

7654-TR-~~8186~~-TM
0100

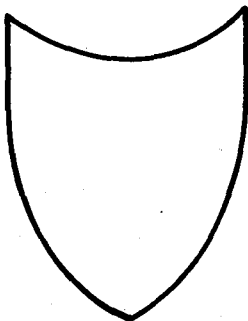
SOUTH AFRICAN DEFENCE FORCE

SUID - AFRIKAANSE WEERMAG

RS - B25 - SA

TECHNICAL MANUAL

TEGNIJSE HANDBOEK



THOMSON-CSF

SHEET INDEX

SHEET No.	DATE OF ISSUE	SHEET No.	DATE OF ISSUE	SHEET No.	DATE OF ISSUE
0-1 to 0-8	original				
1-1 to 1-9	original				
2-1 to 2-8	original				
3-1 to 3-6	original				
4-1 to 4-96	original				
5-1 to 5-24	original				
6-1 to 6-145	original				
7-1 to 7-33b	plates original				
8-1 to 8-175	original				

INDEX OF CONTENTS

	Pages
SECTION 0	
Index of contents	0-1
Index of illustrations	0-4
Index of plates	0-6
SECTION 1	
GENERAL INFORMATION	
1.1 Breakdown of the technical manual	1-1
1.2 Introduction	1-2
1.3 Symbology	1-4
1.3.1 And logic function	1-4
1.3.2 Nand logic function	1-5
1.3.3 Logic inclusive OR function	1-5
1.3.4 Logic inclusive NOR function	1-6
1.3.5 Logic exclusive OR function	1-6
1.3.6 Logic NOT function	1-7
1.3.7 Flip Flop	1-7
1.4 Abbreviations used	1-9
SECTION 2	
DESCRIPTION AND CHARACTERISTICS	
2.1 Description	2-1
2.1.1 Description of a complete unit	2-1
2.1.2 Composition of the MAN-PACK Transceiver	2-1
2.1.3 Design of the MAN-PACK Transceiver	2-3
2.2 Characteristics	2-4
2.2.1 Electrical characteristics	2-4
2.2.1.1 Characteristics common to transmission and reception	2-4
2.2.1.2 Transmission characteristics	2-6
2.2.1.3 Reception characteristics	2-7
2.2.2 Mechanical characteristics	2-8
SECTION 3	
OPERATING INSTRUCTIONS	
3.1 Specifications	3-1
3.2 Details of a collective unit	3-2
3.3 Operating instructions	3-2

3.3.1	Mounting the antennas	3-2
3.3.2	Adjustments and operations	3-3
3.3.3	Sidetone	3-3
3.3.4	Operation with remote control	3-4
3.3.5	Closing down the station	3-4
3.3.6	Battery use	3-4
3.3.7	Available capacity after storage	3-5
3.4	Maintenance	3-5
3.5	Current repairs	3-6

SECTION 4 THEORY OF OPERATION

4.1	General theory of operation	4-1
4.1.1	Operation of synthesizer	4-1
4.1.1.1	General information	4-1
4.1.1.2	Principle of operation	4-3
4.1.1.3	Main circuits used	4-6
4.1.1.4	Operation	4-11
4.1.2	General operation of the reception channel, Transmission channel and ancillary circuits	4-14
4.1.2.1	Reception channel	4-14
4.1.2.2	Transmission channel	4-15
4.1.2.3	Ancillary circuits	4-17
4.1.3	General operation of the 20 W amplifier, antenna unit and ancillary circuits	4-18
4.1.3.1	Reception channel	4-18
4.1.3.2	Transmission channel	4-18
4.1.3.3	Ancillary circuits of the 20 W amplifier	4-19
4.1.3.4	Ancillary circuits of the antenna tuning unit	4-21
4.1.4	General operation of the d.c. Voltage generating circuits	4-23
4.2	Detailed operation	4-26
4.2.1	Detailed operation of the Synthesizer	4-26
4.2.1.1	Generation of the 5 MHz, 2,5 MHz, 25 kHz and 1 kHz reference signals	4-26
4.2.1.2	Generation of the 100 and 105 MHz signals used as a fixed heterodyne	4-29
4.2.1.3	Operation of the Main loop	4-31
4.2.1.4	Operation of the Secondary loop	4-53
4.2.2	Detailed operation of the receiving channel, transmitting channel and ancillary circuits	4-67

	Pages
4.2.2.1 Reception channel	4-67
4.2.2.2 Transmission channel	4-71
4.2.2.3 Ancillary circuits	4-77
SECTION 5 THIRD LINE MAINTENANCE	
5.1 Operational check	5-2
5.2 Removing and fitting standard components	5-4
SECTION 6 FOURTH LINE MAINTENANCE	
6.1 List of test apparatus	6-1
6.2 Test data sheets	6-2
6.3 Special disassembly and reassembly procedure	6-3
SECTION 7 CIRCUITS AND BLOCKS DIAGRAMS	
SECTION 8 INDEX OF EQUIPMENT ILLUSTRATIONS	

INDEX OF ILLUSTRATIONS

	Pages
Figure 1.1 : Operational capabilities of the RS.B25.SA MAN-PACK Transceiver	1-3
Figure 1.2 : Simplified block diagram of the RS.B25.SA MAN-PACK Transceiver	1-3
Figure 1.3 : Representation of the AND Logic Function	1-4
Figure 1.4 : Representation of the NAND Logic Function	1-5
Figure 1.5 : Representation of the Inclusive OR Function	1-5
Figure 1.6 : Representation of the Logic Inclusive NOR function	1-6
Figure 1.7 : Representation of the exclusive OR function	1-6
Figure 1.8 : Representation of the logic NOT function	1-7
Figure 1.9 : Representation of the a flip-flop	1-7
Figure 3.1 : Mounting the antennas	3-2
Figure 4.1 : Block diagram of the feedback loop of a VCO	4-1
Figure 4.2 : Capacitance - versus - Voltage curve of a varicap	4-2
Figure 4.3 : Theory of operation of the phase loop used in the synthesizer	4-3
Figure 4.4 : Waveform of the search signal	4-6
Figure 4.5 : Functional block diagram of the primary loop variable divider	4-7
Figure 4.6 : Theory of operation of the compressor control loop	4-20
Figure 4.7 : Block diagram of the converter unit	4-23
Figure 4.8 : Block diagram of the charger	4-24
Figure 4.9 : Schematic diagram of the divider by 10 or 12	4-36
Figure 4.10 : Timing chart of a counting by ten	4-38
Figure 4.11 : Timing chart of the counting by twelve	4-40
Figure 4.12 : Diagram of the divider by ten of the variable - preset divider	4-41
Figure 4.13 : Diagram of the variable - preset divider	4-44

	Pages
Figure 4.14: Enabling timing chart	4-46
Figure 4.15: Timing chart of the generation of command C or order to divide	4-47
Figure 4.16: Diagram of frequency discriminator and D/A converter	4-48
Figure 4.17: Synchronization of the sawtooth	4-50
Figure 4.18: Generation of the feedback control error signal	4-51
Figure 4.19: Generation of the sideband controls	4-52
Figure 4.20: Circuit diagram of a module	4-55
Figure 4.21: Circuit diagram of the variable preset divider	4-56
Figure 4.22: Enabling timing chart for the settings 10 kHz = 0 and 1 kHz = 0	4-58
Figure 4.23: Enabling timing chart for the settings 10 kHz = 9 and 1 kHz = 9	4-59
Figure 4.24: Enabling with the 100 kHz control set to an even value	4-60
Figure 4.25: Enabling with the 100 kHz control set to an odd value	4-61
Figure 4.26: Enabling with the settings 100 kHz controls : even 10 kHz = 0, 1 kHz = 0	4-62
Figure 4.27: Circuit diagram of the frequency discriminator and digital to analog converter	4-64
Figure 4.28: AGC Voltage generating circuit	4-80
Figure 4.29: Block diagram of the call signal generating circuit	4-93

INDEX OF PLATES

- PLATE 1 : View of complete installation (A and B Version)
- PLATE 2 : Composition of transceiver system (A and B Version)
- PLATE 3 : View of front panel (A and B Version)
- PLATE 4 : Breakdown of the transceiver Basic unit (A and B Version)
- PLATE 5 : Operation of the transceiver (A and B Version)
- PLATE 6 : Standard exchange of battery unit (A and B Version)
- PLATE 7 : Synthesizer - Bloc diagram (A and B Version)
- PLATE 8 : Transmission - Reception channels - Block diagram
(A and B Version)
- PLATE 9 : 20 W amplifier - Antenna timing unit block diagram
(A and B Version)
- PLATE 10 : General interconnexion diagram (A and B Version)
- PLATE 11A: Synthesizer N° 1 Board Interconnections (A Version)
- PLATE 11B: Synthesizer N° 1 Board Interconnections (B Version)
- PLATE 12 : Synthesizer N° 1 Board Diagram of main loop
mixer module - Z05 (A and B Version)
- PLATE 13 : Synthesizer N° 1 Board Diagram of divider by four
module - Z06 (A and B Version)
- PLATE 14 : Synthesizer N° 2 Board Circuit diagram (A and B Version)
- PLATE 15 : Synthesizer N° 2 Board Diagram of divider by two
module - Z02 (A and B Version)
- PLATE 16 : Synthesizer N° 2 Board Diagram of phase comparator
module - Z03 (A and B Version)
- PLATE 17 : Synthesizer N° 2 Board Diagram of digital (analog converter
module - Z22 (A and B Version)
- PLATE 18 : Synthesizer N° 3 Board Circuit diagram (A and B Version)

- PLATE 19 : Synthesizer N° 3 Board Diagram of filter matching module - Z01 (A and B Version)
- PLATE 20 : Synthesizer N° 3 Board Diagram of 105 MHz mixer Z02 (A and B Version)
- PLATE 21 : Synthesizer N° 3 Board Diagram of 100 MHz amplifier module - Z03 (A and B Version)
- PLATE 22 : Synthesizer N° 3 Board Diagram of 100 MHz Oscillator module - Z04 (A and B Version)
- PLATE 23A: HF Unit Circuit diagram (A Version)
- PLATE 23B: HF Unit Circuit diagram (B Version)
- PLATE 24 : Frequency selector board - Schematic diagram (A and B Version)
- PLATE 25 : Filter and 2,5 MHz IF circuits board - Schematic diagram (A and B Version)
- PLATE 26A: AF board - Schematic diagram (A Version)
- PLATE 26B: AF board - Schematic diagram (B Version)
- PLATE 27 : Exciter board - Schematic diagram (A and B Version)
- PLATE 28 : Peripheral circuits board - Schematic diagram (A and B Version)
- PLATE 29 : 20 W amplifier - Circuit diagram (A and B Version)
- PLATE 30 : Antenna tuning unit - Schematic diagram (A and B Version)
- PLATE 31 : Converter unit - Schematic diagram (A and B Version)
- PLATE 32 : Battery unit - Diagram of charger (A and B Version)
- PLATE 33A: Remote control unit - Schematic diagram (A Version)
- PLATE 33B: Remote control unit - Schematic diagram (B Version)

SECTION ONE

GENERAL INFORMATION

1-GENERAL INFORMATION

1.1 - BREAKDOWN OF THE TECHNICAL MANUAL

The Technical Manual of the MAN-PACK Transceiver is divided into the eight following sections :

- Section 1 - GENERAL INFORMATION
- Section 2 - DESCRIPTION AND SPECIFICATIONS
- Section 3 - OPERATING INSTRUCTIONS
- Section 4 - THEORY OF OPERATION
- Section 5 - FIELD MAINTENANCE
- Section 6 - BASE WORKSHOP MAINTENANCE
- Section 7 - CIRCUITS AND BLOCK DIAGRAMS
- Section 8 - INDEX OF EQUIPMENT ILLUSTRATIONS

Section 1 gives the breakdown of this manual, a brief description of the MAN-PACK Transceiver, indicates the symbols and abbreviations used.

Section 2 "DESCRIPTION AND CHARACTERISTICS" describes the system with référence to photographic illustrations, gives the electrical and mechanical characteristics of the MAN-PACK Transceiver.

Section 3 "OPERATING INSTRUCTIONS" gives all the information required for correct use of the system.

Section 4 "THEORY OF OPERATION" is divided into two parts :

- . Part one deals with the general functioning with reference to detailed block diagrams.
- . Part two deals with the details of each function contained in each block of the block diagrams. This operation is illustrated by circuit diagrams of sub assemblies and the interconnection diagram of the Transceiver.

Section 5 "FIELD MAINTENANCE" deals with 1st, 2nd and 3rd line servicing operations. It describes the adjustments and checks to be carried out on the equipment, as well as the fault-finding procedure for rapid detection of a faulty subassembly. The instructions for dismounting and mounting simple components are also detailed.

Section 6 "REPAIR AND WORKSHOP MAINTENANCE" completes section 5 "FIELD MAINTENANCE" and deals with the delicate operations (checks, tests or adjustments) to be carried out on the equipment. It gives the best procedure to be used to locate a faulty component. This fault-finding procedure is illustrated by waveforms and typical values.

Section 7 "CIRCUITS AND BLOCK DIAGRAMS" includes photographic illustrations of the equipment, functional block diagrams, circuit diagrams of the boards or sub-assemblies and interconnection diagrams .

Section 8 "INDEX OF EQUIPMENT ILLUSTRATIONS" enables identification of the different parts the equipment.

1.2 - INTRODUCTION

The RS-B25 SA Type MAN-PACK Transceiver is of an entirely new design from both a technical and technological standpoint. It is the outcome of the joint development of a new generation of communication equipment.

The working principles used both on transmission and reception simplify the design of the transceiver. It should be emphasized that this simplified design substantially improves performance.

Many of the circuits of the MAN-PACK Transceiver use microelectronic technology. Many functions are performed by monolithic integrated circuits, mainly in the digital parts of the equipment.

The communication range extends from 2 to 30 MHz for the operating modes A2-j ("Morse"), A3-h ("AM"), A3-j ("LSB" lower sideband and "HSB" Upper sideband). The communication frequency is selected via a synthesizer, 1 kHz stepped, which ensures good frequency stability for the whole equipment and provides 28 000 channels.

The MAN-PACK Transceiver is fitted with cadmium-nickel cells with an autonomy of operation for 12 to 15 hours in the A3-j mode with a Transmit/Receive cycle of 1 minute to 9 minutes (normal speech).

Antenna tuning is fully automatic and takes place when a new operating frequency is selected, each time the transceiver is switched and when required by the operator.

With a remote control unit the MAN-PACK Transceiver can be used by two operators with up to 1,5 km distance between them.

This principle is illustrated in figure 1.1.

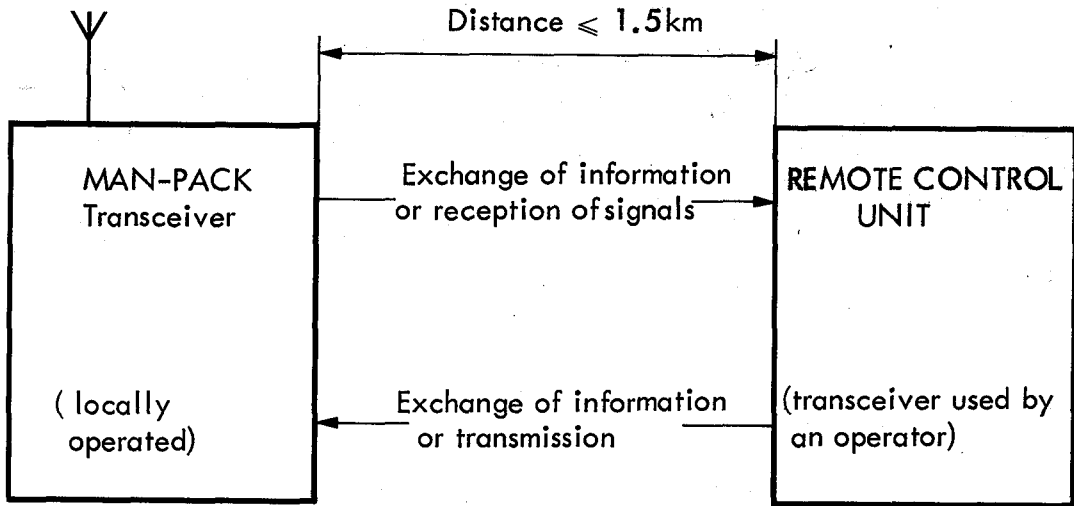


Figure 1.1 - Operational Capabilities of the RS B25-SA MAN-PACK Transceiver.

The two operators may, in turn, exchange information, transmit or receive a signal. However, the operator using the remote control cannot switch on the MAN-PACK Transceiver or select a frequency; these two operations can be carried out only by the operator using the MAN-PACK Transceiver.

From the operational standpoint, the MAN-PACK performs five completely separate functions as shown in figure 1.2 below:

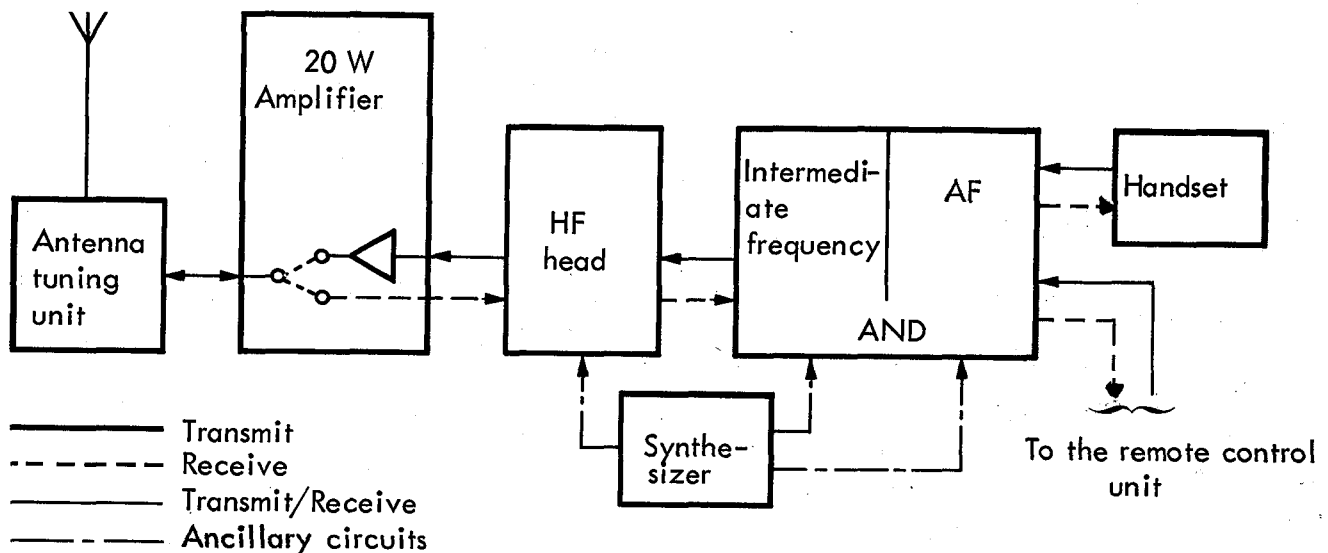


Figure 1.2 - Simplified Block Diagram of the RS B25 SA MAN-PACK Transceiver.

- (a) The "Synthesizer" function provides the heterodyne frequencies required for correct operation of the MAN-PACK Transceiver.
- (b) The "HF Head", "IF" and "AF Frequency functions" are typical of a transceiver.
- (c) The "20 W Amplifier" function provides two different transmitted powers (normal power and reduced power) and selects either the transmitting or the receiving channel.
- (d) The "Antenna Tuning Unit" function is also a typical transceiver function. In the MAN-PACK Transceiver this function takes any environmental change into account when using the whip or open wire antenna.

1.3 - SYMBOLOLOGY

This paragraph deals with the symbols used to represent logic functions, analog functions using conventional symbols.

1.3.1 - AND Logic Function

The AND Logic Function is shown in figure 1.3 below :

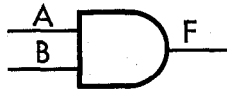


Figure 1.3 - Representation of the AND Logic Function

The logic equation of the output signal F is the following :

$$F = A \cdot B$$

The truth table is as follows :

Inputs		Output
A	B	F
High (1)	High (1)	High (1)
High (1)	Low (0)	Low (0)
Low (0)	High (1)	Low (0)
Low (0)	Low (0)	Low (0)

1.3.2 - NAND Logic Function

The NAND Logic Function is shown in figure 1.4 below :

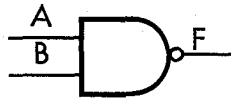


Figure 1.4 - Representation of the NAND Logic Function

The logic equation of the output signal F is the following :

$$F = \overline{A \cdot B} = \overline{A} + \overline{B}$$

The truth table is as follows :

Inputs		Output F
A	B	
High (1)	High (1)	Low (0)
High (1)	Low (0)	High (1)
Low (0)	High (1)	High (1)
Low (0)	Low (0)	High (1)

1.3.3 - Logic Inclusive-OR Function

The Inclusive-OR function is shown in figure 1.5.



Figure 1.5 - Representation of the Inclusive-OR Function

The logic equation of the output signal F is the following :

$$F = A + B$$

The truth table is as follows :

Inputs		Output
A	B	F
High (1)	High (1)	High (1)
High (1)	Low (0)	High (1)
Low (0)	High (1)	High (1)
Low (0)	Low (0)	Low (0)

1.3.4 - Logic Inclusive-NOR Function

The Logic Inclusive-NOR Function is shown in figure 1.6.

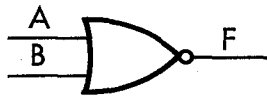


Figure 1.6 - Representation of the logic Inclusive-NOR function.

The logic equation of the output signal F is the following :

$$F = \overline{A + B} = \overline{A} \cdot \overline{B}$$

The truth table is as follows :

Inputs		Output
A	B	F
High (1)	High (1)	Low (0)
High (1)	Low (0)	Low (0)
Low (0)	High (1)	Low (0)
Low (0)	Low (0)	High (1)

1.3.5 - Logic Exclusive-OR Function

The logic Exclusive-OR function is shown in figure 1.7.



Figure 1.7 - Representation of the Exclusive-OR function.

The logic equation of the output signal F is the following :

$$F = A \cdot \bar{B} + \bar{A}B = A \oplus B$$

The truth table is as follows :

Inputs		Output
A	B	F
High (1)	High (1)	Low (0)
High (1)	Low (0)	High (1)
Low (0)	High (1)	High (1)
Low (0)	Low (0)	Low (0)

1.3.6 - Logic NOT Function

The logic NOT function is shown in figure 1.8.



Figure 1.8 - Representation of the logic NOT function.

The logic equation of the output signal F is the following :

$$F = \bar{A}$$

The truth table is as follows :

Input A	Output F
High (1)	Low (0)
Low (0)	High (1)

1.3.7 - Flip-Flop

Figure 1.9 shows a flip-flop.

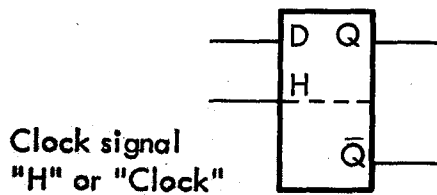


Fig. 1.9 - Representation of a flip-flop.

The output signal Q of the flip-flop repeats the input signal D (high or low), when the clock signal H is active.

This repetition is not instantaneous. It occurs only after a time interval θ called transfer time ; this time interval θ is of the order of a few nanoseconds, which, in certain cases, is considered as negligible. The output signal \overline{Q} is the complemented signal of the output signal Q .

The output signal \overline{Q} is the signal complemented with respect to the output signal Q .

An active signal at terminal R forces flip-flop outputs Q and \overline{Q} . Output Q is at logic level 0 while output \overline{Q} is at logic level 1.

As long as the signal is active, the clock pulses have no effect on flip-flop outputs.

An active signal at terminal S forces flip-flop outputs Q and \overline{Q} . Output Q is at logic level 1 while output \overline{Q} is at logic level 0. As long as the signal is active, the clock pulses have no effect on flip-flop outputs.

1.4 ABBREVIATIONS USED

A	Ampère
AE	Alternative current
AF	Audio Frequency
AGC	Automatic Gain Control
D	Depth
DC	Direct Current
H	Height
HF	High Frequency
HSB	High Side Band
L	Length
LSB	Low Side Band
ML	Main Loop
MLH	Main Loop Heterodyne
SL	Secondary Loop
SLH	Secondary Loop Heterodyne
SSB	Single Side Band
V	Volt
VCO	Voltage Controlled Oscillator
W	Width

SECTION TWO

DESCRIPTION AND CHARACTERISTICS

2-DESCRIPTION AND CHARACTERISTIQUES

2.1 - DESCRIPTION

2.1.1 - Description of a Complete unit (Plate 1)

The complete MAN-PACK Transceiver unit type RS B25 SA consists of :

- . A transceiver assembly, including the antenna tuning unit and the battery unit (item 1, 2, 3).
- . A harness (item 11).
- . A whip antenna (item 8).
- . An open wire antenna (item 9).
- . A remote control unit (item 7).
- . A telephone handset (item 4).
- . A headset (item 5).
- . A keyer (item 6).
- . A battery charging cable (item 10).
- . A spare battery unit.

2.1.2 - Composition of the MAN-PACK Transceiver (Plates Nos. 2 and 3)

The RS B25 SA type MAN-PACK Transceiver consists of :

- . A battery unit (with built-in charger (plate 2, item 1)
- . A transceiver, i.e HF head, IF , AF , Synthesizer and associated circuits (Plate 2, item 2)
- . A 20 W amplifier with transmit and receive channel switching (plate 2, item 3)
- . An antenna tuning unit (plate 2, item 4) fitted with an antenna coupling device (plate 2, item 5).


The battery unit, transceiver and antenna-tuning unit (plate 2, items 1, 2, and 4) the (plate 2, item 6) carry all the controls and connecting components required for the operation of the MAN-PACK Transceiver.

In the following, the whole of the three front panels shall be hereinafter called the "Front Panel of the RS B25 SA MAN-PACK Transceiver".

The rear panel of the 20 W amplifier (plate 2, item 3) is fitted with a connector (plate 2, item 7) for use with an auxiliary "100 W" amplifier.

The rear panel of the Antenna Tuning unit (Plate 2 item 4) is fitted with a drying out bung (Plate 2 item 8). This opening is used only for drying out purposes.



The front panel of the RS B25 SA MAN-PACK Transceiver carries the following :


- . An external power supply connector (plate 3, item 1) whereby the battery may be charged from an external DC source.
- . A pushbutton "  " (plate 3, item 2) which, when actuated, permits automatic antenna tuning when required (use of the whip or **open wire antenna**).


Five communication frequency selectors, i. e. :

- . Tens of MHz selector "10 MHz" (plate 3, item 3)
- . MHz selector "1 MHz" (plate 3, item 4)
- . Hundreds of kHz selector "100 kHz" (plate 3, item 6)
- . Tens of kHz selector "10 kHz" (plate 3, item 7)
- . kHz selector "1 kHz" (plate 3, item 8)

A configuration selector (plate 3, item 5) with 3 positions, with one spring-loaded

- . On the "  " position, the remote control unit is off. The transceiver operates alone.
- . The "  " position is used when the remote control unit is connected to the system. The operator with the MAN-PACK transceiver and the operator with the remote control unit can :
 - . receive the same signal simultaneously
 - . transmit alternately
 - . exchange information in a closed circuit (Intercom effect).
- . On the "CALL-ROEP" position, the operator with the MAN-PACK transceiver calls the operator with the remote control unit.

On release of the selector from the "CALL ROEP" position it returns automatically to the "  " position.

- . An On-Off and transmitted power selector switch (plate 3, item 9) with three positions :
 - . "  " is the switched off position
 - . " L " corresponds to low power transmission
 - . " H " corresponds to HIGH power transmission.
- . A coaxial connector (plate 3, item 10) which is the 50 Ω HF output or the VEHICULE HF connector (auxiliary 100 W amplifier).

An antenna selector (plate 3, item 10) with four positions.

When it is set to the positions " 50 Ω " and " VEHICULE ", the signal, input or output is through the coaxial connector (plate 3, item 10)

The "WIRE" position is for use with an open wire antenna.

The "WHIP" position is for use with a whip antenna.

- . A moisture indicator (plate 3, item 13)
- . A mode selector (plate 3, item 14), with four positions :
 - "MORSE" for operation in the A2j mode.
 - "LSB" for operation in the A3j lower sideband mode .
 - "HSB" for operation in the A3j upper sideband mode.
 - "AM" for operation in the A3h mode on transmission and AM on reception.
- . A ground terminal (plate 3, item 15) .
- . A volume control potentiometer (Plate 3, item 16) .
- . Two telephone line connecting terminals connecting the transceiver to the remote control unit (plate 3, items 17 and 18) .
- . Two connectors for the telephone handsed, headset or keyer (plate 3, items 19 and 20) .

2.1.3 - Design of the MAN-PACK Transceiver (Plate 4)

The MAN-PACK Transceiver consists of :

- . An "RF head" (item 1) fitted with a 102.5 MHz IF crystal filter (item 11). The HF head circuits are conventional transmission - reception circuits of signal wavelengths 10 to 150 metres.
- . A Peripheral Circuits board (item 2) which accommodates the ancillary circuits required for operation of the transmission and reception channels.
- . A Filter and IF 2.5 MHz Circuit board (item 3), the circuits of which are conventional transmission and reception circuits.
- . An Exciter board (item 4) which accommodates conventional AF circuits for the Transmission channel.

- . A Converter unit (item 5) which delivers the low power d.c. voltages required for the correct operation of the MAN-PACK Transceiver.
- . An "AF" board (item 6) which accommodates conventional AF circuits for the Reception channel.
- . Three boards provided for the Synthesizer, described as follows :
 - . Synthesizer n° 3 (item 7)
 - . Synthesizer n° 2 (item 8)
 - . Synthesizer n° 1 (item 9).

The circuits of these three boards supply the heterodyne signals required for the operation of the transceiver.

- . A Setting or Synthesizer-0 (in short "Board 0") (item 10) is associated with the three Synthesizer boards n° 1, n° 2 and n° 3.

NOTE : Some of the circuits in the Peripheral-Circuits boards **Synthesizer** n° 1, Synthesizer n° 2 and Synthesizer n° 3 use microelectronic technology.

2.2 - CHARACTERISTICS

2.2.1 - Electrical Characteristics

2.2.1.1 - Characteristics Common to Transmission and Reception.

- Type of equipment	: Single Sideband Transceiver with compatible AM Amplitude-Modulated Communication Capability (AM mode).
- Mode of Operation	: (a) A2j : (b) A3j on transmission and AM on reception : (c) A3j upper sideband : (d) A3j lower sideband
- Frequency range	: 2 to 29.999 MHz
- Number of channels available	: 28 000
- Channel spacing	: 1 kHz
- Frequency setting	: by decade
- Autonomy	: 14 hours for a cycle of 1 minute transmission - 9 minutes reception (voice)
- Frequency stability	: $\pm 1 \times 10^{-6}$ over a temperature range between - 15 and + 55° C

- Antenna	: (a) Whip, 2.315 m long (b) Open wire, 19 m long which may be reduced to 7 m by means of short-circuits, so that the antenna operates on a quarter-wave length.
- Standing-wave ratio (SWR) - Battery unit	: less than 2. (a) fitted with built-in charger, operating from a variable 10 to 32 V d.c. supply. (b) can be charged either when coupled to the transceiver or separately. (c) composition : Nickel-Cadium (d) quantity : twelve 4-AH cells (e) Charging ratio C/10 (f) Rating : 14.4 V

2.2.1.2 - Transmission Characteristics

- Transmitted power in A2j mode	:	
- Transmitted power in A3h mode	:	20 W PEP in 50 ohms during transmission at normal level
- Transmitted power in A3j mode (upper or lower sideband)	:	
- Carrier and unwanted sideband rejection	:	greater than 40 dB in A3j mode
- Linearity (intermodulation product):	:	≥ 25 dB
- Harmonics	:	≤ -40 dB with respect to peak power (measured on dummy antenna)
- Dynamic AF range	:	15 dB approx. for a constant transmitted power
- Compression time	:	(a) Rise time 1.5 μ s approx.
- Output protection	:	against short-circuits and open circuits
- Continuous operation	:	This configuration is not detrimental to the equipment

2.2.1.3 - Reception Characteristics

- Total bandwidth in A2j mode	:	300 Hz centered on 1 kHz at 6 dB
- Total bandwidth in AM mode	:	≥ 3 kHz
- Total bandwidth in A3j mode	:	2.6 kHz* at 6 dB
- Sensitivity in A3j mode for an input voltage of 0.5 μ V**in 50 Ω	:	The signal + noise to noise ratio ≥ 12 dB
- Protection against first image frequency	:	≥ 90 dB
- Protection against second image frequency	:	≥ 80 dB
- Protection against first intermediate frequency	:	≥ 90 dB
- Protection against interfering signals	:	For an interfering signal 15 % off tune from a wanted 2 μ V SSB signal. The signal + noise to noise ratio is ≥ 10 dB for an interfering signal amplitude of: A Version . 5 V in the range 2 to 18 MHz . 2 V in the range 18 to 30 MHz B Version . 5 V in the range 2 to 18 MHz . 4 V in the range 18 to 25 MHz . 3 V in the range 25 to 30 MHz ASSB signal 100 dB above a wanted 2 μ V SSB signal and 5 % off tune gives an output with a signal + noise to noise ratio ≥ 10 dB.
- AF power output		(a) 10 mW in 300 Ω with a signal distortion of less than 7 %. (b) 20 mW in 150 ohms.
- Automatic gain control		The AF level does not vary by more than 3 dB for an input voltage variation of 1 μ V to 100 mV.

* 2.7 kHz for B Version

** 0.4 μ V for B Version

2. 2.2 - Mechanical Characteristics

- Weight of transceiver fitted with the antenna tuning unit and the battery unit.	: ≤ 7.865 kg
- Size of transceiver fitted with the antenna tuning unit and the battery case	L = 420 m/m W = 215 m/m H = 90 m/m
- Tightness	: Fully tight
- Resistance to vibration, bumps and shocks	: The MAN-PACK Transceiver meets the requirements of specifications applicable to portable equipment.

SECTION THREE

OPERATING INSTRUCTIONS

3 - INSTRUCTIONS FOR USE

3.1 SPECIFICATIONS

- HF portable transceiver
- Frequency range 2-30 MHz in 1 kHz steps.
- Automatic antenna tuning unit, to be used with a whip or open wire antenna
- Modes of operation

SSB telephony A3J, HSB and LSB selectable

AM telephony, A3H

SSB Key tone A2J, HSB

- RF power output
 - On A3J :
20 Watt PEP
 - On A3H :
6 Watt PEP, reduced power
 - On A2J :

- Power supply

Self-contained rechargeable battery giving an autonomy of approximately 14 hours.

- Remote control facility to enable RT operation over a two-core telephone line for a distance up to 1.5 km.

3.2. DETAILS OF A COLLECTIVE UNIT (Plate 1)

Nº	DESCRIPTION	REF.	Qty
1	Transmitter Receiver Unit	RSB25SA	1
2	Automatic Antenna Tuning Unit	—	1
3	Battery Unit	B25/10	1
4	Handset		1
5	Headset		1
6	Morse Key	B25/85	1
7	Remote Control Unit	B25/87	1
8	Whip Antenna	B25/80	1
9	Open wire Antenna	B25/81	1
10	Battery charging cable	B25/84	1
11	Carrying bag	B25/86	1
12	Operator's Hand Book		1

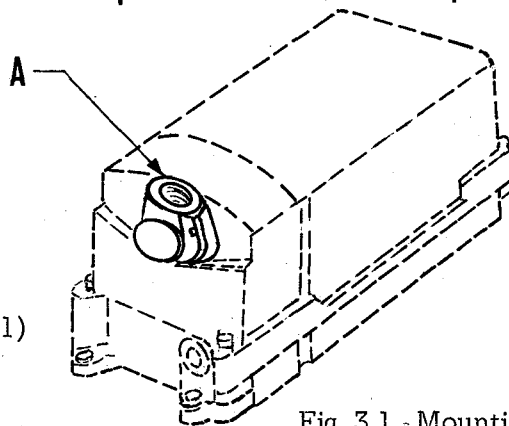


Fig. 3.1 - Mounting the antennas.


3.3 OPERATING INSTRUCTIONS3.3.1 MOUNTING THE ANTENNAS (Fig. 3.1)

Whip antenna screws into socket (A).

Wire antenna fits into slot behind knurled screws on socket (A).

Before deploying wire antenna check that the correct circuit is opened as shown on the winding frame.

3.3.2 ADJUSTMENTS AND OPERATIONS (Plate 3)

- Plug in the handset into one of the sockets (19-20). The second socket may be used to connect headset or morse key or another headset.
- Select the required frequency of operation by means of switches (3 to 8). The frequency is read directly off the switches MHz, kHz.
- Select the required mode of operation HSB, LSB, AM, or MORSE by means of selector (14).
- Select the type of antenna to be used, whip or open wire, by means of selector (11).
- Positions  and 50 Ω are used only with the equipment in vehicle configuration (see separate handbook for this particular use).
- Switch RC selector (5) to position 0.
- Switch RF selector (9) to L or H as required.
- Adjust control knob (16) to the required audio level in the ear-piece ; to increase the level turn clockwise. When the tone in the ear-piece ceases, the equipment is ready for reception. A tone appears while automatic tuning is in progress.
- This «Automatic tuning» takes place after each change of frequency, each switching on and on operator's request by pressing the appropriate switch (2).
- To transmit, operate the pressel switch on the handset and speak normally in the mouth piece. When the pressel switch is released the equipment is on reception.
- When in MORSE mode, a morse key is connected to one of the connector (19-20) the other still connected to a handset. If no morse key is available, it is possible to key with the pressel switch.

3.3.3 SIDETONE

Sidetone on transmit will be heard when :

- Battery is OK.
- Antenna current is OK.

When sidetone dissapears :

- there is 15 minutes operation left if battery is getting flat, or,

- antenna connection is poor or absorbing material is too close to antenna. Move the set for optimum position, retune and check for sidetone. With wire antenna, check that correct circuit is open.

3.3.4 OPERATION WITH REMOTE CONTROL (Plate 3)

Connect each lead of the line to the terminal (17 and 18) on the main unit and the remote control unit (20).

Set switch RC (5) to \odot .

Both local and remote operators can communicate with each other without transmitting and they are both capable of receiving incoming signals.

They can also call each other by setting the RC switch (5) to position «CALL» for the local operator and, press the call switch located on the remote control unit for the remote operator (Plate 1).

To transmit, operators must depress their own pressel switch and speak.

Local volume control sets level for both local and remote operators.

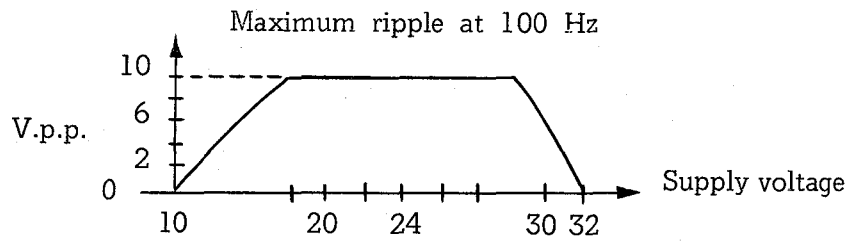
3.3.5 CLOSING DOWN THE STATION

- Set selector (9) to the off position.
- Dismount the antenna.
- Disconnect the handset or morse key.
- Stow away the various accesories in the carrying harness.

3.3.6 BATTERY USE

Charge with C/10 built in charger.

- Nominal charging time :
14 hours, temperature between 15° C and 25° C, from any 10-30 V DC source.
- Maximum charging time :
Greater than 20.000 hours, temperature must be higher than 0° C.



3.3.7 AVAILABLE CAPACITY AFTER STORAGE

– Self discharge takes place, especially at high temperatures.

Percentage of total capacity available	Number of days in store	Storage temperature
80%	180	0° C
50%	70	20° C
50%	25	30° C

3.4 MAINTENANCE

- Keep all external parts of the transceiver in a good state of cleanliness and free from dirt. To clean use a dry cloth.
- Special care must be taken of the handset, antenna, battery and vehicle connectors.
- When not in use all connectors must be fitted with the protective covers provided.

3.5 CURRENT REPAIRS

SYMPTOMS	PROBABLE CAUSE	ACTIONS
No background noise	RF switch to «OFF» position, volume control turned down	Position RF switch to L or H. Increase level by turning volume control knob clockwise. Clean connector contacts, check for good aspect of the connector.
Poor receiving conditions	Faulty handset Faulty battery unit Damp antenna base Site unsuitable Volume control turned down	Replace handset Mount spare battery unit. Wipe it dry. Change for a more open site. Increase volume control by turning knob clockwise.
Back-ground noise does not disappear in trans- mission	Faulty handset Low battery Faulty handset	Replace handset. Mount spare battery unit. Replace handset.
Send signal not received at the far end.	- Site unsuitable - Not in the correct mode of operation	Change for a more open site. Select the required mode of operation.
Send signal not heard in earpiece	Low battery Antenna disconnected.	Mount spare battery unit. Check antenna mounting. Operator must stay clear of antenna during operation.

The equipment is to be send for second line repair when operation remains incorrect once the above checks have been carried out. Further investigations are to be carried out by the maintenance personnel and not by the operator.

SECTION FOUR
THEORY OF OPERATION

4—THEORY OF OPERATION

4.1 - GENERAL THEORY OF OPERATION

4.1.1 - Operation of Synthesizer

4.1.1.1 - General Information

A VCO feedback loop is shown in figure 4.1.

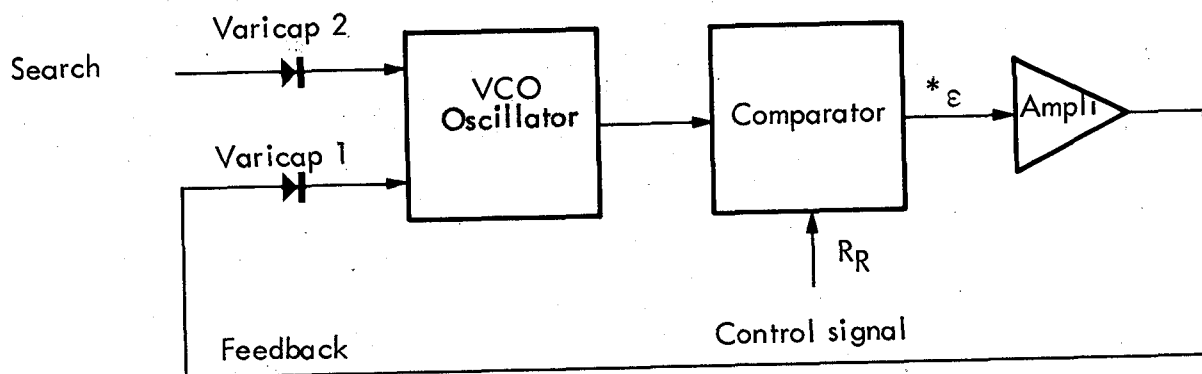


Figure 4.1 - Block Diagram of the feedback loop of a VCO.

* ϵ = Error signal

The frequency F_o of the VCO signal output (voltage-controlled oscillator) (VCO) is variable and related to the voltage across the two Varicaps. Varicap n° 1 is located in the feedback loop. Varicap n° 2 is located in the search or pre-positioning circuit.

The signal with a variable frequency F_o is compared with the reference signal of a fixed frequency F_{10} . This yields an error signal ε .

The aim sought is to obtain an error signal of frequency zero (signal applied to varicap n° 1)

If the frequency F_o , the signal from the VCO, is very different from the reference frequency F_r , the signal applied to the comparator, the feedback control is no longer possible ; the loop gain is insufficient. This makes it necessary to pre-position the oscillator by means of a search signal appearing across the varicap n° 2.

This search is carried out in steps (stepped voltage) ; each step being long enough, in time, to enable the feedback loop to lock. It should be noted that as the open loop gain is variable related to the voltages applied to the two varicaps, (owing to the variation in the capacitance-to-voltage slope) it affects the purity of the oscillator frequency spectrum.

The capacitance-versus-voltage curve of a varicap is shown in figure 4.2

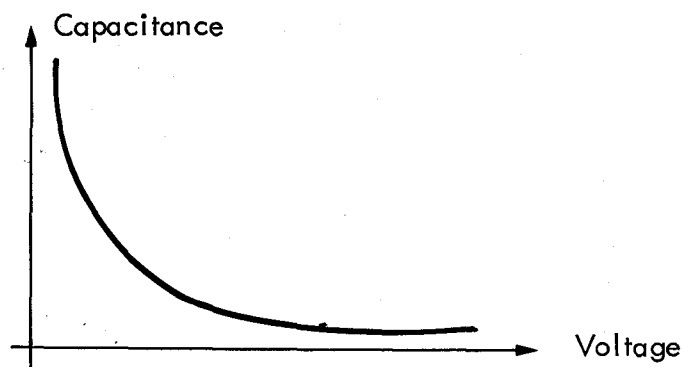


Figure 4.2 - Capacitance-versus-voltage curve of a varicap.

4.1.1.2 - Principle of operation

The principle of operation of the synthesizer used in the MAN-PACK Transceiver is shown in figure 4.3.

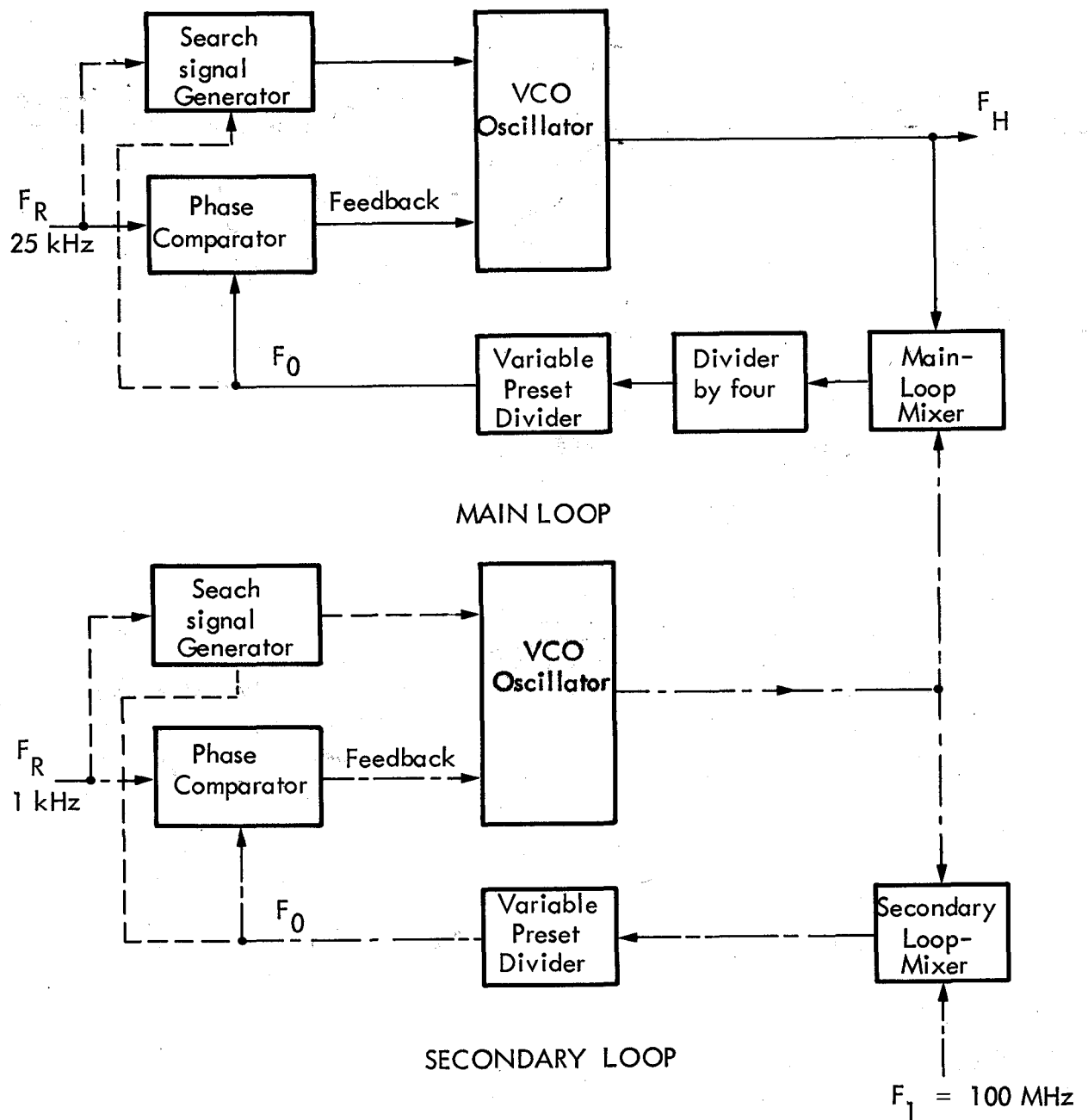


Figure 4.3 - Theory of operation of the phase loop used in the synthesizer.

The phase loop used in the MAN-PACK Transceiver Synthesizer is a two-loop system.

- . A main loop operates with a step of 200 kHz
- . A secondary loop operates within the main loop with a step of 1 kHz, repeated every 200 kHz.

The signal from the VCO is a signal with a frequency F_H acting as an heterodyne for the transceiver.

The VCO closed-loop control (main loop) operates as follows :

The signal with a frequency F_H from the VCO is applied to a mixer (main-loop mixer) which also receives a signal from the 1 kHz stepped secondary loop repeated every 200 kHz.

The signal from said mixer is divided by four and applied to a variable preset divider related to the setting (10 MHz, 1 MHz and 100 kHz controls). The variable preset divider delivers a signal with a frequency F_o which is compared to a reference signal of fixed frequency equal to 25 kHz.

The error signal (feedback) originates from a comparator which receives the signals F_o and F_r (25 kHz).

The aim sought is to obtain an error-signal of frequency equal to zero.

If $F_o \neq F_r$, a stepped voltage is delivered by a search generating device until the feedback circuit is locked.

The signal applied to the main-loop mixer from the secondary loop is delivered by a second VCO which, in turn, is controlled by the secondary loop (VCO').

The signal from the VCO is also applied to the secondary-loop mixer which receives a fixed signal at a frequency 100 MHz.

The signal from the secondary-loop mixer is applied to a variable-preset divider, the latter being related to the setting (100 kHz, 10 kHz, and 1 kHz controls). The variable preset divider delivers a signal at a frequency F_o , which is compared to a reference signal, of fixed frequency equal to 1 kHz.

The error (feedback) signal originates from a phase comparator which receives the signals F_o and F_r (1 kHz).

The frequency of the signals from the oscillators VCO and VCO' according to the setting is shown in the table below :

Setting (kHz)	Frequency of signal from VCO (MHz)	Frequency of the signal from VCO' (in MHz)
02000	104.500	100.500
02050	104.550	100.550
02100	104.600	100.600
02199	104.699	100.699
02200	104.700	100.500
03000	105.500	100.500
05000	107.500	100.500
10000	112.500	100.500
15000	117.500	100.500
20000	122.500	100.500
29000	131.500	100.500
29999	132.499	100.699

4.1.1.3 - Main Circuits used

(A) Search Signal Generating Circuit

The search signal generating circuit included in the main loop or the secondary loop consists of a frequency discriminator followed by a digital-to-analog converter.

The D/A converter decodes the digital signal from the discriminator into an analog signal having the form shown in figure 4.4.

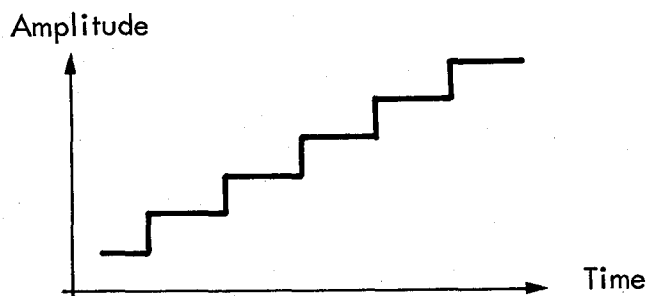


Figure 4.4 - Waveform of the Search Signal

(B) Phase Comparator Circuit

The phase comparator circuit is a conventional sample-and hold type network.

(C) Variable-Preset Divider

The operation of the variable-preset divider of the main loop is shown by the block diagram in figure 4.5.

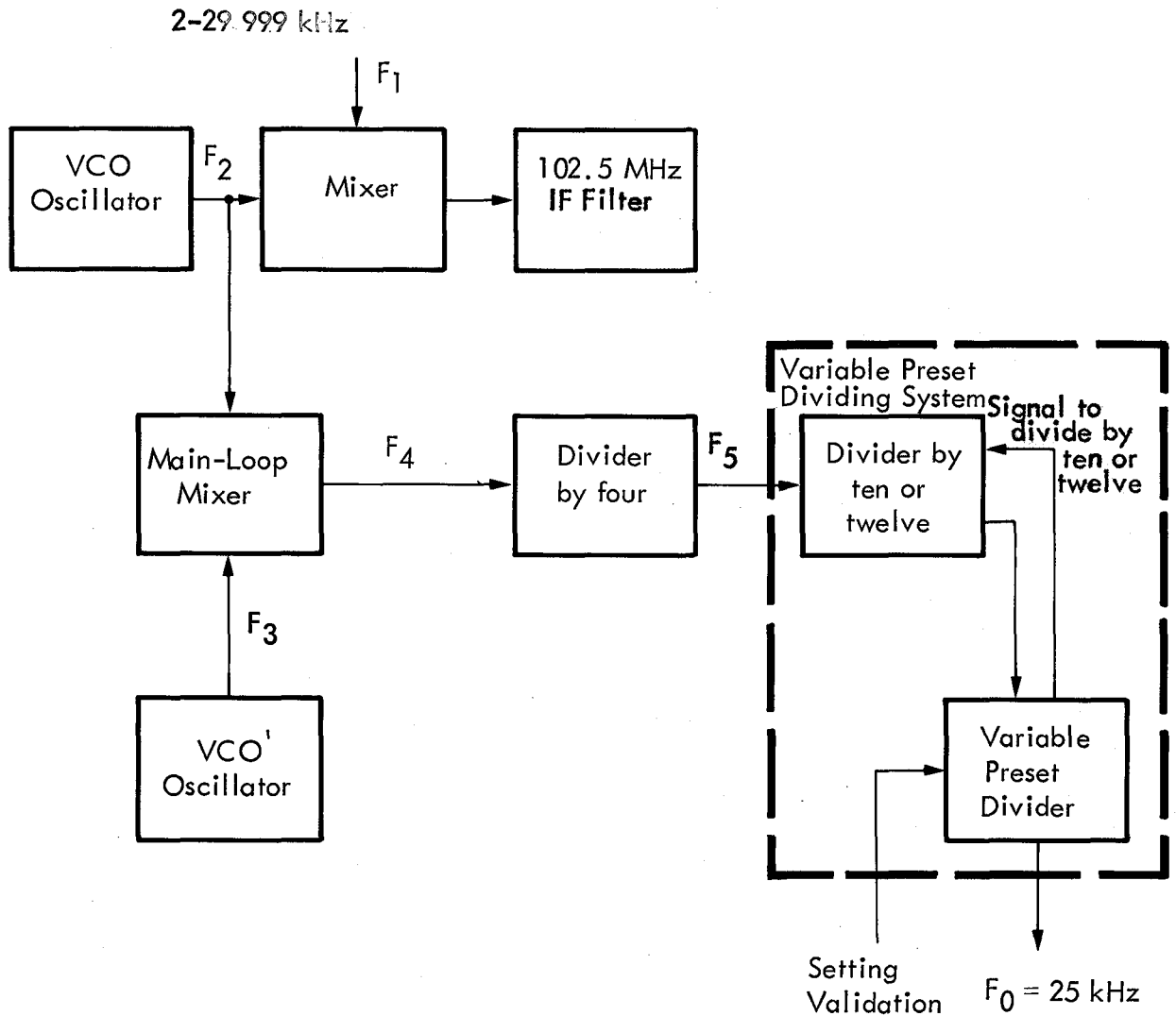


Figure 4.5 - Functional Block Diagram of the Primary-Loop Variable Preset Divider

The 102.5 MHz IF Filter is used by both the transmission channel and the reception channel.

The 102.5 MHz signal originates from a mixer which receives the signal at the frequency F_1 (2 to 29.9999 MHz, depending on setting) and the signal at the frequency F_2 from the VCO' Oscillator.

The frequency F_2 of the signal from the VCO is also related to the setting (10 MHz, 1 MHz and 100 kHz controls) and is expressed by the relation :

$$F_2 = 102.5 \text{ MHz} + (2 \text{ to } 29.999 \text{ MHz})$$

$$F_2 = 104.5 \text{ to } 132.499 \text{ MHz}$$

The signal at frequency F_2 is applied to the main-loop mixer which also receives the signal at the frequency F_3 from the VCO' oscillator.

The frequency F_3 of the signal from the VCO' oscillator is related to the setting (100 kHz, 10 kHz and 1 kHz controls) and varies from 100.5 to 100.699 MHz.

The signal at the frequency F_4 from the main-loop mixer is expressed by the formula :

$$F_4 = F_2 - F_3$$

hence : Minimum value of $F_4 = 104.5 - 100.5 = 4 \text{ MHz}$

$$\text{Maximum value of } F_4 = 132.499 - 100.699 = 31.8 \text{ MHz}$$

The frequency F_4 of the signal from the main-loop mixer is related to the setting and varies from 4 to 31.8 MHz in 200 kHz steps.

The frequency F_5 of the signal from the divider by 4 is also related to the setting and varies from 1 to 7.95 MHz in 50 kHz steps.

As the variable-preset divider system receives a signal at a frequency F_5 variable from 1 to 7.95 MHz, depending on the setting and has, if operation is correct, to deliver a signal with a fixed frequency F_0 equal to 25 kHz, the limits of the overall division D_0 are the following :

$$\text{Minimum value of } D_0 = 1000 : 25 = 40$$

$$\text{Maximum value of } D_0 = 7950 : 25 = 318.$$

Spacing of two consecutive values : $50 : 25 = 2$

Over the whole communication range (2 to 29.999 MHz) the value of the overall division is 40 - 42 - 44 - 46 - 48 - 50 - 52 314 - 316 - 318.

The different values of the overall division are obtained through a divider by ten or twelve and a variable preset divider which determines the total number of divisions to be carried out, depending on the setting (10 MHz, 1 MHz, and 100 kHz controls). At the end of each counting, the main loop reset signal is generated.

From the beginning of the cycle, the division by twelve command or "C" command is generated. When the required number of divisions by twelve is completed, the **variable-preset** divider generates the division-by-ten command. The number of divisions by ten corresponds to the division rank less the number of divisions by twelve.

When the division (s) by ten is (are) carried out, an end-of-division signal (main-loop reset) is generated.

The variable preset divider is then reset to its initial position.

Certain frequencies do not require division (s) by twelve. The only frequency requiring no division by ten is that corresponding to the setting 02.800 MHz.

The value of the overall division, the rank of the variable preset divider, the number of division (s) by twelve and of division (s) by ten are given, by way of example, in the following table :

Setting (kHz)	Overall Division	Division rank of the Variable Preset Divider	Number of divisions by twelve	Number of divisions by ten
02000	40	4	0	4
02200	42	4	1	3
02400	44	4	2	2
02600	46	4	3	1
02800	48	4	4	0
03000	50	5	0	5
03200	52	5	1	4
03400	54	5	2	3
03600	56	5	3	2
03800	58	5	4	1
04000	60	6	0	6
04800	68	6	4	2
05000	70	7	0	7
10000	120	12	0	12
15000	170	17	0	17
20000	220	22	0	22
25000	270	27	0	27
29000	310	31	0	31
29800	318	31	4	27
29999	318	31	4	27

The theory of operation of the variable-preset divider in the secondary loop is similar with that in the main loop. It is related to the 100 kHz, 10 kHz and 1 kHz controls.

Every 200 kHz, a signal with in 100.5 MHz and 100.699 MHz is delivered by the VCO oscillator depending on the setting.

As the fixed-frequency signal applied to the secondary-loop mixer is at 100 MHz, the division rank of the variable divider changes for each frequency setting. Said rank is comprised between 500 and 699.

4.1.1.4 - Operation (Plate n° 7)

The voltage-controlled oscillator (VCO) included in the HF Read is related to three control voltages, i.e. :

- . Sub-band voltage generated by the sub-band control of the frequency selector.
- . Alignment voltage (pre-positioning or search) generated by the digital-to-analog converter which, in turn, is related to the frequency discriminator, both in the Synthesizer n° 2 Board.
- . Feedback control voltage generated by the phase comparator in the Synthesizer n° 2 Board.

The reference signal at 25 kHz originates from a temperature compensated crystal oscillator (TCXO) oscillating at 5 MHz. The signal from this oscillator is divided by two, then by 100 (dividers in the Synthesizer n° 2 Board) and becomes the reference signal at the frequency 25 kHz, required for operation of the primary loop. A divider by 25 in the Synthesizer n° 2 board enables the reference signal at 1 kHz required for operation of the secondary loop to be generated from the 25 kHz reference signal.

(A) Operation of the Main Loop

The reference signal at 25 kHz is applied at the same time to the Phase Comparator and to the Frequency Discriminator and D/A Converter in the Synthesizer n° 2 board.

The Phase Comparator and the Frequency Discriminator and D/A Converter also receive a signal from the variable-preset divider fitted on the Frequency Selector board which, in turn, is related to the setting of the communication frequency. However, the main loop is related, as regards the setting, only to the 10 MHz, 1 MHz and 100 kHz controls (even values only of the 100 kHz control).

When the frequency of the signal from the variable-preset divider is very different from 25 kHz (e.g. on changing the communication frequency), the Frequency Discriminator and D/A Converter delivers a stepped voltage to the alignment varicap of the VCO in the HF head until the feedback circuit is locked.

Thereafter, the phase comparator (in Synthesizer Board n° 2) controls the VCO in the HF head.

The HF-head VCO delivers a signal the frequency of which is related to the setting and variable from 104.5 to 132.4999 MHz.

After amplification, this signal is :

- . used as a variable heterodyne for the transmit channel and receive channel circuits of the MAN-PACK Transceiver .
- . applied to the Main-Loop Mixer (Synthesizer n° 1 Board) which receives a signal from the secondary loop at a frequency variable from 100.5 to 100.699 MHz depending on the setting (100 kHz, 10 kHz, 1 kHz controls). This frequency range has steps of 1 kHz and is repetitive every 200 kHz.

The frequency of the signal from the main-loop mixer in Synthesizer n° 1 varies with the setting (on front panel).

This frequency varies from 4 to 31.8 MHz. The signal at a frequency of 4 to 31.8 MHz is applied to a divider by ten or twelve, via a divider by four (these two dividers are included in the Synthesizer n° 1 board). The rank (or command) of division by ten or twelve is generated from the variable-preset divider, which in turn, is related to the setting (10 MHz, 1 MHz and 10 kHz).

The variable-preset divider included in the Frequency Selector board associated with the divider by ten or twelve can vary from 4 to 31 with the setting.

The signal from the variable-preset divider is at a frequency of 25 kHz.

This signal is applied to the phase comparator (synthesizer n° 2 board) which also receives the 25 kHz reference signal. The signal from the phase comparator controls the VCO in the HF head.

(B) Operation of the Secondary Loop

The 1 kHz reference signal is applied at the same time to the phase comparator and to the frequency-discriminator and D/A Converter in the Synthesizer n° 1 board.

The Phase-Comparator and the Frequency Discriminator and D/A Converter also receive a signal, from the variable-preset divider fitted in the Frequency Selector board, which, in turn is related to the setting of the communication frequency. However, the secondary loop is related, as regards the setting, only to the 100 kHz, 10 kHz and 1 kHz controls.

When the frequency of the signal from the variable-preset divider is very different from 1 kHz (e.g. on frequency change), the Frequency Discriminator and D/A Converter circuit delivers a stepped voltage to the alignment varicap of the VCO in the Synthesizer n° 1 board until the feedback circuit is locked.

Thereafter, the VCO in the Synthesizer n° 1 board is controlled by the phase comparator.

The VCO in the Synthesizer n° 1 board delivers a signal whose frequency is related to the setting (100 kHz, 10 kHz and 1 kHz controls) and variable from 100.5 to 100.699 MHz.

After amplification, this signal is applied :

- . to the main-loop mixer
- . to the secondary-loop mixer in Synthesizer n° 3 board. Said mixer also receives a signal at 100 MHz from a crystal oscillator (Synthesizer board n° 3).

The signal from the secondary-loop mixer in Synthesizer board n° 3 has a frequency varying with the setting between 500 and 699 kHz.

The variable-preset divider in the Frequency-Selector board receives the signal from the Secondary-Loop Mixer and, depending on the setting, carries out a division the rank of which can vary from 500 to 699.

