CCITT groups and in CCITT supergroups 1 through 6 during development testing, installation, and operation service. The system can also be used for measurements of attenuation including crosstalk, distortion ratio, and unweighted signal-to-noise ratios.



SIEMENS D/W2007 CARRIER-FREQUENCY LEVEL MEASURING SETUP
6 KHZ to 18.6 MHZ

Siemens D/W2007 is a compact level measuring system for selective measurements on wideband carrier systems with balanced or coaxial lines. Measurements of level, attenuation, and gain are possible in office or field. Pilot and channel level can be covered without interrupting the system operation, and crosstalk and harmonic distortion can be determined quickly and accurately. This system features automatic tuning for frequency control of the level oscillator and AFC and scale-spread indication on the level meter for reading accuracy. The measured value is the algebraic sum of the digital readout and the meter reading.

Measurements can be made manually and by the swept-frequency method. Attachments are available to convert the instrument into a sweep measuring setup for a wide variety of applications. Western Electric jacks, 75, 124, 135, 150 ohms, balanced and unbalanced, are standard. The instruments can also be battery-operated (12 to 48 volts) with the same accuracy.

