V-7 Z < 1 Ω AMPLIFIER

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Refer to schematic in plate V-9.

This subassembly comprises an amplifier using complementary transistors which receives frequency F5 : 10 Hz/1 MHz from the Demodulator Amplifier. It provides a signal with 0 dBm/75 Ω to + 20 dBm/75 Ω electromotive force, depending on the level of the main output signal, at an impedance of less than 1 Ω .

V-8 PARALLEL BCD PROGRAMMING (OPTION 010)

Refer to schematic in plate V-12.

This option enables the logic signals from the manual controls of the synthesizer to be replaced by external parallel BCD signals applied to programming connectors (SO3) and (SO4).

V-9 IEEE BUS PROGRAMMING (OPTION 020)

Refer to block diagram in figure V-11, and schematics in plates V-10 and V-11.



Figure V-11 IEEE BAC PROGRAMMING

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This option, consisting of two subassemblies, converts the data supplied by the IEEE Bus into parallel BCD signals which are substituted in Programming mode for the logic signals from the manual synthesizer controls.

V-9-1 IEEE BUS ISOLATOR

This circuit comprises a series of Schmitt triggers (integrated circuits SN1 and SN2, plate V-10), followed by galvanic isolators (transformers T1, T2 and T3) which enable the ground of the IEEE bus to be isolated from that of the synthesizer. For this reason, the various circuits upstream of the galvanic isolators are supplied by a +5 V floating voltage issued from the IEEE Bus Registers subassembly.

The secondary winging of each transformer is connected in a feedback to a C-MOS gate (integrated circuits SN5, SN6 and SN7) which stores the transient pulse induced in the winding.

V-9-2 IEEE BUS REGISTERS

This circuit converts the data transmitted by the IEEE Bus Isolator subassembly into parallel BCD signals.

The handshake process with the IEEE bus is entirely controlled by the HEF 4738 integrated circuit, with the aid of a 4014 shift-register. These two integrated circuits provide for the recognition of the address selected by switches (K10), for the Local/Remote control of the synthesizer, and for the control of the Decoding circuit. The HEF 4738 integrated circuit is controlled by a 2 MHz square-wave signal obtained by dividing by 2 the frequency generated by a 4 MHz oscillator (integrated circuit SN30).

The digits and the characters CR, A, ?, F, < and > are decoded by four decoders (integrated circuits SN4 and SN5, plate V-11) followed by NOR gates (integrated circuits SN6 to SN9) and J_{\perp}^{\perp} flip-flops (integrated circuits SN10, SN11 and SN12). The decoding circuit also controls transfer of data from lines DIO1 to DIO4 to the output registers, and supplies the Demodulator-Amplifier with the Inhibition and the ALC time constant programming signals.

The output level attenuation transmitted on lines DIO1 to DIO4 is transferred to the Attenuation Register consisting of 4 shift registers (integrated circuits SN14 and SN15) and to the Attenuation Memory consisting of 16 type D flip-flops (integrated circuits SN20 to SN23), which supplies this attenuation in parallel BCD code to the Output Level Coding subassembly.

The output frequency transmitted on lines DIO1 to DIO4 is transferred to the Frequency Register consisting of 8 shift registers (integrated circuits SN16 to SN19) and to the Frequency Memory consisting of 24 type D flip-flops (integrated circuits SN24 to SN29), which supplies this frequency in parallel BCD code to the Generation 10^{0} Hz - 10^{1} Hz - 10^{2} Hz and Generation 10^{3} Hz - 10^{4} Hz - 10^{5} Hz subassemblies.

V-14

CHAPTER VI MAINTENANCE

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The tests described in the following pages are designed to enable the user to check that the instrument conforms to the technical characteristics set out in chapter II. These tests may be carried out as acceptance tests, as periodic performance checks, or as a control on the instrument characteristics following repairs.

