TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

TEST SET, NOISE LOADING, AN/GSM-161A (INCLUDING FILTERS)

This copy is a reprint which includes current pages from Changes 1-2. Title was changed by Change 1.

H E A D U A R T E R S , D E P A R T M E N T O F T H E A R M Y
SEPTEMBER 1972

Alternative Color Coding

for Mains Leads

(Blue - Black - Green/Yellow series)

WARNING: The color coding on mains leads is being changed to conform with international recommendations. During the change-over period, the instrument with which this manual is issued may be wired in either the old or new colors as follows:

	Old color code	New color code	Sleeve symbol
LINE (PHASE)	Blue	Brown	
NEUTRAL	Black	Blue	N
EARTH (GROUND)	Green/Yellow	Green/Yellow	

Note particularly that BLUE is line in the old coding and neutral in the new coding.

CHANGE

No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 2 December 1982

Operator's, Organizational, Direct Support, and
General Support Maintenance Manual
TEST SET, NOISE LOADING, AN/GSM-161A
(INCLUDING FILTERS)

TM 11-6625-1568-14-1, 18 September 1972, is changed as follows:

1. New or changed material is indicated by a vertical bar in the margin of the page.

2. Remove old pages and insert new pages as indicated below:

Remove Pages	*Insert Pages*
i	i
1-1 and 1-2	1-1 and 1-2
4-5 and 4-6	4-5 and 4-6
A-1	A-1
B-1 through B-38	B-1 through B-50

3. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

ROBERT M. JOYCE
Major General, United States Army
The Adjutant General

TECHNICAL MANUAL

HEADQUARTERS
DEPARTMENT OF THE ARMY

No. 11-66251568-14-1

WASHINGTON, DC, 18 September 1972

Operator's, Organizational, Direct Support, and General Support Maintenance Manual TEST SET, NOISE LOADING, AN/GSM-161A (INCLUDING FILTERS)

This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and content specified in AR 3103, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

CHAPTER A

INTRODUCTION

A.1 SCOPE

a. This manual describes Test Set, Noise Loading AN/GSM-161A hereinafter referred to as Marconi Instruments Model OA-2090A White Noise Test Set. This manual covers its installation, operation and organizational, direct and general support maintenance.

b. Throughout this manual, where appropriate, references are made to other publications which contain information applicable to the operation and maintenance of the Model CA-2090A. A complete listing of applicable reference publications is provided in appendix A.

c. The maintenance allocation chart appears in appendix B.

A.2 CONSOLIDATED INDEX OF ARMY PUBLICATIONS AND BLANK FORMS

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

A.3 MAINTENANCE FORMS, RECORDS, AND REPORTS

a. Reports of Maintenance and Unsatisfactory Equipment. Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System (TAMMS).

b. Report of Packaging and Handling Deficiencies. Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR735-11-2/DLAR 4140.55/NAVMATINST 4355.73/AFR 400-54/ MCO 4430.3E.

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/ MCO P4610.19C/DLAR 4500.15.

A.4 REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, N. J. 07703. In either case, a reply will be furnished direct to you.

A.5 ADMINISTRATIVE STORAGE

Administrative Storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in TM 740-90-1.

A.6 DESTRUCTION OF ARMY ELECTRONICS MATERIEL

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

A.7 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

If your AN/GSM-161A needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design.

Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, N. J. 07703. We'll send you a reply.

4.6 ORGANIZATIONAL MONTHLY PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Sequence No.	Item to be inspected	Procedure	References
1	Publications	Check to see that publications are complete, serviceable, and current.	DA Pam 310-1
2	Modification work orders	Check to see that all URGENT MWO's have been applied and that all NORMAL MWO's have been scheduled.	DA Pam 310-1
3	Completeness	Check equipment for completeness and general condition.	
4	Cleanliness	Clean exterior surfaces of equipment.	Para 4.7
5	Preservation	Inspect equipment to determine that it is free of bare spots, rust, and corrosion	Para 4.7 and 4.8
6	External receptacles	Inspect external receptacles for breakage and for firm seating.	
7	Meter glass	Inspect front panel glass window for damaged housing, broken glass, physical damage, dust, or moisture.	
8	Cables	Inspect external cables for cuts, cracked, or gouged jackets, fraying, or kinks.	
9	Hardware	Inspect all exterior hardware for looseness and damage. The Model OA2090A cover, carrying handle, and all bolts and screws must be tight and not damaged.	
10	Operation	During operation, be alert for any abnormal indications.	

4.7 CLEANING

Inspect the exterior of the Model 2090A. The exterior surface must be free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

b. Remove grease, fungus, and ground-in dirt from the exterior surfaces; use a cloth dampened (not wet) with trichlorotrifluoroethane.

CAUTION

Be careful when cleaning around plugs and jacks; dirt forced into jacks will cause malfunction.

c. Remove dust or dirt from plugs and jacks with a brush.

CAUTION

Do not press on the meter face (glass) when cleaning; the meter may become damaged.

d. Clean the front panel, meter, and control knobs; use a soft, clean cloth. If necessary, dampen the cloth with water; mild soap may be used for more effective cleaning.

4.8 RUSTPROOFING AND PAINTING

a. Rustproofing. When the finish on the Model 2090A has become badly scarred or damaged, rust and corrosion can be prevented by touching up the bare surfaces. Use No. 000 sandpaper to clean the surface down to the bare metal. Obtain a bright, smooth finish.

b. Painting. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on. the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 43-0118.

4.9 LUBRICATION INSTRUCTIONS

a. Do not use excessive amounts of Lubricating Oil, Instrument (OAI) and do not allow connections to become greasy.

b. Be sure that lubricants and points to be lubricated are free from sand, grit, or dirt. Before lubrication, clean all surfaces to be lubricated; use a lint-free cloth dampened with trichlorotrifluoroethane. Keep cleaning compound off surrounding parts.

c. Lubrication intervals designated are for daily 8 hour periods of operation. For longer periods of operation, intervals should be shortened.

CHAPTER 1

GENERAL INFORMATION

1.1 FEATURES

White Noise Test Set OA 2090A permits the measurement of intermodulation products and noise in multi-channel telephone link equipment. A noise signet generated by the instrument is used to simulate full traffic conditions in any number of channels up to 2700. This signal is applied to the baseband circuit of the equipment under test and the noise in a narrow slot is compared in the loaded and unloaded states. The instrument conforms with the recommendations of the Xth Plenary 1963 Assembly of CCIR held at Geneva.

The instrument consists of two units: a Noise Generator type TF 2091 and a Noise Receiver type TF 2092A. The generator includes a selection of high- and low-pass filters to restrict the noise to the required bandwidth and bandstop filter to create a slot within the band. The receiver has a selection of narrow band-pass filters corresponding to the generator slots and a meter and attenuator to measure the relative noise level as the generator slot is switched in and out.

A standardizing noise source is fitted to the receiver to facilitate receiver sensitivity standardization remote from the generator.

OA 2090AR is a rack-mounting version of the test set comprising Noise Generator type TF 2091R and Noise Receiver type TF 2092AR and is otherwise identical with OA 2090A,

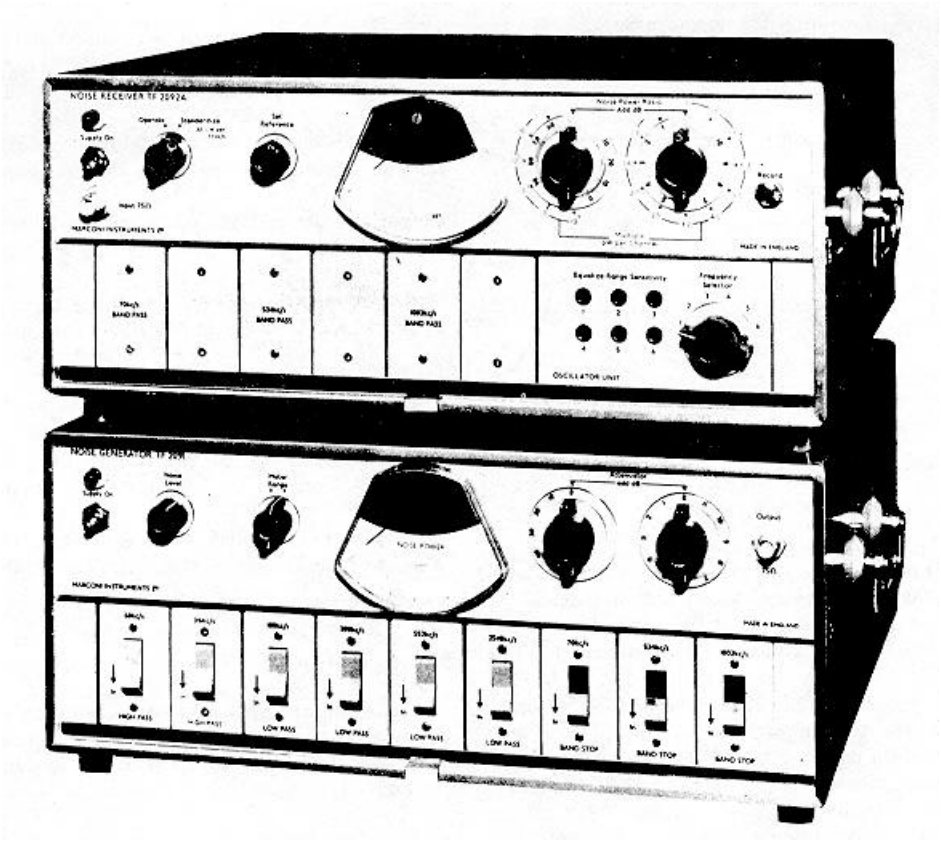


Figure 1.1 White Noise Test Set OA 2090A

1.2 DATA SUMMARY

Noise generator

The generator may be loaded with up to 9 filters. These will include high-pass and low-pass filters corresponding to the baseband of the system under test, and band-stop filters for selected slot frequencies. The type numbers of those available are listed in Appendix 1.

Noise band characteristics: white noise is generated over the frequency band from below 12 kHz to above 12388 kHz. When a high-pass filter and low-pass filter are in circuit the r. m. s. noise level within the pass band does not vary by more than 1 dB. The noise is attenuated by at least 25 dB at all frequencies lower than 20, below the high-pass cut-off frequency, and higher than 10% above the low-pass cut-off frequency.

Some deterioration in this figure may be experienced with systems of 1800 channels and above when the generator is set to provide maximum output (e. g. at 17.6 dBm output with 1800 channels), owing to the saturation of the output amplifier. Errors of this type may be minimized by using the procedure described in Sect. 2.4.

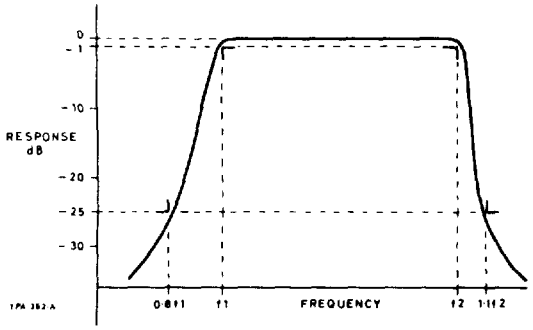


Figure 1.2 Generator noise band characteristic

Stop band characteristics: the noise is attenuated by more than 80 dB over a bandwidth of at least 3 kHz, and by at least 3 dB at frequencies of (0.02 f_c + 4) kHz from the centre frequency f_c kHz.

Noise power output: the reference level is adjustable to above -15 dBm per kHz bandwidth up to a maximum total power of +20 dBm into 75Ω. The monitor measures total power and has two ranges, 0 to +10 dBm (black range) and +10 to +20 dBm (red range). (dBm means dB relative to 1 mW.)

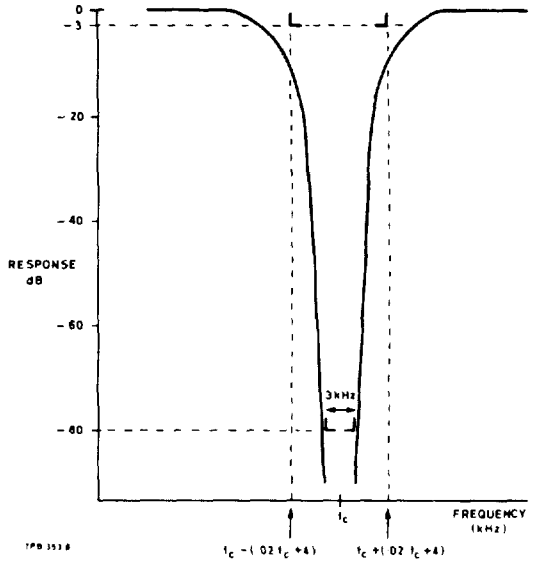


Figure 1.3 Generator stop band characteristic

Monitor accuracy: +1 dB between +5 and +10 dBm and between +15 and +20 dBm. ± 2 dB between 0 and +5 dBm, and between +10 and +15 dBm.

Output impedance: 75 Ω. Return loss greater than 20 dB with 6 dB or more attenuation inserted.

Output attenuator: 51 dB in steps of 1 dB and 10 dB. Accuracy: 1% of attenuator setting +0.1 dB.

Power requirements: 95 V to 130 V a. c. or 190 V to 260 V a. c.; 45 Hz to 500 Hz. Consumption 50 VA.

Dimensions and weight

Height	Width	Depth
7 5/8 in	18 5/8 in	17 in
(19. 5 cm)	(47.5 cm)	(43.2 cm)

Weight (without filters): 26 lb (11.8 kg).
Weight of one filter: 1 lb 2 oz (480 gm).

Noise receiver

The instrument may be loaded with up to 6 band-pass filters and 6 local oscillator boards. The type numbers of those available are listed in Appendix 1.

Effective bandwidth: nominally 1 kHz.

Sensitivity: better than -115 dBm per kHz of noise signal bandwidth for a usable meter deflection.

The gain of each reception band is adjustable to give equal sensitivity for the six bands.

Input attenuator: direct reading in noise power ratio and pW noise per 3.1 kHz channel bandwidth. Range: 0 to 111 dB in 10 steps of 10 dB and 11 steps of 1 dB. Accuracy: +1% of attenuation value +0. 1d: Calibration: 0 to 101 dB for noise power ratio; 1 pW to 13 x 105 pW noise power per 3.1 kHz channel bandwidth. Input impedance: 75 Q. Return loss: when switched to 'operate' greater than 20 dB for all positions of input attenuator when the indicated level exceeds 0.1 pW per channel. When switched to 'standardize' greater than 26 dB.

Recorder output: suitable for use with 1 mA recorder.

Standardizing noise source level: 1 pW or -90 dBm per 3.1 kHz channel bandwidth (-95 dBm per kHz bandwidth). Noiseband characteristic: noise is generated over the band 10 kHz to 13 MHz. Within these frequency limits the level does not vary by more than ±0. 25 dB. Noise power accuracy: +0.5 dB at 1 pW per channel.

Power requirements: 95 V to 130 V or 190 V to 260 V; 45 Hz to 500 Hz. Consumption 15 VA approximately.

Dimensions: As generator.
Weight (without filters): 25 lb (11.4 kg).
Weight of one filter: 1 lb 2 oz (480 gm).

Overall inherent intermodulation and noise better than 75 dB (or 70 dB for measuring channels below 50 kHz) measured as a 'back-to-back' noise power ratio i. e., with the generator output TM 11-6625-156814-1 connected directly to the receiver input, and with the power level not greater than that recommended by CCIR as the loading for the bandwidth in use.

Accessories supplied

Two BNC plugs, Greenpar type GE 37570C30.

One telephone plug, Bulgin type P38.

For bench mounting OA 2090A: two Mains Leads type TM 7052.

Or, for rack-mounting OA 2090AR: two free sockets, Bulgin type P430/SE.

Accessories available

High-pass Filters type TM 7728 series, Low-pass Filters type TM 7720 series, together with Bandstop Filters type TM 7729 series and Band-pass Filters type TM 7730 series. Local Oscillator boards type TM 7793, 4, and 5 series to suit the system under test. Further information is contained in Appendix 1 to this manual.

Matching Transformer type TM 5955; 75 Q unbal. to 150 Q bal.

Matching Transformer type TM 5955/1; 75 n unbal. to 140 Q bal.

Connecting Lead type TM 4726/260; 6 ft long with BNC plug at each end.

Front-panel Cover type TM 7958/3.

Front-panel Cover type TM 7957; provides stowage for leads .

Rack Mounting Kit type TM 8270; to fit one unit into a 19 in rack.

CHAPTER 2

OPERATION

2.1 PRINCIPLES OF OPERATION

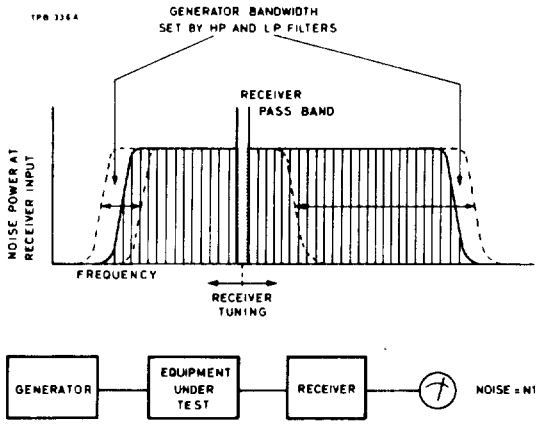
Frequency division multiplex cable and radio relay systems may carry as many as 2700 different telephone channels with a 4 kHz spacing in a total bandwidth of approximately 12.5 MHz.

In such systems it is essential that intermodulation and thermal interference in any channel, due to the telephone traffic in other channels, is kept to a minimum. The former is produced mainly by non-linearity and phase distortion and is audible to a subscriber as interference resembling random noise.

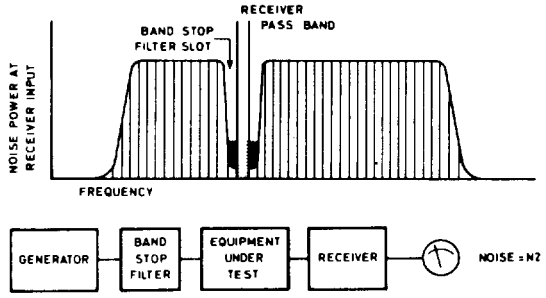
If white noise (that is random noise of uniform frequency distribution) occupying the traffic bandwidth is applied to the system at a suitable power level, a fully loaded telephone system will be very closely simulated. Furthermore, if a filter with a very narrow stop band is interposed between the white noise source and the system, the conditions then existing will be equivalent to a fully loaded system except for one quiet channel. A receiver tuned to the quiet channel may be used to indicate the noise level produced by intermodulation of the components of the white noise occupying the remainder of the frequency band. The method outlined is closely similar to, say, a 600 channel system in which 599 channels are in use by subscribers and the remaining channel is used to listen to the noise produced by the 599 telephone · conversations.

Measurements are normally made at three widely separated channel frequencies. The highest frequency is more sensitive to phase distortion and intermodulation in the r.f. and i.f. circuits under test. Undesired mixer frequency components (crossover distortion) are most noticeable at the middle frequency and non-linearity at the lowest frequency. The effects become more marked as the number of channels increase because the channel frequencies being measured become more separated.

To make a measurement, white noise of the appropriate bandwidth and power level is applied from the noise generator with all slot filters 'out' to the system under test. The output of the system is connected to the noise receiver,



(1) Receiver samples generator noise.



(2) Band-stop filter switched in. Receiver samples intermodulation noise in slot.

(3) Noise power ratio = N_1 / N_2.

Figure 2.1 Principle of operation

which is switch tuned to the frequency of the bandstop filter it is desired to employ for producing the quiet channel. Receiver sensitivity should be adjusted to give a convenient meter reading when the receiver input attenuator is set to maximum attenuation. The band-stop filter is switched in and attenuates the noise in a narrow portion of the generator band by more than 80 dB.

To find the noise level in this narrow slot at the receiving end of the radio link or system, the noise receiver input attenuator must be adjusted to

restore the original meter deflection. The difference between the initial and final attenuator setting, in decibels, referred to as the 'noise power ratio' gives a measure of the amount of intermodulation and thermal noise produced in the system.

2.2 PREPARATION FOR USE

Installation

TF 2091 and TF 2092A are electrically independent and need not be mounted close together It is possible to arrange them at opposite ends of a radio link, assuming the operators can communicate with each other.

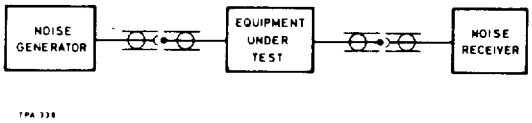


Figure 2.2 Connections to equipment

TF 2091R and TF 2092AR are rack-mounting versions to fit a standard 19 in rack.

In common with other apparatus employing semiconductor devices, the performance of the instruments may be affected if they are subjected to excessive temperatures. Therefore, completely remove the plastic covers if supplied, and avoid using the instruments over, or near to, hot equipment. Keep them well away from transmitter r.f. output fields.

Power supply

Normally the test set is supplied with the main selector switch on each instrument set for supply voltages within the range 190 to 260 V. For input voltages in the range 95 to 130 V the selector switch on the rear panel must be moved to the 115 V setting from the previous 230 V setting. Do this by unscrewing the plate securing the switch button, pressing the switch to the required position, reversing the plate and replacing it to hold the switch in the new position. Change the mains fuses from 100 mA to 250 mA in the noise receiver, and from a to 1 A in the noise generator for use on the lower voltage range.

Attach a suitable 3 pin plug to the mains lead, noting that the wires have the standard colour coding:

Connection	*Colour*	*Sleeve*
Line (phase)	Blue	----
Neutral	Black	Black with white 'N'
Earth (ground)	Yellow/Green	Yellow with green earth symbol

Mechanical meter zero

If necessary adjust the meter zero, with the supply switched off, by small adjustments to the screw above the meter window.

Connecting to the equipment under test

The test set is designed for use with equipment of 75 Q impedance and is fitted with BNC sockets. It is essential that 75 I cable be used.

Connect the generator OUTPUT socket to the input of the equipment under test and the output of the equipment to the INPUT socket of the receiver. When making a test on a link system the generator may have to be remote from the receiver, in which case the test procedure requires two operators with intercommunication. Alternatively, the 'go' and 'return' circuits can be looped so that the generator and receiver are on the same site (see Fig. 2.3) to indicate go/no-go. Further testing would be necessary to determine the faulty link.

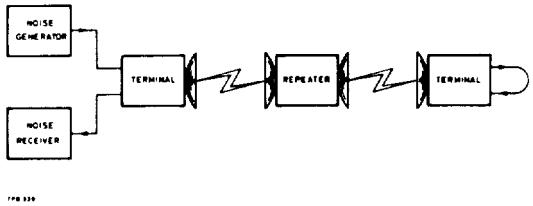


Figure 2.3 Loop testing of radio link

The apparatus may be used immediately upon switching on, but maximum stability is not reached for several minutes.

2.3 CONTROLS

Generator

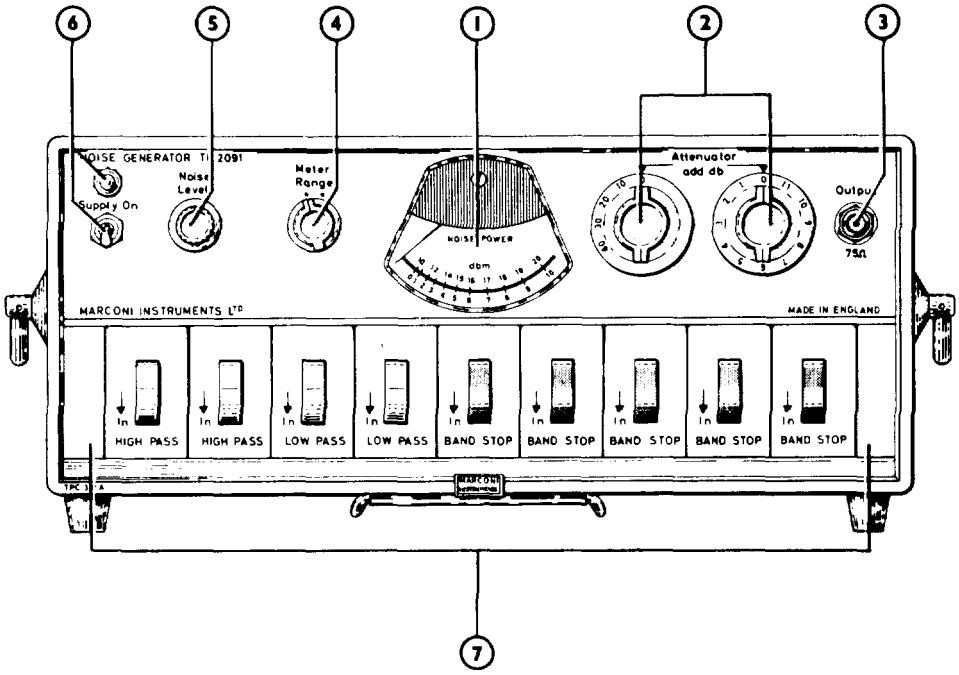


Figure 2.4 Generator controls

(1) METER. Indicates available power in decibels relative to 1 mW in a 75 0 load at the OUTPUT socket. Actual power output is given by the meter reading less the sum of the ATTENUATOR dial readings.