The signal from the variable-preset divider has a frequency equal to 1 kHz.

Said signal is applied to the phase comparator in synthesizer n° 1 board which also receives the 1 kHz reference signal. The VCO' in synthesizer n° 1 board is controlled by the signal from the phase comparator.

(C) Operation of the Ancillary Circuits

The ancillary circuits permit generating :

- . A 100 MHz signal in the A2j (MORSE), A3h (AM) or A3j - upper side band modes of operation. This signal acts as a fixed heterodyne for the transmit and receive circuits of the MAN-PACK Transceiver.
- . A 105 MHz signal in the A3j - lower sideband mode of operation. This signal acts as a fixed heterodyne for the transmit and receive circuits of the MAN-PACK Transceiver.
- . A 2.5 MHz signal which is used in the transmission channel and the reception channel.
- . A 1 kHz signal used only on transmission in the A3j (Morse) mode of operation or on antenna tuning.

In the Morse, AM (A3h) or HSB (A3j upper sideband) modes, a validation signal fed through the mode selector on the front panel, enables an amplifier (synthesizer n° 3 board) which also receives the 100 MHz signal from the crystal oscillator in synthesizer n° 3 board. After matching, this signal is used as a fixed heterodyne for the transmission and reception channels of the MAN-PACK Transceiver. In the A3j lower sideband mode, the validation signal through the front-panel mode selector, enables a mixer (synthesizer n° 3 board) which receives :

- . A signal at 100 MHz from the crystal oscillator in synthesizer n° 3 board.
- . A signal at 5 MHz from the TCXO oscillator.

The 105 MHz signal from the mixer is applied to a Filter matching circuit in Synthesizer n° 3 board) which is also enabled by a validation signal.

The 105 MHz signal is also used as a fixed heterodyne for the transmission and reception channel circuits of the MAN-**PACK** Transceiver.

A 2.5 MHz signal from the divider by two in the Synthesizer n° 2 board is used in the transmission and reception channels of the MAN-**PACK** Transceiver.

A 1 kHz signal from the divider by 25 in the Synthesizer n° 2 board is used only on transmission in the A2j (Morse) mode or during antenna tuning.

4.1.2 - General Operation of the Reception Channel, Transmission Channel and Ancillary Circuits

4.1.2.1 - Reception Channel (Plate 8)

The reception signal at a frequency of 2 to 30 MHz, from the 20 W Amplifier, is applied to the reception mixer (in the Transmit-Receive Mixer module of the HF head) through an Input Protection Circuit (HF head) and a 2 to 30 MHz filter in the Transmit-Receive Mixer module of the HF head.

This reception mixer also receives the variable heterodyne signal at a frequency of 104.5 to 132.5 MHz, from the Synthesizer (see para. 4.1.1) through a Transmit-Receive Changeover Device.

The 102.5 MHz signal from the reception mixer is applied to the 102.5 MHz filter in the HF head, through a Transmit-Receive Changeover Device (Transmit-Receive Mixer module of the HF head).

The resulting 102.5 MHz signal from the reception mixer is applied to the 102.5 MHz filter and 2.5 and 102.5 MHz mixer module of the HF head, through the two Transmit-Receive Changeover devices, a filter and an amplifier which also receives the AGC voltage.

This mixer also receives the fixed heterodyne signal at 100 MHz (operation in the Morse, AM or USB mode) or 105 MHz (operation in the LSB mode) from the synthesizer (see para. 4.1.1.) through an amplifier in the IF and 2.5 and 102.5 MHz module of the HF head.

The 2.5 MHz signal from the mixer is applied to an amplifier through a transmit-receive changeover device. The amplifier and changeover device are in the IF and 2.5 and 102.5 MHz module of the HF head.

The 2.5 MHz signal from the amplifier is applied to :

- . An Amplifier and A3h filters device enabled through a mode selector device when operating in the AM mode.
- . An Amplifier and SSB and A2j Filters device enabled through a Mode Selector Device and a Transmit-Receive Changeover device when operating in the MORSE, LSB and USB modes.

The signal from the Amplifier and Filters device is applied, whatever the mode of operation, to a common amplifier. This amplifier and all the above-mentioned devices are in the Filter and 2.5 MHz IF board.

The signal from the common amplifier is applied to a second amplifier which also receives the AGC voltage, through a Transmit-Receive Changeover device. This device and the second amplifier are in the Filter and 2.5 MHz IF board.

The signal from the second amplifier is applied to :

- . An SSB and A2j demodulator when operating in the Morse, LSB or HSB modes.
- . An A3h detector, through an impedance matching circuit when operating in the AM mode.

Selection is carried out at the output of the demodulator or detector by a mode selector device, which enables the signal to be directed to the AF circuits.

The SSB and A2j demodulator, A3h detector, impedance matcher and mode selector device are in the Filter and 2.5 MHz IF board.

The signal from the mode selector device in the Filter and 2.5 MHz IF board is applied to an amplifier in the AF board :

- . either directly when operating in the A3h or A3j modes (AM, LSB or USB) .
- . or through a filter when operating in the A2j (Morse) mode.

Switching is achieved by two mode selector devices in the AF board.

The signal from the above-mentioned amplifier is applied to the local earphone through an amplifier in the AF board and through the "VOL" potentiometer on the control panel.

The remote control amplifier in the AF board is connected in parallel with the local earphone.

4.1.2.2 - Transmission Channel (Plate 8)

When operating in the A3h or A3j (AM, LSB or USB) bands, the signal from the local microphone or the remote microphone is applied to filter networks through a Transmit-Receive Changeover Device and a Mode Selector Device. Both devices and the filter networks are in the Exciter board.

When operating in the A2j mode, the 1 kHz frequency from the Synthesizer (see para. 4.1.1.) modulated at the keying rate, is applied to the filter networks through a mode selector device.

The signal from the filter networks is applied to an amplifier via a variable attenuator (in the Exciter board).

The signal from the amplifier is :

- . Applied to a modulator which also receives a 2.5 MHz signal from the Synthesizer (see para. 4.1.1).
- . Looped through the variable attenuator by means of a detector and an amplifier (Exciter board). This circuit is the AF regulating loop.

An SSB signal is delivered by the modulator.

The SSB signal with carrier suppressed is applied to an Amplifier and SSB Filters device through a Transmit-Receive Changeover Device. Both devices are in the Filter and 2.5 MHz IF board.

The signal from the Amplifier and SSB Filters device is applied to an amplifier (Exciter board) via an amplifier and a Transmit-Receive Changeover device (arranged in the Filter and 2.5 MHz IF board). The Exciter-board amplifier also receives a Compressor Control signal from the peripheral circuits.

In the A3h mode (AM), carrier reinjection is carried out on this amplifier. This carrier reinjection is a 2.5 MHz signal from the Synthesizer (see para. 4.1.1) enabled through a Mode Selector Device and an amplifier (Exciter board).

The signal from the amplifier in the Exciter board receiving the Compressor Control and Carrier Reinjection signals is a 2.5 MHz signal. The latter is applied to the mixer contained in the IF and 2.5 and 102.5 MHz module for the HF head through an amplifier and a Transmit-Receive Changeover device located in the IF and 2.5 and 102.5 MHz Mixer module of the HF head. This mixer also receives - after amplification - the Fixed Heterodyne signal at 100 MHz (operation in the Morse, AM or USB mode) or 105 MHz (operation in the LSB mode) from the Synthesizer (see para. 4.1.1).

The mixer delivers a signal at 102.5 MHz. The latter is applied to the 102.5 MHz filter through an amplifier and two Transmit-Receive Changeover devices. The Transmit-Receive Changeover devices are both located in the IF and 2.5 and 102.5 MHz module of the HF head.

The 102.5 MHz signal from the 102.5 MHz filter is applied to the transmission mixer located in the Transmit-Receive Mixer of the HF head via a Transmit-Receive Changeover Device located in the Transmit-Receive Mixer module of the HF head.

The transmission mixer also receives the Variable Heterodyne signal at 104.5 to 132.5 MHz from the Synthesizer (see para. 4.1.1.) via a Transmit-Receive Changeover Device.

From the output of the mixer the transmission signal, which is between 2 and 30 MHz is fed through a 2-30 MHz wide-band filter, then through a pre-amplifier to the 20 W Amplifier.

4.1.2.3 - Ancillary Circuits

The ancillary circuits permit generating :

- . An AGC voltage
- . A remote-to-local calling signal
- . A local-to-remote calling signal
- . A changeover signal (transmit Receive).

(A) Generation of the AGC Voltage

In all operating modes, the signal from the Impedance Matching circuit in the Filter and 2.5 MHz IF board is applied to an AGC Generating Circuit. The signal from said circuit is connected to a matching circuit located in the Peripheral Circuits board. The AGC signal delivered by said matching circuit is applied to :

- . A second amplifier located in the Filters and 2.5 MHz IF board.
- . An amplifier located in the IF and 2.5 and 102.5 MHz Mixer module of the HF head.

(B) Generation of the Remote-to-Local Calling Signal

The signal from the remote set fed through the line, triggers the call generator located in the AF board.

The signal from the call generator is applied to the local earphone via an amplifier in the AF board.

(C) Generation of the Local-to-Remote Calling Signal

The call generator is enabled by a validation signal fed through the call selector on the control panel when the former is set to the "CALL-ROEP" position.

The signal from the call generator is applied to the line via an AF amplifier and a remote-control amplifier.

(D) Generation of the Changeover Voltage (transmit Receive)

The order transmit receive from the remote set is applied to a comparator in the AF Board. The comparator also receives a signal from the current generator.

The comparator output signal is connected to a Transmit-Receive Changeover device which also receives the Transmit signal from the pressel switch and the Antenna Tuning Control Signal.

The Changeover signal is delivered by said device.

The Transmit or Receive signals are validated in the Peripheral Circuits board.

The Transmit or Receive validation signals are applied to all the Transmit-Receive Changeover Devices.

4.1.3 - General Operation of the 20 W Amplifier, Antenna Tuning Unit and Ancillary Circuits

The received signal from the Antenna Tuning Circuits is fed through the 20 W Amplifier towards the HF unit.

The transmission channel from the HF unit consists of the 20 W Amplifier circuits and the Antenna Tuning Unit.

The ancillary circuits of the 20 W Amplifier are the following :

- . Power supply circuits.
- . Compressor control loops.

The ancillary circuits of the Antenna Tuning Unit are the following :

- . Antenna tuning control circuits.
- . Antenna tuning feedback control loop.
- . Transmission monitoring circuits.

4.1.3.1 - Reception Channel (Plate 9)

The signal at 2 to 30 MHz, received by the antenna, is applied to the HF unit through :

- . An antenna switch, an harmonics filter (antenna tuning unit) and a transmit receive changeover device (20 W Amplifier) when the front-panel antenna switch is set to "50 Ω " or VEHICULE.
- . A variable inductor, a 20 dB coupler (used during the antenna tuning cycle) an antenna switch, an harmonics filter (antenna tuning unit) and a Transmit-Receive Changeover Device (20 W Amplifier) when the front-panel antenna switch is set to WHIP or WIRE.

4.1.3.2 - Transmission Channel (Plate 9)

The transmission signal from the HF Unit, at a frequency of 2 to 30 MHz and of approximately 1 mW PEP is applied to a first push-pull stage through a phase splitter preamplifier and an input matching transformer. The signal from the first push-pull is applied to a second push-pull via an inter-stage matching transformer. The transmission signal from the second push-pull is applied to a Transmit-Receive Changeover Device via an output matching transformer and a coupler.

The Transmit-Receive Changeover Device, the coupler, the two push-pull stages and the three transformers and the input preamplifier are included in the 20 W Amplifier.

The transmission signal from the Transmit-Receive Changeover Device is applied to the antenna through :

- . A coupler and harmonics filter when the front-panel antenna switch is set to 50 Ω or VEHICLE.
- . An harmonics filter, a coupler, a 20 dB coupler and a variable inductor when the front-panel antenna switch is set to WHIP or WIRE.

These are included in the antenna tuning unit.

4.1.3.3 - Ancillary Circuits of the 20 W Amplifier (Plate 9)

(A) Power Supply Circuits

The BATTERY + voltage is applied to a stabilized power supply via a Current Measuring Circuit.

The stabilized power supply also receives a transmission control signal.

The stabilized voltage from the stabilized power supply is applied to two push-pull stages, to the input preamplifier and to two temperature-compensated bias circuits.

The voltage from the first temperature-compensated bias circuit is applied to the first push-pull circuit.

The voltage from the second temperature-compensated bias circuit is applied to the second push-pull circuit.

(B) Compressor Control Loops

The compressor control loops are illustrated in figure 4.6.

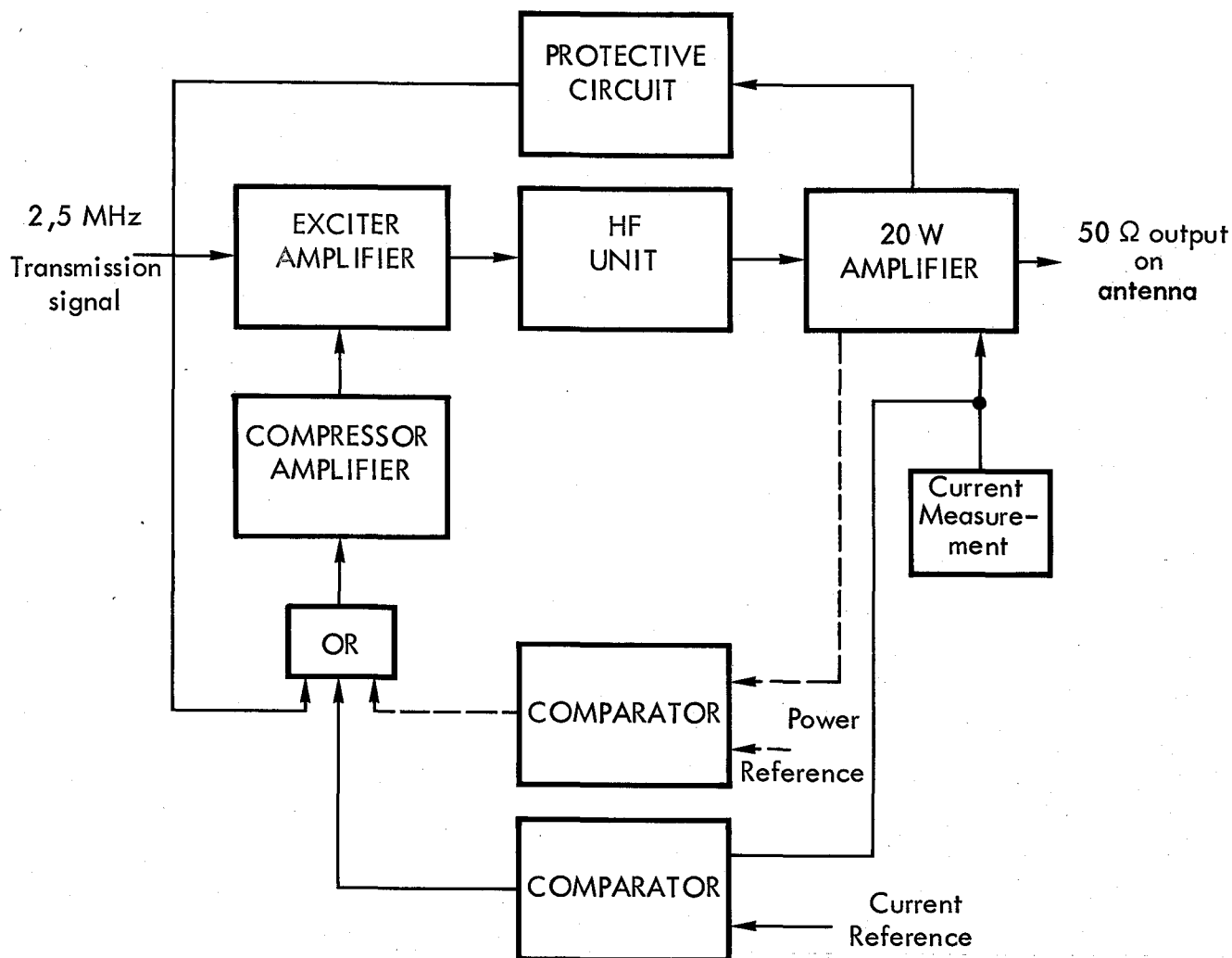


Figure 4.6 - Theory of operation of the Compressor Control Loops

There are three compressor control loops, two controlling the output current, the third controlling the power.

(a) Current Control Loop

The average current consumption is measured through a Current Measuring Circuit. The resultant signal is applied to a comparator which also receives a Current reference with a given and constant value.

The error signal from the comparator is applied to the compressor amplifier located in the Exciter board.

The error signal therefore is the regulating signal which regulates the power transmitted by the exciter amplifier.

(b) Output Current Control Loop

A protective circuit is provided to detect excessive output current. Beyond a given threshold, a signal is generated by the protective circuit and applied to the compressor amplifier. Its effect is to limit the transmitted power.

(c) Power Control Loop

A signal, related to the transmitted power, is applied to a comparator which also receives a Power reference signal with a fixed and constant value.

This reference may have two different values, one corresponding to the Normal Power (20 W), the other to the Reduced Power (6 W).

The error signal from this comparator is applied to the compressor amplifier located in the Exciter board. It is the regulation control signal of the transmitted power.

4.1.3.4 - Ancillary Circuits of the Antenna Tuning Unit(A) Antenna Tuning Control Circuits

A Programme circuit located in the Peripheral Circuits board is validated by any change in the communication frequency (10 MHz, 1 MHz, 100 kHz and 10 kHz controls), any actuation of the pushbutton marked " Ψ ", or by switching the transceiver on.

The Beginning-of-Cycle signal is generated by the Programme circuits. This signal validates :

- . The Power Supply Circuits of the antenna tuning unit
- . The Antenna Tuning Tone Circuit in the Exciter board, where by a 1 kHz signal is applied to the earphone.
- . The Changeover circuit in the AF board (the MAN-PACK Transceiver is transmitting during antenna tuning).

The Power Supply circuit generates a signal which validates :

- . A logic circuit
- . A motor drive circuit
- . A Pre-positioning comparator
- . A feedback comparator.

The logic circuit generates 3 signals.

From the beginning of cycle signal the logic enables the prepositioning comparator.

When the variable inductor reaches the "prepositioning" point, the logic circuit generates :

- . A feedback comparator validating signal
- . An end-of-prepositioning signal.

When inductor is tuned, the logic circuit generates the End-of-Cycle signal. The latter is applied to the Programme Circuit (Peripheral Circuits board) which inhibits the whole antenna tuning system after a given fixed time.

The logic circuit receives a signal from the motor drive circuit. This circuit is included in the antenna tuning control loop.

(B) Antenna Tuning Feedback Control Loop

The variable inductor is mechanically linked to the wiper of the antenna tuning potentiometer and antenna tuning driving motor.

From the beginning of the cycle, a fixed and well-defined reference voltage, together with the voltage from the antenna tuning potentiometer wiper are applied to the prepositioning comparator. The error signal from the prepositioning comparator is applied to the logic circuit.

The signal from the logic circuit is applied to :

- . The motor drive circuits which cause the motor to rotate. The variable-inductor value and the antenna potentiometer wiper position "follow" the rotation of the motor.

When the variable inductor reaches the prepositioning part, the feedback control cycle begins.

Two voltages VR (reflected voltage) and VD (direct voltage) from the 20 dB coupler (in the transmission channel and the reception channel), are applied to a discriminator via a phase-shifter. The two signals from the discriminator are applied to the feedback control comparator. The error signal from the feedback control comparator is applied to the logic circuit.

The signal from the logic circuit is applied :

- . To the motor drive circuit, which causes the motor to rotate. The motor drives the variable inductor **until it** reaches its exact tuning value. The feedback comparator detects the tuning of the variable inductor and sends to the logic circuit a signal in order to reverse the direction of rotation of the motor.

The logic circuit then delivers to the programm the signal "end of cycle". Owing to its inertia the inductor swings about the exact tuning value.

The amplitude of such swing is decreasing without ever being null.

After reception of the signal "end of cycle" the programm circuit inhibits all the antenna tuning system with a fixed time delay determined by the programm circuit.

(C) Transmission Monitoring Circuits

A signal from the coupler is applied to a matching circuit (in the Peripheral Circuits board) when the system is on transmission.

Said circuit also receives a validation signal from the battery.

In case of faulty operation of the :

- . transmission circuit
- . battery

an inhibition signal is generated by the matching circuit.

This signal prevents re-transmission of speech to the earphone.

4.1.4 - General Operation of the d.c. Voltage Generating Circuits

The MAN-PACK Transceiver is fitted with a Converter unit which generates the d.c. voltages required. The Converter unit is powered from the battery box.

The MAN-PACK Transceiver is also fitted with a charger unit to charge the batteries from an external d.c. source which may vary from + 10 to + 32V.

The charger unit is included in the battery box.

(A) Converter

The block diagram of the Converter unit is shown in figure 4.7.

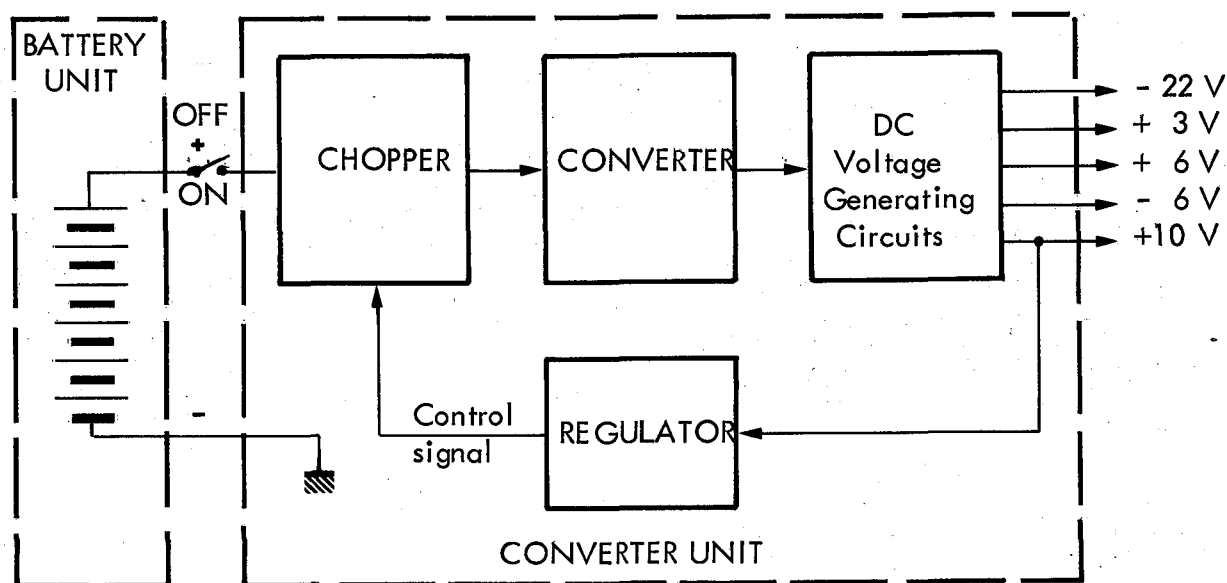


Figure 4.7 - Block Diagram of the Converter unit.

The +14.5 Volts d.c. voltage from the Battery unit is applied via an "ON" "OFF" switch to a chopper included in the Converter unit. The signal from the chopper is applied to a converter delivering a signal applied to the D.C. Voltage Generating Circuits. The D.C. voltage generating Circuits deliver the following voltages :

- . - 22 V (two generating circuits)
- . + 3 V (two generating circuits)
- . + 6 V
- . - 6 V
- . + 10 V

These voltages are distributed as required to the various sub units composing the MAN-PACK Transceiver.

The Converter and d.c. voltage generating circuits are included in the Converter unit.

The + 10 V voltage from the D.C. Voltage Generating Circuits is applied to a regulator located in the Converter unit.

The control signal from the regulator is applied to the chopper.

This circuit constitutes the control loop of the Converter unit.

(B) Charger

The block diagram of the Charger is shown in figure 4.8.

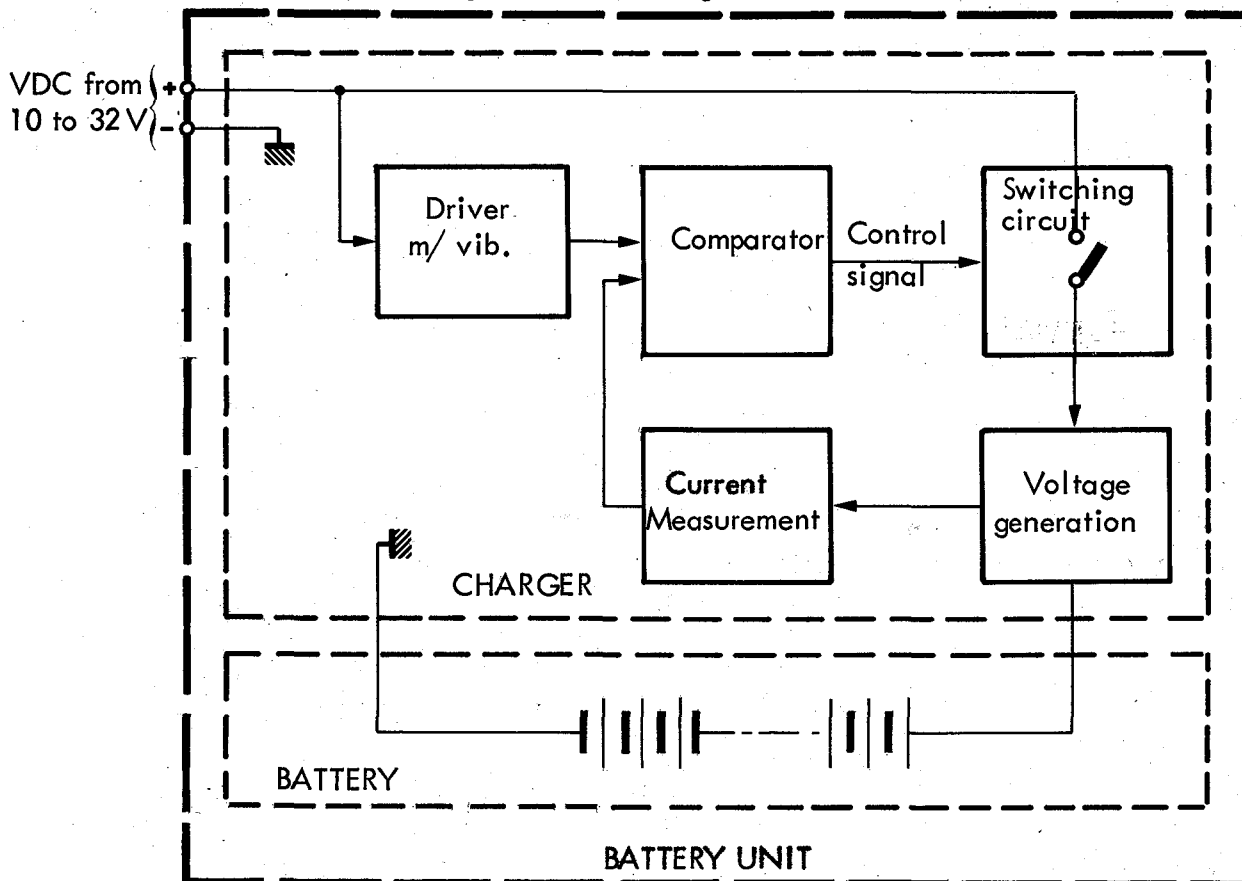


Figure 4.8 - Block Diagram of the Charger.

The battery is charged from an external d.c. source which can vary from + 10 to + 32 V.

Battery charging does not affect operation of the MAN-PACK Transceiver.

The external d.c. voltage (+ 10 to 32 V) is applied :

- . To a switching circuit
- . To a driver circuit (multivibrator) causing the former to operate.

The signal from the multivibrator is applied to a comparator which also receives the signal from a Current Measuring Circuit.

As soon as the external source is applied to the Charger unit, the comparator delivers a control signal applied to a switching device. This causes the Voltage Generating circuit to be powered from the external d.c. source.

The amount of energy stored by the voltage generating circuit is sensed by the current measuring circuit, which, at a given value of current generates a signal which causes the comparator to change state, and thereby causing the switching circuit to disconnect the voltage generating circuit from the external supply.

The voltage generating circuit now discharges the stored energy into the batteries. (Chopper blocking period). The rate of charge is controlled by the multivibrator. Once the Voltage Generating circuit is discharged, the next cycle is initiated on occurrence of the signal originating from the driver multivibrator.

See Page 3-4 and 3-5 for additional information, on battery use.

4. 2 - DETAILED OPERATION

4. 2. 1 - Detailed Operation of the Synthesizer

4. 2. 1. 1 - Generation of the 5 MHz, 2.5 MHz, 25 kHz and 1 kHz Reference Signals (Plates 10, 14 and 15)

All the reference signals are generated from the TCXO Temperature Compensated Crystal Oscillator which delivers a sinewave signal with a peak-to-peak amplitude of 220 mV and a frequency of 5 MHz (Plate 10).

This signal is applied :

- . To terminal A5 on Synthesizer Board No. 3
- . To terminal B4 on Synthesizer Board No. 2 (Plate 14) and is directly connected to terminal 3 on the Divider by Two module Z02 (Plate 15) which operates as follows.

The 5 MHz signal is applied to the interface transistor Q01, common emitter configuration.

The signal from the collector of transistor Q01 triggers an Eccles-Jordan type circuit consisting of transistors Q02 and Q03 and the associated circuits.

The signal from the Eccles-Jordan circuit is applied to output terminal S2 via output matching transistors Q04 and Q05, cascode-connected.

The signal appearing at output terminal S2 is a square signal, with a p.r.f. of 2.5 MHz.

Another output signal from the Eccles-Jordan circuit is filtered by L01, C02 and C03. The frequency of the sinewave signal appearing at output terminal S1 is 2.5 MHz.

The 2.5 MHz control signal from the Exciter board operates, when active (on reception in the A3 mode) transistor Q01 (Plate 14), which causes the 2.5 MHz sinewave signal to appear at terminal A2 of Synthesizer board No. 2 (Plate 14). This signal is used in the transceiver.

The square wave signal with a p.r.f. of 2.5 MHz is the clock signal of the first flip-flop of the Divider by 100 (Plate 14).

The divider by 100 delivers a 25 kHz signal which is used as a reference signal in the main loop.

This divider by 100 consists of :

- . A divider by four
- . Two dividers by five

The divider by four consists of the flip-flops 1 and 2 of the module Z04.

The signal from output Q of flip-flop No. 2 in module Z04 acts as a clock signal for the first divider by five. The p.r.f. of this clock signal is 625 kHz.

The first divider by five consists of :

- . Flip-flops Nos. 1 and 2 of module Z05
- . Flip-flop No. 1 of module Z07
- . NOR gate No. 1 of module Z06

Note : Owing to the presence of 3 flip-flops, this counter can divide by up to $8(2^3)$. However, the NOR gate permits, on the fifth pulse, the resetting of the counter to zero and thus restoring it in its initial position.

The signal from the output Q of flip-flop No. 1 of module Z07 acts as a clock signal for the divider by five. The p.r.f. of this clock signal is 125 kHz.

The second divider by five consists of :

- . Flip-flop No. 2 of module Z07
- . Flip-flops Nos. 1 and 2 of module Z11
- . NOR gate No. 4 of module Z06.

The output signal from terminal 11 of the module Z06 is shaped through the differentiator network (R17 and C16). This signal is then applied to the matching circuits consisting of two NOR gates Nos. 2 and 3 of module Z06 (used as an inverting amplifier).

The pulsed signal, with the following characteristics :

- . PRF equal to 25 kHz
- . Pulse length equal to 2 μ s, originates from output 4 of module Z06,

and is applied to :

- . A frequency discriminator (module Z12) performing the "alignment" function of the VCO oscillator.
- . A phase comparator (module Z03) performing the feedback control function of the VCO oscillator

The 1 kHz signal required for operation of the secondary loop originates from a divider by 25 which, in turn, is triggered by the pulsed signal with a p.r.f. equal to 25 kHz (Plate 14).

This divider by 25 consists of two dividers by five.

The signal with a p.r.f. of 25 kHz from the Q output of flip-flop No. 2 in module Z11 is the clock signal of the first divider by five.

The first divider by five consists of :

- . Flip-flops Nos. 1 and 2 of module Z13,
- . Flip-flop No. 1 of module Z16,
- . NOR gate No. 1 of module Z14.

The pulsed signal with a p.r.f. of 5 kHz, from the Q output of flip-flop No. 1 of module Z16, is the clock signal of the second divider by five.

This second divider by five consists of :

- . Flip-flop No. 2 of module Z16,
- . Flip-flop Nos. 1 and 2 of module Z21,
- . NOR gate No. 4 of module Z14.

The output signal from terminal 3 of module Z14 is shaped through the differentiator network (R23 and C24), then amplified by the NOR gate No. 3 of module Z14 (used as an inverting amplifier).

The pulsed signal, with the following characteristics :

- . Negative pulse,
- . PRF equal to 1 kHz,
- . Pulse length between 3 and 4.5 μ s, originates from output 11 of module Z14.

This signal is applied to :

- . Output terminal A7 of Synthesizer No. 2 Board,
- . A matching circuit consisting of the NOR gate No. 2 of module Z14
- . inverting the waveform of the signal.

This signal, from the NOR gate No. 2 of module Z14 has the same characteristics as those mentioned above but is "inverted" (positive pulse).

The output signal from terminal 10 of module Z14 is applied to terminal A6 of Synthesizer No. 2 Board.

These two signals are necessary for correct operation of the secondary loop (see para. 4.2.1.4).

A 1 kHz pulsed signal originates from output Q of flip-flop No. 2 of module Z21, then filtered by R24, R25, R26, C22 and C23. Following this filtering, a 1 kHz sinewave signal appears at terminal B9 of Synthesizer Board No. 2. This signal is used in the transceiver.

4. 2. 1. 2 - Generation of the 100 and 105 MHz signals used as a Fixed Heterodyne.

Both signals originate from a crystal oscillator in the Synthesizer Board No. 3 (Plate 18).

Said oscillator operates as follows (Plate 22) :

The crystal Y01, operated in the series mode, is connected to the emitter of transistor Q01 via terminal 2 of the 100 MHz Oscillator Module and to the emitter of transistor Q02 via terminal 6 of the 100 MHz Oscillator Module.

The oscillator proper consists of transistors Q01 and Q02 and the associated circuits. This oscillator is of the selective feedback emitter coupled-type.

The oscillation frequency is set exactly to 100 MHz by the two variable capacitors C13 and C15 (Plate 18).

The signal from the collector of transistor Q02 is applied to the base of the interface transistor Q03 operating as an amplifier.

The signal from the collector of transistor Q03 is applied to the primary of the impedance matching transformer T01.

The 100 MHz signal from the secondary of T01 is applied, via terminal 14 of the 100 MHz Oscillator Module to :

- . Terminal 6 of the 100 MHz Amplifier Module (generation of the fixed-heterodyne signal with a frequency equal to 100 MHz).
- . Terminal 6 of the 105 MHz Mixer Module (generation of the fixed-heterodyne signal with a frequency equal to 105 MHz).
- . Terminal 11 of the 100 MHz Amplifier Module (generation of the signal required for correct operation of the Secondary Loop).

A) Generation of the 100 MHz Fixed-Heterodyne Signal

When the mode selector switch located on the front panel is set to one of the three positions MORSE, HSB, or AM, the -6V d.c. supply voltage from the Converter is applied to terminal B5 of Synthesizer Board No. 3 (Plate 18).

This voltage, filtered by R03 and C05 (Plate 18) is applied to terminal 8 of the 100 MHz Amplifier Module enabling operation of the amplifier, due to the presence of a supply voltage.

The 100 MHz Amplifier (Plate 21) consists of transistors Q10 and Q11 and the associated circuits. It receives the signal (terminal 6) delivered by the 100 MHz Oscillator Module. An amplified signal appears at output terminal 1 of the 100 MHz Amplifier Module and is directly applied to terminal 16 of the Filter Matching Module (Plate 18).

The matching circuit (Plate 19) only consists , in this particular case, of transformer T02 and resistor R17.

A 100 MHz signal appears at terminal 15 of the Filter Matching **Module** and is applied directly to output terminal A3 of Synthesizer Board No. 3 (Plate 18).

This signal is used in the transceiver.

B) Generation of the 105 MHz Fixed-Heterodyne Signal

When the mode selector on the front panel is in the LSB position, the -6V d.c. supply voltage from the Converter unit is applied to terminal A4 of Synthesizer Board No. 3 (Plate 10).

This voltage, filtered by R01 and C03 (Plate 18), is applied to :

- . Terminal 11 of the 105 MHz Mixer Module, enabling operation of **the** mixer, owing to the presence of a supply voltage.

The 105 MHz Mixer operates as follows : (Plate 20)

The 100 MHz signal from the 100 MHz Oscillator is applied, via input terminal 6 , to a matching amplifier consisting of transistors Q01 and Q02 and the associated circuits.

A 100 MHz signal from the collector of transistor Q01 is applied to the primary of transformer T01.

The 5 MHz signal from the reference signal generating circuits (see para. 4. 2. 1. 1) is applied via input terminal 8 to a matching amplifier circuit consisting of transistor Q03 and the associated circuits.

The 5 MHz signal is applied to the centre-tap of transformer T02.

Mixing takes place in transformers **T01 and T02** and diodes CR01 to CR04 (ring modulator).

The secondary of transformer T02 delivers a 105 MHz signal and a component at 95 MHz. This signal appears at input 10 of the Filter Matching Module.

The matching circuit (Plate 19) consists of transistor amplifiers Q01 and Q02 and the associated circuits.

The output signal from **output** terminal 13 is applied to a filtering device (Plate 18) which consists of a crystal filter FL01 and the associated circuits. It permits suppressing spurious components and passes only the fundamental frequency ($F = 105$ MHz). The filter input and output are matched through variable capacitors C01 and C02.

The signal from this filter is applied to input terminal 3 of the Filter Matching Module.

The matching circuit (Plate 19) consists of transistor amplifiers Q03, Q04, the associated circuits, and transformer T01.

The 105 MHz signal from output terminal 15 of the Filter Matching Module, is **applied** directly to terminal A3 of Synthesizer Board No. 3 (Plate 18).

This signal is used in the transceiver.

C) Generation of the signal required for correct operation of the secondary loop
(Plate 21)

The 100 MHz signal appearing at terminal 11 of the 100 MHz amplifier module is applied to an amplifier consisting of transistors Q01, Q02 and their associated circuits.

The output 100 MHz signal appears at terminal 16 of the 100 MHz Amplifier Module.

Said signal is required for correct operation of the Secondary Loop.

4. 2. 1. 3 - Operation of the Main Loop (ML)

The operation of the Main Loop is described in nine sub-paragraphs as follows :

- (A) Operation of the voltage controlled oscillator by a feedback loop (main loop) "VCO".
- (B) Operation of the amplifier amplifying the output signal of the VCO feed into the loop.
- (C) Operation of the main-loop mixer (mixing of the signal from the VCO and a signal from the secondary loop).
- (D) Operation of the divider by **four** (division of the frequency of the signal from the main-loop mixer).
- (E) Operation of the divider by 10 or 12 (division depending on the order to divide by ten or twelve, divides the frequency of the signal from the divider by four. The order to divide originates from the variable preset divider, see sub-para. F).
- (F) Operation of the variable preset divider (which generates a division "rank" and the **divide by 10** or 12 order, depending on the setting 100 kHz, 1 MHz, and 10 MHz, in order to obtain a signal of frequency 25 kHz
- (G) Operation of the frequency discriminator generating an ALIGNMENT (search) signal resulting from the difference between a reference frequency (25 kHz) and a frequency from the variable-preset divider. This search signal becomes stabilized and is stored once the frequency from the variable **preset divider** is equal to the 25 kHz reference frequency.
- (H) Operation of the phase comparator generating a feedback control error signal resulting from the comparison between the reference signal and the signal from the variable preset divider. This error signal controls the phase of the VCO oscillator.

- (1) Operation of the sub-band control device. The signal from this device also pre-positions the VCO oscillator.

A) Operation of the VCO oscillator (Plates 23A and 23B)

The VCO oscillator is located on the VCO board fitted in the HF Unit.

This is a Colpitts type oscillator. The variation in oscillation frequency is achieved by variation in the d.c. control potential across the varicaps.

This oscillator consists of a field effect transistor Q401, source-follower configuration, its associated circuits, and the tuned inductor L406 with the three varicaps CR403, CR404, and CR405.

The feedback control voltage, filtered by inductor L402, L404 and capacitor C403, controls the varicap CR405. A corrector network (Plate 10), located in the feedback control network consists of resistors R101, R102, capacitor C101 and diodes CR101 and CR102.

The alignment control voltage, filtered by inductor L403 controls the varicap CR403. A corrector network located in the alignment circuit consists of resistors R401, R402, capacitor C401 and diodes CR401, and CR402.

The sub-band pre-positioning voltage, filtered by capacitors C402, C405, and C411, controls the varicap CR404 and the alignment varicap CR403.

DC insulation between the varicap CR405 and the varicaps CR403, CR404 is ensured by capacitor C414.

Capacitors C407 and C412 provide :

- . DC insulation between the varicaps and the transistor oscillator Q401.
- . AC coupling between transistor Q401 and the tuned circuit.

This voltage-controlled oscillator delivers a signal whose frequency varies from 104.5 to 132.499 MHz depending on the setting (2 MHz to 29.999 MHz).

NOTE : Depending on the setting, the sub-band Control voltage pre-positions the oscillator :

- . in the low sub-band from 104.5 to 122.499 MHz (setting 2 to 19.999 MHz)
- . in the high sub-band from 122.5 to 132.499 MHz (setting 20 to 29.999 MHz).

The signal with a frequency varying from 104.5 to 132.499 MHz depending on the setting (originating from the "source" of the field effect transistor Q401) is applied to the amplifier via capacitor C416.

B) Operation of the Amplifier (Plates 23A and 23B)

The amplifier is located on the VCO board of the HF unit.

This amplifier consists of a "MOS" tetrode type transistor Q402, common source configuration, and its associated circuits. It receives the signal from the VCO oscillator. The output signal originates from inductor L406 inserted between the drain of transistor Q402 and the d.c. supply voltage (+9.5 V stabilized).

The amplified signal, the frequency of which varies from 104.5 to 132.499 MHz with the setting (2 to 29.999 MHz), appears at terminal 9 of connector J101 in the HF Unit (Plate 10).

C) Operation of the Main-Loop Mixer (Plates 11A, 11B and 12)

The Main-Loop Mixer is located in the Main-Loop Mixer module included in the Synthesizer Board No. 1.

The signal, the frequency of which varies from 104.5 to 132.5 MHz with the setting (2 MHz to 29.999 MHz) delivered by the amplifier (see sub-para. B) is applied to terminal 6 of the Main-Loop Mixer.

The resultant signal is applied to a matching amplifier consisting of transistors Q02, Q03 and the associated circuits, and the matching transformer T02.

A signal, the frequency of which varies from 104.5 to 132.499 MHz with the frequency setting, appears across the primary (1 and 2) of transformer T03.

A signal from the secondary loop, with a frequency varying from 100.5 to 100.699 MHz with the setting of the controls "100 kHz", "10 kHz" and "1 kHz", is applied to the primary (1 and 2) of transformer T04 via terminal 16.

NOTE : By way of indication, the frequency of the signal from the secondary loop versus the setting of the controls 100 kHz, 10 kHz, and 1 kHz, is given in the table below.

100 kHz setting	10 kHz setting	1 kHz setting	Frequency of signal from secondary loop
0	0	0	100.5 MHz
0	5	0	100.550 MHz
1	0	0	100.600 MHz
1	9	9	100.699 MHz
2	0	0	100.5 MHz
3	9	9	100.699 MHz
4	0	0	100.5 MHz
5	9	9	100.699 MHz
6	0	0	100.5 MHz
7	9	9	100.699 MHz
8	0	0	100.5 MHz
9	9	9	100.699 MHz

Mixing takes place in the transformers T03, T04 and the diodes CR01 thru CR04. The network used is a typical ring modulator configuration.

The signal, the frequency of which varies from 4 to 31.8 MHz with the setting (2 to 29.999 MHz) originates from the secondary of transformer T03. It is applied to a matching amplifier, consisting of transistor Q01 and its associated circuits, via a filter consisting of inductor L01 and capacitors C09, C10 and C11. The output signal, the frequency of which varies from 4 to 31.8 MHz is delivered by the collector of transistor Q01. It is applied to the output terminal 9 via the matching transformer T1 and capacitor C03.

D) Operation of the Divider by Four (Plate 21)

The signal, the frequency of which varies from 4 to 31.8 MHz with the setting, delivered by terminal 9 of the Main-Loop Mixer module is applied to terminal 8 of the "divide by 4" module (Plates 11A and 11B)

Actually, the divider by four consists of two dividers by two connected in cascade.

The signal from terminal 8 of the Divider by Four module is applied to the base of interface transistor Q01, common-emitter configuration.

The signal from the collector of transistor Q01 triggers the first divider-by two. The first divider by two is an Eccles-Jordan type circuit consisting of transistors Q02 and Q04 and its associated circuits.

The signal, the frequency of which varies from 2 to 15.9 MHz with the setting, originating from the collector of transistor Q04, triggers the second divider by two. The second divider by two is an Eccles-Jordan type circuit consisting of transistors Q03 and Q05 and its associated circuits.

The signal, the frequency of which varies from 1 to 7.95 MHz, originating from the collector of transistor Q05 is applied to output terminal 6 of the Divider by Four module.

E) Operation of the Divider by Ten or Twelve (Plates 11A and 11B)

The Divider by 10 or 12 (module Z04) is located in Synthesizer Board No. 1.

A divider of this type is shown diagrammatically in figure 4.9.

The signal, the frequency of which varies from 1 to 7.95 MHz with the frequency setting, is the clock signal of the four flip-flops of module Z04.

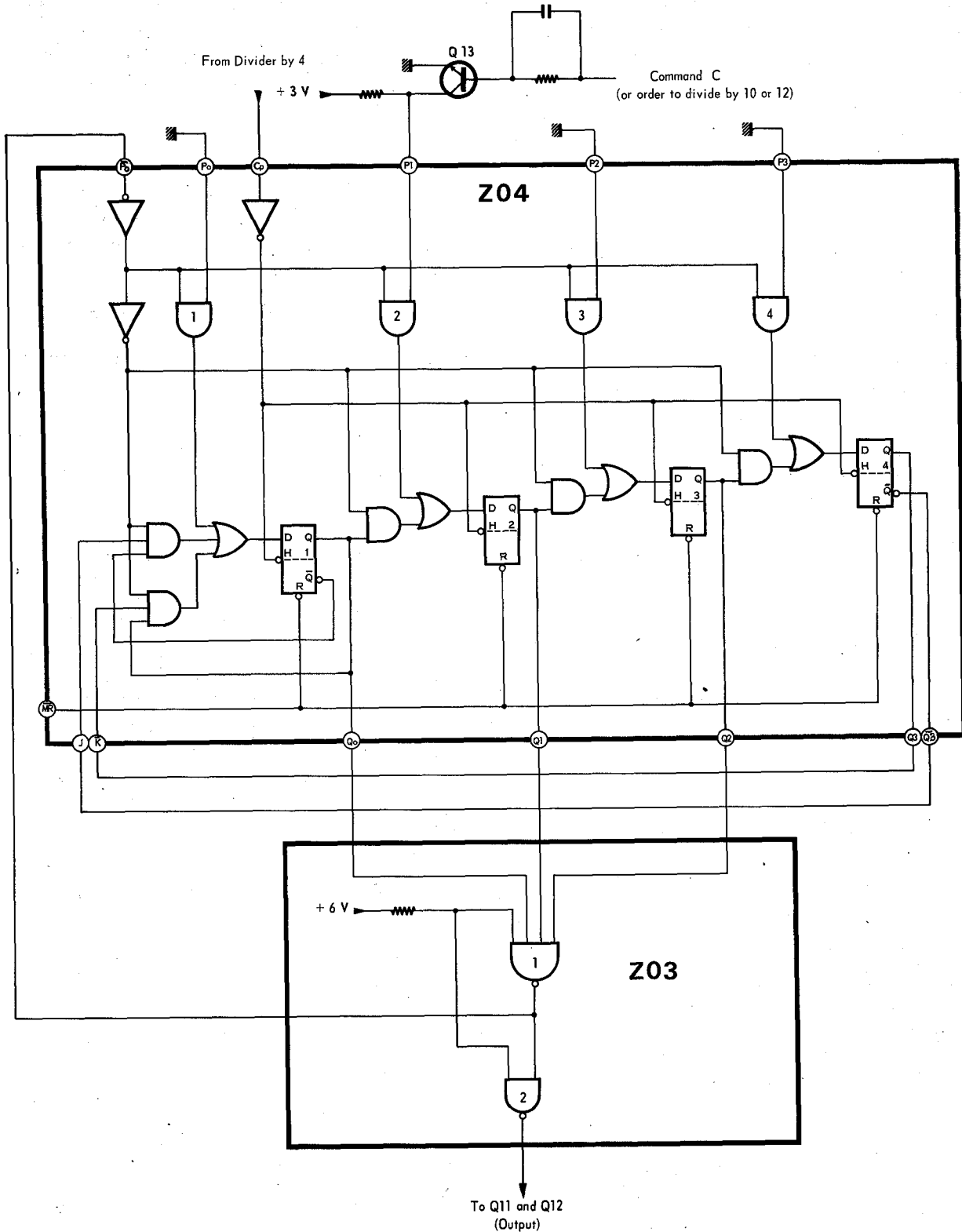


Figure 4. 9 - Schematic Diagram of the Divider by 10 or 12.

(a) In a division by 10, the command C (zero level) from the variable preset divider (see sub-para. 7), drives transistor Q13 to cut-off.

A logic level 1 is applied to one of the two inputs of AND gate No. 2. On completion of counting, a logic level one is applied to the second input of AND gate No. 2 via NAND gate No. 1 in module Z03. Input D of flip-flop No. 2 is forced at a logic level one, while the other D inputs of flip-flops 1, 3 and 4 are at logic level zero.

The state of the four flip-flops during counting is shown in the table below (the sign X shows a change in state).

Clock pulses	Flip-flop No. 1	Flip-flop No. 2	Flip-flop No. 3	Flip-flop No. 4
1	X	-	X	X
2	X	X	X	-
3	X	X	X	X
4	-	X	X	X
5	X	-	X	X
6	-	X	-	X
7	X	-	X	-
8	X	X	-	X
9	-	X	X	-
10	-	-	X	-

The counting by 10 is illustrated by the timing chart in figure 4. 10.

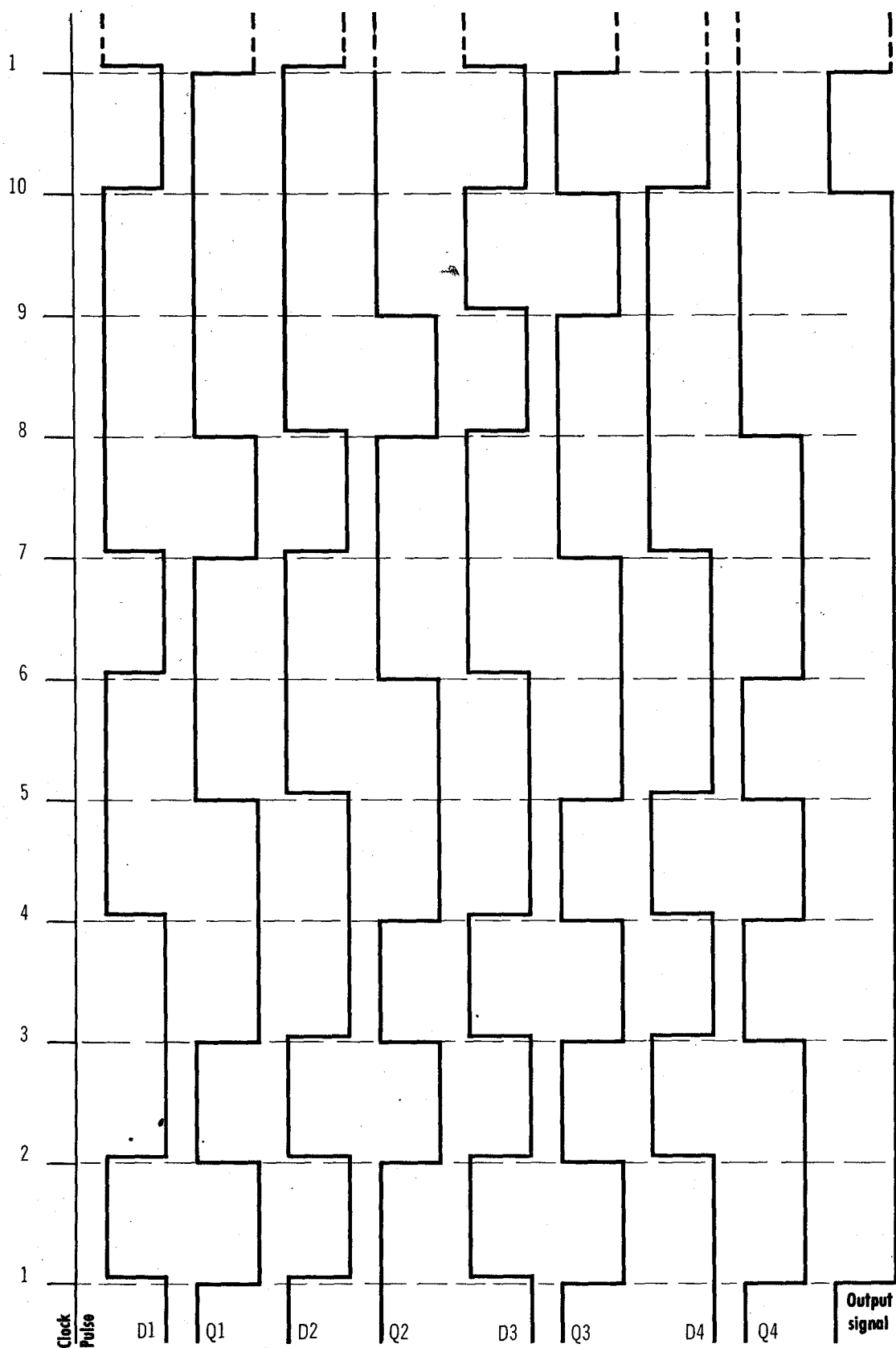


Figure 4.10 - Timing Chart of a Counting by Ten

(b) In a division by 12, the command C from the variable preset divider (see subparagraph F) at logic level one, causes transistor Q13 to conduct.

A logic level zero is applied to one of the two inputs of AND gate No. 2. On completion of counting or just before the beginning of counting, input D of flip-flops Nos. 1, 2, 3, and 4 are at logic level zero.

The state of the four flip-flops during counting is shown in the table below (the sign X shows a change in state).

Clock pulses	Flip-flop No. 1	Flip-flop No. 2	Flip-flop No. 3	Flip-flop No. 4
1	X	X	X	-
2	X	-	-	-
3	X	X	-	-
4	X	X	X	-
5	X	X	X	X
6	-	X	X	X
7	X	-	X	X
8	-	X	-	X
9	X	-	X	-
10	X	X	-	X
11	-	X	X	-
12	-	-	X	X

The counting by 12 is illustrated by the timing chart in figure 4. 11.

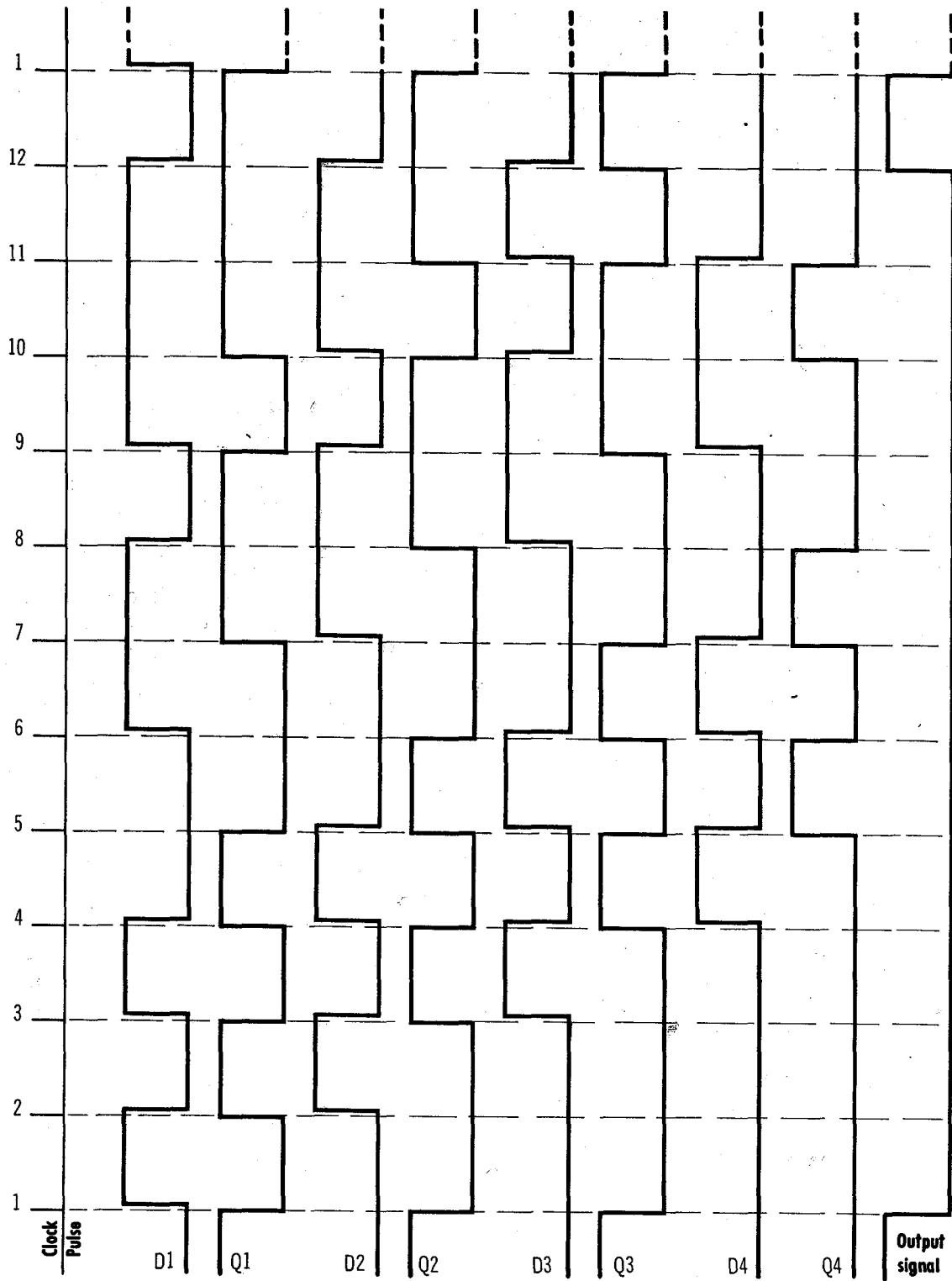


Figure 4. 11 - Timing Chart of the Counting by Twelve

The **output** signal from the divider by 10 or 12 is applied to output terminal A12 of Synthesizer Board No. 1 via an interface device consisting of transistors Q11 and Q12 and their associated circuits mounted in a cascode configuration.

F) Operation of the Variable Preset Divider (Plate 24)

The variable preset divider in the main loop consists of the following modules :

- . Z11 (Divider by Ten)
- . Z12 (NOR gate and inverter circuit)
- . Z13 (two flip-flops)
- . Z07 (four NOR gates)
- . Z05 (two NOR gates)

These modules are located in the Frequency Selector Board.

The Divider by Ten is shown diagrammatically in figure 4. 12

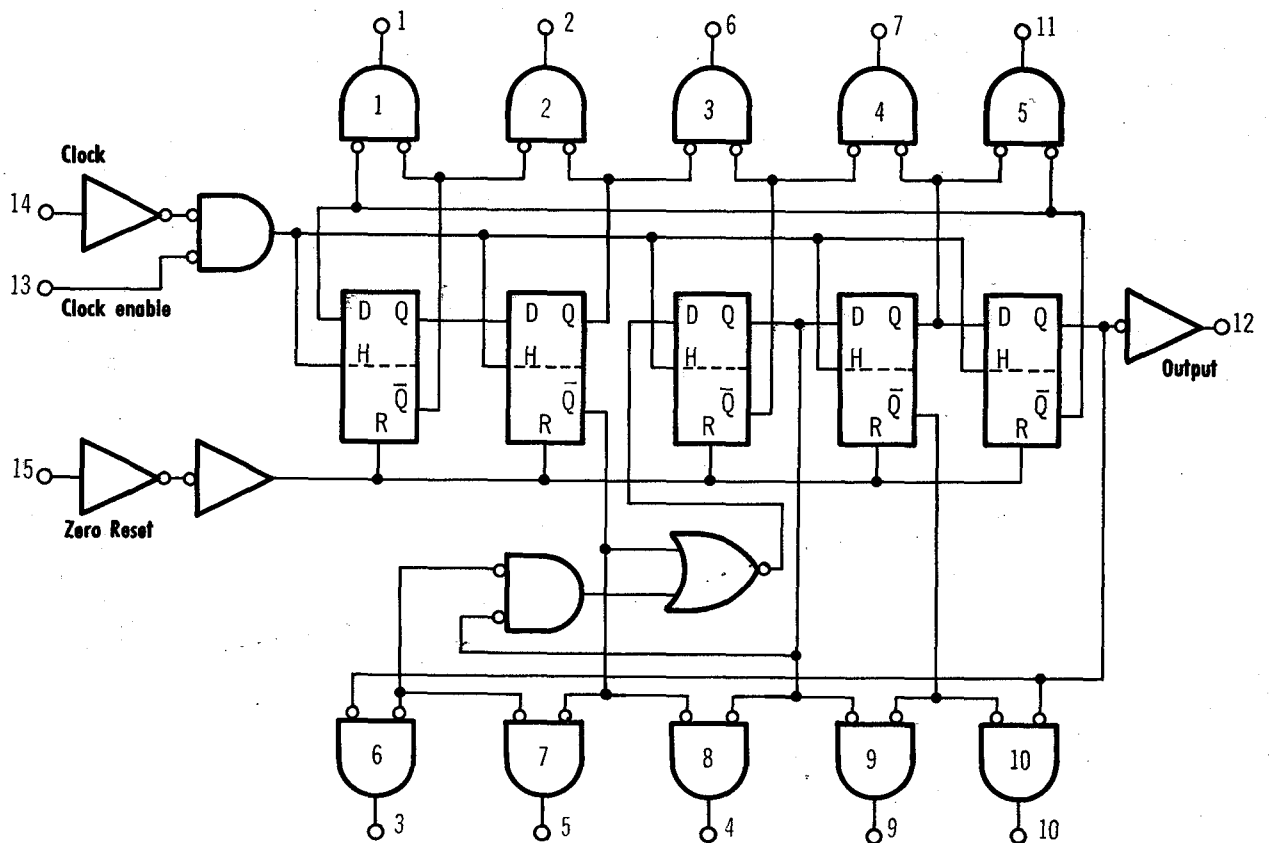


Figure 4. 12 - Diagram of the Divider by Ten of the Variable-Preset Divider.

This counter by ten advances on each clock pulse, which permits enabling, i.e. obtaining a logic level one at the output of each of the ten AND gates, the inputs of which are inverted on each clock pulse.

Only one output is at logic level one, the nine others being at logic level zero.

The table below shows :

- . The gate enabled (sign X for enable)
- . The output logic level appearing at each terminal of the module, versus the clock pulses.

NOTE : Output terminal 12 is unused

Terminal 14 is the input of the clock circuit

Terminals 13 and 8 are at logic level zero

Terminal 15 is the input of the reset circuit.