A.		
TYPE OF INSTRUMENT	REFERENCE	CHARACTERISTICS
Alternostat		0 V to 260 V ; 200 W
Multimeter	FLUKE 8000 A	DC/AC ; accuracy ± 1%
Oscilloscope	H.P. 180C + 1808A + 1820C	75 MHz bandwidth
Frequencymeter	SCHLUMBERGER FH 2523	10 Hz to 500 MHz ; 9 digits
RF voltmeter	H.P. 3400 A	10 Hz to 10 MHz ; accuracy \pm 1%
Milliwattmeter	WANDEL & GOLTERMANN EPM-1	10 kHz to 300 MHz ; accuracy <u>+</u> 0.015 dB
Standard attenuator	SIEMENS D 2054	0 dB to 99.9 dB
Decibelmeter	ADRET 6101B + 6303B + 63032A + 63030B	DC to 11 MHz ; resolution 0.01 dB
Spectrum analyser	ADRET 6100B + 6303B + 6503A + 63032A	DC to 11 MHz ; dynamic range 120 dB
X-Y recorder	H.P. 7041A	Speed 76 cm/s
ECF 136	ADRET	Impedance transformer 75 $\Omega/150~\Omega/600~\Omega$
ECF 141	ADRET	Asymmetry detector
Frequency difference multiplier	ADRET 4110A	Resolution 10^{-8} to 10^{-12}
Frequency standard	ADRET 3310A	300 Hz to 60 MHz ; stability $\pm 5.10^{-9}/24$ h
DC source	ADRET 102	Accuracy \pm 5.10 ⁻⁵ ; output current 50 mA
Decibelmeter Spectrum analyser X-Y recorder ECF 136 ECF 141 Frequency difference multiplier Frequency standard	ADRET 6101B + 6303B + 63032A + 63030B ADRET 6100B + 6303B + 6503A + 63032A H.P. 7041A ADRET ADRET ADRET 4110A ADRET 3310A	O dB to 99.9 dB DC to 11 MHz ; resolution 0.01 dB DC to 11 MHz ; dynamic range 120 dB Speed 76 cm/s Impedance transformer 75 $\Omega/150 \Omega/600 \Omega$ Asymmetry detector Resolution 10 ⁻⁸ to 10 ⁻¹² 300 Hz to 60 MHz ; stability $\pm 5.10^{-9}/24$ h