(2) ATTENUATOR controls. Adjust output in 10 dB and 1 dB steps.

(3) OUTPUT socket. BNC type.

(4) METER RANGE switch. Use black position with black scale on meter for setting standard power outputs up to 10 dBm. Use red position with red scale for 10 to 20 dBm outputs.

(5) NOISE LEVEL control. Adjusts the output level of the noise source. Set to give the standard power output appropriate to the bandwidth.

(6) SUPPLY switch and pilot lamp.

(7) FILTERS. High-pass and low-pass (grey switches) determine noise bandwidth; band-stop (red) create slots in the noise band.

Receiver

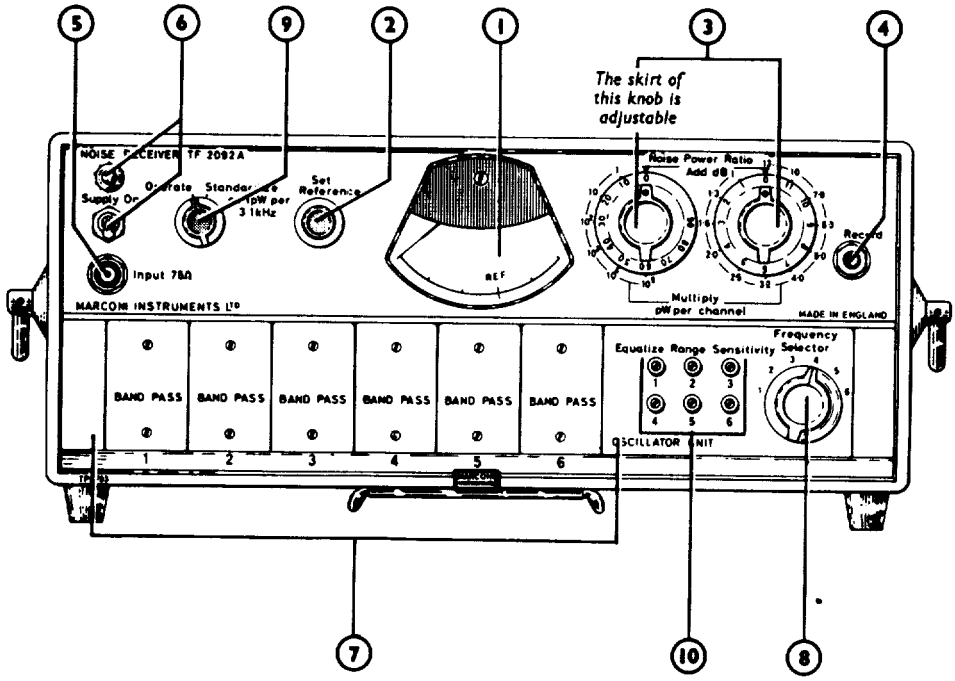


Figure 2.5 Receiver controls

(1) METER. Indicates the reference level for noise power, ratio measurement.

(2) SET REFERENCE control. Adjusts receiver gain to give a standard meter reading.

(3) INPUT ATTENUATOR controls. Adjusts the receiver input in 10 dB and 1 dB steps. Calibrated in pW per channel and noise power ratio. To facilitate direct reading the coarse attenuator skirt is adjustable independent of the attenuation setting.

(4) RECORD jack. Accepts 2-pole telephone plug for connection to external indicator or recorder

(5) INPUT socket. BNC type.

6)) SUPPLY switch and pilot lamp.

(7) FILTERS determine receiver pass band centre frequency, which must coincide with generator band-stop filter frequency.

(8) FREQUENCY selector switch. Selects the band-pass filter and appropriate oscillator.

(9) OPERATE/STANDARDIZE switch. Selects input or standardizing noise source signal to feed into INPUT attenuators. In the STANDARDIZE position the input socket is terminated in 75 n.

(10) EQUALIZE RANGE SENSITIVITY controls. Allows each channel to be set to the same sensitivity.

2.4 SETTING UP THE NOISE GENERATOR

The output of the noise generator must be terminated in 75 i2 when the instrument is being set up. Normally the equipment under test will provide the termination.

1) Switch in a high-pass and a low-pass filter to give the noise bandwidth required by the equipment under test as shown in Table 2.1. Do not use more than one high-pass and one low-pass filter at a time. Switch out all the band-stop filters.

2) Switch the generator meter range switch to the appropriate position using the NOISE LEVEL control to set to the level as indicated by the Table 2.1. If the generator is connected at an interconnection point which has a relative power level of, for instance, -33 dBr, then the generator output ATTENUATOR is set to 33 dB. (The output noise level is equal to the indicated meter reading minus the attenuator reading.)

Consider an example: a 600 channel system. From Table 2.1 the bandwidth is 60 to 2540 kHz, the NOISE LEVEL is 12.8 dBm0, the METER RANGE is red, and the relative noise level is -33 dBr. To achieve these conditions switch in the 60 kHz high-pass and 2540 kHz low-pass filters by depressing the filter switches. Switch the METER RANGE switch to red and adjust the NOISE LEVEL control to give an indication on the meter of 12.8 dBm on the red scale. Switch in 30 dB on the coarse ATTENUATOR and 3 dB on the fine. The generator is now giving the required output.

For systems of 1800 channels and above set the NOISE LEVEL control so that the indicated level does not exceed 15 dBm and adjust the attenuator reading to give the required noise level. By this means a sharp noise cut-off characteristic is maintained.

Example: Consider a 1800 channel system. From 2.1 the meter indication should be 17.6 dB on the red scale and the relative level should be -33 dBr.

3) Set the NOISE LEVEL control so that indicated level is less than 15 dBm as required by the above, say 14.6 dBm and switch in (17.6 14.6) dB, i.e. 3 dB less attenuation by selecting 30 dB only on the coarse ATTENUATOR. If a non-standard bandwidth is used adjust for a meter reading corresponding to the reading derived from the formulas below.

These represent the correct power for applying to a point of zero relative level in the system and are derived from the expressions:

(-15 + 10 logo0N)	dBm for 240 channels or above,
(-1 + 4 log10N)	dBm for 12 to 240 channels, where N equals the number of channels.

For systems using more than 300 channels the output must always be set to at least 10 dBm

TABLE 2.1 CCIR recommended levels

System capacity, channels	Generator bandwidth kHz	Meter indication, dBm0*, set by NOISE LEVEL control	METER RANGE switch setting	Output power density dBm per kHz	CCIR test-tone level per channel at baseband interconnection points dBr
12	12-60	3.3		-13.5	-36
24	12-108	4.5		-15.3	-36
36	12-156	5.2		-16.4	-36
48	12-204	5.7		-17.1	-36
60	12-252	6.1	BLACK	-17.7	-36
	or 60-300				
120	60-552	7.3		-19.6	-36
240	60.1052	8.8		-21.2	-36
300	60-1300	9.8		-21.1	-36
600	60-2540	12.8		-21.1	-36
960	60-4028	14.8		-21.2	-36
	or 316-4188		RED	-21.1	-33
1800	316-8204	17.6		-21.4	-33
2700	316-12388	19.3		-21.5	-33

**dBmO means dB relative to zero reference level (single channel test tone level)*

as shown on the meter (red range), since the high frequency performance of the meter circuit is better on the red range; lower output levels can then be obtained by using the ATTENUATOR controls.

Note: For most purposes the peak to r. m. s. ratio of white noise is not important. Sometimes, however, statistical studies may be made requiring a ratio of at least 12 dB. In these cases, where a wide dynamic range is required, the noise generator' meter indication should not exceed 15 dBm, as above this level an increasing degree of peak clipping takes place.

2.5 SETTING UP THE NOISE RECEIVER FOR MEASURING NOISE POWER RATIO

When the generator has been set as in Sect. 2.4 and the receiver has been fitted with the appropriate band-pass filters and oscillators, (for selection see Table 2.1 and method of fixing Sect. 4.14 and 4.15), connect the equipment as in Fig. 2.6a. The receiver is set up to measure noise power ratio (n.p.r.) as follows:

(1) Turn all EQUALIZE RANGE controls fully clockwise using a screwdriver.

(2) Turn the SET REFERENCE control to midtravel.

(3) Choose one of the selected measurement frequencies by means of the FREQUENCY SELECTOR switch.

(4) Switch the OPERATE/STANDARDIZE switch to OPERATE.

(5) Switch the fine INPUT ATTENUATOR to indicate 0 dB, that is with the symbol 0 on the skirt vertical and coincident with the black indicating arrow.

(6) Adjust the coarse INPUT ATTENUATOR until the meter reading is close to the REF mark on the meter.

(7) Switch the FREQUENCY SELECTOR to the other selected frequencies in turn and note which gives the minimum meter reading. Leave the switch at the position of minimum reading.

(8) Adjust the SET REFERENCE control to give a meter reading on the reference mark.

(9) Switch the FREQUENCY SELECTOR to the other frequencies and, without touching the SET REFERENCE control, adjust the EQUALIZE RANGE SENSITIVITY presets to give a meter reading at the same reference mark. (Use only the EQUALIZE RANGE SENSITIVITY control for the particular range, e.g., adjust EQUALIZE RANGE SENSITIVITY control 4 when FREQUENCY SELECTOR is switched to range 4.)

(10) Leaving the control knob in the same switch position, adjust the calibrated coarse ATTENUATOR control skirt to have the symbol 0 vertical, i.e., coincident with the black indicating arrow.

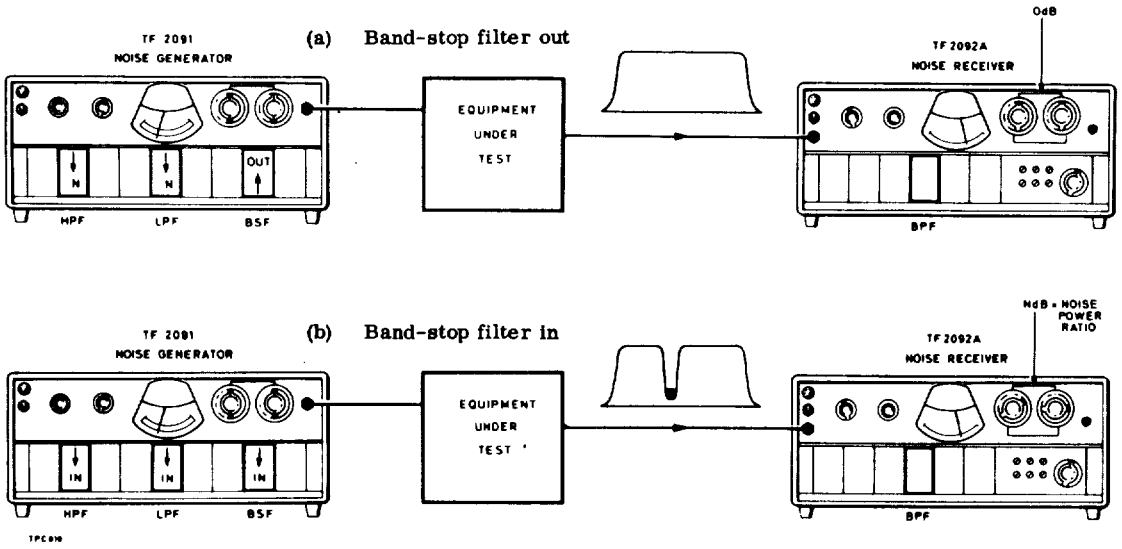


Figure 2.6 Measuring noise power ratio

The skirt is turned by pushing it towards the front panel and rotating it. Click positions will be. felt and it will be found that the required position can be 'clicked' into. With the ATTENUATOR controls set in this position it will be noted that the indicated n.p.r. is 0 dB.

The receiver is now set up to measure noise power ratio with the chosen range having a common reference point.

2.6 MEASUREMENT OF NOISE POWER RATIO

Having completed the previous Sect. 2.5, n. p. r. at any of the band-stop filter frequencies in the bandwidth of the generator can be measured as follows:

(1) Turn the receiver FREQUENCY SELECTOR switch to the frequency at which the noise power ratio is to be measured. The BAND SELECTOR switch positions are numbered to correspond to the six band-pass filter positions.

(2) Switch IN the generator band-stop filter of the same frequency as selected in (1), see Fig. 2.6 The meter reading on the receiver will drop because of the loss of power in the slot

(3) Choose whichever of the following two systems is appropriate.

Transmission line system

When third order non-linear distortion dominates use the NOISE LEVEL control on the generator to restore the generator meter reading to its initial value. (This is likely to apply for relatively long transmission systems and when the loading level is relatively high.)

When second order non-linear distortion dominates do not readjust. (This is likely to apply for relatively short transmission systems and subnormal signal loading levels.)

Radio system

In general do NOT readjust the meter reading unless the difference in meter reading level is significant.

(4) Adjust the receiver coarse and fine INPUT ATTENUATOR controls so that the receiver meter indication is restored to the reference mark. The noise power ratio is obtained by adding the coarse and fine INPUT ATTENUATOR dial readings, i.e. sum the figures on the two ATTENUATOR skirts indicated by the black arrows to obtain the n.p.r. in dB's.

(5) Switch to the other band-stop filter frequencies and repeat (1) to (4). Since the sensitivity has been made equal on all chosen ranges it is not necessary to check the reference level when changing ranges.

The noise power ratio of an equipment or link, measured in this way, is the ratio of (i) the portion of the noise representing a multi-channel signal that occurs in a narrow bandwidth, to (ii) the inherent and intermodulation noise in the same bandwidth when signals are not applied in that band but are applied over the remainder of the multichannel frequency range. Part (i) of the ratio also includes inherent and intermodulation noise, but this is negligible in comparison with the noise representing the signal.

The noise receiver should not be operated with the SET REFERENCE control in the extreme counter-clockwise direction, i.e. at minimum gain, as the control is very sensitive in this position. The method outlined above will eliminate this possibility.

Try not to make a measurement with the noise receiver coarse attenuator in the fully clockwise position. Under this condition the white noise receiver input is connected via the fine attenuator only to the input of the band-pass filter, and this is a poor match for the system under test outside the pass band frequencies. Under normal operating conditions the noise receiver input attenuation will be greater than a setting of 0.1 pW on the pW scale, and so the return loss will be as stated in the data summary, Sect. 1.2. (The coarse attenuator has two unmarked positions which are x 10^{-1} and x 10^{-2} pW respectively, or 10 dB each, to facilitate these low level measurements.)

Use of RECORD output

Although the meter is the primary means of observing output on the receiver, the RECORD jack on the front panel permits the use of a recorder to monitor the output. The direct voltage available for a recorder is up to 2 V e.m.f. at a source impedance of several kΩ. Most 1 mA recorders are suitable.

2.7 DERIVING RATIO OF TEST-TONE LEVEL TO NOISE

It is possible to convert the noise power ratio, measured as in Sect. 2.6, into a ratio of test-tone level to noise (inherent and intermodulation) in a single channel. (This is a baseband measurement only. The multiplex noise must be checked separately and added on to get the figure for the system.)

Taking the multi-channel signal power which the generator has been adjusted to simulate, the proportion of it falling in the width of one channel is calculated. By expressing this in dB below test-tone level and adding it to the noise power ratio, the level of inherent and intermodulation noise in one channel below test-tone level is obtained. Expressed as it is, in dB, this is the required ratio. Thus the ratio of test-tone level to psophometrically weighted unwanted noise in one channel is given by:

N + 10 log (A/B - P + 2.5) decibels where

N = noise power ratio in dB,

A = bandwidth of multi-channel signal in kHz,

B = width of one channel in kHz,

P = multi-channel signal power simulated by the generator in dB above test-tone level.

2-8 SETTING UP THE RECEIVER TO MEASURE ABSOLUTE NOISE

(1) Turn all EQUALIZE RANGE SENSITIVITY controls fully clockwise.

(2) Switch OPERATE/STANDARDIZE switch to STANDARDIZE (the test equipment under test is automatically terminated in 75 /).

(3) Switch FREQUENCY SELECTOR switch to one of the frequencies to be standardized.

(4) Switch coarse and fine INPUT ATTENUATORS so that 1 pW is indicated on the red scale engraved round each attenuator control by the red coated button head on the pointer of each attenuator knob. In this initial setting the pointer of each knob indicates an engraved black spot.

(5) Adjust SET REFERENCE for a meter reading near the reference mark.

(6) Switch the FREQUENCY SELECTOR to the other selected frequencies in turn and note which gives the minimum meter reading. Leave the switch in this position.

(7) Adjust SET REFERENCE control to give a meter reading on the reference mark.

(8) Switch the FREQUENCY SELECTOR to the other frequencies and, without touching the SET REFERENCE control, adjust the EQUALIZE RANGE SENSITIVITY presets to give a meter reading at the same reference mark. (Use only the EQUALIZE RANGE SENSITIVITY preset for the particular range, e.g. adjust EQUALIZE RANGE SENSITIVITY control 4 when FREQUENCY SELECTOR is switched to range 4.) The receiver is now set to measure noise power by means of the calibration on the INPUT ATTENUATORS provided the SET REFERENCE control is not disturbed.

2-9 MEASURING ABSOLUTE NOISE

Having set up the receiver (Sect. 2.8) continue as follows:

(1) Switch the INPUT ATTENUATOR controls to give an indication of 13 x 105 pW.

(2) Switch OPERATE/STANDARDIZE switch to OPERATE.

(3) Without adjusting the SET REFERENCE control adjust the coarse and fine INPUT ATTENUATOR to restore the reading on the meter to the reference mark.

(4) The input level is then found by multiplying the indicated, red, figures together, the answer being in unweighted pW/channel. For conversion from unweighted noise power per 3.1 kHz channel to psophometrically weighted power, voltage into 600 Q and FIA-Line and C-Message weighting, see Figs. 2.10 and 2.11.

2-10 OUT-OF-BAND TESTING

The test set may be supplied with filters for out-of-band test frequencies, particularly those recommended by the CCIR which include 50, 270, 331, 607, 1499, 3200, 4715 and 9023 kHz. This is intended to enable maintenance measurements to be made under actual traffic conditions. The method involves the measurement of noise, including intermodulation products, in narrow bands whose centre frequencies are approximately

TABLE 2.2

Typical filter frequencies for various system capacities in kHz

No. of channels	Bond limits		In-bond test channels			Out-of-bond test channels	
	High-pass	Low-pass	Lower	Centre	Upper	Lower	Upper
12	12	60	27	40	50	-	-
24	12	108	40	70	105	-	-
36	12	156	40	70	105	-	-
48	12	204	40	105	185	-	-
60	12	252	40	185	245	-	-
60	60	300	70	185	270	50	331
120	60	552	70	270	534	50	607
240	60	1052	70	534	1002	50	-
300	60	1300	70	534	1248	50	1499
600	60	2660	70	1248	2438	50	3200
960	60	4028	70	2438	3886	50	4715
960	316	4188	534	2438	3886	270	4715
1200	316	5564	534	3886	5340	-	-
1800	316	8204	534	3886	8002	-	-
2700	316	12388	534	3886	12150	-	-

10% above the upper frequency limit and 10% below the lower limit of the traffic band. Measurements above the signal band are generally more sensitive to changes of thermal and intermodulation noise in the r. f. and i. f. parts of the equipment, whereas measurements below the band are more sensitive to changes in modulators and demodulators.

(1) Before making a measurement, the receiver must be standardized against the noise source, see Sect. 2.8.

(2) Turn the INPUT ATTENUATOR controls to indicate 13 x 105 pW and connect the receiver input to the system under test. It may be necessary to match the impedance of the test set to that of the system under test. A band-stop filter at the out of-band frequency should be connected in the input to the system to ensure that the out-of-band power at the receiver input is coming only from the system under test. The out-of-band frequency to be used can be found from Table 2.2.

(3) Switch OPERATE/STANDARDIZE switch to OPERATE.

tore the meter reading to the reference mark by adjusting the INPUT ATTENUATOR controls. The out-of-band noise power at the receiver input is found by multiplying the indicated red figures together, the units being unweighted pW per channel bandwidth.

For continuous monitoring it is convenient to use a pen recorder connected to the RECORD socket. If a two-channel system is available plotting the traffic level on the other channel will show if the variation of spurious noise is due to traffic level (i.e. intermodulation noise) or fading (thermal noise).

2.11 SYSTEM COMPONENT TESTING

The high output of the noise generator provides facilities to test video equipment, wideband amplifier, passive apparatus etc., in conjunction with the noise receiver, or an h. f. spectrum analyser or a tunable level meter.

In applications such as this the noise power ratio of the equipment under test may be nearly as good as that of the white noise test set.

Fig. 2.7 shows the effect of the difference between the back-to back n.p.r. and the actual n.p.r. reading, and gives the correction factor to add to the measured value.

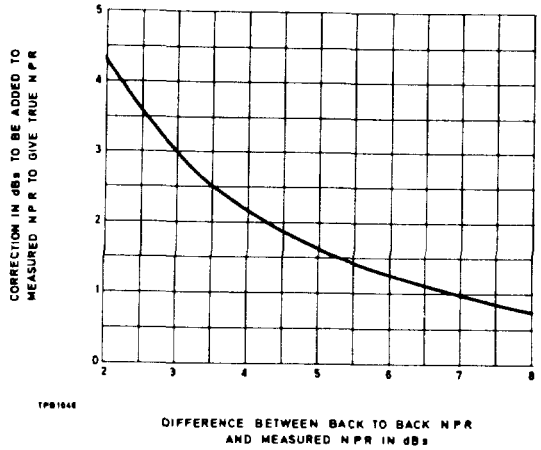


Figure 2.7 Correction factor

2.12 MEASURING RESIDUAL SYSTEM NOISE

The residual system noise (or baseband intrinsic noise ratio) is a measure of the idle noise due to thermal noise carrier leaks, spurious f.m. in oscillator etc. It is defined as the ratio of noise in a test channel with all channels loaded to the noise in the test channel with all channel loading removed.

The procedure is therefore to measure the n.p.r. using Sect. 2.5 and 2.6. Then replace the noise generator with a 75 Q load. Reset the receiver meter to the reference mark using the receiver input attenuator. The difference between the two readings is a measure of the residual noise of the system.

The difference between measured n.p.r. and residual system noise is a measure of the amount of spurious noise in the system caused by intermodulation distortion and crosstalk.

In addition to a measurement of residual noise a useful check is to examine the baseband signal using a spectrum analyser, such as mt type OA 1094 series with an L. F. Extension Unit TM 6448, to ensure that the residual noise measurement is not in error due to spurious signals (e.g. excessive carrier leaks, etc.)

2.13 ESTABLISHING THE SAFETY MARGIN OF A SYSTEM

The level of noise loading recommended by the CCIR, Table 2.1, simulates 'busy hour' traffic conditions. A graph of noise power ratio against noise loading will establish the safety margin in the system.

1) Connect the noise generator to the transmitter and the noise receiver to the receiver of the system under test.

2) Apply a noise signal equivalent to the minimum noise loading in the working region of the system and measure the n.p.r. (Sects. 2.5, 2.6.).

Although the amount of thermal noise is generally constant, the proportion of thermal noise to r. f. signal level will vary for different r. f. levels; a different curve results (see Fig. 2.8). The level of r.f. signal should therefore be that for which the safety margin is required.

3) Repeat 2) increasing the noise loading in steps of say 1 dB and plot the curve of n.p.r. against noise loading. As can be seen from Fig. 2.8, the n. p. r. improves to a certain point as the proportion of thermal noise decreases; after this point intermodulation effects have an increasing influence. A point is reached, called the 'crash point' when the n. p. r. is worse than that permissible for the system. The safety margin of the system can now be found by comparing the CCIR recommended level (Table 2.1) with the crash point.

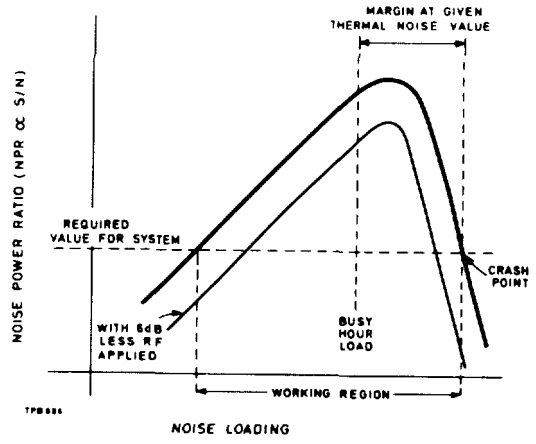


Figure 2.8 System noise loading

2.14 USE OF CONVERSION CHARTS

In this manual there are several conversion charts. These are:

dBm to watts (Fig. 2.9)

The Noise Generator, type TF 2091, is calibrated in dBm; this chart facilitates conversion to and from pW to extend the instrument's versatility.