Clock Pulse		1	2	3	4	5	6	7	8	9	10
Gate 1	Enable	-	-	-	-	X	-	-	-	-	-
	Log. lev. of terminal 1	0	0	0	0	1	0	0	0	0	0
Gate 2	Enable	X	-	-	-	-	-	-	-	-	-
	Log. lev. of terminal 2	1	0	0	0	0	0	0	0	0	0
Gate 3	Enable	-	-	-	-	-	-	X	-	-	-
	Log. lev. of terminal 6	0	0	0	0	0	0	1	0	0	0
Gate 4	Enable	-	-	X	-	-	-	-	-	-	-
	Log. lev. of terminal 7	0	0	1	0	0	0	0	0	0	0
Gate 5	Enable	-	-	-	-	-	-	-	-	X	-
	Log. lev. of terminal 11	0	0	0	0	0	0	0	0	1	0
Gate 6	Enable	-	-	-	-	-	-	-	-	-	X
	Log. lev. of terminal 3	0	0	0	0	0	0	0	0	0	1
Gate 7	Enable	-	-	-	-	-	X	-	-	-	-
	Log. lev. of terminal 5	0	0	0	0	0	1	0	0	0	0
Gate 8	Enable	-	X	-	-	-	-	-	-	-	-
	Log. lev. of terminal 4	0	1	0	0	0	0	0	0	0	0
Gate 9	Enable	-	-	-	-	-	-	-	X	-	-
	Log. lev. of terminal 9	0	0	0	0	0	0	0	1	0	0
Gate 10	Enable	-	-	-	X	-	-	-	-	-	-
	Log. lev. of terminal 10	0	0	0	1	0	0	0	0	0	0

The variable-preset divider is shown diagrammatically in figure 4. 13.

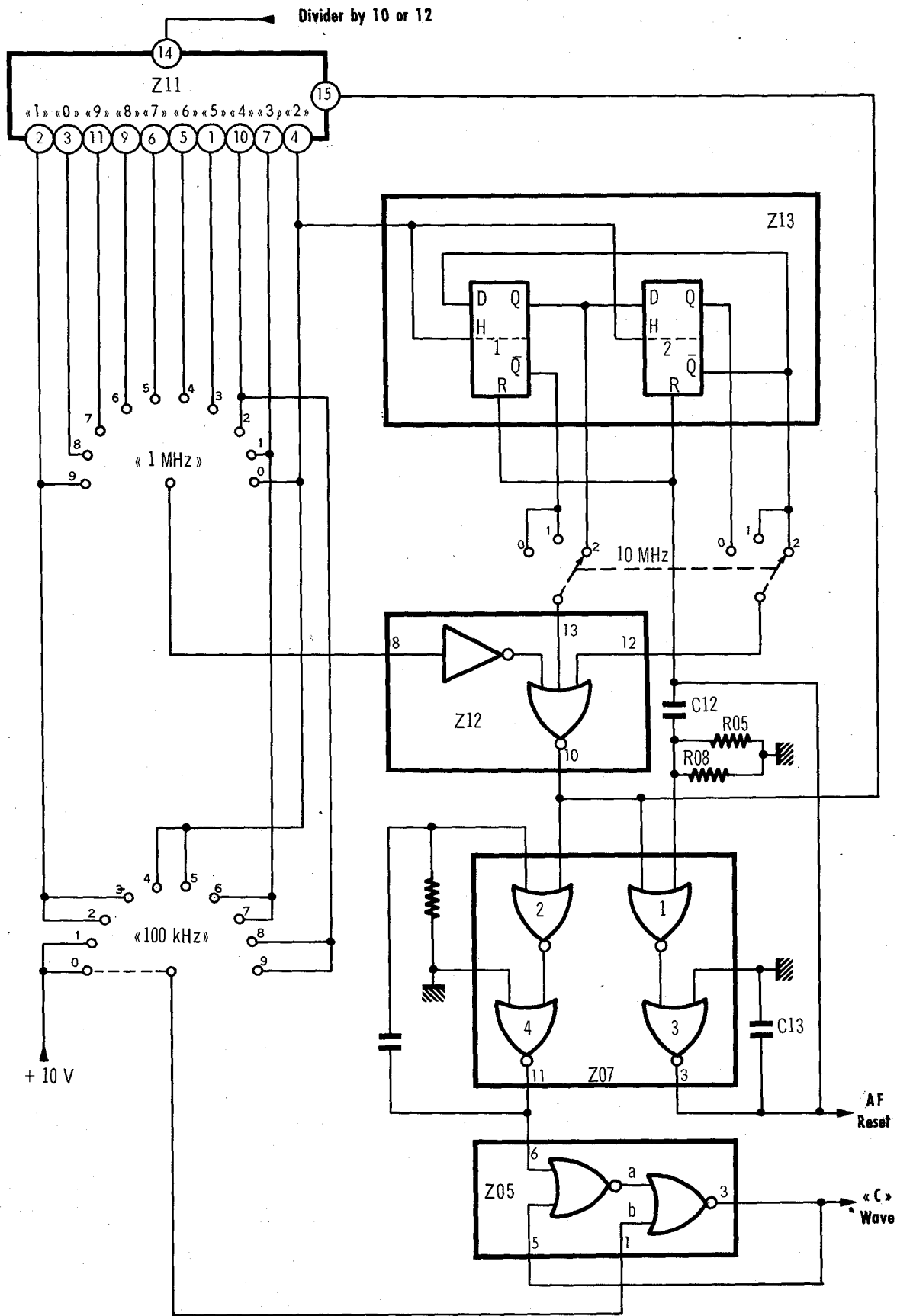


Figure 4.13 - Diagram of the variable-preset divider.

The signal from the divider by 10 or 12, applied to terminal 14 of module Z11, is the clock signal of the five flip-flops composing the divider by 10 (module Z11).

The quoted numeral (figure 4. 12) opposite the output terminals of module Z11, indicates the number of clock pulses required to cause a logic level one to appear at the proper output terminal, the latter being active (the cycle is repeated every ten pulses).

The signal from terminal four is at a logic level one on the second clock pulse, the 12th clock pulse, the 22nd clock pulse, and so on, so long as a logic level one does not appear at terminal 15 (counter reset) of module Z11. This signal is the clock pulse applied to the enabling device consisting of flip-flops 1 and 2 of module Z13.

The 10 MHz selector, depending on its position "0", "1" or "2", selects the output Q or \bar{Q} of flip-flops 1 and 2 of module Z13 and applies the corresponding logic level to the input terminal 13 and 12 of module Z12.

For the zero reset signal of the counter-by-10 (module Z11) to be active (logic level one), the signal applied to the three inputs of the NOR gate of module Z12 must be at logic level zero.

Depending on the setting of the 10 MHz selector, the inputs 12 and 13 of the NOR circuit of the module Z12 are pre-positioned to logic level zero as follows :

Setting of 10 MHz Selector	Logic level of terminal 13 of module Z12	Logic level of terminal 12 of module Z12
0	at logic level zero when signal \bar{Q} from flip-flop No. 1 of Z13 is at logic level zero	at logic level zero when signal Q from flip-flop No. 2 of Z13 is at logic level zero
1	at logic level zero when signal \bar{Q} from flip-flop No. 1 of Z13 is at logic level zero	at logic level zero when signal \bar{Q} from flip-flop No. 2 of Z13 is at logic level zero
2	at logic level zero when signal Q from flip-flop No. 1 of Z13 is at logic level zero	at logic level zero when signal \bar{Q} from flip-flop No. 2 of Z13 is at logic level zero

The enabling of inputs 12 and 13 of NOR circuit in module Z12 versus the clock pulses from the Divider by 10 or 12 is shown in the timing chart of figure 4. 14.

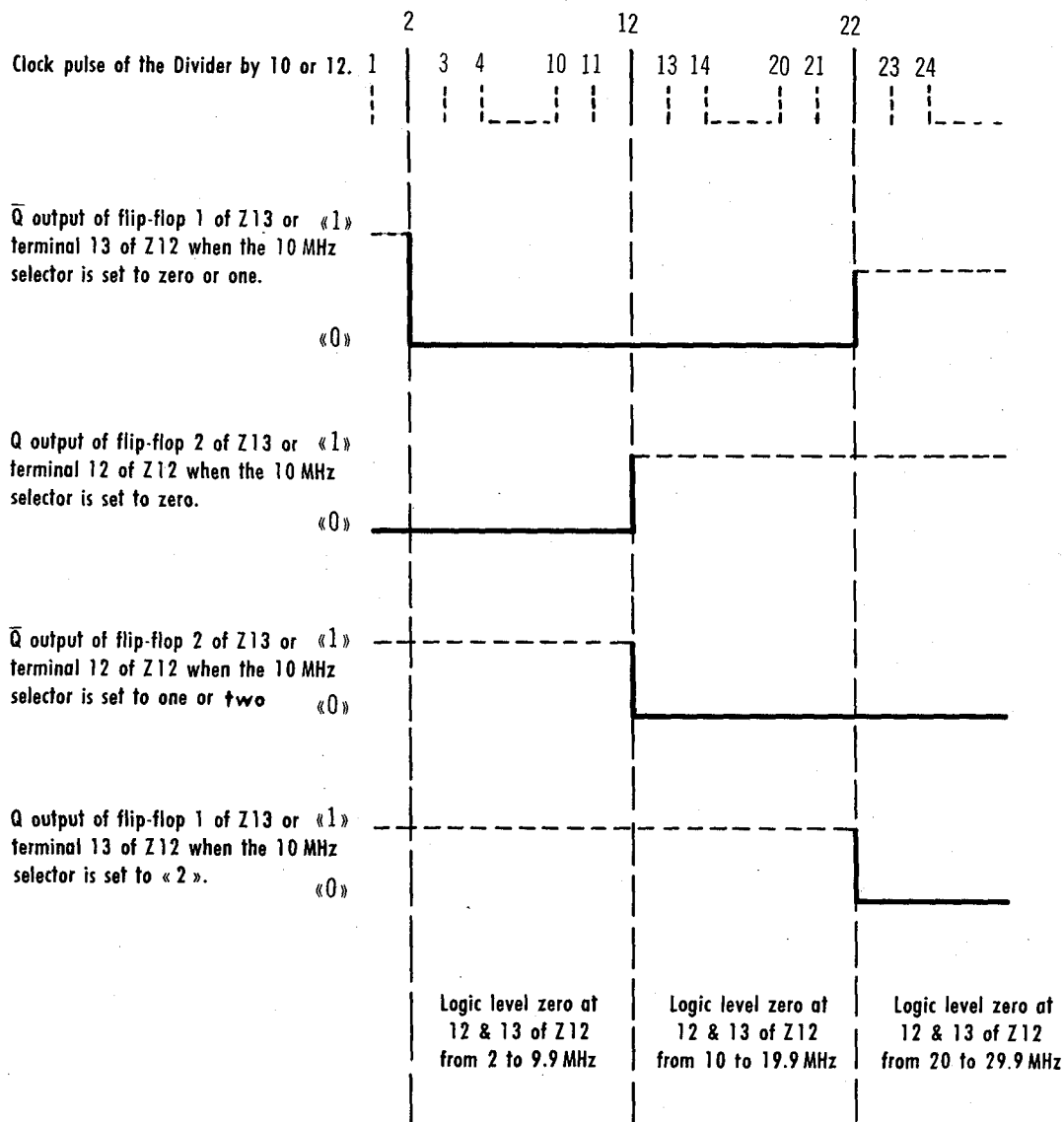


Figure 4.14 - Enabling Timing Chart.

The third input of the NOR gate of Z12 is related to the position of the 1 MHz selector. On the clock pulse corresponding to this position, a logic level one appears at terminal 8 of Z12, producing a logic level zero on the third input of the NOR gate of Z12.

When the 3 inputs of the NOR gate of Z12 are at the logic level zero, a logic level one appears at output terminal 10 of module Z12, causing the flip-flops of the divider by ten (module Z11) to be reset to zero.

The Main-Loop Reset signal is consequently at the logic level one, shaped by the monostable multivibrator consisting of NOR gates (1 & 3) and resistors R05, R08 and capacitor C12.

As the Main-Loop Reset signal is at level one, it causes the flip-flops 1 and 2 of Z13 to be reset to zero.

All the device is restored to the initial state; the occurrence of a signal from the divider by 10 or 12 initiates a new cycle.

The command C or division rank is generated as follows.

The Main-Loop Reset signal at level one (start or end of counting) drives the input "a" of the NOR gate of module Z05 to logic level zero. The input "b" is related to the setting of the 100 kHz selector. So long as the output terminal of the divider by ten in module Z11 is not at logic level one, a logic level zero appears at the input "b" of the NOR gate of Z05, the "command C" signal is at logic level one which then corresponds to a division by 12 of the divider by 10 or 12.

When a logic level one appears at terminal "b" of the NOR gate, the Command C signal changes over to logic level zero. This level locks the two NOR gates of module Z05. The **Command C** signal remains at logic level zero, whatever the logic level of terminal "b" of the NOR gate in module Z05.

The generation of Command C versus the setting of the 100 kHz selector is shown by the timing chart in figure 4. 15.

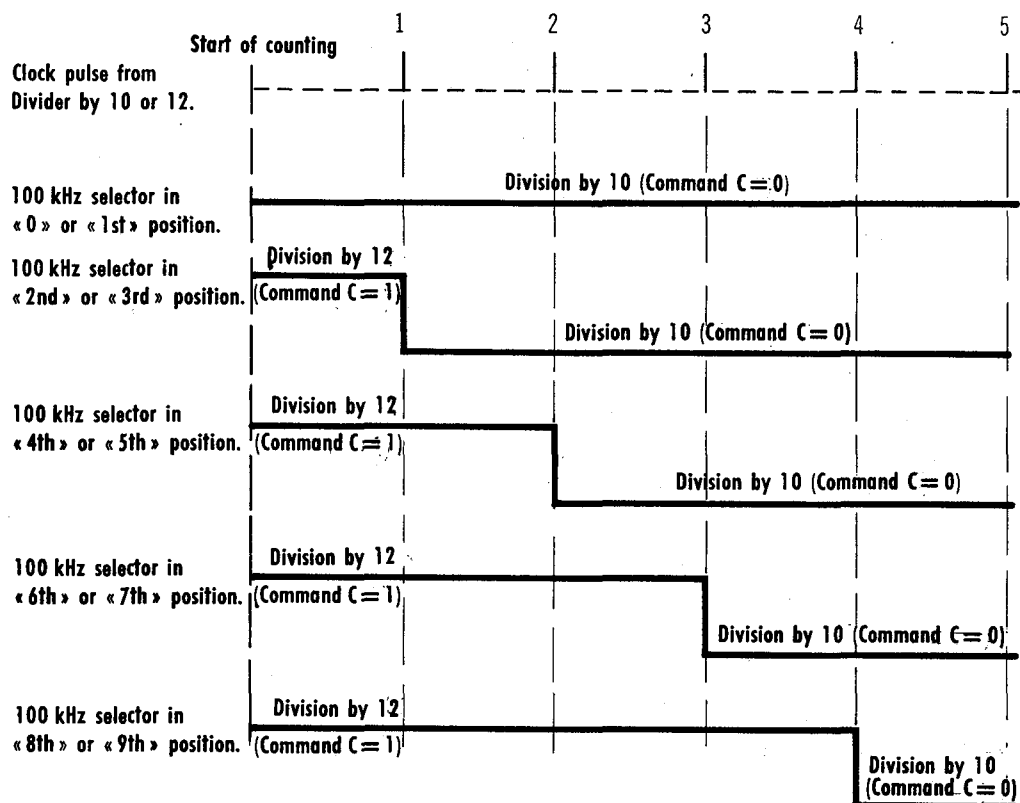


Figure 4. 15 - Timing Chart of the Generation of Command C or Order to Divide.

G) Operation of the Frequency Discriminator and D/A Converter (Plate 14)

The frequency discriminator and digital-to-analog converter are located in Synthesizer Board No. 2, and consist of modules Z12, Z15, Z17, and Z22.

The frequency discriminator and digital-to-analog converter are shown diagrammatically in figure 4. 16.

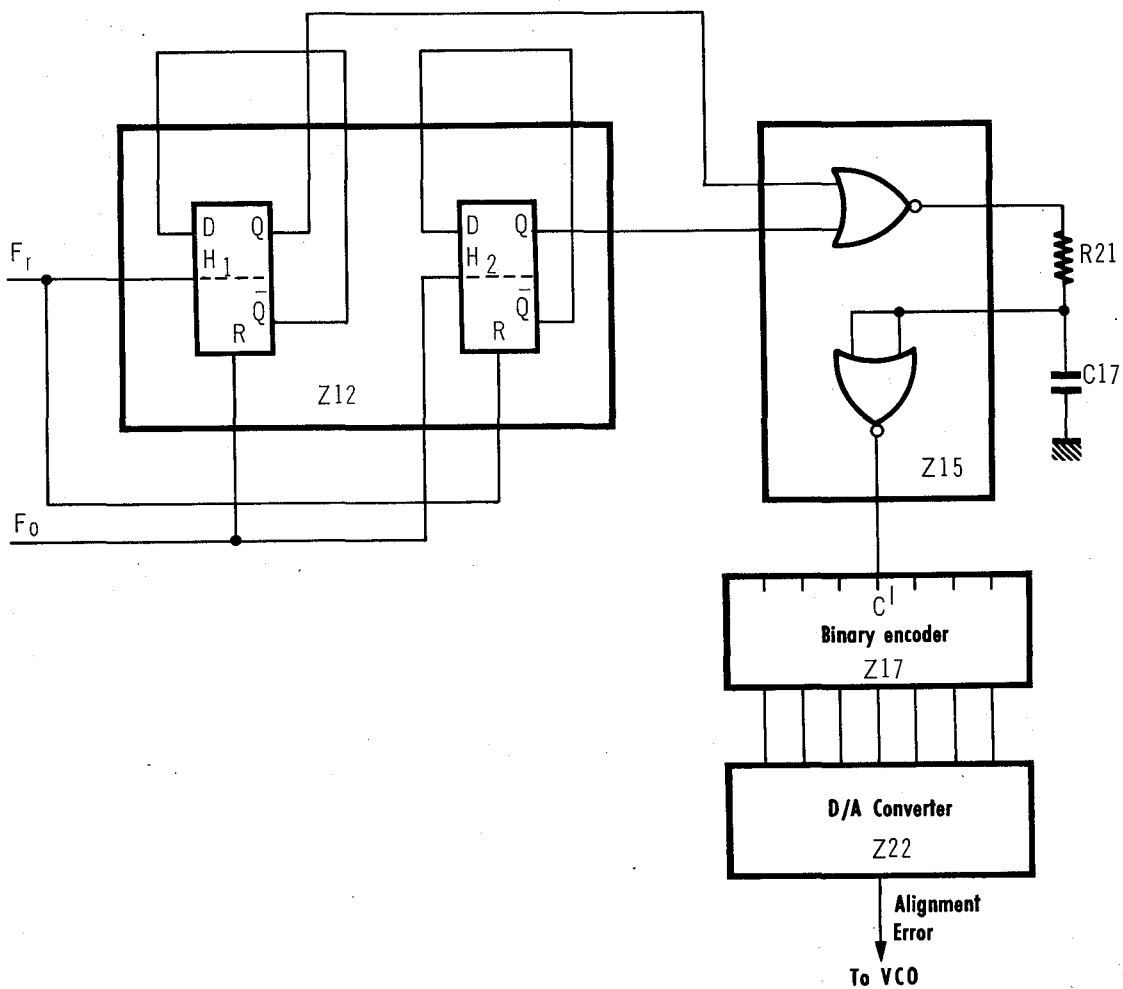


Fig. 4. 16 - Diagram of Frequency Discriminator and D/A Converter

The purpose of the frequency discriminator and D/A converter is to supply an Alignment (Search) signal to control the VCO.

The signal with a fixed frequency (F_r) equal to 25 kHz, from the divider by 100 (in Synthesizer Board No. 2) is the clock signal of flip-flop No. 1 and the zero reset signal of flip-flop No. 2 in module Z12.

The signal at the frequency F_o from the variable preset divider is the clock signal of flip-flop No. 2 and the zero reset signal of flip-flop No. 1 in module Z12.

If the fixed frequency F_r is higher than the frequency F_o , the output Q of flip-flop No. 1 changes its state on each pulse while output Q of flip-flop No. 2 remains continuously at level zero. The signal appearing at output Q of flip-flop No. 1 is retransmitted to the binary counter (module Z17) via the NOR gate and the inverter circuit in module Z15. This signal is re-shaped via resistor R21 and capacitor C17.

If the frequency F_o is higher than the fixed frequency F_r , the output Q of flip-flop No. 2 changes its state on each clock pulse, while output Q of flip-flop No. 1 remains continuously at level zero. The signal appearing at the output Q of flip-flop No. 2 is retransmitted to the binary counter (module Z17) via the NOR gate and inverter circuit in module Z15. This signal is re-shaped through resistor R21 and capacitor C17.

When the frequency F_r is equal to the frequency F_o , both flip-flops remain in the Reset position. The output Q of the two flip-flops remains at level zero.

The binary counter (module Z17) is a 7-bit counter providing different combinations depending on the number of clock pulses 2^7 (128).

The clock signal from the binary counter are connected to the D/A converter (Plate 17) (module Z22).

The D/A converter transforms the binary data from the counter into stepped voltage.

The Alignment Search voltage originates from the D/A Converter. This stepped voltage can provide up to 128 steps at the most.

This stepped voltage controls the VCO oscillator.

H) Operation of the Phase Comparator (Plates 14 and 16)

The phase comparator is located in Synthesizer Board No. 2. It consists of module Z03, transistors Q02, Q03 and the associated circuits (Plate 14).

The signal with a fixed frequency equal to 25 kHz is applied to the base of the interface transistor Q01 (Plate 16) in a common emitter configuration, via input terminal "I" of module Z03. The signal from the collector of transistor Q01 is applied to a sawtooth generator consisting of transistors Q02 to Q04 and the associated circuits. Transistors Q5 and Q6 in an emitter-follower configuration act as an interface stage.

The sawtooth appearing at output terminal "15" of module Z03 is synchronized at the frequency 25 kHz.

This principle is shown in figure 4. 17.

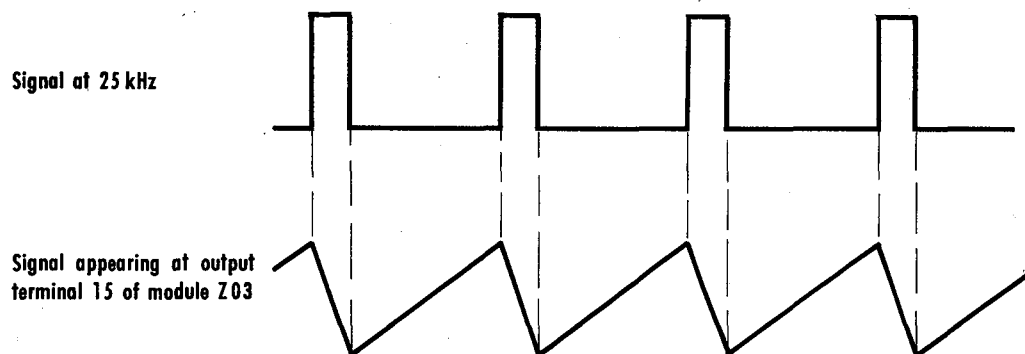


Figure 4. 17 - Synchronization of the sawtooth

The sawtooth signal from terminal 15 of module Z03 is applied to the sampling (MOS) transistor Q02 (Plate 14).

When the ML RESET signal from the variable preset divider appears at terminal A9 of Synthesizer Board No. 2, the sampling transistor Q02 conducts. Capacitor C13 charges instantaneously at the sawtooth instantaneous value. When the ML RESET signal disappears, the sampling transistor Q02 is cut off. The voltage across C13 is stored.

The voltage across capacitor C13 is applied to the temperature compensated amplifier device consisting of transistor Q03 (Plate 14) and transistors Q07 to Q09 and the associated circuits (Plate 16).

The signal from the emitter of transistors Q08 and Q09 (Plate 16) is filtered in order to suppress the 25 kHz component. The voltage at terminal 10 of module Z03 is the Feedback Control Error signal.

NOTE : When the device is locked the voltage across C13 is a constant voltage which no longer varies on the occurrence of the ML RESET signal.

The generation of the Feedback Control Error signal is shown in figure 4. 18.

The Feedback Control Error signal drives the VCO oscillator.

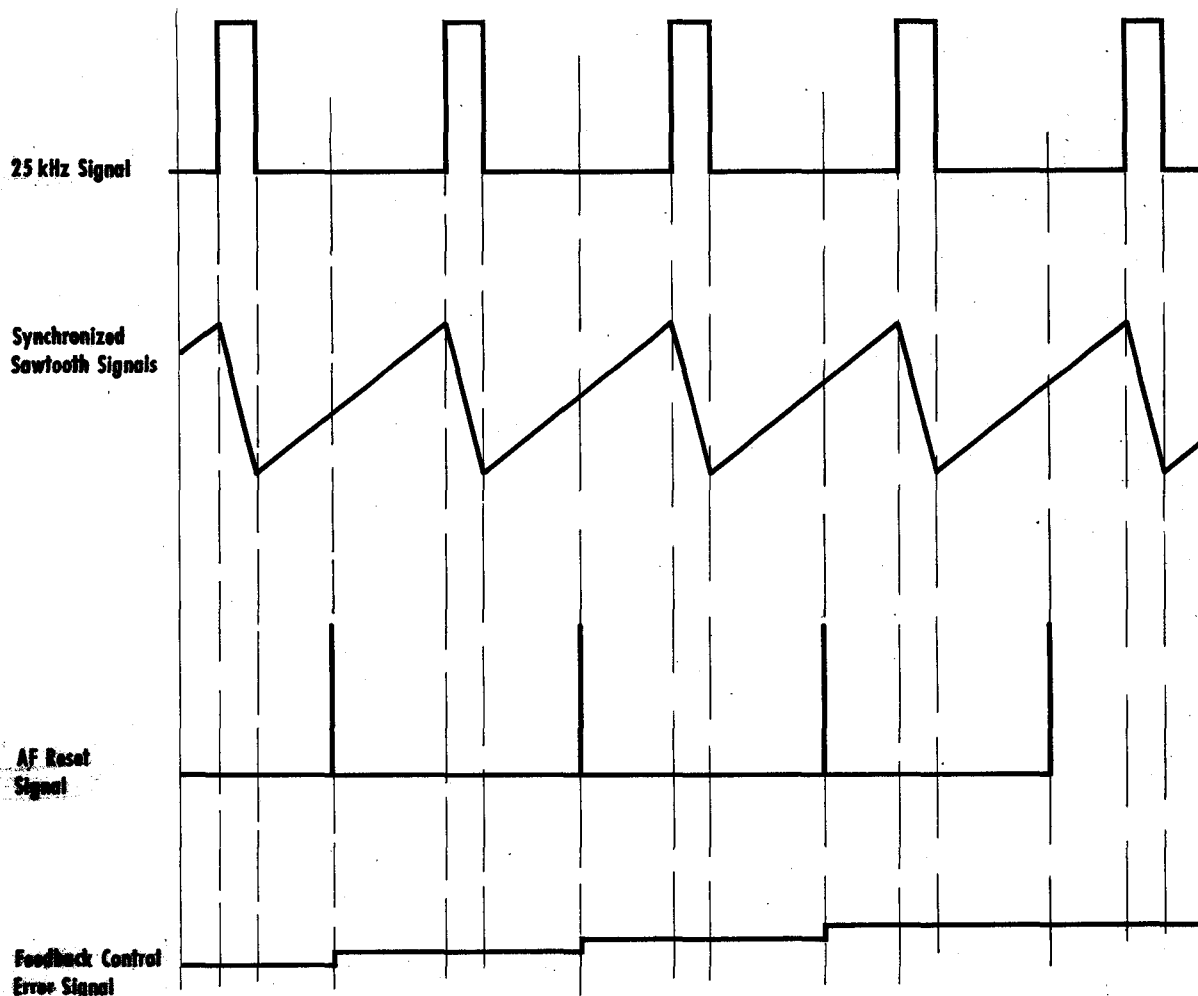


Figure 4. 18 - Generation fo the Feedback Control Error Signal.

1) Operation of the Sub-band Control Device (Plates 10 and 24)

The VCO is pre-positioned in one of two sub-bands depending on the setting.

The first, or low sub-band, pre-positions the oscillator when the setting is within 2 and 19.9 MHz.

The second, or high sub-band, pre-positions the oscillator when the setting is within 20 and 29.9 MHz.

The sub-band control generation principle is shown in figure 4.19.

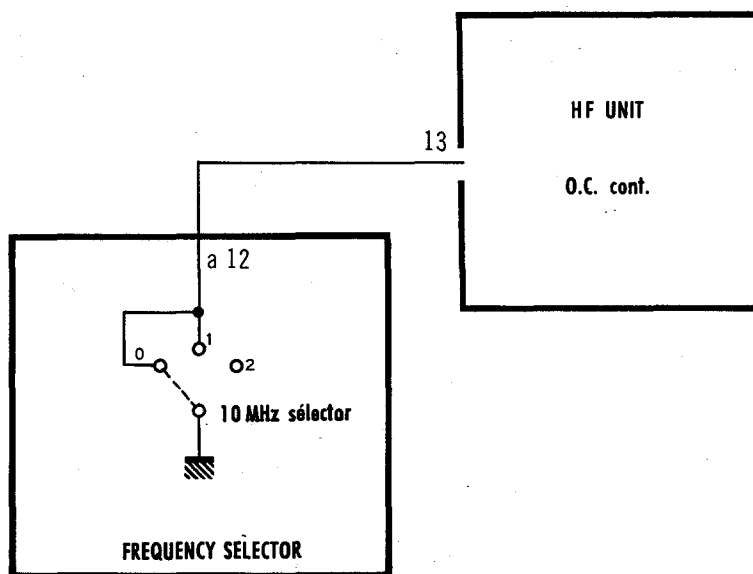


Figure 4. 19 - Generation fo the Sideband Controls

When the 10 MHz selector is in position "0" or "1", a logic level zero appears at terminal 13 of the HF Unit, enabling the VCO to be pre-positioned in the low sub-band.

When the 10 MHz selector is in position "2", a logic level one appears at terminal 13 of the HF Unit, enabling the VCO to be pre-positioned in the high sub-band (varicap bias change).

4. 2. 1. 4 - Operation of the Secondary Loop (SL)

The operation of the secondary loop is described in six sub-paragraphs as follows :

- (A) Operation of the voltage-controlled oscillator by a feedback control loop (Secondary Loop) "VCO'".
- (B) Operation of the amplifier amplifying the output **signal of the VCO' feed** into the loop.
- (C) Operation of the Secondary-Loop mixer (mixing of the signal from the VCO' and a signal with a fixed frequency equal to 100 MHz).
- (D) Operation of the Variable Preset Divider (which generates a division rank, depending on the setting 100 kHz, 10 kHz and 1 kHz, in order to yield a signal at a frequency of 1 kHz).
- (E) Operation of the frequency discriminator generating an "ALIGNMENT" error signal resulting from the difference between a reference frequency and a frequency from the variable preset divider. This signal controls the oscillator VCO'.
- (F) Operation of the phase comparator generating a feedback control error signal resulting from the comparison between the reference signal and the signal from the variable preset divider. This signal controls the oscillator VCO'.

A) Operation of the Oscillator VCO' (Plates 11A and 11B)

The oscillator VCO' is located in Synthesizer Board No. 1.

The variation in the oscillation frequency is achieved, as for oscillator VCO in the main loop, by variation of the control d.c. voltage across the varicaps.

This oscillator consists of transistor Q07 in a common base configuration and its associated circuits.

The varicap CR02 is controlled by the feedback control voltage originating from the phase comparator.

The Alignment control voltage from the "frequency discriminator and digital-to-analog converter" unit controls the varicap CR01.

DC insulation between the two varicaps is ensured by capacitor C23.

DC insulation between the varicaps and transistor Q07 is ensured by capacitor C33.

This voltage-controlled oscillator delivers a signal with a variable frequency, repetitive every 200 kHz, depending on the setting of the 100 kHz, 10 kHz and 1 kHz controls. The frequency of said signals varies from 100.5 to 100.699 MHz.

The signal, the frequency of which varies from 100.5 to 100.699 MHz, originates from the emitter of transistor Q07 and is applied to the amplifier via resistor R35 and capacitor C24.

B) Operation of the Amplifier

The amplifier is located in Synthesizer Board No. 1.

It consists of transistor Q06 in a common base configuration and its associated circuits.

The signal from 'VCO' is applied to the emitter of transistor Q07.

The amplifier is tuned by inductor L02 and variable capacitor C31 for signals of frequency 100.5 to 100.699 MHz.

The amplified signal (from the collector of transistor Q06) the frequency of which varies from 100.5 to 100.699 MHz, with the setting of the 100 kHz, 10 kHz, and 1 kHz controls, appears :

- . at input terminal 16 of the Main-Loop Mixer (module Z05)
- . at output terminal A6 of Synthesizer Board No. 1.

C) Operation of the Secondary-Loop Mixer (Plate 18)

The Secondary-Loop Mixer is located in Synthesizer Board No. 3.

The signal (with a frequency varying from 100.5 to 100.699 MHz with the setting of the 100 kHz, 10 kHz, and 1 kHz controls) originating from output terminal A6 of Synthesizer Board No. 1, is applied to the primary of transformer T03 via input terminal A11.

The signal with a fixed frequency equal to 100 MHz, from the 100 MHz Amplifier module (see para. 4. 2. 1. 2, sub-para C) is applied to the primary of transformer T02.

Mixing takes place in transformers T02 and T03, and diodes CR01 to CR04.

The network used is of the ring modulator type.

The signal whose frequency varies from 500 to 699 kHz, originates from the secondary of transformer T03; It is applied to a matching amplifier consisting of transistor Q01 in a common emitter configuration and its associated circuits.

The signal whose frequency varies from 500 to 699 kHz originates from the collector of transistor Q01 and is applied directly to output terminal B10 of Synthesizer Board No. 3.

D) Operation of the Variable Preset Divider (Plate 24)

The variable preset divider consists of module Z01 to Z06 located in the Frequency Selector Board.

The signal with a frequency varying from 500 to 699 kHz with the setting of the 100 kHz, 10 kHz and 1 kHz controls, originating from output terminal B10 of Synthesizer Board No. 3, is applied to an interface device, via input terminal A4 of the Frequency Selector board.

The interface device consists of transistors Q01, Q02 and the associated circuits.

The signal, the frequency of which varies from 500 to 699 kHz, originating from the collector of transistor Q02 is applied to terminal 14 of module Z02.

The modules Z02, Z04 and Z06 are identical.

The composition of a module is shown in figure 4. 20.

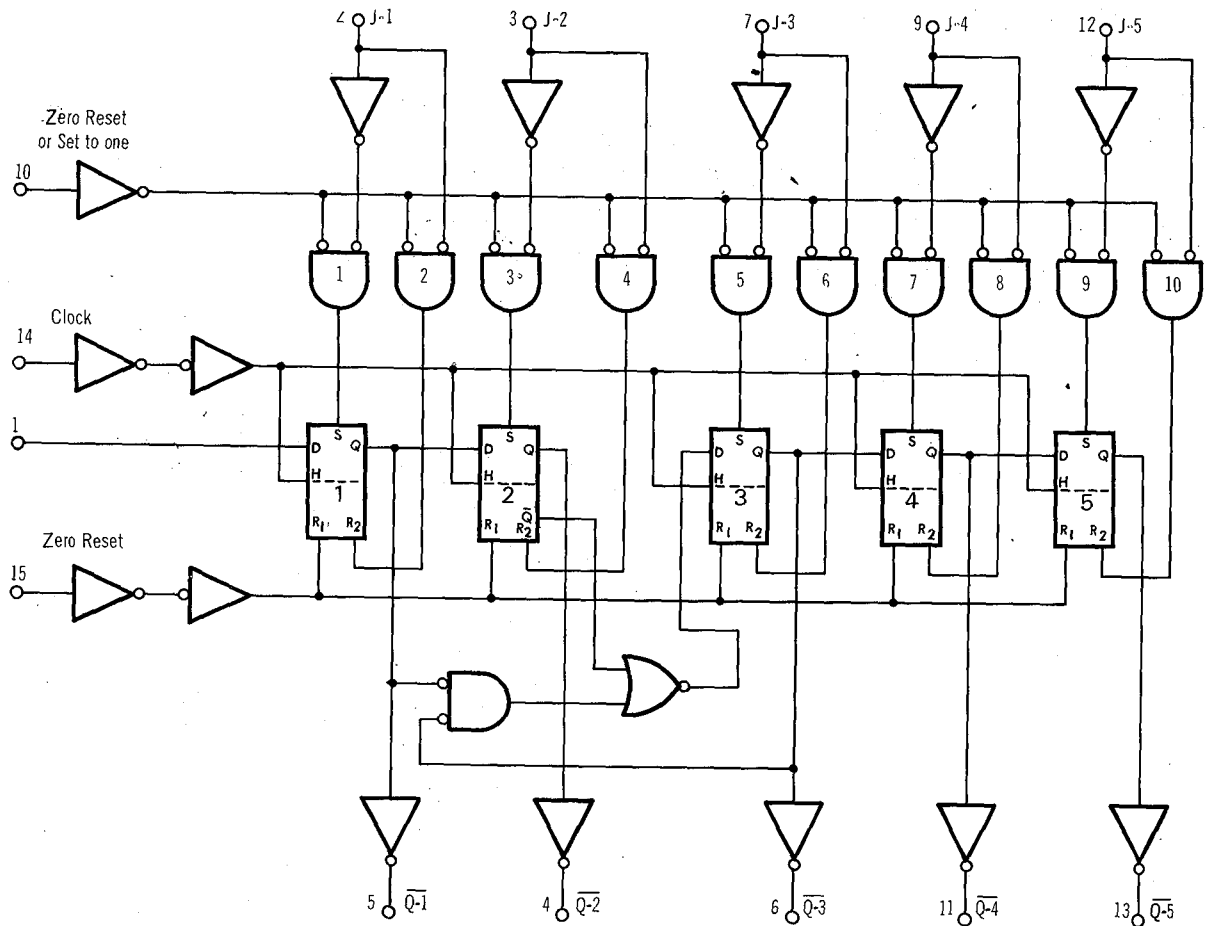


Figure 4. 20 - Circuit Diagram of a Module

A counter of this type can count up to five. However, counting by ten is possible when output terminal 13 ($\overline{Q_5}$) is connected to input terminal 1.

The circuitry is a typical counter circuit.

However, when the Zero Reset or Setting to One is active (logic level one), the logic level of the Q output of each flip-flop is set to the logic level occurring at the relevant J input.

The output Q is set to a logic level one by the gates Nos. 1, 3, 5, 7 and 9 (which implies that J1, J2, J3, J4, and J5 are at the logic level one and that setting to One is also at logic level one).

The output Q is set to a logic level zero by the gates Nos. 2, 4, 6, 8 and 10 (which implies that J1, J2, J3, J4, and J5 are at logic level zero and that Zero Reset is at logic level one).

As a flip-flop is set individually, independently of the others flip-flops, the device provides 32 (2⁵) different combinations.

The variable preset divider is shown in figure 4. 21.

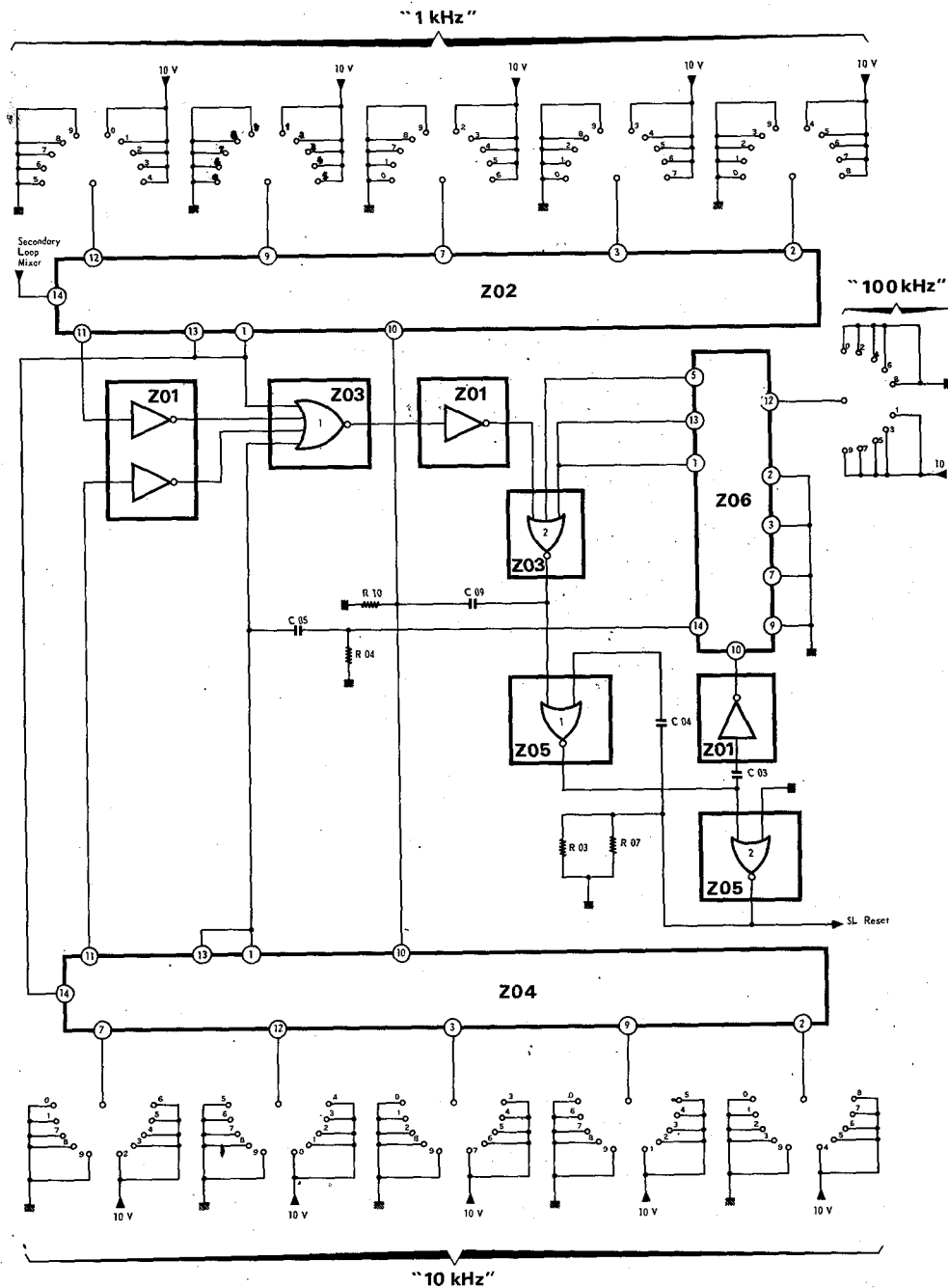


Figure 4. 21 - Circuit Diagram of the Variable Preset Divider

The signal from the interface device receiving the Secondary Loop Mixer signal is the clock signal of the count-down counter in Module Z02.

The output Q of each flip-flop is set to a logic level corresponding to the 1 kHz setting when a logic level one appears at terminal 10 of module Z2.

The output signal $\overline{Q5}$ (terminal 13) is fed back to the input (terminal 1) of module Z02. This signal is used as a clock signal for module Z04.

The output Q of each flip-flop in module Z04 is set to a logic level corresponding to the 10 kHz setting, when a logic level one appears at terminal 10 of module Z04.

The NOR gate No. 1 of module Z03 receives the signals :

- . $Q4$ of module Z02 (through an inverter circuit of module Z01)
- . $\overline{Q5}$ of module Z02
- . $Q4$ of module Z04 (through an inverter circuit of module Z01)
- . $\overline{Q5}$ of module Z04.

This NOR gate is enabled when the 4 signals mentioned above are at logic level zero.

Such enabling depends on the setting of the 1 kHz and 10 kHz controls.

Out of all the possible combinations as regards setting up, the two most interesting ones are the two extreme combinations, namely the settings "00" and "99", the others being intermediate combinations.

Enabling of the NOR gate No. 1 of module Z03 for the setting "00" (10 kHz and 1 kHz controls) is shown in figure 4. 22.

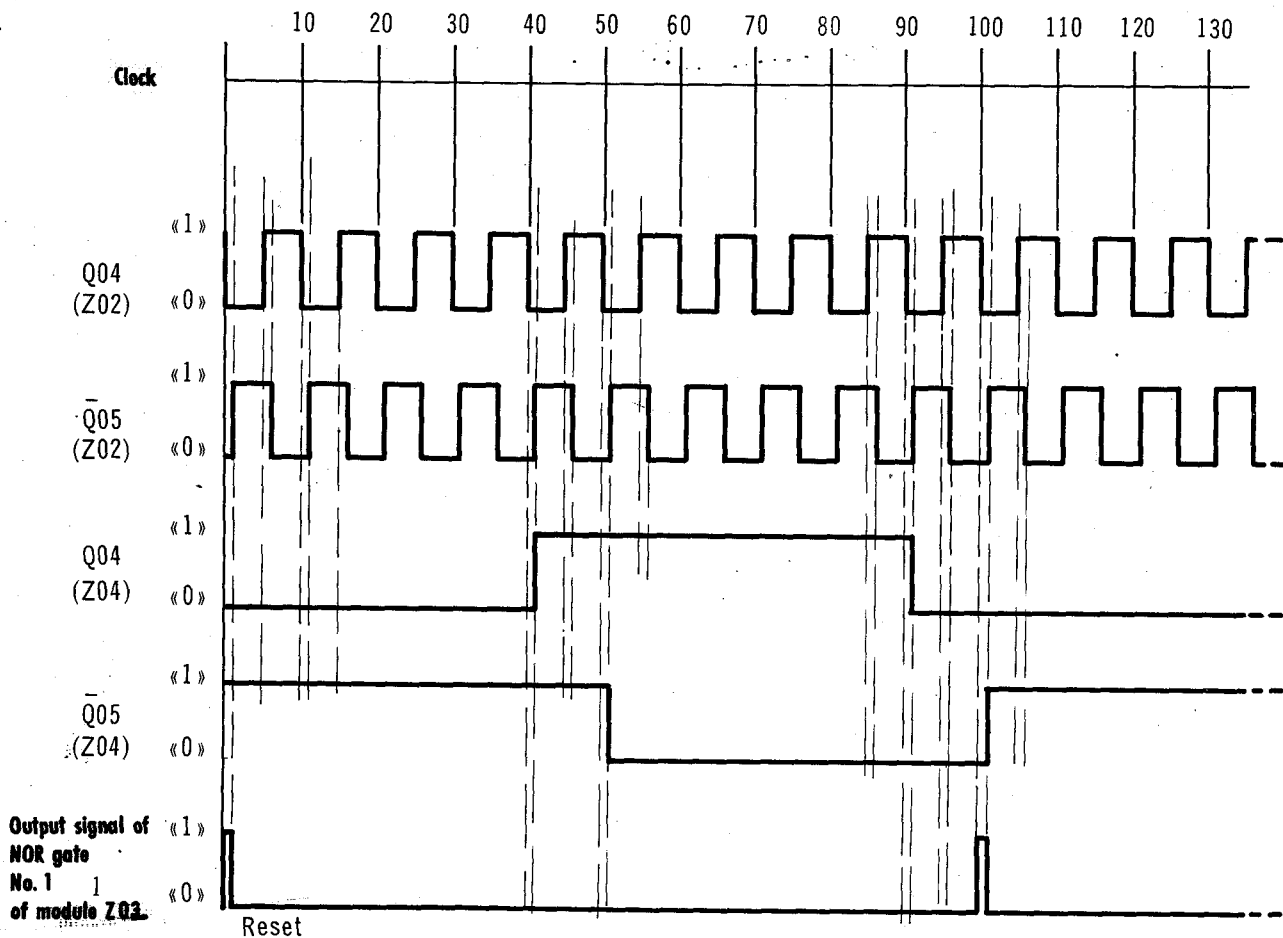


Figure 4. 22 - Enabling Timing Chart for the settings 10 kHz = 0 and 1 kHz = 0

It can be seen from the foregoing timing chart that the output signal of the NOR gate No. 1 of module Z03 is enabled :

- . Between the Reset pulse and the first counting pulse,
- . Between the 100th and the 101st counting pulses,
- . Between the 200th and the 201st counting pulses,
- . Between the 300th and the 301st counting pulses, etc...

NOTE : Change in the setting of 1 kHz offsets the enabling pulse between the 1st and 10th clock pulses.

Enabling of the NOR gate No. 1 of module Z03 for the setting "9.9" (10 kHz and 1 kHz controls) is shown in figure 4. 23.

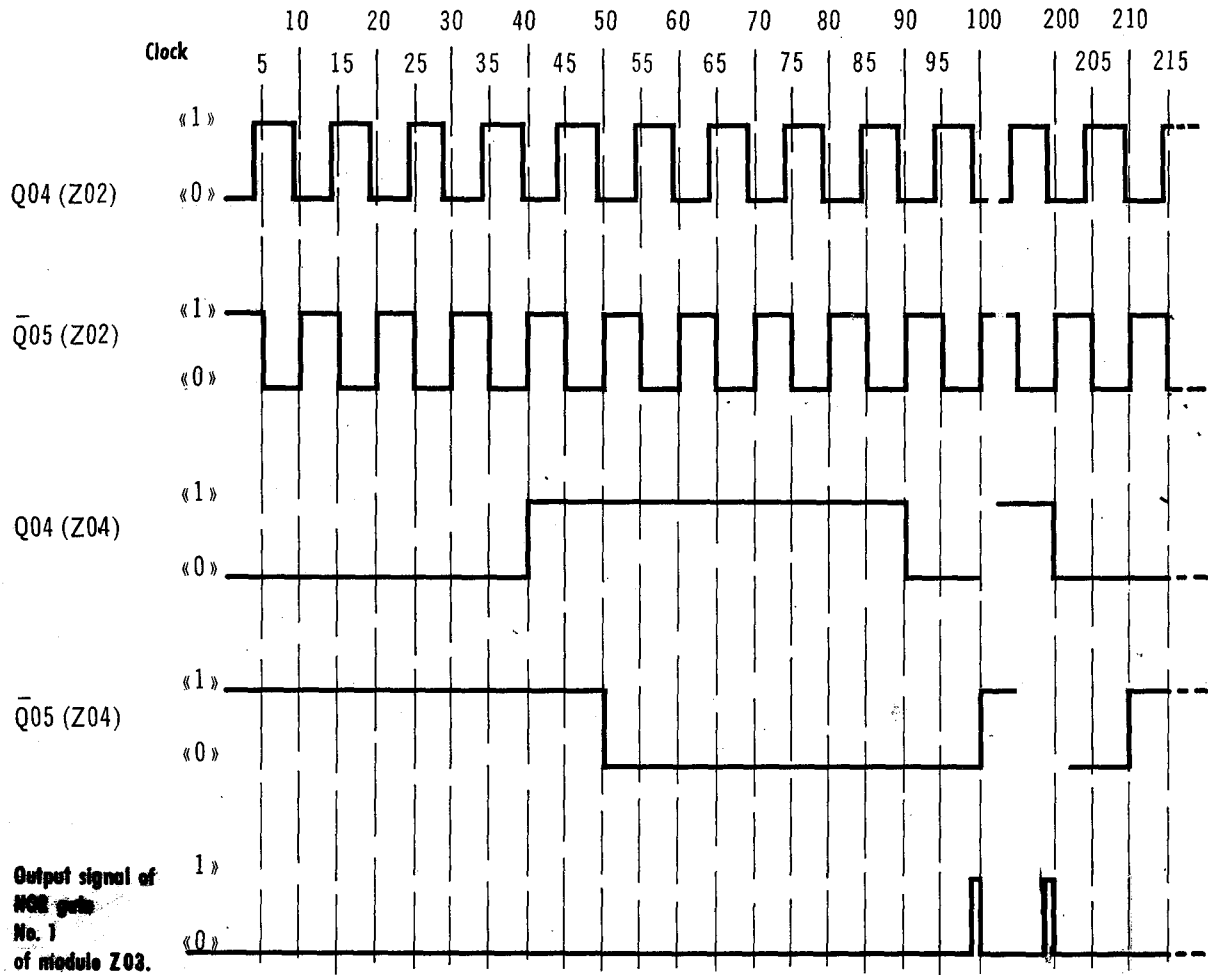


Figure 4. 23 - Enabling Timing Chart for the settings 10 kHz = 9 and 1 kHz = 9

It can be seen from the foregoing timing chart that the output signal of NOR gate No. 1 of module Z03 is enabled :

- . Between the 99th and 100th counting pulses,
- . Between the 199th and the 200th counting pulses,
- . Between the 299th and 300th counting pulses, etc...

NOTE : A change in the setting of 10 kHz offsets the enabling pulse between the 10th and 100th clock pulses in 10-pulse steps.

REMARK : For reference, it should be reminded that the state of a flip-flop changes on the front edge of the clock-pulse. The inter-layer transfer time may be neglected.

Enabling of the NOR gate No. 1 of module Z03 (logic level one) pre-positions one of the three inputs of the NOR gate No. 2 of module Z03 to the logic level zero, owing to the inverter circuit in module Z01.

The other two inputs of the NOR gate No. 2 of module Z03 receive the signals $\bar{Q}1$ and $\bar{Q}5$ respectively from module Z06.

Only the flip-flop No. 5 of module Z06 can be set to logic level one at its output Q , owing to the presence of the 100 kHz selector.

On the positions 0, 2, 4, 6 and 8 of the 100 kHz selector, the output Q of flip-flop No. 5 of module Z06 is set to zero, in the presence of the zero reset pulse.

On the positions 1, 3, 5, 7 and 9 of the 100 kHz selector, the output Q of flip-flop No. 5 of module Z06 is forced to one in the presence of a one-reset pulse.

The waveform of the signals from terminals 5 and 13 of module Z06 for an even setting of the 100 kHz control is shown in the timing chart of figure 4. 24.

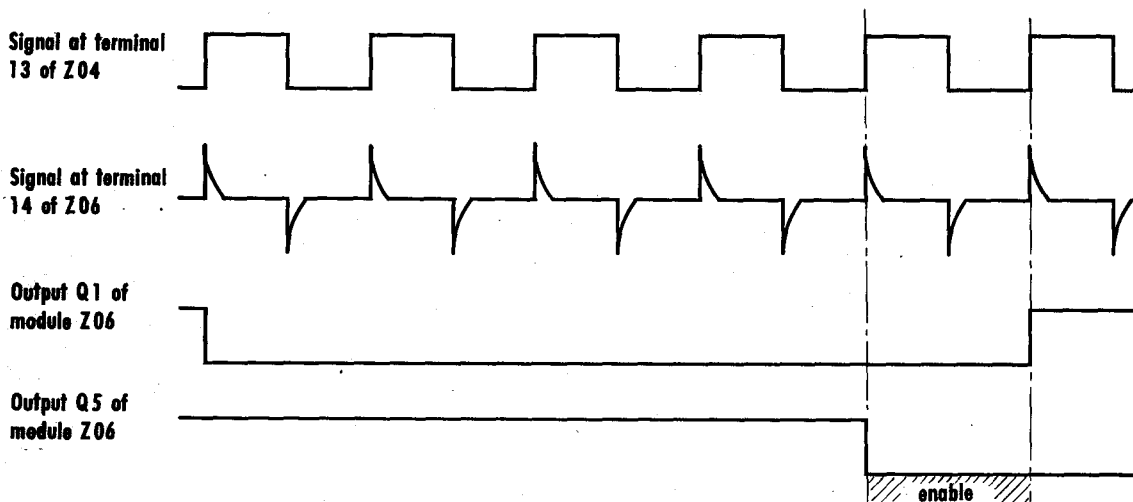


Figure 4. 24 - Enabling with the 100 kHz Control Set to an Even Value

The foregoing timing chart shows that the NOR gate No. 2 of module Z03 (logic level zero) is enabled between the 5th and the 6th clock pulses.

The waveform of the signals from terminals 5 and 13 of module Z06 for an odd setting of the 100 kHz control is shown in figure 4. 25.

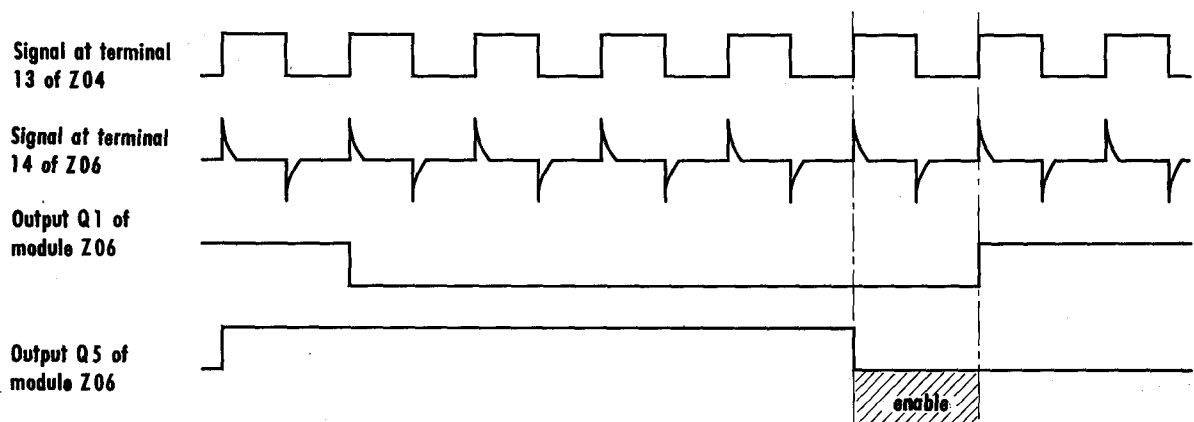


Figure 4. 25 - Enabling with the 100 kHz Controls Set to an Odd Value

The above timing chart shows that the NOR gate No. 2 of module Z03 (logic level zero) is enabled between the 6th and the 7th clock pulses.

The NOR gate No. 2 of module Z03 is fully enabled when its three inputs are at logic level zero. Such enabling takes place after a number of pulses from the Secondary Loop Mixer, said number being determined by the setting of the 100 kHz, 10 kHz and 1 kHz controls.

The minimum number of pulses from the Secondary Loop Mixer required to enable the NOR gate No. 2 of module Z03 is obtained with the following setting up :

- . 100 kHz control : even setting
- . 10 kHz control : 0
- . 1 kHz control : 0

This is illustrated by the timing chart in figure 4. 26.

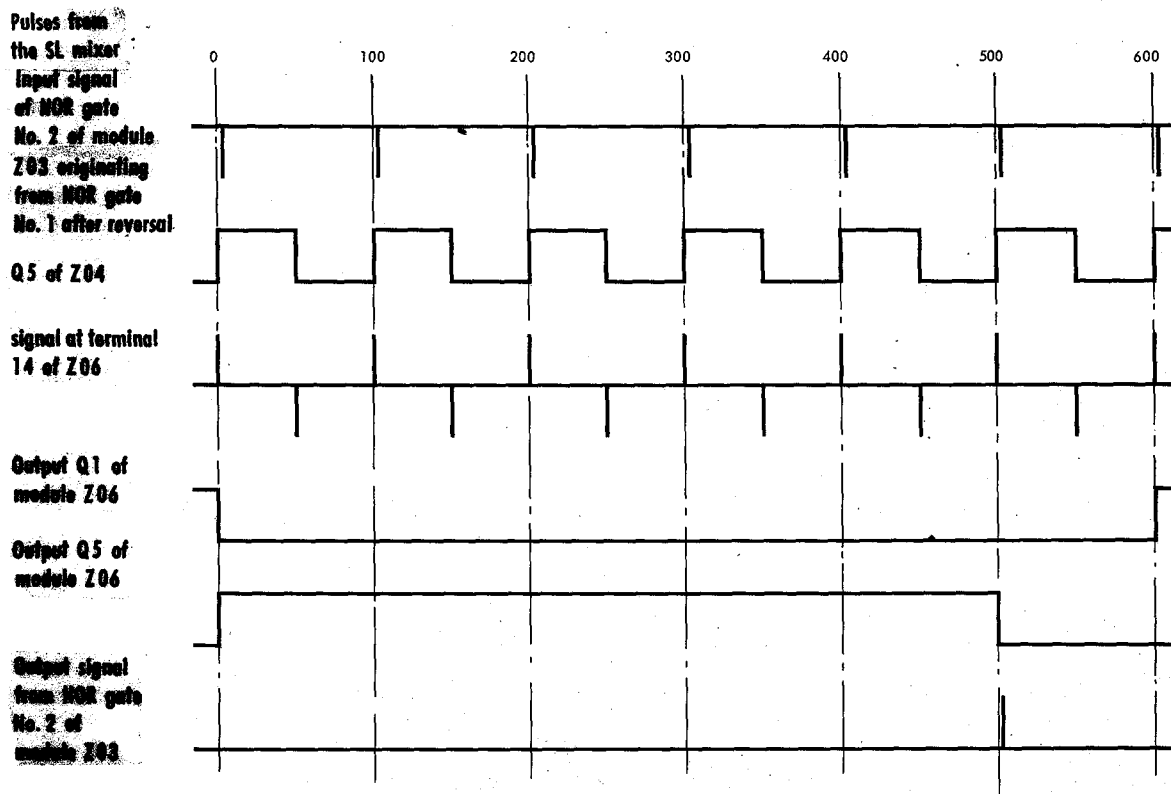


Figure 4. 26 - Enabling with the Settings 100 kHz Controls : even 10 kHz = 0, 1 kHz = 0

In this case, the output signal of gate No. 2 in module Z03 is at logic level one between the 500th and 501st pulses from the Secondary-Loop Mixer.

This logic level one results in :

- . enabling of the Reset pulse applied to modules Z02 and Z04
- . triggering of the monostable multivibrator consisting of the NOR gates No. 1 and 2 in module Z05. The SL Reset signal then is at logic level one. The pulse length of the SL Reset signal is determined by capacitor C04 and resistors R03 and R07.

The reset pulse applied to module Z06 originates from the NOR gate No. 1 in module Z05 through an inverter circuit in module Z01.

In the configuration considered above, the variable preset divider carries out a division by 500.

The maximum number of pulses from the Secondary Loop Mixer required to enable the NOR gate No. 2 in module Z03 is obtained with the following setting up :

- . 100 kHz control : odd setting
- . 10 kHz control : 9
- . 1 kHz control : 9

The input signal of gate No. 2 in module Z03, originating from gate No. 1 in module Z03 is at level zero between :

- . the 99th and 100th pulses from the Secondary Loop Mixer
- . the 199th and 200th pulses from the Secondary Loop Mixer
- . the 299th and 300th pulses from the Secondary Loop Mixer
- . the 399th and 400th pulses from the Secondary Loop Mixer
- . the 499th and 500th pulses from the Secondary Loop Mixer
- . the 599th and 600th pulses from the Secondary Loop Mixer
- . the 699th and 700th pulses from the Secondary Loop Mixer.

As the 100 kHz control is set to an odd numeral, the other two inputs of the NOR gate No. 2 of module Z03 are at logic level zero between the 600th and 700th pulses from the Secondary Loop Mixer.

The variable preset divider carries out a division by 699.

E) Operation of the Frequency Discriminator (Plates 11A and 11B)

The Frequency Discriminator and Digital-to-**Analog** Converter are located in the Synthesizer Board No. 1.

It consists of modules Z01 and Z02.

The Frequency Discriminator and D/A Converter unit is shown diagrammatically in figure 4. 27.

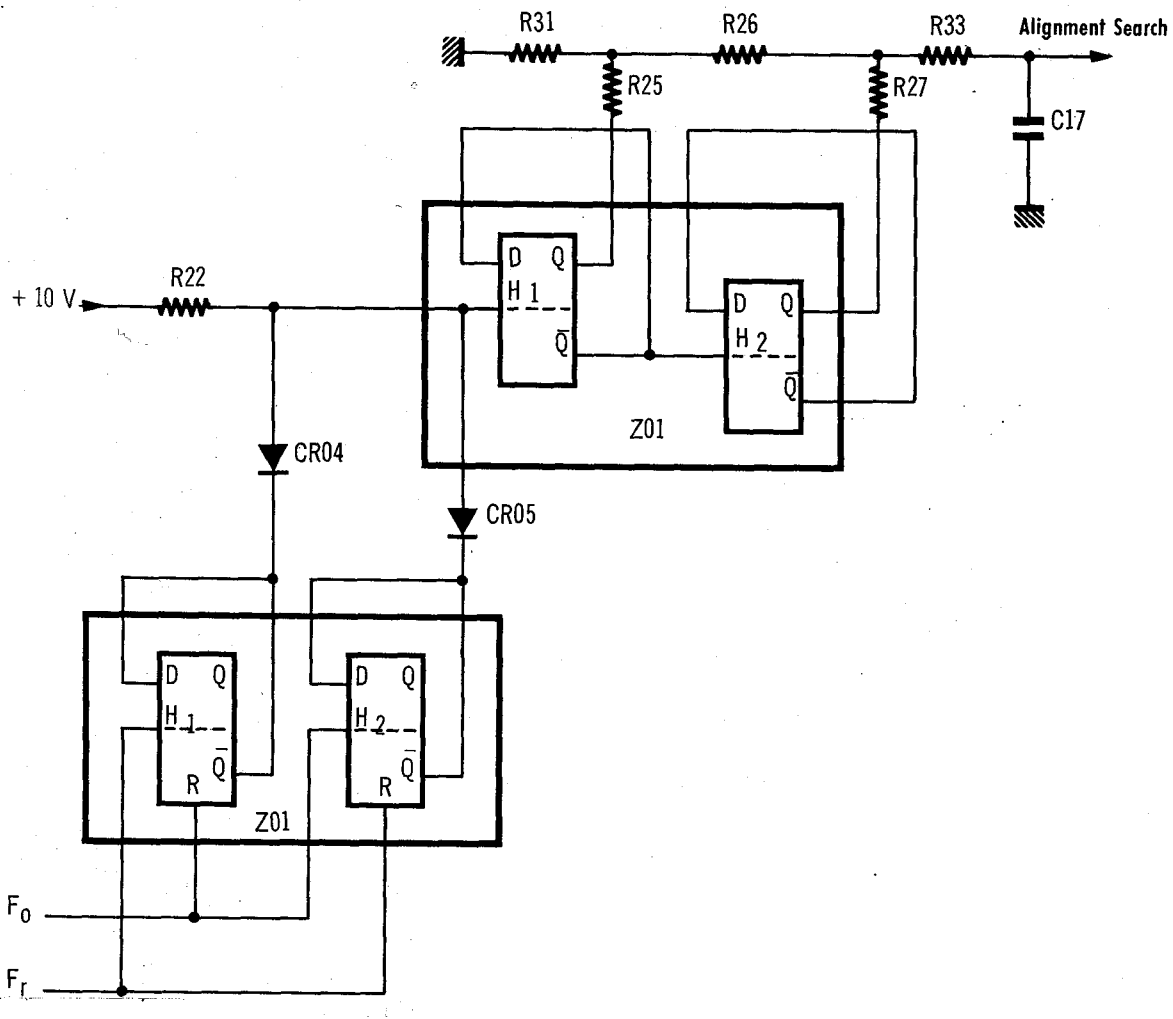


Figure 4. 27 - Circuit Diagram of the Frequency Discriminator and Digital-to-Analog Converter

The purpose of the Frequency Discriminator and D/A converter is to provide an ALIGNMENT (SEARCH) signal in order to control VCO'.