INSTRUMENTS REQUIRED FOR EXECUTING TESTS

	Nº d'ESSAI TEST NUMBER	CONDITIONS	SANCTIONS RESULTS	
	1	VISUAL CHECK		
		Check the external appearance of the instrument and		
1 + 1 •		that protective fuse $f1$ is of the correct rating		
		(300 mA for 115V supply, 150 mA for 230 V supply).		
	2	MAINS SUPPLY REGULATION		
	45 Hz to 450 Hz			
	115V - 230V	Connect the instrument to a 45 Hz/450 Hz power supply through an alternostat, as shown in figure VI-1.		
	power supply			
4 24 24	Alternostat			
	Multimeter	115 V		
		ALIMENTATION ALTERNATIVE ALTERNOSTAT 2230A		
		Figure VI-1 MAINS SUPPLY REGULATION		an di Ant
		a) Vary the supply frequency between 45 Hz and 450 Hz		
		for supply voltages of 115V and 230V.		
		Measure the voltages present at connector $(S01)$ of		
		the rear panel :	Accuracy :	
		+ 12V relative to ground.	+ 11.8 V to + 12.5 V	
		 12V relative to ground. + 6V relative to ground. 	- 11.8 V to - 12.5 V	
		er (erative to ground.	+ 5.75 V to + 6.25 V	
A .				
		+ 6 V		
		-12V - (-) - + 12V		
		Figure VI-2 CONNECTOR (SOI)		
		b) Repeat the above test using the alternostat to		
		apply voltages of $115V \pm 10\%$ and $230V \pm 10\%$.	The previously measured	
			voltages must remain sub- stantially identical.	
		c) Use the multimeter to measure the current drawn by	P < 20 VA	
		the instrument at both mains supply voltages. Cal- culate the apparent power consumption by means of		
		the formula $P = UI$.		
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 STATURE STATULE IF REPLE Ser supply Attendents A Bestidual I FIRPLE With the instrument supplied at 50 Max, use the 250 Max to supplied at connector (a) . Contrasting and the oscilloscope to massure the Larington on the 120, with and -120 woltages available at connector (a) . CUTPUT FREQUENCE CUTPUT FREQUENCE Connector (b) is the same as that set on survices (c), use the frequency of 500 000 Max on switches (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (b) is the same as that set on survices (c). Connector (c) is the same as that set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as the set on survices (c). Connector (c) is the same as	Nº d'ESSAI TEST NUMBER	CONDITIONS	SANCTIONS RESULTS	
Power supply Atternostat 250 Hz Jowpass filter Doc1lioscope With the instrument supplied at 50 Hz, use the 250 Hz Instruments (If the connector (10)). Residual ripple (\$ 5 m/p-p) 4 OUTPUT FREQUENCY 9 OUTPUT FREQUENCY 9. Synthesizer mode : DI source (1) Synthesizer mode : With the frequencymeter and the 2230A synthesizer connector (1) is the same as that set on switches (12). 9. Generator mode : Set a frequency of 500 000 Hz on switches (12). Set potentiometer (12) to the 0.5 mark, and adjust the verifier of this potentiometer to as at to adjust the verifier of this potentiometer to as at to adjust the verifier of this potentiometer to as at to adjust the verifier of this potentiometer for 30 at to adjust the verifier of this potentiometer for 30 at to adjust the verifier of this potentiometer for 30 at to adjust the verifier of this potentiometer for 30 at to adjust the verifier of this potentiometer for 30 at to adjust the adjust is 150 Hz in all circumstances. If the error is greater than 50 Hz, the amplifier All of subassembly 02 7003 (Control Circuits, plate V-7) must be recalibrated as follows : - set a frequency of 500 000 Hz on switches (12), nelease the three keys of keyboard (10), and set potentiometer Pl of to loating of indicator this potentiometer Pl of to loating of indicator this potentiometer Pl of to loating of indicator the potentiometer Pl of to loating and adjust the verifier of this potentiometer (1) to 0.1, and adjust poten- tiometer Pl of subassembly 02 7003 to adjust poten- tiometer Pl of subassembly 02 7003 to adjust the potentiometer (1) is set to 1.				
Power supply Atternostat 200 Hz Towpass filter and the dscilloscope to measure the LF ripple on the +12v, + 6V and -12V voltages avai- lable at connector (30). Residual ripple s 5 m/p-p 4 OUTPUT FREQUENCY a) Synthesizer mode : With the frequencymeter to check that the frequency, use the frequencymeter to the same 5 MHz reference frequency, use the frequencymeter to the the 220A synthesizer connector (1) is the same as that set on switches (22). e) Generator mode : Set a frequency of 500 000 Hz on switches (22), set potentiometer (2) to the 0.5 mark, and adjust the vernier of this potentiometer to as at to obtain very slow flashing of indicator lights (32). Then measure the output frequency at various positions of potentiometer (2), the vernier to fights (32). Then measure the output frequency at various positions of potentiometer (2), the vernier being latel (1) 100 ± 50 kHz (2) 300 ± 50 kHz (2) 300 ± 50 kHz (2) 500 ± 500 kHz (2) 700 ± 50 kHz (2) 900 ± 50 kHz (3) 900 ± 50 kHz (3) 900 ± 50 kHz (3) 900 ± 50 kHz (3) 900 ± 50 kHz (4) 900 ± 50 kHz (4) 900 ± 50 kHz (5) 100 ± 50	3	RESIDUAL LE RIPPLE		