To use this chart the power in watts can be read directly from the chart by looking at the adjoining column and reading off the power for a particular value in dBm.

pW to pWp, dBmp, mVp, dBa and dBrnc (Figs. 2.10 and 2.11)

Fig. 2.10 covers a power range of 10^7 to 1 and is intended for approximate conversions. Use it by laying a rule, or straight edge, across the columns; the pW scale is repeated to ensure accurate alignment of the rule.

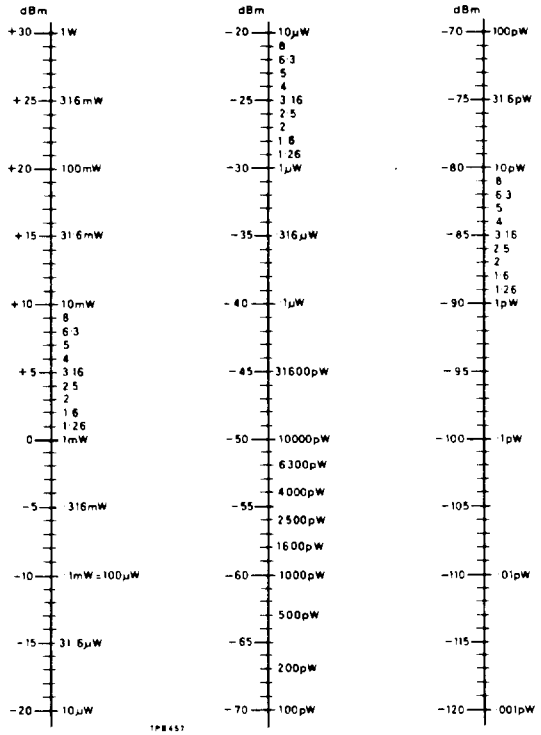


Figure 2.9 dBm to watts conversion chart

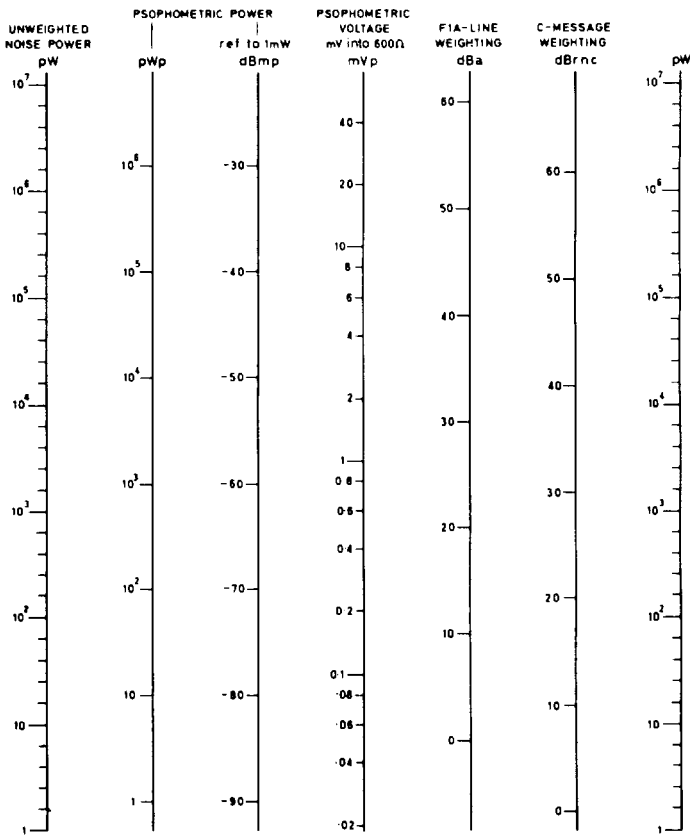


Figure 2.10 pW to pWp, dBmp, mVp, dBo and dBrnc conversion chart (Power range 107 to 1)

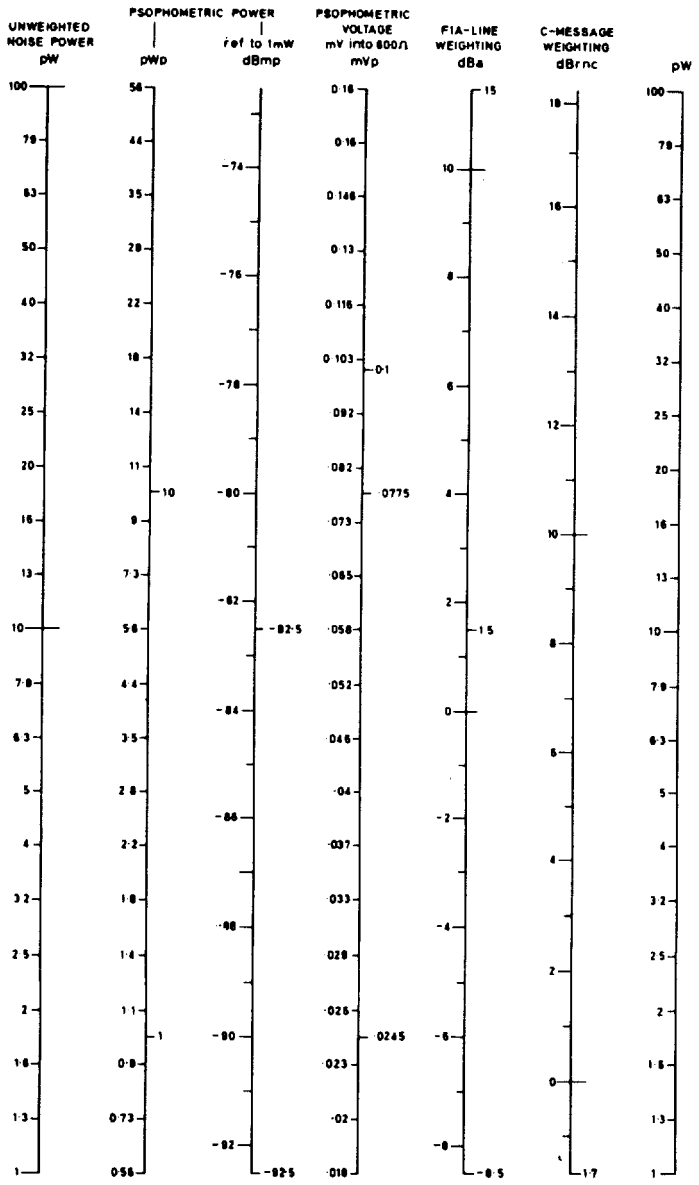


Figure 2.11 pw to pWp, dgmp, mVp, dBa and dBrnc conversion chart (Power range 100 to 1)

Fig. 2.11, which covers a power range of 100 to 1, is used in the same way. It is intended for interpolation after an approximate conversion has been obtained from Fig. 2.10.

Example 1: to convert 10^4 pW into dBrnc.

Using Fig. 2.10, 10^4 pW is seen to be equivalent to between 30 and 40 dBrnc. From Fig. 2.11, 10 pW is equivalent to 8.2 dBrnc. The value of 104 pW in dBrnc is therefore 38. 2 dBrnc.

Example 2: to convert 6. 3 x 103 pW to mVp.

Using Fig. 2.10, 6. 3 x 103 pW is seen to be equivalent to between 1 and 2 mVp. From Fig. 2.11, 6. 3 pW corresponds to 0. 046 mVp, and 63 1W to 0. 146 mVp. Hence in this example 6.3 x 103 pW is equivalent to 1.46 mVp since from Fig. 2.10 the answer lies between 1 and 2 mVp.

N.P.R. distribution graph (Fig. 2.12)

This graph is of the CCIR recommended test tone levels for single channel against noise power ratio. If the system satisfies the CCIR recommendation, the test tone signal to channel noise ratio will be equal to the value obtained from the graph.

Example: with a 2700 channel system and an n.p.r of 50 dB, what is the expected test tone signal to channel noise ratio?

The point of coincidence of the 2700 channel curve and 50 dB n.p.r. is 67 dB on the signal to channel noise axis. Therefore 67 dB is the required value.

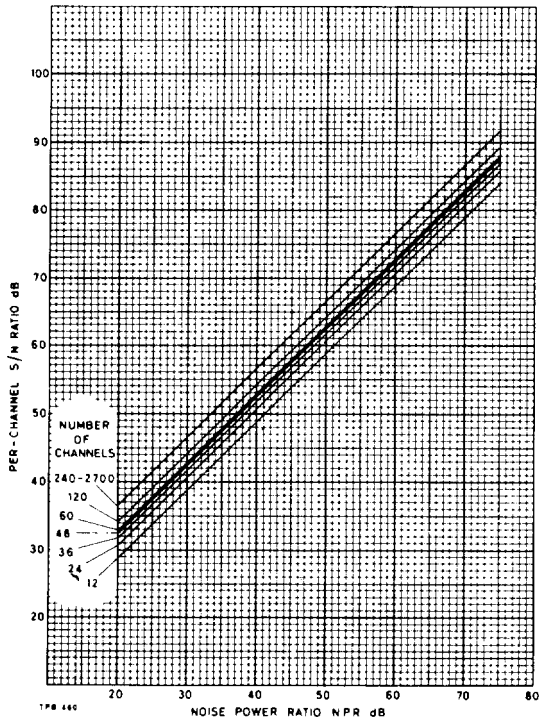


Figure 2.12 N.P.R. distribution graph

dB to nepers (Fig. 2.13)

This chart is read by looking at the separate digits and adjusting the decimal point to the appropriate value. It can be used in two ways as follows:

Example 1: to convert 124 dB to nepers (approx.)

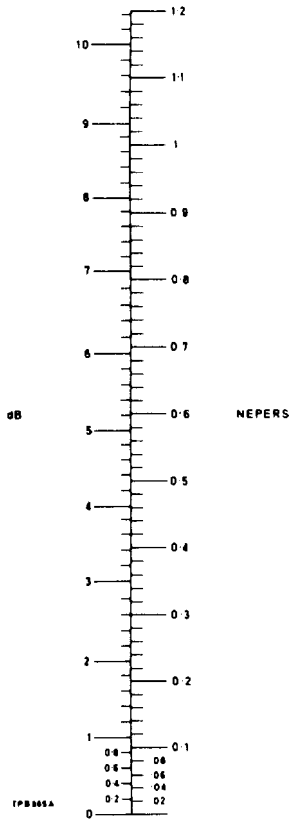


Figure 2.13 dB to nepers conversion chart

From the chart, 1.24 dB is approximately equivalent to 0.14 Np, therefore 124 dB is approximately equivalent to 14 Np.

Example 2: to convert 124 dB to nepers (precisely)

10 dB	=	1.15 Np
. .100 dB	=	11.5 Np
2 dB	=	0.23 Np
. .20 dB	=	2.3 Np
4 dB	=	0.46 Np

124 dB is therefore equivalent to

11.5 +2.3 + 0.46 = 14.3 Np

To convert a ratio expressed in decibels into a ratio expressed in nepers multiply by 0.1151.

Conversely to convert a ratio expressed in nepers into a ratio expressed in decibels multiply by 8. 688.

CHAPTER 3

TECHNICAL DESCRIPTION

3.1 NOISE GENERATOR TF2091

Noise Source TM 7637-*see Fig.* 6.3

A white noise junction diode, MR200, is used to develop random noise with a substantially flat spectrum over the entire range of 10 kHz to 12.5 MHz. The diode is reverse-biased, and a very small current from the 100 V supply flows through it, controlled by the potentiometer RV200.

VT200 is a buffer amplifier presenting 75 : to the output. RV201 presets the gain to determine the noise power output level (1 pW per 3. 1 kHz bandwidth). RV203 is the front panel NOISE LEVEL control.

Low Level Amplifier TM 7638-*see Fig.* 6.4

From the noise source unit the signal passes to the low level amplifier, a three-stage high gain circuit. The first and the second stages have feedback loops to give stability and a wider frequency response.

The third stage is an emitter follower to provide a low output impedance. The input and output impedances are 75 R and the overall gain of the amplifier is 50 dB.

High Level Amplifier TM 7639-*see Fig.* 6.5

From the filters the noise signal is amplified by six transistors in the high level amplifier. The first stage VT400 and VT401 resembles in action the feedback pair in the low level amplifier. VT402 is a common emitter amplifier followed by two emitter followers, VT403 and VT404, in cascade which provide the drive for the power amplifier VT405. From the high level amplifier the noise is fed to the noise generator output via the coarse and fine attenuators.

Meter Circuit TM 7732-*see Fig.* 6.6

Noise output is connected to the OUTPUT terminal via the band-stop filters, and its level is monitored at the output by the meter circuit.

The input to the meter circuit is fed firstly to an approximate 10 dB pad which is controlled by the METER RANGE switch.

VT500 is the buffer amplifier which is used to isolate the diode circuitry as no intermodulation, such as would be caused by a meter diode, can be allowed after the band-stop filters. The diodes MR500, MR501 act as a voltage doubler.

Following the rectifiers are two resistive meter range circuits selected by the METER RANGE switch.

With the generator output loaded in 75 2 the meter indicates the true output power into the attenuator since the band-stop filters precede the meter circuitry.

Power Supply TM 7594-*see Fig.* 6.2

The input transformer has two primary windings which are arranged in series or parallel by switch SB. With switch SB in the 230 V setting mains supplies of 190 to 260 V can be used with the windings in series, and in the 115 V setting supplies of 95 to 130 V can be used with

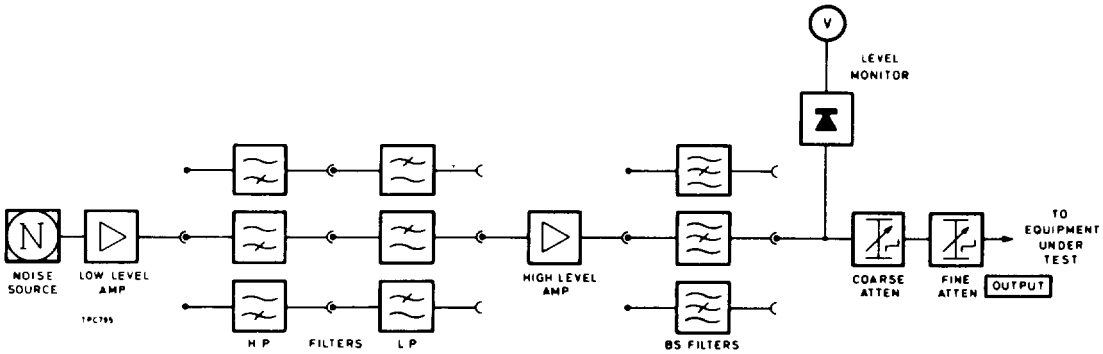


Figure 3.1 Generator block diagram

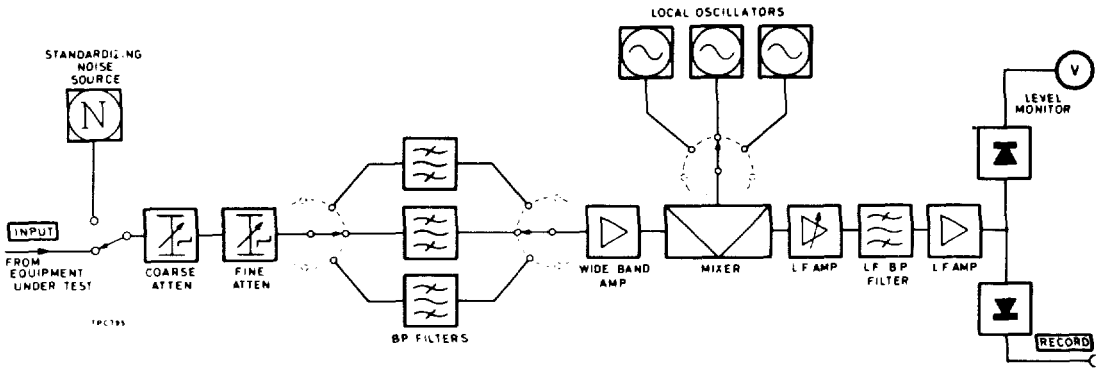


Figure 3.2 Receiver block diagram

parallel windings. Both line and neutral supply connections are fused. The neon pilot lamp is across one half of the primary winding.

The secondary is centre-tapped and drives a series regulator circuit through full-wave rectifiers MR100 and MR101. The regulated output is at 54 V, and two other potentials are available; 25 V tapped from the 54 V line, and 100 V obtained by superimposing 45 V on the 54 V supply. The 45 V line is derived from the secondary voltage by a half-wave rectifier MR102, and is stabilized by MR103, 104 and 105 in series.

VT1 is the series stabilizer, and MR106 and 107 provide a reference potential for the emitter of VT101, the error signal amplifier. RV1O1 sets the output voltage level; hum and output fluctuations pass via VT100 to the base of VT1. RV100 is adjusted for minimum ripple and RV102 adjusts the 25 V line voltage.

Resistor R1 is fitted to discharge C1 when the supply is switched off. Resistor R3 is fitted to discharge C1 when fuse FS3 blows; this minimizes the risk to transistor VT1 should the fuse be replaced immediately after failure.

3.2 NOISE RECEIVER TF2092A

Standardizing Noise Source TM 7670-*see Fig.* 6.11

A semiconductor noise diode, MR700, has a preset current controlled by RV700 passing through it in the reverse biased condition. As a result the diode emits noise in the range 10 kHz to 13 MHz, which is then fed through a common emitter stage, VT700. The noise output level is adjusted in calibration by selecting the value of R705 in the emitter stage, the output at the high end of the frequency spectrum being controlled by the capacitor, C707. With the output terminated in 75Ω a noise reference level of -90 dBm per 3.1 kHz bandwidth (1 pW per channel) is produced.

Wide Band Amplifier TM 8815 -*see Fig.* 6.14

After passing through the INPUT ATTENUATORS and a band-pass filter determined by the FREQUENCY SELECTOR switch, the noise input from the equipment under test reaches a three stage wide band amplifier. Two feedback pairs provide voltage amplification; the third stage, an emitter follower, provides impedance matching. The input impedance is 750Ω, the output 75Ω.

The first stage is designed for a low level of inherent noise, and the last for a low impedance to drive the mixer circuit which follows. Two negative feedback loops give high stability and help to achieve the wide frequency response. The gain of the amplifier is preset to 30 dB by RV200 in the second feedback loop.

Local Oscillator Box TM 8750

The local oscillator box contains six slots for plug-in local oscillator boards, see below and the following circuitry.

The FREQUENCY SELECTOR switch SC selects the local oscillator board required, connecting the HT to the appropriate board and the local oscillator signal to SKT600.

The EQUALIZE RANGE SENSITIVITY potentiometers numbered 1 to 6 on the front panel, are selected by switch SC and are effectively

variable resistors in series with the SET REFERENCE control. The resistors have minimum resistance (which is the condition for maximum sensitivity) when the front panel controls are fully clockwise.

Local Oscillator Boards TM 7793/4/5 series

A wide selection of channel frequencies is available; each channel requiring a band-pass filter, a band-stop filter, and a local oscillator board to operate.

The local oscillator board circuitry is basically as in Fig. 3.3. Frequency requirements affect both the circuit configuration and component values.

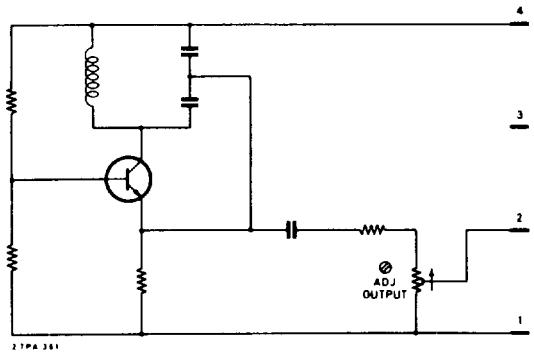


Figure 3.3 Typical oscillator circuit

In operation, when a particular local oscillator board is selected by the FREQUENCY SELECTOR switch, approximately 20 V is applied to contact 4 and the output is taken from contact 2. The local oscillator is tuned to the centre frequency of the channel. The output level is preset by means of a potentiometer.

Mixer TM 7672-*see Fig.* 6.15

The mixer presents an impedance of 75 12 at PL300 to the signal from the wide band amplifier. A high-pass filter (C302, L300, C303) attenuates all frequencies below 10 kHz before the mixer to reduce any unwanted noise introduced in the Wide Band Amplifier.

The local oscillator signal, at the centre frequency of the r.f. pass band, is fed to the emitter of VT300 via SKT300 and the emitter follower VT301. RV300 adjusts the current in VT300 for optimum mixing, and the 1 kHz lowpass filter (C309, C310 and L301) removes unwanted local oscillator and noise input frequencies in the output of the mixer. The low frequency output is taken from SKT301 (5.1 ki2 output resistance) to the 1. f. amplifier TM 8816.

L.F. Amplifier TM 8816-*see Fig.* 6.16a and b

The first stage of the amplifier VT400, VT401, VT402 provides an input impedance of 5.1 kQ at plug PIA00. The output signal from this stage is of low impedance and passes through the equalization potentiometers and the SET REFERENCE gain control to plug PL401.

The second stage is a conventional common emitter stage with an output resistance of 8. 2 ki, supplying the signal for the audio band-pass filter TM 7774 via SKT400.

The audio band-pass filter has a bandwidth 500 Hz to 1 kHz: since there are 2 sidebands the effective bandwidth is 1 kHz. This filter determines the bandwidth of the receiver.

The final amplifying stage, VT404, VT405, VT406, provides the output at SKT401 with overall a. c. feedback via R425 and d. c. feedback via R420.

MR401, MR402 is part of the a. c. feedback loop, with the 100 mA meter across pins 402, 403. The Zener diode, MR400, limits the transient swing on the collector of VT406 to stop undue meter deflection.

VT407 is used as an emitter follower supplying the voltage doubler network MR403, MR404 and the resultant d.c. is smoothed by the C416, R428, C417 combination. A 1 mA d.c. recorder can be driven by the resulting smoothed d.c.

Power Supply TM 7710-*see Fig.* 6.10

The input transformer has two primary windings which are arranged in series or parallel by switch SB. With switch SB in the 230 V setting mains supplies of 190 to 260 V can be used with the windings in series, and in the 115 V setting supplies of 95 to 130 V can be used with parallel windings. Both line and neutral supply connections are fused. The neon pilot lamp is across one half of the primary windings.

One of the secondary windings is centretapped and the output taken through MR100 and MR101 to the series regulator circuit formed by the voltage reference Zener diode MR102, and the three transistors VT1. VT100, VT10O1. The other secondary winding produces 100 V d. c. from a half-way rectifier MR103 and stabilized by a chain of Zener diodes MR104, llR105, MR106, MR107, MR108. This voltage is used to provide bias for the noise diode in the Standardizing Noise Source TM 7670.

RV100 is provided to allow adjustments to be made for minimum ripple, and RV101 sets the output level at 25 V.

The reservoir capacitor, C1, is fitted with a parallel resistor to discharge it when the supply is s-witched off a necessary safeguard in a semiconductor instrument.

The 25 V line is fused. This fuse must not be removed or replaced until the reservoir capacitor has had time to discharge.

3.3 FILTERS

There are four main groups of filters used in the test set which all have an input impedance of 75 52.

a)	High-pass	These are used in the generator and are individually switched.
b)	Low-pass	
c)	Band-stop	
d)	Band-pass	This is used in the receiver. Filters in this group have 750Ω output impedance and are not individually switched.

In all the filters the circuitry, which consists of combinations of inductors and capacitors, is contained on printed boards. The switched filters contain a bulkhead behind the front panel to which is attached the rocker mechanism actuating two micro-switches. In the 'Filter-in' position the filter is switched between input and output sockets. In the 'Filter-out' position the circuit is replaced by a shorting link with a 20 pF capacitor to overcome the mismatch due to the inductance of the link.

Four configurations of filters are illustrated, one from each group. Other configurations are used, depending on the frequency and steepness of the cut-off characteristic.

(a) High-pass

These filters are based on an m-derived Darlington filter and consist of three capacitance-coupled series tuned inductive/capacitive shunt arms.

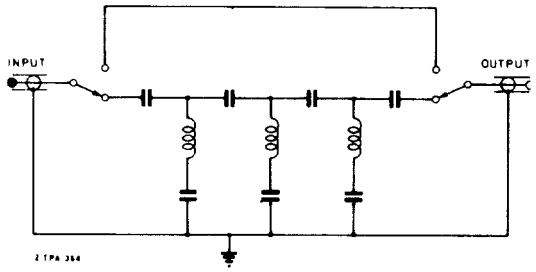


Figure 3.4 Typical high-pass filter circuit

(b) Low-pass

These filters are based on Cocci insertion loss design of Chebyshev type filters, and consist of three parallel tuned circuits in the series arm together with four capacitive shunt arms.