The reference signal with a fixed frequency (F_r) equal to 1 kHz, from the divider by 25 (in Synthesizer Board No. 2) is the clock signal of flip-flop No. 1 and the zero reset signal of flip-flop No. 2 in module Z01.

The signal with a frequency F_0 , from the variable preset divider is the clock signal of flip-flop No. 2 and the zero reset signal of flip-flop No. 1 in module Z01.

If the **reference** frequency F_r is higher than the signal frequency F_o , the output \bar{Q} of flip-flop No. 1 changes its state on each clock pulse while the output \bar{Q} of flip-flop No. 2 remains at logic level one.

When the output \bar{Q} of flip-flop No. 1 is at logic level zero, this causes the diode CR04 to conduct and a logic level zero is applied to the clock circuit of flip-flop No. 1 in module Z02.

When the output \bar{Q} of flip-flop No. 1 is at logic level one, the latter cuts off the diode CR04 and a logic level one is applied to the clock circuit of flip-flop No. 1 in module Z02.

If the **signal** frequency F_o is higher than the reference frequency F_r , the output \bar{Q} of flip-flop No. 2 changes its state on each clock pulse, while the output \bar{Q} of flip-flop No. 1 remains at logic level one (CR04 cut off).

The logic levels from the output \bar{Q} of flip-flop No. 2 are re-transmitted to the clock circuit of flip-flop No. 1 in module Z02 by diode CR05 (conductive: level zero; cut off; level one).

If the reference frequency F_r is equal to the signal frequency F_o , the flip-flops Nos. 1 and 2 of module Z01 no longer change their state and the output \bar{Q} of each flip-flop is at logic level zero.

The D/A converter consists of module Z02 and the voltage divider R25, R26, R27 and R31.

In the absence of a clock signal applied to the module Z02, the outputs Q of flip-flops Nos. 1 and 2 in module Z02 are at logic level zero. The ALIGNMENT(SEARCH) signal is at zero volt (1st step).

The front edge of the first clock pulse causes the state of flip-flop No. 1 to change.

The output Q is at logic level one, the output \bar{Q} at logic level zero.

The ALIGNMENT(SEARCH) signal is at 2.5 V (2nd step).

The front edge of the second clock pulse causes the state of flip-flop No. 1 to change (output \bar{Q} changes from zero to one) thus causing the state of flip-flop No. 2 to change. The output Q of flip-flop No. 2 is at logic level one, while output Q of flip-flop No. 1 is at logic level zero.

The ALIGNMENT(SEARCH) signal is at +5 V (3rd step).

The front edge of the first clock pulse causes the state of flip-flop No. 1 to change (output \bar{Q} changes from zero to one, output Q changes from one to zero). This pulse produces no change in the state of flip-flop No. 2.

The ALIGNMENT(SEARCH) signal is at 7.5 V (4th step).

The front edge of the fourth clock pulse causes the output Q of flip-flops Nos. 1 and 2 in module Z02 to be reset to zero.

F) Operation of the Phase Comparator (Plates 11A and 11B)

The phase comparator is located in Synthesizer Board No. 1.

It consists of transistors Q01 to Q05 and the associated circuits.

It operates in the same way as for the Main Loop (see para. 4. 2. 1. 3, sub-para. H).
In the configuration shown in plates 11A and 11B :

- . Transistor Q01 and its associated circuits acts as an amplifier for the reference signal, the frequency of which is 1 kHz.
- . Transistor Q02, Q03, the associated circuits and capacitor C05 constitute a sawtooth generator (operating as an integrator).
- . Transistor Q04 is the field effect transistor used as a sampling transistor.
- . Capacitor C05 acts as a storage capacitor.
- . Transistor Q05 and its associated circuits are used as an output matching-amplifier.

The output signal of the output matching-amplifier is the Feedback Control Error signal applied to oscillator 'VCO'.

4. 2. 2 - Detailed Operation of the Receiving Channel, Transmitting Channel and Ancillary Circuits

4. 2. 2. 1 - Reception Channel

Operation of the Reception Channel is described in three sub-paragraphs :

- . Operation of the receiving circuits contained in the HF Head
- . Operation of the receiving circuits contained in the Filter and 2.5 MHz IF Board
- . Operation of the receiving circuits contained in the AF Board.

A) Operation of the receiving circuits contained in the HF Head (Plates 23 and 23 B)

The incoming signal, whatever the operating mode (A2-J "MORSE", A3-H "AM", A3-J "LSB" or "HSB") fed through the 20 W Amplifier is applied to the Input Protection circuit via terminal C3 of connector J01 in the HF Head.

The frequency of the reception signal is within 2 and 29.999 MHz.

The purpose of this circuit is to protect the receiver input circuits against too high d.c. voltages and a.c. voltages.

This circuit is enabled only on Reception, owing to the presence of the Reception 6V d.c. voltage (see para. 4. 2. 2. 3).

Protection against d.c. voltage is achieved through capacitor C101.

Protection against a.c. voltages is provided as follows :

- . The voltage across the two Zener diodes CR102 and CR105 is the threshold voltage.

Beyond this threshold :

- . The positive half-waves are clipped by diodes CR104, CR106 and CR105.
- . The negative half-waves are clipped by diodes CR101, CR102 and CR103.

Protection against the image frequency (220 MHz approx.) is provided by the circuit containing inductor L101 and capacitor C104 for the A version and L102, C107 for B version.

In the B version C102, C104 and L101 constitute a high pass filter to eliminate signals below 2 MHz.

The reception signal, the frequency of which may vary from 2 to 29.999 MHz, delivered by the Input Protection circuit is applied directly to another 2 to 30 MHz filter located in the Transmission-Reception Mixer Board.

This second filter embodies :

for the A version :

- . Inductors L303, L305, L306
- . Fixed capacitors C304, C307, C312, C314, C317, C321 and C323
- . Variable capacitor C306.

for the B version :

- . Inductors L301, L303, L305, L306
- . Fixed capacitors C301, C302, C304, C307, C368.

The reception signal, the frequency of which may vary from 2 to 29.999 MHz, delivered by this filter, is applied to matching transformer T302 and T303.

The reception signal from the centre-tap transformer T303 is applied to the gate of four field effect transistors Q303 to Q306 (in a mixer configuration).

In the B version the bias current is adjusted by R328.

The variable heterodyne signal, the frequency of which varies from 104.5 to 132.5 MHz with the setting, delivered by the matching transformer (in a common emitter configuration) in the VCO board, is switched to the primary of transformer T304, through the diode CR301 made to conduct by the presence of the Receive +6 V d.c. voltage.

NOTE : The Receive +6 V d.c. voltage not only enables diode CR301 to conduct, it also causes diode CR307 to conduct (Reception output signal enabled) and cuts off the diodes CR302, CR311 and CR312 (transmission circuits disabled).

The four field effect transistors Q303 through Q306, the associated circuits and transformer T304 form the 102.5 MHz Mixer.

A signal with an intermediate frequency equal to 102.5 MHz appears across the secondary winding of transformer T306.

This signal is retransmitted to the 102.5 MHz crystal filter FL01, via diode CR307 (the latter conducting, see note above).

The 102.5 MHz signal from crystal filter FL01 is applied to the pi-network located in the IF 2.5 and 102.5 MHz Mixer Board, via diode CR201 made to conduct by the presence of the Reception +6 V voltage (this voltage cuts off diode CR202, inhibiting the transmission circuit).

This pi-network consists of :

- . a fixed capacitor C212
- . a variable inductor L203
- . a variable capacitor C222.

The signal from this pi-network, tuned to 102.5 MHz, is applied to an amplifying device consisting of field effects transistors with double grid control Q202, Q204 and their associated circuits.

NOTE : Transistors Q202 and Q204 receive the AGC voltage (see para 4223 E) delivered by transistor Q201. The level of the AGC voltage is set by resistor R214.

The 102.5 MHz signal from the amplifying device is switched to the primary of transformer T201 via diode CR204, made to conduct by the presence of the Receive +6 V voltage (this voltage cuts off diode CR205, inhibiting the transmission circuit).

A signal with a fixed frequency 100 MHz (on reception in the A2-J "MORSE", A3-H "AM", and A3-J "HSB" modes) or 105 MHz (on reception in the A3-J "LSB" mode) from the Synthesizer (see para. 4. 2. 1. 2) is applied to an amplifier via terminal C2 of connector J01 in the HF Head.

This amplifier consists of transistor Q205 in a common emitter configuration and its associated circuits.

The signal from this amplifier is applied to the centre-tap of the primary winding of Transformer T202.

The 2.5 MHz mixer consists of transformers T201 and T202, diodes CR206, CR207, CR211 and CR212, resistors R251, R252, R254 and R255, capacitors C256, C257, C261 and C262. This mixer is also used on transmission.

The circuit used is of the ring modulator type.

The resulting 2.5 MHz signal from transformer T202 is applied to a matching circuit consisting of transistor Q206 in a common emitter configuration, and the associated circuits.

NOTE : Transistors Q201, Q202, Q204 and Q206 are energized only on reception (presence of the Receive +10 V voltage).

A 2.5 MHz signal appears across the secondary winding of matching transformer T 203 (located in the collector circuit of transistor Q206) and is applied to output terminal 25 of connector J01 on the HF Head.

B) Operation of the Reception Circuits Contained in the Filter and 2.5 MHz IF Board (Plate 25)

The 2.5 MHz signal from output terminal 25 of connector J01 of the HF Head is applied to an input matching device consisting of transformer T01, capacitor C02 and resistor R05, via the input terminal A3.

On reception of a signal in the A2-J "MORSE", A3-J "LSB" or "HSB" mode, the signal from the input matching device is switched to the base of transistor Q01 via diode CR02 made to conduct by the presence of the Receive 6 V voltage. This voltage cuts off diode CR01, inhibiting the transmission circuit (The network Q01, FL01, Q03 and Q07 is common to the transmit and receive channel).

Transistor Q01, in a common emitter configuration and its associated circuits is used as an amplifier. The signal from said amplifier, is filtered (FL01) and applied to a matching device consisting of transistors Q03, Q04 and the associated circuits.

The 2.5 MHz reception signal from this device appears at the base of transistor Q07.

On reception of a signal in the A3-H "AM" mode, the signal from the input matching device is applied to the base of transistor Q02. On reception of a signal in the A3-H "AM" mode, the A3 -6 V d.c. voltage enables transistors Q02, Q05 and Q06 and inhibits transistors Q01, Q03 and Q04.

Transistor Q02, in a common emitter configuration, and its associated circuits, is used as an amplifier. The signal from said amplifier is filtered (FL02 used only on reception) and applied to a matching device consisting of transistors Q05, Q06 and their associated circuits.

The 2.5 MHz reception signal from this device appears at the base of transistor Q07.

Whatever the operating mode, the 2.5 MHz reception signal from the impedance matching device consisting of emitter-follower transistor Q07 is applied to an amplifier consisting of operational amplifiers Z01, Z02 and the associated circuits (Transmission circuits are inhibited by cutting off of the diode CR05 owing to the presence of the Receive -6 V voltage).

This amplifier system also receives the AGC voltage (see para. 4. 2. 2. 3. E).

On the reception of a signal in the A2-J "MORSE" or A3-J "LSB" or "HSB" mode, the reception signal from the amplifying device is applied to a demodulator circuit consisting of Z03 and the associated circuits. The demodulated AF signal from the demodulator circuit is applied to output terminal A8 of the Filter and 2.5 MHz IF Circuit Board via diode CR04, made to conduct by the presence of the -6 V d.c. voltage.

On reception of a signal in the A3-H "AM" mode, the reception signal from amplifier Z02 is applied to a matching amplifier consisting of transistors Q12, Q13 and the associated circuits.

The signal from this device is applied :

- . To the reception signal detection diode CR07
- . To the AGC voltage generating circuit (see para. 4. 2. 2. 3-E)

NOTE : The AGC voltage is generated whatever the operating mode.

The rectified AF signal from diode CR07 is applied to output terminal A8 of the Filter and 2.5 MHz IF Circuit Board via diode CR05 made to conduct by the presence of the A3 +5 V voltage (diode CR04 is thus cut off).

C) Operation of the Reception Circuit Contained in the AF Board (Plates 26A and 26B)

The AF signal from terminal A8 of the Filter and 2.5 MHz IF Circuit Board appears at input terminal B5 of the AF Board.

On the reception of a signal in the A3-H "AM" or A3-J "HSB" or "LSB" modes, the AF signal from input terminal B5 is applied to an amplifying device consisting of operational amplifier Z03 and its associated circuits, through diode CR11 made to conduct by the presence of the +10 V and +5 V voltages.

On the reception of a signal in the A2-J "MORSE" mode, the AF signal from input terminal B5 is applied to a filter network consisting of transistors Q07, Q12 and their associated circuits, because diode CR11 is cut off by the presence of the A3-J -6 V voltage. The filtered AF signal is applied to operational amplifier Z03.

The amplified AF signal from the operational amplifier is applied to another amplifying device consisting of operational amplifier Z02 and the associated circuits, through the volume control potentiometer "VOL" (fitted on the front panel) and the field effect transistor Q24 made to conduct by the absence of the Local Control Signal.

The AF signal from the operational amplifier is applied :

- . To the headset of the local transceiver
- . To the headset of the remote station, through the remote control amplifier (transistor Q03 and its associated circuits) and transistor Q08 made to conduct by the presence of the Receive +6 V voltage.

4. 2. 2. 2 - Transmission Channel

Operation of the Transmission Channel is described in three sub-paragraphs :

- . Operation of the transmission circuits contained in the Exciter Board and the Filter and 2.5 MHz IF Circuit Board
- . Operation of the transmission circuits contained in the HF Head
- . Operation of the power circuits.

A) Operation of the Transmission Circuits Contained in the Exciter Board and the Filter and 2.5 MHz IF Circuit Board (Plate 25 and 27)

NOTE : Unless otherwise specified, the components mentioned in this sub-paragraph are located in the Exciter Board (Plate 27).

When operating in the A3-H "AM" or A3-J "LSB" or "HSB" mode, the signal from the local microphone or the remote transceiver is applied to a filter network consisting of resistor R32 and capacitor C21 through the field effect transistor Q01.

The transistor conducts as the diodes CR01 and CR02 are cut off (lack of A2-J -6 V voltage and presence of Transmit +6 V voltage).

When operating in the A2-J mode "MORSE" 1 kHz signal from the synthesizer (cf. 4. 2. 1. 1) is applied to the matching amplifier consisting of Q08 and associated circuit (emitter follower configuration). The signal from the emitter of Q08 is applied to the field effect transistor Q02. This transistor is conducting when the signal "cde A2-J" is present. This signal is applied directly to the keyer and modulates the 1 kHz at the keying rate.

In addition, the presence of the A2-J -6 V voltage drives the field effect transistor Q01 to cut off (operation in the A3-H or A3-J mode).

NOTE : Whatever the operating mode, the signal applied to the filter network is also retransmitted to the local earphone via B14, through the operational amplifier Z02 located in the AF Board (see Plates 26A and B).

In all operating modes the signal from the filter network is applied to a modulator (module Z03) through a variable attenuator and an amplifier. This modulator also receives a 2.5 MHz signal from the Synthesizer (see para. 4. 2. 1. 1).

The variable attenuator consists of the fixed resistor R36 and the drain-source resistor of the field effect transistor Q11.

This drain-source resistor varies with the d.c. voltage applied to the control gate.

This d.c. voltage is generated as follows.

A signal modulated at 2.5 MHz and with an amplitude varying with the transmission signal, originates from modulator Z03 and is applied to an amplifying device consisting of transistors Q14, Q15 and the associated circuits.

The signal from this amplifier is detected by diodes CR12 and CR13, then applied to a d.c. amplifier consisting of transistors Q05, Q06 and the associated circuits. Diodes CR14 and CR15 permit :

- . Temperature compensation
- . Determining the operating threshold voltage of transistor Q06.

A d.c. voltage, the value of which depends on the signal from the modulator is delivered by the d.c. amplifier and yields the signal driving the field effect transistor Q11. This device constitutes an AF regulation loop.

The amplifier receiving the transmission signal from the variable attenuator consists of operational amplifier Z02 and the associated circuits.

The gain of operational amplifier Z02 is related to the value of resistors R77 and R81. Potentiometer R57 permits adjusting the Offset voltage of operational amplifier Z02, which results in the adjustment of the modulator offset voltage.

Modulation is carried out by means of module Z03 and the associated circuits.

The modulated signal (with carrier suppressed), originating from terminal 6 of modulator Z03 is applied to terminal A5 of the Exciter board, through the diode CR24, whatever the operating mode.

This signal is then applied to terminal A5 of the Filter and 2.5 MHz IF Circuit Board (Plate 25).

This signal is switched to the base of transistor Q01 via diode CR01 made to conduct by the presence of the Transmit +6 V voltage (Plate 25).

As on reception, transistors Q01, Q03, Q04, Q07, SSB filter FL01 and the associated circuits are used as an 2.5 MHz IF amplifier.

The transmission signal from the impedance matching transistor Q07 is switched to output terminal A14 of the Filter and 2.5 MHz IF Circuit board, through the diode CR05 made to conduct by the presence of the Transmit +6 V voltage (Plate 25).

The transmission signal with carrier suppression from terminal A14 of the Filter and 2.5 MHz IF Circuit board is applied directly to input terminal A2 of the Exciter Board (Plate 27). This signal is applied to terminals 5 and 6 of the operational amplifier Z01 via diode CR11 made to conduct by the presence of the Transmit +6 V voltage.

When operating in the A3-H "AM" mode, the carrier has to be reinjected.

The re-injection circuit is as follows.

The 2.5 MHz signal from the Synthesizer (see para. 4. 2. 1. 1) is applied to a matching amplifier consisting of transistors Q12, Q13 and the associated circuits, through switching diode CR16 made to conduct by the presence of the A3 +5 V voltage. The 2.5 MHz signal from the collector of transistor Q12 (amplitude adjusted by R44) is applied to the input terminals 5 and 6 of operational amplifier Z01, superimposing this signal on that appearing at input terminal A2, as explained above. The gain of operational amplifier Z01 is adjusted by the compressor control (see para. 4.2.2. 3F).

The transmission signal modulated at 2.5 MHz is originated from operational amplifier Z01 and is applied to output terminal B6 of the Exciter Board.

B) Operation of the Transmission Circuits Contained in the HF Head (Plates 23A and 23B)

The transmission signal modulated by 2.5 MHz signal and originating from terminal B6 of the Exciter board is applied to a matching amplifier located in the IF and 2.5 102.5 MHz Mixer Circuit board through terminal 27 of connector J01 in the HF Head.

This matching amplifier consists of transistor Q207, its associated circuits, and a matching transformer T204.

The modulated 2.5 MHz transmission signal, originating from the secondary winding of transformer T204 is applied to terminals E1 and E2 of transformer T202 located in the 102.5 MHz Mixer.

An heterodyne signal with a fixed frequency 100 MHz (on transmission in the A2-J "MORSE", A3-H "AM and A3-J "HSB" modes) or 105 MHz (on transmission in the A3-J "LSB" mode) delivered by the Synthesizer (see para. 4. 2. 1. 2) is applied to an amplifier (containing transistor Q205 in a common emitter configuration, and the associated circuits) through terminal C2 of connector J01 on the HF Head.

The signal from this amplifier is applied to terminal S2 of transformer T202.

Transformers T201 and T202, diodes CR206, CR207, CR211 and CR212, resistors R251, R252, R254 and R255, capacitors C256, C257, C261 and C262 constitute the mixer 102.5 MHz.

This mixer is also used on reception.

The circuit used is the typical circuit of a ring modulator.

The modulated 102.5 MHz transmission signal, originating from the 102.5 MHz Mixer, is switched to an amplifier consisting of transistor Q203 in a common emitter configuration and its associated circuits through diode CR205 made to conduct by the presence of the Transmit -6 V voltage.

NOTE : This voltage cuts off diode CR204, inhibiting the reception circuits.

The base bias voltage of Q203 is controlled by R231. By adjusting this resistor the transmit channel gain is being adjusted.

The transmission signal from the collector of transistor Q203 is applied to a filter tuned to the frequency 102.5 MHz (C217, L204 and C223) allowing suppression of unwanted spurious signals.

The transmission signal from this filter is applied to the crystal filter FL01) through diodes CR202 and CR203 made to conduct by the presence of the Transmit -6 V voltage.

NOTE : This voltage also cuts off diode CR201, inhibiting the reception circuits.

The modulated 102.5 MHz transmission signal, originating from the crystal filter FL01, is switched to terminal E2 of transformer T307 (Transmit-Receive board) included in the transmission mixer, through the diodes CR311 and CR312 made to conduct by the presence of the Transmit -6 V voltage.

An heterodyne signal whose frequency varies from 104.5 to 131.999 MHz with the setting (10 MHz, 1 MHz, 100kHz, 10 kHz and 1 kHz controls) is delivered by amplifier Q403 (in VCO Board) and switched to the centre tap of the secondary winding of transformer T307 via diode CR302.

Transformers T305 and T306, diodes CR303, CR304, CR305 and CR306, resistors R322, R323, R324 and R325, capacitors C343, C345, C346 and C347 constitute the transmission mixer.

This is a typical ring modulator circuit.

The modulated transmission signal whose frequency varies from 2 to 29.999 MHz with the setting, delivered by the transmission mixer, is applied to a filter network consisting of inductors L311, L312, L313, L314 and capacitors C331, C332, C335, C336 and C337. This is a low-pass 2 - 29.999 MHz filter.

The transmission signal from the filter network is applied to the 20 W amplifier via an amplifier (transistors Q301, Q302 and the associated circuits) and from output terminal 23 of connector J01 on the HF Head.

C) Operation of the Power Circuits (Plate 29)

The transmission signal with a power of about 1 mW PEP, originating from output terminal 23 of connector J01 on the HF Head, is applied to a phase splitting amplifier through the input terminal 17 of connector J102 on the 20 W amplifier, and inductor L08.

Inductor L08 matches the preamplifier input with the output circuits of the HF Head.

The phase splitting amplifier consists of the complementary transistors Q03, Q04 and the associated circuits. It is biased in class A. The negative feedback is provided by resistors located in the emitter circuit of each transistor (R14, R16, R18 for Q03, and R15, R17, R19 for Q04). L01 and L03 are RF chokes. The capacitors and the phase-splitter line transformer T1 constitute the collector load of transistors Q03 and Q04.

Capacitors C04 and C05 produce an HF negative feedback.

The transmission signal from transformer T01 is applied to the base of transistors Q07 and Q11, via matching resistors R33, R34 (Q07) and R35, R36 (Q11).

Transistors Q07, Q11 and the associated circuits constitute a push-pull preamplifier class AB.

The base bias voltage is delivered by balancing transformer T02 ; the HF is decoupled to ground through capacitor C13. Impedance matching ensuring maximum inter-stage power transfer is provided by transformer T02.

The line transformer T04, matched by the balancing transformer T05, constitutes the collector load of transistors Q07 and Q11.

The collector d.c. supply of transistors Q07 and Q11 originates from transformer T03. The latter, associated with resistors R41 and R44, provides a collector-base negative feedback (R41 for Q07, R44 for Q11).

The transmission signal from transformer T04 is applied to the base of transistors Q16 and Q17 via matching resistors R55, R56, R57, R69 and L04 and C48 (common to both channels) for Q16 and R61, R62 and R63, R70 and L05 for Q17.

Transistors Q16, Q17 and the associated circuits constitute a push-pull power amplifier class AB.

The base bias voltage originates from balancing transformer T05 ; capacitors C27 and C31 provide an HF decoupling on the bias circuit.

The d.c. power supply of the collector of transistors Q16 and Q17 originates from the balancing transformer T06. The latter is associated with resistors R64 and R65 to provide a collector-to-base negative feedback (R64 for Q16, R65 for Q17).

The line transformer T07 constitutes the collector load of transistors Q16 and Q17.

The transmission signal from transformer T07 is applied to the transmit-receive channel

selector (see para. 4. 2. 2. 3, sub-para. C) through the coupler (the latter is included in the circuit generating the Compressor Control signal, see para. 4. 2. 2. 3, sub-para. F). This signal ensures power regulation and amplifier protection.

The transmission signal, the normal power of which is 20 W PEP, from the channel selector is applied to the load (antenna or 50-ohm connector) after transiting through the Antenna Tuning Unit (see para. 4.2. 2. 3, sub-para. D).

4. 2. 2. 3 - Ancillary Circuits

The ancillary circuits common to the Transmission and Reception channels and those pertaining to the Transmission channel or the Reception channel, are the following :

- A) Transmit-receive Switching circuit. This is common to the Transmission and Reception channels.
- B) Transmit-receive generating Circuits (these circuits are assigned either to the Transmission channel or to the Reception channel).
- C) Transmit-receive signal Channel Selector circuits. These are used either by the Transmission channel or by the Reception channel.
- D) Antenna Tuning Unit circuits. This is used for transmission and reception.
- E) AGC voltage generating circuits used in Reception only.
- F) Compressor Control generating circuits used in Transmission Only.
- G) Circuits generating the d.c. voltages required for the power circuits. These are used in Transmission only.
- H) Variable inductor control circuits used only during the Antenna tuning cycle.
- I) Mode selection generating circuits used for Transmission or for Reception.
- J) Converter circuits and ancillary d.c. voltage generator. These circuits are used in Transmission and Reception.
- K) Transmission control and battery charge control inhibition circuit.
- L) Remote control circuits used on Transmission and Reception.
- M) Charger circuit. This is the only circuit fully independent from Transmission and Reception.

A) Transmit-Receive Switching Circuit (Plates 26A and 26B)

This circuit generates the Transmitter Receive control which appears in the form of a voltage of +6 V (receive) or +3 V (transmit) at terminal B8 of the AF Board.

On reception, diodes CR13 and CR07 (used on remote control) with +6 V at A13) are cut off. A +6 V voltage appears at terminal B8 of the AF Board.

On transmission, two cases may occur :

- (1) The signal from the pressel switch (0 volt) operates diode CR13. The voltage of +3 V approximately appears at terminal B8 of the AF Board.
- (2) The signal from comparator Z01 (0 volt) is applied to the junction R93, C47, CR13. Diode CR13 is cut off. The voltage of +3 V approximately appears instantaneously at terminal B8 of the AF Board (only for remote control).

The Transmit-Receive changeover (+6 V on terminal B8) is delayed with respect to the signal appearing at terminal A14 by a time interval θ determined by the RC time constant (R93, R97 and C47). This time constant is necessary when operating in the A2-J mode.

B) Transmit-Receive Voltage Generating Circuits (Plate 28)

The various voltages originate from the transistor switching networks driven by the switching signal (see sub-para. A).

The first switching network generates the voltages Receive -6 volts and Transmit +6 volts appearing at terminal B7 of the Peripheral Circuits board.

This network consists of transistors Q01, Q02, Q03, Q04, Q05, Q08 and the associated circuits.

The second switching network generates the Transmit +6 V applied to terminal A7 and Receive +6 V applied to terminal B9. This network includes transistors Q12, Q13, Q14 and Q16. The switching control signal originates from the first network (collector voltage of transistors Q04 and Q05).

The third switching network generates the Receive +10 V applied to terminal B8 and Transmit +10 V applied to terminal A5. This network consists of transistors Q23 through Q26 and the associated circuits. The switching control signal originates from the second network (collector voltage of transistors Q13 and Q14).

A fourth switching network, consisting of transistors Q06, Q07, Q11, Q15, Q17, Q21, Q22 and the associated circuits, enable the following circuits :

- . On reception, terminal A9 of the Peripheral Circuit Board (Transmit-Receive changeover +3 V in 20 W amplifier)
- . On transmission terminals B10 and A17 (-6 volts) in the Peripheral Circuits board.

C) Transmit-Receive Signal Channel Selector Circuits (Plate 29)

The channel selector consists of :

- . Inductors L09, L12 to L14,
- . Capacitors C45, C47, C51, C52 and C54,
- . Diodes CR07, CR08 and CR11,
- . Resistors R88.

As soon as the Man-Pack transceiver is switched on, the +3 V (TR) voltage from the converter (see sub-paragraph J) is applied to the channel selector through terminal 23 of connector J102 of the 20 W Amplifier.

On reception, the antenna signal, transiting through the antenna tuning unit (see sub-paragraph D) appears at antenna terminal BA of the 20 W amplifier. This signal is transmitted to the HF Head owing to the conduction of diode CR07 (0 volt at the cathode. See sub-paragraph B).

On transmission, diode CR11 is made to conduct (+3 V at the anode, see sub-para. B, with the cathode grounded via T11, T12 and T07).

The transmit signal from the coupler appears at antenna terminal BA. After being fed through the Antenna Tuning Unit, this signal is applied to the antenna.

The presence of Transmit +3 V signal allows diode CR08 to conduct, which short-circuits the Receive input of the HF Head to the ground.

D) Operation of the Antenna Tuning Unit (Plate 30)

The circuits used on transmission or reception of a signal are common circuits. They consist of :

- . An harmonic filter consisting of inductors L202 and L203 and capacitors C201 through C205.
- . A coupler T301 (included in the transmission control inhibiting circuit)
- . A coupler T101 (included in the feedback control of variable inductor L201 for the antenna tuning cycle).
- . A variable inductor L201.
- . An antenna selector switch.

The circuitry listed above corresponds to the path followed by a signal on transmission ; the path is reversed for a signal on reception.

NOTE : In the portable version the antenna selector switch shall compulsorily be in the Wire or Whip position.

The variable inductor L201 and coupler T101 are not used in the 50 ohm or Vehicle position.

E) AGC Voltage Generating Circuits (Plates 25 and 28)

On reception of a signal in the A2-J MORSE, A3-H AM or A3-J HSB or LSB modes, an automatic gain control (AGC) voltage is generated from the Filter and 2.5 MHz Circuit Board and the Peripheral Circuits Board.

The generation of said voltage is illustrated in figure 4. 29.

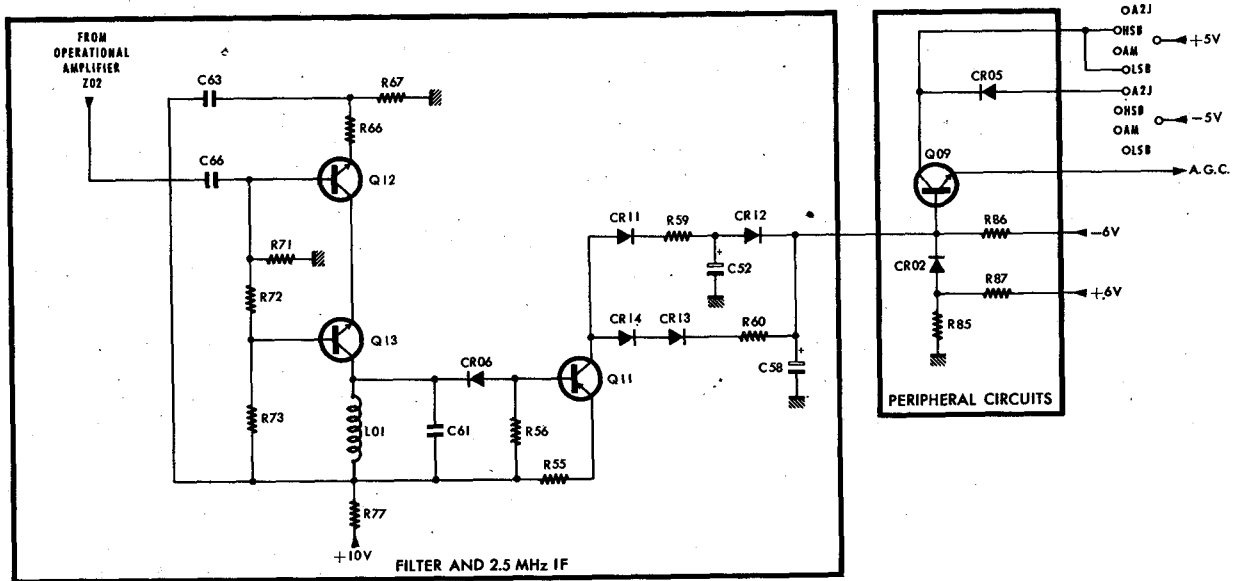


Figure 4. 28 - AGC Voltage Generating Circuit

Regardless of the operating mode, the 2.5 MHz reception signal from operational amplifier Z02 is applied to a matching amplifier consisting of transistors Q12, Q13 and associated circuits.

The reception signal is detected by diode CR06.

The negative signal detected appears at the base of transistor Q11 used as a d.c. amplifier. A d.c. voltage proportional to the reception signal, delivered by said amplifier, feeds two time constant circuits. One is used in steady-state operation, the other operates only in transient operation on the occurrence of high level (e.g. interference) signals.

On reception of a signal in steady-state operation, the time constant is determined by resistor R59 and capacitor C52 (long time constant). Two diodes CR11 and CR12 conduct. The voltage across capacitor C52 is re-transmitted practically in full across capacitor C58 (the threshold voltage of diode CR12).

On reception of a high level signal (transient operation) the time constant is determined by resistor R60 and capacitor C58 (short time constant).

As the threshold voltage of diodes CR14 and CR13 is overshoot, these diodes conduct. The voltage across capacitor C58 becomes higher than its previous level. The voltage across capacitors C52 and C58 becomes different owing to the different time constant of each circuit.

As the voltage across capacitor C58 is higher than that across capacitor C52, it cuts off diode CR12, inhibiting the circuit CR11, R59, C52.

Irrespective of the level of the signal received (steady-state or transient operation) a d.c. voltage proportional to said signal is applied to the base of transistor Q09.

The operation of transistor Q09 is determined by the operating mode of the Man-Pack Transceiver. This operation is the same on reception of a signal in the A2-J MORSE and A3-J HSB or LSB mode. It is different when the transceiver is used in the A3-H AM mode.

On reception of a signal in the A2-J or A3-J mode, operation is as follows.

The transistor Q09 in a common collector configuration, fed by a d.c. voltage of 5 V is switched according to the operating mode.

The emitter of transistor Q09 delivers an AGC voltage proportional to the reception signal.

The AGC voltage is then generated at a low impedance.

On reception of a signal in the A3-H mode, with the collector of transistor Q09 not powered, the base-emitter junction is used as a diode. The conduction level is set by voltage divider R85 and R87.

When the reception signal is such that the voltage from the time constant circuits overshoots this level, an AGC voltage is delivered by the emitter transistor Q09 (base-emitted junction used as a diode).

Said voltage is also proportional to the signal received.

Whatever the reception mode in use, the AGC voltage is applied :

- To the base of amplifier transistor Q201 located in the IF and 2.5 MHz and 102.5 MHz Mixer Board in the HF Head (Plates 23A and 23B) via potentiometer R51 (Plate 25). In addition, the operating level of the AGC is controlled separately by potentiometer R214 located in the emitter circuit of transistor Q201 (Plates 23A and 23B),
- To the operational amplifiers Z01 and Z02 located in the Filter and 2.5 MHz IF Circuit Board (Plate 25).

F) Compressor Control Generating Circuits (Plates 28 and 29)

The compressor Control signal is generated by three separate circuits.

The first is a protective circuit connected to the power amplifier located in the 20 W Amplifier.

The second allows for the data delivered by the coupler located in the 20 W Amplifier and a power reference.

The third allows for the output current of the stabilized power supply located in the 20 W Amplifier and for a current reference.

The first circuit (Plate 29) consists of transistor Q10 and its associated circuits.

The transmission signal from the collector of power transistor Q16 is detected (CR13) and applied to the base of transistor Q10 connected as an amplifier. The output signal of the amplifier is applied to the OR gate diode CR14. The other components of the OR gate originate from the other Compressor Control circuits.

The Compressor Control signal appears at terminal 31 of connector J102 located in the 20 W Amplifier.

Operation of the second circuit is as follows :

The coupler (T11 and T12) located in the 20 W Amplifier supplies two voltages related directly :

- . One to the direct power (Voltage V_D)
- . The other to the reflected power (Voltage V_R) (Plate 29)

These two voltages are rectified (CR06 for VR and CR12 for VD), then filtered (R92, C44 for VR and R95, C46 for VD) and applied across 27 (VR) and 26 (VD) of connector J102 of the 20 W Amplifier (Plate 29).

The voltages VR and VD are applied to a summing circuit via terminals A21 and A20 of the Peripheral Circuits Board (Plate 28). The summing circuit consists of resistors R41, R44 and R46.

The summation signal is applied to terminal 3 of operational amplifier Z01.

The operational amplifier and associated circuits constitute an amplifier, the gain of which is determined by the ratio between resistors R45 and R53.

The output signal of amplifier Z01 is switched to two different circuits depending on the value of the VD VR peak and VD VR mean signal.

The VD VR peak value of the signal from operational amplifier Z01 is applied to terminal 3 of comparator amplifier Z03. Terminal 2 receives a power reference signal.

This power reference signal is delivered by a voltage divider connected between the Supply Voltage generated by the stabilized power supply located in the 20 W Amplifier, and the ground.

When the power selector switch fitted on the front panel is in the HIGH position, the voltage divider consists of R56, R57 (variable) and R62.

When the power selector switch fitted on the front panel is in the LOW position, the voltage divider consists of R56, R57, R62, CR11 and R91 (grounded via terminal A13).

The operational amplifier Z03 and the associated circuits constitute a typical comparator circuit. The output of said comparator is the Compressor Control signal which appears at terminal A18 via the diode CR03 (OR gate on Compressor Control line).

A fraction of the output voltage (determined by resistors R92 and R93) varying with the VR VD mean value, is applied to input terminal 3 of operational amplifier Z04 which receives a voltage from the OR gate (CR12) driven by the comparator amplifier Z02. The input terminal 2 of operational amplifier receives a fixed voltage generated by a voltage divider connected between the Supply Voltage delivered by the stabilized power supply located in the 20 W Amplifier, and the ground.

The operational amplifier Z04 and the associated circuits operate as an integrator comparator. The output signal of the integrator comparator is the Compressor Control signal which appears at terminal A18 via diode CR04 (OR gate on Compressor Control line).

The third circuit operates as follows:

The current absorbed by the stabilized power supply included in the 20 W Amplifier (Plate 29) is fed through two precision low rating resistors (R46 and R47) and is connected to the negative pole of the battery (ground) via resistors R36 and R42 (Plate 28). The voltage appearing across resistor R42 is applied to input terminal 2 of operational amplifier Z02.

A reference signal from the battery voltage is applied to the second input terminal 3 of operational amplifier Z02.

The operational amplifier and associated circuits operate as a comparator and deliver a signal which is applied to the OR-inclusive circuit (diode CR12).

This signal is the second input applied to terminal 3 of comparator Z04 whose operation has been described above.

G) Circuits Generating the DC Voltages Required for the Power Circuits (Plate 29)

The various d.c. voltages required for operation of the power circuits are delivered by a 13.5 V stabilized power supply.

This power supply consists of :

- . An operational amplifier Z02 and the associated circuits
- . Transistors Q13, Q15 and the associated circuits operating as an amplifier
- . Ballast transistor Q14
- . A protection circuit (assigned to this regulator) consisting of transistor Q12 and the associated circuits.

A constant reference voltage supplied by diode CR5 is applied, on transmission, to terminal 3 of operational amplifier Z02. This d.c. voltage originates from the Transmit +10 V voltage.

The second input terminal 2 of the operational amplifier Z02 receives a fraction of the stabilized 13.5 V voltage (adjustable by potentiometer R82).

The operational amplifier Z02 and the associated circuits operate as an integrator comparator.

Any variation in the comparator input voltage is retransmitted, via the amplifier, (transistors Q13, Q15 and the associated circuits) to the base of ballast transistor Q14.

Transistor Q12 is the overcurrent protection transistor. It is cut off when operation is normal. The increase in the current fed through the measuring resistors R46 and R47 causes the base-emitter voltage of Q12 to increase and the latter to conduct. The conduction of Q12 results in a reduction of the base voltage of ballast transistor Q14. This reduction in the ballast transistor base voltage results in a reduction of the Supply Voltage.

The 13.5 V stabilized voltage is applied to preamplifier Q03, Q04, to amplifier Q07 and to power amplifier Q16 and Q17.

The base bias voltage of amplifier transistors Q07 and Q11 is generated from a temperature-compensated stabilized power supply consisting of transistors Q01, Q02 and the associated circuits. Transistor Q02 is fed across the Supply Voltage (at collector) and the ground (at emitter).

The base-emitter voltage of transistor Q02 (located near transistors Q07 and Q11) varies with temperature substantially in the same way as the base-emitter voltage of transistors Q07 and Q11.

Transistor Q02 base bias voltage which originates from potentiometer R01 is compared with transistor Q02 base-emitter threshold voltage.

The collector voltage, which varies with temperature, drives transistor Q01 (base voltage), Q01 is a ballast transistor which allows amplifier Q07, Q11 to be powered.

As the base bias current of power transistors Q16 and Q17 has to be constant with temperature, said transistors are fed from a temperature-compensated biasing device.

This temperature-compensated biasing device consists of operational amplifier Z01, transistors Q05-Q06 and the associated circuits.

The operational amplifier Z01 operates as a comparator amplifier. A reference voltage variable with temperature is applied to input terminal 3 of the comparator amplifier Z01 (generated through heat-sinked diode CR03). Input terminal 2 receives the Power Supply voltage and the Transmit -6 V voltage.

Any variation in the input voltage is amplified and applied to the base of transistor Q06.

Transistor Q05 is a protective transistor in case of failure of the Transmit -6 V voltage. In normal operation, transistor Q05 is cut off.

In the absence of the Transmit -6 V, transistor Q05 is driven to saturation. A zero potential (ground) is applied to the comparator input and results in the suppression of the bias voltage of power transistors Q16 and Q17.

NOTE : In the absence of the Transmit -6 V voltage, the stabilized power supply and the temperature-compensated bias power supplies are inhibited. This provides additional protection to the power amplifier.

(H) Operation of the Variable Inductor Control Loop

The variable inductor control loop operates in two cycles :

- . Pre-positioning cycle
- . Feedback control cycle

and operates on :

- . Starting up of the system
- . Actuation of the pushbutton fitted on the front panel and marked
- . Change of communication frequency by means of the 10 kHz, 100 kHz, 1 MHz and 10 MHz controls on the front panel.

Operation of the control loop device results in temporary appearance of a 0 volt level at terminal A15 of the Peripheral Circuits board (Plate 28). The disappearance of the 0 volt level causes timer Z05 in the Peripheral Circuits board to operate. A logic level one (antenna tuning control) signal is delivered by terminal 14 of the timer and appears at terminal A19 of the Peripheral Circuits board.

This logic level one is applied to the AF Board (Plates 26A and 26B). This level saturates transistors Q23 and Q16. Saturation of Q23 causes the transceiver system to change over to transmit. Operation of Q16 enables the A3 + 5 V voltage. The transceiver then transmits in the A3-H (AM) mode during the antenna tuning cycle, regardless of the operating mode selected (A2-J, A3-H or A3-J).

- . To terminal B2 of the Exciter board (Plate 27). This signal causes transistor Q19 in an emitter-follower configuration to conduct, thus applying a 1 kHz signal from the synthesizer (see para. 4.2.1.1) to the AF amplifier (Z02 - plate 26A and 26B). The signal from the AF amplifier is applied to the local earphone.
- . To terminal 1 of connector J2 in the antenna tuning unit (Plate 30). This signal drives Q02 to saturation and causes Q01 to conduct. The + 12.7 V d.c. voltage is applied to both voltage regulators Q14 and Q03.

Voltage regulator Q14 feeds the module Z01 (prepositioning and feedback control comparator). The voltage regulator delivers a voltage of + 5 V which :

- . Powers module Z03 (two flip-flops)
- . Applies a logic level 1 at the input of flip-flop No. 1 of module Z03
- . Powers module Z02
- . Powers one of the input terminals of the repeater potentiometer (the other input is grounded)
- . Powers the sub-band device through resistors R37, R40 and terminal 16 of connector J2 on the Antenna Tuning Unit.

A resistor network (R09, R12, R13, R14 and R15 - Plate 24), selected by the setting of the 10 MHz, 1 MHz, and 100 kHz control delivers across terminal 16 of connector J2 of the antenna control unit and the ground, a prepositioning voltage. The various combinations are obtained according to the setting to be obtained at input 4 of comparator No. 1 (prepositioning) through a winding of the filtering inductor (Plate 30).

Flip-flops 1 and 2 of module Z03 are reset to zero by the + 5 V voltage after a period of time equal to the time constant due to resistor R15 and C05. Flip-flop output Q is at logic level 0 while output \overline{Q} is at logic level 1. Comparator No. 1 (prepositioning) of module Z01 is validated and powered by the logic level 1 from output \overline{Q} of module Z03 flip-flop No. 1.

(1) Prepositioning Cycle

The variable inductor is mechanically linked to the driving motor and the repeater potentiometer wiper. The repeater potentiometer wiper delivers a DC signal proportional to the value of the variable inductor. This DC voltage is, during the prepositioning cycle, compared by comparator No. 1 of module Z01 to the DC voltage preset by the 10 MHz, 1 MHz and 100 kHz controls. The comparator delivers one of a two-state signal in order to drive the motor-inductor assembly in such direction that the voltage delivered by the potentiometer wiper is equal to the preset voltage. When both comparator input voltages are equal, the comparator changes state and delivers a signal to start the feedback control cycle and therefore end the prepositioning cycle.

The comparator No. 1 receives at terminal 3 the repeater potentiometer wiper voltage and the preset voltage at terminal 4 via the windings of filtering inductor L06.

NOTE : The effect of any spurious pulse at the comparator level is eliminated by both windings of inductor L06.

The output of comparator No. 1 in module Z01 is reshaped by R35 and C21 and inverted (NOR circuit No. 1 of module Z02).

The reversed signal is applied :

- . To the input of a second inverter circuit (NOR circuit No. 2 in module Z02)
- . To the base of control transistor Q07.

Transistor Q07 enables or inhibits the sign-reversing switch transistors in the power supply circuit of the motor Q12 (ground) and Q04 (+ power supply).

The signal from the output of the second inverter (NOR circuit No. 2 module Z02) is applied to the base of control transistor Q06.

The control transistor Q06 enables or inhibits the sign-changing switch transistors in the power supply circuit of the motor Q11 (ground) and Q05 (+ power supply). The motor polarity is inverted.

This signal :

- . Reverses operation of the control transistors thus reversing the motor power supply.

- Causes the state of outputs Q and \bar{Q} of flip-flop No. 1 in module Z03 to change (change of logic level of the clock circuit). As output \bar{Q} is at logic level zero, it inhibits comparator No. 1 (prepositioning). As output Q is at logic level one it prepositions an input of the NOR circuit No. 4 in module Z02 and enables comparator No. 2 (feedback control loop) of module Z01 (beginning of feedback control cycle)
- Causes a logic level one to appear at input D of flip-flop No. 2 of module Z03.

NOTE : Flip-flop No. 2 does not change state, although its clock signal has the same origin as that of flip-flop No. 1. This is due to the delay introduced by R34 and C17 located in the clock circuit of flip-flop No. 2.

(2) Feedback Control Cycle

The 20 dB coupler (T101 and T102) generates two voltages, a direct voltage VD and a reflected voltage VR related to the H F current fed through the coupler. Each voltage is applied to a phase-shifter network.

The phase-shifter network assigned to the direct channel consists of resistors R01, R04 and R07, inductors L01 and L03 and capacitors C03 and C06. It is tuned (L01 and L03) to 3.9 MHz and shifts the phase of the VD signal from 140° to 305° within the band 2 to 29.999 MHz.

The phase-shifter network assigned to the reflected channel is of the same type as that of the direct channel. It consists of resistors R02, R05 and R11, inductors L02 and L04, and capacitors C04 and C07. It is tuned (L02 and L04) to 17 MHz and shifts the phase of signal VR from 50 to 215 in the 2 - 29.999 MHz band.

The total phase-shift is equal to 90° in the 2 - 29.999 MHz band.

The signal from each phase-shifter is applied to a phase discriminator consisting of transformer T01, diodes CR02, CR03, resistors R16, R17, R22 to R25 (balancing potentiometers) and capacitors C13 and C14.

The signals from the phase discriminator are applied to the input of comparator No. 2 (feedback control) of module Z01, via inductor L05 (same use as inductor L06).

The signal from comparator No. 2 (feedback control loop) switches the motor power supply in the same way as in the Prepositioning cycle, since the circuit is common to both functions.

Reversal of the sign of the signal at the input of comparator No. 2 (feedback control) causes :

- Reversal of operation of control transistors Q06 and Q07
- State of outputs Q and \bar{Q} of flip-flop No. 2 of module Z03 to change. Logic level zero of output \bar{Q} of flip-flop No. 2 is applied to the input of the NOR circuit No. 3 in module Z02.

The end-of-cycle signal from the output of NOR circuit No. 4 of module Z02 is active (logic level zero). This logic level zero appears at input 1 of timer Z05 (Plate 28), inhibiting the latter after a fixed time interval ξ .

The feedback control cycle is then stopped.

NOTE : Transistor Q13 (Plate 30) initiates the End-of-Cycle signal when the motor reaches the limit-stop. Operation of one of the motor limit switches produces a short-circuit across the motor. The latter operates as a generator (motor braking). A pulse is transmitted to the base of transistor Q13.

I) A2-J Command Generating Circuit (Plates 26A and 26B)

This consists of transistor Q22 and the associated circuit.

The signal from the pressel (0 V) causes diode CR12 and transistor Q22 to conduct.

A + 6 V command voltage appears at terminal A9 of the AF Board enabling the circuits involved in the A2-J mode fitted in the Exciter board.

J) Operation of the Converter Circuit (Plate 31) and Generation of Auxiliary d.c. Voltages

The various d.c. voltages required for operation of the Man-Pack Transceiver are generated by the Converter circuit from the d.c. voltage delivered by the battery.

Operation of said circuit is described in the three-following sub-paragraphs :

- (1) Operation of the free-running converter
- (2) Operation of the chopper
- (3) Operation of the chopper control circuit.

The generation of auxiliary d.c. voltages is described in sub-paragraph (4).

(1) Operation of the Free-Running Converter

The free-running converter is of the conventional type. It consists of transistors Q05, Q06, the associated circuits and transformer T02. It operates at a frequency approximating 17 500 kHz. The RC network (R06, C05) enables an unbalance to be produced in transistor Q05 base circuit, thus allowing the converter to start as from voltage application, i.e. on appearance of the + 14.5 V d.c. voltage from the battery. Two primary windings of transformer T02 (1 per transistor) generate a positive feedback voltage at the base of transistors Q05 and Q06.

Seven voltages are generated by four secondary windings, following rectification and filtering, namely : twice - 22 V, twice + 3 V, + 6 V, - 6 V and + 10 V.

(2) Operation of the Chopper

This chopper is included in the output voltage stabilizing loop. Its purpose is to apply a d.c. voltage necessary for operation of the free-running converter, so as to make the output voltages independent from the loads and the battery voltage.

The chopper consists of transistors Q01, Q02 (in a common emitter configuration), the associated circuits, diodes CR01 and CR04, transformer T01 and capacitor C06.

On application of the + 14.5 volts from the battery to the Converter unit, capacitor C06 charges through the primary winding of transformer T01 and diode CR04 because transistor Q02 is cut off.

On switching of the converter, a positive synch pulse from terminal 15 of transformer T02 (winding generating the + 10 V d.c. voltage) is applied to the base of transistor Q02, via capacitor C02.

This pulse causes transistor Q02 to conduct, thus driving diode CR04 to cut off (a voltage equal to 0 volt is applied to its anode).

The battery voltage (+ 14.5 V) is applied entirely across the primary winding of transformer T01, inducing in the secondary winding a voltage which maintains the conduction of Q02.

As transistor Q01 and diode CR01 both conduct, a current is fed through the secondary winding of transformer T01; the load resistance being the variable collector-to-emitter resistance of transistor Q01 (varying with the base bias). This current yields a constant control voltage applied to the base of transistor Q02.

At the same time the magnetizing current fed through the primary of transformer T01 increases in value, thus causing the collector current of transistor Q02 to increase.

At the end of a time θ determined by the impedance of transistor Q01, the collector-to-emitter resistance of transistor Q02 increases. This time interval θ may be variable since the impedance of transistor Q01 is related to the base bias voltage of the latter. However, this base voltage is here kept constant owing to the presence of the stabilizing loop (see sub-paragraph 3).

The collector-to-emitter resistance of transistor Q02 increases. The voltage from secondary winding of transformer T01 decreases. This reduction causes, at a given value, transistor Q02 to be cut off, thus isolating the anode of diode CR04 from the ground.

The voltage U_0 across the primary winding of transformer T01 is equal to :

$$U_0 = U_{\text{battery}} + U_{\text{induced in the primary}}$$

This voltage U_0 causes diode CR04 to conduct. Capacitor C06 (storage capacitor) charges. The voltage across its terminals tends to value U_0 . Said voltage is applied to the free-running converter. In closed-loop operation, the average voltage across C06 (voltage applied to free-running converter) is the supply voltage of said converter.

(3) Operation of the Chopper Control Circuit

The chopper control circuit is a stabilizing circuit. It consists of transistors Q03, Q04 and the associated circuits.

The rectified voltage + 10 V from the free-running converter, stabilized by zener diode CR03 is the reference voltage of transistor Q03 in an emitter-follower configuration. The voltage from transistor Q03 is applied to a comparator amplifier (transistor Q04 and the associated circuits) receiving at its base a variable fraction of the rectified + 10 V voltage delivered by the free-running converter (base voltage compared with the reference given by the emitter of transistor Q03). The signal from the comparator amplifier is the control signal of the chopper (amplifier error signal).

The stability of the stabilizing loop is ensured by the RC network (R08, C01).

(4) Generation of the Auxiliary d.c. Voltages

There are two auxiliary d.c. voltages, namely :

- (a) + 9.5 V stabilized
- (b) + 5 V.

(a) Generation of the + 9.5 V d.c. Voltage (Plate 14)

The battery voltage is applied to input terminal A5 of Synthesizer Board No. 2.

The battery voltage originating from this terminal is applied to a voltage regulator which consists of module Z01 and the associated circuits. The output voltage may be obtained at the desired value by means of variable resistor R08.

The regulated 9.5 V output voltage appears at terminal B5 of the Synthesizer Board. It powers :

- . The VCO board in the HF Head
- . The Synthesizer board No. 1 (terminal A5)
- . The Frequency Selector board (terminal B7).

(b) Generation of the + 5 V d.c. Voltage (Plate 26A and 26B)

The voltages + 10 V and + 6 V from the Converter are applied to a regulator which consists of transistor Q21 in an emitter-follower configuration and the associated circuits. The + 5 V voltage from the emitter of transistor Q21 appears at terminal A7 of the AF Board.

This voltage is applied to :

- . Terminal A10 of the Filter and 2.5 MHz IF Circuit Board
- . Terminal B13 of the Exciter Board
- . A moving contact of the operating mode selector.

(a) In the MORSE position, the A2J5 Volts signal is applied to :

- . Terminal A3 of the Peripheral Circuits Board (AGC Circuit)
- . Terminal B10 of the AF Board.

(b) In the HSB or LSB position, the SSB 5 volt signal is applied to terminal B5 of the Peripheral Circuits Board

(c) In the AM position, the A3 5 volt signal is applied to :

- . Terminal B6 of AF Board
- . Terminal B17 of Exciter Board
- . Terminal A9 of Filter and 2.5 MHz If Circuit board.

K) Generation of the Transmission Control Inhibiting Circuit

The HF transmission current is fed through a coupler located in the Antenna Tuning Unit (Plate 30). This coupler consists of transformer T301, resistors R301, R302, capacitor C305 and diode CR301.

A rectified signal, the value of which varies with the transmission current appears at terminal 13 of connector J2 of the Antenna Tuning Unit.

This signal originating from terminal 13 of connector J2 is applied to a transistorized circuit operating as a logic OR circuit, via the terminals B15 and B16 of the Peripheral Circuits board (Plate 28).

This circuit consists of transistors Q27, Q31 and the associated circuits. It also receives the Battery + signal.

In normal operation (battery voltage and transmission correct), both transistors Q27 and Q31 are cut off.

The output signal from the emitter of transistors Q27 and Q31 is applied to a comparator consisting of transistor Q32 and the associated circuits (reference level determined by R102 and R103).

If operation is correct, transistor Q32 is driven to saturation. A signal higher than + 5 V is delivered by this collector. This signal causes the field effect transistor Q24 in the AF Board to conduct, with diode CR16 cut off (Plate 26A and 26B).

The absence of transmission (Q31 saturated - plate 28) or battery voltage too low (Q27 saturated) causes transistor Q32 to be cut off. A signal lower than + 5 V causes the field effect transistor to be cut off, owing to the conduction of diode CR16 (plate 26). In this case, the transmission signal is no longer transmitted to the local earphone.

L) Remote Control Circuits (Plates 26A and 26B)

The remote control circuits permit :

- . Transmission of incoming signals to the remote operator
- . Reception of the AF signal originating from the remote control unit for transmission by the transceiver
- . Transmission of a call signal from the transceiver to the remote control unit
- . Reception of a call signal from the remote control unit.

The remote control circuits essentially consist of :

- . A current generator
- . A comparator
- . A call signal generating circuit
- . A remote control inhibiting circuit.

The constant-current generator consists of transistor Q02 and the associated circuits. It is powered when the configuration selector S3 fitted on the front panel is set to "●" or "call" (CALL position).

The constant current generator is connected to :

- . The comparator
- . The remote set via the telephone line

The value of the current fed through the telephone line is determined by the remote set as follows :

- . 0 mA (open circuit) when a call from the remote set is transmitted via the transceiver
- . 4 mA on reception of a signal to the remote set
- . 8 mA on transmission of a signal from the remote set.

(1) Reception of a Signal

The comparator, consisting of the operational amplifier Z01 and the associated circuits, receives :

- . A current from the constant-current generator of 4 mA determined by the remote set.

The comparator output signal cuts off diode CR07. No signal is transmitted to the switching circuits.

The AF signal from operational amplifier Z02 modulates the line current via the remote control amplifier Q03.

(2) Transmission of a Signal

The comparator, consisting of operational amplifier Z01 and the associated circuits receives :

- . A current from the constant current generator of 8 mA determined by the remote set.

The comparator delivers a 0 V signal retransmitted to the switching circuit via diode CR07 (diode CR07 is conducting).

The transmission signal from the remote set is applied to the Exciter board.

(3) Transmission and Reception of a Call Signal

The call signal generating circuit is shown in figure 4. 30.

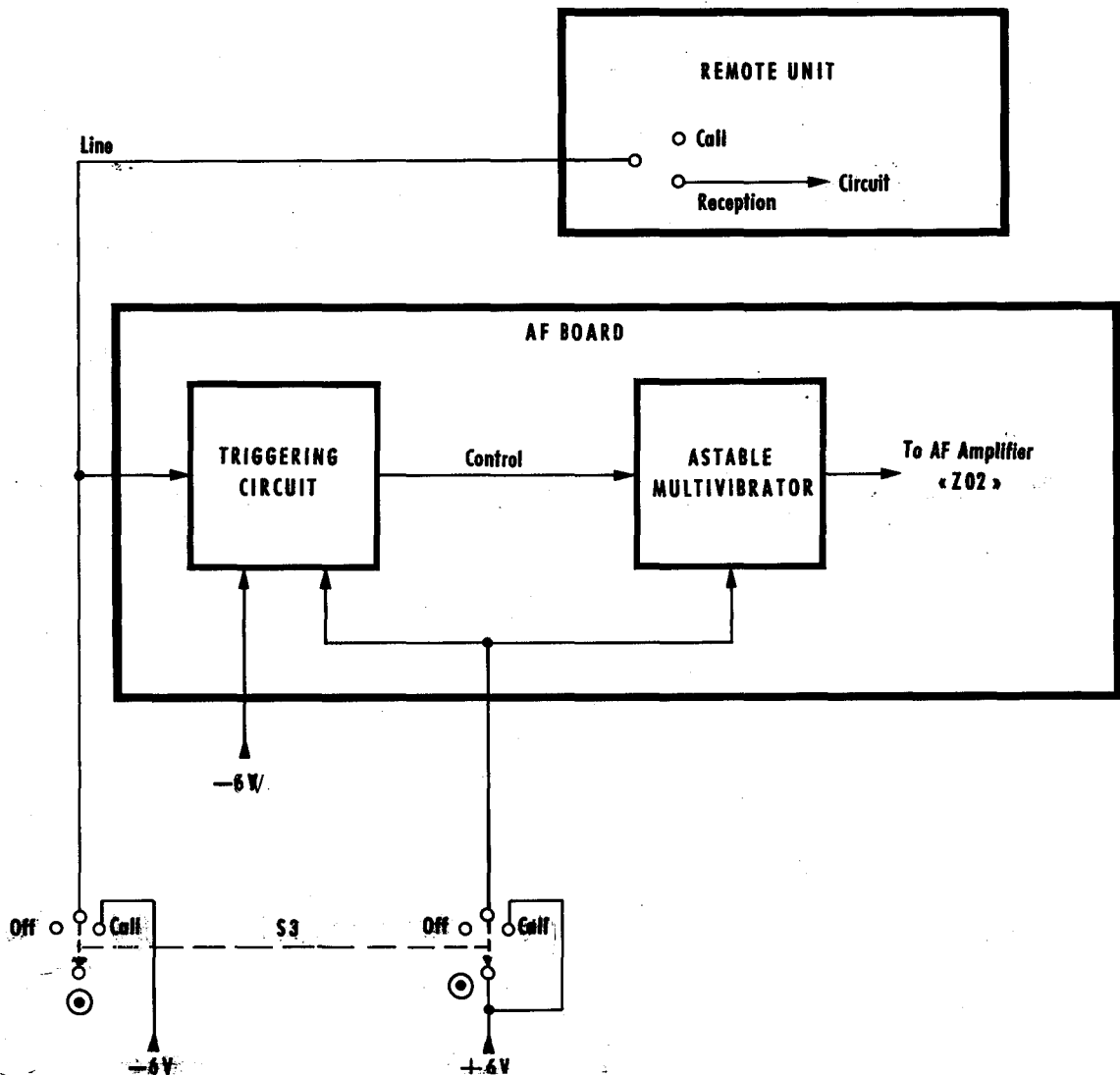


Figure 4.29 - Block Diagram of the Call Signal Generating Circuit

This circuit consists of a triggering circuit and an astable multivibrator.

When selector S3 on the Man-Pack Transceiver front panel is in position " " or "CALL", the triggering circuit and the astable multivibrator are powered from a d.c. voltage of + 6 V.

When selector S3 on the Man-Pack Transceiver front panel is in the "CALL" position or when selector S01 of the remote set is in the call position, a signal enabling the astable multivibrator is generated by the triggering circuit. The signal from this multivibrator is applied, via the operational AF amplifier (Z02) to the local set earphone (transceiver proper) and to the remote set earphone (remote unit).

The triggering circuit (Plate 26A and 26B) consists of transistor Q11 (A version), Q11 - Q25 and Q26 (B version).