Alternosist low-pass filter and the oscilloscope to measure the LF ripple on the +12V, +6V and -12V voltages available at connector (SD). Residual ripple 4 OUTPUT FREQUENCY 4 OUTPUT FREQUENCY a) Synthesizer mode : With the frequencymeter and the 2230A synthesizer connector (D) is the same as that set on switches (C), set potentiometer (D) to the 0.5 mark, and adjust the vernier of this potentiometer is as to obtain very slow flashing of indicator fights (GS). b) Generator mode : Set a frequency of 500 000 Hz on switches (C), set potentiometer (D) to the 0.5 mark, and adjust the vernier of this potentiometer is as to obtain very slow flashing of indicator fights (GS). b) Generator mode : Set a frequency of 500 000 Hz on switches (C), set potentiometer (D), the vernier being left in its initial position. The waximm permissible and its in all circumstances. If the error is greater than 50 kik, the amplifier Al2 of subassembly 02 7003 (Control Circuits, plate V-7) must be recalibrated as follows : - Set a frequency of 500 000 kiz on switches (R), release the three keys of keyboard (E), and set potentiometer Pl to 0.5, and adjust the vernier of this potentiometer (D) to 0.5, and adjust potentiometer (D) to 0.5, and adjust potentiometer (D) to kiz. - Depress the "GERER", key of keyboard (E), set potentiometer (D) to kiz. Output frequency Hz frequency field kize potentiometer (D) to kiz. - Depress the "GERER", key of keyboard (E), set potentiometer (D) to kiz. Output frequency : 1Miz ± 50 kiz - Depress the "GERER", key of				
Alternosist low-pass filter and the oscilloscope to measure the LF ripple on the +12V, +6V and -12V voltages available at connector (SD). Residual ripple 4 OUTPUT FREQUENCY 4 OUTPUT FREQUENCY a) Synthesizer mode : With the frequencymeter and the 2230A synthesizer connector (D) is the same as that set on switches (C), set potentiometer (D) to the 0.5 mark, and adjust the vernier of this potentiometer is as to obtain very slow flashing of indicator fights (GS). b) Generator mode : Set a frequency of 500 000 Hz on switches (C), set potentiometer (D) to the 0.5 mark, and adjust the vernier of this potentiometer is as to obtain very slow flashing of indicator fights (GS). b) Generator mode : Set a frequency of 500 000 Hz on switches (C), set potentiometer (D), the vernier being left in its initial position. The waximm permissible and its in all circumstances. If the error is greater than 50 kik, the amplifier Al2 of subassembly 02 7003 (Control Circuits, plate V-7) must be recalibrated as follows : - Set a frequency of 500 000 kiz on switches (R), release the three keys of keyboard (E), and set potentiometer Pl to 0.5, and adjust the vernier of this potentiometer (D) to 0.5, and adjust potentiometer (D) to 0.5, and adjust potentiometer (D) to kiz. - Depress the "GERER", key of keyboard (E), set potentiometer (D) to kiz. Output frequency Hz frequency field kize potentiometer (D) to kiz. - Depress the "GERER", key of keyboard (E), set potentiometer (D) to kiz. Output frequency : 1Miz ± 50 kiz - Depress the "GERER", key of	Power supply	With the instrument supplied at 50 Hz use the 250 Hz		
 250 Hz 10M-pass filter 0scilloscope 4 OUTPUT FREQUENCY a) Synthesizer mode : OUTPUT FREQUENCY a) Synthesizer mode : With the frequencymeter and the 2230A synthesizer connected to the same 5 MHz reference frequency, use the frequencymeter to check that the frequency, at connector (1) is the same as that set on switches (2). b) Generator mode : Set a frequency of 500 000 Hz on switches (2), set potentiometer (P) to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator is initial position. The maximum permissible error relative to the frequency indicated on the gradua- ted dial is ± 50 kHz in all circumstances. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 7003 (Control Circuits, plate V-7) must be recalibrated as follows : Set a frequency of 500 000 Mz on switches (2), release the three keys of kyboard (3), and set potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust potentiometer (P) to 1.1 and adjust the vernier of this potentiometer (P) to 0.1 and adjust the vernier of thi		low-pass filter and the oscilloscope to moscupe the	Desident	
filter Table at connector (0). 0cilliscope a) 4 OUTPUT FREQUENCY a) Synthesizer mode : With the frequencymeter and the 2230A synthesizer connected to the same 5 Hiz reference frequency, at connector (1) is the same as that set on switches (2). at connector (1) is the same as that set on switches (2). b) Generator mode : Set a frequency of 500 000 Hz on switches (2). set potentiometer (1) to the 0.5 mark, and adjust the verniter of this potentiometer so as to obtain or potentiometer (1). the vernifer being left in its initial position. The maximum permissible error relative to the frequency indicated on the graduated dial is ± 50 kHz in all circumstances. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 7003 (control Circuits, plate V-7) must be recalibrated as follows : - Set a frequency of 500 000 Hz on switches (2). release the Three keys of keyboard (3), and set potentiometer (1) to 0.5 and adjust the verniter of this potentiometer (1) to 1.1 and digust be treatilitient of this potentiometer (1) to 0.5 and adjust the verniter of this potentiometer (1) to 1.1 and digust be treatilitient of the output frequency field (3). set to potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilitient of the set potentiometer (1) to 1.1 and digust be treatilit	250 Hz low-pass	LF ripple on the $\pm 12V_{\star} \pm 6V_{\star}$ and $\pm 12V_{\star}$ voltages avai-		