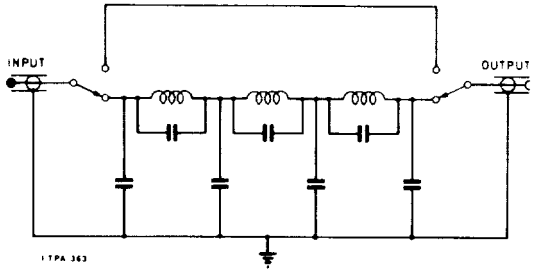


Figure 3.5 Typical low-pass filter circuit

(c) Band-stop

These filters are Darlington type design; the actual configuration depends on frequency, but three series-tuned arms are common to all types. All the circuits are nominally tuned to the centre frequency.

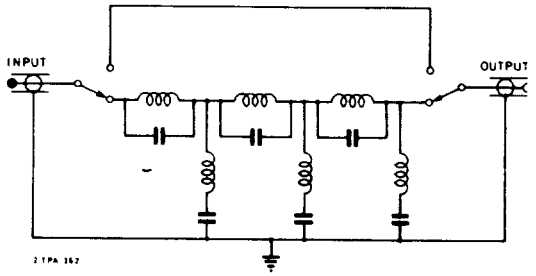


Figure 3.6 Typical band-.stop filter circuit

(d) Band-pass

Low frequency filters of this group employ a Cauer-Darlington type with pre-distortion for dissipation. The parallel-tuned circuits in the series arm are tuned to frequencies outside the pass band in order to give a sufficiently steep cut-off characteristic. This is the filter illustrated.

High frequency filters employ a Cohn narrowband pre-distorted maximally flat design, consisting of six parallel-tuned shunt arms capacitively coupled.

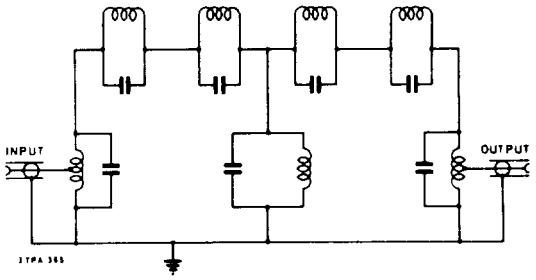


Figure 3.7 Typical band-pass filter circuit

CHAPTER 4

MAINTENANCE

4.1 SCOPE OF MAINTENANCE

a. The maintenance duties assigned to the operator of the Type 1A7A are listed below together with a reference to the paragraphs covering the specific maintenance functions. The duties assigned do not require tools or test equipment other than those issued with the equipment.

(1) Operator' s daily preventive maintenance checks and services (para 4.4).

(2) Operator' s weekly preventive maintenance checks and services (para 4.5).

(3) Cleaning (para 4.7).

b. The maintenance duties assigned to the organizational maintenance repairmen of the equipment are listed below, together with a reference to the paragraphs covering the specific functions. The duties assigned do not require tools or test equipment other than those issued with the equipment.

(1) Organizational monthly preventive maintenance checks and services (para 4.6).

(2) Rustproofing and paint (para 4.8).

4.2 PREVENTIVE MAINTENANCE

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, reduce downtime, and assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 4.4 through 4.7 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 4.4 and 4.5) outline functions to be performed at specific intervals. These checks and services are designed to maintain Army equipment in a combat-serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the charts indicate what to check, how to check, and the normal conditions; the References column lists the paragraphs that contain detailed repair or replacement procedures. If the defect cannot be remedied by the operator, a higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with instructions given in TM 38-750.

4.3 PREVENTIVE MAINTENANCE CHECKS AND SERVICES PERIODS

Preventive maintenance checks and services of the Model OA 2090A are required daily, weekly, and monthly.

a. Paragraph 4.4 specifies the checks and services that must be accomplished daily, or under the special conditions listed below:

(1) Before the equipment is taken on a mission.

(2) When the equipment is initially installed.

(3) When the equipment is reinstalled after removal for any reason.

(4) At least once a week, if the equipment is maintained in standby condition.

b. Paragraphs 4.5 and 4.6 specify additional checks and services that must be performed weekly and monthly. Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 4.6) once each month. A month is defined as approximately 30 calendar days of 8-hour-per-day operation. If the equipment is operated 16 hours a day, the monthly preventive maintenance checks and services should be performed at 15-day intervals. Adjustment of the maintenance interval must be made to compensate for any unusual operating conditions. Equipment maintained in a standby (ready for immediate operation) condition must have monthly preventive maintenance checks and services. Equipment in limited storage (requires service before operation) does not require monthly preventive maintenance.

4.4 OPERATOR' S DAILY PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Sequence No.	Item to be inspected	Procedure	References
1	Model OA 2090A	Check equipment for completeness and general condition.	
2	Exterior surfaces	Clean exterior surface of equipment.	Para 4.7
3	External receptacles	Inspect external receptacles for breakage and for firm seating.	
4	Meter glass	Inspect front panel glass window for damaged housing, broken glass, physical damage, dust, or moisture.	
5	Knobs, controls, and switches.	During operation (Item 6), check knobs, controls, and switches for proper mechanical action. Action must be positive, without backlash, binding, or scraping.	
6	Operation	During operation, be alert for any abnormal indications.	

4.5 OPERATOR'S WEEKLY PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Sequence No.	Item to be inspected	Procedure	References
1	Cables	Inspect external cables for cuts, cracked, or gouged jackets, fraying, or kinks.	
2	Hardware	Inspect all exterior hardware for looseness and damage. The model OA 2090A cover, carrying handle, hinges, and all bolts and screws must be tight and not damaged.	
3	Preservation	Inspect equipment to determine that it is free of bare spots, rust, and corrosion. If these conditions exist, refer to a higher category maintenance for repair.	Para 4.7 and 4.8

4.6 ORGANIZATIONAL MONTLHLY PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Sequence No.	Item to be inspected	Procedure	References
1	Publications	Check to see that publications are complete, serviceable, and current.	DA Pam 310-4
2	Modification work orders	Check to see that all URGENT MWO' s have been applied and that all NORMAL MWO' s have been scheduled.	DA Pam 310-7
3	Completeness	Check equipment for completeness and general condition.	
4	Cleanliness	Clean exterior surfaces of equipment	Para 4.7
5	Preservation	Inspect equipment to determine that it is free of bare spots, rust, and corrosion.	Para 4.7 and 4.8
6	External receptacles	Inspect external receptacles for breakage and for firm seating.	
7	Meter glass	Inspect front panel glass window for damaged housing, broken glass, physical damage, dust, or moisture.	
8	Cables	Inspect external cables for cuts, cracked, or gouged jackets, fraying, or kinks.	
9	Hardware	Inspect all exterior hardware for looseness and damage. The Model OA 2090A cover, carrying handle, and all bolts and screws must be tight and not damaged.	
10	Operation	During operation, be alert for any abnormal indications.	

4.7 CLEANING

Inspect the exterior of the Model 2090A. The exterior surface must be free of dust, dirt, grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

Warning: Prolonged breathing of cleaning compound is dangerous; provide adequate ventilation. Cleaning compound is flammable; do not use near a flame. Avoid contact with the skin; wash off any that spills on the hands.

b. Remove grease, fungus, and ground in dirt from the cases; use a cloth dampened (not wet) with Cleaning Compound (Federal stock No. 7930-395-9542).

c. Remove dust or dirt from plugs and jacks with a brush.

Caution: Do not press on the meter face (glass) when cleaning; the meter may become damaged.

d. Clean the front panel, meter, and control knobs; use a soft, clean cloth. If necessary, dampen the cloth with water; mild soar may be used for more effective cleaning.

4.8 RUSTPROOFING AND PAINTING

a. Rustproofing. When the finish on the Model 2090A has become badly scarred or damaged, rust and corrosion can be prevented by touching up the bare surfaces. Use No. 000 sandpaper to clean the surface down to the bare metal. Obtain a bright, smooth finish.

b. Painting. Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning and refinishing practices specified in TB 746,10.

4.9 LUBRICATION INSTRUCTIONS

a. Gasoline should not be used as a cleaning fluid for any purpose. When the equipment is overhauled or repairs are made, clean the parts with cleaning compound.

b. Do not use excessive amounts of Lubricating Oil, Instrument (OAI) (FSN 9150-6646518) and do not allow connections to become greasy.

c. Be sure that lubricants and points to be lubricated are free from sand, grit, or dirt. Use cleaning compound to clean all parts. Before lubrication, clean all surfaces to be lubricated; use a lint-free cloth dampened with cleaning compound. Keep cleaning compound off surrounding parts.

d. Lubrication intervals designated are for daily 8-hour periods of operation. For longer periods of operation, intervals should be shortened.

4.10 GENERAL

Semiconductor devices are used throughout the test set and, although they have inherent long term reliability and mechanical ruggedness, they are easily damaged by overloading, reversed polarity and heat or radiation. Avoid prolonged soldering, strong r.f. fields or short circuits. Do not use insulation testers. Always allow a few seconds for the h.t. lines to discharge before attempting any operation on the internal components.

It may be desirable after some time to clean and lubricate the switch contacts, using benzine or white spirit (not carbon tetrachloride) and lubricating with a suitable lubricant such as 1% petroleum jelly in white spirit.

4.11 FUSES

All the fuses are set in the rear panel. The noise generator has four: two supply fuses rated at ½ A for 240 V or 1 A for 110 V, and two h.t. fuses, of 50 mA and ½ A rating.

The noise receiver has three fuses, two supply fuses of 100 mA (or 250 mA for 110 V supplies) and a 250 mA h.t. fuse.

It is not necessary to remove the case or cover to reach the fuses but it is essential to switch off the supply, unplug the supply lead and wait at least 30 seconds before fitting a new fuse.

4.12 REMOVING THE CASE

The case is held on by four 2 BA screws in the back. The rack-mounting version has top and bottom covers secured by a screw at each corner. Generator and receiver have similar covers or cases; the bottom plate of the case is separately detachable by undoing six screws, four of which also secure the feet.

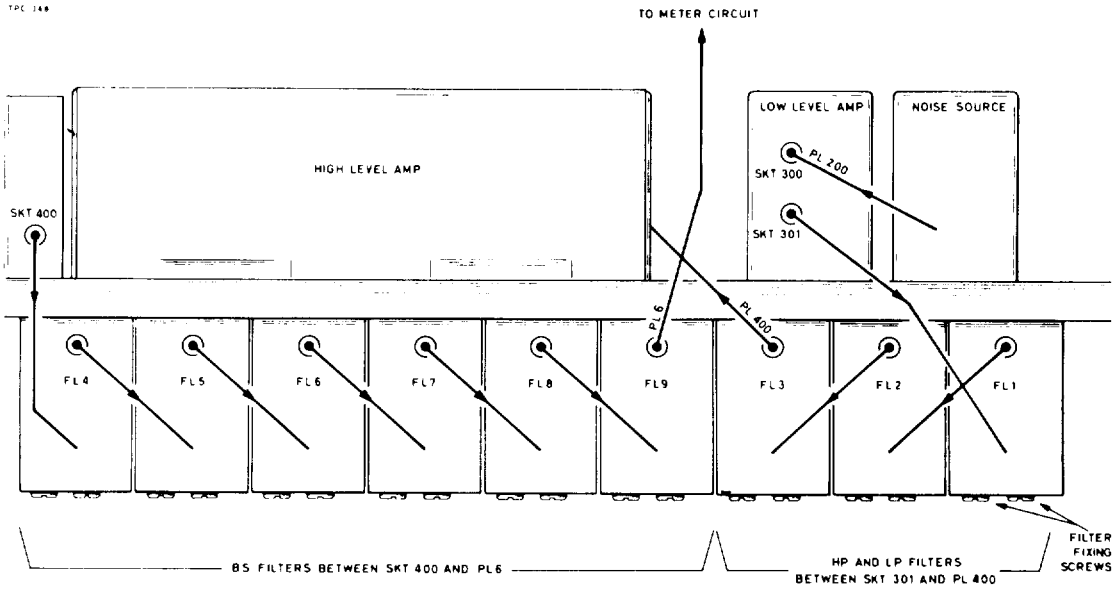


Figure 4.1 Generator filter connections

4.13 FITTING GENERATOR FILTERS

The noise generator can accommodate a selection of low-pass, high-pass and band-stop filters, up to a total of nine. High-pass and low pass filters are connected in cascade between SKT301 on the low level amplifier and PL400 on the high level amplifier as shown in Fig. 4.1. Band-stop filters are fitted in cascade between SKT400 on the high level amplifier and PL6.

Switch off the supply and take out the mains plug. Remove the bottom plate of the case.

If there is a space, remove the blank panel unit after undoing the single fixing screw; if not, remove the unwanted filter. Each filter is held in place by two long spring-loaded captive screws passing through the body of the filter into the chassis. Noise generator filters make electrical connection by means of a socket and trailing plug; Fig. 4.1 shows the correct connections for each type of filter, and these must be observed. High pass and low-pass filters come before the high level amplifier and band-stop filters come after it.

Note: Do not undo the screws in the front panels of the filters or blank panels.

4.14 FITTING RECEIVER FILTERS

The noise receiver can accommodate up to six band-pass filters which are connected to adjacent pairs of plugs from the oscillator unit as shown in Fig. 4.2.

Switch off the supply, and take out the mains plug. Remove the bottom plate of the case. The position for the new filter will be occupied by either an old filter or a blank panel at the front and a cable clip at the rear, which must be removed.

Filters are attached by two long spring-loaded captive screws passing through the bodies of the filters into the chassis; blank panels and cable clips are held by short screws into the same holes in the chassis as are used for mounting the filters.

Screw the new filter into place. Each filter position has its own pair of leads which carry sleeves with numbers corresponding to the six positions. On the back of each filter are two BNC sockets, labeled INPUT and OUTPUT. The leads come from the frequency selector switch box as shown in Fig. 4.2; all the INPUT leads originate from one slot, and the OUTPUT leads from another.

Note: Do not undo the screws in the front panels of the filters or blank panels.

For example, a filter fitted in No. 2 position will have leads marked '2'; the lead to its INPUT socket originates from the slot labeled FILTER INPUT LEADS and the lead to the OUTPUT socket from the slot labeled FILTER OUTPUT LEADS. A filter connected the wrong way round will not

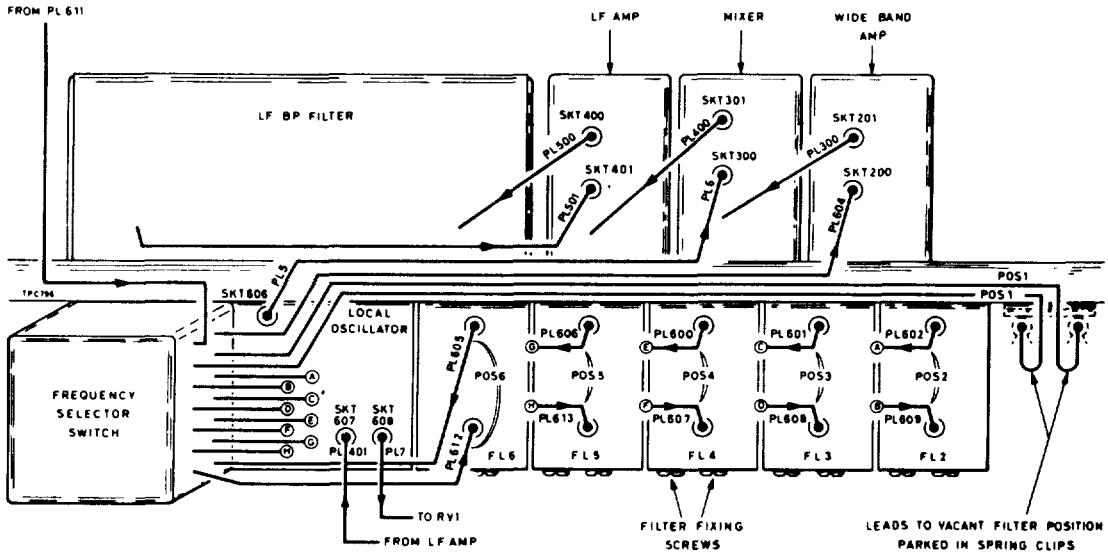


Figure 4.2 Receiver filter connections

function. Note that each band-pass filter has an associated local oscillator board which must also be fitted in the appropriate position. (See Fig. 4.3.)

Attach the cable clip to one of the tapped holes in the rear panel. Never leave cables loose inside the case.

4.15 FITTING RECEIVER LOCAL OSSCILATOR BOARDS

Switch off the supply, and take out the mains plug. With the bottom plate of the case or dustcover removed, the oscillator box which contains the FREQUENCY SELECTOR switch is accessible. It may be opened after removing two screws from the rear end of its cover.

Inside the box oscillator boards fit into sockets, and are steadied by slotted plastic guides. The sockets are numbered from one to six to correspond to the setting of the FREQUENCY SELECTOR switch and the band-pass filter. A local oscillator board fitted in a certain socket will be selected with the appropriate filter when the switch is set to the corresponding number.

Press the board firmly into its socket and screw the oscillator box lid down to hold it in place.

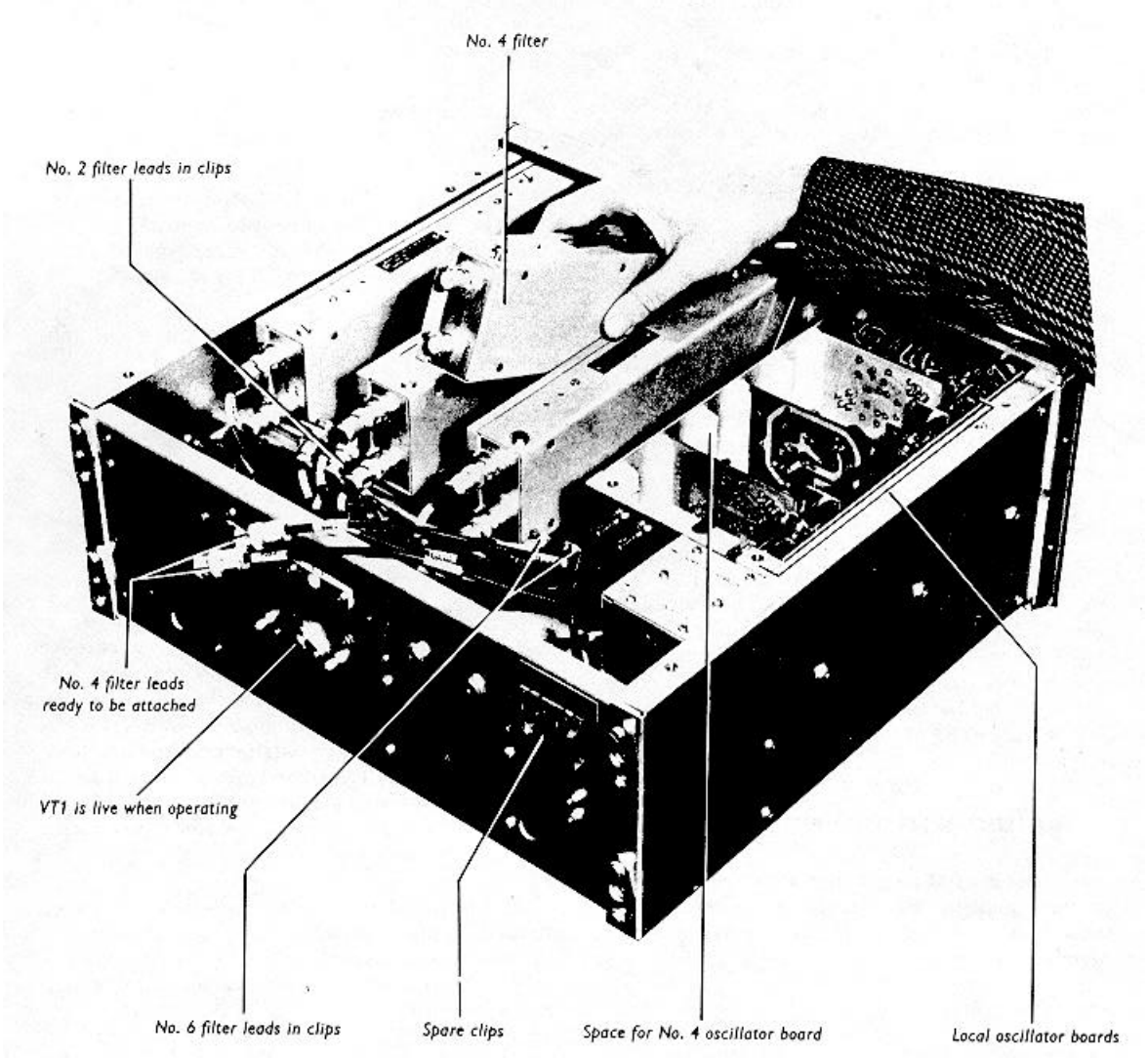


Figure 4.3 Changing receiver filters

'Back-to-back' testing

After fitting a new channel to the OA 2090A the following test should be made to check the system for inherent intermodulation.

(1) Set the receiver FREQUENCY/SELECTOR switch to the new channel position.

(2) Set the receiver OPERATE/STANDARDIZE switch to OPERATE.

(3) Turn the appropriate EQUALIZE RANGE SENSITIVITY control fully clockwise.

(4) Switch the receiver fine INPUT ATTENUATOR to indicate 0 dB.

(5) Rotate the receiver coarse INPUT ATTENUA TOR control skirt relative to the control knob so that the red reference line on the skirt coincides with the red button on the pointer of the control knob.

(6) Switch the coarse INPUT ATTENUATOR to indicate 0 dB.

(7) Set the generator to operate on a bandwidth which includes the test frequency. Set output level to the CCIR recommended level at point of zero reference level (column 3 of Table 2.1) and output ATTENUATORS to 0 dB.

(8) Connect the generator OUTPUT socket to the receiver INPUT socket by means of a 75 Ω coaxial lead.

(9) Adjust receiver SET REFERENCE control to give a meter reading at the reference mark.

(10) Measure noise power ratio as described in Sect. 2.6, paragraphs (2), (3) and (4).

The noise power ratio 'back-to-back' figure obtained should exceed 70 dB for channel frequencies below 50 kHz and exceed 75 dB for all other frequencies.

4.16 ADJUSTMENT OF PRESET CONTROLS

Test gear of a very high standard is require, for these adjustments. Do not make any adjustment to the preset controls unless you are quite certain that it is necessary.

Apparatus required:

(a) Multi-range d.c. voltmeter, 20 kΩ/V; e.g. Avometer model 8.

(b) Variable mains transformer; e.g. Variac.

(c) Sweep generator, 15 MHz, with differential detector facility; e.g. **mi** type TF 1099.

(d) Oscilloscope with 15 MHz bandwidth.

(e) R.F. step attenuator, 0 to 60 dB in 1 dB steps; e.g. **mi** type TF 2163 or TF 1073A.

(f) Standardized tunable level meter, 75 Ω impedance.

(g) Standardized power meter, 75 Ω. for use up to 15 MHz. Up to at least 100 mW range, with an accuracy of ±¼ dB.

(h) Signal generator, 10 kHz to 15 MHz; e.g. **mi** type TF 14411.

(j) Counter 10 kHz to 12.5 MHz; e.g. **mi** type TF 1417 may be used up to at least 10 MHz.

Above this frequency the Converter type TF 2400 may be required or **mi** type TF 2401 series.

(k) Valve voltmeter d.c. to 15 MHz; e.g. **mi** type TF 2604.

(l) Audio oscillator to produce 700 Hz; e.g. **mi** type TF 2001.

Noise generator

Layout

When the case is removed all the active units are readily accessible. Situated in screened boxes are: on the left the noise source, next to it the low level amplifier; behind the attenuator cams the high level amplifier is mounted transversely, with the noise output transistor mounted in a heat sink bolted to the right-hand side panel. The meter circuit board stands unscreened behind the meter. Each cover is easily removed when its two fixing screws have been taken out.

The power supply lies inside the back panel, its printed board standing at one side adjacent to the mains transformer. The series regulator transistor is mounted on a black heat sink, and has a live case.

All the filters are mounted on the underside of the main chassis.

Power unit

Preset controls: RV100, RV101, RV102.

Apparatus required: a and b.

The following adjustments must be made with the normal working load on the power supply.

With the voltmeter across the 54 V supply, adjust RV101 to give exactly 54 V, then adjust RV102 to give 25 V on the 25 V line.