In the absence of a call, transistor Q11 conducts.

In the presence of a call, transceiver selector S3 on CALL position or selector S01 on remote unit in call position, a -6 V signal cuts off transistor Q11, the collector voltage of which being then positive.

The astable multivibrator consists of transistors Q13, Q14 and the associated circuits. The circuitry used is that of a typical Abraham-Bloch multivibrator. In the absence of a call, transistor Q13 is cut off while transistor Q14 is saturated (stable position). In the presence of a call, transistor Q11 enables the multivibrator.

The signal from the multivibrator is a square signal, the recurrence frequency of which approximates 3 kHz. This signal is applied to terminal 7 of operational amplifier Z02.

The signal from said amplifier is applied to :

- . The local earphone (Man-Pack transceiver)
- . The remote set earphone via the remote control amplifier Q03 and the associated circuits.

M) Operation of the Charger (Plate 32)

The charger permits charging the batteries from an external 10 to 32 V d.c. source.

This charger essentially consists of :

- . An Abraham-Bloch type multivibrator consisting of transistors Q01, Q02 and the associated circuits
- . A converter consisting of transistors Q04, Q05, the associated circuits, diode CR05 and transformer T01.
- . A measuring detector consisting of transistor Q03 and the associated circuits
- . A protective circuit against a supply voltage too low for correct operation of the charger, consisting of transistor Q06 and the associated circuits.

The battery is charged only during the chopper blocking period.

The external d.c. voltage is filtered by inductor L01 and capacitor C01. This filtered d.c. voltage is applied to :

- . Transistors Q04 and Q05 of the converter
- . Comparator
- . Transistor Q03 in the measuring detector
- . Transistor Q06 of the protective circuit, via variable resistor R08
- . Multivibrator via ballast transistor Q07.

Application of the external voltage enables the multivibrator. The square signal delivered by it is applied to input 5 of comparator Z01. The square signals synchronize operation of each cycle.

The voltage from the comparator output drives transistor Q04 to saturation. As transistor Q04 is saturated, one of the two primary windings of transformer T01 is fed through the diode CR05 made conductive. The resulting induced voltage in the second primary winding creates a positive feedback to the base of transistor Q05 and causes it to conduct. As transistor Q05 is saturated, the external d.c. voltage is almost entirely retransmitted across 5 and 6 of the primary winding of transformer T01 (owing to the decay voltage of transistor Q05).

The magnetizing current in the primary winding of transformer T01 increases, thus causing the voltage across resistor R17 to increase.

This voltage is retransmitted across capacitor C06 via transistor Q03 and the diode CR04, then applied to input 6 of the comparator.

Said voltage varies with the value of the magnetizing current and increases as a "ramp" up to switching of comparator Z01.

The reference voltage appears at terminal 5 of the comparator, the variable voltage is applied to terminal 6.

The signal from the comparator cuts off transistor Q04, thus cutting off transistor Q05 (this cut off determines the pulse length).

At this instant, the power stored ($1/2 LI^2$, which is constant, irrespective of the external voltage) in the secondary winding of transformer T01 causes diode CR07 to conduct.

The voltage appearing across the secondary winding of transformer T01, smoothed by inductor L02 and capacitors C11 and C12, feeds the battery (the charging rate is set by R03 determining the multivibrator frequency).

The charger operating cycle is restored to the initial state. A new cycle is initiated by the next square signal delivered by the multivibrator.

In normal operation, transistor Q06 is cut off. If the base voltage U_b becomes negative with respect to the emitter voltage, a positive voltage from the collector is applied to the input terminal 6 of the comparator, owing to the conduction of transistor Q05 (Ext. Supply U less than battery U). The signal from comparator Z01 cuts off transistor Q04 and Q05 inhibiting operation of the charger.

NOTE : The filtering networks L03, C101 through C103, L04 and C104 inhibit any possible radiation from the converter.

REMARKS :

1. Diode CR102 isolates the converter from the external voltage in case of supply voltage sign reversal.
2. The battery is protected against charger failures by diode CR101.

SECTION FIVE

3rd LINE MAINTENANCE

5.1 - OPERATIONAL CHECK

The procedure for checking the overall operation of the RS-B25-SA Manpack Transceiver is explained in the Maintenance Guide Sheet G1.

IMPORTANT : The overall operational check of the Man-Pack Transceiver shall be carried out when the latter is removed from the carrying harness.

Assembly : MAN-PACK Sub-assembly :	MAINTENANCE GUIDE SHEET	
Purpose : Operational check	Number : G1 Folio : 1/1	
<u>FACILITIES</u>	<u>Documents</u> See manual of test set	<u>Test equipment</u> See manual of test set
	<u>Tools</u> . See Manual of test set . Test set	
<u>PROCEDURE</u> The various phases of the procedure are indicated in the field test set manual.		

5.2 - REMOVING AND FITTING STANDARD COMPONENTS

This paragraph deals with the removal and fitting of standard components which, as in the case of the check, are to be carried out when the Man-Pack transceiver is removed from its harness.

The different operations carried out with the relevant sheet numbers are listed in the table below.

Sheet No.	Operation
D1	Standard exchange of the battery unit
D2	Standard exchange of the antenna tuning unit
D3	Removal and remounting of the transceiver unit protective cover
D4	Standard exchange of the 20 W Amplifier
D5	Standard exchange of the HF head
D6	Standard exchange of the converter unit
D7	Standard exchange of the frequency selector Printed circuit board assembly
D8	Standard exchange of a printed circuit board assembly "Peripheral Circuits", "Filter and 2.5 MHz IF", "Exciter", "AF", "Synthesizer No. 3", or "Synthesizer No. 2".
D9	Standard exchange of the Synthesizer printed-circuit board assembly No. 1.

Assembly : MAN-PACK	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Battery Unit	Number : D1 Folio : 1/2
Purpose : Standard exchange of battery unit	Personnel : 1 assistant
	Time

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Not applicable	Not applicable	Not applicable
<u>Spare part</u> A battery unit		

PROCEDURE(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna tuning unit
- . Put the Man-Pack system on a flat and clean surface, with the front panel facing the operator.

(B) Dismantling

1. Release the two battery unit toggle fasteners
2. Disengage the toggle fasteners completely
3. While holding the transceiver unit, pivot the battery unit to the left, the front right edge acting as a hinge (this ensures withdrawal of the battery unit connector from the transceiver unit connector without damage).
4. Uncouple the battery unit from the transceiver unit by disengaging the fixing lug (located on the front panel of the battery unit) from its housing (located on the front panel of the transceiver unit)
5. Remove the battery unit

(C) Remounting

1. Couple the battery unit with the transceiver unit by engaging the fixing lug (located on the front panel of the battery unit) into its housing (located on the front panel of the transceiver unit).

2. Put the front right edge of the battery unit against the front left edge of the transceiver unit.
3. While holding the transceiver unit, pivot the battery unit to the right (which permits plugging the battery unit connector into the transceiver unit connector without damage).
4. Put the rear toggle fastener into its initial position.
5. Lock the rear toggle fastener.
6. Put the front toggle fastener into its initial position.
7. Lock the front toggle fastener.

Assembly : MAN-PACK Sub-assembly : Antenna Tuning Unit	MOUNTING AND DISMANTLING DATA SHEET Number : D2 Folio : 1/1
<u>Purpose</u> : Standard exchange of antenna tuning unit	Personnel : 1 assistant Time :

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Not applicable <u>Spares</u> One antenna tuning unit	Not applicable	. One Allen key for hexagon socket head screws, size 4 mm . Silicone grease S14 . Dry cloth.

PROCEDURE

(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna tuning unit
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator.

(B) Dismantling

1. Remove the four fixing screws of the antenna tuning unit by means of the 4 mm hexagon key
2. Withdraw the antenna tuning unit from the transceiver unit, by pulling perpendicularly to the transceiver unit (left to right).
3. Remove the antenna tuning unit.

(C) Remounting

1. Remove the sealing gasket adjacent to the antenna tuning unit connector.
2. Clean the sealing gasket with a clean, dry cloth.
3. Coat the sealing gasket with Silicone grease.
4. Put the sealing gasket back into place and remove excess grease with a dry clean cloth.
5. Put the antenna tuning unit back into place.
6. Tighten the four fixing screws by means of the 4 mm Allen key.
7. Dry out the Man-Pack transceiver (see sheet D18).

Assembly : MAN-PACK	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Transceiver Unit	Number : D3 Folio : 1/2
<u>Purpose</u> : Removal and remounting of the transceiver unit protective cover.	Personnel : 1 assistant
	Time

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D1 Section 5 - Sheet D2	Not applicable	<ul style="list-style-type: none"> . One Allen key for hexagon socket heat screws, size 4 mm . Silicone grease SI4 . Dry coth.
<u>Spares</u> Not applicable		

PROCEDURE(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna tuning unit
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Loosen the four fixing screws on the front panel, by means of the 4 mm Allen key
4. Remove the transceiver from the case by pulling it out horizontally
5. Withdraw and remove the seal.

(C) Remounting

1. Clean the seal by means of a dry, clean coth
2. Grease the seal with Silicone grease.
3. Put the seal into its initial position and remove excess grease with a dry clean cloth
4. Introduce the transceiver into its protective case
5. Check that transceiver is in its initial position
6. Tighten the four fixing screws by means of the Allen key

Number D3

Folio 2/2

7. Remount the antenna tuning unit (see sheet D2)
8. Remount the battery unit (see sheet D1)
9. Dry out the Man-Pack assembly (see sheet).

Assembly : MAN-PACK Sub-assembly : 20 Watt Amplifier	MOUNTING AND DISMANTLING DATA SHEET						
Purpose : Standard exchange of 20 Watt Amplifier	Number : D4 Folio : 1/2						
<u>FACILITIES</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%; text-align: center;"><u>Documents</u></th> <th style="width: 33%; text-align: center;"><u>Test equipment</u></th> <th style="width: 33%; text-align: center;"><u>Tools</u></th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> Section 5 - Sheet D1 Section 5 - Sheet D2 <u>Spares</u> 20 W amplifier </td> <td style="vertical-align: top; text-align: center;"> Not applicable </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> . One 4 mm Allen key for hexagon head socket screws . Silicone grease SI4 . Dry cloth </td> </tr> </tbody> </table>	<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>	Section 5 - Sheet D1 Section 5 - Sheet D2 <u>Spares</u> 20 W amplifier	Not applicable	<ul style="list-style-type: none"> . One 4 mm Allen key for hexagon head socket screws . Silicone grease SI4 . Dry cloth 	Personnel : 1 assistant Time
<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>					
Section 5 - Sheet D1 Section 5 - Sheet D2 <u>Spares</u> 20 W amplifier	Not applicable	<ul style="list-style-type: none"> . One 4 mm Allen key for hexagon head socket screws . Silicone grease SI4 . Dry cloth 					
<u>PROCEDURE</u> (A) <u>Preliminary Steps - Safety Requirements</u> <ul style="list-style-type: none"> . Set the "O, L, H" selector on the transceiver front panel to "O" . Disconnect the antenna in use from the antenna unit . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator (B) <u>Dismantling</u> <ol style="list-style-type: none"> 1. Remove the battery unit (see sheet D1) 2. Remove the antenna tuning unit (see sheet D2) 3. Loosen the four fixing screws of the 20 W amplifier by means of the 4 mm Allen key 4. Withdraw the 20 W amplifier from the transceiver unit (C) <u>Remounting</u> <ol style="list-style-type: none"> 1. Remove the seal 2. Clean the seal by means of a dry and clean cloth 3. Grease the seal with Silicone grease 4. Put the seal into its initial position and remove excess grease with a dry clean cloth 5. Put the 20 W amplifier into its initial position 							

Number D4

Folio 2/2

6. Tighten the four fixing screws of the 20 W amplifier by means of the 4 mm Allen key
7. Remount the antenna tuning unit (see sheet D2)
8. Remount the battery unit (see sheet D1)
9. Dry out the Man-Pack assembly (see sheet)

Assembly : TRANSCEIVER UNIT	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : HF Head	Number : D5 Folio : 1/2
<u>Purpose</u> : Standard exchange of the HF Head	Personnel : 1 assistant Time

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D1 Section 5 - Sheet D2 Section 5 - Sheet D3	Not applicable	. One 4 mm Allen key for hexagon socket head screws . One 5 mm screwdriver . Silicone grease SI4 . Dry cloth
<u>Spares</u> One HF head		

PROCEDURE(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna unit
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator.

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Remove the transceiver protective housing (see sheet D3)
4. Loosen both HF head fixing screws by means of the 5 mm screwdriver
5. Withdraw and remove the 2 fixing screws and washers
6. Withdraw and remove the HF head.

(C) Remounting

1. Put the HF head in its initial position
2. Put both HF head fixing screws and washers in their initial position
3. Tighten both fixing screws by means of the 5 mm screwdriver
4. Remount the transceiver protective housing (see sheet D3)

Number D5

Folio 2/2

5. Remount the antenna tuning unit (see sheet D2)
6. Remount the battery unit (see sheet D1)
7. Dry out the Man-Pack assembly (see sheet)

Assembly : TRANSCEIVER Sub-assembly : Converter Unit	MOUNTING AND DISMANTLING DATA SHEET Number : D6 Folio : 1/2
Purpose : Standard exchange of Converter Unit	Personnel : 1 assistant Time

FACILITIES

Documents
 Section 5 - Sheet D1
 Section 5 - Sheet D2
 Section 5 - Sheet D3

Spares
 One converter unit

Test equipment
 Not applicable

Tools

- . One 4 mm Allen key for hexagon socket head screws
- . One 5 mm screwdriver
- . Silicone grease S14
- . Dry cloth

PROCEDURE

(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna unit
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator.

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Remove the transceiver protective housing (see sheet D3)
4. Loosen the converter unit fixing screws by means of the 5 mm screwdriver
5. Withdraw and remove the fixing screws and washers while noting their initial location
6. Withdraw and remove the converter unit.

(C) Remounting

1. Put the converter unit in its initial position
2. Put both fixing screws and washers in their initial position
3. Tighten both fixing screws by means of the 5 mm screwdriver
4. Remount the transceiver protective housing (see sheet D3)

Number D6

Folio 2/2

5. Remount the antenna tuning unit (see sheet D2)
6. Remount the battery unit (see sheet D1)
7. Dry out the Man-Pack assembly (see sheet).

Assembly : TRANSCEIVER	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Setting Selector PC board assembly	Number : D7 Folio : 1/2
Purpose : Standard exchange of the setting selector PC board assembly	Personnel : 1 assistant
	Time

FACILITIESDocuments

Section 5 - Sheet D1

Section 5 - Sheet D2

Section 5 - Sheet D3

Spares

One setting selector PC board assembly

Test equipment

Not applicable

Tools

- . One 4 mm Allen key for hexagon socket head screws
- . One 5 mm screwdriver
- . One PC board assembly extractor with 126 mm center-to-center spacing
- . Silicone grease SI4
- . Dry cloth

PROCEDURE(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O"
- . Disconnect the antenna in use from the antenna unit
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator.

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Remove the transceiver protective housing (see sheet D3)
4. On the transceiver front panel set the "10 MHz", "1 MHz", "100 kHz", "10 kHz" and "1 kHz" selectors to "O".
5. Loosen the PC board assembly fixing screws by means of the 5 mm screwdriver. Withdraw and remove both fixing screws and washers.
6. Put the PC board assembly extractor in place.
7. Withdraw and remove the setting selector PC assembly from the transceiver.

(C) Remounting

1. Check that the selector of the setting selector PC board assembly and those of the transceiver unit are in their initial position (slot on PC board switches downward).

2. Put the setting selector PC board assembly into its initial position.
3. Put both PC board assembly fixing screws and washers in their initial position.
4. Tighten both fixing screws by means of the 5 mm screwdriver.
5. Remount the transceiver protective housing (see sheet D3)
6. Remount the antenna tuning unit (see sheet D2)
7. Remount the battery unit (see sheet D1)
8. Dry out the Man-Pack assembly (see sheet)

Assembly : TRANSCEIVER UNIT Sub-assembly : PC Board Assemblies : Peripheral Circuits Filter and 2.5 MHz IF Circuit Exciter AF Synthesizer No. 3 Synthesizer No. 2	MOUNTING AND DISMANTLING DATA SHEET Number : D8 Folio : 1/2
Purpose : Standard exchange of any of the following PC board assemblies : "peripheral circuits", "filter and 2.5 MHz IF circuit", "Exciter", "AF", "Synthesizer No. 3" or "Synthesizer No. 2".	Personnel : 1 assistant Time

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D1 Section 5 - Sheet D2 Section 5 - Sheet D3	Not applicable	<ul style="list-style-type: none"> . One Allen key for 4 mm hexagon socket head screws . One 3 mm screwdriver . One PC board assembly extractor, centre-to-centre spacing 126 mm . Silicone grease SI4 . Dry cloth
<u>Spares</u> PC board assembly of same part number		

PROCEDURE

(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O".
- . Disconnect the antenna in use from the antenna tuning unit.
- . Put the Man-Pack system on a flat and clean surface, with the front panel facing the operator.

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Remove the transceiver protective housing (see sheet D3)
4. Remove the screw securing the holding strip by means of the 3 mm screwdriver
5. Withdraw and remove the holding strip
6. Put the PC board assembly extractor into place
7. Withdraw and remove the PC board assembly.

(C) Remounting

1. Put the selected PC board assembly into its initial position
2. Put the holding strip into its initial position

Number D8

Folio 2/2

3. Tighten the holding strip securing screw by means of the 3 mm screwdriver
4. Remount the transceiver unit protective housing (see sheet D3)
5. Remount the antenna tuning unit (see sheet D2)
6. Remount the battery tuning unit (see sheet D1)
7. Dry out the Man-Pack system (see sheet).

Assembly : TRANSCEIVER UNIT Sub-assembly : Synthesizer PC Board Assembly No. 1	MOUNTING AND DISMANTLING DATA SHEET Number : D9 Folio : 1/2
Purpose : Standard exchange of Synthesizer board assembly No. 1	Personnel : 1 assistant Time

FACILITIESDocuments

Section 5 - Sheet D1
 Section 5 - Sheet D2
 Section 5 - Sheet D3

Test equipment

Not applicable

Tools

- . One Allen key for 4 mm hexagon socket head screw
- . One 3 mm screwdriver
- . One PC board assembly extractor, centre-to-centre spacing 126 mm
- . Silicone grease SI4
- . Dry cloth

PROCEDURE(A) Preliminary Steps - Safety Requirements

- . Set the "O, L, H" selector on the transceiver front panel to "O".
- . Disconnect the antenna in use from the antenna tuning unit.
- . Put the Man-Pack transceiver on a flat, clean surface, with front panel facing the operator.

(B) Dismantling

1. Remove the battery unit (see sheet D1)
2. Remove the antenna tuning unit (see sheet D2)
3. Remove the transceiver protective housing (see sheet D3)
4. Remove the screw securing the holding strip by means of a 3 mm screwdriver
5. Withdraw and remove the holding strip
6. Remove the 3 screws and washers securing the PC board assembly, by means of the 3 mm screwdriver
7. Put the PC board assembly extractor into place
8. Withdraw and remove the PC board assembly.

(C) Remounting

1. Put the PC board assembly into its initial position

2. Put in and tighten the 3 screws and washers securing the PC board assembly
3. Put the holding strip into its initial position
4. Tighten the holding strip fixing screw by means of the 3 mm screwdriver
5. Remount the transceiver protective housing (see sheet D3)
6. Remount the antenna tuning unit (see sheet D2)
7. Remount the battery unit (see sheet D1)
8. Dry out the Man-Pack system (see sheet).

SECTION SIX

4th LINE MAINTENANCE

6.1 LIST OF TEST APPARATUS

- Spectrum analyzer type H.P 141 T
 - plug in unit 8552 B
 - plug in unit 8553 B
- Powermeter type Marconi TF 2503
- Two tones AF generator Type Marconi TF 2005 R
- Synthesizer type HP 8660 A
 - plug in unit 86601 A
 - plug in unit 86631 B
- HF generator type HP 606 B
- HF generator type HP 608 F
 - synchroniser type HP 8708 A
- Distortion-meter type HP 334 A (AF voltmeter)
- HF voltmeter type Boonton 92 BD
- Multimeter
- Stabilized power supplies
- Oscilloscope type Philipps PM 3370
 - plug in unit PM 3372
- Numerical voltmeter type Schlumberger VB 1466
 - plug in unit VB 1479
- Tracking plug in unit type HP 8443 A
- Frequency-meter type Schlumberger FH 2521
- Pulse generator type Ferisol P 120
- Ammeter type HP 428 B
- Vector voltmeter type HP 8405 A

6.2 TEST DATA SHEETS

The test data sheets are the following.

- C1 : Synthesizer N^o 3 PC Board assembly
- C2 : Exciter PC Board assembly
- C3 : Synthesizer N^o 1 PC Board assembly
- C4 : Synthesizer N^o 2 PC Board assembly
- C5 : AF PC Board assembly
- C6 : Filter and 2,5 MHz IF PC Board assembly
- C7 : 20 W amplifier
- C8 : Converter unit
- C9 : Remote control unit
- C10 : RF Head
- C11 : Battery unit
- C12 : Peripheral circuits
- C13 : Antenna tuning unit
- C14 : Frequency selector PC Board assembly

<u>Assembly</u> : MAN - PACK MK I and MK II <u>Subassembly</u> : "SYNTHESIZER NO. 3" PC BOARD ASSEMBLY	TEST DATA SHEET							
<u>PURPOSE</u> : Verification and Adjustment of "Synthesizer No. 3" PC Board Assembly	<u>Number</u> : C1 <u>Folio</u> : 1 of 3 <u>Personnel</u> : 1 electronic technician <u>Time</u> :							
<p><u>FACILITIES</u></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; width: 33%;"><u>Documents</u></th> <th style="text-align: center; width: 33%;"><u>Test Equipment</u></th> <th style="text-align: center; width: 33%;"><u>Tools</u></th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;">Plate 18</td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> . 1 Stabilized power supply, + 3 V . 1 Stabilized power supply, - 6 V . 1 RF synthesizer, 5 MHz, standard . 1 RF generator, 100.5 MHz, standard . 1 RF HF voltmeter, standard . 1 Spectrum analyzer, standard . 1 Frequency meter, standard </td> <td style="vertical-align: top;">1 rimmer screwdriver</td> </tr> </tbody> </table>			<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>	Plate 18	<ul style="list-style-type: none"> . 1 Stabilized power supply, + 3 V . 1 Stabilized power supply, - 6 V . 1 RF synthesizer, 5 MHz, standard . 1 RF generator, 100.5 MHz, standard . 1 RF HF voltmeter, standard . 1 Spectrum analyzer, standard . 1 Frequency meter, standard 	1 rimmer screwdriver
<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>						
Plate 18	<ul style="list-style-type: none"> . 1 Stabilized power supply, + 3 V . 1 Stabilized power supply, - 6 V . 1 RF synthesizer, 5 MHz, standard . 1 RF generator, 100.5 MHz, standard . 1 RF HF voltmeter, standard . 1 Spectrum analyzer, standard . 1 Frequency meter, standard 	1 rimmer screwdriver						
<p><u>PROCEDURE</u></p> <p>1 - <u>Preliminary Operations</u> :</p> <ul style="list-style-type: none"> . Connect - 6 V stabilized power supply to terminal A6 of PC board assembly. . Connect + 3 V stabilized power supply to terminal A9 of PC board assembly. . Connect common point of stabilized power supplies to terminals A1, A13, B1, B3, B4, B6, B7, B9, B11 and B13 of PC board assembly (chassis). 								

II - Procedure

This consists of the following operations :

- . Adjustment of 100 MHz heterodyne oscillator.
- . Adjustment of 105 MHz heterodyne.
- . Verification of secondary loop mixer.

(A) Adjusting the 100 MHz Oscillator

- (1) Connect - 6 V stabilized power supply to terminal B5 of PC board assembly.
- (2) Connect frequency meter to terminal A3 of PC board assembly.
- (3) Connect the HF voltmeter to terminal A3 of PC board assembly.
- (4) Set capacitor C13 for a frequency of 100 MHz approximately as read off the frequency meter and maximum voltage off the HF voltmeter.
- (5) Set capacitor C15 for a frequency within 99 999 950 and 100 000 050 Hz as read off the frequency meter and a maximum voltage greater than or equal to 90 mV as read off the HF voltmeter (output $Z = 50 \Omega$).
- (6) Disconnect frequency meter and HF voltmeter from terminal A3 of the PC board assembly.
- (7) Disconnect - 6 V stabilized power supply from terminal B5 of PC board assembly.

(B) Adjusting the 105 MHz Heterodyne

- (1) Connect - 6 V stabilized power supply to terminal A4 of PC board assembly.
- (2) Connect frequency meter to terminal A3 of PC board assembly.
- (3) Connect the HF voltmeter to terminal A3 of PC board assembly.
- (4) Connect spectrum analyzer to terminal A3 of PC board assembly.
- (5) Connect 5 MHz RF synthesizer to terminal A5 of PC board assembly.
- (6) Set the 5 MHz RF synthesizer so that it delivers a signal with an amplitude of 220 V r.m.s.
- (7) Set capacitors C01 and C02 for maximum voltage as read off the HF voltmeter. Check that signal frequency read off the frequency meter is of 105 MHz ± 50 Hz that the amplitude as read off the HF voltmeter is greater than or equal to 90 mV (output $Z = 50 \Omega$).
- (8) Note characteristics of signal read off the spectrum analyzer set to 105 MHz.
- (9) Note characteristics of signal read off the spectrum analyzer set to 100 MHz and check that attenuation is greater than or equal to 40 dB versus the 105 MHz signal.
- (10) Note the characteristics of signal read off the spectrum analyseur set to 95 MHz and check that attenuation is greater than or equal to 30 dB versus the 105 MHz signal.

- (11) Disconnect frequency meter, HF voltmeter and spectrum analyzer from terminal A3 of PC board assembly.
- (12) Disconnect the 5 MHz RF generator from terminal A5 of PC board assembly.
- (13) Disconnect - 6 V stabilized power supply from terminal A4 of PC board assembly.

(C) Verifying the Secondary Loop Mixer :

- (1) Connect - 6 V stabilized power supply to terminal B5 of PC board assembly.
- (2) Connect frequency meter to terminal B10 of PC board assembly.
- (3) Connect the HF voltmeter to terminal B10 of PC board assembly.
- (4) Connect RF generator set to 100.5 MHz (F1) to terminal A11 of PC board assembly.
- (5) Set the RF generator so as to obtain a signal with an amplitude of 140 mV.
- (6) Check for a frequency of 500 kHz as read off the frequency meter (F1 - F2 = 500 kHz, F2 = F of signal at terminal A3).
- (7) Check that amplitude of signal as read off the HF voltmeter is greater than or equal to 400 mV.
- (8) Disconnect the frequency meter and HF voltmeter from terminal B10 of PC board assembly.
- (9) Disconnect the 100.5 MHz RF generator from terminal A11 of PC board assembly.
- (10) Disconnect - 6 V stabilized power supply from terminal B5 of PC board assembly.

III - Final Operations

- . Disconnect - 6 V stabilized power supply from terminal A6 of PC board assembly.
- . Disconnect + 3 V stabilized power supply from terminal A9 of PC board assembly.

<u>Assembly</u> : MAN-PACK MK I and MK II <u>Subassembly</u> : 'EXCITER' PC BOARD ASSEMBLY	TEST DATA SHEET
	<u>Number</u> : C2 <u>Folio</u> : 1 of 7
<u>PURPOSE</u> : Verification and Adjustment of 'Exciter' PC Board Assembly	<u>Personnel</u> : 1 electronic technician
	<u>Time</u> :

FACILITIES

<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>
Plate 27	<ul style="list-style-type: none"> . 1 Stabilized power supply, + 6 V . 1 Stabilized power supply, - 6 V . 1 Stabilized power supply, + 10 V . 1 Stabilized power supply, + 5 V . 1 RF generator, high stability . 1 AF generator, standard . 1 Spectrum analyzer, standard . 1 HF volmeter, standard . 1 Power supply, varying between 0 and 5 V, standard . 1 Remanence measuring instrument. . 1 AF volmeter . Multimeter 	<ul style="list-style-type: none"> . 1 Load resistor, 50 Ω . 1 Coaxial cable . 1 Chopper

PROCEDURE

1 - Preliminary Operations

- . Connect + 6 V stabilized power supply to terminals B9 and B19 of PC board assembly.
- . Connect - 6 V stabilized power supply to terminals A6 and A17 of PC board assembly.
- . Connect + 10 V stabilized power supply to terminal B5 of PC board assembly.
- . Connect + 5 V stabilized power supply to terminal B13 of PC board assembly.
- . Connect common point of stabilized power supplies to terminals A1, A11, A12, A20, B1, B10 and B20 of PC board assembly (chassis).

- . Connect the high stability RF generator to terminal A19 of PC board assembly.
- . Set the RF generator so as to obtain a signal with an amplitude of 100 mV r.m.s. and a frequency of 2.5 MHz.

II - Operating Procedure

The different operating procedures to be carried out are as follows :

- . Adjustment of carrier rejection circuit in SSB transmission.
- . Check of AF compression in SSB transmission.
- . Check of time constant of the AF compression.
- . Check of RF compression in SSB transmission.
- . Check in A3H transmission.
- . Check in MORSE transmission (A 2J).
- . Check of A3H switching.

(A) Adjusting the Carrier Rejection Circuit in SSB Transmission

- (1) Connect AF generator to terminal A13 of PC board assembly.
- (2) Set the AF generator so that it delivers a signal with an amplitude of 10 mV and a frequency of 1 kHz.
- (3) Connect the spectrum analyzer and HF voltmeter to terminal A5 of the PC board assembly.
- (4) Connect + 6 V stabilized power supply to terminals A4, A8 and A15 of the PC board assembly.
- (5) Set the spectrum analyzer to 2.5 MHz and note the value of signal as read off spectrum analyzer.
- (6) Set spectrum analyzer to 2.501 MHz and note the signal value.
- (7) Set the spectrum analyzer to 2.499 MHz and note the signal value.
- (8) Set potentiometer R57 so that the signal read off the spectrum analyzer at frequencies 2.501 and 2.499 MHz may be higher than 35 dB versus the signal read with spectrum analyzer set to 2.5 MHz.
- (9) Check that the RF voltage read off the HF voltmeter is higher than or equal to 5 mV r.m.s.

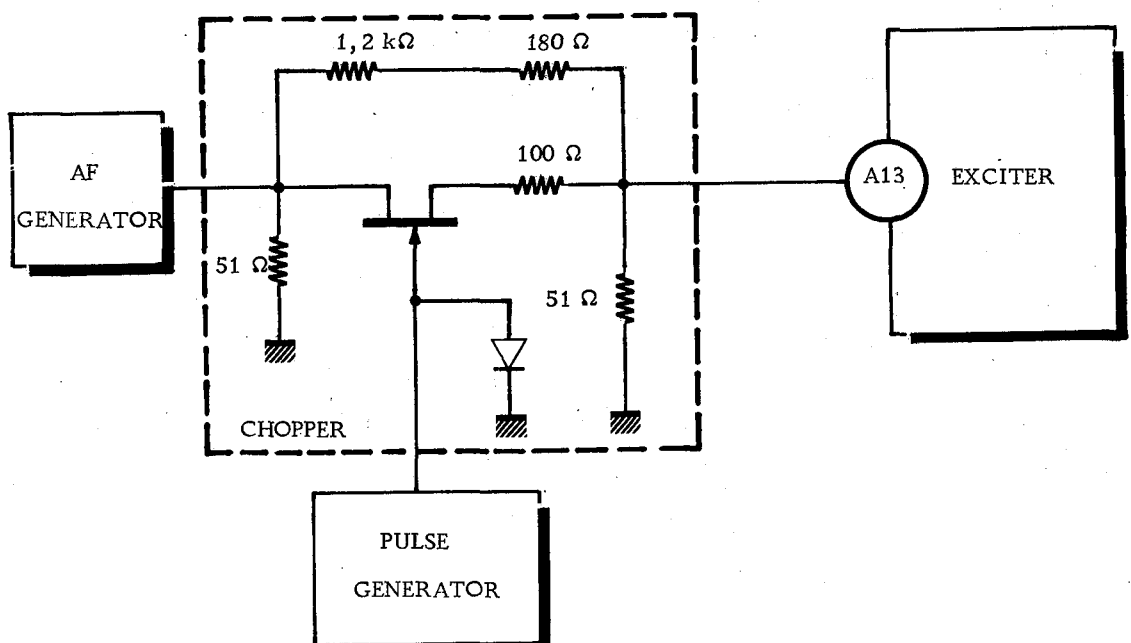
(B) Checking the AF Compression in SSB Transmission

- (1) Adjust the carrier rejection circuit in SSB transmission as indicated in subparagraph A.
- (2) Disconnect the spectrum analyzer from terminal A5 of PC board assembly.
- (3) Set the AF generator so as to obtain a voltage of 1 mV and check that voltage read off the HF voltmeter is between 1.8 and 8 mV.

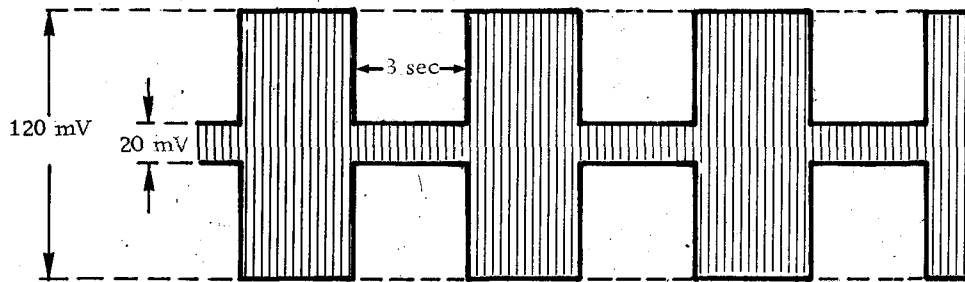
- (4) Set the AF generator so as to obtain a voltage 10 mV and check that the voltage read off the HF voltmeter is higher than 5 mV.
- (5) Set the AF generator so as to obtain a voltage of 100 mV and check that voltage read off the HF voltmeter is between 10 and 25 mV.
- (6) Disconnect the HF voltmeter from terminal A5 of PC board assembly.

(C) Checking the Time Constant of the AF Compression

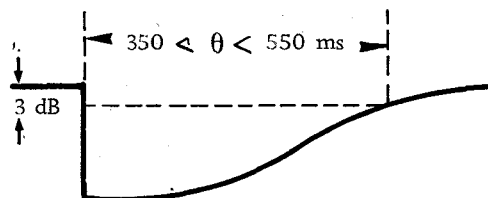
- (1) Disconnect AF generator from terminal A13 of PC board assembly and vacuum-tube voltmeter from terminal A5.
- (2) Prepare the following setup.



- (3) Set the AF generator so as to obtain a signal with the following characteristics :
 - $F = 1 \text{ kHz}$
 - $U = 40 \text{ mV r.m.s.}$
- (4) Set the pulse generator as follows :
 - . Frequency : $\frac{1}{6} \text{ Hz}$
 - . Duration : 3s with form factor 1/1
 - . Output on negative channel amplitude 0 and - 5 volts.
- (5) Connect oscilloscope and AF voltmeter to terminal B14 of PC board assembly.
- (6) Set the AF generator while pressing the ON pushbutton on the pulse generator so as to obtain 40 mV off the AF voltmeter. Check that the waveform displayed on the oscilloscope is the same as the one below.



- (7) Release ON pushbutton of pulse generator.
- (8) Connect "channel A" output of remanence measuring instrument to terminal A5 of PC board assembly.
- (9) Adjust the remanence measuring instrument as follows :
 - . Amplitude : 20 mV per mark
 - . Scanning : 100 or 200 ms
 - . Manual inscription : adjustment
 - . Synch : triggered
 - . Remanence : x1 (or blanking).
- (10) Press simultaneously ON pushbuttons of the pulse generator and remanence measuring instrument.
- (11) Check that the time constant of signal displayed on remanence measuring instrument is within 350 and 550 ms.
The signal time constant is shown bellow :



- (12) Release the ON pushbuttons.
- (13) If need be, set resistor R37 in the PC board assembly to a value approximating 470 k Ω so as to obtain a time constant within 350 and 550 ms.
- (14) Disconnect the remanence measuring instrument from terminal A5 of PC board assembly.
- (15) Disconnect chopper from terminal A13 of PC board assembly.
- (16) Disconnect voltmeter and oscilloscope from terminal B14 of PC board assembly.
- (17) Connect the AF generator to terminal A13 of PC board assembly.

(D) Checking the RF Compression in SSB Transmission

- (1) Adjust the carrier rejection circuit in SSB transmission as indicated in sub-paragraph A.
- (2) Check the AF compression in SSB transmission as indicated in sub-paragraph B.
- (3) Check the time constant of the AF compression as indicated in sub-paragraph C.
- (4) Connect terminal A2 to terminal A5 of PC board assembly by means of a coaxial cable.
- (5) Connect the variable power supply to terminal B7 of PC board assembly.
- (6) Set the variable power supply so that it delivers 0 V.
- (7) Set the AF generator so that it delivers 10 mV.
- (8) Connect the HF voltmeter to terminal B6 of PC board assembly.
- (9) With potentiometer R44 at mid-range, set potentiometer R26 successively for minimum and maximum value. Check that voltage read off the HF voltmeter varies from 3 to 20 mV. Adjust resistor R28 if need be ($470\ \Omega$, $1\ \text{k}\Omega$ or $1.8\ \text{k}\Omega$).
- (10) Set potentiometer R26 for maximum output power as read off the HF voltmeter.
- (11) Set the variable power supply so that it delivers 3 V ; note the voltage value read off the HF voltmeter and check for a signal attenuation higher than 40 dB.
- (12) Disconnect the variable power supply from terminal B7 of BC board assembly.
- (13) Connect terminal B7 to one of terminals A1, A11, A12, A20, B1, B10 of B20 of PC Board assembly.
- (14) Set potentiometer R26 for a voltage of 10 mV as read off the HF voltmeter.

(E) Checking in A3H Transmission

- (1) Proceed to same checks as for the SSB mode (see sub-paragraphs A, B, C and D).
- (2) Connect the + 5 V power supply to terminal B17 of PC board assembly.
- (3) Connect spectrum analyzer and RF voltmeter to terminal B6 of PC board assembly
- (4) Adjust potentiometer R44 so that the three rays seen off the spectrum analyser have the same amplitude (2.5 MHz). Measure RF level.
- (5) Connect the variable power supply to terminal B2 of PC board assembly.
- (6) Set the power supply so as to obtain a voltage of + 3 V.
- (7) Check on the spectrum analyzer that the two sidebands have disappeared.
- (8) Disconnect the spectrum analyzer from terminal B6 of PC board assembly.
- (9) Connect the $50\ \Omega$ resistor between terminal B6 and terminals A1, A11, A12, A20, B1, B10 or B20 of PC board assembly.
- (10) Connect the HF voltmeter to terminal B6 of PC assembly.

- (11) Check that the voltage read off the RF voltmeter is 6 dB higher than the value noted in (4).
- (12) Disconnect the 50 Ω resistor and HF voltmeter from terminal B6 of PC board assembly.
- (13) Disconnect the short-circuit connecting terminal B7 with the chassis (terminals A1, A11, A12, A20, B1, B10 or B20).
- (14) Disconnect the coaxial cable connecting terminals A2 and A5 of PC board assembly.
- (15) Disconnect the 5 V power supply from terminal B17 of PC board assembly.

(F) Checking in MORSE Transmission (A2J)

- (1) Connect the - 6 V power supply to terminal B16 of PC board assembly.
- (2) Connect the + 5 V power supply to terminal A16 of PC board assembly.
- (3) Connect the AF voltmeter to terminal B14 of PC board assembly and check that voltage read off the AF voltmeter is of 0 V.
- (4) Disconnect AF generator from terminal A13 and connect it to terminal B12 ; check that voltage read off the AF voltmeter is of 0 V.
- (5) Connect the + 5 V power supply to terminal B11 of PC board assembly via a 10 k Ω resistor.
- (6) Check that voltage read off the AF voltmeter is between 1.5 mV and 4 mV.
- (7) Connect the coaxial cable across A5 and A2 of PC board assembly.
- (8) Disconnect the AF voltmeter from terminal B14 of PC board assembly and connect an HF voltmeter to terminal B6 of same board.
- (9) Check for a voltage of 20 mV approximately as read off the AF voltmeter, or 10 mV when terminated into 50 Ω .
- (10) Disconnect the HF voltmeter from terminal B6 of PC board assembly.
- (11) Disconnect the coaxial cable from terminals A5 and A2 of PC board assembly.
- (12) Disconnect the AF generator from terminal B12 of PC board assembly.
- (13) Disconnect the + 5 V power supply from the 10 k Ω resistor connecting it to terminal B11 of PC board assembly.
- (14) Disconnect the + 5 V power supply from terminal A16 of PC board assembly.
- (15) Disconnect the - 6 V power supply from terminal B16 of PC board assembly.

(G) Checking the A3H Switching

- (1) Connect terminal A9 of PC board assembly to terminals A1, A11, A12, A20, B1, B10 and B20 of same board.
- (2) Connect DC voltmeter to terminal A7 of PC board assembly and check for a voltage approximating 0 V off the voltmeter.

- (3) Disconnect the DC voltmeter from terminal A7 and connect it to terminal B8 of PC board assembly.
- (4) Check for a voltage approximating 1.8 V as read off the DC voltmeter.
- (5) Disconnect terminal A9 from terminals A1, A11, A12, A20, B1, B10 and B20 of PC board assembly.
- (6) Connect terminal A9 to terminals A6 and A17 of PC board assembly.
- (7) Check for a voltage approximating - 4.2 V off the DC voltmeter.
- (8) Disconnect the DC voltmeter from terminal BB and connect it to terminal A7 of PC board assembly.
- (9) Check for a voltage approximating - 6 V off DC voltmeter.
- (10) Disconnect DC voltmeter from terminal A7 of PC board assembly.
- (11) Disconnect the lead between terminal A9 and terminals A6 and A17 of PC board assembly.

(H) Final Operations

- (1) Disconnect high stability RF generator from terminal A19 of PC board assembly.
- (2) Disconnect the common point of stabilized power supplies from terminals A1, A11, A12, A20, A21, B1, B10 and B20 of PC board assembly.
- (3) Disconnect the + 5 V stabilized power supply from terminal B13 of PC board assembly.
- (4) Disconnect the stabilized + 10 V power supply from terminal 5 of PC board assembly.
- (5) Disconnect stabilized - 6 V power supply from terminals A6 and A17 of PC board assembly.
- (6) Disconnect stabilized + 6 V power supply from terminals B9 and B19 of PC board assembly.

<u>Assembly</u> : MAN PACK MK I and MK II <u>Subassembly</u> : 'SYNTHESIZER NO.1' PC BOARD ASSEMBLY	TEST DATA SHEET
	Number : C3 Folio : 1 of 5
<u>PURPOSE</u> : Verification and Adjustment of 'Synthesizer No. 1' PC Board Assembly	Personnel : 1 electronic technician
	Time

FACILITIES

Documents

Plates 11A and 11B

Test Equipment

- . 1 Stabilized power supply, + 6 V
- . 1 Stabilized power supply, + 3 V
- . 1 Stabilized power supply, - 6 V
- . 1 Stabilized power supply, + 5 V
- . 1 Stabilized power supply, + 9.5 V
- . 1 Stabilized power supply, - 22 V
- . 1 Stabilized power supply, adjustable from 0 to + 10 V
- . 1 Frequency meter, standard
- . 1 Oscilloscope
- . 1 Synthesizer
- . 3 Pulse generators, standard
- . 1 RF voltmeter

Tools

- 1 resistor, 50 Ω
- 1 resistor, 10 k Ω

PROCEDURE

1 - Preliminary Operations

- . Connect stabilized + 6 V power supply to terminal B11 of PC board assembly.
- . Connect stabilized + 3 V power supply to terminal A11 of PC board assembly.
- . Connect stabilized - 6 V power supply to terminals A2 and B7 of PC board assembly.
- . Connect stabilized + 9.5 V to terminal A5 of PC board assembly.
- . Connect stabilized - 20 V power supply to terminal B5 of PC board assembly.
- . Connect the common point of power supplies to terminals A1, A7, A9, A13, B1, B6, B8, B12 and B13 (chassis) of PC board assembly.

II - Operating procedure

The different operating procedures to be carried out are as follows :

- . Adjustment of VCO'.
- . Verification of primary loop mixer, divider by four and divider by ten or twelve.
- . Verification of digital-to-analog converter.
- . Verification of phase comparator.

(A) Adjusting the Voltage-Controlled Oscillator (VCO')

- (1) Set the stabilized power supply adjustable from 0 to + 10 V to 3.5 V.
- (2) Connect the adjustable stabilized power supply (set to 3.5 V) to test terminal TP01.
- (3) Connect the + 5 V stabilized power supply to test terminal TP02.
- (4) Connect the frequency meter, oscilloscope and HF voltmeter across a $50\ \Omega$ resistor connected to terminal A6 of PC board assembly.
- (5) Set capacitor C34 so as to obtain a signal frequency of 100.6 MHz as read off the frequency meter.

Check of the CDA varicap frequency coverage :

- (1) Set the stabilized power supply connected to TP01 (adjustable from 0 to + 10 V) so as to obtain a voltage of 0 V.
- (2) Check that signal frequency read off frequency meter is lower than 100.5 MHz (approximating 100.4 MHz).
- (3) Increase the value of voltage delivered by the adjustable power supply connected to TP01 so as obtain + 7.5 V while checking the signal frequency read off the frequency meter. Check that frequency is greater than 100.7 MHz (approximating 100.8 MHz).

Check of the phase loop varicap frequency coverage :

- (1) Set the stabilized power supply connected on TP01 to 3.5 volts.
- (2) Set the variable stabilized power supply connected on TP02 to 5 volts.
- (3) Check that the signal frequency on terminal A6 is 100.6 MHz.
- (4) Set the variable stabilized power supply connected on TP02 to 0 volt.
- (5) Check that the signal frequency on terminal A6 is less than 100.5 MHz.
- (6) Set the variable stabilized power supply connected on TP02 to 9.5 volts.
- (7) Check that the signal frequency on terminal A6 is greater than 100.7 MHz.
- (8) Disconnect :
 - . Variable power supply from test point TP01.
 - . Stabilized + 5 V power supply from test point TP02.

Number : C3

Folio : 3 of 5

Check of the phase loop varicap frequency slope :

- (1) Set adjustable power supply to + 5 V and connect it to test point TP02.
- (2) Connect the stabilized + 5 V power supply to test point TP01.
- (3) Note the value of signal frequency read off the frequency meter.
- (4) Vary the voltage delivered by power supply connected to test point TP02 by 1 V ; note the new value of signal frequency read off the frequency meter and check that the frequency deviation is greater than 20 kHz.
- (5) Disconnect :
 - . Adjustable power supply from test point TP02.
 - . + 5 V stabilized power supply from test point TP01.

Adjustment of the VCO' Amplifier :

- (1) Set stabilized power supply (adjustable from 0 to 10 V) to 3.5 V and connect the power supply to test point TP01.
- (2) Connect the + 5 V stabilized power supply to test point TP02.
- (3) Check for a signal frequency of 100.6 MHz off the frequency meter.
- (4) Set capacitor C31 so as to obtain maximum voltage as read off the oscilloscope and RF voltmeter. Said voltage shall be at least 100 mV.
- (5) Disconnect the frequency meter, oscilloscope, RF voltmeter and 50 Ω resistor from terminal A6 of PC board assembly.

(B) Checking the Primary Loop Mixer, Divider by Four, and Divider by Ten or Twelve

- (1) Adjust the VCO' as indicated in sub-paragraph A.
Set the stabilized power supply connected on TP01 to 3.5 volts.
- (2) Set the 0-10 V adjustable power supply connected on TP02 such that the signal frequency on terminal A6 is 100.6 MHz.
- (3) Connect synthesizer to terminal A8 of PC board assembly.
- (4) Set synthesizer so that it delivers an RF signal with 50 mV amplitude and 124.6 MHz frequency.
- (5) Connect frequency meter and oscilloscope to terminal A12 of PC board assembly.
- (6) Ground terminal B9 of PC board assembly (A1, A7, A9, A13, B1, B6, B8, B12 and B19).
- (7) Check that signal frequency read off frequency meter is of 600 kHz. Said frequency is obtained as follows : 124.6 MHz (primary loop heterodyne) less 100.6 MHz = 24 MHz at input of divider by four.
24 MHz : 40 = 600 kHz.
- (8) Check for a signal amplitude of 9 V p-p on the scope.
- (9) Disconnect short-circuit connecting terminal B9 of PC board assembly with the ground.
- (10) Connect the + 9.5 V power supply to terminal B9 of PC board assembly via the 10 k Ω resistor.

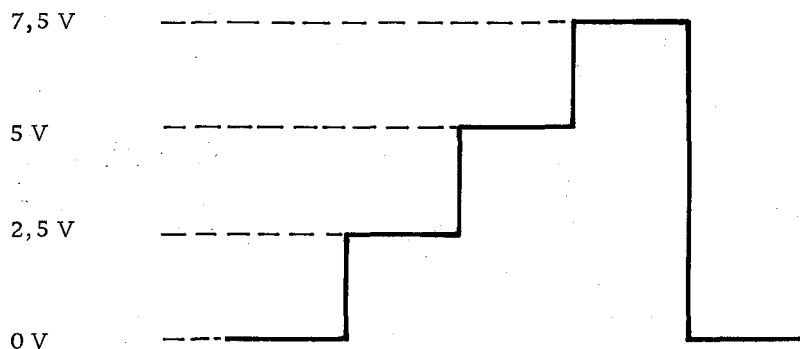
Number : C3

Folio : 4 of 5

- (11) Check for a signal frequency of 500 kHz off the frequency meter; said voltage is obtained as follows :
 $124.6 \text{ MHz (primary loop heterodyne)} - 100.6 \text{ MHz} = 24 \text{ MHz}$ at input of divider by four.
 $24 \text{ MHz} : 4 = 6 \text{ MHz}$ at output of divider by four.
 $6 \text{ MHz} : 12 = 500 \text{ kHz}$.
- (12) Check that signal amplitude read off the scope is of 9 V p-p.
- (13) Disconnect :
- . Oscilloscope
 - . Frequency meter
 - . Synthesizer
 - . Power supply, + 9.5 V, complete with resistor.

(C) Checking the Digital/Analog Converter

- (1) Adjust the VCO as indicated in sub-paragraph A.
- (2) Disconnect adjustable stabilized power supply from test point TP01.
- (3) Disconnect the + 5 V stabilized power supply from test point TP02.
- (4) Connect a pulse generator to terminal B3 of PC board assembly and adjust it so that it delivers positive signals with :
- . 3 μs duration
 - . 9.5 V amplitude positive
 - . 1 kHz repetition frequency.
- (5) Connect a pulse generator to terminal B2 of PC board assembly and adjust it so that it delivers positive signals with :
- . 3 μs duration
 - . 9.5 V amplitude positive
 - . 1.05 kHz repetition frequency.
- (6) Connect the oscilloscope to test point TP01.
- (7) Check on oscilloscope that displayed signal has the following waveform :



- (8) Disconnect the pulse generator from terminal B2 of PC board assembly.
- (9) Connect terminal B2 of PC board assembly to terminal B3.
- (10) Check on the scope that the signal is continuous and corresponds to one of 0, 2,5, 5 or 7.5 V steps.
- (11) Remove connection between terminals B2 and B3 of PC board assembly.

(12) Disconnect the pulse generator from terminal B3 of PC board assembly.

(13) Disconnect the oscilloscope from test point TP01.

(D) Checking the Phase Comparator

(1) Adjust the VCO as indicated in sub-paragraph A.

(2) Check that no stabilized power supply is connected to test points TP01 of TP02.

(3) Connect a pulse generator to terminal A3 of PC board assembly and set it so as to obtain negative signals with :

- . 3 μ s duration
- . 9.5 V amplitude negative
- . 1 kHz repetition frequency.

(4) Connect a pulse generator to terminal B2 of PC board assembly and set it so as to obtain positive signals with :

- . 3 μ s duration
- . 9.5 V amplitude positive
- . 1 kHz repetition frequency
- . Phase-shift varying with respect to that delivered by the pulse generator connected to terminal A3 of PC board assembly.

(5) Connect the oscilloscope to test point TP02.

(6) Check on scope that signal is continuous and within 0 and 9.5 V.

(7) Disconnect oscilloscope from test point TP02.

(8) Disconnect pulse generator from terminal B2 of PC board assembly.

(9) Disconnect pulse generator from terminal A3 of PC board assembly.

III - Final Operations

- . Disconnect the + 6 V stabilized power supply from terminal B11 of PC board assembly.
- . Disconnect the + 3 V stabilized power supply from terminal A11 of PC board assembly.
- . Disconnect the - 6 V stabilized power supply from terminals A2 and B7 of PC board assembly.
- . Disconnect the + 9.5 V stabilized power supply from terminals A5 of PC board assembly.
- . Disconnect the - 22 V stabilized power supply from terminal B5 of PC board assembly.
- . Disconnect the common point of power supplies from terminals A1, A7, A9, A13, B1, B6, B8, B12 and B13 (maximum) of PC board assembly.

<u>Assembly</u> : MAN PACK MK I and MK II <u>Subassembly</u> : 'SYNTHESIZER NO.2' PC BOARD ASSEMBLY	TEST DATA SHEET
	Number : C4 Folio : 1 of 5
<u>PURPOSE</u> : Verification of 'Synthesizer No. 2' PC Board Assembly	Personnel : 1 electronic technician
	Time :

FACILITIES

Documents

Plate 14

Test Equipment

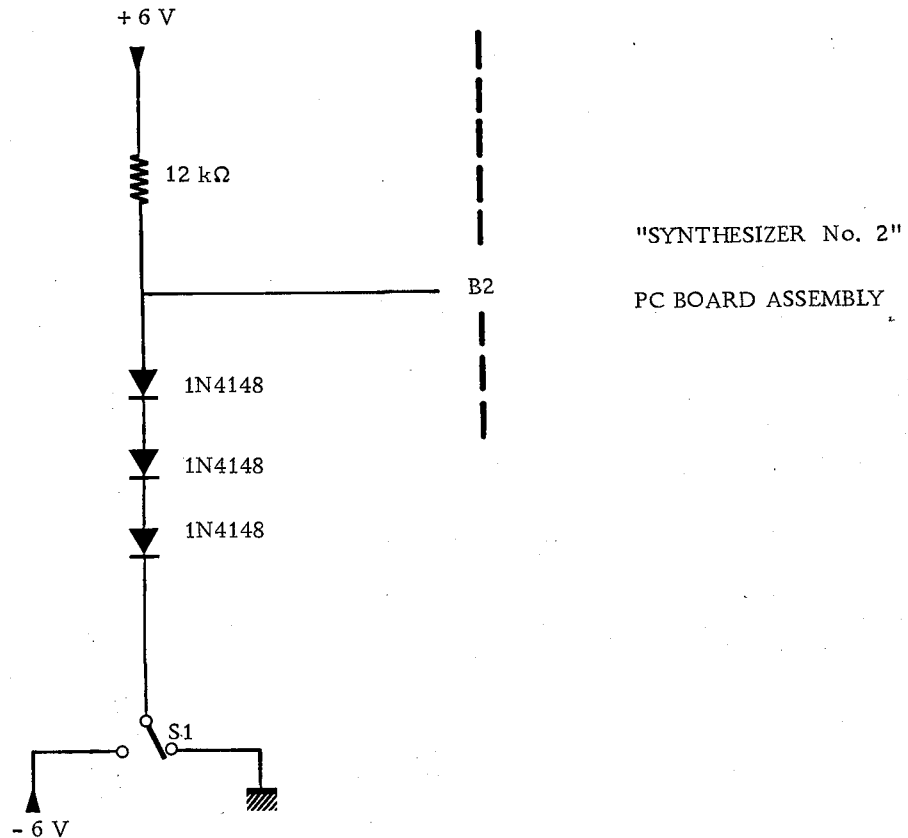
- . 1 Stabilized power supply, + 6 V
- . 1 Stabilized power supply, - 6 V
- . 1 Stabilized power supply, + 14.5 V
- . 1 Stabilized power supply, + 3 V
- . 1 Generator, 5 MHz
- . 1 HF voltmeter
- . 1 Frequency meter
- . 1 Pulse generator
- . 1 Digital voltmeter
- . 1 AF voltmeter

Tools

1 Resistor, 12 k Ω
 3 Diodes
 1 Changeover switch

PROCEDUREI - Preliminary Operations

(1) Carry out the following setup.



Check that setup is grounded via changeover switch S1.

- (2) Connect the + 3 V stabilized power supply to terminal A4 of PC board assembly.
- (3) Connect the + 14.5 V stabilized power supply to terminal A5 of PC board assembly.
- (4) Connect the - 6 V stabilized power supply to terminal A12 of PC board assembly.
- (5) Connect the common point of power supplies to terminals A1, A8, A10, A13, B1, B6, B7, B8 and B13 of PC board assembly (ground terminals).

II - Operating Procedure

The different operating procedures to be carried out are as follows :

- . Verification of 9.5 V voltage stabilizer.
- . Verification of divider by 2
- . Verification of divider by 100
- . Verification of divider by 25
- . Verification of digital/analog converter
- . Verification of frequency discriminator.

NOTE : The various verifications of the 'Synthesizer No.2' PC board assembly shall be carried out systematically in the order indicated above.

(A) Checking the 9.5 V Voltage Stabilizer

- (1) Connect digital voltmeter to terminal B5 of PC board assembly.
- (2) Check that d.c. voltage read off digital voltmeter is within + 9.025 and + 9.975 V.
If need be, adjust value of resistor R08 so as to obtain a d.c. voltage within this range.
- (3) Disconnect digital voltmeter from terminal B5 of PC board assembly.

(B) Checking the Divider by Two

- (1) Connect 5 MHz a.c. generator to terminal B4 of PC board assembly.
- (2) Set 5 MHz a.c. generator so as to obtain a signal of 220 mV r.m.s. sine with an impedance of 50 Ω .
- (3) Connect HF voltmeter and frequency meter to terminal A2 of PC board assembly in 50 Ω impedance.
- (4) Connect the - 6 V power supply to external setup by means of changeover switch S1 and check that voltage read off the HF voltmeter is lower than 5 mV.
- (5) Ground external setup by means of changeover switch S1.
- (6) Check that :
 - . Voltage read off the HF voltmeter is at least 50 mV.
 - . Frequency read off the frequency meter is equal to 2.5 MHz.
- (7) Disconnect the HF voltmeter and frequency meter from terminal A2 of PC board assembly.
- (8) Disconnect external setup from terminal B2 of PC board assembly.

(C) Checking the Divider by 100

- (1) Connect oscilloscope to test point TP01.
- (2) Check on scope that :
 - . Pulse amplitude is of 9.5 V
 - . Pulse repetition frequency is of 25 kHz.
 - . Duration of pulses is within 1.6 μ s and 2.4 μ s.
- (3) Disconnect oscilloscope from test point TP01.

(D) Checking the Divider by 25

- (1) Connect oscilloscope to terminal A6 of PC board assembly.
- (2) Check on scope that :
 - . Pulses are positive
 - . Pulse amplitude is of 9.5 V
 - . Pulse repetition frequency is of 1 kHz

Number : C4

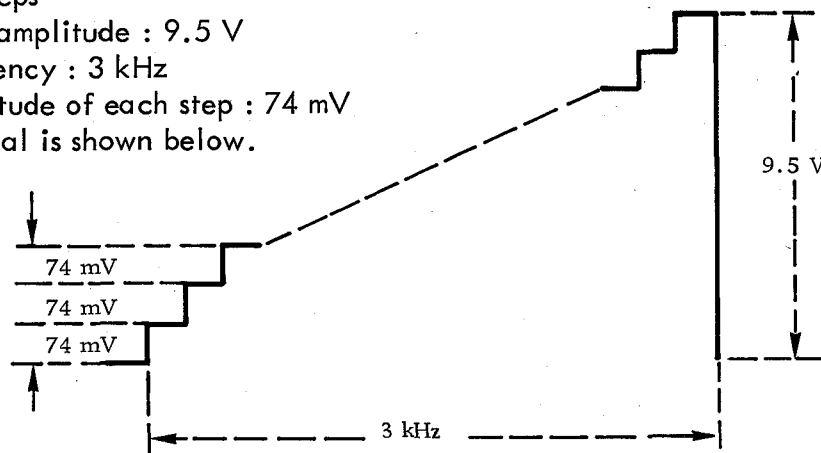
Folio : 4 of 5

. Pulse duration is within $1.4 \mu\text{s}$ and $2.1 \mu\text{s}$.

- (3) Disconnect oscilloscope from terminal A6 and connect it to terminal A7 of PC board assembly.
- (4) Check on scope that :
 - . Pulses are negative
 - . Pulse amplitude is of 9.5 V
 - . Pulse repetition frequency is of 1 kHz
 - . Pulse duration is within $1.4 \mu\text{s}$ and $2.3 \mu\text{s}$.
- (5) Disconnect oscilloscope from terminal A7 of PC board assembly.
- (6) Connect the AF voltmeter to terminal B9 of PC board assembly.
- (7) Check that voltage read off the AF voltmeter is of 100 mV .
- (8) Disconnect the audio voltmeter.

(E) Checking the Digital/Analog Converter

- (1) Connect a pulse generator to terminal A9 of PC board assembly.
- (2) Trigger the oscilloscope by means of 5 MHz generator and adjust the pulse generator as follows :
 - . Amplitude : 9.5 V
 - . Pulse repetition frequency : 28 kHz
 - . Pulse duration : 1.6 to $2 \mu\text{s}$
- (3) Connect oscilloscope to terminal B10 of PC board assembly.
- (4) Check on scope that signal characteristics are as follows :
 - . 128 steps
 - . Total amplitude : 9.5 V
 - . Frequency : 3 kHz
 - . Amplitude of each step : 74 mV
 The signal is shown below.

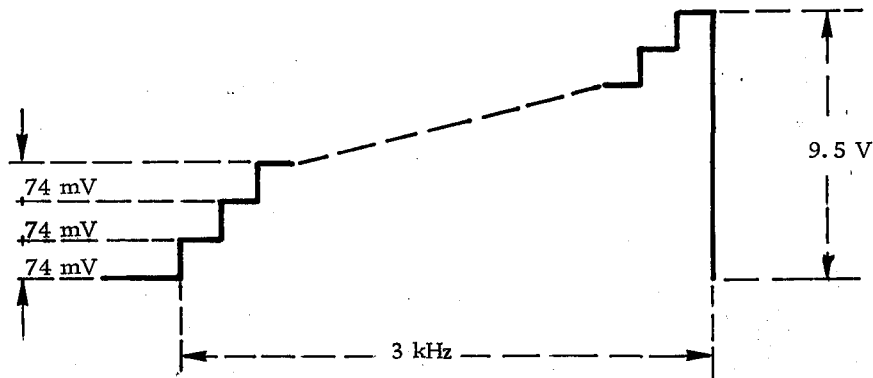


- (5) Set the pulse generator as follows :
 - . Amplitude : 9.5 V
 - . Pulse repetition frequency : 22 kHz
 - . Pulse duration : 1.6 to $2 \mu\text{s}$.
- (6) Check on the scope that signal characteristics are as follows :
 - . 128 steps
 - . Total amplitude : 9.5 V
 - . Frequency : 3 kHz

Number : C4

Folio : 5 of 5

. Amplitude of each step : 74 mV.
The signal is shown below :



(7) Set the pulse generator as follows :

- . Amplitude : 9.5 V
 - . Pulse repetition frequency : 25 kHz
 - . Pulse duration : 1.6 to 2 μ s.
- Check on scope for a d.c. signal within 0 and 9.5 V.

(F) Checking the Phase Discriminator

- (1) Check that pulse generator repetition frequency is of 25 kHz.
- (2) Disconnect oscilloscope from terminal B10 and connect it to terminal B12 of PC board assembly.
- (3) Check that signal displayed on scope is continuous and within 0 and + 8.9 V by varying the pulse generator phase versus the 5 MHz reference.
- (4) Disconnect :
 - . Oscilloscope from terminal B12
 - . Pulse generator from terminal B9
 - . Pulse generator from terminal B4 of PC board assembly.

III - Final Operations

- (1) Disconnect the external setup from terminal B2 of PC board assembly.
- (2) Disconnect the +3 V stabilized power supply from terminal A4 of PC board assembly.
- (3) Disconnect the + 14.5 V stabilized power supply from terminal A5 of PC board assembly.
- (4) Disconnect the - 6 V stabilized power supply from terminal A12 of PC board assembly.
- (5) Disconnect the common point of stabilized power supplies from terminals A1; A8, A10, A13, B1, B6, B7, B8 and B13 of PC board assembly (ground terminals).