 a) OUTPUT FREQUENCY a) Synthesizer mode: b) Generator mode: b) Generator mode: b) Generator mode: b) Generator mode: c) Set a frequency of 500 000 Hz on switches (2). set potentiometer (2) to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator lights (3). Then measure the output frequency at various positions of potentiometer (2), the vernier being left in its initial position. The maximum permissible error relative to the frequency indicated on the graduatted dial is ± 50 Ht in all circumstances. If the error is greater than 50 KHz, the amplifier Al2 of subassembly 02 7003 (Control Circuits, plate Y-7) must be recalibrated as follows: - Set a frequency of 500 000 Hz on switches (2), release the three keys of keyboard (2), and set potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer (2) to 0.1 and adjust potentiometer P2 of subassembly 02 7003 to obtain an output frequency of 100 kHz. Then check the value of the output frequency Hmz ± 50 kHz 	filter	lable at connector (SOI).	< > mvp~p	
 a) Synthesizer mode : a) Synthesizer mode :: b) Generator mode :: connected to the same 5 Miz reference frequency, use the frequencymeter to check that the frequency, at connector (1) is the same as that set on switches (2). b) Generator mode :: b) Generator mode :: b) Generator mode :: b) Generator mode :: cat a frequency of 500 000 Hz on switches (2), set potentionmeter (1), the vernier of this potentioneter so as to obtain very slow flashing of indicator lights (25). c) The there is greater than 50 kHz, the amplifier relative to the frequency indicated on the graduated dial is ± 50 kHz in all circumstances. c) If the error is greater than 50 kHz, the amplifier Al of subassembly 02 7003 (2001 Hz 700 ± 50 kHz 0.9 900 ± 50 kHz 0.9 100 kHz 0.9 100 0.1 and adjust potentioneter P2 to 0.5, and adjust the vernier of this potentioneter so as to obtain a very slow flashing of indicator lights (20) 1.1 and adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of the output frequency model adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of	Oscilloscope			
 a) Synthesizer mode : a) Synthesizer mode :: b) Generator mode :: connected to the same 5 Miz reference frequency, use the frequencymeter to check that the frequency, at connector (1) is the same as that set on switches (2). b) Generator mode :: b) Generator mode :: b) Generator mode :: b) Generator mode :: cat a frequency of 500 000 Hz on switches (2), set potentionmeter (1), the vernier of this potentioneter so as to obtain very slow flashing of indicator lights (25). c) The there is greater than 50 kHz, the amplifier relative to the frequency indicated on the graduated dial is ± 50 kHz in all circumstances. c) If the error is greater than 50 kHz, the amplifier Al of subassembly 02 7003 (2001 Hz 700 ± 50 kHz 0.9 900 ± 50 kHz 0.9 100 kHz 0.9 100 0.1 and adjust potentioneter P2 to 0.5, and adjust the vernier of this potentioneter so as to obtain a very slow flashing of indicator lights (20) 1.1 and adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of the output frequency model adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of				
 a) Synthesizer mode : a) Synthesizer mode :: b) Generator mode :: connected to the same 5 Miz reference frequency, use the frequencymeter to check that the frequency, at connector (1) is the same as that set on switches (2). b) Generator mode :: b) Generator mode :: b) Generator mode :: b) Generator mode :: cat a frequency of 500 000 Hz on switches (2), set potentionmeter (1), the vernier of this potentioneter so as to obtain very slow flashing of indicator lights (25). c) The there is greater than 50 kHz, the amplifier relative to the frequency indicated on the graduated dial is ± 50 kHz in all circumstances. c) If the error is greater than 50 kHz, the amplifier Al of subassembly 02 7003 (2001 Hz 700 ± 50 kHz 0.9 900 ± 50 kHz 0.9 100 kHz 0.9 100 0.1 and adjust potentioneter P2 to 0.5, and adjust the vernier of this potentioneter so as to obtain a very slow flashing of indicator lights (20) 1.1 and adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of the output frequency model adjust potentioneter P2 of subassembly 02 7003 to obtain an output frequency (100 kHz. c) hen check the value of	4	OUTPUT FREDUENCY		
DC source With the frequencymeter and the 2230A synthesizer connected to the same 5 Miz reference frequency, use the frequencymeter to check that the frequency, at connector (1) is the same as that set on switches (2). b) Generator mode : Set a frequencymeter (2) to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator lights (25). Then measure the output frequency at various positions of potentiometer (2), the vernier being left in its initial position. The maximum permissible error relative to the frequency at various positions of potentiometer (2), the vernier being left in its initial position. The maximum permissible error relative to the frequency at various positions of so that in circumstances. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 2003 (Control Circuits, plate V-1) must be recalibrated as follows : 0.1 100 ± 50 kHz 0.5 as for option invery slow flashing of indicator lights (35). . Berpress the "EENER", key of keyboard (3), and set potentiometer P1 of subassembly 02 7003 so as to obtain a very slow flashing of indicator lights (35). . Output frequency : 0.1 this potentiometer (2) to 0.1 and adjust the vernier of this potentiometer so as to obtain a very slow flashing of indicator lights (35). . Output frequency : 1.1 mo utput frequency of 100 kHz. Then check the value of the output frequency in this potentiometer (2) to 0.1 and adjust potentiometer (2) is set to 1. . .				