RV100 controls the stability of the h.t. supply. Measure the potential of the 54 V line, while varying the mains supply voltage by means of the Variac between 190 and 260 V (or 95 and 130 V), and set RV100 to give the smallest possible variation in the h. t. supply.

Low level amplifier

Preset controls: RV300, RV301, C302, C306.

Apparatus required: c, d and e.

Disconnect the coaxial leads connecting the low level amplifier to the noise source and the high-pass filter. Connect the apparatus according to Fig. 4.4, feeding the output from the attenuator into SKT300, and taking the output from SKT301 to the input probe of the sweep generator. A 75 Ω impedance match must be preserved at both the input and the output.

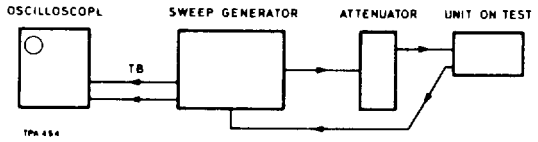


Figure 4.4 Frequency response testing

Switch on the supplies. Insert 50 dB in the external attenuator, and 10 dB in the sweep generator attenuator, giving an input of about 3 mV to the amplifier.

Set the sweep width to 13 MHz, and check the linearity with the cover on. Considerable non-linearity would suggest a faulty transistor or other component.

Remove the cover. Reduce the sweep width to minimum and adjust RV300 and RV301 to give zero differential deflection i.e., a gain of 50 dB at 100 kHz. Increase the sweep width again, and adjust C302 and C306 to give the flattest possible response when the cover is on.

High level amplifier

Preset controls: RV400, C405.

Apparatus required: c, d and e.

Using the same procedure as for the low level amplifier, adjust the gain by means of RV400 to 32 dB at 100 kHz, measured between PA00 and SKT400.

Frequency response may be adjusted by C405, and should be substantially flat with a slight rise at the high frequency end. This allows for h.f. losses in the, interconnecting cables and attenuators.

Meter circuit

Preset controls: C501, RV500, RV501.

Apparatus required: f, g and h.

Turn the METER RANGE switch to the red range (high level). Feed the signal generator at approximately 50 mV, 100 kHz into the high level amplifier which should be terminated by switching in at least 10 dB on the output attenuator. Measure the level at the OUTPUT socket with the standardized level meter and note the indication on the front panel meter. Adjust trimmer C501 to give the same indication as before on the front panel meter.

Disconnect the signal generator, reconnect the internal couplings and set the output attenuator to 0 dB.

Connect the standardized power meter to the generator output socket.

Switch in high- and low-pass filters corresponding to the highest available system capacity between 600 and 2700 channels and switch the METER RANGE switch to red. Adjust NOISE LEVEL control to provide an output between 0.01 and 0. 1 W and set RV501 so that the internal meter agrees with the standardized power meter.

Secondly switch in high- and low-pass filters corresponding to the highest system capacity between 12 and 300 channels and switch the METER

RANGE to black. Adjust the NOISE LEVEL control to provide an output between 1 and 10 mW and set RV500 so that the internal meter again agrees with the standardizing power meter.

It may not be possible to set both ranges if the appropriate filters are not available.

Noise source.

Preset controls: RV200, RV201, C206.

Apparatus required: a, d and f.

RV200 sets the current through the noise diode.

(1) The required bias current is a function of the noise diode and will be within the limits 300 pA to 2 μA. If-the diode is operated with any other bias current it will not produce white noise. For this reason, unless you have the relevant information for the particular diode in your instrument and are quite certain that the instrument is faulty, you should not make any adjustment to this control.

(2) As a rough guide, when the noise source is operating correctly, the output waveform of the complete TF 2091 when viewed on an oscilloscope will appear with equal positive and negative peak distortions and be free of low frequency transients.

RV201 sets the available output level. Set the tunable level meter to 100 kHz, and connect to the output plug PL200. Adjust the potentiometer so that the level meter indicates 1 pW per 3.1 kHz or -95 dBm per 1 kHz bandwidth into 75 Ω when the NOISE LEVEL control is turned fully clockwise.

Should it be necessary to change the setting of this control, the frequency response will be adversely affected. C206 is selected to give a flat noise output characteristic from 10 kHz to 13 MHz when the NOISE LEVEL control is set 8 to 10 dB below maximum output.

Noise receiver

Layout

All sub units and filters are accessible when the carrying case or dust cover is removed. Situated on the main chassis from left to right looking towards the instrument from the front panel are: the standardizing noise source, wide band amplifier, mixer, 1.f. amplifier, coarse and fine attenuators, with the 1.f. band-pass filter behind the attenuators.

On the underside of the main chassis is fitted the local oscillator box and up to six band-pass filters. The mains transformer and power unit printed board are mounted on the back panel, together with the series regulator transistor. Care should be taken to avoid shorting the case of this transistor to chassis when the supply is switched on.

Power supply

Preset controls: RV100, RV101.

Apparatus required: a and b.

The following adjustments must be made with the normal working load on the power supply.

With the voltmeter connected between the h.t. line and earth adjust RV101 to give exactly 25 V.

RV100 controls the stability of the h.t. supply. Measure the potential of the 25 V line, while varying the mains supply voltage by means of the variac between 190 and 260 V (or 95 and 130 V), and set RV100 to give the smallest possible variation in the h.t. supply.

Wide band amplifier

Preset controls: RV200.

Apparatus required: h and k or c, e and d.

The voltage gain of the amplifier should be 30 dB at 100 kHz between SKT200 and SKT201. If any components are replaced it may be necessary to reset the gain by adjusting RV200. The input (750 Ω) and the output (75Ω) should be correctly terminated when the gain is measured.

The sweep generator method illustrated under 'low level amplifier' may be used if a 75 Ω - 750 Ω matching pad is introduced between attenuator output and unit on the test input; allowance must be made for the additional loss in this pad. Alternatively, the gain may be measured using the sweep generator method without a matching pad, provided the external attenuator is set to 35 dB to allow for the mismatch. The wide band amplifier input level should be approximately 1 mV.

Frequency response may be upset by component changes, but in general, if the amplifier gives the correct gain after changing a transistor, the response will be satisfactory.

Mixer

Preset control: RV300.

RV300 adjusts the current through VT300 for optimum mixer efficiency which is indicated by the maximum meter reading when noise is fed into the receiver input socket from the noise generator.

Local oscillator

Preset controls: L1, RV1.

Apparatus required: j and k.

L1 sets the oscillator frequency, and should be set up at the ambient temperature (e.g. 23°C) for a frequency accuracy within 0.1%. Connect the counter via a blocking capacitor to the junction of R306 and C307 in the mixer, in order not to pull the oscillator frequency.

RV1 adjusts the output voltage, measured at the output socket of the oscillator box (do not disconnect the lead to the mixer, but make the connection inside the box).

The correct output voltage depends on the frequency of the oscillator as follows:

Below 50 kHz:	0.45 V
Between 50 kHz and 4 MHz:	0.6 V
Above 4 MHz:	1.1 V

L.F. amplifier

Apparatus required: k and l.

With the SET REFERENCE and all EQUALIZE RANGE SENSITIVITY controls fully clockwise apply a 700 kHz signal of 20 μV into PL400 and measure the output at the record jack. This should be approximately 0.7 mA into 1 kΩ.

Standardizing noise source

Apparatus required: a, d and f.

RV700 sets the current through the noise diode. The correct operating current will be between 300 μA and 2 mA. Unless you have the relevant information for the particular diode, you should not make any adjustment to this control. In the event of VT700 being replaced it may be necessary to check the noise output level.

Connect the tunable level meter to the output of the noise source PL700, and switch the OPERATE/ STANDARDIZE switch to STANDARDIZE. Set the tunable level meter to 100 kHz and select a value of R705 to give an output level of 1 pW ±2.5% per 3.1 kHz channel bandwidth. If a different value of R705 is required it will be necessary to select a value of C707 to give a noise characteristic level within 10% between 10 kHz and 13 MHz.

CHAPTER 5

CALIBRATION AND FAULT FINDING

5.1 GENERAL

The scope of this chapter covers the calibration of the white noise test set, to bring its specifications within limits, and fault finding procedures which are to be considered in addition to, and used with, the information contained in Chap. 4.

The test equipment required for calibration and fault finding is the same as listed in Sect. 4.16, with the addition of a true r.m.s. voltmeter with a 75 Ω termination.

5.2 NOISE GENERATOR PERFORMANCE TEST

5.2.1 Power level

The power output available from the noise generator will depend upon the bandwidth, which is determined by the high and low-pass filters used. Noise power is measured with the true r.m.s. voltmeter terminated with a 75 Ω load and connected to the OUTPUT socket of the noise generator by a 75 Ω cable. (If the voltmeter is calibrated in dBm in 600 Ω it will read 9 dB low; e.g., 0 dBm (75 Ω) will be shown as -9 dBm. However, the load must be 75 ΩΩ, NOT 600 Ω.)

The equipment settings should be:

High and low-pass filters	-	IN
Band-stop filters	-	OUT
Attenuators (both)	-	0 dB
Supply switch	-	ON

a) Set NOISE LEVEL control to maximum and determine that the available power is sufficient for the bandwidth in use. The levels shown in Table 2.1 should be obtainable. If not, a fault condition exists see Sect. 5.4.

b) Check that the meter indication of noise power is within specification when compared with the external meter at various points on each scale. When recalibration is required, refer to Sect. 4-16 Meter circuit.

5.2.2 Attenuator accuracy

Use the same set-up as used in Sect. 5.2.1.

Fine attenuator, 0 - 11 dB: Adjust the NOISE LEVEL control to give a full-scale reading on the voltmeter. Switch in the attenuator steps one by one, checking against voltmeter reading. Return the attenuator to 0 dB.

Coarse attenuator, 0 - 40 dB: Adjust the NOISE LEVEL control to give 0 dB indication on the voltmeter. Switch in the attenuator steps in turn and change the voltmeter range in 10 dB steps to correspond the voltmeter should continue to read on the 0 dBm mark within the accuracy of the equipment.

5.2.3 Noise level flatness

Connect the standardized tunable level meter to the input of the noise generator via a 75 Ω cable with the meter set to 75 Ω impedance and 1 to 4 kHz bandwidth. Tune the voltmeter slowly over the pass band of the noise. The frequency response should be within specification. Adjustment procedures are shown in Sect. 4.16 and 5.4. (NOTE: It is not possible to measure the response of the band stop filters using the level meter with noise applied, owing to the inherent intermodulation distortion in selective voltmeters.)

5.3 NOISE RECEIVER PERFORMANCE TEST

5.3.1 Sensitivity

Set the noise generator to the correct power level for the bandwidth in use and connect to the receiver. Set both receiver attenuators to 0 dB; in the case of the coarse unit, line the red spot up with the red line on the skirt first. Switch the receiver to each of the channels in turn. On each channel, a reading of at least half-scale on the meter should be obtainable within the range of the OUTPUT LEVEL control. Check that the residual noise of the receiver is not excessive by disconnecting the noise generator and observing that the previous reading decreases by at least 10%. Where the required sensitivity is not achieved, refer to Sect. 5.4.

5.3.2 Attenuator accuracy

Remove the case from the instrument and remove the BNC output connector (PL611) from the receiver attenuator. Connect the level meter to the attenuator output socket. Connect the signal generator (tuned to 1 MHz) to the INPUT of the noise receiver. Tune the level meter for maximum reading, rotate each attenuator one position at a time and cross-check with the reading on the level meter. Accuracy should be within the specification.

5.3.3 Back-to Back Test

This test is an overall test of noise generator, noise receiver, band-stop and band-pass filters and oscillator modules. Connect as in Sect. 5.3.1 and test as specified in Sect. 4.6. The basic noise power ratio of the equipment itself should be within specification; if not, refer to Sect. 5.4.

5.4 Test Procedure for Oscillator Modules

Apparatus required

Marconi TF 2092A Noise Receiver

Voltmeter VTVM (High impedance, DC to 15 MHz)

Frequency Counter (to 15 MHz)

Procedure

a. - Fit the board to be tested in the oscillator box of the Noise Receiver, as indicated in paragraph 4.15.

b. - Connect the counter, directly, if high impedance, or via a 2.2Ki resistor if impedance is less than 1KP2, to the output socket of the oscillator box. Do not disconnect the lead to the mixer, but make the connection inside the box.

c. - Check that the frequency measured in the counter is within +1%.

d. - Connect the high input impedance voltmeter to the same point described above for frequency measurement.

e. - Check that the voltage readings are within the following limits:

For frequencies below 50 kHz	0.450 Volts +10 mV
For frequencies between 50 kHz and 4 MHz	0.600 Volts +10 mV
For frequencies above 4 MHz	1.100 Volts +10 mV

5.5 Test Procedure for Filters

Apparatus required

Frequency Counter	(15 MHz)
Signal Generator	(10 kHz to 20 MHz)
Level Meter, Selective	(750 Ω and 75 Ω input impedance

Procedure

a. - All checks must be made with the filter in its box, and all screws in place.

b. - Adjust the signal generator frequency until the counter reads the frequency of the filter to be tested.

c. - Adjust the output of the signal generator to obtain a reference reading on the Level Meter.

d. - Connect the filter to be tested, as indicated in diagram below.

e. - Measure and record levels at the discrete frequencies indicated in the respective technical data for the type of filter under test.

f. - Check that the readings at the frequencies indicated are within the limits stated in the technical data sheet.

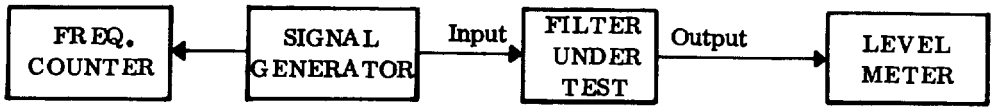


Figure 5.1 Test circuit for filters

5.6 FAULT FINDING

The following table lists troubles that may be encountered during calibration of the test set, possible causes or fault areas to be checked and recommended remedial procedures to be followed. The table is divided into two parts, one for the noise generator and the other for the noise receiver.

TABLE 5.1

Noise generator

Symptom	*Possible fault areas*	*Remedies*
Noise output insufficient or non-existent	Blown fuses	Check for shorts etc. Replace fuses.
	Power supply	Check power supply voltages. Sect. 4.16 - Generator power unit.
	Internal interconnections	Check.
	Attenuators	Check. Measure level at output of band-stop filters. If there is output at this point, check attenuators as below.
	Band-stop filter	Measure level at output of high level amplifier. If there is output at this point, check switches in band-stop filters. If necessary correct inconsistencies.
	High level amplifiers	Faulty output transistor on high level amplifier. Check as in Sect. 4.16 - High level amplifier. If correct, check input level to high level amplifier.
	High- and low-pass filters	Check switches. Otherwise replace.
	Low-level amplifiers	Check low-level amplifier and noise source together with interconnecting cables. See Sect. 4.16 - Low-level amplifier.
Noise output but no meter reading	Meter board	Check voltages on meter board. Check switch wiring and meter.
Noise level bandwidth in error	High- and low-pass filters	Replace with alternatives.
Attenuator steps in error	Attenuators	Check for broken springs or loose mounting if steps open-circuit. Otherwise check for broken resistors, shorts etc.
Noise level disappears when band-stop filter inserted	Filter switch	Check micro-switch contacts for shorts. Otherwise replace.

TABLE 5.2

Noise receiver

NOTE: Normally, the meter reading on the receiver fluctuates to a greater extent than on the noise generator owing to restricted bandwidth in the receiver. This is not a fault condition.

Symptom	*Possible fault areas*	*Remedies*
No reading on receiver	Band-stop filter in noise generator	Check that all band-stop filters are switched out.
	Blown fuses	Check for shorts etc. Replace fuses.
	Power supply	Check power supply voltages. See Sect. 4.16 - Receiver power supply.
	Band-pass filter	Connect voltmeter with 750 Ω load to output of particular filter. Insertion loss should be not greater than 9 dB. If necessary, replace filter.
	Oscillator module	Check that oscillator is fitted correctly. Check oscillator frequency and level (see Sect. 4.16 - Local oscillator). Adjust or replace.
	Amplifier and other modules	Check wide-band amplifier, mixer, band-pass filter, 1.f. amplifier and meter (see Sect. 4.16 -Receiver). Check interconnections between units.
Attenuator faulty giving erratic n.p.r. readings	Attenuators	Check in same manner as noise generator.

CHAPTER 6

CIRCUIT DIAGRAM

CIRCUIT NOTES

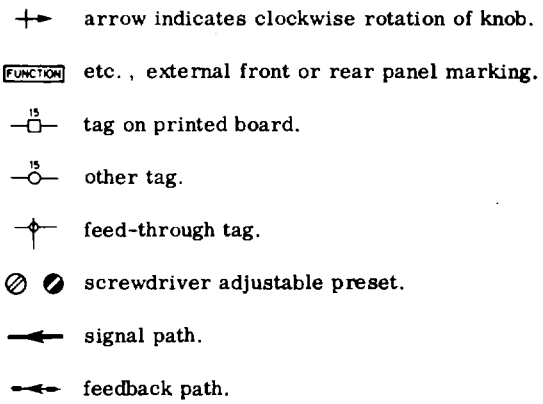
1. COMPONENT VALUES

Resistors: No suffix = ohms. k = kilohms. M = megohms.
Capacitors: No suffix = microfarads. p = picofarads.
* value selected during test; nominal value shown.

2. VOLTAGES

These are d.c. and relative to chassis unless otherwise indicated. Measured with 20 kΩ/V meter.

3. SYMBOLS



4. SWITCHES

Rotary switches are drawn schematically. Numbers or letters indicate control knob setting.

1F	=	1st section (front panel), front
1B	=	1st section, back
2F	=	2nd section, front etc.

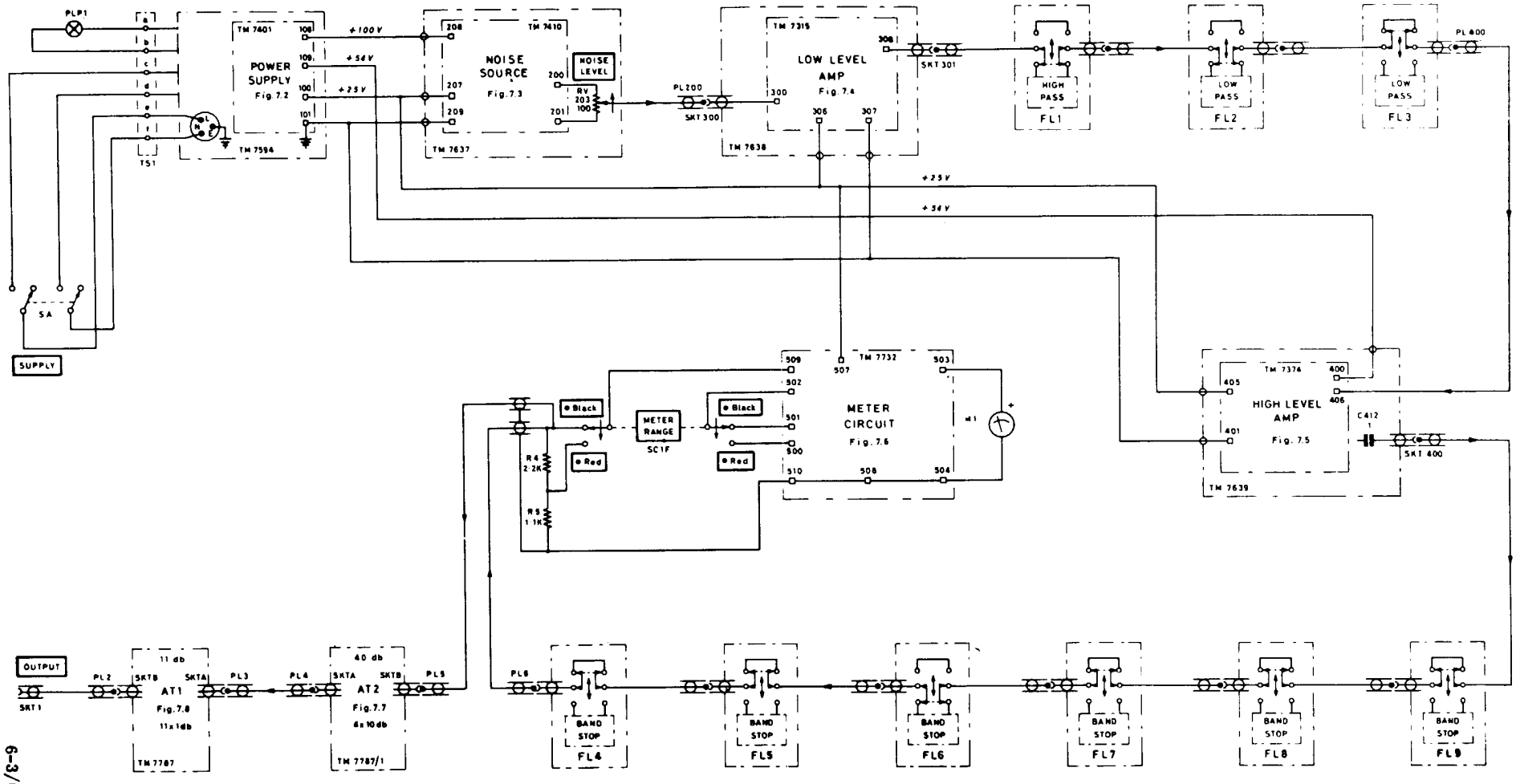


Figure 6.1 Generator inter-unit wiring circuit.

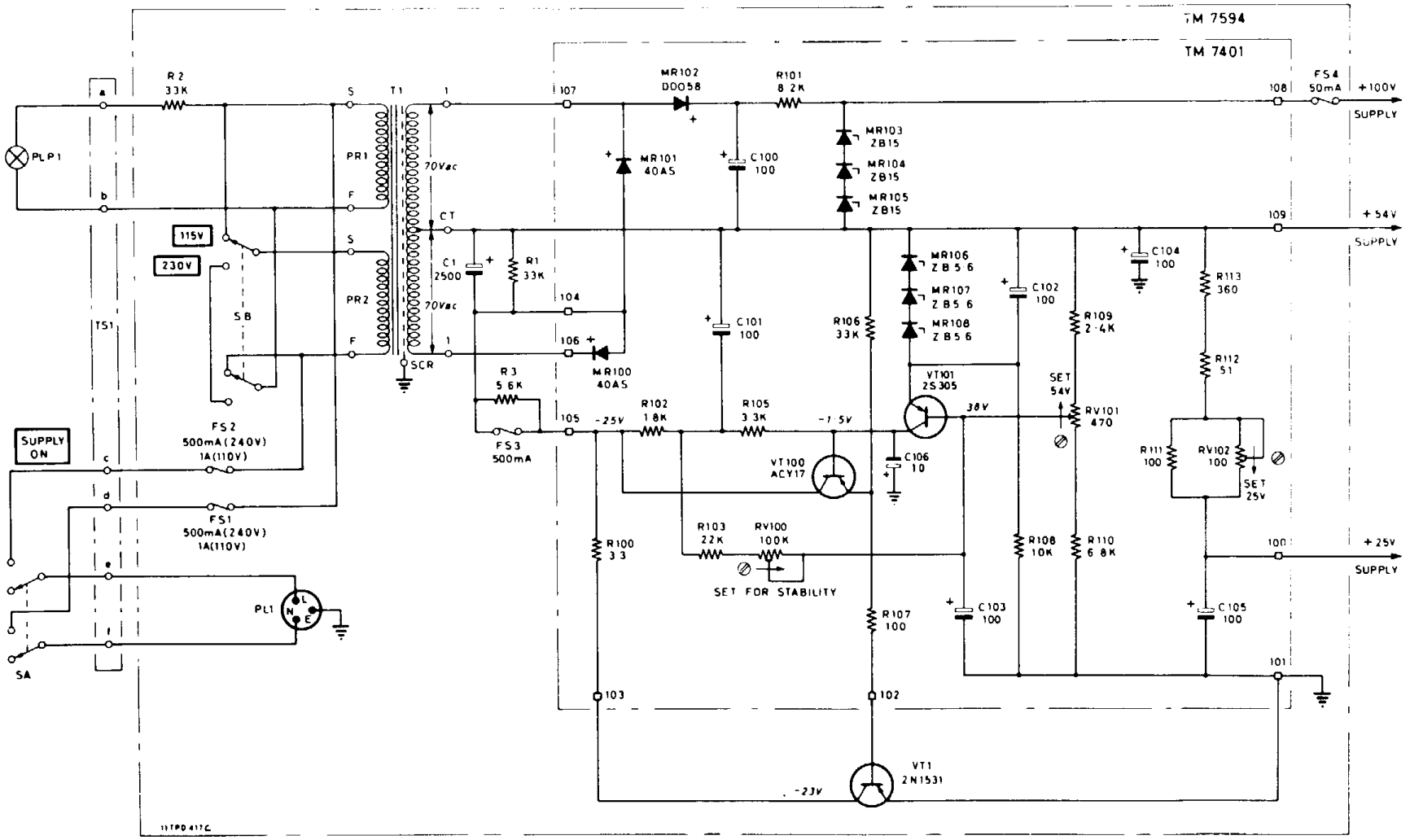


Figure 6.2 Generator power supply circuit.