Assembly : MAN-PACK MK I and MK II Subassembly : 'AF' PC BOARD ASSEMBLY	TEST DATA SHEET
	Number : C5 Folio : 1 of 8
<u>PURPOSE</u> : Verification of 'AF' PC Board Assembly	Personnel : 1 Electronic Technician
	Time :

FACILITIES
Documents

Plates 26A and
26B

Test Equipment

- . 1 Stabilized power supply
+ 10 V
- . 1 Stabilized power supply
+ 6 V
- . 1 Stabilized power supply
+ 3 V
- . 1 Stabilized power supply
- 6 V
- . 1 Stabilized power supply
+ 14.5 V
- . 1 AF generator
- . 1 Distortion meter
- . 1 Oscilloscope
- . 1 Voltmeter with an input
impedance greater than
10 M Ω
- . 1 Voltmeter or multimeter

Tools

1 Remote control unit

PROCEDUREI - Preliminary Operations

Connect the common point of stabilized power supplies to terminals A1 , A20, B1 and B20 of PC board assembly.

II - Operating Procedure

The different operating procedures to be carried out are as follows :

- (A) Verification of + 5 V stabilized power supply.
- (B) Verification of transmission/reception switching and MORSE control
- (C) Verification of AF amplifier
- (D) Verification of remote control

(A) Checking the + 5 V Stabilized Power Supply

- (1) Connect the + 10 V stabilized power supply to terminal A3 of PC board assembly.
- (2) Connect the + 6 V stabilized power supply to terminal A8 of PC board assembly.
- (3) Connect a d.c. voltmeter to terminal A7 of PC board assembly.
- (4) Check that voltage read off the voltmeter is within + 4.5 and 5.5 V
- (5) Disconnect the d.c. voltmeter from terminal A7 of PC board assembly.
- (6) Disconnect the + 6 V stabilized power supply from terminal A8 of PC board assembly.
- (7) Disconnect the + 10 V stabilized power supply from terminal A3 of PC board assembly.

(B) Checking the Transmission/Reception Switching and MORSE Control

(B-a) Preliminary Operations

- (1) Check the + 5 V stabilized power supply as indicated in sub-paragraph A.
- (2) Connect the + 10 V stabilized power supply to terminal A3 of PC board assembly.
- (3) Connect the + 6 V stabilized power supply to terminals A8 and A13 of PC board assembly.

(B-b) Checking the Transmission/Reception Switching (Beginning of Cycle)

- (1) Check that terminal A14 is not connected.
- (2) Connect terminal B12 to terminals A1, A20, B1 and B20 of PC board assembly (chassis terminals).
- (3) Connect the d.c. voltmeter to terminal A9 of PC board assembly and check that voltage read off the voltmeter approximates 0 V.
- (4) Disconnect the d.c. voltmeter from terminal A9 and connect it to terminal B6 of PC board assembly ; check that voltage read off the d.c. voltmeter is lower than or equal to 0.5 V.
- (5) Disconnect the d.c. voltmeter from terminal B6 and connect it to terminal B8 of PC board assembly ; check that voltage read of d.c. voltmeter is equal or greater than 5.7 V.
- (6) Disconnect terminal B12 from terminals A1, A20, B1 and B20 of PC board assembly and connect it to terminal A7 of same board ; check that voltage read off the voltmeter connected to B8 approximates 2 V.
- (7) Disconnect the d.c. voltmeter from terminal B8 and connect it to terminal B6 of PC board assembly ; check that voltage read off the d.c. voltmeter approximates 5 V.
- (8) Disconnect the d.c. voltmeter from terminal B6 and connect it to terminal A9 of PC board assembly ; check that voltage read off the d.c. voltmeter approximates 6 V.

(B-c) Checking the Transmission/Reception Switching (Pressel Switch)

- (1) Connect terminal A14 to terminals A1, A20, B1 and B20 of PC board assembly (ground terminals).
- (2) Check that voltage read off the voltmeter on terminal A9 approximates 6 V.
- (3) Disconnect the d.c. voltmeter from terminal A9 and connect it to terminal B6 of PC board assembly ; check that voltage read off d.c. voltmeter approximates 0 V.
- (4) Disconnect d.c. voltmeter from terminal B6 and connect it to terminal B8 of PC board assembly ; check that voltage read off d.c. voltmeter approximates 2 V.
- (5) Disconnect :
 - . Voltmeter from terminal B8 of PC board assembly
 - . Terminal A14 from terminals A1, A20, B1 and B20 of PC board assembly
 - . Terminal B12 from terminals A1, A20, B1 and B20 of PC board assembly.

(B-d) Checking the Transmission/Reception Time Constant

- (1) Connect the dual track oscilloscope as follows :
 - . Channel 'A' : terminal B8 of PC board assembly
 - . Channel 'B' : terminal A9 of PC board assembly.
- (2) Connect terminal A14 to terminals A1, A20, B1 and B20 of PC board assembly.
Check on scope that signal displayed on channel 'A' is delayed by more than 100 ms approximately with respect to signal displayed on channel "B" on grounding of terminal A14.
- (3) Disconnect :
 - . Channel 'A' of oscilloscope from terminal B8 of PC board assembly.
 - . Channel 'B' of scope from terminal A9 of PC board assembly.
 - . **Terminal A14** from terminals A1, A20, B1 and B20 of PC board assembly.

(B-e) Final Operations

- . Disconnect the + 6 V power supply from terminals A8 and A13 of PC board assembly.
- . Disconnect the + 10 V stabilized power supply from terminal A3 of PC board assembly.

(C) Checking the AF Amplifier(C-a) Preliminary Operations

- (1) Check the + 5 V stabilized power supply as indicated in sub-paragraph A.
- (2) Connect the + 10 V power supply to terminals A3 and A16 of PC board assembly.
- (3) Connect the + 6 V stabilized power supply to terminals A8 and B3 of PC board assembly.

- (4) Connect the - 6 V power supply to terminal B18 of PC board assembly.
- (5) Short-circuit terminals A5 and B19 of PC board assembly.

(C-b) Checking the Amplifier in A3H or SSB

- (1) Set potentiometer R88 for maximum efficiency.
- (2) Connect distortion meter as a voltmeter in a 300Ω impedance to terminal B16 of PC board assembly.
- (3) Connect an AF generator to terminal B5 of PC board assembly.
- (4) Set the AF generator for
 - . A signal frequency of 1 kHz
 - . A voltage of 1.7 V r.m.s. as read off the distortion-meter (voltmeter).
 The voltage of signal from the AF generator shall be lower than or equal to 2.5 mV.
- (5) Connect a voltmeter with a high input impedance (greater than $10 M\Omega$) to terminal B14 of PC board assembly and note the value of voltage read off the voltmeter.
- (6) Disconnect voltmeter from terminal B14 and connect it to terminal B19 ; check that voltage read off the voltmeter is substantially equal to that measured at terminal B14.
Disconnect the high impedance voltmeter from terminal B19.
- (7) Set the distortion meter so as to measure the distortion level ; this shall be lower than or equal to max. 3 %.
- (8) Set the distortion meter so that it operates as a voltmeter.
- (9) Increase the frequency of signal delivered by the AF generator until the voltage read off the voltmeter is of 1.2 r.m.s. (3 dB) and note the value of frequency F1.
- (10) Reduce the frequency of signal delivered by the AF generator until the voltage read off the voltmeter is again equal to 1.2 V r.m.s. (3 dB).
Note the value of frequency F2.
Check that the frequency difference ΔF corresponding to equation
$$\Delta F = F1 - F2$$
 is greater than 2.7 kHz.
- (11) Set AF generator so as to obtain a signal frequency of 1 kHz.

(C-c) Checking the Squelch

- (1) Short-circuit terminal B2 and terminals A1 , A20 , B1 and B20 of PC board assembly (ground terminals).
- (2) Check that voltage read off voltmeter approximates 0 V.
- (3) Disconnect the short-circuit connecting terminal B2 to terminals A1 , A20 , B1 and B20 of PC board assembly.

(C-d) Checking the Local Monitoring Control

- (1) Short-circuit terminal A6 and terminals A1 , A20 , B1 and B20 of PC board assembly (ground terminals).

- (2) Check that voltage read off voltmeter approximates 0 V.
- (3) Disconnect the short-circuit between terminal A6 and terminals A1, A20, B1 and B20 of PC board assembly.

(C-e) Checking the Amplifier in MORSE Mode

- (1) Connect the - 6 V stabilized power supply to terminal A2 of PC board assembly.
- (2) Short-circuit terminals A7 and B10 of PC board assembly.
- (3) Check that potentiometer R88 is at maximum of efficiency.
- (4) Check that frequency of signal from AF generator is of 1 kHz.
- (5) Set the value of signal from the AF generator so that voltage read off the distortion meter be of 1.7 V r.m.s.

The voltage of signal from the AF general shall be lower than or equal to 5 mV.

- (6) Increase the frequency of signal from AF generator until the voltage displayed on the voltmeter is of 0.85 V r.m.s. (6dB) and note the value of frequency F3.
- (7) Reduce the frequency of signal from AF generator until voltage read off voltmeter is again equal to 0.85 V r.m.s. (6 dB) ; note the value of frequency F4 and check that frequency difference ΔF corresponding to equation $\Delta F = F3 - F4$ is greater than 300 Hz.

(C-f) Final Operations

- (1) Disconnect the AF generator from terminal B5 of PC board assembly.
- (2) Disconnect the distortion meter from terminal B16 of PC board assembly.
- (3) Disconnect short-circuits from terminals :
 - . A7 and B10
 - . A5 and B19 of PC board assembly.
- (4) Disconnect the - 6 V stabilized power supply from terminals A2 and B18 of PC board assembly.
- (5) Disconnect the + 6 V stabilized power supply from terminals A8 and B3 of PC board assembly.
- (6) Disconnect the + 10 V stabilized power supply from terminals A3 and A16 of PC board assembly.

(D) Checking the Remote Control

(D-a) Preliminary Operations

- (1) Check the + 5 V stabilized power supply as indicated in sub-paragraph A.
- (2) Check the transmission/reception switching and MORSE control as indicated in sub-paragraph B.
- (3) Check the amplifier as indicated in sub-paragraph C.

Number : C5

Folio : 7 of 8

- (4) Connect terminal B15 of PC board assembly to one of connecting terminals of a remote control unit.
- (5) Connect terminal A15 of PC board assembly to one of connecting terminals of a remote control unit.
- (6) Short-circuit terminals A5 and B19 of PC board assembly.
- (7) Connect the + 14.5 V stabilized power supply to terminal A12 of PC board assembly.
- (8) Connect the + 10 V stabilized power supply to terminals A3 and A16 of PC board assembly.
- (9) Connect the + 6 V stabilized power supply to terminals A8, A13 and A18 of PC board assembly.
- (10) Connect the - 6 V stabilized power supply to terminal B18 of PC board assembly.

(D-b) Checking on Reception

- (1) Connect the + 6 V stabilized power supply to terminal B3 of PC board assembly.
- (2) Connect the distortion meter (set as a voltmeter in a 300 Ω impedance) to terminal B16 of PC board assembly.
- (3) Connect an AF generator to terminal B5 of PC board assembly.
- (4) Set the AF generator so as to obtain :
 - . A signal frequency of 1 kHz
 - . A voltage of 1.7 V r.m.s. as read off the distortion meter (voltmeter).
- (5) Disconnect the distortion meter with a 300 Ω impedance from terminal B16 of PC board assembly and connect it to the earphones connector of the remote control unit.
Check that voltage read off the distortion meter approximates 1.7 V r.m.s.
- (6) Connect a voltmeter to terminal B8 of PC board assembly and check that voltage read off the voltmeter approximates 5.7 V.
- (7) Disconnect :
 - . Voltmeter from terminal B8 of PC board assembly
 - . Distortion meter from 'earphones' connector of remote control unit
 - . AF generator from terminal B5 of PC board assembly.

(D-c) Checking the call Signal

- (1) Connect oscilloscope to terminal B16 of PC board assembly.
- (2) Disconnect the connection between terminal A15 of PC board assembly and one of connecting terminals of the remote control unit.
- (3) Check that characteristics of signal displayed on scope are as follows :
 - . Frequency : 2.7 kHz approximately
 - . Amplitude : 2 V p-p approximately
- (4) Disconnect oscilloscope from terminal B16 of PC board assembly.

- (5) Connect terminal A15 of PC board assembly to connecting terminal of remote control unit.

(D-d) Checking on Transmission

- (1) Short-circuit terminals 2 and 3 of remote control unit connector J01.
- (2) Disconnect the + 6 V stabilized power supply to terminal B3 of PC board assembly.
- (3) Connect the - 6 V stabilized power supply to terminal B3 of PC board assembly.
- (4) Connect distortion meter used as a voltmeter in a 300 Ω impedance to 'earphones' connector of remote control unit.
- (5) Connect AF generator to terminal A19 of PC board assembly.
- (6) Set the AF generator so as to obtain :
 - . Signal frequency of 1 kHz
 - . Voltage of 150 mV r.m.s. as read off the distortion meter (voltmeter).
 Check that voltage of signal from AF generator is less than 10 mV.
- (7) Connect a voltmeter to terminal B8 of PC board assembly and check that voltage read off the voltmeter approximates 2 V.
- (8) Disconnect :
 - . Voltmeter from terminal B8 of PC board assembly.
 - . Distortion meter from 'earphones' connector of remote control unit.
 - . AF generator from terminal B19 of PC board assembly.

(D-e) Final Operations

- (1) Disconnect terminals A15 and B15 of PC board assembly from the remote control unit.
- (2) Disconnect short-circuit connecting terminals A5 and B19 of PC board assembly.
- (3) Disconnect the + 14.5 V stabilized power supply from terminal A12 of PC board assembly.
- (4) Disconnect the + 10 V stabilized power supply from terminals A3 and A16 of PC board assembly.
- (5) Disconnect the + 6 V stabilized power supply from terminals A8, A13 and A18 of PC board assembly.
- (6) Disconnect the - 6 V stabilized power supply from terminals B3 and B18 of PC board assembly.
- (7) Disconnect the short-circuit connecting terminals 2 and 3 of remote control unit connector J01.

III - Final Operations

Disconnect the common point of stabilized power supplies from terminals A1, A20, B1 and B20 of PC board assembly (ground terminals).

<u>Assembly :</u> MAN-PACK MK I and MK II <u>Subassembly :</u> "FILTER AND 2.5 MHz IF" PC BOARD ASSEMBLY	TEST DATA SHEET <u>Number :</u> C6 <u>Folio :</u> 1 of 7							
<u>PURPOSE :</u> Verification of "Filter and 2.5 MHz IF" PC Board Assembly	<u>Personnel :</u> 1 electronic technician <u>Time :</u>							
<p><u>FACILITIES</u></p> <table border="1"> <thead> <tr> <th><u>Documents</u></th> <th><u>Test Equipment</u></th> <th><u>Tools</u></th> </tr> </thead> <tbody> <tr> <td> Plate 25 </td> <td> <ul style="list-style-type: none"> . 1 Stabilized power supply, -6 V . 1 Stabilized power supply, +5 V . 1 Stabilized power supply, +10 V . 1 Stabilized power supply, +6 V . 1 Spectrum analyzer, fitted with a tracking generator . 1 RF Generator . 1 AF Vacuum-tube voltmeter . 1 Generator, fixed frequency . 1 Frequency meter . 1 Distortion meter </td> <td></td> </tr> </tbody> </table>			<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>	Plate 25	<ul style="list-style-type: none"> . 1 Stabilized power supply, -6 V . 1 Stabilized power supply, +5 V . 1 Stabilized power supply, +10 V . 1 Stabilized power supply, +6 V . 1 Spectrum analyzer, fitted with a tracking generator . 1 RF Generator . 1 AF Vacuum-tube voltmeter . 1 Generator, fixed frequency . 1 Frequency meter . 1 Distortion meter 	
<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>						
Plate 25	<ul style="list-style-type: none"> . 1 Stabilized power supply, -6 V . 1 Stabilized power supply, +5 V . 1 Stabilized power supply, +10 V . 1 Stabilized power supply, +6 V . 1 Spectrum analyzer, fitted with a tracking generator . 1 RF Generator . 1 AF Vacuum-tube voltmeter . 1 Generator, fixed frequency . 1 Frequency meter . 1 Distortion meter 							

PROCEDUREI - Preliminary Operations :

- (1) Connect common point of power supplies to terminals A1, A11, A12, A20, B1, B3 to B12 and B20 of PC board assembly (ground terminals).
- (2) Connect +ve of 5 V stabilized power supply to terminal A10 of PC board assembly.
- (3) Connect -ve of - 6 V stabilized power supply to terminal A7 of PC board assembly.
- (4) Connect the +ve of + 6 V stabilized power supply to terminals A6 and B16 of PC board assembly.
- (5) Connect the +ve of +10 V stabilized power supply to terminal B14 of PC board assembly.

II - Operating Procedure :

- (A) Adjusting the SSB and MORSE Filter and Checking the Gain in Transmission
- (B) Adjusting the A3H Filter
- (C) Checking the SSB Reception
- (D) Checking the A3H Reception
- (E) Adjusting the HF Head AGC

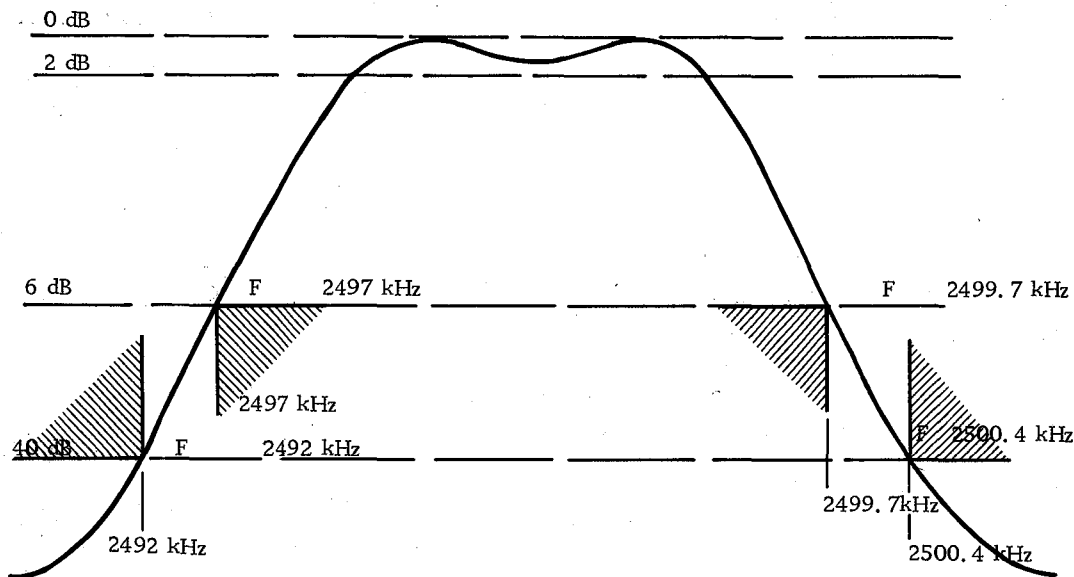
(A) Adjusting the SSB and MORSE Filter and Checking the Gain in Transmission(a) Switching in "Transmission"

- (1) Connect terminal A15 (0V transmission) of PC board assembly to one of ground terminals A1, A11, A12, A20, B1, B3 to B13 or B20 of PC board assembly.
- (2) Connect terminal A4 (+ 6 V transmission) of PC board assembly to terminal A6 or B16 of same PC board assembly.

(b) Adjusting the SSB and MORSE Filter

- (1) Connect tracking generator output to terminal A5 of PC board assembly. Set tracking generator as follows :
 - . Level : - 30 dBm approx.
 - . Frequency : 2.5 MHz, wobbled
- (2) Connect spectrum analyzer input to terminal A14 of PC board assembly.
- (3) Adjust T02 and T03 for a response curve with the following parameters as read off the analyzer :
 - . Ripple : < 2 dB
 - . 6 dB Attenuation : (1) Upper frequency : ≥ 2499.7 kHz
(2) Lower frequency : ≤ 2497 kHz
 - . 40 dB Attenuation : (1) Upper frequency : ≤ 2500.4 kHz
(2) Lower frequency : ≥ 2492 kHz

Said curve is shown below :



- (4) Disconnect analyzer input from terminal A14 of PC board assembly.
- (5) Disconnect tracking generator output from terminal A5 of PC board assembly.

(c) Checking the Gain in Transmission

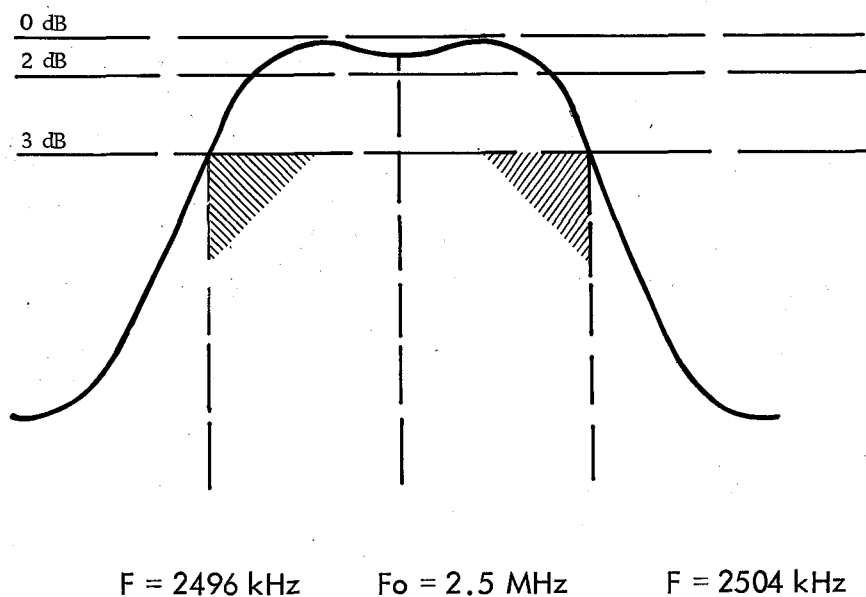
- (1) Connect RF generator to terminal A5 of PC board assembly
- (2) Set RF generator as follows :
 - . Level : - 30 dBm
 - . Frequency : 2499 kHz
- (3) Connect the high impedance HF voltmeter to terminal A14 of PC board assembly
- (4) Check that gain $\left(\frac{V_o}{V_i}\right)$ is greater than or equal to 0 dBm
- (5) Disconnect the high impedance voltmeter from terminal A14 of PC board assembly.
- (6) Disconnect RF generator from terminal A5 of PC board assembly
- (7) Disconnect terminal A15 of PC board assembly from ground terminals A1, A11, A12, A20, B1, B3 to B13 or B20 of PC board assembly.
- (8) Disconnect terminal A4 of PC board assembly from terminals A6 or B16 of said PC board.

(B) Adjusting the A3H Filter

- (1) Connect terminal A13 (-6 V A3) of PC board assembly to terminal A7 of same PC board.
- (2) Connect terminal A9 (+5 V A3) of PC board assembly to terminal A10 of same PC board.
- (3) Connect terminal A4 (+ 6 V transmission) of PC board assembly to terminal A6 or B16 of same PC board.

- (4) Connect terminal A15 (0 V transmission) of PC board assembly to one of the following terminals : A1, A11, A12, A20, B1, B3 to B12 or B20 (ground terminals).
- (5) Connect tracking generator output to terminal A3 of PC board assembly.
- (6) Set tracking generator so that it may deliver a wobbled signal with the following parameters :
 - . Level : - 30 dBm
 - . Reference frequency : 2.5 MHz
- (7) Connect analyzer input to terminal A14 of PC board assembly.
- (8) Set T01 for maximum voltage as read off the analyzer.
- (9) Set C25 and T04 so as to obtain a response curve with the following parameters as read off the analyzer :
 - . Ripple : lower than 2 dB
 - . 3 dB Attenuation : (1) Upper frequency : ≥ 2504 kHz
 - (2) Lower frequency : ≤ 2496 kHz

Said curve is shown below :

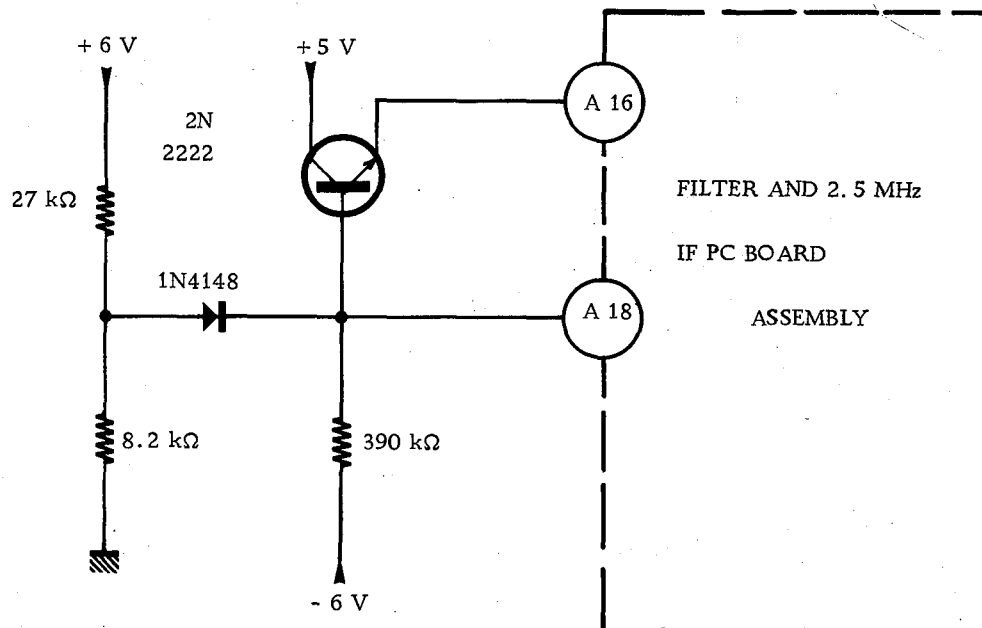


- (10) Disconnect analyzer input from terminal A14 of PC board assembly.
- (11) Disconnect tracking generator output from terminal A3 of PC board assembly.
- (12) Disconnect short-circuit between terminal A15 of PC board assembly and one of terminals A1, A11, A12, A20, B1, B3 to B12 or B20 (ground terminals) of same PC board assembly.
- (13) Disconnect short-circuit between terminal A4 and terminal A6 or B16 of PC board assembly.
- (14) Disconnect short-circuit between terminal A13 and terminal A7 of PC board assembly.
- (15) Disconnect short-circuit between terminals A9 and A10 of PC board assembly.

(C) Checking the SSB Reception

Note : Prior to checking the SSB reception adjust SSB filter (see sub-paragraph A) and A3H filter (see sub-paragraph C).

- (1) Short-circuit terminal A16 (AGC input) of PC board assembly and one of terminals A1, A11, A12, A20, B1, B3 to B12 or B20 (ground terminals) of same PC board.
- (2) Connect terminal A4 to terminal A7 of PC board assembly.
- (3) Connect terminal A15 (+ 6 V reception) to terminal A6 or B16 of PC board assembly.
- (4) Connect fixed frequency generator (2.5 MHz \pm 2.5 Hz) to terminal B18 of PC board assembly.
Set generator so that it delivers a signal with an amplitude of 100 mV r.m.s. (approx.)
- (5) Connect a frequency meter and an AF voltmeter to terminal A8 of PC board assembly.
- (6) Connect a d.c. voltmeter to terminal A18 of PC board assembly.
- (7) Connect an RF generator to terminal A3 of PC board assembly.
- (8) Set RF generator so as to obtain a signal with the following parameters :
 - . Amplitude : 15 μ V approx.
 - . Frequency : 2499 kHz
- (9) Check that :
 - . Frequency read off frequency meter is of 1 kHz
 - . Voltage reading off the AF voltmeter is at least 25 mV r.m.s. (approx.)
 - . Voltage reading off d.c. voltmeter is 1.2 V max. (AGC voltage)
- (10) Disconnect short-circuit between terminal A16 and one of terminals A1, A11, A12, A20, B1, B3 to B12 or B20 (ground terminals) of PC board assembly. Disconnect d.c. voltmeter from terminal A18.
- (11) Carry out the following setup :



- (12) Connect a distortion meter to terminal A8 of PC board assembly.
- (13) Set RF generator so as to obtain a signal with the following parameters :
 - . Amplitude : 200 μ V
 - . Frequency : 2499 kHz
- (14) Check that :
 - . Frequency read off frequency meter is of 1 kHz
 - . Voltage read off AF voltmeter is greater than or equal to 200 mV r.m.s.
 - . Distortion is lower than or equal to 5 %
- (15) Disconnect :
 - . Distortion meter
 - . Frequency meter from terminal A8 of PC board assembly
 - . AF voltmeter
- (16) Disconnect external circuitry connecting terminals A16 and A18 of PC board assembly.
- (17) Disconnect RF generator from terminal A3 of PC board assembly.
- (18) Disconnect fixed frequency generator (2.5 MHz) from terminal B18 of PC board assembly.
- (19) Disconnect :
 - . Short-circuit between terminal A15 and terminal A6 or B16 of PC board assembly.
 - . Short-circuit between terminal A4 and terminal A7 of PC board assembly.

(D) Left intentionally blank

(E) Adjusting the RF Head AGC

- (1) Connect terminal A16 (AGC) to terminal A18 of PC board assembly via the external setup mentioned in paragraph D ("Checking the SSB Reception").
- (2) Connect terminal A4 (- 6 V reception) to terminal A7 of PC board assembly.
- (3) Connect terminal A15 (+ 6 V reception) to terminal A6 or B16 of PC board assembly.
- (4) Connect the fixed frequency generator (2.5 MHz) to terminal B18 of PC board assembly.
Set generator so as to obtain a signal amplitude of 100 mV r.m.s. approx.
- (5) Connect RF generator to terminal A3 and set generator so as to obtain a signal with the following parameters :
 - . Amplitude : 200 μ V
 - . Frequency : 2499 kHz
- (6) Connect a d.c. voltmeter to terminal B17 of PC board assembly.
- (7) Adjust potentiometer R54 so as to obtain a voltage 2.7 V as read off the d.c. voltmeter.
- (8) Disconnect voltmeter from terminal B17 of PC board assembly.
- (9) Disconnect RF generator from terminal A3 of PC board assembly.
- (10) Disconnect the fixed frequency generator from terminal B18 of PC board assembly.

- (11) Disconnect short-circuit between terminal A15 and terminal A6 or B16 of PC board assembly.
- (12) Disconnect short-circuit between terminal A4 and terminal A7 of PC board assembly.
- (13) Disconnect external setup from terminals A16 and Q18 of PC board assembly.
- (14) Disconnect short-circuit between terminals A9 and A10 of PC board assembly.

III - Final Operations :

- (1) Disconnect
 - . The +ve of + 10 V stabilized power supply from terminal B14 of PC board assembly.
 - . The +ve of + 6 V stabilized power supply from terminals A6 and B16 of PC board assembly.
 - . The -ve of - 6 V stabilized power supply from terminal A7 of PC board assembly.
 - . The +ve of + 5 V stabilized power supply from terminals A9 and A10 of the PC board assembly.
- (2) Disconnect common point of the stabilized power supplies from terminals A1, A11, A12, A20, B1, B3 to B12 and B20 of PC board assembly (ground terminals).

<u>Assembly</u> : MAN-PACK MK I and MK II <u>Subassembly</u> : 20 W AMPLIFIER	TEST DATA SHEET <u>Number</u> : C7 <u>Folio</u> : 1 of 8
<u>PURPOSE</u> : Verification and Adjustment of 20 W Amplifier	<u>Personnel</u> : 1 electronic technician <u>Time</u> :

FACILITIES

Documents

Plate 29

Test Equipment

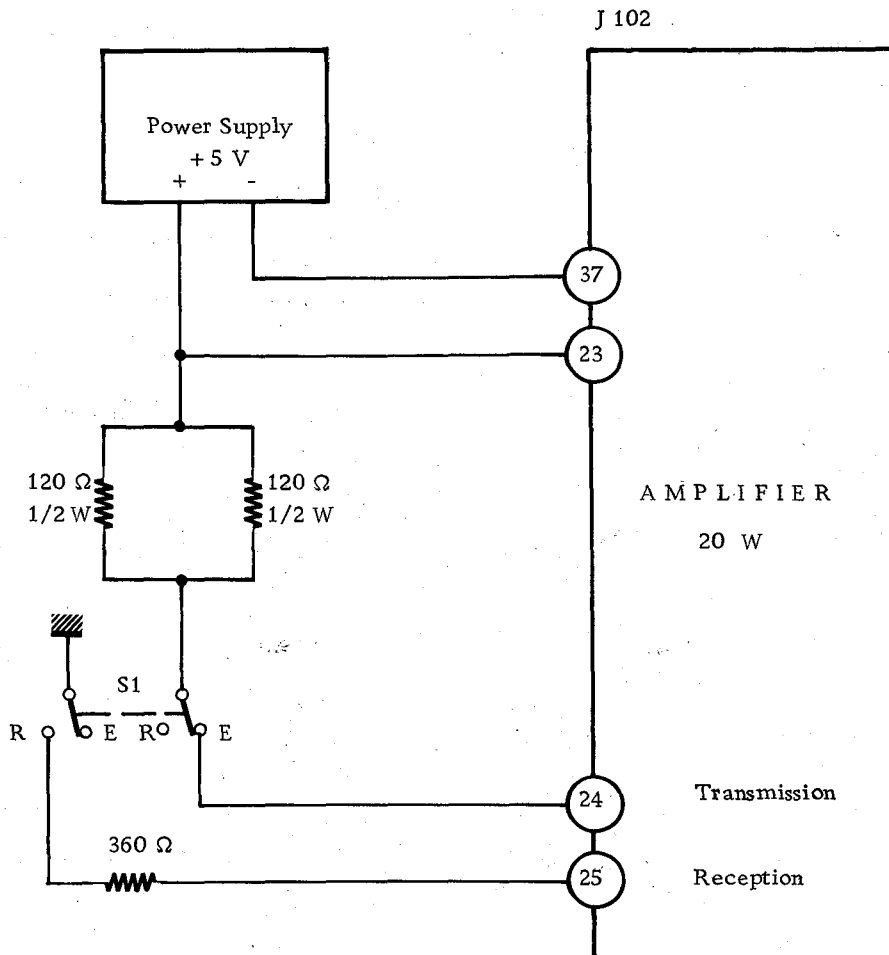
- . 1 Stabilized power supply, +5 V
- . 1 Stabilized power supply, -6 V
- . 1 Stabilized power supply, +10 V
- . 1 Stabilized power supply, +14.5 V
- . 1 Vacuum-tube voltmeter
- . 1 Ammeter with probe
- . 2 RF generators with couplers
- . 1 Wattmeter
- . 1 Spectrum analyzer

Tools

1 Screwdriver, 5 mm

PROCEDUREI - Preliminary Operations :

(1) Prepare the following setup :



(2) Check that changeover S1 is on "transmission" (position E)

II - Operating Procedure :

It is imperative to carry out the checks and adjustments in the order indicated hereafter :

- (a) Check and adjustment of power supply
- (b) Check and adjustment of bias currents
- (c) Check of amplifier
- (d) Check of intermodulation
- (e) Check of coupler
- (f) Check of operation in reception
- (g) Check of current measuring
- (h) Check of overdrive.

Number : C7

Folio : 3 of 8

(A) Checking and Adjusting the Power Supply

- (1) Disconnect the power supply strap (P7).
- (2) Disconnect the biasing straps (P1 and P2).
- (3) Connect -6V stabilized power supply to terminal 30 of connector J02 in the 20 W amplifier.
- (4) Connect +10V stabilized power supply to terminal 38 of connector J102 in 20 W amplifier.
- (5) Connect common point of -6V and + 10 V stabilized power supplies to terminal 37 of connector J102 in 20 W amplifier.
- (6) Connect a 14.5 V stabilized power supply to connector J101 of 20 W amplifier.

CAUTION : Observe the correct polarities.

- (7) Connect a d.c. voltmeter across terminals 29 (+) and 37 (-) of connector J102 in 20 W amplifier.
- (8) Check for a voltage of 13.2 V off d.c. voltmeter. If need be, adjust potentiometer R82 by means of the 5 mm screwdriver in order to obtain the 13.2 V.
- (9) Disconnect DC voltmeter from terminals 29 and 37 of connector J102 in 20 W amplifier.
- (10) Disconnect 14.5 V stabilized power supply from connector J101 in 20 W amplifier.
- (11) Disconnect +10 V stabilized power supply from terminals 38 and 37 of connector J102 in 20 W amplifier.
- (12) Disconnect -6 V stabilized power supply from terminals 30 and 37 of connector J102 in 20 W amplifier.
- (13) Put the power supply (P7) and biasing (P1 and P2) straps into place.
- (14) Connect -6 V stabilized power supply across terminals 30 (-) and 37 (+) of connector J102 in 20 W amplifier.
- (15) Connect +10 V stabilized power supply across terminals 38 (+) and 37 (-) of connector J102 in 20 W amplifier.
- (16) Connect 14.5 stabilized power supply to connector J101 of 20 W amplifier.

(B) Checking and Adjusting Bias Currents

- (1) Connect ammeter probe to strap (P3) located in transistor Q07 collector circuit. Note the value of bias current read off the ammeter.
- (2) Disconnect ammeter probe from strap P3 located in transistor Q07 collector circuit.
- (3) Connect ammeter probe to strap P4 located in transistor Q11 collector circuit. Note value of bias current read off the ammeter.
- (4) Check that :
 - . Bias current of transistors Q07 and Q11 are within 40 and 60 mA
 - . The sum of bias currents approximates 100 mA.
 If need be, adjust potentiometer R01 by means of the 5 mm screwdriver so as to obtain the above-mentioned values.

- (5) Connect ammeter probe to strap P5 located in transistor Q16 collector circuit. Note the value of bias current read off ammeter.
- (6) Disconnect ammeter probe from strap P5 located in transistor Q16 collector circuit.
- (7) Connect ammeter probe to strap P6 located in transistor Q17 collector circuit. Note value of bias current read off the ammeter.
- (8) Check that :
 - . Bias current of transistors Q16 and Q17 is within 40 to 60 mA
 - . Sum of all bias currents approximates 100 mA
 - If need by, adjust potentiometer R26 by means of 5 mm screwdriver so as to obtain above-mentioned values.
- (9) Disconnect ammeter.

IMPORTANT NOTE : If current from collector of a transistor is not within the specifications, DO NOT replace the faulty transistor alone. Always replace the transistors by matched pairs (Q07 and Q11 or Q16 and Q17).

(C) Check of Amplifier in Transmission

- (1) Check power supply (see para. A) and bias currents (see para. B).
 - (2) Connect an RF generator to terminal 17 of connector J102 in 20 W amplifier.
 - (3) Connect a wattmeter to connector J105 on 20 W amplifier (load impedance : 50 Ω).
 - (4) Adjust RF generator so as to obtain a frequency of 2 MHz. Adjust the RF generator output signal level so as to obtain a mean power of 10 W off the wattmeter.
- Compute ratio : $\frac{\text{Output Power}}{\text{Input Power}}$. This shall be equal or greater than 43 dB input power (0.5 mW maximum).
- (5) Connect ammeter probe to power supply input line of 20 W amplifier. Check for a power supply current value not exceeding 3A off the ammeter.
 - (6) Disconnect ammeter probe from power supply input line of 20 W amplifier.
 - (7) Connect ammeter probe to strap P3 of transistor Q07 collector circuit. Note the value of collector current as read off ammeter.
 - (8) Disconnect ammeter probe from strap P3 and connect it to strap P4 of transistor Q11 collector circuit. Note the value of collector current read off ammeter.
 - (9) Check that :
 - . Values of collector currents are equal, to within 20 mA.
 - (10) Disconnect ammeter probe from strap P4.
 - (11) Connect ammeter probe to strap P5 of transistor Q16 collector circuit. Note the value of collector current read off ammeter.

- (12) Disconnect ammeter probe from strap P5 and connect it with strap P6 of transistor Q17 collector circuit. Note the value of collector current as read off ammeter.
 - (13) Check that :
 - . Values collector currents are equal to within 200 mA.
 - (14) Disconnect ammeter probe from strap P6.
 - (15) Adjust RF generator so as to obtain a signal frequency of 30 MHz. Adjust RF generator output level so as to obtain a mean power of 10 W as read off wattmeter. Input power shall be within 0.5 and 2 mW.
- Compute ratio : $\frac{\text{Output Power}}{\text{Input Power}}$. This shall be equal or greater than 43 dB.
- (16) Connect ammeter probe to power supply input line of 20 W amplifier. Check for a power supply current value of 3.5 A maximum off the ammeter.
 - (17) Disconnect ammeter probe from strap P7 of 20 W amplifier.
 - (18) Connect ammeter probe to strap P3. Note collector current (Q07) off ammeter.
 - (19) Disconnect ammeter probe from strap P3 and connect it to strap P4. Note the collector current (Q11) reading off ammeter.
 - (20) Check that :
 - . Values of collector currents are equal, to within 20 mA.
 - (21) Disconnect ammeter probe from strap P4.
 - (22) Connect ammeter probe to strap P5 and note collector current (Q16) off ammeter.
 - (23) Disconnect ammeter probe from strap P5 and connect it to strap P6. Note value of collector current (Q17) off the ammeter.
 - (24) Check that :
 - . Values of collector currents are equal to within 200 mA.
 - (25) Disconnect ammeter probe from strap P6.
 - (26) Disconnect RF generator from terminal 17 of connector J102 on 20 W amplifier.
 - (27) Disconnect wattmeter from test connector J105 on 20 W amplifier.

(D) Checking the Intermodulation

- (1) Check :
 - . Power supply (see para. A)
 - . Bias current (see para. B)
 - . Amplifier (see para. C).
- (2) Using a coupler, connect two RF generators to terminal 17 of connector J102 on 20 W amplifier.
- (3) Connect a wattmeter loaded by $50\ \Omega$ to test connector J105.
- (4) Adjust the RF generators so that frequency of generated signals are 1 kHz apart. within the 25 and 30 MHz band.

- (5) Increase level of signal delivered by each RF generator so as to obtain a mean output power of 10 W.
- (6) Connect a spectrum analyzer via a coupler to test connector J105 and wattmeter. Check that intermodulation spectral lines are greater than 25 dB.
- (7) Disconnect spectrum analyzer from test connector J105.
- (8) Disconnect both generators fitted with coupler from terminal 17 of connector J102.

(E) Checking the Coupler

- (1) Check :
 - . Power supply (see para. A)
 - . Bias current (see para. B)
 - . Amplifier (see para. C).
- (2) Connect wattmeter to test connector J105.
- (3) Connect RF generator to terminal 17 of connector J102.
Adjust RF generator so as to obtain :
 - . Signal frequency : 2 MHz
 - . Signal level : 10 W mean power as read off wattmeter.
- (4) Connect a DC voltmeter across terminals 26 (+) and 37 (-) of connector J102 on 20 W amplifier. Check for a voltage approximating 1 V off the voltmeter (VD).
- (5) Disconnect DC voltmeter from terminals 26 (+) and 37 (-) of J102 and connect it across terminals 27 (+) and 37 (-) of connector J102.
Check for a voltage of 100 mV at most off the voltmeter (VR).
- (6) Proceed to same checks 3, 4 and 5 for a signal frequency of 30 MHz generated by RF generator the results must be similar.
- (7) Disconnect DC voltmeter from terminals 27 (+) and 37 (-) of connector J102 on 20 W amplifier.
- (8) Decrease the signal generator output level to a minimum.
- (9) Disconnect the wattmeter load from J105.
- (10) Connect the Ammeter probe to **power supply input line**.
- (11) Increase the signal generator level tuned to 2 MHz for a current of 2.5 A measured on the ammeter.
- (12) With the DC voltmeter connected to 27 of J102 measure the VR voltage, approximately 0.9 volts.
- (13) Repeat steps 11 and 12 but for a frequency of 30 MHz and 3 A measured on the ammeter, VR measured approximately 0.5 volts.
- (14) Decrease signal generator level to a minimum.
- (15) Disconnect DC voltmeter from pin 27 of J102.
- (16) Disconnect wattmeter from J105.
- (17) Disconnect RF generator from 17 of J102.

(F) Checking isolation of Tx/Rx switching device.

(1) Check :

- . Power supply (see para. A)
- . Collector current (see para. B)
- . Amplifier (see para. C)
- . Intermodulation (see para. D)
- . Coupler (see para. E).

(2) Connect wattmeter to test connector J105 of 20 W amplifier.

(3) Connect an RF generator to terminal 17 of connector J102 on 20 W amplifier. Adjust RF generator so as to obtain :

- . Signal frequency : 2 MHz
- . Signal level : 10 W mean power off wattmeter.

(4) Connect a low power wattmeter to terminal 1 of J102.

(5) Check for power less than 10 mW as read off wattmeter.

(6) Disconnect wattmeter from test terminal 1 of connector J102 on 20 W amplifier.

(7) Carry out the same checks for a frequency (signal delivered by RF generator) of 30 MHz.

(8) Disconnect :

- . Both wattmeters
- . RF generator from terminal 17 of connector J102.

(G) Check of current measuring

(1) Connect RF generator on terminal 17 of J102.

(2) Connect a DC voltmeter between terminals 22 (+) and 28 (-).

(3) Connect the ammeter probe to strap P7.

(4) Increase signal generator level tuned to 2 MHz for a current of 3 A measured on the ammeter.

(5) The voltage measured across pins 22 and 28 of J102 must be 0.33 volts.

(6) Disconnect ammeter :

- . Signal generator
- . DC voltmeter.

(H) Check of overdrive

(1) Connect a DC voltmeter between pin 31 (+) and 41 (-) of J102.

(2) Set the switch of the external set up to reception.

(3) Connect the ammeter probe to **power supply input line.**

(4) Connect the signal generator, tuned to 2 MHz, to terminal 17 of J102 and adjust the level for 3 volts read on the DC voltmeter connected to pins 31 and 41 of J102.

(5) Measure, the current on the ammeter which must, between 1 and 2 A.

(6) Repeat step 4 for a frequency of 30 MHz.

Number : C7

Folio : 8 of 8

- (7) Measure the current on the ammeter which must be between 3 and 4.5 A.
- (8) Disconnect : the signal generator :
 - . The DC voltmeter
 - . The ammeter probe.

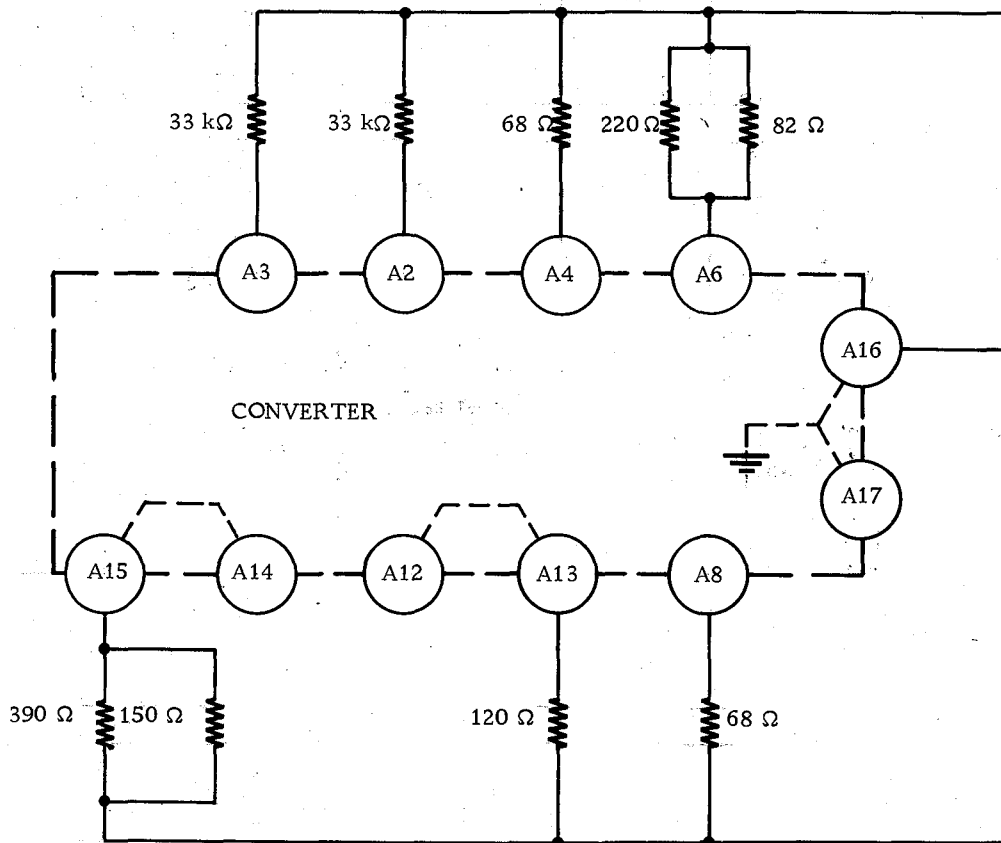
III - Final Operations

- (1) Disconnect :
 - . The - 6 V stabilized power supply from terminals 30 and 37 of connector J102 in 20 W amplifier
 - . The + 10 V stabilized power supply from terminals 38 and 37 of connector J102 in 20 W amplifier
 - . The + 14.5 V stabilized power supply from connector J101 of 20 W amplifier.
- (2) Disconnect 20 W amplifier external setup.

<u>Assembly :</u> MAN-PACK MK I and MK II <u>Subassembly :</u> CONVERTER UNIT	TEST DATA SHEET	
<u>PURPOSE :</u> Verification and Adjustment of Converter Unit	<u>Number :</u> C8 <u>Folio</u> : 1 of 6	
<u>FACILITIES</u> <u>Documents</u> Plate 31	<u>Test Equipment</u> . 1 Stabilized power supply, +14.5 V adjustable within +10V and +20V . 1 DC voltmeter	<u>Tools</u> . 1 Resistor, 82 Ω . 1 Resistor, 120 Ω . 1 Resistor, 150 Ω . 1 Resistor, 220 Ω . 1 Resistor, 390 Ω . 2 Resistors, 68 Ω . 2 Resistors, 33 k Ω

PROCEDUREI - Preliminary Operations

(1) Prepare the following setup :



(2) Connect the - ve of + 14.5 V stabilized power supply to terminal A16, A17, B2, B3 ... B18 or B19 (ground terminal).

(3) Connect the + ve of + 14.5 V stabilized power supply to terminal A18 or A19.

II - Operating Procedure

This paragraph deals with :

- (a) Adjustment and check of stabilizer.
- (b) Verification of converter unit.

(A) Adjusting and Checking the Stabilizer

(1) Connect a d.c. voltmeter across terminals A14 or A15 (+) and A6, A17, B2, B3 ... B18 or B19 (ground terminal).

Number : C8

Folio : 3 of 6

- (2) Adjust potentiometer R21 so as to obtain a voltage of + 9.9 to + 10.1 V as read off DC voltmeter. Said voltage is the reference voltage U_0 .
- (3) Adjust stabilized power supply connected across terminals A18 or A19 and A16, A17, B2, B3 ... B18 or B19 so as to obtain a voltage of + 12 V.
Check that voltage read off DC voltmeter is equal to U_0 (reference voltage) $\pm 1\%$.
- (4) Adjust stabilized power supply connected across terminals A18 or A19 and A16, A17, B2, B3 ... B18 or B19 so as to obtain a voltage of + 19 V.
Check that voltage read off DC voltmeter is equal to U_0 (reference voltage) to within 1%.
- (5) Adjust stabilized power supply connected across terminals A18 or A19 and A16, A17, B2, B3 ... B18 or B19 so as to obtain a voltage of 14.5 V.
Check that voltage read off DC voltmeter is equal to reference voltage U_0 (voltage within 9.9 and 10.1 V).

(B) Verification of Converter Unit

- (1) Disconnect DC voltmeter from terminals A14 or A15 and A16, A17, B2, B3 ... B18 or B19 (ground terminal).
- (2) Connect DC voltmeter across terminals A3 (-) and A16, A17, B2, B3 ... B18 or B19 (ground, + ve).
- (3) Check for a voltage within - 17.6 and - 26.4 V as read off DC voltmeter.
- (4) Disconnect DC voltmeter from terminal A3 (-) and connect it to terminal A2 (-).
- (5) Check for a voltage within - 17.6 and - 26.4 V as read off DC voltmeter.
- (6) Disconnect DC voltmeter from terminal A2 (-) and connect it to terminal A12 or A13 (-).
- (7) Check that voltage read off DC voltmeter is within - 5.7 and - 6.3 V.
- (8) Disconnect DC voltmeter from terminals A12 or A13 (-) and A16, A17, B2, B3 ... B18 or B19 (ground, + ve).
- (9) Connect DC voltmeter across terminals A4 (+ ve) and A16, A17, B2, B3 ... B18 or B19 (ground, - ve).
- (10) Check that voltage read off DC voltmeter is within 2.835 and + 3.165 V.
- (11) Disconnect DC voltmeter from terminal A4 and connect it to terminal A6.
- (12) Check that voltage read off DC voltmeter is within 2.835 and 3.165 V.
- (13) Disconnect DC voltmeter from terminal A6 and connect it to terminal A8.
- (14) Check that voltage read off DC voltmeter is within + 5.7 and 6.3 V.

Number : C8

Folio 4 of 6

- (15) Disconnect DC voltmeter from terminals A8 and A16, A17, B2, B3 ... B18 or B19 (ground, - ve).
- (16) Connect terminal A4 to one of terminals A16, A17, B2, B3 ... B18 or B19.
- (17) Check that converter unit is switched off.
- (18) Disconnect short-circuit between terminal A4 and one of terminals A16, A17, B2, B3 ... B18 or B19.
Check voltage readings off DC voltmeter as indicated in following table (table no. 1) :

Terminal + of DC voltmeter	Terminal - of DC voltmeter	Value to be Obtained
A16, A17, B2, B3 ... B18 or B19	A3	0 V approx.
	A2	
	A12 or A13	
A4	A16, A17, B2, B3 ... B18 or B19	
A6		
A8		
A14 or A15		

- (19) Disconnect + ve of + 14.5 V stabilized power supply then reconnect it with terminal A18 or A19.
- (20) Check that :
- . Converter is switched on
 - . Output voltages read off DC voltmeter are the same as those mentioned hereafter (table 2) :

Number : C8

Folio 5 of 6

Terminal + of DC voltmeter	Terminal - of DC voltmeter	Value to be Obtained (in volts)
A16, A17, B2, B3 ... B18 or B19	A3	within - 17.6 and - 26.4
	A2	within - 17.6 and - 26.4
	A12 or A13	within - 5.7 and - 6.3
A4	A16, A17, B2, B3 ... B18 or B19	within + 2.835 and + 3.165
A6		within + 2.835 and + 3.165
A8		within + 5.7 and + 6.3
A14 or A15		within + 9.9 and + 10.1

- (21) Connect terminal A6 to one of terminals A16, A17, B2, B3 ... B18 or B19.
- (22) Check that converter is not operating.
- (23) Disconnect short-circuit between terminal A6 and one of terminals A16, A17, B2, B3 ... B18 or B19.
Check output voltages read off DC voltmeter as indicated in table no. 1 above.
- (24) Disconnect the + ve of + 14.5 V stabilized power supply then reconnect it to terminal A18 or A19.
- (25) Check that :
- . Converter is switched on
 - . Output voltages read off DC voltmeter are the same as those mentioned in table no. 2.
- (26) Connect terminal A8 to one of terminals A16, A17, B2, B3 ... B18 or B19.
- (27) Check that converter is not operating.
- (28) Disconnect short-circuit between terminal A8 and one of terminals A16, A17, B2, B3 ... B18 or B19.
Check output voltages read off DC voltmeter as indicated in table no. 1.
- (29) Disconnect the + ve of + 14.5 V stabilized power supply then reconnect it to terminal A18 or A19.
- (30) Check that :
- . Converter is switched on
 - . Output voltages read off VTVM are the same as those mentioned in table no. 2.

- (31) Connect terminal A12 or A13 to one of terminals A16, A17, B2, B3 ... B18 or B19.
- (32) Check that converter is not operating.
- (33) Disconnect short-circuit between terminal A12 or A13 and one of terminals A16, A17, B2, B3 ... B18 or B19.
Check output voltages read off DC voltmeter as per table no. 1.
- (34) Disconnect the + ve of + 14.5 V stabilized power supply then reconnect it to terminal A18 or A19.
- (35) Check that :
- . Converter is switched on
 - . Output voltages read off DC voltmeter are the same as those mentioned in table no. 2.
- (36) Connect terminal A14 or A15 to one of terminals A16, A17, B2, B3 ... B18 or B19.
- (37) Check that converter is not operating.
- (38) Disconnect short-circuit between terminal A14 or A15 and one of terminals A16, A17, B2, B3 ... B18 or B19.
Check output voltages read off DC voltmeter as indicated in table no. 1.
- (39) Disconnect the + ve of + 14.5 V stabilized power supply then reconnect it to terminal A18 or A19.
- (40) Check that :
- . Converter is switched on
 - . Output voltages read off DC voltmeter are the same as those mentioned in table no. 2.
- (41) Disconnect DC voltmeter.

Note : Prior to any troubleshooting or fault-repair, check that voltage across test terminal TP01 and ground approximates + 20.6 V.
(Said voltage depends upon the load).

III - Final Operations

- (1) Disconnect the + ve of + 14.5 V stabilized power supply from terminal A18 or A19.
- (2) Disconnect the - ve of + 14.5 V stabilized power supply from terminal A16, A17, B2, B3 ... B18 or B19 (ground terminals).
- (3) Disconnect converter from external setup.

<u>Assembly :</u> MAN-PACK MK I and MK II <u>Subassembly :</u> "REMOTE CONTROL UNIT"	TEST DATA SHEET	
<u>PURPOSE :</u> Verification and Adjustment of Remote Control Unit	<u>Number :</u> C9 <u>Folio :</u> 1 of 5 <u>Personnel :</u> 1 electronic technician <u>Time :</u>	
<u>FACILITIES</u>		
<u>Documents</u> Plates 33A and 33B	<u>Test Equipment</u> <ul style="list-style-type: none"> . 1 Milliammeter . 1 AF Generator . 1 Stabilized power supply, 15 V . 2 AF Voltmeters 	<u>Tools</u> <ul style="list-style-type: none"> . 2 Loads, 600 Ω . 1 Resistor, 1 kΩ . 1 Capacitor

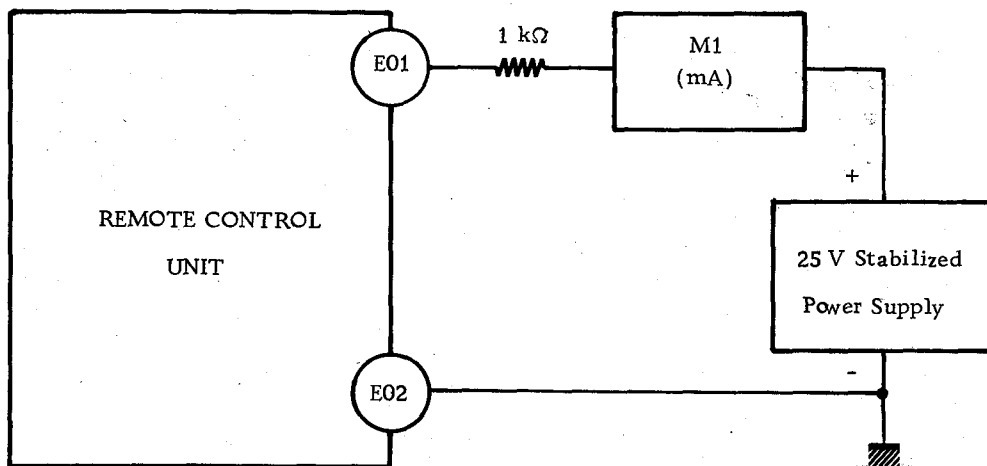
PROCEDURE

The following operations shall be carried out :

- (a) Adjustment of "transmit-receive" changeover
- (b) Check of transmit channel gain
- (c) Check of receive channel gain

(A) Adjusting the Transmit/Receive ChangeoverI - Preliminary Operations :

Prepare the following setup :

II - Operating Procedure :(a) Adjustment in Transmission Operation

- (1) Short-circuit terminals 2 and 3 of connector J01 on remote control unit
- (2) Adjust potentiometer R04 so as to obtain a current within 7.9 and 8.1 mA as read off milliammeter M1.
- (3) Disconnect short-circuit between terminals 2 and 3 of connector J01.

(b) Adjustment in Reception Operation

- (1) Check that terminal 2 of connector J01 is not connected (terminal "open-circuited").
- (2) Adjust potentiometer R06 so as to obtain a current within 3.9 and 4.1 mA as read off milliammeter M1.

Number : C9

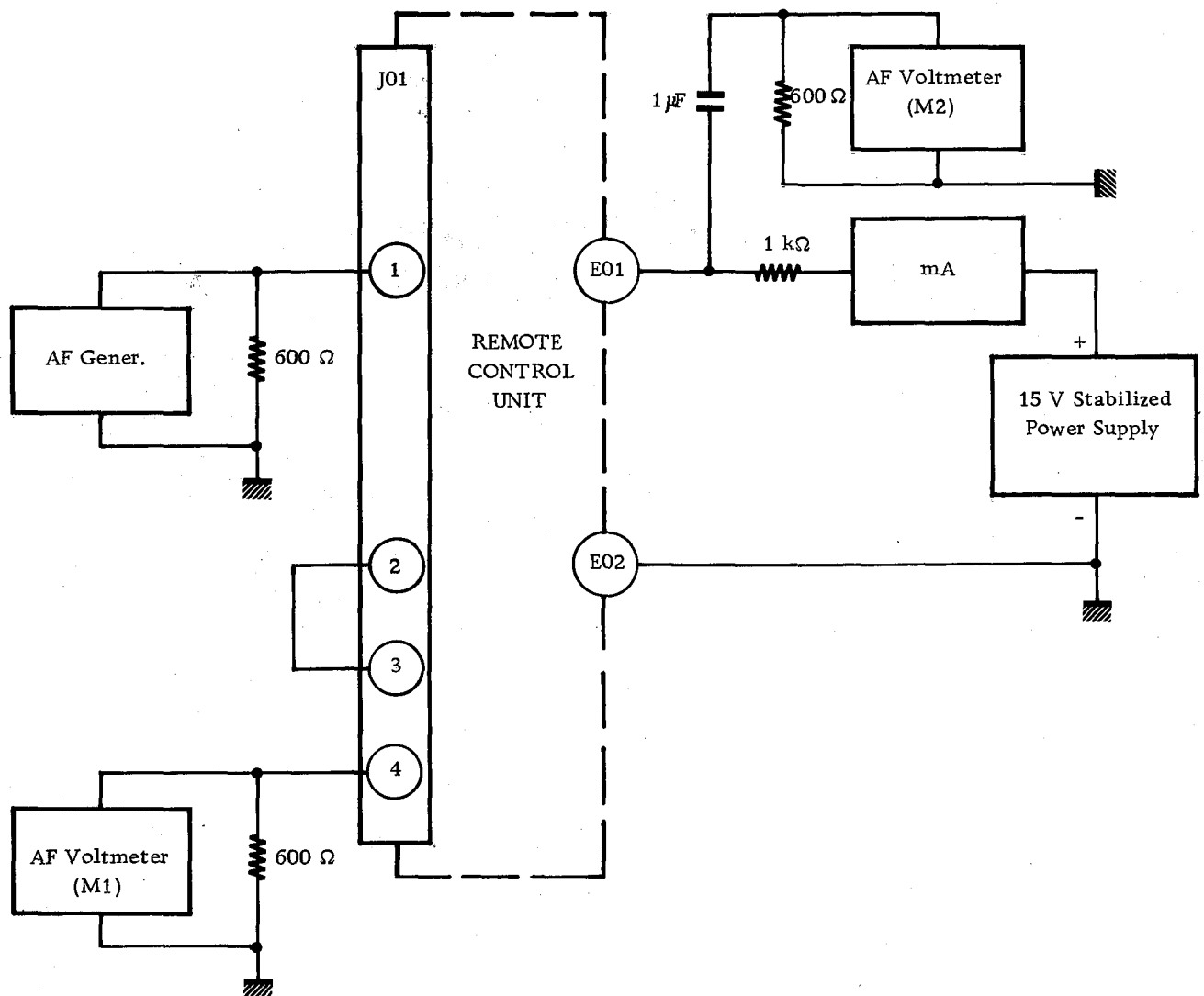
Folio : 3 of 5

III - Final Operation :

Disconnect remote control unit from external setup.