DC source With the frequencymeter and the 2230A synthesizer connected to the same 5 Miz reference frequency, use the frequencymeter to check that the frequency at connector (1) is the same as that set on switches (2). b) Generator mode : Set a frequency of 500 000 Hz on switches (2). set potentiometer (P) to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator lights (05). Then measure the output frequency at various positions of potentiometer (1), the vernier being left in its initial position. The maximum permissible error relative to the frequency at various positions of so both for all is to the rougency at various positions. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 2003 (Control Circuits, plate V-7) must be recalibrated as follows : 0.1 100 ± 50 kHz 0.5 500 kHz 0.5 500 kHz 0.8 sto obtain very slow flashing of indicator lights (83). . 0.5 500 kHz 0.9 900 ± 50 kHz 0.9 900 ± 50 kHz 0.9 900 ± 50 kHz 0.1 ights (85). . Depress the "GENER", key of keyboard (3), and set potentiometer P1 of subassembly 02 7003 so as to obtain a very slow flashing of indicator lights (95). Then set potentiometer (P1 to 0.1 and adjust potentiometer P2 of subassembly 02 7003 to obtain an output frequency is set to 1. Output frequency : 1 MHz ± 50 kHz	Frequencymeter	a) Synthesizer mode		
 connected to the same 5 MHz reference frequency, use the frequencymeter to check that the frequency at connector II is the same as that set on switches (2). b) Generator mode : Set a frequency of 500 000 Hz on switches (2), set potentiometer (P) to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator lights (3). Then measure the output frequency at various positions of potentiometer (P), the vernier being left in its initial position. The maximum permissible error relative to the frequency indicated on the graduated dial is ± 50 kHz in all circumstances. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 7003 (Control Circuits, plate V-7) must be recalibrated as follows : Set a frequency of 500 000 Hz on switches (K2), release the three keys of keyboard (K3), and set potentiometer P1 of subassembly 02 7003 so as to obtain very slow flashing of indicator lights (53). Depress the "GENER", key of keyboard (K3), set potentiometer (P1 to 0.1 and adjust the vernier of this potentiometer (P1 to 0.1 and adjust potentiometer P2 of subassembly 02 7003 to obtain an output frequency of 100 kHz. Due potentiometer (P1 is set to 1. 	DC source			
 use the frequencymeter to check that the frequency at connector 1 is the same as that set on switches 2. b) Generator mode : Set a frequency of 500 000 Hz on switches 2. set potentiometer P to the 0.5 mark, and adjust the vernier of this potentiometer so as to obtain very slow flashing of indicator lights (53). Then measure the output frequency at various positions of potentiometer (D), the vernier being left in its initial position. The maximum permissible error relative to the frequency indicated on the graduated dial is the the frequency indicated on the graduated dial is to bitk in all circumstances. If the error is greater than 50 kHz, the amplifier Al2 of subassembly 02 7003 (control Circuits, plate V-7) must be recalibrated as follows : Set a frequency of 500 000 Hz on switches (K2), release the three keys of keyboard (K3), and set potentiometer (D) to 0.5, and adjust the vernier of this potentiometer so as to obtain a very slow flashing of indicator lights (D3). Depress the "GENER", key of keyboard (K3), set potentiometer (D) to 0.1 and adjust potentiometer P is set to 1. 		with the frequencymeter and the 2230A synthesizer		
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of this potentiometer so as to obtain a very slow flashing of indicator lights (DS3). Then set potentiometer (P1) to 0.1 and adjust poten- tiometer P2 of subassembly 02 7003 to obtain an output frequency of 100 kHz. Then check the value of the output frequency when potentiometer (P1) is set to 1. Uutput frequency : 1 MHz ± 50 kHz		- Depress the "GENER", key of keyboard (K3), set		
slow flashing of indicator lights (DS3). Then set potentiometer (P1) to 0.1 and adjust poten- tiometer P2 of subassembly 02 7003 to obtain an output frequency of 100 kHz. Then check the value of the output frequency when potentiometer (P1) is set to 1. Utput frequency : 1 MHz ± 50 kHz		potentiometer $(P1)$ to 0.5, and adjust the vernier of this potential		
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Then check the value of the output frequency Output frequency : when potentiometer $(P1)$ is set to 1. I MHz \pm 50 kHz				
when potentiometer $(P1)$ is set to 1. I MHz \pm 50 kHz				
			Output frequency :	
VI-3		when potentiometer PI is set to 1.	1 MHz <u>+</u> 50 kHz	
VI-3				
VI-3				
		VI_3		
		11-2		
· "你们,你们们们,你们们们,你们们们,你们们们们,你们们们,你们们们们,你们们们们们,你们们们们们,你们们们们们们	and an			