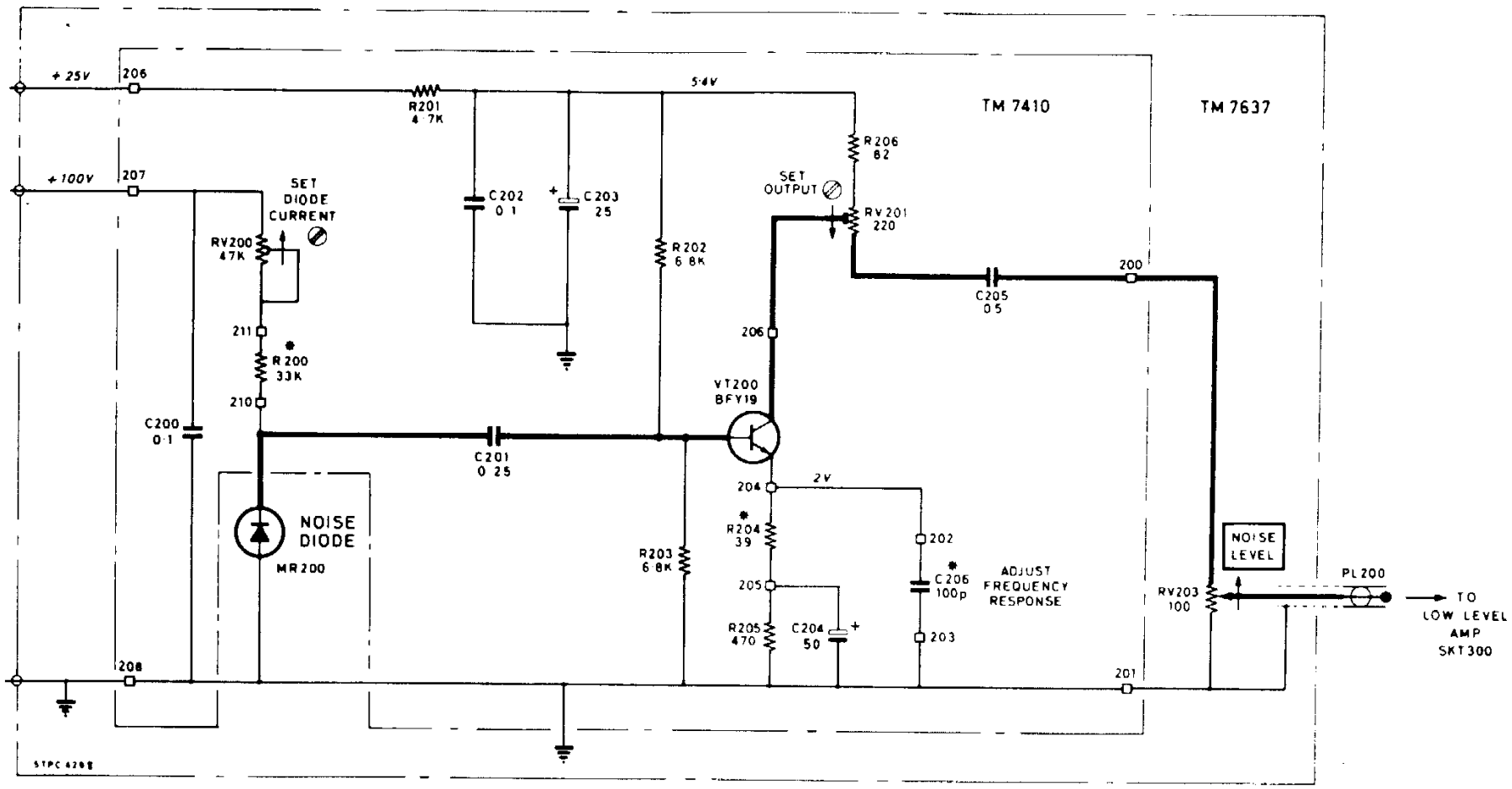


Figure 6.3 Generator noise source circuit.

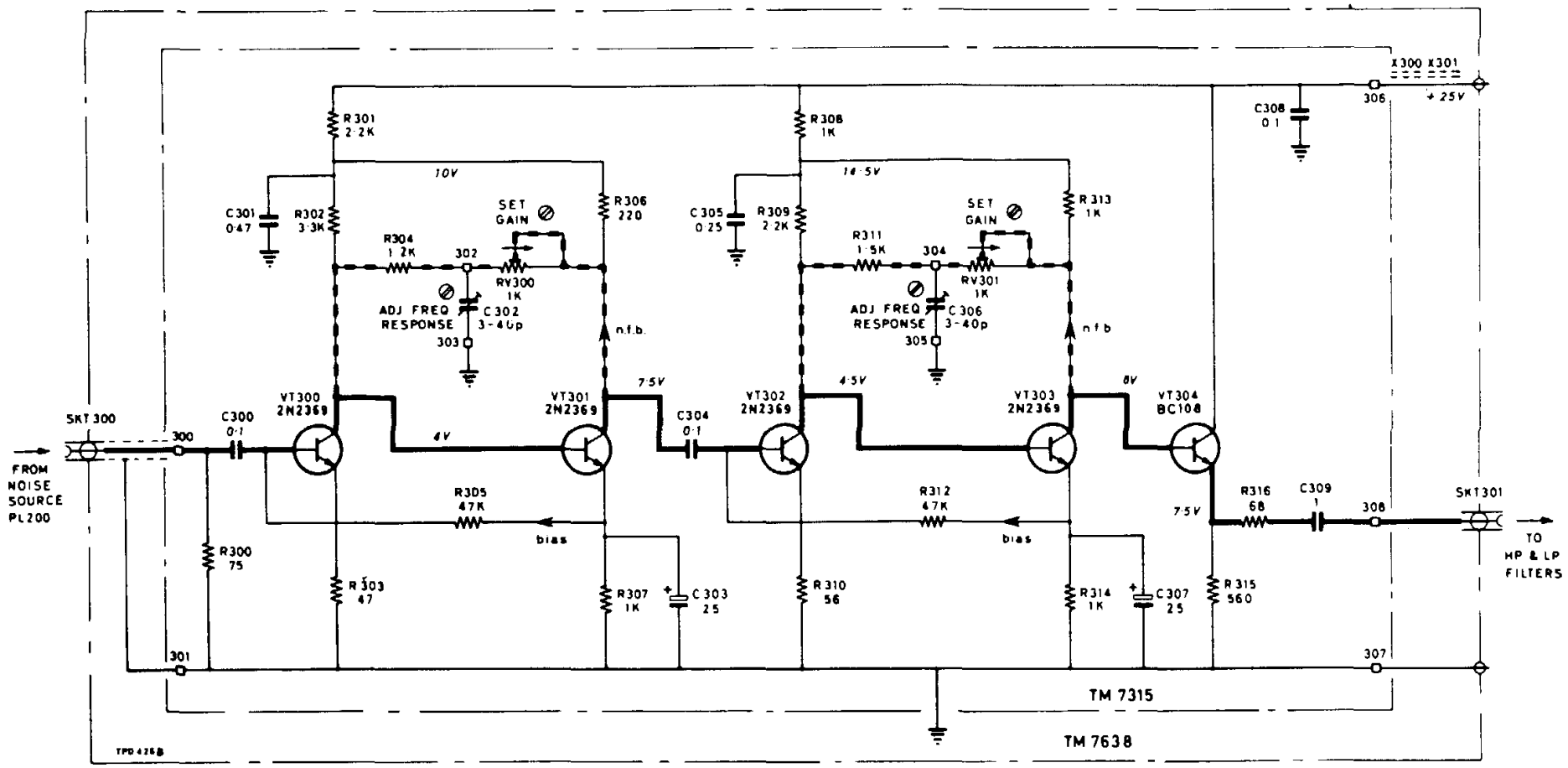


Figure 6.4 Generator low level amplifier circuit.

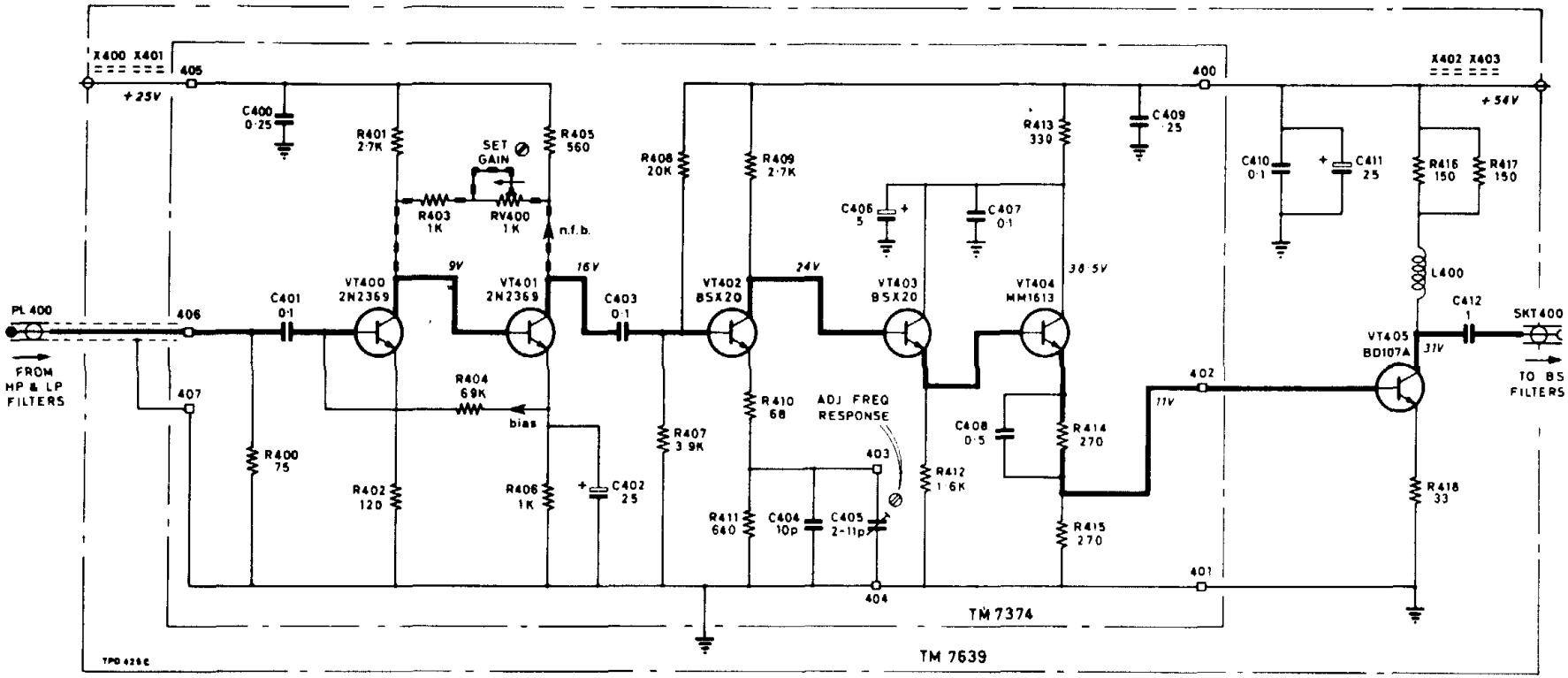


Figure 6.5 Generator high level amplifier circuit.

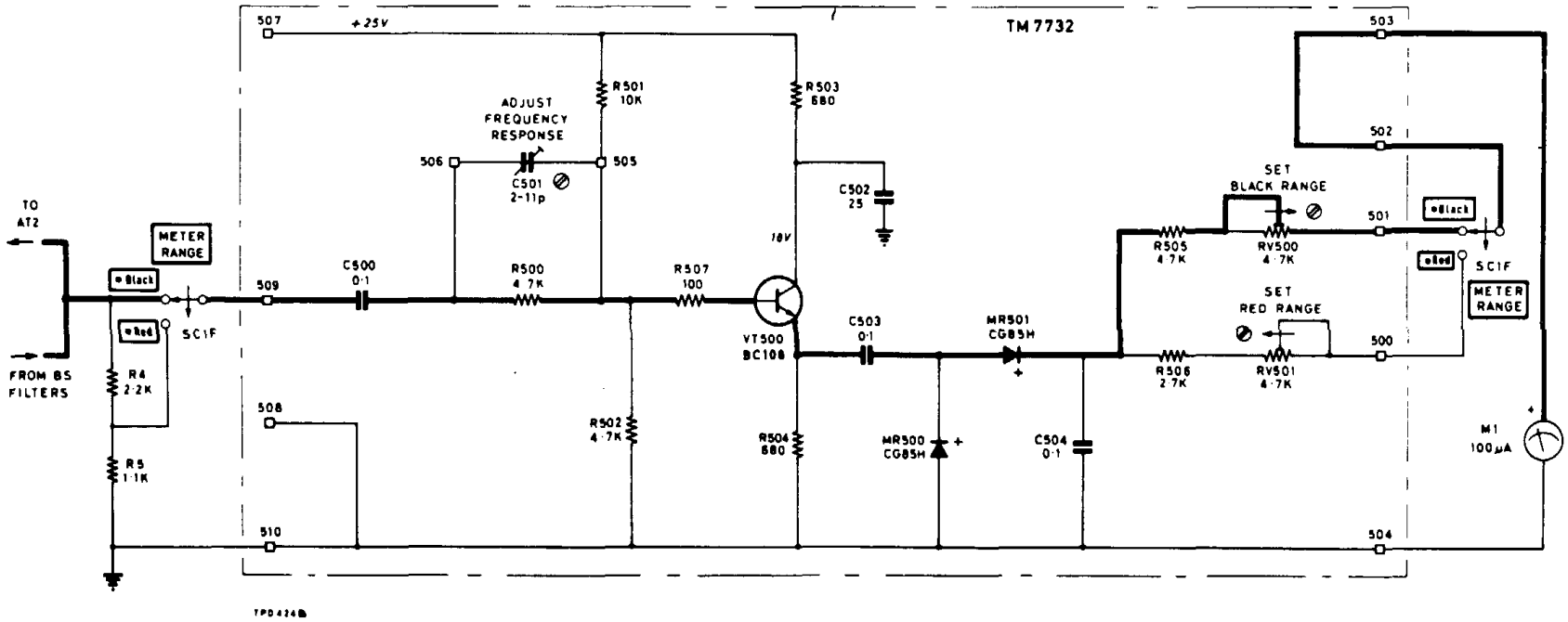


Figure 6.6 Generator meter circuit.

SET dB	ATTEN dB	PADS IN CIRCUIT (X) 10dB	20dB	30dB
0	0			
10	10	X		
20	20		X	
30	30	X	X	
40	40	X		X

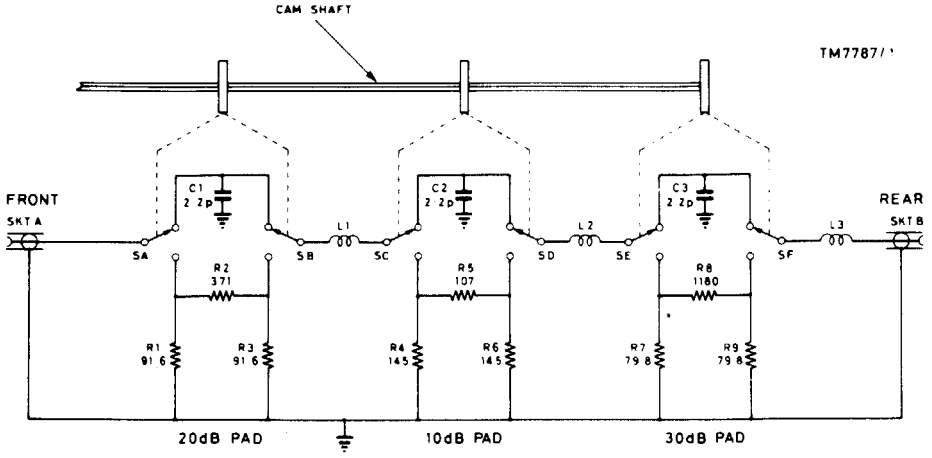


Figure 6.7 Generator 40 dB step attenuator circuit

SET dB	ATTEN dB	PADS IN CIRCUIT (X) 1dB	2dB	3dB	6dB
0	0				
1	1	X			
2	2		X		
3	3	X	X		
4	4	X		X	
5	5		X	X	
6	6	X	X	X	
7	7	X			X
8	8		X		X
9	9	X	X		X
10	10	X		X	X
11	11		X	X	X

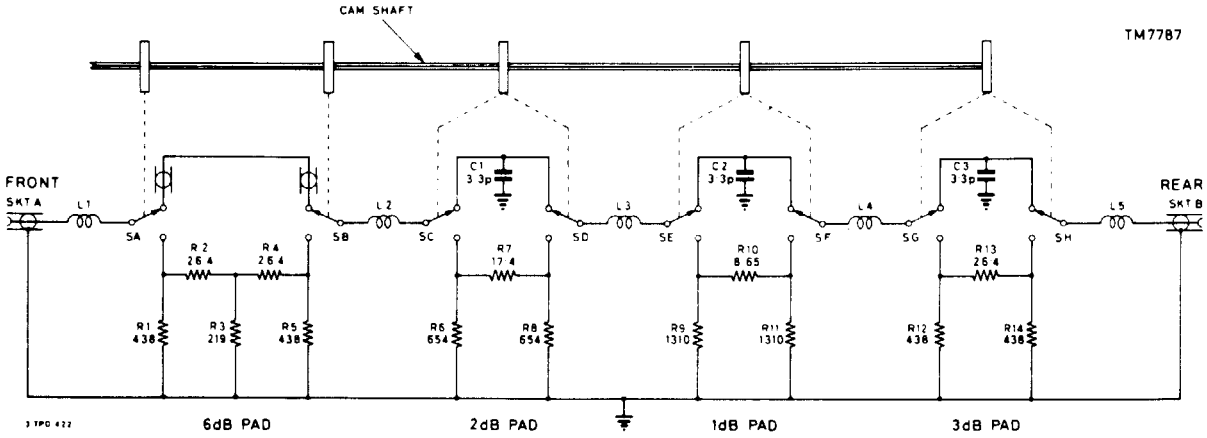


Figure 6.8 Generator 11 dB step attenuator circuit

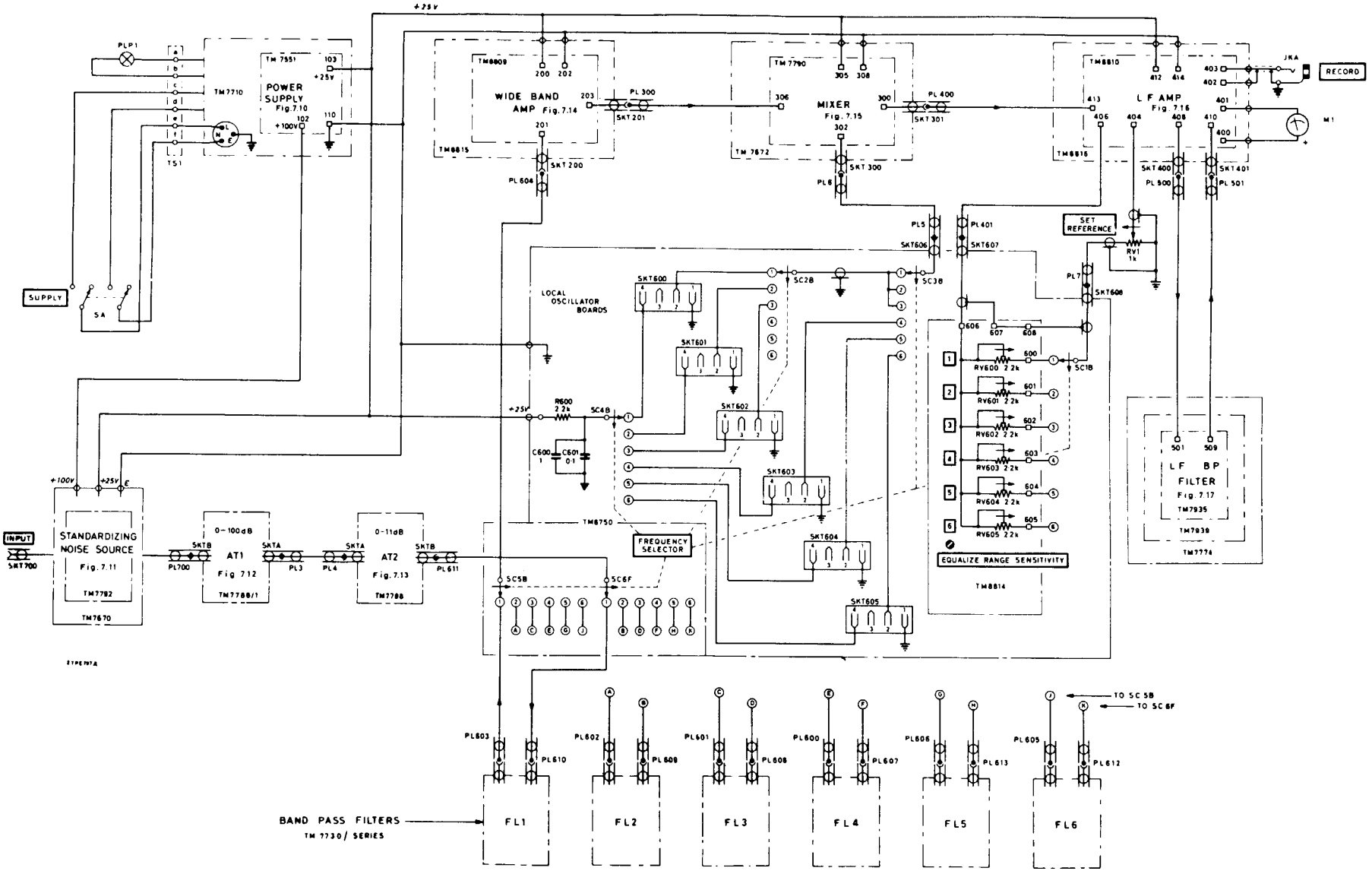


Figure 6.9 Receive inter-unit wiring circuit.

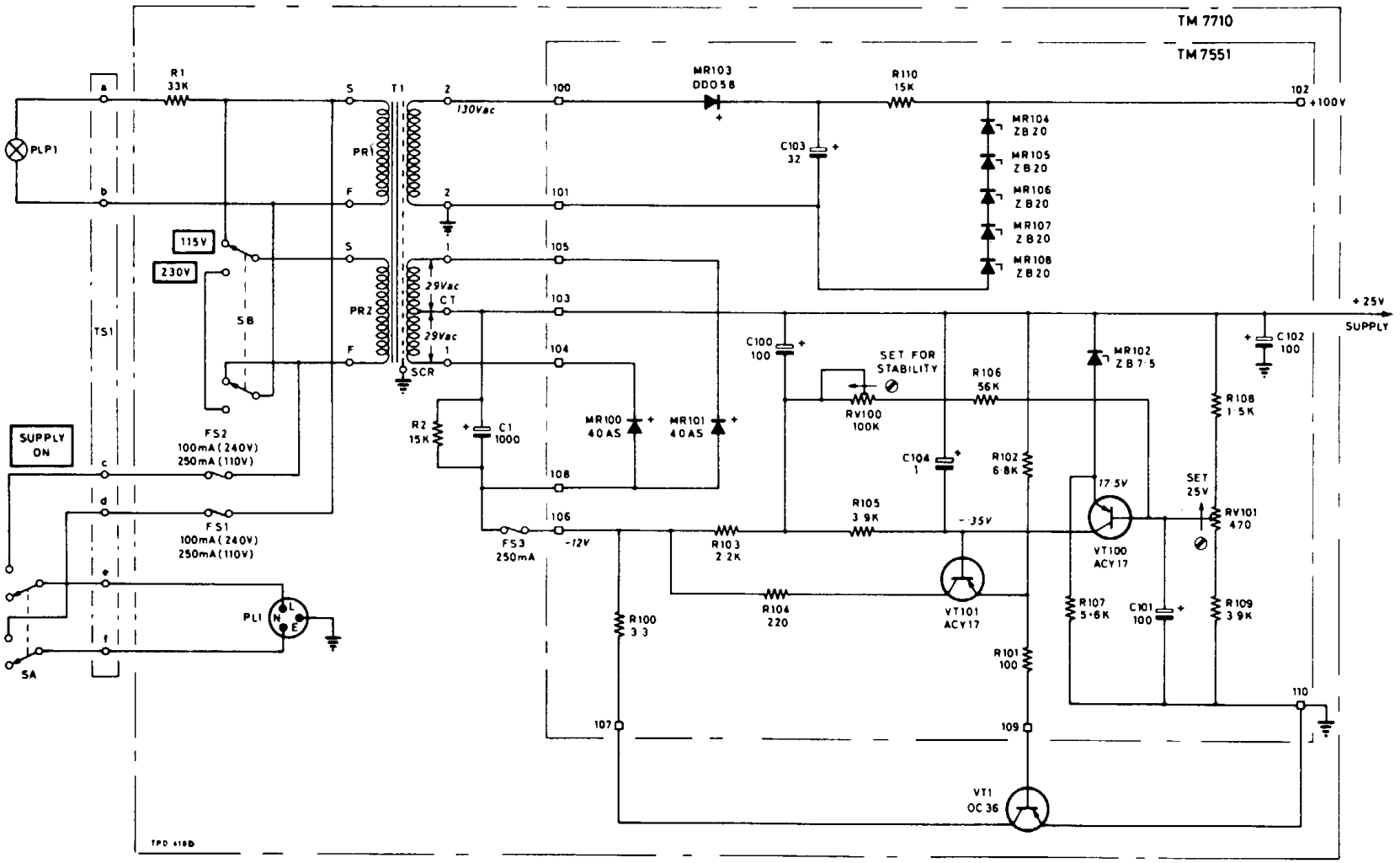


Figure 6.10 Receive power supply circuit.