(B) Checking the Transmit Channel GainI - Preliminary Operations :

Prepare the following setup :



II - Operating Procedure :

(1) Adjust AF generator so as to obtain :

- . A signal frequency of 1 kHz
- . A signal level high enough to note :
 - . Voltage delivered by AF generator (U_0)
 - . Voltage read off AF voltmeter (M2) (U_1)

(2) Compute the gain between voltages U_1 and U_0 .

This shall be within 21 and 28 dB

(3) Adjust AF generator so as to obtain :

- . A signal frequency of 1 kHz
- . A signal level high enough to note :
 - . Voltage delivered by AF generator (U_2)
 - . Voltage read off AF voltmeter M1 (U_3)

(4) Compute the gain between voltages U_3 and U_2 .

This shall be within 14 and 25 dB

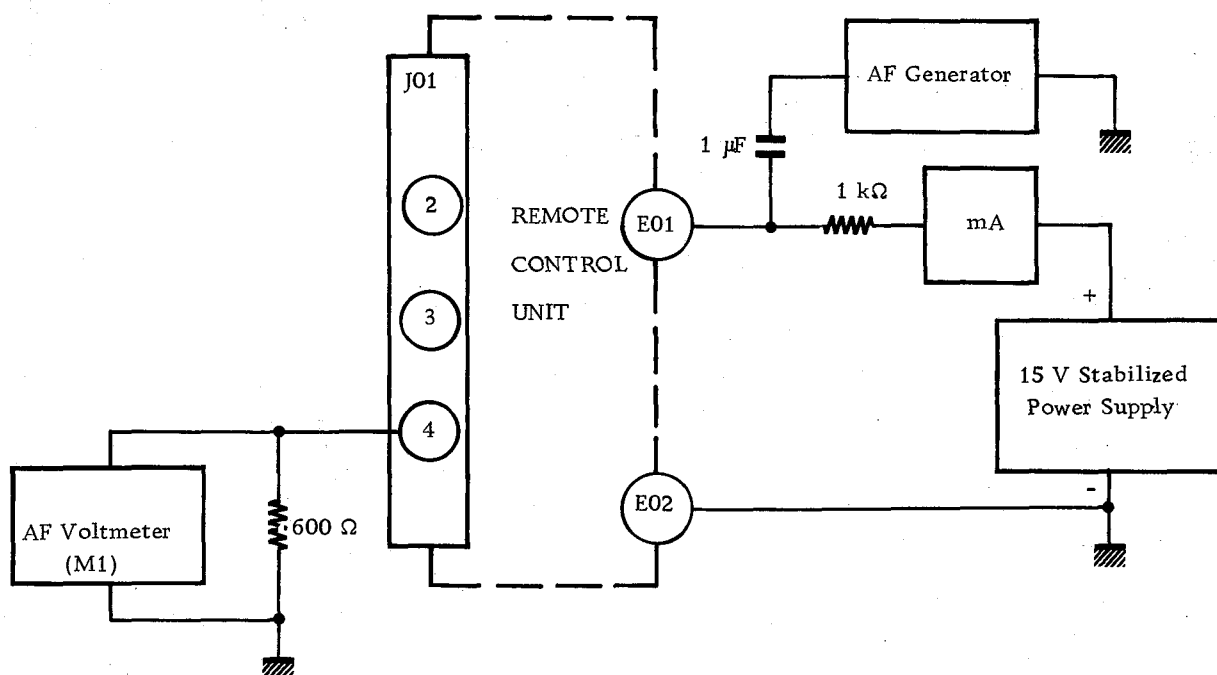
Check the call facility. Depress call switch : the current through the milliammeter must fall to zero.

III - Final Operation :

Disconnect remote control unit from external setup.

(C) Checking Receive Channel Gain :I - Preliminary Operations :

Prepare the following setup :



Number : C9

Folio : 5 of 5

II - Operating Procedure :

(1) Adjust AF generator so as to obtain :

- . A signal frequency of 1 kHz
- . A signal level high enough to note :
 - . Voltage delivered by AF generator (U_0)
 - . Voltage read off voltmeter M1 (U_1)

(2) Compute the gain between voltages U_0 and U_1 .

This shall be within -14 and -12 dB.

III - Final Operation :

Disconnect remote control unit from external setup.

<u>Assembly</u> : MAN-PACK MK I and MK II <u>Subassembly</u> : HF HEAD	TEST DATA SHEET <u>Number</u> : C10 <u>Folio</u> : 1 of 8
<u>PURPOSE</u> : Verification and Adjustment of RF Head	<u>Personnel</u> : 1 electronic technician <u>Time</u> :

FACILITIES

Documents

Plates 23A and 23B

Test Equipment

- . 1 Stabilized power supply,
+ 2.57 V
- . 2 Stabilized power supplies,
+ 6 V
- . 1 Stabilized power supply,
- 6 V
- . 1 Stabilized power supply,
+ 9.5 V
- . 1 Stabilized power supply,
+ 10 V
- . 1 Stabilized power supply,
- 22 V
- . 2 Stabilized power supplies,
adjustable within 0 to 10 V.
- . 1 HF voltmeter
- . 1 frequencymeter
- . 1 RF generator
- . 1 tracking generator

Tools

- . 1 Split connector,
with shorting links
- . 1 Man-Pack transceiver
with Synthesizer Unit

PROCEDURE

Verification and adjustment of the HF head consist in :

- . Checks and adjustment of the VCO
- . Checks and adjustment of transmit and receive channels.

Note : These require the use of a Man-Pack transceiver with a synthesizer unit in good operating condition.

(A) Checking and Adjusting the VCOI - Preliminary Operations

- (1) Check that terminals 2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 (ground terminals) are correctly connected. Connect them if need be.
- (2) Connect the +ve of +10 V stabilized power supply to terminal 8 of connector J01 in HF head. Connect the -ve of said power supply to ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (3) Connect the +ve of +9.5 V stabilized power supply to terminal 17 of connector J01 of HF head. Connect the -ve of said power supply to ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (4) Connect the -ve of -20 V stabilized power supply to terminal 4 of connector J01 in HF head. Connect the +ve of said power supply to ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (5) Connect a stabilized power supply adjustable from 0 to 10 V across terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 in the HF head. Said power supply simulates the VCO alignment voltage.
- (6) Connect a stabilized power supply adjustable from 0 to 10 V across terminals 5 (+) and 6 (-) or 7 of connector J01 in HF head. Said stabilized power supply simulates the VCO clamping voltage.
- (7) Connect a HF voltmeter and a frequency meter across terminals 9 and 10 or 11 (chassis) of connector J01 in HF head.

II - Operating Procedure(a) Adjustment in Upper Band

- (1) Adjust stabilized power supply connected across terminals 5 (+) and 6 (-) of connector J01 (control voltage simulation) so as to obtain a voltage of +1 V.
- (2) Adjust stabilized power supply connected across terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 (alignment voltage simulation) so as to obtain a voltage of 0 V.
- (3) Adjust inductor L405 so as to obtain a frequency of 121,480 and 121.520 MHz as read off the frequency meter. Check that voltage off HF voltmeter approximates 300 mV.
- (4) Adjust stabilized power supply connected across terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 (alignment voltage simulation) so as to obtain a voltage of 9 V and at 5 (+) and 6 (-) a voltage of 7 V.

(5) Check for :

- . A frequency of $134 \leq F \leq 134.5$ MHz off the frequency meter.
- . A voltage approximating 300 mV off the HF voltmeter.

(b) Check in Lower Band

- (1) Check that the stabilized power supply connected across terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 (alignment voltage simulation) delivers a voltage of 9 V.
- (2) Check that the stabilized power supply connected across terminals 5 (+) and 6 (-) of connector J01 (phase control voltage simulation) delivers a voltage of 4 V.
- (3) Connect terminal 13 of connector J01 to ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (4) Check for :
 - . A frequency greater than ≥ 124 MHz off the frequency meter.
 - . A voltage approximating > 250 mV off the HF voltmeter.
- (5) Adjust the stabilized power supply connected across terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 (alignment voltage simulation) so that it delivers a voltage of 0 V.
- (6) Check for :
 - . A frequency less than 100.5 MHz off the frequency meter.
 - . A voltage approximating > 250 mV off the HF voltmeter.
- (7) Disconnect HF voltmeter from terminal 9 of connector J01 and connect it to terminal "S HET" on the HF head VCO unit.
- (8) Check that voltage read off HF voltmeter is greater than 1.5 V.
- (9) Disconnect HF voltmeter from "S HET" terminals and ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (10) Disconnect short-circuit between terminal 13 of connector J01 and ground terminals (2, 3, 6, 7, 10, 11, 12, 22, 24, 26 and 28 of connector J01).

NOTE : Above-mentioned values allow for the effect of HF head shield when in situ.

II - Final Operations

- (1) Disconnect frequency meter from terminals 9 and 10 of connector J01 in HF head.
- (2) Disconnect :
 - . Stabilized power supply from terminals 5 (+) and 6 (-) of connector J01.
 - . Stabilized power supply from terminals 1 (+) and 3 (-) or 1 (+) and 2 (-) of connector J01 in HF head.
- (3) Disconnect :
 - . -ve of -22 V stabilized power supply from terminal 4 of connector J01.
 - . +ve of -22 V stabilized power supply from ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).
- (4) Disconnect :
 - . +ve of +9.5 V stabilized power supply from terminal 17 of connector J01.
 - . -ve of +9.5 V stabilized power supply from ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).

Number : C10

Folio : 4 of 8

(5) Disconnect :

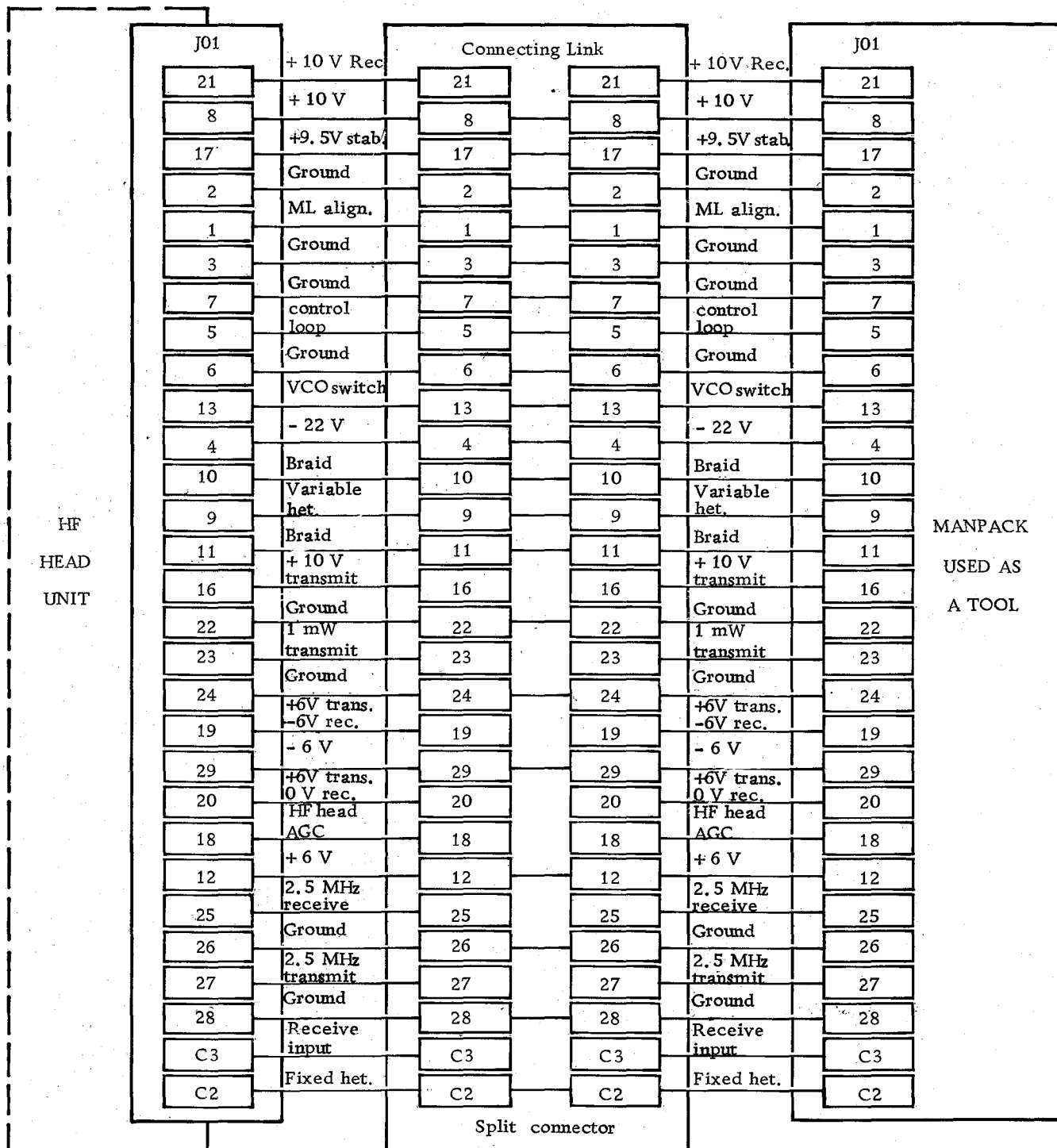
- . +ve of +10 V stabilized power supply from terminal 8 of connector J01
- . -ve of +10 V stabilized power supply from ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01).

- (6) If need be, put ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of connector J01) in their initial configuration.

(B) Adjustment and Checking of "Transmit-Receive" Channel

I - Preliminary Operations

Prepare the following setup, using the split connector and a Man-Pack transceiver as tools.



11 - Operating Procedure

(a) Adjustment and Check of Receive Channel

- (1) Check that terminals 2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 (ground terminals) are properly connected. If not, connect them.
- (2) Connect the + ve of + 10 V stabilized power supply to terminal 21 of split connector (HF head side). Connect the - ve of same power supply to terminal 2 of the split connector.
- (3) Connect the + ve of + 6 V stabilized power supply to terminal 19 and 20 of the split connector (HF head side). Connect the - ve of same power supply with ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of the split connector on HF head side).
- (4) Only for the B version. Adjust R328 for a current in the 10 volts supply line between 9 and 11 mA.
- (5) Connect an HF generator across terminal C3 of the split connector (HF head side) and ground terminals 2, 3, 6, 7, 10, 11, 22, 24, 26 and 28 of the split connector on HF head side).
- (6) Connect a HF voltmeter terminating in $50\ \Omega$ across terminal 25 of the split connector (HF head side) and ground terminal 26 of the split connector.
- (7) Switch the Man-Pack transceiver used as a "tool".
- (8) Select 02.500 MHz by means of frequency selectors located on Man-Pack transceiver.
- (9) Set HF generator as follows :
 - . Signal frequency = 2.5 MHz
 - . Signal level (U_0) = 2 mV.
- (10) Set :
 - . Variable capacitors C344, C222, C235, C246
 - . Variable inducor L203
 - . Cores of transformers T203 and T306 so as to obtain maximum voltage off the HF voltmeter (voltage U_1).

N.B. - Only for B version ; adjust L01 for a maximum read off the HF voltmeter.

- (11) Compute the gain of receive channel using the following formula :

$$G = 20 \log \frac{U_1}{U_0}$$

The gain should approximate 30 dB.

- (12) Connect the + ve of 2.57 V stabilized power supply to connector terminal 18 (AGC) of split connector (HF head side). Connect - ve of same stabilized power supply to terminal 26 of the split connector (HF head side).
- (13) Set potentiometer R214 so as to obtain a receive channel gain of 24 dB

$$G = 20 \log \frac{U_1}{U_0}$$

Number : C10

Folio : 6 of 8

- (14) Disconnect 2.57 V stabilized power supply from terminals 18 and 26 of split connector (HF head side).
- (15) Select 29.999 MHz by means of pushbuttons located on Man-Pack transceiver used as a "tool".
- (16) Set HF generator as follows :
 - . Signal frequency = 29.999 MHz
 - . Signal level = 2 mV
- (17) A version :
Adjust C306 for a maximum reading of the HF voltmeter .

B version :
Adjust L301, L303, L305 and L306 for a maximum reading of the HF voltmeter.
- (18) Switch off the Man-Pack transceiver.
- (19) Disconnect HF voltmeter terminating in 50 Ω from terminals 25 and 26 of the split connector.
- (20) Disconnect HF generator from terminal C3 and ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28) of the split connector.
- (21) Disconnect + 6 V stabilized power supply from terminal 20 and ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28) of the split connector.
- (22) Disconnect + 6 V stabilized power supply from terminal 19 and ground terminals (2, 3, 6, 7, 10, 11, 22, 24, 26 and 28) of split connector.
- (23) Disconnect + 10 V stabilized power supply from terminals 21 and 2 of the split connector.

(b) Adjustment and Check of Transmit Channel

- (1) Connect the + ve of + 10 V stabilized power supply to terminal 16 of the split connector (HF head side). Connect the - ve of said power supply to terminal 22 of the split connector (HF head side).
- (2) Connect the - ve of - 6 V stabilized power supply to terminal 19 of the split connector (HF head side). Connect the + ve of said power supply to terminal 24 of the split connector (HF head side).
- (3) This step is not necessary.
- (4) Connect tracking generator output across terminals 27 (signal) and 28 (chassis) of the split connector (HF head side).
- (5) Connect :

<ul style="list-style-type: none"> . A frequency meter . A HF voltmeter . Spectrum analyzer input 	}	Across terminals 23 and 22 or 23 and 24 of the split connector (HF head side).
--	---	--

Note : Overall matching impedance presented by the measuring instruments shall be equal to 50 Ω .

- (6) Set tracking generator so as to obtain a signal with :
 - . Frequency aligned with 2.5 MHz (as read off frequency meter).
 - . Amplitude equal to 14 mV (U_0).

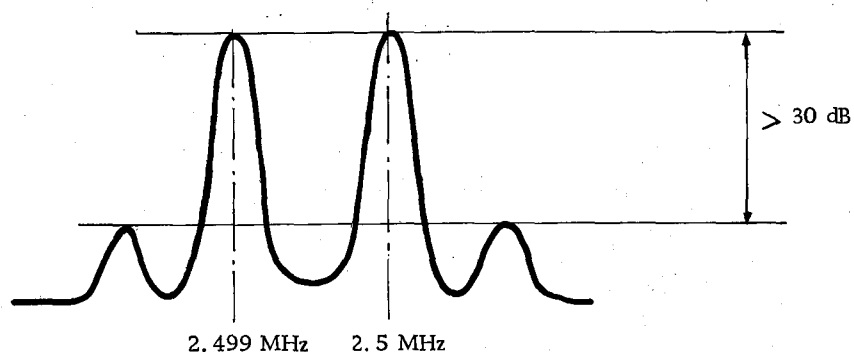
- (7) Switch "ON Man-Pack transceiver used as a tool".
- (8) Select 02.500 MHz by means of frequency selectors located on transceiver.
- (9) Set :
- . Variable capacitor C223
 - . Variable inductors L311, L312, L313, L314
 - . Core of transformer T204
- } So as to obtain maximum voltage off the HF voltmeter (U_1).
- (10) Compute the transmit channel gain using the formula

$$G = 20 \log \frac{U_1}{U_0}$$

The gain should approximate 24 dB.

Note : If need be, adjust resistor R231 so as to obtain this gain value.

- (11) Wobulate frequency of signal from tracking generator about 2.5 MHz (with a constant signal amplitude of 14 mV).
- (12) Check on spectrum analyzer that the filter parameters are as follows :
- . Variation in the band : ≤ 2 dB (if need be, adjust capacitor C223)
 - . Passband at 3 dB ≥ 6.5 kHz
 - . Passband at 40 dB ≥ 25 kHz.
- (13) Disconnect the tracking generator.
- (14) Connect two RF generator across terminals 27 (signal) and 28 (chassis) of split connector RF head side).
- (15) Set RF generator so as to obtain a signal with :
- . Frequency of 2.499 MHz and 2.5 MHz.
 - . Level of 10 mV.
- (16) Check on spectrum analyzer that wave form displayed is identical with that shown below :



If need be, adjust resistor R231 so as to obtain a level greater than 30 dB (see fig. above).

- (17) Note the value of voltage read off HF voltmeter (U').
- (18) Check that gain computed by means of formula $G = 20 \log \frac{U'}{10 \text{ mV}}$ is greater than 24 dB.
- (19) Disconnect the one RF generator from terminals 27 and 28 of the split connector (HF head side).

Number : C10

Folio : 8 of 8

- (20) Set the remaining RF generator so as to obtain a signal with :
- . Frequency aligned with 29.999 MHz
 - . Amplitude equal to 10 mV (U_2).
- (21) Select 29.999 MHz by means of frequency selector on the Man-Pack transceiver used as a "tool".
- (22) Note the value of voltage read off HF voltmeter (U_3).
- (23) Compute the gain, using formula : $G = 20 \log \frac{U_3}{U_2}$
Said gain should approximate 24 dB.
- (24) Switch off the transceiver.
- (25) Disconnect :
- . Frequency meter
 - . HF voltmeter
 - . Tracking generator input
- } from terminals 23 and 22 or 23 and 24 of the split connector (HF head side)
- (26) Disconnect tracking generator output from terminals 27 and 28 of the split connector (HF head side).
- (27) Disconnect short-circuit between terminal 20 of the split connector (HF head side) and ground terminals (2, 3, 6, 7, 10, 11, 22, 23, 24, 26 and 28 of the split connector ; HF head side).
- (28) Disconnect the -6 V stabilized power supply from terminals 19 and 24 of the split connector (HF head side).
- (29) Disconnect the +10 V stabilized power supply from terminals 16 and 22 of the split connector (HF head side).

III - Final Operations

Disconnect the HF head unit and the Man-Pack transceiver from the split connector.

<u>Assembly</u> : MAN - PACK MK I and MK II <u>Subassembly</u> : BATTERY UNIT	TEST DATA SHEET							
<u>PURPOSE</u> : Verification and Adjustment of Battery Unit	<u>Number</u> : C11 <u>Folio</u> : 1 of 3 <u>Personnel</u> : 1 electronic technician <u>Time</u> :							
<u>FACILITIES</u> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;"><u>Documents</u></th> <th style="text-align: left;"><u>Test Equipment</u></th> <th style="text-align: left;"><u>Tools</u></th> </tr> </thead> <tbody> <tr> <td> Plate 32 </td> <td> <ul style="list-style-type: none"> . 1 Stabilized power supply, adjustable within 5 V and 40 V. . 1 Ammeter. . 1 DC voltmeter . 1 Stabilized power supply, +15 V. . 1 Stabilized power supply, +16 V. </td> <td> <ul style="list-style-type: none"> . 1 Load resistor, 25 Ω. </td> </tr> </tbody> </table>			<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>	Plate 32	<ul style="list-style-type: none"> . 1 Stabilized power supply, adjustable within 5 V and 40 V. . 1 Ammeter. . 1 DC voltmeter . 1 Stabilized power supply, +15 V. . 1 Stabilized power supply, +16 V. 	<ul style="list-style-type: none"> . 1 Load resistor, 25 Ω.
<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>						
Plate 32	<ul style="list-style-type: none"> . 1 Stabilized power supply, adjustable within 5 V and 40 V. . 1 Ammeter. . 1 DC voltmeter . 1 Stabilized power supply, +15 V. . 1 Stabilized power supply, +16 V. 	<ul style="list-style-type: none"> . 1 Load resistor, 25 Ω. 						

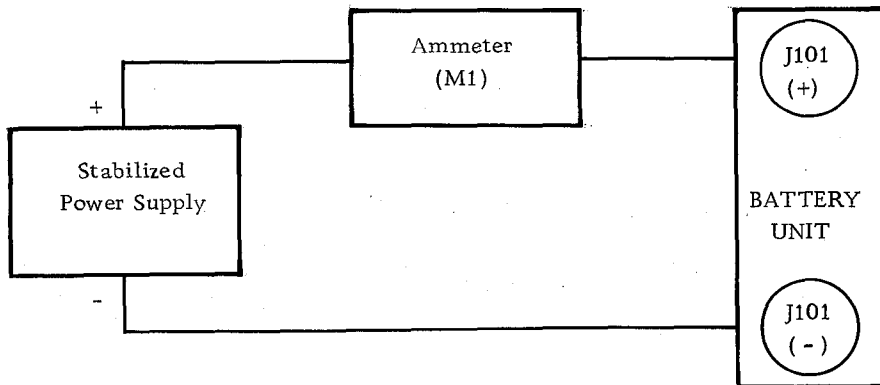
PROCEDURE

Operations shall be carried out in the following order :

- (a) Check of battery unit
- (b) Opening of battery unit
- (c) Disassembly of charger
- (d) Opening of charger
- (e) Adjustment of charger alone

(A) Checking the Battery Unit1 - Input Check

(1) Prepare the following setup :



- (2) Adjust stabilized power supply so that it delivers a voltage of 32 V.
- (3) Check that current read off ammeter approximates 300 mA.
- (4) Adjust stabilized power supply so that it delivers a voltage of 10 V.
- (5) Check that current read off ammeter M1 approximates 1.1 A.
- (6) Adjust stabilized power supply so that it delivers a voltage of 9 V.
- (7) Check for a current approximating zero off ammeter M1.
- (8) Adjust stabilized power supply so that it delivers a voltage of 15 V.
- (9) Disconnect stabilized power supply from ammeter M1 and connector J01 (-).
Connect power supply as above but reverse polarities.
- (10) Check that current read off ammeter M1 approximates zero.
- (11) Disconnect stabilized power supply from ammeter M1 and connector J01 (-).
Connect stabilized power supply as indicated in setup.

II - Output Check

- (1) Proceed to input checks as indicated in sub-paragraph I.
- (2) Connect a d.c. voltmeter across terminals + and - of J102.
- (3) Check that d.c. voltmeter pointer deviates in right direction when stabilized power supply is adjusted so as to deliver a voltage of 15 V.

Note : Value read off voltmeter depends upon charge of batteries.

(B) Opening the Battery Unit

Proceed to open the battery unit.

(C) Removal of the Charger

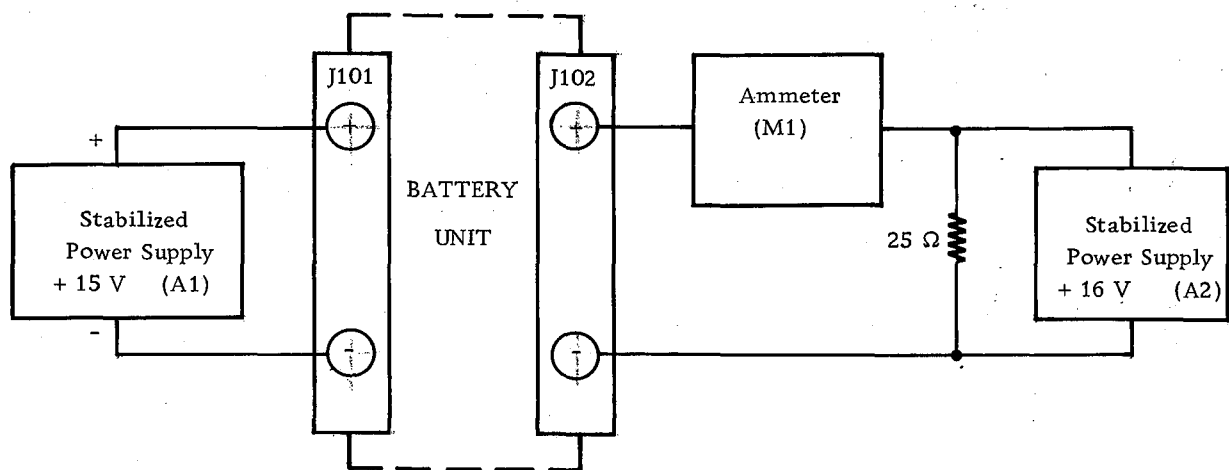
Remove the charger. See operation D16, of special disassembly and re-assembly procedures.

(D) Opening the Charger

Open the charger. See operation D17.

(E) Adjusting the Charger Alone

- (1) Check that battery unit is not connected with external setup mentioned in sub-paragraph A.
- (2) Prepare the following setup while checking that stabilized power supplies are on "OFF".



Caution : Always switch ON the power supplies in the following order.

- (3) Switch on the +16 V stabilized power supply
- (4) Switch on the +15 V stabilized power supply
- (5) Adjust resistor R03 so as to obtain an output current of 400 mA as read off ammeter.
- (6) Adjust stabilized power supply A1 so that it delivers a voltage of 9.5 V.
- (7) Adjust resistor R08 so as to obtain an output current of 0 mA as read off ammeter.
- (8) Disconnect battery unit from external setup.

<u>Assembly</u> : MAN - PACK MK I and MK II <u>Subassembly</u> : PERIPHERAL CIRCUITS	TEST DATA SHEET <u>Number</u> : C12 <u>Folio</u> : 1 of 12
<u>PURPOSE</u> : Verification and Adjustment of "Peripheral Circuits"	<u>Personnel</u> : 1 electronic technician <u>Time</u> :

FACILITIES

Documents

Plate 28

Test Equipment

- . 1 Stabilized power supply, + 6 V
- . 1 Stabilized power supply, + 14.5 V
- . 1 Stabilized power supply, + 13.2 V
- . 1 Stabilized power supply, + 5 V
- . 1 Stabilized power supply, + 3 V
- . 1 Stabilized power supply, - 6 V
- . 1 Stabilized power supply, + 10 V
- . 1 Stabilized power supply, adjustable from 0 to 15 V
- . 1 DC voltmeter

Tools

- . 1 Resistor, 47 Ω
- . 1 Resistor, 820 Ω
- . 1 Resistor, 5 k Ω
- . 2 Resistors, 150 Ω
- . 1 Resistor, 220 Ω
- . 1 Resistor, 620 Ω
- . 1 Resistor, 430 Ω
- . 1 Resistor, 180 Ω
- . 1 Resistor, 22 k Ω
- . 1 Resistor, 33 k Ω
- . 3 Resistors, 4.7 k Ω
- . 1 Resistor, 316 Ω
- . 1 Resistor, 12 Ω
- . 1 Resistor, 46.4 Ω
- . 1 Resistor, 1 k Ω
- . 1 Resistor, 10 k Ω
- . 1 Resistor, 470 Ω
- . 1 Resistor, 390 Ω
- . 1 Resistor, 24 k Ω

PROCEDURE

The operations shall be carried out in the following order :

- (a) Check of transmit/receive changeover
- (b) Check and adjustment of RF compressor
- (c) Check of AGC amplifier
- (d) Check of local monitor control

I - Preliminary Operations

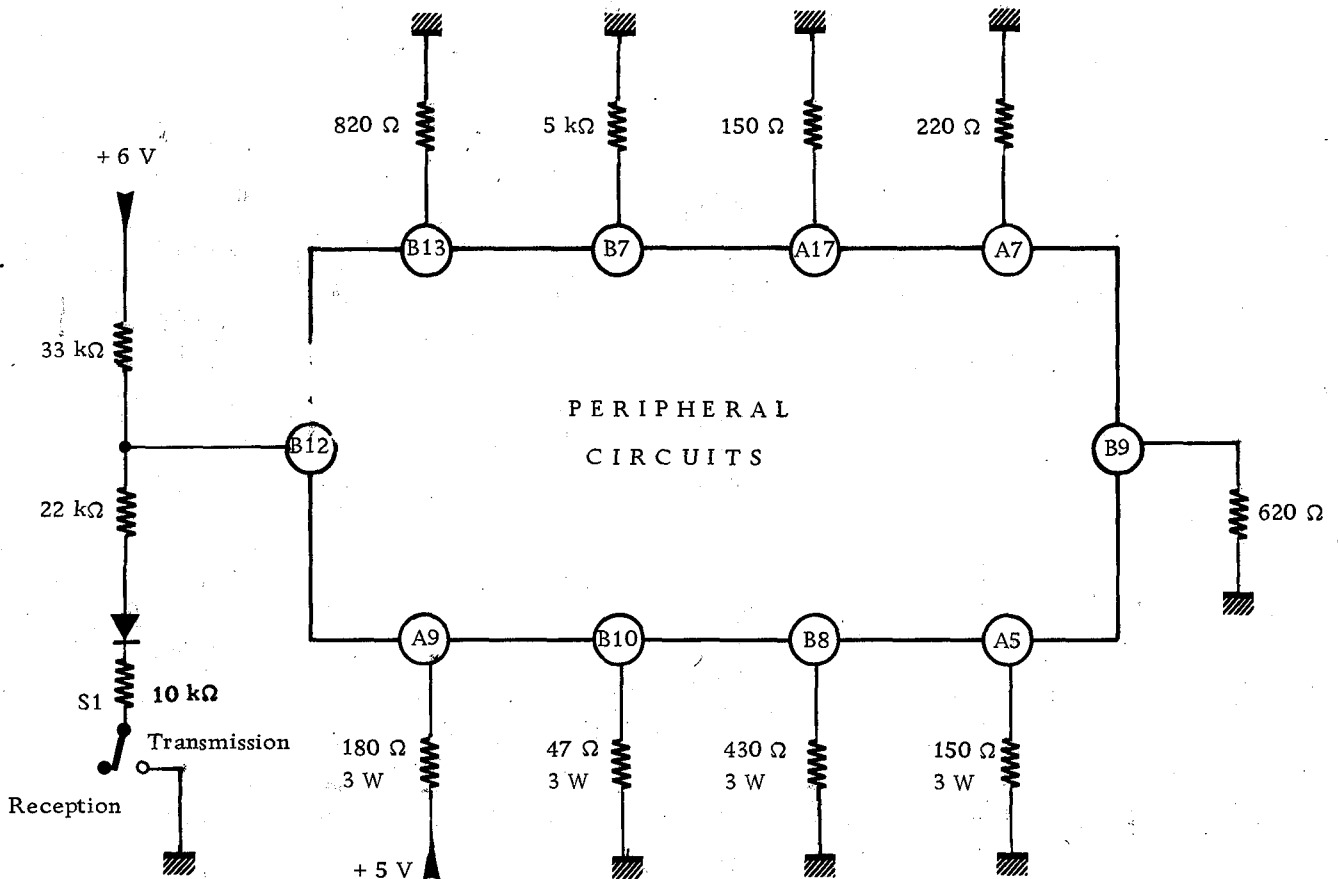
- (1) Connect the +ve of +6V stabilized power supply to terminal A8 and the -ve of same power supply to ground terminals (A2, A22, B2 and B22).
- (2) Connect the +ve of +14.5V stabilized power supply to terminal B14 and the -ve of same power supply to ground terminals (A2, A22, B2 and B22).
- (3) Connect the +ve of +13.2V stabilized power supply to terminal A16 and the -ve of same power supply to ground terminals (A2, A22, B2 and B22).
- (4) Connect the +ve of +3V stabilized power supply to terminal A14 and the -ve to ground terminals (A2, A22, B2 and B22).
- (5) Connect the +ve of +3V stabilized power supply to terminal A11 and the -ve to ground terminals (A2, A22, B2 and B22).
- (6) Connect the -ve of -6V stabilized power supply to terminal B11 and the +ve to ground terminals (A2, A22, B2 and B22).
- (7) Connect the positive of +10 V stabilized power supply to terminal A6 and the - ve to ground terminals (A2, A22, B2 and B22).

II - Operating Procedure

(A) Checking the Transmit/Receive Switching :

(a) Preliminary Operations

Prepare the following setup :



(b) Reception Operation

- (1) Check that changeover S1 is on "Reception"
- (2) Connect a voltmeter in series with a 4.7 kΩ resistor to the various terminals mentioned in table hereafter, in which the polarities to be observed and the values to be obtained are also indicated.

Number : C12

Folio : 4 of 12

Terminal to which the +ve of Voltmeter is Connected	Terminal to which the -ve of Voltmeter is Connected	Value to be Obtained
A2, A22, B2 or B22	B7	- 6 V
B13	A2, A22, B2 or B22	+ 6 V
B8		+ 10 V
B9		+ 6 V
A9		≤ 2.5 V
A7		0 V
A5		
A17		
B10		

(3) Disconnect the voltmeter from the test terminals to which it is connected.

(c) Transmission Operation

(1) Set changeover S1 to transmission.

(2) Connect the voltmeter in series with a 4.7 k Ω resistor to the various terminals mentioned in table hereafter in which the polarities to be observed and the values to be obtained are also indicated :

Terminal to which the +ve of Voltmeter is Connected	Terminal to which the -ve of Voltmeter is Connected	Value to be Obtained
B7	A2, A22, B2 or B22	+ 6 V
A2, A22, B2 or B22	B13	- 6 V
	B8	0 V
	B9	
A9	A2, A22, B2 or B22	+ 5 V
A7		+ 6 V
A5		+ 10 V
A2, A22, B2 or B22		A17
B10	A2, A22, B2 or B22	> 1.6 V

(3) Disconnect voltmeter from test terminals to which it is connected.

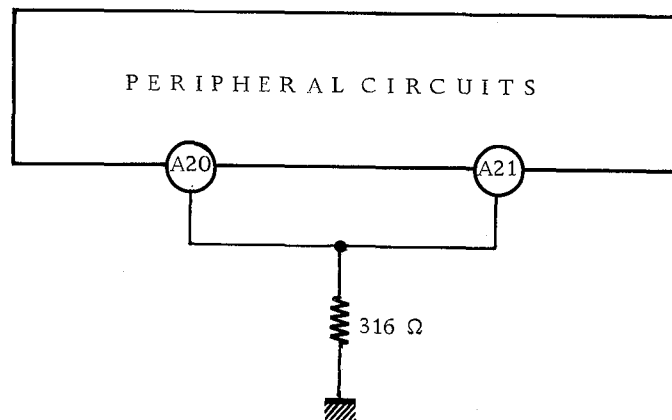
(d) Final Operations

Disconnect the "peripheral circuits" PC board assembly from external setup.

(B) Checking and Adjusting the RF Compressor :

(a) Preliminary Operations

- (1) Prepare the setup shown in sub-paragraph A.
- (2) Check that changeover S1 of external setup is on transmission.
- (3) Prepare the following external setup :



(b) Operating Procedure

(1) Checking Control Range of Potentiometer R57 :

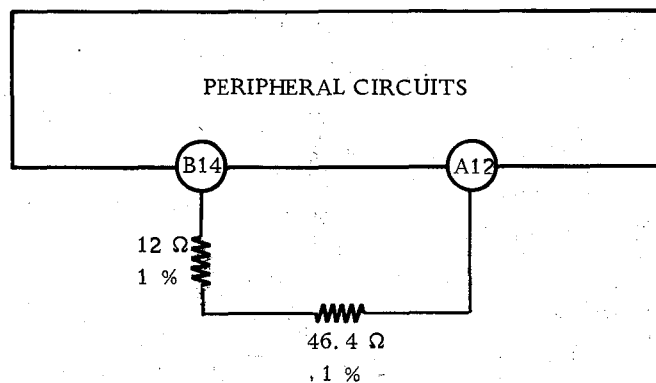
- . Connect a d.c. voltmeter across terminals B17 and A2, A22, B2 or B22.
- . Set R57 to minimum. Check that voltage read off the DC voltmeter is within 7.1 and 8.1 V.
- . Set potentiometer R57 to maximum. Check that voltage off the DC voltmeter is within 9.2 and 10.15 V.
- . Disconnect the DC voltmeter from terminals B17 and A2, A22, B2 or B22.

(2) Checking the Normal Power/Reduced Power Control :

- . Connect a d.c. voltmeter across terminals B17 and A2, A22, B2 or B22.
- . Connect terminal A13 to one of terminals A2, A22, B2 or B22.
- . Set potentiometer R57 to minimum. Check that voltage read off the DC voltmeter is within 2.6 and 3 V.
- . Disconnect short-circuit between terminal A13 and one of terminals A2, A22, B2 or B22.
- . Disconnect the DC voltmeter from terminals B17 and A2, A22, B2 or B22.

(3) Adjusting Z02 Offset :

- Check that changeover S1 of external setup is on transmission.
- Connect a stabilized power supply adjustable from 0 to 10 V across terminal B17 and one of terminals A2, A22, B2 or B22. Adjust power supply so that it delivers a voltage of 0 V.
- Prepare the following setup :



- Connect a d.c. voltmeter in series with a 1 kΩ resistor across terminal B18 and one of terminals A2, A22, B2 or B22.
- Adjust potentiometer R51 so as to obtain a voltage within -1.0 and +10 mV off the HF voltmeter.

CAUTION : Do not alter further the setting of potentiometer R51.

- Disconnect external setup from across terminals A12 and B14.
- Disconnect the DC voltmeter from terminals B18 and A2, A22, B2 or B22.
- Disconnect the stabilized power supply from terminals B17 and A2, A22, B2 or B22.

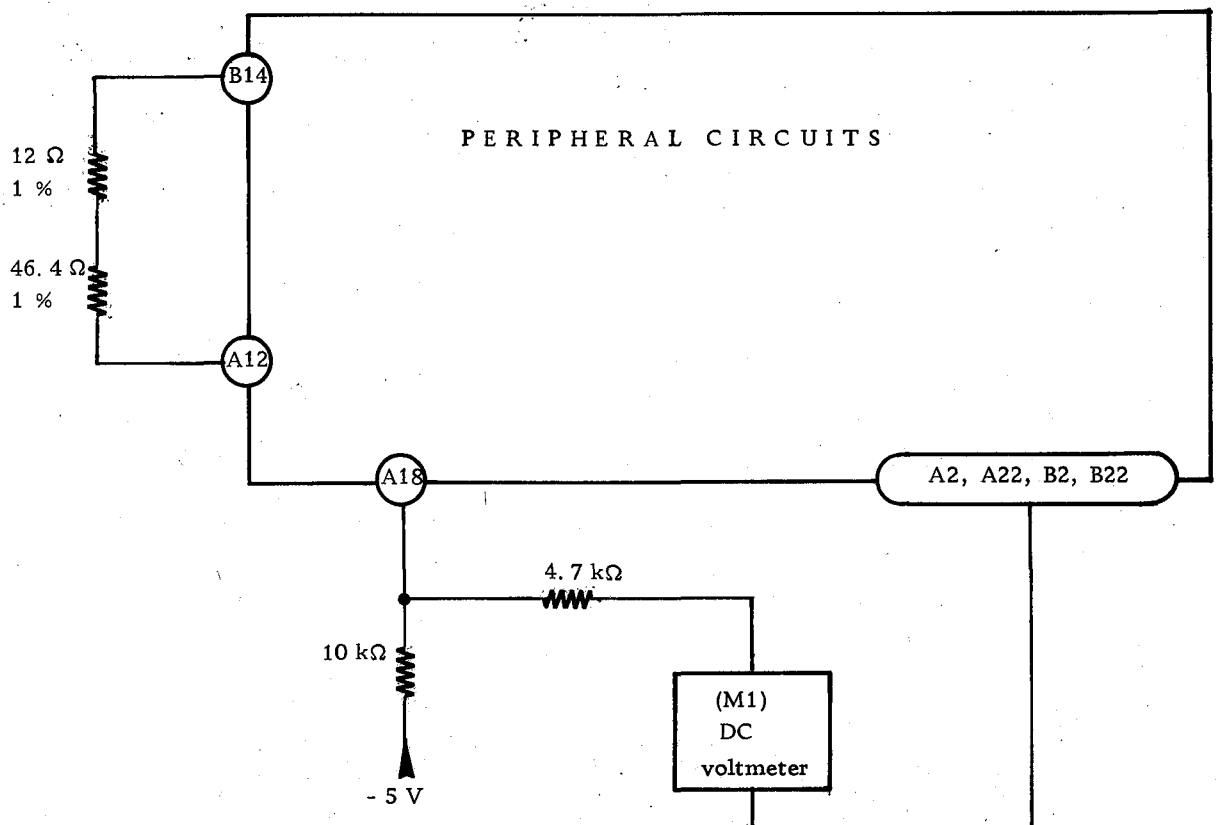
(4) Compressor and Gain Control Zero Setting :

- Check that changeover S1 of external setup is on transmission.
- Connect a stabilized power supply adjustable from 0 to 10 V across terminal B17 and one of terminals A2, A22, B2 or B22. Adjust said power supply so that it delivers a voltage of 0 V.

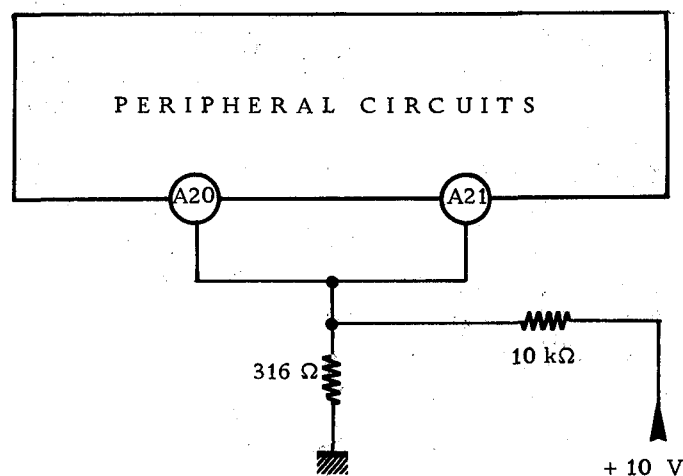
Number : C12

Folio : 7 of 12

- Prepare the following setup :



- Note the value of voltage U_0 off the DC voltmeter (M1).
- Disconnect external setup between terminals A20 and A21.
- Prepare the following setup :



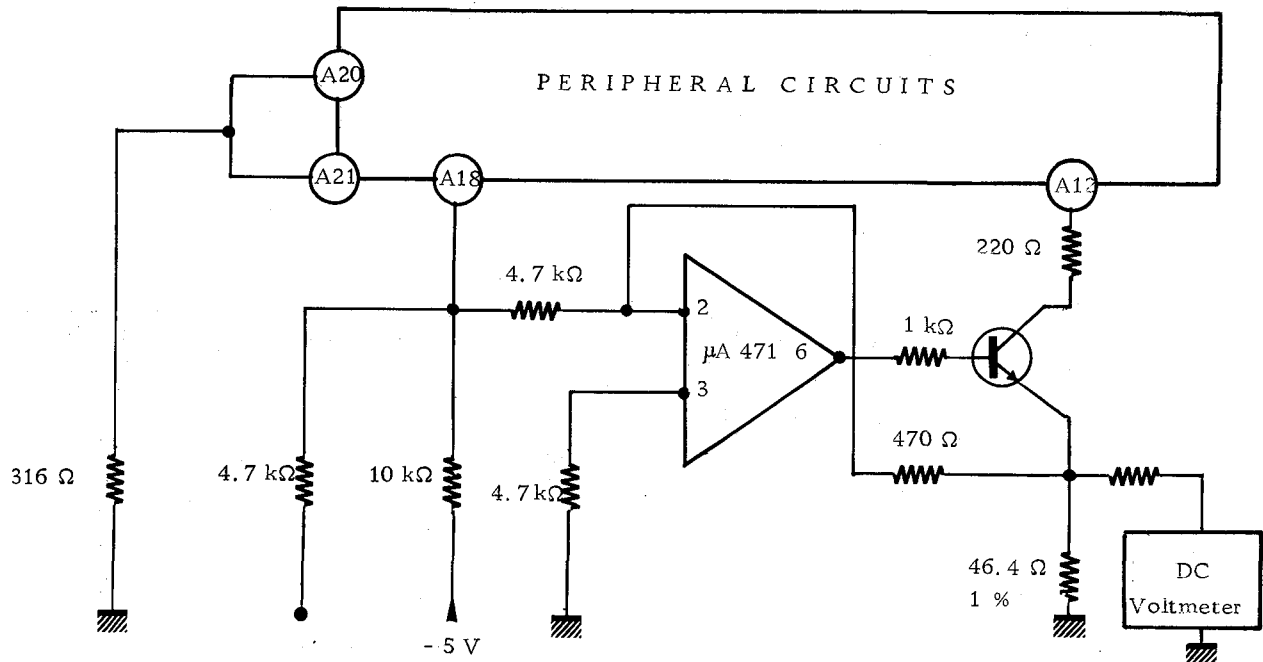
- Note the value of voltage U_1 off the DC voltmeter (M1).
Check that :

$$U_1 - U_0 = \Delta V \text{ with } \Delta V \text{ within } 7.2 \text{ and } 8.$$

- Disconnect terminal A20 from terminal A21.
- Disconnect terminal A12 from terminal B14.
- Disconnect A18 from A2, A22, B2 or B22.
- Disconnect stabilized power supply from terminals B17 and A2, A22, B2 or B22.

(5) Checking Potentiometer R83 Setting Range (Power Regulation) :

- Connect a stabilized power supply adjustable from 0 to 10 V across terminals B17 and one of terminals A2, A22, B2 or B22. Adjust it so as to obtain a voltage of $7\text{ V} \pm 10\text{ mV}$.
- Prepare the following setup :



- Adjust potentiometer R83 so as to obtain maximum voltage off the DC voltmeter (U_0).
- Disconnect the DC voltmeter from external setup.
- Connect the DC voltmeter across terminals A12 and B14 (U_1 is the voltage read).
- Disconnect the DC voltmeter from terminals A12 and B14 and connect it to terminal B18 in series with a $1\text{ k}\Omega$ resistor and one of terminals A2, A22, B2 or B22 (ground terminals).

Check that ratio : $\frac{U_2}{U_1}$ is within 5.8 and 6.3 V.

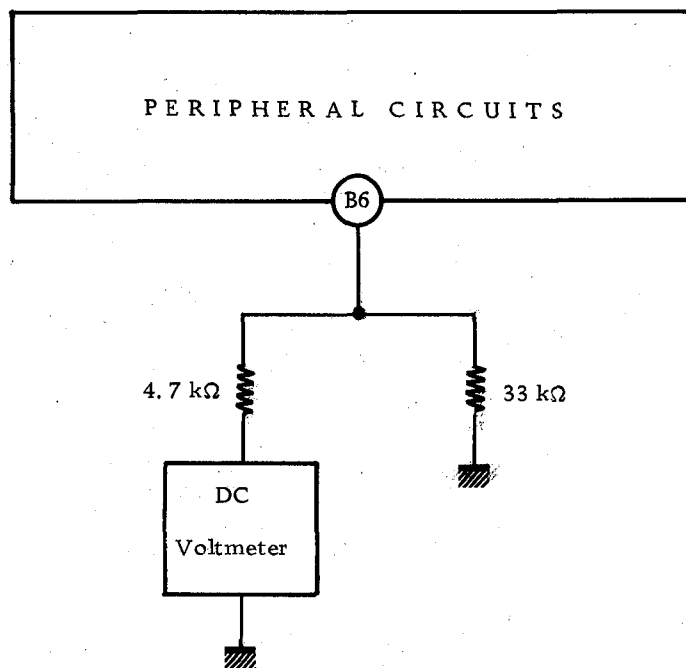
- Disconnect the DC voltmeter from terminals B18 and A2, A22, B2 or B22 and connect it as indicated in above-mentioned setup.
- Adjust potentiometer R83 so as to obtain minimum reading off the DC voltmeter (U_3).
- Disconnect the DC voltmeter from external setup.
- Connect the DC voltmeter across terminals A12 and B4 (let U_4 be the voltage across said terminals). Check that voltage is within 0.2 and 0.3 V.
- Disconnect the DC voltmeter from terminals A12 and B14.
- Disconnect external setups between :
 - Terminals A20 and A21
 - Terminals A18 and A12
- Disconnect the stabilized power supply from terminals B17 and A2, A22, B2 or B22.

(c) Final Operations

Disconnect the "peripheral circuits" PC board from the external setup.

(C) Checking the AGC Amplifier :**(a) Preliminary Operations**

- (1) Prepare the setup described in sub-paragraph A (called preliminary operations).
- (2) Check that changeover S1 in external setup is on Reception.
- (3) Connect a + 10 V stabilized power supply across terminals A3 (+) and A2, A22, B2 or B22 (-).
- (4) Prepare the following setup :

**(b) Operating Procedure**

- (1) Check that voltage off the DC voltmeter is within 0.3 and 0.45 V.
- (2) Connect a + 10 V stabilized power supply to terminal A4 and terminal A2, A22, B2 or B22 (ground) through a 390 kΩ resistor.
- (3) Check that voltage off the DC voltmeter is within 1.2 and 1.5 V.
- (4) Disconnect the + 10 V stabilized power supply from terminals A4 and A2, A22, B2 or B22.

(c) Final Operations

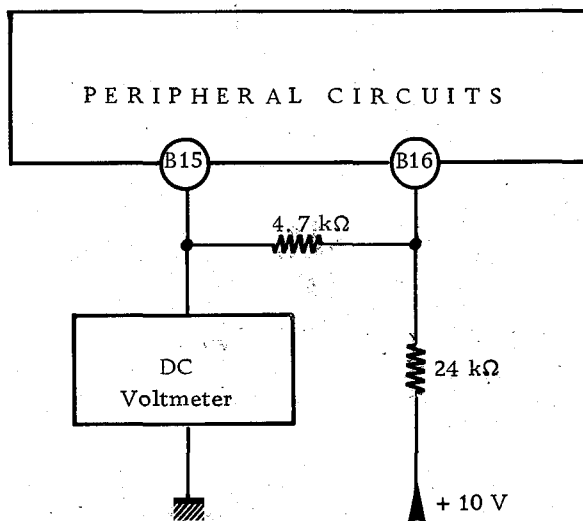
- (1) Disconnect the + 10 V stabilized power supply from terminals A3 (+) and A2, A22, B2 or B22 (-).
- (2) Disconnect the "Peripheral circuits" PC board from the various external setups.

(D) Checking the Local Control :**(a) Preliminary Operations**

- (1) Prepare the setup mentioned in sub-paragraph A.
- (2) Check that changeover S1 of external setup in on "Transmission".
- (3) Connect a + 12.6 V stabilized power supply across terminals B14 and A2, A22, B2 or B22 (ground).

(b) Operating Procedure**(1) Battery :**

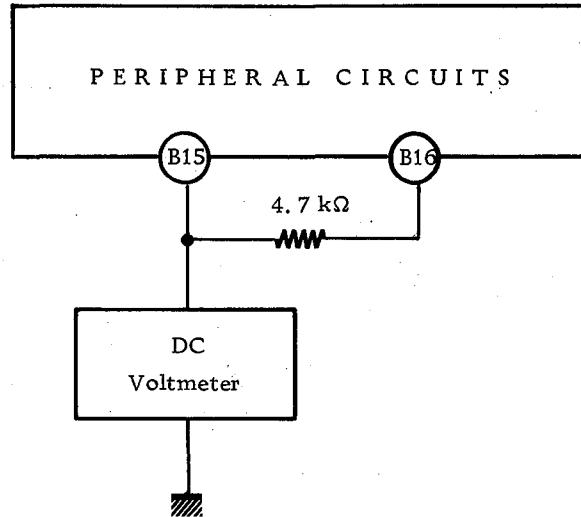
. Prepare the following setup :



- . Check for a voltage within 5.95 to 6.15 V off the DC voltmeter
- . Disconnect the DC voltmeter from the external setup.
- . Connect the DC voltmeter across terminals A10 and A2, A22, B2 and B22. Check that voltage off the DC voltmeter is within 6.3 and 6.9 V.
- . Adjust the stabilized power supply connected across terminals B14 and A2, A22, B2 or B22 (ground) so that it delivers 11.5 V.
- . Check for a voltage within - 6.5 and - 5.3 V off the DC voltmeter.
- . Disconnect the DC voltmeter from terminals A10 and A2, A22, B2 and B22.
- . Adjust the stabilized power supply connected across terminals B14 and A2, A22, B2 or B22 so as to obtain a voltage of 12.6 V.
- . Disconnect the PC board assembly from the external setup connecting terminals B15 and B16.

(2) Weak Transmission :

- Prepare the following setup :



- Check for a voltage within -5.3 and -6.5 V off the DC voltmeter.
- Disconnect the PC board assembly from the external setup connecting terminals B15 and B16.

(c) Final Operations

- (1) Disconnect the stabilized power supply from terminals B14 and A2, A22, B2 and B22 (ground).
- (2) Disconnect the PC board assembly from the external setup.

(E) Checking the Antenna Tuning Cycle :

This shall be carried out by means of a test set during the overall check.

III - Final Operations

(1) Disconnect :

- -ve of -6 V stabilized power supply from terminal B11.
- +ve of -6 V stabilized power supply from terminals A2, A22, B2 or B22 (ground).

(2) Disconnect :

- +ve of $+3$ V stabilized power supply from terminal A11.
- -ve of $+3$ V stabilized power supply from terminals A2, A22, B2 or B22 (ground).

(3) Disconnect :

- +ve of $+5$ V stabilized power supply from terminal A14.
- -ve of $+5$ V stabilized power supply from terminals A2, A22, B2 or B22 (ground).

Number : C12

Folio : 12 of 12

(4) Disconnect :

- . +ve of +13.2 V stabilized power supply from terminal A16.
- . -ve of +13.2 V stabilized power supply from terminals A2, A22, B2 or B22 (ground).

(5) Disconnect :

- . +ve of +14.5 V stabilized power supply from terminal B14.
- . -ve of +14.5 V stabilized power supply from terminal A2, A22, B2 or B22.

(6) Disconnect :

- . +ve of + 6 V stabilized power supply from terminal A8
- . -ve of + 6 V stabilized power supply from terminal A2, A22, B2 or B22 (ground).

<u>Assembly</u> : MAN - PACK MK I and MK II	TEST DATA SHEET
<u>Subassembly</u> : ANTENNA TUNING UNIT	<u>Number</u> : C13 <u>Folio</u> : 1 of 9
<u>PURPOSE</u> : Verification and Adjustment of Antenna Tuning Unit	<u>Personnel</u> : 1 electronic technician <u>Time</u> :

FACILITIESDocuments

Plate 30

Test Equipment

- . 1 Tracking generator
- . 1 DC voltmeter
- . 1 Differential voltmeter
- . 1 RF Millivoltmeter
- . 1 Phasemeter with two probes
- . 1 Dual-trace oscilloscope
- . 2 Wattmeters
- . 2 Stabilized power supplies, + 3 V
- . 1 Stabilized power supply, + 5 V
- . 1 Stabilized power supply, + 13.2 V
- . 1 Stabilized power supply, + 14 V

Tools

- . 3 Resistors, 16.5 Ω
- . 1 Resistor, 50 Ω
- . 1 Resistor, 1 k Ω
- . 1 Resistor, 3.3 k Ω
- . 1 Resistor, 100 k Ω
- . 2 Coaxial cables
- . 1 Connector, split, with shorting links
- . 1 Capacitor-inductor adapter link
- . 1 Soldering iron
- . Solder
- . 1 Man-Pack transceiver in operating condition

PROCEDURE

The operations shall be carried out in the following order :

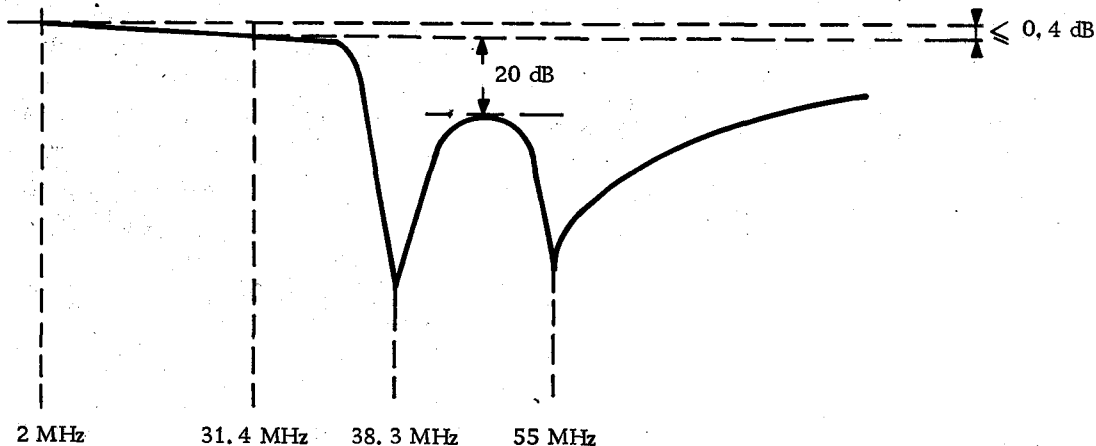
- (a) Adjustment of band-pass filter.
- (b) Adjustment of all-pass filter.
- (c) Adjustment of discriminator zero.
- (d) Check of presetting.
- (e) Check of RF current coupler.

(A) Adjusting the Band-Pass Filter :

- (1) Set selector "WHIP-WIRE-VEHICULE-50Ω" to 50Ω .
- (2) Connect tracking generator output to coaxial connector J02 (source impedance = 50 Ω).
- (3) Connect :
 - . 1 HF voltmeter.
 - . 1 Spectrum analyzer (tracking generator input) with output "50 Ω".

CAUTION : Total output impedance shall be of 50 Ω.

- (4) Set frequency of signal delivered by tracking generator to 38.3 MHz.
- (5) Set inductor L02 for minimum voltage off the HF voltmeter.
- (6) Set frequency of signal delivered by tracking generator to 55 MHz.
- (7) Set inductor L03 so as to obtain minimum voltage as read off HF voltmeter.
- (8) Wobble frequency of signal from tracking generator from 2 to 65 MHz.
- (9) Check that curve on the spectrum analyzer (tracking generator) is as shown below.



Check that attenuation between 2 and 30 MHz is 0.4 dB at most.

Number : C13

Folio : 3 of 9

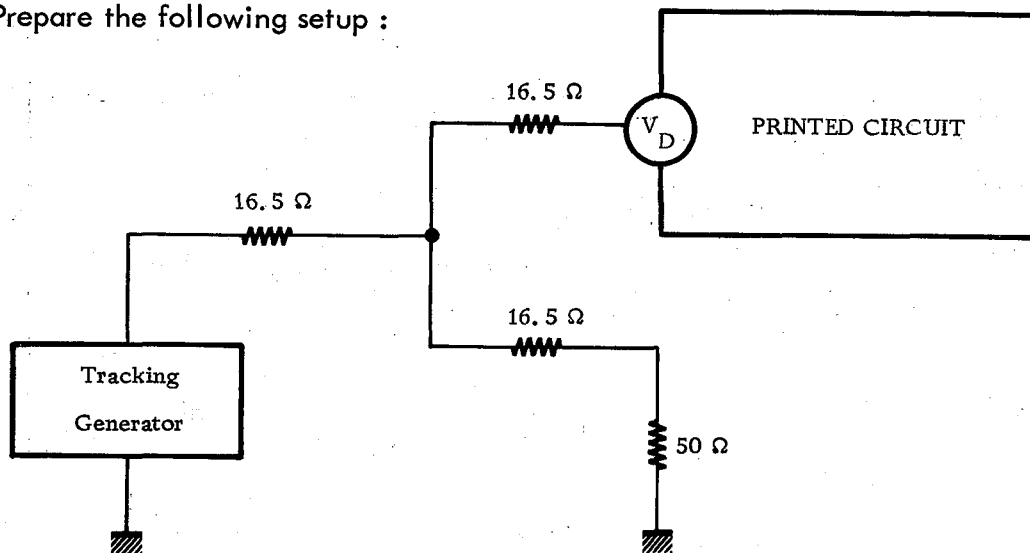
(10) Disconnect :

- . Tracking generator output from coaxial connector J02.
- . Tracking generator input (spectrum analyzer) and HF voltmeter from "50 Ω " output.

(B) Adjusting the All-Pass Filter :

(1) Disconnect the cables from Vr and Vd of printed circuit.

(2) Prepare the following setup :



(3) Disconnect links TP08 and TP05 from printed circuit.

(4) Connect an RF millivoltmeter to test terminal TP03 of printed circuit.

(5) Set frequency of signal delivered by tracking generator to 17 MHz (output impedance = 50 Ω).

(6) Set variable inductor L03 on the printed circuit for a minimum voltage off the RF millivoltmeter.

(7) Put link TP08 back to its initial position.