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Nº d'ESSAI EST NUMBER	CONDITIONS	SANCTIONS RESULTS	
	c) Sweeper mode :		
	Set a frequency of 500 000 Hz on switches $(K2)$,		
ана (1996) Артана (1996)	set potentiometer (P1) to 0.5, and adjust the		
· · · ·	vernier of the potentiometer so as to obtain		
	very slow flashing of indicator lights $(DS3)$.		
	Apply -5V to connector $(J7)$ and use the frequen-	Linearity : <u>+</u> 10%	
	cymeter to check that the output frequency is less than 100 kHz. Then apply +5V to connector		
	J7 and chech that the output frequency is		
	between 900 kHz and 1.1 MHz.		
5	OUTPUT LEVEL		
lliwattmeter	a) In Synthesizer mode, set a frequency of 10 kHz on		
andard tenuator	switches (K_2) and select an output impedance of		
cibelmeter	75 Ω by means of keyboard (K5).		
F 136	Using the milliwattmeter, measure the output level at connector $(J1)$ when -0.00 dBm and +0.00 dBm are		
	set on switches (K4).	Accuracy at 0 dBm : <u>+</u> 0.2 dB	
	If necessary, adjust the level at -0.00 dBm using		
	potentiometer P1 and then the level at $\pm 0.00 \text{dBm}$		
	by means of potentiometer P2 of the Demodulator-		
	Amplifier subassembly (plate V-4).		
	b) In Synthesizer mode, set a frequency of 10 kHz on		
	switches (K^2) and select an impedance of 150 Ω on		
	keyboard (K5).		
	Set +3.01 dBm on switches K4 and measure the		
	output level with the milliwattmeter,	Measured level :	
	matching the impedances by setting the ECF 136 to 150 Ω (insertion loss 3.01 dB).	0 dBm <u>+</u> 0.2 dB	
	If necessary, adjust potentiometer P1 of the		
	Output Module (plate V-6) for calibrating this		
	level.		
	c) In Synthesizer mode, set a frequency of 10 kHz on		
	switches (K2) and select an impedance of 600 Ω on		
	keyboard (K5).		
	Set 9.03 dBm on switches $(K4)$ and measure the output level using the milliwattmeter, matching		
	the impedances by switching the ECF 136 to 600 Ω	Measured level : 0 dBm + 0.2 dB	
	(insertion loss 9.03 dB).		
	d) In Synthesizer mode, set a frequency of 10 kHz and	0.01 dB steps :	
	an impedance of 75 Ω , and check the accuracy of	<u>+</u> 0.005 per step,	
	the 0.01 dB and 0.1 dB steps of the output level using the milliwattmeter.	max.error <u>+</u> 0.01 dB.	
	using the mitri Wattheter.		
			I
	V1-4		