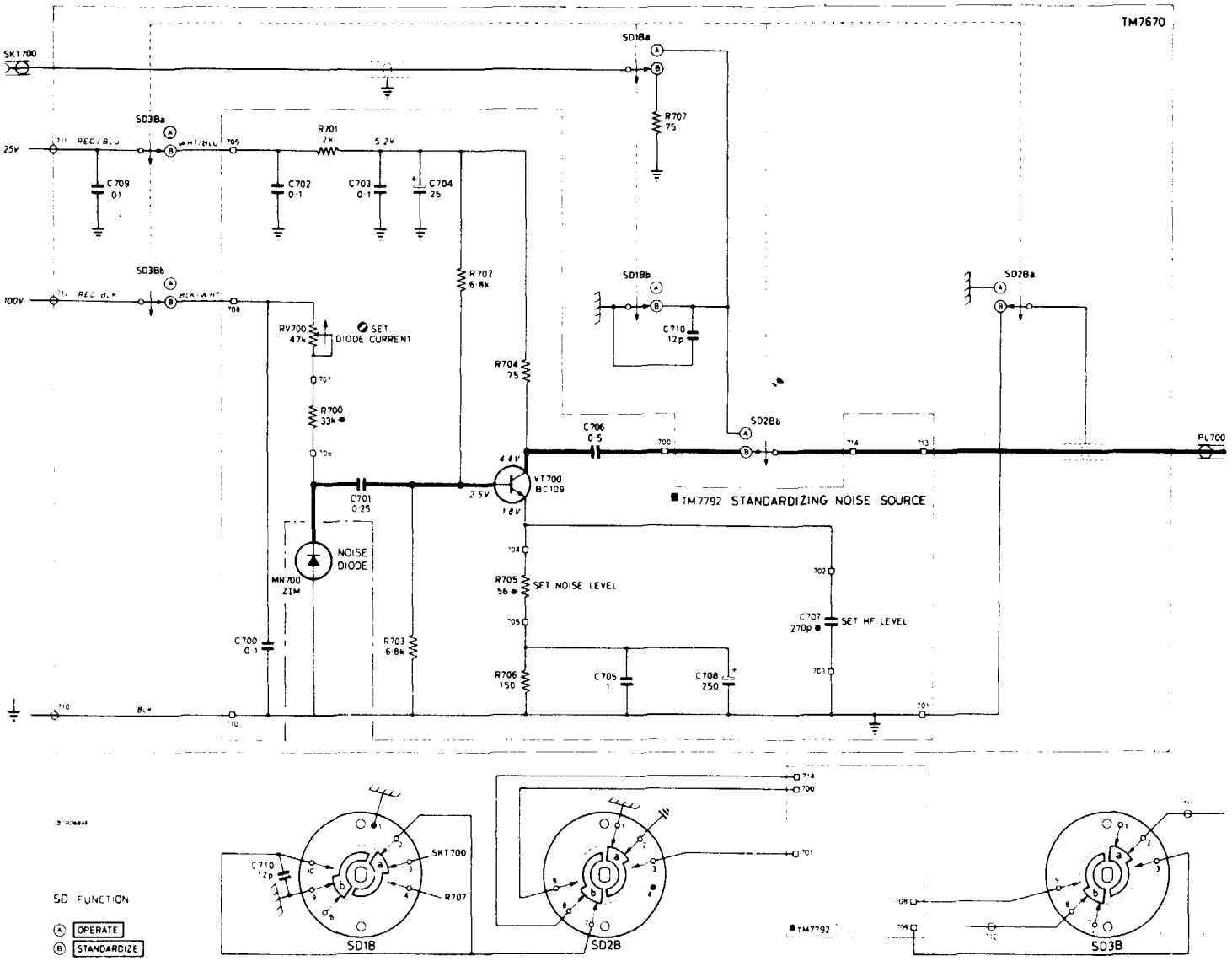


Figure 6.11 Receiver noise source circuit.

×pW	ATTEN	PADS IN CIRCUITS(X)			
	dB	10dB	20dB	30dB	60dB
	100	X		X	X
	90	X	X		X
	80		X		X
10^5	70	X			X
10^4	60	X	X	X	
10^3	50		X	X	
10^2	40	X		X	
10	30	X	X		
1	20		X		
	10	X			
	0				

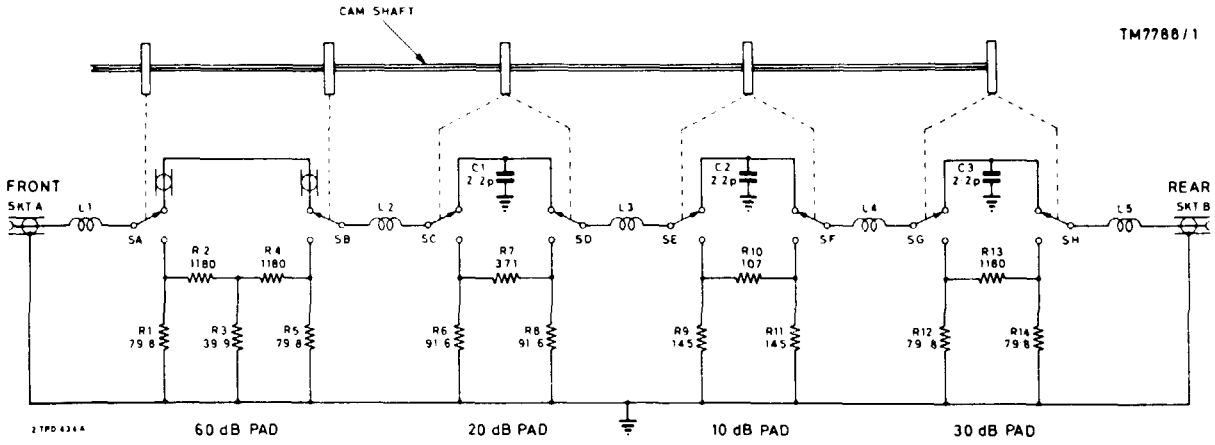


Figure 6.12 Receiver 100 dB step attenuator circuits

SET	ATTEN	PADS IN CIRCUIT (X)			
dB	dB	1dB	2dB	3dB	6dB
0	11		X	X	X
1	10	X		X	X
2	9	X	X		X
3	8		X		X
4	7	X			X
5	6	X	X	X	
6	5		X	X	
7	4	X		X	
8	3	X	X		
9	2		X		
10	1	X			
11	0				

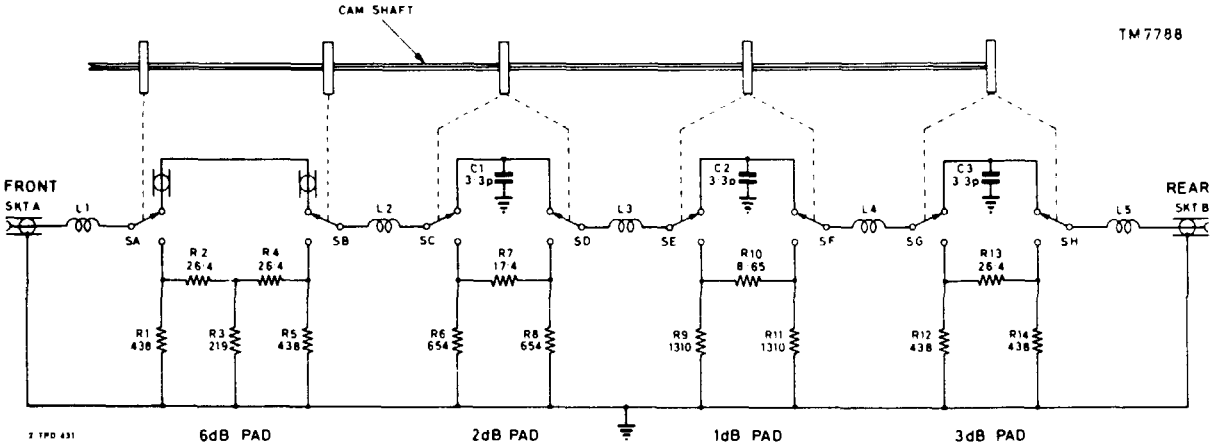


Figure 6.13 Receiver 11 dB step circuit

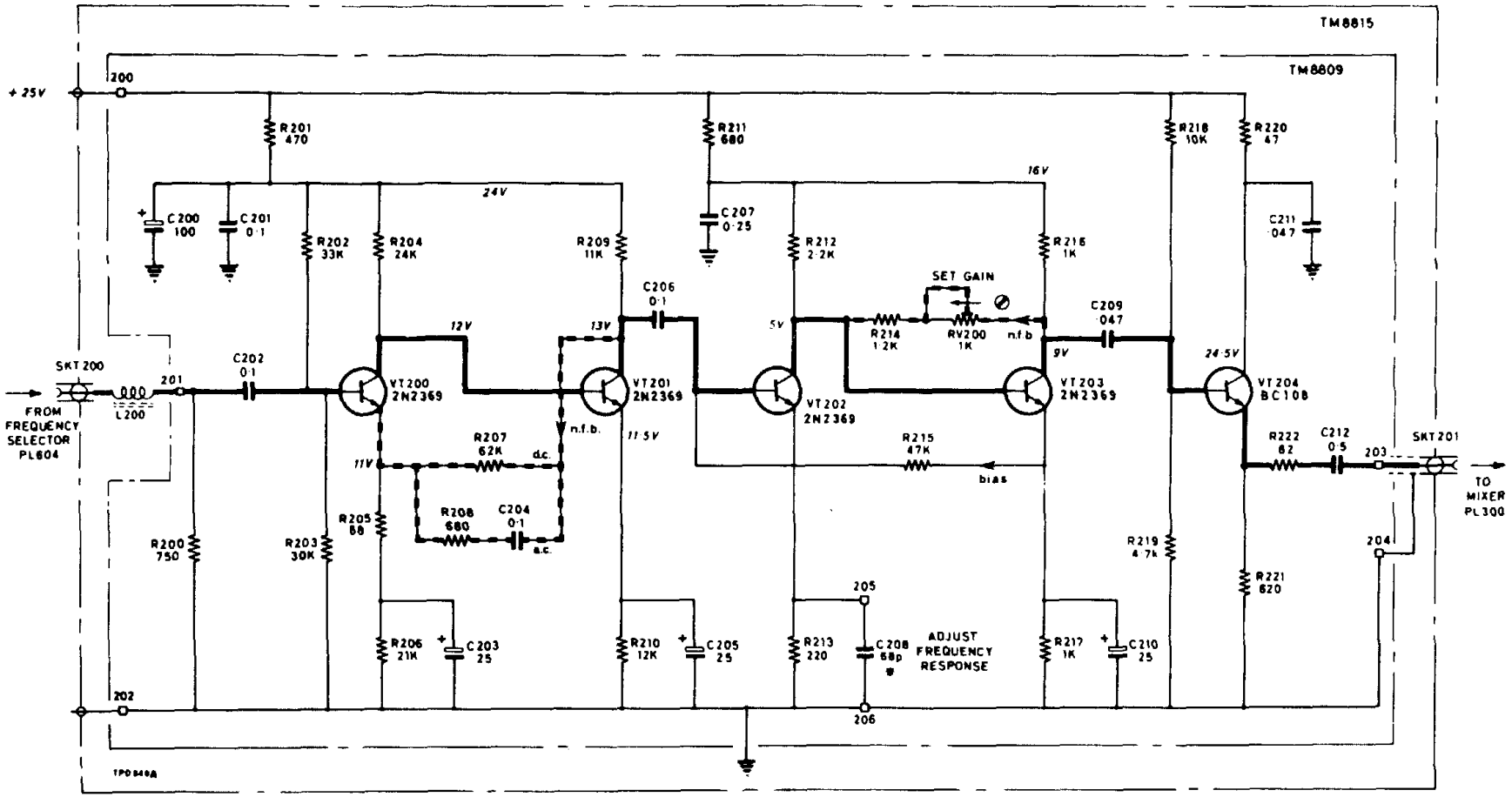


Figure 6.14 Receiver wide band amplifier circuit.

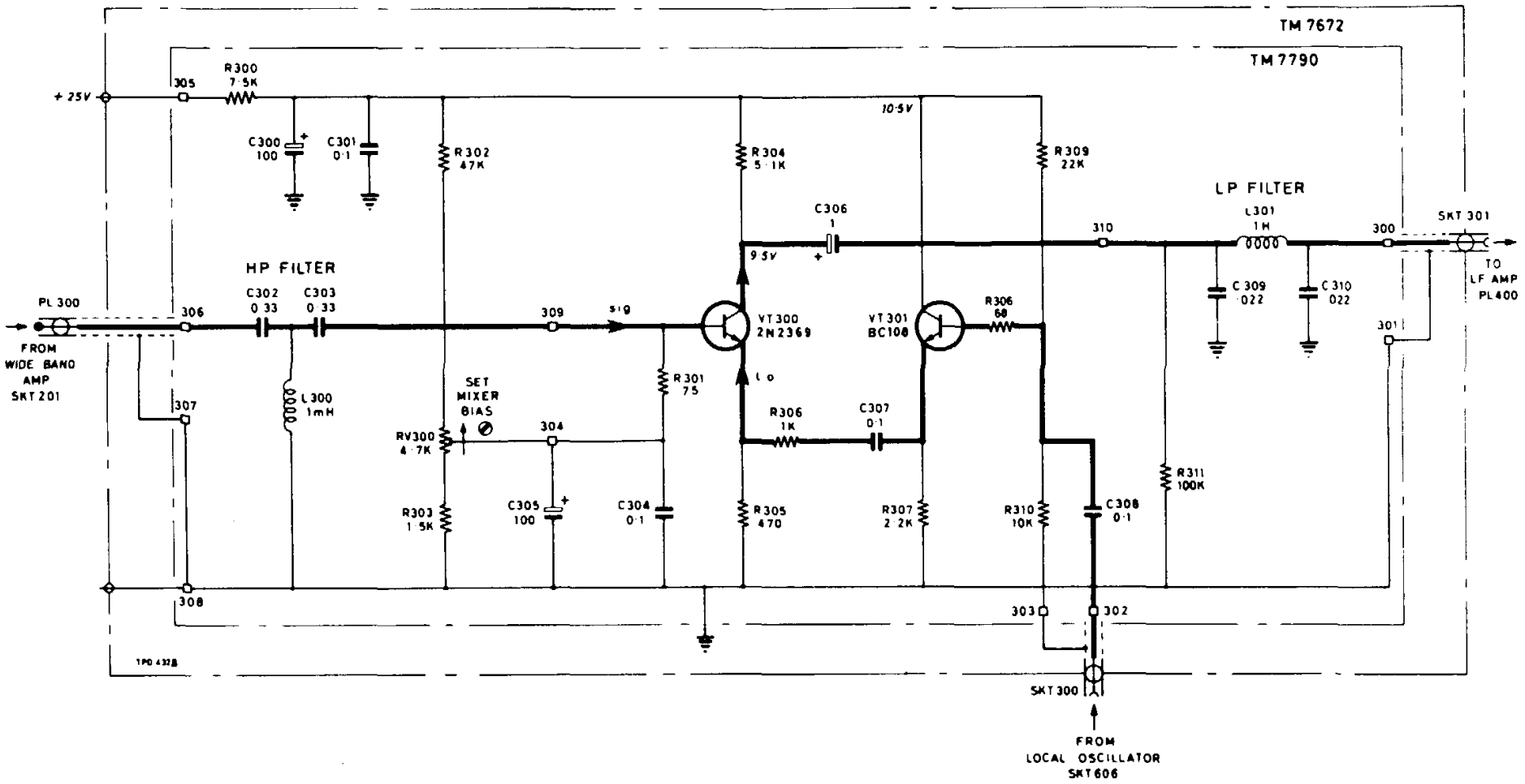


Figure 6.15 Receiver mixer unit circuit.

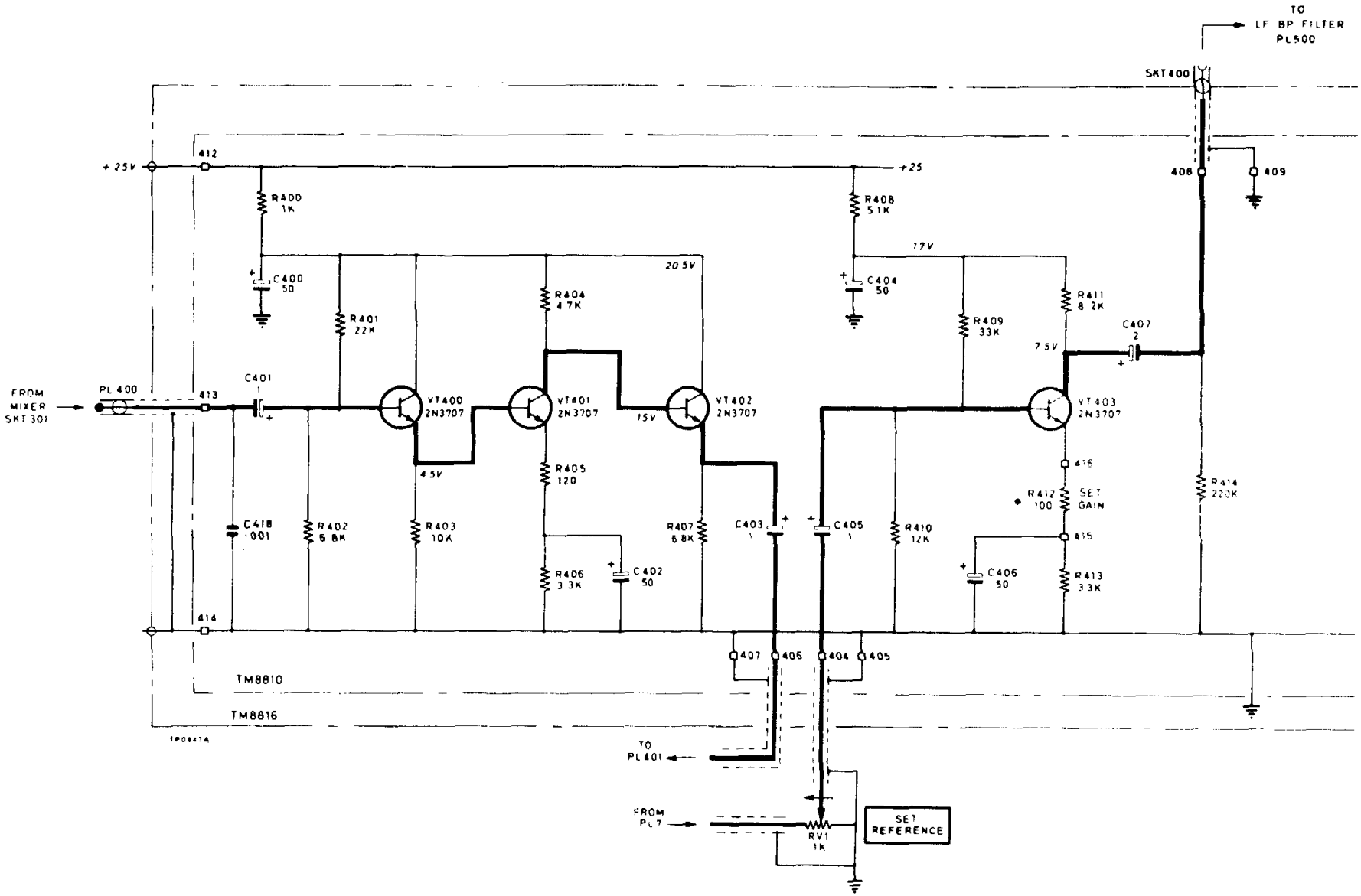


Figure 6.16a Receiver I.F. amplifier circuit.

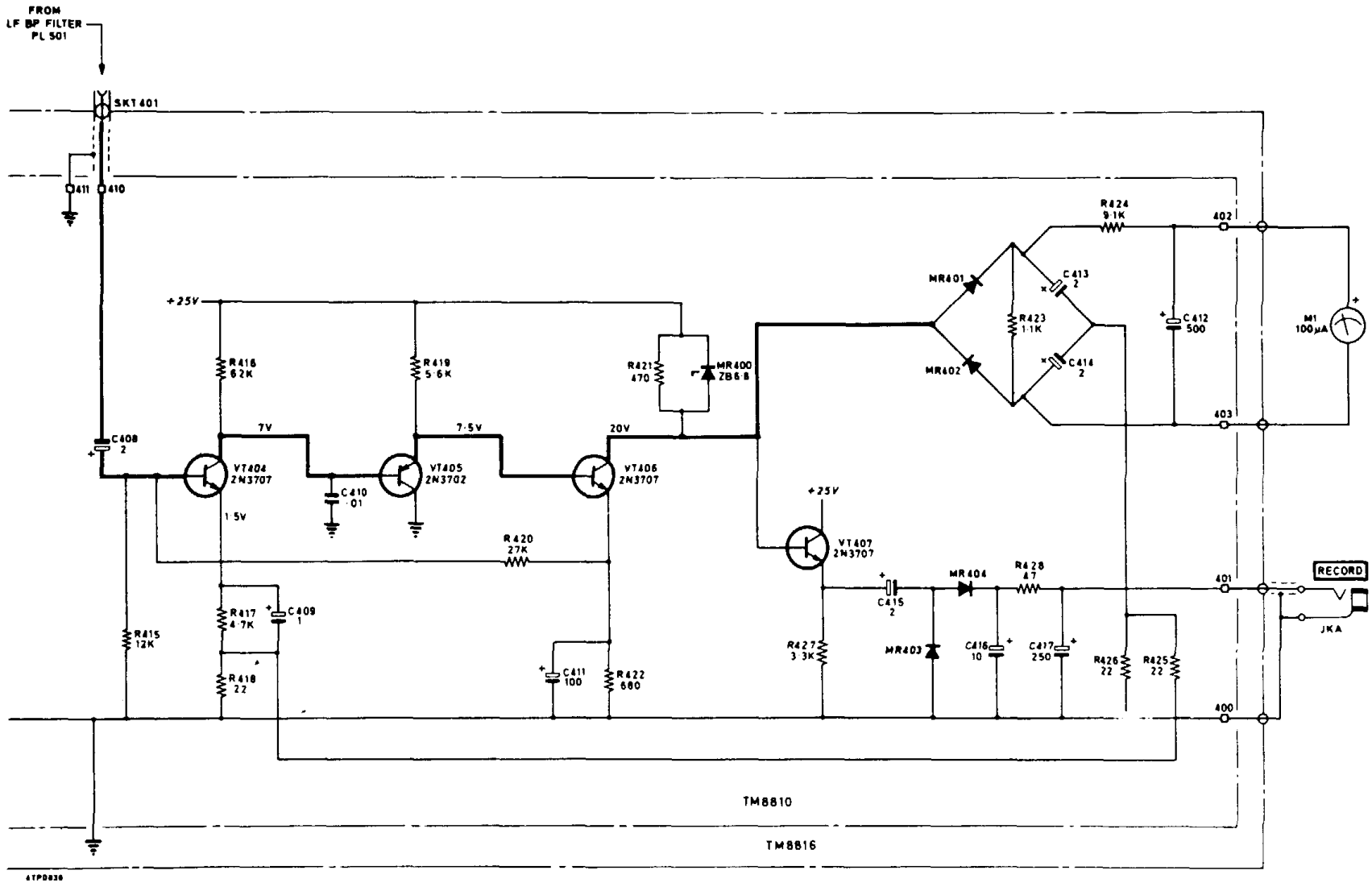


Figure 6.16b Receiver I.F. amplifier circuit.