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	SANCTIONS RESULTS
igure VI-3	0.1 dB steps :
ittenuator	
er 6101B	\pm 0.01 dB per step,
	max.error \pm 0.02 dB.
ne 1 dB and	
	1 dB steps :
	± 0.03 dB per step,
	max.error ± 0.05 dB.
DECIBELMETER	10 dB steps :
) 6101B + 6303B	± 0.1 dB per step,
	max.error <u>+</u> 0.2 dB
75Ω input	from 0 dBm to -60 dBm.
dB STEPS	
a ser a ser a ser	
to the	
ts reference	
signal obtained	
r.	
et switch (K9)	
iwattmeter to	
50 H- 1 - 1 - 1 - 1	
50 Hz to 1 MHz,	Level flatness :
tput level rela-	± 0.05 d8 from 50 Hz
	to 1 MHz.
t switch $(K9)$	
\sim	
wattmeter to	
es by switching	
s 3.01 dB).	
200 Hz to 1 MHz	Level flatness :
ion.	± 0.05 dB from 200 Hz
	to 200 kHz.
	+ 0 1 d8 from 200 1.11
	<u>+</u> 0.1 dB from 200 kHz

to 620 kHz.

Nº d'ESSAI TEST NUMBER	CONDITIONS	SANCTIONS RESULTS
	to F < 10 kHz and connect the milliwattmeter to output (J^2) , matching the impedances by switching the ECF 136 to 600 Ω (insertion loss 9.03 dB).	<u>+</u> 0.2 dB from 620 kHz to 1 MHz.
	Vary the synthesized frequency from 200 Hz to 300 kHz, and measure the output level variation.	Level flatness : <u>+</u> 0.05 dB from 200 Hz to 110 kHz.
7	SIGNAL UNBALANCE	<u>+</u> 0.3 dB from 110 kHz to 300 kHz.
RF voltmeter ECF I41	a) 150 Ω impedance : Set + 6.00 dBm on switches K4 ,set switch K9 to F < 10 kHz and connect the ECF 141 (switched to 150 Ω) to connector J2.	Signal unbalance :
	Connect the output of the ECF 141 to the RF volt- meter and measure the signal level relative to 0 dBm/600 Ω while varying the synthesized frequency from 200 Hz to 620 kHz.	- 50 dB
	b) 600 Ω impedance : Set + 0.00 dBm on switches K4, set switch K9 to F < 10 kHz and connect the ECF 141 (switched	
	to 600 Ω) to connector $(J2)$. Connect the output of the ECF 141 to the RF volt- meter and measure the signal level relative to 0 dBm/600 Ω while varying the synthesized frequency from 200 Hz to 110 kHz.	Signal unbalance : - 50 dB
8	HARMONIC AND NONHARMONIC CONTENT	
Spectrum analyser X-Y recorder ECF 136	a) 75 Ω impedance : Set + 10 dBm on switches $(K4)$ and connect the spectrum analyser to output $(J1)$, ensuring that the impedances are matched.	
	Measure the relative levels of the harmonic and nonharmonic components at various frequencies between 50 Hz and 1 MHz, switch $(F9)$ being set to F < 10 kHz for frequencies less than 10 kHz.	Harmonics at + 10 dBm : - 45 dB from 50 Hz to 300 Hz. - 55 dB from 300 Hz to 1 MHz.
	b) 150 Ω impedance :	Nonharmonics : - 60 dB
	Set + 10 dBm on switches $(K4)$ and connect the spectrum analyser to output $(J2)$, ensuring that the impedances are matched by switching the ECF 136 to 150 Ω (insertion loss 3.01 dB).	
	Measure the relative levels of the harmonic and nonharmonic components at various frequencies	Harmonics at + 10 dBm : - 50 dB
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Nº d'ESSAI TEST NUMBER	CONDITIONS	SANCTIONS RESULTS
	between 200 Hz and 1 MHz, switch (K9) being set to	41
	F < 10 kHz for frequencies less than 10 kHz.	Nonharmonics : - 60 dB
	c) 600 Ω impedance :	- 00 08
	Set + 10 dBm on switches $(K4)$ and connect the	
	spectrum analyser to output (JZ) , ensuring that the impedances are matched by switching the ECF	
	136 to 600 α (insertion loss 9.03 dB).	
	Measure the relative levels of the harmonic and	
	nonharmonic components at various frequencies	Harmonics at + 1
	between 200 Hz and 300 kHz, switch (K9) being set	- 50 dB Nonharmonics : -
	to F < 10 kHz for frequencies less than 10 kHz.	nonmarmonites
9	PHASE-NOISE	
Spectrum analyser	Set + 10 dBm on switches $(K4)$, select a 75 Ω impe-	
X-Y recorder ECF 136	dance on keyboard $(K5)$, and connect the spectrum	
EUF 130	analyser to $output(JI)$.	Phase-noise in a band :
	With switch $(K9)$ set to F < 10 kHz, measure the phase-	~ 85 dB at 100
	noise at 100 Hz, 1 kHz, 10 kHz and 100 kHz from	- 95 dB at 1 k
	carrier at various output frequencies.	- 110 dB at 10 k - 120 dB at 100k
	These measurements may also be carried out at the	
	150 Ω or 600 Ω output, using the ECF 136 adaptor.	
10	SQUARE-WAVE OUTPUT	
Oscilloscope	Use the oscilloscope to measure the rise and fall	Rise time : 300 r
	times of the square-wave signals at connector $(J3)$.	Fall time : 100 r
11	TRACKING OUTPUT	
RF voltmeter	a) Output level :	
Spectrum analyser X-Y recorder	Use the RF voltmeter to measure the level of the	Level :
X I TECOTOET	tracking signal available at connector $(J4)$.	+ 6 dBm/75 Ω ± 2
	b) Nonharmonic content :	
	Use the spectrum analyser to measure the relative levels of nonharmonic components of the tracking	N N
	signal.	Nonharmonics : -
12	AUXILIARY OUTPUT Z < 1 Ω	
Milliwattmeter	a) Output level :	
Spectrum analyser	Set a frequency of 10 kHz on switches $(K2)$ at a	
X-Y recorder	level of +0.00 dBm on switches (K4). Use the	Level : 0 dBm/75
	milliwattmeter to measure the level of the signal	
	at connector $(J8)$ for a 75 Ω load.	
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Nº d'ESSAI TEST NUMBER	CONDITIONS	SANCTIONS
		RESULTS
	If necessary, adjust this level by means of poten-	
	tiometer P2 of the Z < 1 Ω Amplifier subassembly (plate V-9).	
	b) Output level flatness :	
	Set + 0.00 dBm on switches (K4), set switch (K9)	
	to $F < 10$ kHz, and connect the milliwattmeter to	Level flatness :
	connector J8	\pm 0.5 dB from 50 Hz to
	Vary the synthesized frequency from 50 Hz to 1 MHz and measure the output level variation relative	200 Hz. + 0.3 dB from 200 Hz to
	to 0 dBm.	1 MHz.
	c) Harmonic and nonharmonic content :	
	Set + 10 dBm on switches $(K4)$ and connect the	Harmonics at 10 15
	spectrum analyser to output JB.	Harmonics at + 10 dBm : - 40 dB from 50 Hz to
	Measure the relative levels of the harmonic and	300 Hz. - 50 dB from 300 Hz to
	nonharmonic components at various frequencies	I MHz.
	between 50 Hz and 1 MHz, with switch $(K9)$ set to F < 10 kHz for frequencies less than 10 kHz.	Nonharmonics : - 60 dB
13	1 MHz REFERENCE OUTPUT	
RF voltmeter	Use the RF voltmeter to measure the level of the 1 MHz	Level :
	reference output at connector (J_6) for a load of 50 Ω .	550 mVrms/50 Ω ± 10 %
14		
14	MASTER OSCILLATOR STABILITY	
Frequency diffe-	Use the frequency difference multiplier to measure the	
rence multiplier	relative difference & F/F between the 5 MHz frequency	$\left \frac{\Lambda F'}{\Lambda F} - \frac{\Lambda F}{\Lambda F} \right < 3.10^{-6}$
Frequency	available at connector (J_6) and the 5 MHz signal from the frequency standard.	$\left \frac{\Lambda F}{F} - \frac{\Lambda F}{F}\right < 3.10^{-6}$
standard		after 24 hours of
	Leave the synthesizer switched on, and measure the	continuous operation.
	difference $\Delta F'/F$ between the two frequencies 24 hours later.	
	If necessary, recalibrate the internal Master Oscilla-	
	tor by means of capacitor C13 located on the Gonora	
	tion 10^0 Hz - 10^1 Hz - 10^2 Hz subassembly.	
15	EVIEDNAL DECEDENCE FORME	
	EXTERNAL REFERENCE FREQUENCY	
Oscilloscope Frequency	Connect the 5 MHz reference frequency from the fre-	
standard	quency standard to connector $(J5)$ on the synthesizer and to channel 1 on the oscilloscope.	
	Connect output (J_6) of the synthesizer to channel 2	
	of the oscilloscope, and check that the two signals	
	appearing on the screen are stationary relative to one	
	another as the level of the 5 MHz reference frequency applied to connector $(J5)$ is varied from 220 mVrms/	
la de la companya de Recordo de la companya	50 Ω to 1 Vrms/50 Ω .	
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CHAPTER VII

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PLATES, SCHEMATICS, PARTS LIST

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PLATE III_1

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2230A PRINCIPLE OF OPERATION



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PLATE IV-2

2230A _ REAR - PANEL DESCRIPTION