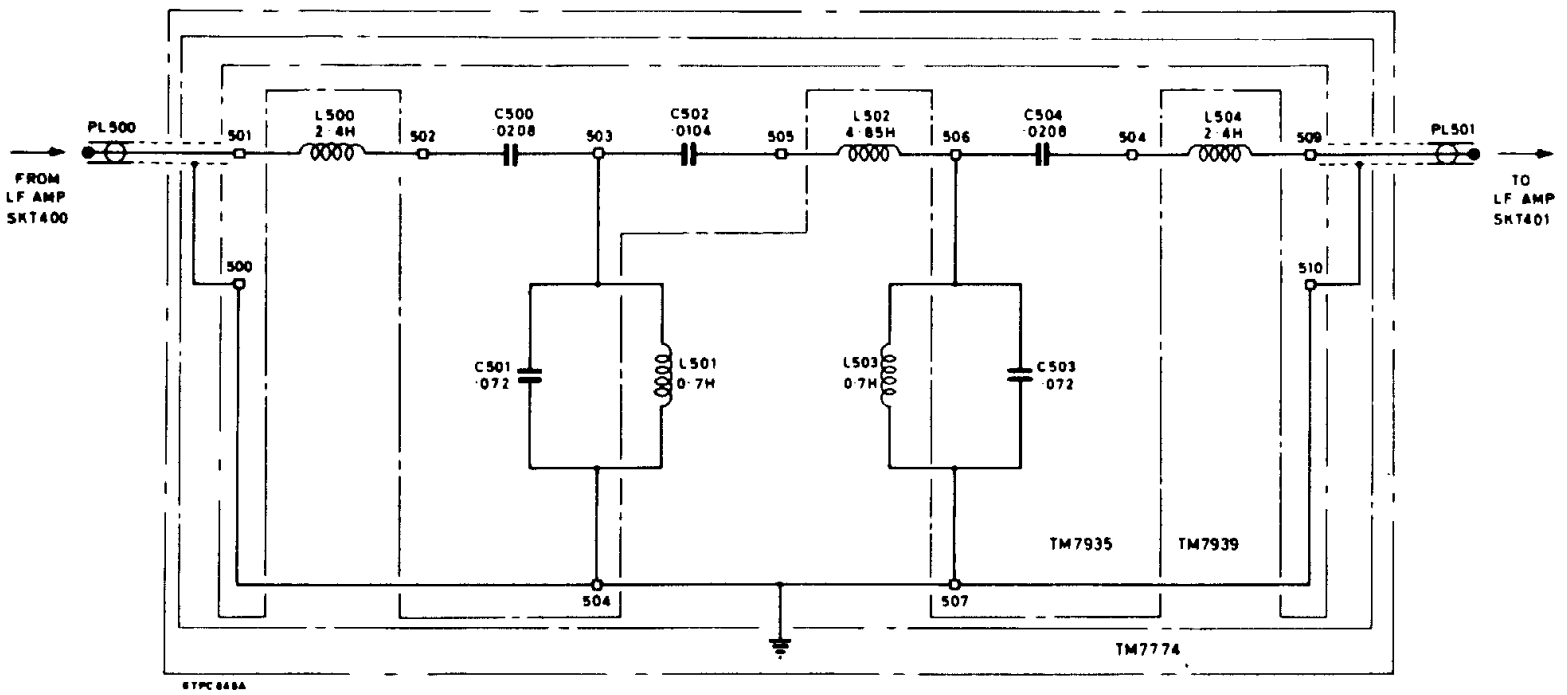


Figure 6.17 Receiver I.F. band-pass filter unit circuit.

AVAILABLE FILTERS

The filters listed below are those generally available.

Frequency in kHz	Noise Generator Filters			Receiver Frequency Selectors	
	High Pass	Low Pass	Band Stop	Filters	Oscillators
12	TM 7728	-	-	-	-
14	-	-	TM 7729	TM 7730	TM 7793
27	-	-	TM 7729/21	TM 7730/21	TM 7793/4
34	-	-	TM 7729/12	TM 7730/12	TM 7793/2
40	-	-	TM 7729/1	TM 7730/1	TM 7793/1
56	-	-	TM 7729/13	TM 7730/13	TM 7793,'3
60	TM 7728/1	TM 7720/8	-	-	-
70	-	-	TM 7729/2	TM 7730/2	TM 7794
105	-	-	TM 7729/3	TM 7730/3	TM 7794/1
108	-	TM 7720	-	-	-
140	-	TM 7720/17	-	-	-
152	-	-	TM 7729/19	TM 7730/19	TM 7794/7
156	-	TM 7720/14	-	-	-
185	-	-	TM 7729/4	TM 7730/4	TM 7794/2
204	-	TM 7720/10	-	-	-
245	-	-	TM 7729/22	TM 7730/22	TM 7794/9
252	-	TM 7720/15	-	-	-
270	-	-	TM 7729/5	TM 7730/5	TM 7794/3
290	-	-	TM 7729/14	TM 7730/14	TM 7794/5
300	-	TM 7720/1	-	-	-
316	TM 7728/2	-	-	-	-
342	-	-	TM 7729/16	TM 7730/16	TM 7794/6
534	-	-	TM 7729/6	TM 7730/6	TM 7794/4
552	-	TM 7720/2	-	-	-
695	-	-	TM 7729/20	TM 7730/20	TM 7794/8
1.002	-	-	TM 7729/15	TM 7730/15	TM 7795/5
1.052	-	TM 7720/11	-	-	-
1.248	-	-	TM 7729/7	TM 7730/7	TM 7795
1.300	-	TM 7720/3	-	-	-
2,438	-	-	TM 7729/8	TM 7730/8	TM 7795/1
2.540	-	TM 7720/4	-	-	-
2 660	-	TM 7720/12	-	-	-
3.886	-	-	TM 7729/9	TM 7730/9	TM 7795/2
4.028	-	TM 7720/5	-	-	-
4,188	-	TM 7720/13	-	-	-
4.300	-	TM 7720/18	-	-	-
5,340	-	-	TM 7729/17	TM 7730/17	TM 7795/6
5 564	-	TM 7720/9	-	-	-
6022	-	-	TM 7729/18	TM 7730/18	TM 7795/7
6.200	-	TM 7720/16	-	-	-
8002	-	-	TM 7729/10	TM 7730/10	TM 7795/3
8,204	-	TM 7720/6	-	-	-
12.150	-	-	TM 7729/11	TM 7730/11	TM 7795/4
12.388	-	TM 7720/7	-	-	-

This information supplements that in the Data Summary. The filter frequencies are those recommended by the CCIR Plenary Assembly at Geneva in 1963.

APPENDIX A

REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms	TM 38-750	The Army Maintenance Management System (TAMMS)
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting of Electrical Equipment Shelters	TM 750-90-1	Administrative Storage of Equipment

APPENDIX B

MAINTENANCE ALLOCATION

Section I. Introduction

B-1. General

This appendix provides a summary of the maintenance operations for AN/GSM-161A. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/ action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of material maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be show for each category. The number of task hours specified by the "work-time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew
O - Organizational
F - Direct Support
H - General Support
D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in the Remarks sections, which is pertinent to the item opposite the particular code.

B-4. Tool and Test Equipment Requirements

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers 5-digit) in parentheses.

B-5. Remarks.

a. Reference Code. This code refers to the appropriate item in the maintenance allocation charts, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing in the maintenance allocation charts.

SECTION II MAINTENANCE ALLOCATION CHART FOR

TEST SET, RADIO, AN/GSM-161A (MARCONI OA 2090A)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT.	(6) REMARKS
00	TEST SET, RADIO, AN/GSM-161A (MARCONI OA 2090A)	Inspect	0.2						
		Test				1.5		1 thru 12	
		Align				0.5		1 thru 15, 19 thru 24	
		Replace		0.1				1 thru 24	A
		Repair				32.0		1 thru 21	
		Overhaul							B
01	NOISE GENERATOR, TF2091	Inspect	0.1						
		Test				0.8		1 thru 21, 24	
		Align				0.8		1 thru 15, 19 thru 21	
		Replace	0.1					24	
		Repair				16.0		1 thru 21	
		Overhaul							B
0101	NOISE SOURCE, TM7637	Inspect				0.1		24	
		Test				1.0		1,7,9,16,24	
		Repair				8.0		24	
0102	LOW LEVEL AMPLIFIER, TM 7638	Inspect				0.1		24	
		Test				1.0		1,3,6 thru 8, 14,16,24	
		Align				0.9		3 thru 8,14, 24	
		Repair				8.0		24	
0103	HIGH LEVEL AMPLIFIER, TM7639	Inspect				0.1		24	
		Test				1.5		1,3,6 thru 8, 14,16,24	
		Align				0.9		3 thru 8,14, 24	
		Repair				9.0		24	
0104	ATTENUATOR, TM77E7	Inspect				0.1		24	
		Test				0.2		1,9,11,17,24	
		Repair				1.0		24	
0105	ATTENUATOR, TM7787/1	Inspect				0.1		24	
		Test				0.2		1,9,11,17,24	
		Repair				1.0		24	
02	NOISE RECEIVER, TF2092A	Inspect	0.1						
		Test				0.9		1 thru 17, 22 thru 24	
		Align				0.9		1 thru 15, 22 thru 24	
		Replace	0.1					24	
		Repair				16.0		1 thru 24	
		Overhaul							B
0201	WIDEBAND AMPLIFIER, TM8815	Inspect				0.2		24	
		Test				1.5		1,3 thru 8, 14,16,24	
		Align				1.0		3 thru 8, 14,24	
		Repair				10.0		24	
0202	MIXER, TM7672	Inspect				0.2		24	
		Test				1.5		1,16,22 thru 24	
		Align				1.0		22 thru 24	
		Repair				16.0		24	
0203	L.F. AMPLIFIER, TM8816	Inspect				0.3		24	
		Test				2.0		1,13,14,16, 24	
		Align				1.0		13,14,24	
		Repair				16.0		24	

SECTION II MAINTENANCE ALLOCATION CHART FOR

TEST SET, RADIO, AN/GSM-161A (MARCONI OA2000A)

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
0204	L.F. BANDPASS FILTER, TM7774	Inspect				0.3		24	
		Test				2.0		1,13,14,16, 17,24	
		Repair				16.0		24	
0205	STANDARDIZED NOISE SOURCE, TM7670	Inspect				0.3		24	
		Test				2.5		1,7,9,16,24	
		Align				1.5		1,7,9,24	
		Repair				24.0		24	
0206	EQUALIZER, TM8814	Inspect				0.2		24	
		Test				1.5		1,24	
		Repair				2.0		24	
0207	ATTENUATOR, TM7788	Inspect				0.1		24	
		Test				0.2		1,9,11,17, 24	
		Repair				0.5		24	
0208	ATTENUATOR, TM7788/1	Inspect				0.1		24	
		Test				0.2		1.9.11,17, 24	
		Repair				0.5		24	

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS FOR TEST SET, RADIO, AN/GSM-161A (MARCONI OA 2090A)

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	O,H	MULTIMETER TS-352B/U	6625-00-553-0142	
2	O,H	TRANSFORMER VARIABLE, POWER CN-16B/U	6625-00-235-2086	
3	O,H	SWEEP GENERATOR, M.I.	TF1099	
4	O,H	OUTPUT LEAD ASSEMBLY M.I.	TM4726/18	
5	O,H	INPUT PROBE ASSEMBLY M.I.	TM5332	
6	O,H	OUTPUT PROBE ASSEMBLY M.I.	TM 5331	
7	O,H	OSCILLOSCOPE AII/USM-281A	6625-00-228-2201	
8	O,H	RF STEP ATTENUATOR M.I.	TF1073A	
9	O,H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	
10	O,H	POWER METER (75 OHM, DC-15 MHZ, 100 MW, + 1/4 DB)		
11	O,H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
12	O,H	ATTENUATOR, TEK 011-0057-00		
13	O,H	COUNTER, ELECTRONIC DIGITAL READOUT ArN/USM-207A	6625-00-044-3228	
14	O,H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
15	D,H	TRUE RMS VOLTMETER (10 KHZ-15MHZ, ACCURACY: 2%)		
16	O,H	TEST SET, TRANSISTOR TS-1836B/U	6625-00-168-0954	
17	O,H	IMPEDANCE BRIDGE, GENERAL RADIO TYPE 1656		
18	O,H	HIGH PASS FILTER, 60 KHZ, M.I.	TM7728/1	5915-00-829-1514
19	O,H	LOW PASS FILTER, 1052 KHZ, M.I.	TM7720/11	5915-00-489-5029
20	O,H	LOW PASS FILTER, 2540 KHZ, M.I.	TM7720/4	5915-00-402-3733
21	O,H	BAND STOP FILTER, 2438 KHZ, M.I.	TM7729/8	5915-00-402-3732
22	O,H	BAND PASS FILTER, 2438 KHZ, M.I.	TM7730/8	5915-00-402-3737
23	O,H	OSCILLATOR, 2438 KHZ, M.I.	TM7795/1	6625-00-267-0396
24	C,O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-IOO/G	5180-00-605-0079	

SECTION IV REMARKS

REFERENCE CODE	REMARKS
A	REPLACE COMPONENT TF-2091 OR TF-2092A.
B	RETURN TO MANUFACTURER FOR OVERHAUL.

SECTION V MAINTENANCE ALLOCATION CHART FOR

LOW PASS FILTER, 552 KHZ, MARCONI INSTRUMENTS LTD., TM7720/2

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	LOW PASS FILTER, 552 KHZ, MARCONI INSTRUMENTS LTS., TM7720/2	Inspect	0.1						
		Test				0.3		1 thru 6	
		Adjust				0.5		1 thru 6	
		Replace - Repair		0.1				4	A

SECTION VI TOOL AND TEST EQUIPMENT REQUIREMENTS FOR LOW PASS FILTER, 552 KHZ, MARCONI INSTRUMENTS LTD., TM7720/2

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-IOO/G	5180-00-605-0079	
5	H	HIGH PASS FILTER, 60 KHZ, MARCONI INSTRUMENTS LTD., TM7728/1		
6	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION VII REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION VIII MAINTENANCE ALLOCATION CHART FOR

LOW PASS FILTER, 2540 KHZ, MARCONI INSTRUMENTS LTD., TM7720/4

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	LOW PASS FILTER, 2540 KHZ, MARCONI INSTRUMENTS LTD., TM7720/4	Inspect Test Adjust Replace Repair	0.1	 0.1 		 0.3 0.5 		 1 thru 6 1 thru 6 4	 A

SECTION IX TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
LOW PASS FILTER, 2540 KHZ, MARCONI INSTRUMENTS LTD., TM7720/4

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	HIGH PASS FILTER, 60 KHZ MARCONI INSTRUMENTS LTD., TM7728/1		
6	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION X REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XI MAINTENANCE ALLOCATION CHART
FOR
LOW PASS FILTER, 1052KHZ, MARCONI INSTRUMENTS LTD., TM7720/11

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	LOW PASS FILTER, 1052 KHZ, MARCONI INSTRUMENTS LTD., TM7720/11	Inspect Test Adjust Replace Repair	0.1	 0.1 		 0.3 0.5 		 1 thru 6 1 thru 6 4	 A

SECTION XII TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
LOW PASS FILTER, 1052 KHZ, MARCONI INSTRUMENTS LTD., TM7720/11

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
I	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	HIGH PASS FILTER 60 KHZ MARCONI INSTRUMENTS LTD., TM7728/1		
6	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XIII REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XIV MAINTENANCE ALLOCATION CHART
FOR
HIGH PASS FILTER, 60 KHZ, MARCONI INSTRUMENTS LTD., TM7728/1

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
b0	HIGH PASS FILTER, 60 KHZ, MARCONI INSTRUMENTS LTD., T47728/1	Inspect Test Adjust Replace Repair	0.1	 0.1 		 0.3 0.5 		 1 thru 5 1 thru 5 4	 A

SECTION XV TOOL AND TEST EQUIPMENT REQUIREMENTS FOR HIGH PASS FILTER, 60 KHZ, FARCONI INSTRUMENTS LTD., TM7728/1

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
I	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XVI REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XVII MAINTENANCE ALLOCATION CHART
FOR
BAND STOP FILTER, 70 KIIZ, MARCONI INSTRUMENTS LTD., TM7729/2

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
OD	BAND STOP FILTER, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7729/2	Inspect Test Adjust Replace Repair	0.1	 0.1		 0.3 0.5		 1 thru 5 1 thru 5 4	 A

SECTION XVIII TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND STOP FILTER, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7729/2

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-IOO/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XIX REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XX MAINTENANCE ALLOCATION CHART
FOR
BAND STOP FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD TM7729/6

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
O0	BAND STOP FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7729/6	Inspect Test Adjust Replace Repair	0.1	 0.1 		 0.3 0.5 		 1 thru 5 1 thru S 4	 A

SECTION XXI TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
BAND STOP FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7729/6

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER,ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-IOO/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXII REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXIII MAINTENANCE ALLOCATION CHART
FOR
BAND STOP FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7729/8

(1) GROUP NUMBER	(2) COMPONENT ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQPT.	(6) REMARKS
			C	O	F	H	D		
00	BAND STOP FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7729/8	Inspect Test Adjust Replace Repair	0.1	 O.1 		 0.3 0.5 		 1 thru 5 1 thru 5 4	 A

SECTION XXIV TOOL AND TEST EQUIPMENT REQUIREMENTS FOR BAND STOP FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7729/8

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXV REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXVI MAINTENANCE ALLOCATION CHART
FOR
BAND STOP FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7729/15

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	BAND STOP FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7729/15	Inspect	0.1						
		Test				0.3		1 thru 5	
		Adjust				0.5		1 thru 5	
		Replace		0.1				4	
		Repair							A

SECTION XXVII TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND STOP FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7729/15

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY		NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-IOO/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXVIII REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXIX MAINTENANCE ALLOCATION CHART FOR

BAND PASS FILTER, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7730/2

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	BAND PASS FILTER, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7730/2	Inspect	0.1						
		Test				0.3		1 thru 5	
		Adjust				0.5		1 thru 5	
		Replace		0.1				4	
		Repair							A

SECTION XXX TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND PASS FILTER, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7730/2

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXXI REMARKS

REFERENCE REMARKS CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXXII MAINTENANCE ALLOCATION CHART FOR

BAND PASS FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7730/6

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
OO	BAND PASS FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD., TM773O/6	Inspect	0.1						
		Test				0.3		1 thru 5	
		Adjust				0.5		1 thru 5	
		Replace		0.1				4	
		Repair							A

SECTION XXXIII TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND PASS FILTER, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7730/6

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXXIV REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXXV MAINTENANCE ALLOCATION CHART FOR

BAND PASS FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7730/8

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	BAND PASS FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7730/8	Inspect	0.1						
		Test				0.3		1 thru 5	
		Adjust				0.5		1 thru 5	
		Replace		0.1				4	
		Repair							A

SECTION XXXVI TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND PASS FILTER, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7730/8

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XXXVII REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XXXVIII MAINTENANCE ALLOCATION CHART FOR

BAND PASS FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7730/15

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	BAND PASS FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7730/15	Inspect	0.1						
		Test				0.3		1 thru S	
		Adjust				0.5		1 thru 5	
		Replace		0.1				4	
		Repair							A

SECTION XXXIX TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

BAND PASS FILTER, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7730/15

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	GENERATOR, SIGNAL AN/USM-205	6625-00-788-9672	
2	H	COUNTER, ELECTRONIC, DIGITAL READOUT	6625-00-044-3228	
3	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
4	O,H	TOOL KIT, ELECTRICAL EQUIPMENT TK-10O/G	5180-00-605-0079	
5	H	LEVEL METER, SELECTIVE (75 OHM)	6625-00-832-9047	

SECTION XL REMARKS

REFERENCE CODE	REMARKS
A	RETURN TO VENDOR - PROPRIETARY ITEM.

SECTION XLI MAINTENANCE ALLOCATION CHART FOR

OSCILLATOR MODULE, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7794

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	OSCILLATOR MODULE, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7794	Inspect	0.1						
		Test				0.3		1 thru 8	
		Align				0.5		1 thru 4	
		Replace		0.1				7,8	
		Repair				1.5		1 thru 4,7, 8	

SECTION XLII TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

OSCILLATOR MODULE, 70 KHZ, MARCONI INSTRUMENTS LTD., TM7794

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	COUNTER, ELECTRONIC, DIGITAL READOUT	6625-00-044-3228	
2	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
3	H	POWER SUPPLY PP-6291/U	6625-00-051-5986	
4	H	MIXER, MARCONI INSTRUMENTS LTD., TM7672		
S	H	TEST SET, TRANSISTOR TS-1836B/U	6625-00-168-0954	
6	H	MULTIMETER TS-3528/U	6625-00-553-0142	
7	O,H	MODULE TEST ADAPTER, 2490-ESK-2		
8	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	

SECTION XLIII MAINTENANCE ALLOCATION CHART FOR

OSCILLATOR MODULE, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7794/4

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	OSCILLATOR MODULE, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7794/4	Inspect	0.1						
		Test				0.3		1 thru 8	
		Align				0.5		1 thru 4	
		Replace		0.1				7,8	
		Repair				1.5		1 thru 4,7, 8	

SECTION XLIV TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

OSCILLATOR MODULE, 534 KHZ, MARCONI INSTRUMENTS LTD., TM7794/4

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
2	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
3	H	POWER SUPPLY PP-6291/U	6625-00-051-5986	
4	H	MIXER, MARCONI INSTRUMENTS LTD., TM7672		
5	H	TEST SET, TRANSISTOR TS-1836B/U	6625-00-168-0954	
6	H	MULTMETER TS-352B/U	6625-00-553-0142	
7	O,H	MODULE TEST ADAPTER, 2490-ESK-2		
8	O,H	TOOL KIT, ELECTRONIC EQUIPMENT, TK-100/G	5180-00-605-0079	

SECTION XLV MAINTENANCE ALLOCATION CHART
FOR

OSCILLATOR MODULE, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7795/1

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	OSCILLATOR MODULE, 2438 KHZ, MARCONI INSTRUMENTS LTD., TM7795/1	Inspect	0.1						
		Test				0.3		1 thru 8	
		Align				0.5		1 thru 4 7,8	
		Replace		0.1					
		Repair				1.5		1 thru 4, 7, 8	

SECTION XLVT TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

OSCILLATOR MODULE, 2438 KHZ, MARCONI INSTRUMENTS LTD., TN7795/1

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NATIONAL/NATO NOMENCLATURE	STOCK NUMBER	TOOL NUMBER
1	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
2	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
3	H	POWER SUPPLY PP-6291/U	6625-00-051-5986	
4	H	MIXER, MARCONI INSTRUMENTS LTD., TM7672		
5	H	TEST SET, TRANSISTOR TS-18368/U	6625-00-168-0954	
b	H	MULTIMETER TS-3528/U	6625-00-553-0142	
7	O,H	MODULE TEST ADAPTER, 2490-ESK-2		
8	O,H	TOOL KIT, ELECTRONIC EQUIPMENT, TK-100/G	5180-00-605-0079	

SECTION XLVII MAINTENANCE ALLOCATION CHART FOR

OSCILLATOR MODULE, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7795/5

(1) GROUP NO.	(2) COMPONENT/ ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			UNIT		DS	GS	DEPOT		
			C	O	F	H	D		
00	OSCILLATOR MODULE, 1002 KHZ MARCONI INSTRUMENTS LTD., TM7795/5	Inspect	0.1						
		Test				0.3		1 thru 8	
		Align				0.5		1 thru 4	
		Replace		0.1				7,8	
		Repair				1.5		1 thru 4, 7,8	

SECTION XLVIII TOOL AND TEST EQUIPMENT REQUIREMENTS FOR

OSCILLATOR MODULE, 1002 KHZ, MARCONI INSTRUMENTS LTD., TM7195/5

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/NATO STOCK NUMBER	TOOL NUMBER
1	H	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-00-044-3228	
2	H	VOLTMETER, ELECTRONIC ME-30E/U	6625-00-643-1670	
3	H	POWER SUPPLY PP-6291/U	6625-00-051-5986	
4	H	MIXER, MARCONI INSTRUMENTS LTD., TM7672		
5	H	TEST SET, TRANSISTOR, TS-1836B/U	6625-00-168-0954	
6	H	MULTIMETER TS-352B/U	6625-00-553-0142	
7	O,H	MODULE TEST ADAPTER, 2490-ESK-2		
8	O,H	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-00-605-0079	

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NG: None

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For explanation of abbreviations used, see AR 310-50.

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