(8) Connect :

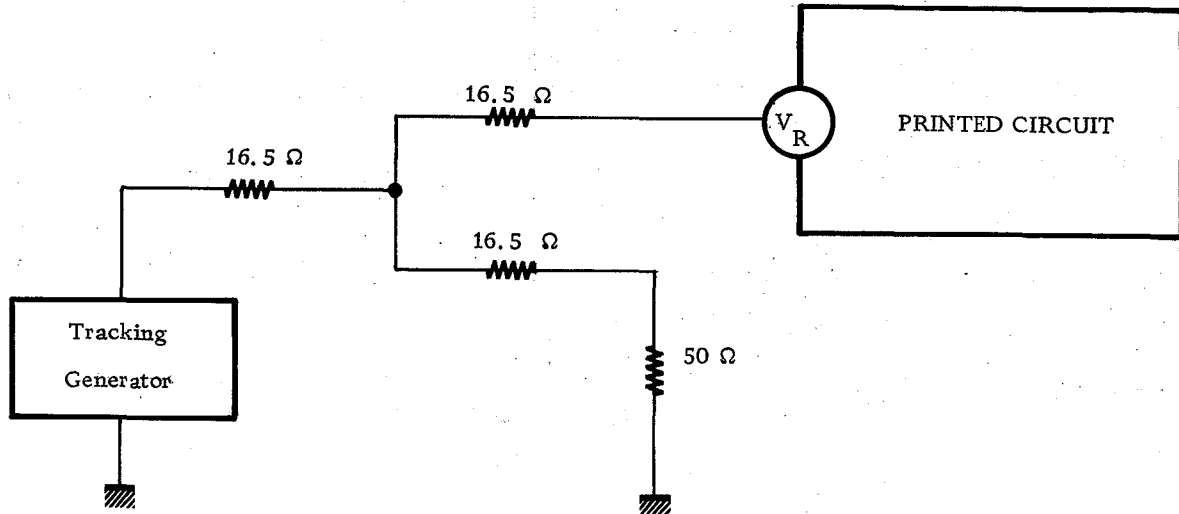
- . 1st probe of phasemeter across test point TP01 in printed circuit and ground (terminal 12 of connector J02).
- . 2nd probe of phasemeter across test point TP03 of printed circuit and ground (terminal 12 of connector J02).

(9) Set variable inductor L01 so as to obtain a phase shift of 180° off the phasemeter.

(10) Disconnect the phasemeter from test points TP01, TP03 and ground, and RF millivoltmeter from TP03.

(11) Disconnect the external setup connected to terminal Vd of printed circuit.

(12) Prepare the following setup :



(13) Set frequency of signal delivered by tracking generator to 3.9 MHz.

(14) Connect the RF millivoltmeter with test terminal TP04 of printed circuit.

(15) Set variable inductor L04 of printed circuit so as to obtain minimum voltage as read off RF millivoltmeter.

(16) Put link TP05 back to initial position.

(17) Disconnect the RF millivoltmeter from test terminal TP03 of printed circuit.

(18) Connect :

- . 1st probe of phasemeter across test point TP02 of printed circuit and ground (terminal 12 of connector J02).
- . 2nd probe of phasemeter across test point TP04 of printed circuit and ground (terminal 12 of connector J02).

(19) Set variable inductor L02 so as to obtain a phase-shift of 180° as read off phasemeter.

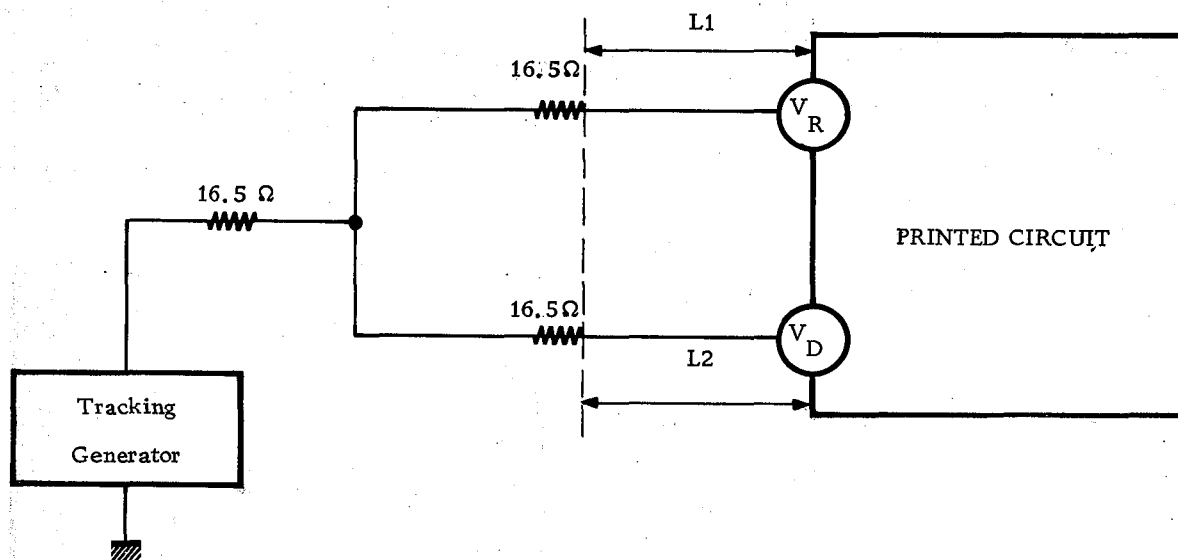
(20) Disconnect the phasemeter from test points TP02, TP04 and ground.

(21) Disconnect external setup connected with terminal Vr of printed circuit.

(C) Adjusting the Discriminator 0 V :

(1) Disconnect links from terminals Vr and Vd of printed circuit.

(2) Prepare the following setup :



CAUTION : Coaxial cables L1 and L2 shall have equal lengths to within 1 cm.

(3) Adjust tracking generator so as to obtain :

- . Signal frequency : within 2 to 30 MHz.
- . Signal level : 3 V r.m.s.

(4) Connect a differential voltmeter across test points TP16 and TP17 of printed circuit.

(5) Adjust potentiometer R25 so as to obtain a voltage of $0\text{ V} \pm 30\text{ mV}$ as read off differential voltmeter.

(6) Disconnect differential voltmeter from test points TP16 and TP17.

(7) Disconnect external setup from terminals Vr and Vd of printed circuit.

(8) Connect links with terminals Vr and Vd of printed circuit.

(D) Checking Presetting :

(1) Disconnect "potentiometer Wiper" link from PC board and short circuit the pin on the PC board to ground.

(2) Connect :

- . +ve of +14 V stabilized power supply to terminal 8 of connector J02.
- . -ve of +14 V stabilized power supply to terminal 12 of connector J02.

(3) Connect :

- . +ve of +13.2 V stabilized power supply to terminal 2 of connector J02.
- . -ve of +13.2 V stabilized power supply to terminal 12 of connector J02.

(4) Connect a 1 kΩ resistor across terminals 16 and 12 of connector J02.

(5) Connect :

- . +ve of +3 V stabilized power supply to terminal 1 of connector J02.
- . -ve of +3 V stabilized power supply to terminal 12 of connector J02.

Number : C13

Folio : 6 of 9

(6) Connect :

- . Channel "a" of dual-trace oscilloscope to test terminal TP25.
- . Channel "b" of dual-trace oscilloscope to test terminal TP22.

(7) Check that :

- . Motor rotates up to limit-stop.
- . Logic state 1 is displayed on oscilloscope channel "a".
- . Logic state 0 is displayed on oscilloscope channel "b".

(8) Connect :

- . +ve of +3 V stabilized power supply to terminal "potentiometer mid-point" of printed circuit.
- . -ve of +3 V stabilized power supply to terminal 12 of connector J02.
- . Remove short circuit from solder pin on PC.

(9) Check that :

- . Motor turns in reverse direction up to the other limit stop.
- . Logic state 1 is displayed on oscilloscope channel "a".
- . Logic state 0 is displayed on oscilloscope channel "b".

(10) Disconnect :

- . Channel "a" of oscilloscope from test terminal TP25.
- . Channel "b" of oscilloscope from test terminal TP22.

(11) Disconnect :

- . +ve of +3 V stabilized power supply from terminal "potentiometer curser" of printed circuit.
- . -ve of +3 V stabilized power supply from terminal 12 of connector J02.

(12) Disconnect +3 V stabilized power supply from terminals 1 and 12 of connector J02.

(13) Disconnect 1 k Ω resistor from terminals 16 and 12 of connector J02.

(14) Disconnect the +13.2 V stabilized power supply from terminals 2 and 12 of connector J02.

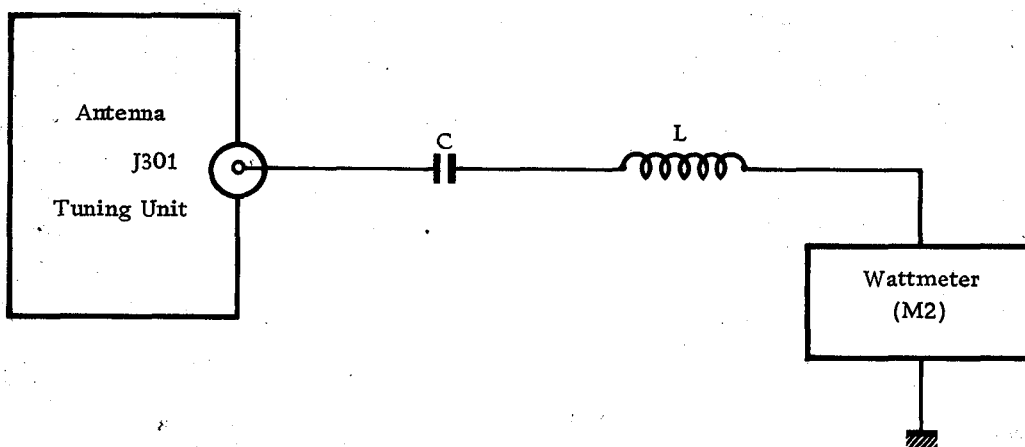
(15) Disconnect the +14 V stabilized power supply from terminals 8 and 12 of connector J02.

(16) Connect link to terminal "potentiometer curser" of printed circuit.

(17) Connect antenna tuning unit to a Man-Pack transceiver in operating condition. Connect connectors J02 of antenna tuning unit under test to connector J02 of Man-Pack transceiver (with antenna tuning unit removed) via a split connector fitted with shorting links.

(18) Connect a wattmeter to "50 Ω " output (M1).

(19) Prepare the following setup :



- (20) Set selector S301 "WHIP-WIRE-VEHICLE-50 Ω " in antenna tuning unit under test to "50 Ω ".
- (21) Select 02.500 MHz on Man-Pack transceiver used as a tool.
- (22) Switch on Man-Pack transceiver and set it for operation in MORSE transmission (A2-J).
- (23) Note value of transmitted power P1 read off wattmeter M1.
- (24) Set selector "WHIP-WIRE-VEHICLE-50 Ω " in antenna tuning unit under test to "WHIP".
- (25) Note value P2 of transmitted power read off wattmeter M2.
Check that difference P between P1 and P2 approximate 3 dB.
- (26) Set selector S301 "WHIP-WIRE-VEHICLE-50 Ω " in antenna tuning unit under test to "50 Ω ".
- (27) Select 29.999 MHz on Man-Pack transceiver used as a tool.
- (28) Note value P3 of transmitted power read off wattmeter M1.
- (29) Set selector S301 "WHIP-WIRE-VEHICLE-50 Ω " in antenna tuning unit under test to "WHIP".
- (30) Note value P4 of transmitted power read off wattmeter M2.
Check that difference ΔP between P1 and P2 is of 3 dB at most.
- (31) Select 02.000 MHz on Man-Pack transceiver used as a tool.
- (32) Set selector S301 "WHIP-WIRE-VEHICLE-50 Ω " in antenna tuning unit under test to "WIRE".
Check that motor moves up to limit stops and stops.
- (33) Set Man-Pack transceiver used as a tool to "OFF".

Number : C13

Folio : 8 of 9

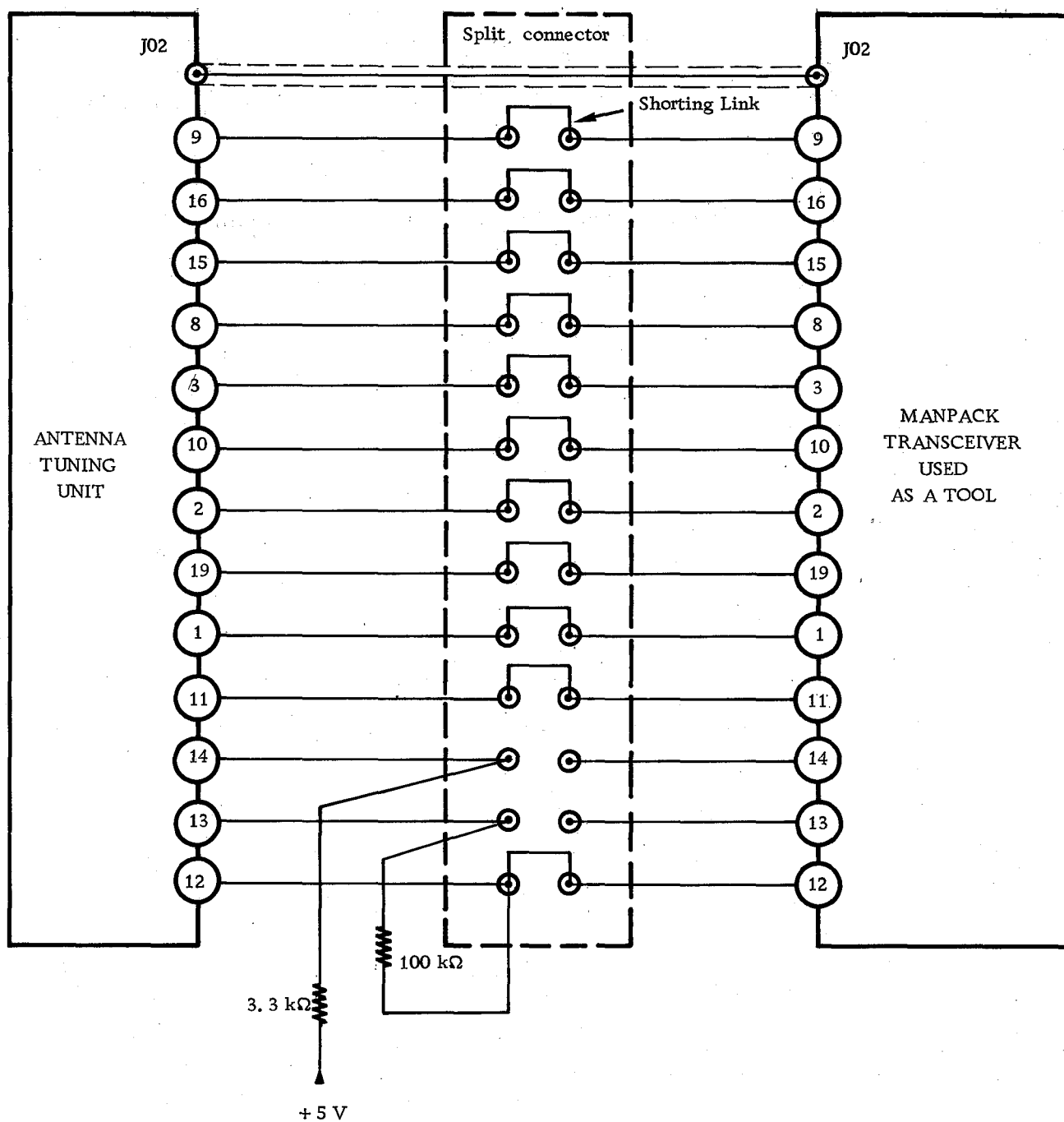
(34) Disconnect :

- . External setup from terminal J301 of antenna tuning unit.
- . Wattmeter from "50 Ω " output.

(35) Disconnect antenna tuning unit under test from split connector which connects it with Man-Pack transceiver used as a tool.

(E) Checking the RF Current Test Sensor :

(1) Prepare the following setup :



Number : C13

Folio : 9 of 9

- (2) Switch on Man-Pack transceiver and check that it is not in transmission operation.
- (3) Connect a DC voltmeter across terminals 12 and 13 of split connector (antenna tuning unit side).
- (4) Set selector S301 "WHIP-WIRE-VEHICULE-50 Ω " in antenna tuning unit under test to 50 Ω " .
- (5) Check that voltage read off DC voltmeter approximates 4.5 V.
- (6) Select 02.000 MHz on Man-Pack transceiver.
- (7) Set Man-Pack transceiver used as a tool to transmission.
- (8) Check that voltage read off DC voltmeter approximates 6.5 V.
- (9) Set Man-Pack transceiver used as a tool to "OFF".
- (10) Disconnect antenna tuning unit under test from split connector.
- (11) Disconnect setups from the split connector.

<u>Assembly</u> : MAN - PACK MK I and MK II <u>Subassembly</u> : FREQUENCY SELECTOR PC BOARD ASSEMBLY	TEST DATA SHEET <u>Number</u> : C14 <u>Folio</u> : 1 of 12
<u>PURPOSE</u> : Verification and Adjustment of Frequency Selector PC Board Assembly	<u>Personnel</u> : 1 electronic technician <u>Time</u> :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Test Equipment</u>	<u>Tools</u>
Plate 24	<ul style="list-style-type: none"> . 1 Stabilized power supply, 9.5 V . 1 Sine-wave generator . 1 Frequency meter . 1 Pulse generator . 1 Oscilloscope with dual-trace unit . 1 Ohmmeter 	<ul style="list-style-type: none"> . Mechanical device indicating position of frequency selectors

PROCEDURE

The following checks and adjustments shall be carried out :

- (a) Adjustment of secondary loop reset pulse.
- (b) Check of dividing ratio of secondary loop variable ratio divider.
- (c) Adjustment of main loop reset pulse.
- (d) Check of "C command" of main loop variable ratio divider.
- (e) Check the dividing ratio of main loop variable ratio divider.
- (f) Check of antenna tuning cycle starting command.
- (g) Check of sub-band commands for vehicle-mounted version.
- (h) Check of presetting sub-band signal.
- (i) Check of "VCO changeover" signal.

I - PRELIMINARY OPERATIONS

- (1) Fit the mechanical device, intended for indicating position of the 10 MHz, 1 MHz, 100 kHz, 10 kHz and 1 kHz selectors and for selecting the frequency, on the "Frequency Selector" PC board.
- (2) Connect the + ve of + 9.5 V stabilized power supply to terminal B7 of PC board assembly.
- (3) Connect the - ve of stabilized power supply to ground terminals (A2, A7, A8, A17, B2, B10 and B17) of PC board assembly.

II - OPERATING PROCEDURE(A) Adjusting the Secondary Loop Reset Pulse

- (1) Connect sine-wave generator to terminal A4 (SLH) of PC board assembly.
- (2) Adjust sine-wave generator so as to obtain :
 - . Signal amplitude : 100 mV Peak to peak.
 - . Signal frequency : 500 kHz.
- (3) Set :
 - . 10 MHz and 1 MHz selectors to 0
 - . 100 kHz selector to 1
 - . 10 kHz and 1 kHz selectors to 9.

- (4) Connect an oscilloscope to terminal B6 of PC board assembly.
- (5) Check that amplitude of pulse off oscilloscope is greater than 8 V.
- (6) Adjust resistor R07 of PC board assembly so that width of pulse read off oscilloscope be within 2.8 and 3.2 μ s.
- (7) Disconnect :
 - . Oscilloscope from terminal B6
 - . Sine-wave generator from terminal A4

(B) Checking the Dividing Ratio of Secondary Loop Variable Ratio Divider

- (1) Connect a sine-wave generator to terminal A4 (SLH) of PC board assembly.
- (2) Adjust sine-wave generator so as to obtain :
 - . Signal amplitude : 100 mV
 - . Signal frequency : 500 kHz.
- (3) Set the 10 MHz, 1 MHz, 100 kHz, 10 kHz and 1 kHz selectors to 0.
- (4) Connect a frequencymeter to terminal B6 of PC board assembly .
- (5) Check that signal frequency read off frequencymeter is of 1 kHz.

Note : In this case, the dividing ratio is 500 with the 100 kHz, 10 kHz and 1 kHz selectors set to 0.

- (6) Table below shows the dividing ratio and frequency of signal from the sine-wave generator required to obtain a signal frequency of 1 kHz as read off frequencymeter, versus the state selected by means of the 100 kHz, 10 kHz and 1 kHz selectors.

Signal Frequency Read off Frequencymeter	Selected State			Dividing Ratio	Frequency of Signal from Sine-Wave Generator (in kHz)
	100 kHz	10 kHz	1 kHz		
1 kHz	0	0	0	500	500
	0	0	1	501	501
	0	0	2	502	502
	0	0	3	503	503
	0	0	4	504	504
	0	0	5	505	505

Number : C14

Folio : 4 of 12

Signal Frequency Read off Frequencymeter	Selected State			Dividing Ratio	Frequency of Signal from Sine-Wave Generator (in kHz)
	100 kHz	10 kHz	1 kHz		
1 kHz	0	0	6	506	506
	0	0	7	507	507
	0	0	8	508	508
	0	0	9	509	509
	0	1	9	519	519
	0	2	9	529	529
	0	3	9	539	539
	0	4	9	549	549
	0	5	9	559	559
	0	6	9	569	569
	0	7	9	579	579
	0	8	9	589	589
	0	9	9	599	599
	1	9	9	699	699
	2	9	9	599	599
	3	9	9	699	699
	4	9	9	599	599
	5	9	9	699	699
	6	9	9	599	599
	7	9	9	699	699
8	9	9	599	599	
9	9	9	699	699	

(7) Disconnect :

- . Frequencymeter from terminal B6
- . Sine-wave generator from terminal A4.

(C) Adjusting the Main Loop Reset Pulse

(1) Connect a pulse generator to terminal A5 (MLH) of PC board assembly.

(2) Adjust pulse generator so as to obtain :

- . Signal amplitude : 10 V
- . Signal frequency : 850 kHz
- . Form factor : 1/1.

(3) Set :

- . 10 MHz selector to 2
- . 1 MHz selector to 9
- . 100 kHz, 10 kHz and 1 kHz selectors to 0.

(4) Connect an oscilloscope to terminal A6 of PC board assembly.

(5) Check that amplitude of signal read off oscilloscope is greater than 8 V.

(6) Adjust resistor R08 of PC board assembly so that the width of signal read off oscilloscope may be within 1.4 to 1.8 μ s.

(7) Disconnect :

- . Oscilloscope from terminal A6
- . Pulse generator from terminal A5.

(D) Checking the "C Command" of Main Loop Variable Ratio Divider

(1) Connect a pulse generator to terminal A5 (MLH) of PC board assembly.

(2) Adjust said generator so as to obtain :

- . Signal amplitude : 10 V
- . Signal frequency : 850 kHz
- . Form factor : 1/1.

(3) Set :

- . 10 MHz selector to 2
- . 1 MHz selector to 9
- . 100 kHz, 10 kHz and 1 kHz selectors to 0.

Number : C14















Folio : 6 of 12

(4) Connect dual-trace oscilloscope as follows :

- . Channel A : connected to terminal A5
- . Channel B : connected to terminal B8.

Trigger oscillator with signal available at terminal A6 of PC board assembly.

(5) Table below shows the shape of signals displayed on oscilloscope in correct operation versus the position of the 100 kHz selector.

Position of 100 kHz Selector	Wave Forms Displayed on Oscilloscope
0	Channel A "1" 
1	Channel B "0" 
2	Channel A 
3	Channel B "1"  "0" 
4	Channel A 
5	Channel B "1"  "0" 
6	Channel A 
7	Channel B "1"  "0" 
8	Channel A 
9	Channel B "1"  "0" 

(6) Disconnect :

- . Channel A of oscilloscope from terminal A5
- . Channel B of oscilloscope from terminal B8
- . Synchronization of oscilloscope from terminal A6
- . Pulse generator from terminal A5.

(E) Checking the Dividing Ratio of Main Loop Variable Ratio Divider

(1) Connect a pulse generator with terminal A5 (MLH) of PC board assembly.

Number : C14

Folio : 7 of 12

(2) Adjust pulse generator so as to obtain :

- . Signal amplitude : 10 V
- . Signal frequency : 100 kHz
- . Form factor : 1/1.

(3) Set :

- . 1 MHz selector to 2
- . 10 MHz, 100 kHz and 1 kHz selectors to 0.

(4) Connect a frequency meter to terminal A6 of PC board assembly.

(5) Check that signal frequency read off frequency meter is of 25 kHz.

Note : In this case, the dividing ratio is 4 for a frequency selection corresponding with "02.000" (kHz).

(6) Table below shows the value of dividing ratio and of frequency from pulse generator required to obtain a frequency of 25 kHz as read off frequency meter, versus state selected by means of the 10 MHz and 1 MHz selectors.

Signal Frequency Read off Frequency Meter (in kHz)	Selected State		Dividing Ratio	Frequency of Signal from Pulse Generator (in kHz)
	10 MHz	1 MHz		
	0	1		
25	0	2	4	100
	0	3	5	125
	0	4	6	150
	0	5	7	175
	0	6	8	200
	0	7	9	225
	0	8	10	250
	0	9	11	275
	1	0	12	300
	1	1	13	325
	1	2	14	350

Number : C14

Folio : 8 of 12

Signal Frequency Read off Frequency Meter (in kHz)	Selected State		Dividing Ratio	Frequency of Signal from Pulse Generator (in kHz)
	10 MHz	1 MHz		
25	1	3	15	375
	1	4	16	400
	1	5	17	425
	1	6	18	450
	1	7	19	475
	1	8	20	500
	1	9	21	525
	2	0	22	550
	2	1	23	575
	2	2	24	600
	2	3	25	625
	2	4	26	650
	2	5	27	675
	2	6	28	700
	2	7	29	725
	2	8	30	750
	2	9	31	775

(7) Disconnect :

- . Frequency meter from terminal A6
- . Pulse generator from terminal A5.

(F) Checking the Antenna Tuning Cycle Starting Command :

- (1) Connect an ohmmeter across terminals B11 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals).

- (2) Set the 10 MHz selector successively to 0, 1 and 2. Check for presence of a transient ground off ohmmeter on each change in position of the 10 MHz selector.
- (3) Set the 1 MHz selector successively to 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Check for presence of a transient ground off ohmmeter each time the position of 1 MHz selector is modified.
- (4) Set the 100 kHz selector successively to 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Check for presence of a transient ground off ohmmeter each time the position of 100 kHz selector is modified.
- (5) Set the 10 kHz selector successively to 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. Check for presence of a transient ground off ohmmeter each time the position of 10 kHz selector is changed.
- (6) Disconnect the ohmmeter from terminals B11 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals).

(G) Checking the Sub-Band Commands for Vehicle-Mounted Version

This shall be carried out as follows :

- . Set the 100 kHz, 1 MHz and 10 MHz selectors to 0.
- . Connect the ohmmeter across terminals B16 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals). Check that resistance read off ohmmeter is 0 Ω . Disconnect ohmmeter.
- . Connect the ohmmeter across terminals A9 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals). Check that resistance read off ohmmeter is of 0 Ω . Disconnect the ohmmeter.
- . Connect ohmmeter across terminals A16 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals). Check that resistance read off ohmmeter is ∞ . Disconnect ohmmeter.
- . Connect the ohmmeter across terminals B13 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals). Check that resistance read off ohmmeter is of 0 Ω . Disconnect ohmmeter.
- . Connect ohmmeter across terminals B14 and A2, A7, A8, A17, B2, B10 or B17 (ground terminals). Check that resistance read off ohmmeter is ∞ . Disconnect ohmmeter.

Table below shows the resistance across ground terminals (A2, A7, A8, A17, B2, B10 or B17) and terminals B16, A9, A16, B13 and B14, depending on position of the 100 kHz, 1 MHz and 10 MHz selectors.

Selected State			Resistance across Ground Terminals (A2, A7, A8, A17, B2, B10 or B17) and terminals :				
10 MHz	1 MHz	100 kHz	B16	A9	A16	B13	B14
0	0	0	0	0	∞	0	∞
0	1	0	0	0	∞	0	∞
0	1	1	0	0	∞	0	∞

Number : C14

Folio : 10 of 12

Selected State			Resistance across Ground Terminals (A2, A7, A8, A17, B2, B10 or B17) and terminals :				
10 MHz	1 MHz	100 kHz	B16	A9	A16	B13	B14
0	1	2	0	0	∞	0	∞
0	1	3	0	0	∞	0	∞
0	1	4	0	0	∞	0	∞
0	2	4	0	0	0	0	∞
0	2	5	∞	0	0	0	∞
0	2	6	∞	0	0	0	∞
0	2	7	∞	0	0	0	∞
0	2	8	∞	0	0	0	∞
0	2	9	∞	0	0	0	∞
0	3	0	∞	∞	0	0	∞
0	4	0	0	∞	0	0	∞
0	5	0	0	∞	∞	0	∞
0	6	0	∞	∞	∞	0	∞
0	7	0	∞	∞	∞	0	∞
0	8	0	∞	0	∞	0	∞
0	9	0	∞	0	∞	0	∞
1	0	0	0	0	∞	∞	∞
2	0	0	0	0	∞	∞	0

(H) Checking the Presetting Sub-Band Signal :

(1) Connect the ohmmeter across terminal B15 and one of ground terminals (A2, A7, A8, A17, B2, B10 or B17).

(2) Table below shows the resistance read off ohmmeter versus the state selected.

Number : C14

Folio : 11 of 12

Selected State			Resistance read off Ohmmeter (in k Ω)	Selected State			Resistance read off Ohmmeter (in k Ω)
10 MHz	1 MHz	100 kHz		10 MHz	1 MHz	100 kHz	
0	0	0	1.54	0	2	9	1.33
0	1	0	1.54	0	3	0	1.05
0	1	1	1.54	0	4	0	0.862
0	1	2	1.54	0	5	0	0.862
0	1	3	1.54	0	6	0	0.678
0	1	4	1.54	0	7	0	0.678
0	2	4	1.54	0	8	0	0.678
0	2	5	1.33	0	9	0	0.678
0	2	6	1.33	1	0	0	0.562
0	2	7	1.33	2	0	0	0.562
0	2	8	1.33				

(3) Disconnect ohmmeter from terminals B15 and A2, A7, A8, A17, B2, B10 or B17.

(I) Checking the "VCO Changeover" Signal :

(1) Connect the ohmmeter across terminal A12 and one of ground terminals (A2, A7, A8, A17, B2, B10 or B17).

(2) Table below shows the resistance read off ohmmeter versus the state selected.

Selected State			Resistance read off Ohmmeter	Selected State			Resistance read off Ohmmeter
10 MHz	1 MHz	100 kHz		10 MHz	1 MHz	100 kHz	
0	0	0	0	0	2	9	0
0	1	0	0	0	3	0	0
0	1	1	0	0	4	0	0
0	1	2	0	0	5	0	0

Selected State			Resistance read off Ohmmeter	Selected State			Resistance read off Ohmmeter
10 MHz	1 MHz	100kHz		10MHz	1 MHz	100 kHz	
0	1	3	0	0	6	0	0
0	1	4	0	0	7	0	0
0	2	4	0	0	8	0	0
0	2	5	0	0	9	0	0
0	2	6	0	1	0	0	0
0	2	7	0	2	0	0	∞
0	2	8	0				

(3) Disconnect ohmmeter from terminals A12 and A2, A7, A8, A17, B2, B10 or B17).

III - FINAL OPERATIONS

- (1) Disconnect the - ve of stabilized power supply from ground terminals (A2, A7, A8, A17, B2, B10 and B17) of PC board assembly.
- (2) Disconnect the + ve of + 9.5 V stabilized power supply from terminal B7 of PC board assembly.
- (3) Remove the mechanical device indicating the position of PC board assembly selectors.

6.3 - SPECIAL DISASSEMBLY AND REASSEMBLY PROCEDURE

6.3.1 - General Care :

1. Prior to any operation with the MOS circuits, take the following care :
 - . Make sure the operator is wearing bracelets connected to the ground via a circuit-breaker.
 - . Short-circuit all terminals in the MOS circuit prior to any operation.
2. Cleanse all the new soldered joints systematically with alcohol.
3. Before fitting new seals, coat them systematically with Rhodersil S 14 silicone grease.
4. Use a soldering iron with the following specifications :
 - . Output power : 40 W
 - . Setup, comprising the soldering iron, grounded
 - . Straight, flat bit with an end of 2 mm at most

6.3.2 - Disassembly and Assembly of Special Components :

This paragraph deals with the disassembly and assembly of special components.

Prior to any operation, read carefully the general precautions to be taken as explained in paragraph 6.3.1.

The table below shows which component is concerned in the various assembly/disassembly sheets.

Sheet No.	Operation
D1	Standard exchange of the CONVERTER PC board assembly
D2	Standard exchange of the "Voltage-Controlled Oscillator" PC board assembly in the RF HEAD
D3	Standard exchange of the "Input Protection Circuits" PC board assembly in the RF HEAD
D4	Standard exchange of the "Transmit-Receive Mixer" PC board assembly in the RF HEAD
D5	Standard exchange of the mixer circuit in the "Transmit-Receive Mixer" PC board assembly of the RF HEAD

Sheet No.	Operation
D6	Standard exchange of the "2.5 and 102.5 MHz IF" PC board assembly in the RF HEAD
D7	Standard exchange of the mixer circuit in the "2.5 and 105.5 MHz" PC board assembly in the RF HEAD
D8	Standard exchange of the 102.5 MHz crystal filter in the RF HEAD
D9	Standard exchange of a switch in the transceiver front panel
D10	Standard exchange of the volume potentiometer in the front panel
D11	Standard exchange of the PC board assembly in the "20 W Amplifier"
D12	Standard exchange of rear plug J103 in the "20 W Amplifier"
D13	Standard exchange of the variable inductor in the "Antenna Tuning Unit"
D14	Opening and closing of the "Battery Unit" and standard exchange of the fuse
D15	Standard of the batteries in the "Battery Unit"
D16	Standard exchange of the charger in the "Battery Unit"
D17	Opening and closing of the charger in the "Battery Unit"
D18	Drying of the Manpack transceiver

Assembly : CONVERTER UNIT Sub-assembly : PC Board Assembly Purpose : Standard exchange of the converter PC Board Assembly	MOUNTING AND DISMANTLING DATA SHEET
	Number : D 1 Folio : 1/1
	Personnel : 1 electronic technician
	Time :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D6	Not applicable	<ul style="list-style-type: none"> . see preferred tools in section 5 - Sheet D6 . one 3 mm screwdriver . one converter extractor
<u>Spares</u>		
PC board assembly of same part number		

PROCEDURE :. Preliminary Steps - Safety Requirements

Remove the converter unit as recommended in section 5, sheet D6.

. Operating Procedure :(A) Dismantling

1. Loosen and remove the 4 fixing screws of the protective cover by means of a 3 mm screwdriver.
2. Withdraw and remove the protective cover.
3. Put the converter extractor into place.
4. Withdraw and remove the PC board assembly.

(B) Remounting

1. Put the PC board assembly in its initial position.
2. Put the protective cover in its initial position.
3. Tighten the 4 fixing screws of the protective cover by means of the 3 mm screwdriver.
4. Remount the converter unit as recommended in section 5, sheet D6.

Assembly : HF Head Sub-assembly : VCO Oscillator Purpose : Standard exchange of the VCO oscillator PC board assembly.	MOUNTING AND DISMANTLING DATA
	Number : D2 Folio : 1/2
	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments

Section 5 - Sheet D5

Spares

one PC board assembly of same part number.

Test equipment

Not applicable

Tools

- . see the preferred tools in section 5 Sheet D5.
- . one 2 mm screwdriver.
- . one pair of tweezers.
- . one 30 W soldering iron.
- . solder.

PROCEDURE :. Preliminary Steps - Safety Requirements :

Remove the HF Head as recommended in section 5, sheet D5.

. Operating Procedure :(A) Dismantling :

1. Loosen the 5 fixing screws of the VCO protective cover by means of the 2 mm screwdriver.
2. Withdraw and remove the 5 fixing screws and washers.
3. Withdraw and remove the VCO protective cover.
4. Loosen the 3 fixing screws of the PC board assembly by means of the 2-mm screwdriver.
5. Withdraw and remove the three fixing screws and washers.
6. Remove the PC board assembly from its initial position.
7. Spot the connections going to the PC board assembly.
8. Unsolder connections of the PC board assembly.
9. Withdraw and remove the PC board assembly.

(B) Remounting :

1. Solder the connections to the PC board assembly in the places previously spotted.
2. Put the PC board assembly in its initial position.
3. Put the 3 fixing screws and washers in their initial position.
4. Tighten the 3 fixing screws of the PC board assembly by means of the 2 mm screwdriver.
5. Put the protective cover in its initial position.
6. Put the 5 fixing screws and washers of the VCO protective cover in their initial position.
7. Tighten the 5 fixing screws of the VCO protective cover by means of the 2 mm screwdriver.
8. Remount the HF head as recommended in section 5, sheet D5.

Assembly : HF HEAD Sub-assembly : Input protection circuits Purpose : Standard exchange of the PC board assembly of the input protection circuits.	MOUNTING AND DISMANTLING DATA SHEET
	Number : D3 Folio : 1/2
	Personnel : 1 electronic technician
	Time :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D5 <u>Spares</u> one PC board assembly of same part number	Not applicable	<ul style="list-style-type: none"> . see preferred tools in section 5, sheet D5. . one 2 mm screwdriver . one 3 mm screwdriver . one open-ended spanner (4mm) . one pair of tweezers . one 30 W soldering iron. . solder

PROCEDURE. Preliminary Steps - Safety requirements

Remove the HF head as recommended in section 5, sheet D5.

. Operating Procedure :(A) Dismantling :

1. Loosen the 6 fixing screws of the protective cover by means of the 2 mm screwdriver.
2. Withdraw and remove the 6 fixing screws and washers.
3. Withdraw and remove the protective cover.
4. Spot the connections of the PC board assembly.
5. Unsolder the connections.
6. Loosen the fixing screw of the PC board assembly by means of the 3 mm screwdriver.
7. Withdraw and remove the fixing screw and washer.
8. Unscrew the fixing stud by means of the 4 mm open-ended spanner.
9. Withdraw and remove the stud and washer.
10. Note the initial location of the PC board assembly.
11. Withdraw and remove the PC board assembly.

(B) Remounting :

1. Put the PC board assembly to its initial position.
2. Put the stud and washer in their initial position.
3. Tighten the fixing stud by means of the 4 mm open-ended spanner.
4. Put the fixing screw and washer in their initial position.
5. Tighten the fixing screw by means of the 3 mm screwdriver.
6. Solder the connections to the PC board assembly in the previously spotted positions.
7. Put the protective cover in its initial position.
8. Put the 6 fixing screws and washers of the protective cover in their initial position.
9. Tighten the 6 fixing screws of the protective cover by means of the 2 mm screwdriver.
10. Remount the HF head as recommended in section 5, sheet D5.

Assembly : HF HEAD Sub-assembly : Transmit/Receive PC board assembly. Purpose : Standard exchange of the transmit/receive PC board assembly.	MOUNTING AND DISMANTLING DATA SHEET
	Number : D4
	Folio : 1/2
	Personnel : 1 electronic technician
	Time :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - Sheet D5	Not applicable	<ul style="list-style-type: none"> . see preferred tools in section 5, sheet D5 . One 2 mm screwdriver. . One 4 mm open-ended spanner. . One pair of tweezers. . One 30 W soldering iron. . Solder.
<u>Spares</u>		
One PC board assembly of same part number.		

PROCEDURE. Preliminary Steps - Safety Requirements

Remove the HF head as recommended in section 5, sheet D5.

. Operating Procedure(A) Dismantling

1. Loosen the 6 fixing screws of the protective cover by means of the 2 mm screwdriver.
2. Withdraw and remove the 6 fixing screws and washers.
3. Withdraw and remove the protective cover.
4. Spot the connections of the PC board assembly.
5. Unsolder the connections.
6. Loosen the 2 fixing screws of the PC board assembly by means of the 2 mm screwdriver.
7. Withdraw and remove the 2 fixing screws and washers.
8. Unscrew the 2 fixing studs by means of the 4 mm open-ended spanner.
9. Withdraw and remove the 2 studs and washers.
10. Note the initial position of the PC board assembly.
11. Withdraw and remove the PC board assembly.

(B) Remounting :

1. Put the PC board assembly in its initial position.
2. Put the 2 fixing studs and washers in their initial position.
3. Tighten the 2 fixing studs by means of the 4 mm open-ended spanner.
4. Put the 2 fixing screws and washers in their initial position.
5. Tighten the 2 fixing screws by means of the 2 mm screwdriver.
6. Solder the connections to the PC board assembly in their previously spotted position.
7. Put the protective cover in its initial position.
8. Put the 6 fixing screws and washers of the protective cover in their initial position.
9. Tighten the 6 fixing screws of the protective cover by means of the 2 mm screwdriver.
10. Remount the HF head as recommended in section 5 - sheet D5.

Assembly : HF head	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Transmit/Receive PC board assembly.	Number : D5 Folio : 1/2
Purpose : Standard exchange of the mixer of transmit/receive PC board assembly.	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments

Section 5 - Sheet D5
Section 6 - Sheet D4

Spares

One mixer of same part number.

Test equipment

Not applicable.

Tools

See preferred tools in section 6 - Sheet D4.

PROCEDURE :. Preliminary Steps - Safety Requirements :

Remove the transmit/receive PC board assembly as recommended in sheet D4 of this section.

. Operating Procedure :(A) Dismantling

1. Remove the solder from the fixing lugs of the mixer protective cover.
2. Withdraw and remove the protective cover of the mixer.
3. Note carefully the position of the 'mixer' printed circuit.
4. Remove the solder from the lugs connecting the mixer with the transmit/Receive printed board assembly circuits.
5. Withdraw and remove the 'mixer' printed circuit.

(B) Remounting :

1. Put the 'mixer' printed circuit in its initial position.
2. Solder the 'mixer' connecting lugs onto the transmit/receive printed board assembly circuits.
3. Put the mixer protective cover in its initial position.
4. Solder the fixing lugs of the mixer protective cover.
5. Remount the transmit/receive PC board assembly as recommended in sheet D4 of this section.

Assembly : HF Head	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Fi 102.5 - 2.5 MHz PC board assembly.	Number : D6 Folio : 1/2
Purpose : Standard exchange of the Fi 102.5 2.5 MHz board assembly.	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments :

Section 5 - Sheet D5

SparesOne PC board assembly of
same part number.Test equipment :

Not applicable

Tools :

- . see preferred tools in section 5 - sheet D5.
- . One 2 mm screwdriver.
- . One 4 mm open-ended spanner.
- . One pair of tweezers.
- . One soldering iron. (30 W).
- . Solder

PROCEDURE :. Preliminary Steps - Safety Requirements :

Remove the HF head as recommended in section 5 - sheet D5.

. Operating Procedure :(A) Dismantling

1. Loosen the 4 fixing screws of the Fi 102.5 - 2.5 MHz protective cover by means of the 2 mm screwdriver.
2. Withdraw and remove the 4 fixing screws and washers of the Fi 102.5 - 2.5 MHz protective cover.
3. Withdraw and remove the protective cover.
4. Spot the connections of the PC board assembly.
5. Unsolder the connections.
6. Unscrew the 4 fixing spacers by means of the 4 mm open-ended spanner.
7. Withdraw and remove the 4 spacers and washers.
8. Note the initial position of the PC board assembly.
9. Remove the PC board assembly by lifting it by the side opposite the HF head connector.
10. Remove the PC board assembly.

(B) Remounting

1. Put the PC board assembly in its initial position.
2. Put the 4 spacers and washers into place.
3. Tighten the 4 spacers by means of the 4 mm open-ended spanner.
4. Solder the connections to the PC board assembly in the previously spotted positions.
5. Put the Fi 102.5 - 2.5 MHz protective cover in its initial position.
6. Put the 4 fixing screws and washers of the protective cover in their initial position.
7. Tighten the 4 fixing screws of the protective cover by means of the 2 mm screwdriver.
8. Remount the HF head as recommended in sheet D5 of section 5.

Assembly : HF HEAD	MOUNTING AND DISMANTLING DATA SHEET
Sub-assembly : Fi 102.5 - 2.5 MHz PC board assembly.	Number : D7 Folio : 1/2
Purpose : Standard exchange of the Fi 102.5-2.5 MHz PC board assembly mixer.	Personnel : 1 electronic technician
	Time :

FACILITIES

<u>Documents :</u> Section 5 - Sheet D5 Section 6 - Sheet D6 <u>Spares :</u> one mixer of same part number.	<u>Test equipment :</u> Not applicable	<u>Tools :</u> See preferred tools in section 6 - Sheet D6
---	---	---

PROCEDURE :. Preliminary steps - Safety Requirements :

Remove the Fi 102.5 - 2.5 MHz PC board assembly as recommended in sheet D6 of this section.

. Operating Procedure :(A) Dismantling

1. Remove solder from the fixing lugs of the mixer protective cover.
2. Withdraw and remove the protective cover of the mixer.
3. Note carefully the position of the 'mixer' printed circuit.
4. Remove solder from the lugs connecting the 'mixer' with the Fi 102.5 - 2.5 MHz printed board assembly circuits.
5. Withdraw and remove the 'mixer' printed circuit.

(B) Remounting

1. Put the 'mixer' printed circuit in its initial position.
2. Solder the 'mixer' connecting lugs onto the Fi 102.5 - 2.5 MHz printed board assembly circuits.
3. Put the mixer protective cover in its initial position.
4. Solder the fixing lugs of the mixer protective cover.
5. Remount the Fi 102.5 - 2.5 MHz PC board assembly as recommended in sheet D6 of this section.

Assembly : HF HEAD Sub-assembly : 102.5 MHz crystal filter Purpose : Standard exchange of the 102.5 MHz crystal filter.	MOUNTING AND DISMANTLING DATA SHEET
	Number : D8
	Folio : 1/2
	Personnel : 1 electronic technician
	Time :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
Section 5 - sheet D5	Not applicable	<ul style="list-style-type: none"> . See preferred tools in section 5 - sheet D5. . one 2 mm screwdriver . one 4 mm open-ended spanner . one pair of tweezers . one 30 W soldering iron. . solder
<u>Spares</u>		
one 102.5 MHz crystal filter of same part number		

PROCEDURE :. Preliminary steps - Safety requirements

Remove the HF Head as recommended in sheet D5 of section 5.

. Operating Procedure(A) Dismantling

1. Loosen the 4 fixing screws of the Fi 102.5 - 2.5 MHz protective cover (plate number) by means of the 2 mm screwdriver.
2. Withdraw and remove the 4 fixing screws and washers of the 102.5 - 2.5 MHz protective cover.
3. Withdraw and remove the protective cover.
4. Spot the connections coming from the PC board assembly Fi 102.5 - 2.5 MHz and going to the 102.5 MHz crystal filter.
5. Unsolder both connections going to the 102.5 MHz crystal filter.
6. Loosen the 6 fixing screws of the transmit/receive protective cover (plate number) by means of the 2 mm screwdriver.
7. Withdraw and remove the 6 fixing screws and washers.
8. Withdraw and remove the transmit/receive protective cover.

9. Spot the connection coming from the 102.5 MHz crystal filter and going to the transmit/receive PC board assembly.
10. Unsolder the connection from the transmit/receive PC board assembly.
11. Loosen both fixing nuts of the 102.5 MHz crystal filter by means of the 4 mm open-ended spanner.
12. Withdraw and remove both fixing nuts.
13. Withdraw and remove both lock washers.
14. Note the position of the 102.5 MHz crystal filter.
15. Withdraw the 102.5 MHz crystal filter carefully, taking care not to damage the connection of the crystal filter.
16. Put down the 102.5 MHz crystal filter.
17. Note the position of the connection going to the 102.5 MHz crystal filter.
18. Unsolder the 102.5 MHz crystal filter remaining connection.

(B) Remounting

1. Solder the connection to the 102.5 MHz crystal filter.
2. Put the 102.5 MHz crystal filter back to its initial position. Take great care not to damage the connection while putting it back to place.
3. Put both lock washers into place.
4. Tighten both fixing nuts by means of the 4 mm open-ended spanner.
5. Solder the connection coming from the crystal filter and going to the transmit/receive PC board assembly in the places previously spotted.
6. Put the transmit/receive protective cover in its initial position.
7. Put the 6 fixing screws and washers of the transmit/receive protective cover in their initial position.
8. Tighten the 6 fixing screws of the transmit/receive protective cover by means of the 2 mm screwdriver.
9. Solder both connections coming from the Fi 102.5 - 2.5 MHz PC board assembly and going to the 102.5 - 2.5 MHz crystal filter.
10. Put the Fi 102.5 - 2.5 MHz protective cover in its initial position.
11. Put the 4 fixing screws and washers of the Fi 102.5 - 2.5 MHz in their initial position.
12. Tighten the 4 fixing screws of the protective housing by means of the 2 mm screwdriver.
13. Remount the HF Head as recommended in sheet D5 of section 5.

<p>Assembly : TRANSCEIVER UNIT</p> <p>Sub-assembly : Front Panel.</p> <p>Purpose : Standard exchange of the front panel switch.</p>	<p>MOUNTING AND DISMANTLING DATA SHEET</p>
	<p>Number : D9</p> <p>Folio : 1/2</p>
	<p>Personnel : 1 electronic technician</p>
	<p>Time :</p>

FACILITIES

<u>Documents</u>	<u>Test equipment</u>	<u>Tools</u>
<p>Section 5 - sheet D3</p> <p>Section 5 - sheet D7</p>	<p>Not applicable</p>	<ul style="list-style-type: none"> . See preferred tools in section 5 - sheet D3 . See preferred tools in section 5 - sheet D7 . one 7 mm screwdriver . one 12 mm tubular spanner . Silicone grease SI 4 . one 30 W soldering iron. . solder
<p><u>Spares</u></p> <p>one switch of same part number.</p>		

NOTE : The front panel of the transceiver unit is fitted with the 3 following switches :

- . ' O-L-H ' or power selector switch.
- . ' MORSE - LSB - HSB - AM ' or operating mode selector switch
- . ' O-O-CALL/ROEP ' or configuration selector switch.

The standard exchange procedure is the same for all these switches.

PROCEDURE :

. Preliminary steps - Safety requirements

1. Dismount the protective cover of the transceiver unit as recommended in section 5 - sheet D3.
2. Dismount the setting selector PC board assembly as recommended in section 5 - sheet D7.

. Operating Procedure

(A) Dismantling

1. Note the exact position of the switch to be dismantled.
2. Loosen the center fixing screw of the control knob by means of the 5 mm screwdriver.
3. Withdraw and remove the center fixing screw and washer.
4. Withdraw and remove the control knob.

5. Loosen the 4 fixing screws of the front panel by means of the 7 mm screwdriver.
6. Withdraw and remove the 4 screws and washers.
7. Disengage the front panel of the transceiver unit, taking care not to damage the connectors (swing the front panel - the lower edge acts as a hinge held by the wiring)
8. Spot the connections going to the switch.
9. Unsolder the connections.
10. Loosen the center fixing nut of the switch by means of the 12 mm tubular spanner.
11. Withdraw and remove the center fixing nut.
12. Withdraw the switch by pulling it from the rear side of the front panel. Put it down.
13. Withdraw and remove the seal.

(B) Remounting

1. Clean the seal with a dry cloth.
2. Grease the seal with silicone grease SI 4 wipe off the surplus grease with a dry cloth.
3. Put the seal into place
4. Put the switch into the place previously noted.
5. Put the switch back to its initial position.
6. Fasten the switch by tightening the center nut by means of the 12 mm tubular spanner.
7. Solder the connections to the switch in the places previously spotted.
8. Remount the front panel on the transceiver unit, taking care not damage the connectors.
9. Put the 4 fixing screws and washers into their initial position.
10. Tighten the fixing screws of the front panel by means of the 7 mm screwdriver.
11. Put the control knob into its initial position.
12. Put the center fixing screw and washer into their initial position.
13. Tighten the center fixing screw by means of the 5 mm screwdriver.
14. Remount the setting selector PC board assembly as recommended in section 5 - sheet D7.
15. Remount the protective cover of the transceiver unit as recommended in section 5 - sheet D3.

Assembly : TRANSCIEVER UNIT Sub-assembly : Front Panel. Purpose : Standard exchange of the volume control potentiometer.	MOUNTING AND DISMANTLING DATE SHEET
	Number : D10
	Folio : 1/2
	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments

Section 5 - sheet D3
Section 5 - sheet D7

SparesTest equipment

Not applicable

Tools

- . See preferred tools in section 5 - sheet D3
- . See preferred tools in section 5 - sheet D7
- . one 7 mm screwdriver.
- . one 12 mm tubular spanner
- . silicone grease SI 4
- . one 30 W soldering iron
- . solder

PROCEDURE :. Preliminary steps - Safety requirements

1. Dismount the transceiver protective cover as recommended in section 5 -sheet D3.
2. Dismount the setting selector PC board assembly as recommended in section 5 - sheet D7.

. Operating Procedure(A) Dismantling

1. Turn the control knob of the volume control potentiometer fully anti-clockwise.
2. Note the position of the control knob.
3. Loosen the center fixing screw of the control knob by means of the 5 mm screwdriver.
4. Withdraw and remove the center fixing screw and washer.
5. Withdraw and remove the control knob.
6. Loosen the 4 fixing screws of the front panel by means of the 7 mm screwdriver.
7. Withdraw and remove the 4 fixing screws and washers.
8. Disengage the transceiver unit front panel, taking care not to damage the connectors.
9. Spot the connections going to the potentiometer.
10. Unsolder the connections.

11. Unscrew the center fixing nut of the potentiometer by means of the 12 mm tubular spanner.
12. Withdraw and remove the center fixing nut.
13. Withdraw the potentiometer by pulling it from the rear side of the front panel. Put it down.
14. Withdraw and remove the seal.

(B) Remounting

1. Clean the seal with a dry cloth
2. Grease the seal with silicone grease SI 4 wipe off the excess grease with a dry cloth.
3. Put the seal back into place.
4. Turn the potentiometer axis anti-clockwise until it reaches stop position.
5. Put the potentiometer into its initial position.
6. Fasten the potentiometer by tightening the center nut by means of the 12 mm tubular spanner.
7. Solder the connections to the potentiometer in the places previously spotted.
8. Remount the front panel onto the transceiver unit, taking care not to damage the connectors.
9. Put the 4 fixing screws and washers of the front panel into their initial position.
10. Tighten the 4 fixing screws of the front panel by means of the 7 mm screwdriver.
11. Put the control knob into its initial position.
12. Put the center fixing screw and washer back into their initial position.
13. Tighten the center fixing screw by means of the 5 mm screwdriver.
14. Remount the setting selector PC board assembly as recommended in section 5 - sheet D7.
15. Remount the protective cover of the transceiver unit as recommended in section 5 - sheet D3.

<p>Assembly : 20 W AMPLIFIER</p> <p>Sub-assembly : PC board assembly.</p> <p>Purpose : standard exchange of the PC board assembly.</p>	MOUNTING AND DISMANTLING DATA SHEET
	<p>Number : D11</p> <p>Folio : 1/2</p>
	<p>Personnel : 1 electronic technician</p>
	<p>Time :</p>

FACILITIES :

Documents
Section 5 - sheet D4

Test equipment
Not applicable

Tools
See preferred tools in section 5 - sheet D4.

Spares

- . one 4 mm screwdriver
- . one 5 mm screwdriver
- . one 5 mm open-ended spanner
- . one special spanner for power transistors
- . DOW-CORNING 340 grease
- . one soldering iron.
- . solder

PROCEDURE :. Preliminary steps - Safety requirements

Dismount the 20 W amplifier as recommended in section 5 - sheet D4.

. Operating Procedure(A) Dismantling

1. Loosen the 4 fixing screws of the screening plate by means of the 4 mm screwdriver.
2. Withdraw and remove the 4 fixing screws and washers.
3. Withdraw and remove the screening plate.
4. Spot the connections going to the PC board assembly.
5. Disconnect the connections.
6. Loosen the 4 fixing studs by means of the 5 mm open-ended spanner.
7. Withdraw and remove the 4 fixing studs and washers.
8. Loosen the 4 fixing nuts of the power transistors by means of the special spanner.
9. Withdraw and remove the fixing nuts of the power transistors.
10. Loosen and remove the binding screws of transistors Q6 and Q14 by means of the 5 mm screwdriver.

11. While holding the 20 W amplifier in position, push on the power transistors so as to disengage the PC board assembly.
12. Withdraw and remove the PC board assembly.
13. Note in which parts of the unit white DOW-CORNING 340 grease has been put on the power transistors and diodes.

(B) Remounting

1. Clean the unit thoroughly
2. Put some DOW-CORNING 340 grease in places previously spotted.
3. Put the PC board assembly back to its initial position.
4. Tighten the binding screws of transistors Q6 and Q14 by means of the 5 mm screwdriver.
5. Clean and grease the power transistor nut seals with silicone grease SI 4. With a dry clean cloth wipe off the excess grease. Put the seals in their initial position.
6. Put the 4 power transistor nuts and seals in their initial positions and tighten them with the special spanner for power transistors.

CAUTION : the tightening torque shall not exceed 15 kg/cm.

7. Put the 4 fixing studs and washers into their initial position.
8. Tighten the 4 fixing studs by means of the 5 mm open-ended spanner.
9. Solder the connections going to the PC board assembly in the places previously spotted.
10. Put the screening plate and washers into its initial position.
11. Put the 4 fixing screws of the screening plate into their initial position.
12. Tighten the 4 fixing screws of the screening plate by means of the 4 mm screwdriver.
13. Remount the 20 W amplifier as recommended in section 5 - sheet D4.

Assembly : MANPACK	ASSEMBLY/DISASSEMBLY SHEET
Subassembly : 20 W Amplifier	Number : D12 Folio : 1/2
Purpose : Standard Exchange of Connector J103	Personnel : 1 electronic technician Time :

FACILITESDocuments

Section 5 - Sheet D4

Spare Parts

1 Connector with same part number

Meters

Not applicable

Tools

- . Tools mentioned in section 5, sheet D4.
- . Special connector locating template with a 35.5 mm tubular spanner.
- . Soldering iron
- . Solder
- . PRC 1201 Q compound
- . Tweezers

PROCEDURE :. Preliminary Operations - Safety Instructions

Disassemble the "20 W Amplifier" as explained in section 5, sheet D4.

. Operating Procedure :(A) Disassembly :

1. Remove the PRC 1201 Q compound from plug J 103 by means of tweezers.
2. Identify the connections terminating in rear plug J 103.
3. Unsolder the connections terminating in rear plug J103 by means of the soldering iron.
4. Loosen the attaching nut of rear plug J103 by means of the 35.5 mm tubular spanner.
5. Withdraw and remove the attaching nut.
6. Withdraw and remove rear plug J103.

(B) Reassembly :

1. Put rear plug J103 in the initial position.
2. Put the attaching nut of rear plug J103 into place
3. Put into place the special connector locating template in the "20 W Amplifier" and the 35.5 mm tubular spanner.
4. Tighten the attaching nut of rear plug J103 by means of the 35.5 mm tubular spanner.

5. Withdraw and remove :
 - . 35.5 mm tubular spanner
 - . Special connector locating template of the rear plug.
6. Solder the connections normally terminating in plug J103 as per arrangement previously noted.
7. Coat rear plug J103 with PRC 1201 Q compound
8. Wait for PRC 1201 Q compound to dry up (this should take about 8 hours at approximately 20° C).
9. Reassemble the "20 W Amplifier" as explained in section 5, sheet D4.

Assembly : MANPACK Subassembly : Antenna Tuning Unit Purpose : Standard Exchange of Variable Inductor and Opening of the Unit.	ASSEMBLY/DISASSEMBLY SHEET
	Number : D13 Folio : 1/2
	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments

Section 5 - sheet D2

Spare Parts1 Variable inductor,
same part no.Meters

Not applicable

Tools

- . Tools mentioned in section 5, sheet D2
- . 3.2 mm Allen key
- . 4 mm Allen key
- . 4 mm screwdriver
- . Soldering iron
- . Solder

PROCEDURE :. Preliminary Operations - Safety Instructions :

Disassemble the "Antenna Tuning Unit" as explained in section 5 sheet D2

. Operating Procedure :(A) Disassembly :

1. Loosen the 6 attaching screws from the metal cover of the "Antenna Tuning Unit" by means of the 3.2 mm Allen key.
2. Withdraw the metal cover of the antenna tuning unit with care so as not to damage the leads.
3. Unsolder :
 - . Orange lead
 - . Yellow lead
 - . White coaxial lead (with red mark)
 - . White coaxial lead (with blue mark)
 - . White coaxial lead in the loom terminating in the printed circuit.
4. Loosen the two connector attaching screws by means of the 4 mm screwdriver ; withdraw and remove the two attaching screws.

5. Loosen the two attaching screws of the printed circuit by means of the 4 mm screwdriver.
6. Lift the printed circuit.
7. Release the two spacers without loosening the nuts.
8. Loosen the two attaching screws of the metal plate by means of the 4 mm screwdriver and withdraw the metal plate.
9. Loosen the four attaching screws of the inductor by means of the 4 mm Allen key.
10. Lift the variable inductor and unsolder the purple lead and the large gauge white lead normally terminating in the variable inductor.
11. Withdraw and remove the variable inductor.

(B) Reassembly :

1. Place the variable inductor inside the antenna tuning unit.
2. Solder the purple lead and the large gauge white lead normally terminating in the variable inductor.
3. Put the variable inductor in its initial position.
4. Tighten the four attaching screws of the inductor by means of the 4 mm Allen key.
5. Put the metal plate back to its initial position.
6. Tighten the two attaching screws of the metal plate by means of the 4 mm screwdriver.
7. Secure the two spacers.
8. Put the printed circuit back to its initial position.
9. Tighten the two attaching screws of the printed circuit by means of the 4 mm screwdriver.
10. Tighten the two attaching screws of the connector by means of the 4 mm screwdriver.
11. Solder :
 - . orange lead
 - . yellow lead
 - . White coaxial lead (with red mark)
 - . White coaxial lead (with blue mark)
 - . White coaxial lead in the loom, terminating normally in the printed circuit.
12. Put carefully the metal cover back into its initial position and be sure not to damage the wiring.
13. Tighten the six attaching screws of the metal cover by means of the 3.2 mm BTR spanner.
14. Reassemble the antenna tuning unit as explained section 5 sheet D2.

Assembly : MANPACK Subassembly : Battery Unit Purpose : Opening and Closing the Battery Unit and Standard exchange of the Fuse.	ASSEMBLY/DISASSEMBLY SHEET
	Number : D14 Folio : 1/1
	Personnel : 1 electronic technician Time :

FACILITIESDocuments

Section 5 - Sheet D1

Spare Parts

Not applicable

Meters

Not applicable

Tools

3.2 mm Allen key

PROCEDURE :. Preliminary Operations - Safety Instructions

Disassemble the "Battery Unit" as explained in section 5 sheet D1.

. Operating Procedure :(A) Opening the Unit :

1. Loosen the four cover attaching screws by means of the 3.2 mm Allen key.
2. Remove the cover from the battery unit.

Note : the fuse is then accessible. Proceed to standard exchange of the fuse if need be.

(B) Closing the Unit :

1. Put the battery unit cover back to its initial place.
2. Tighten the four cover attaching screws by means of the 3.2 mm Allen key.
3. Reassemble the battery unit as explained in section 5 sheet D1.

Assembly : MANPACK Subassembly : Battery Unit Purpose : Standard Exchange of the Batteries in the "Battery Unit"	ASSEMBLY/DISASSEMBLY SHEET
	Number : D15 Folio : 1/2
	Personnel : 1 electronic technician
	Time :

FACILITIES :Documents

Section 5 - Sheet D1
Section 6 - Sheet D14

Meters

Not applicable

Tools

- . Tools mentioned in section 6, sheet D14.
- . 4 mm screwdriver.
- . Soldering iron.
- . Solder

Spare Parts

1 Battery, with same part no.

PROCEDURE :. Preliminary Operations - Safety Instructions :

1. Disassemble the battery unit as explained in section 5, sheet D1.
2. Open the battery unit as explained in section 6, sheet D14.

. Operating Procedure :(A) Disassembly

1. Loosen the four attaching screws of the charger by means of the 4 mm screwdriver.
2. Remove the charger from the chassis so that the batteries may be accessible.
3. Unsolder the red lead originating from the batteries and terminating in the fuse.
4. Unsolder the blue lead coming from the batteries and terminating in the cover.
5. Withdraw and remove the batteries from the battery unit.

(B) Reassembly

1. Put the batteries back to their initial positions.
2. Solder the blue lead coming from the batteries and normally terminating in the cover.
3. Solder the red lead coming from the batteries and terminating in the fuse.
4. Put the charger back to its initial position.
5. Tighten the four attaching screws of the charger by means of the 4 mm screwdriver.

Number D15

Folio 2/2

6. Close the battery unit as explained in section 6, sheet D14.
7. Reassemble the battery unit as explained in section 5, sheet D1.

Assembly : MANPACK Subassembly : Battery Unit. Purpose : Standard Exchange of the Charger in the "Battery Unit"	ASSEMBLY/DISASSEMBLY SHEET
	Number : D16 Folio : 1/1
	Personnel : 1 electronic technician
	Time :

FACILITIESDocuments

Section 5 - Sheet D1
 Section 6 - Sheet D14

Spare Parts

1 Charger, with same part
 no.

Meters

Not applicable

Tools

- . Tools mentioned in section 6,
 sheet D14.
- . 4 mm screwdriver.
- . Soldering iron.
- . Solder

PROCEDURE :. Preliminary Operations - Safety Instructions :

1. Disassemble the battery unit as explained in section 5, sheet D1.
2. Open the battery unit as explained in section 6, sheet D14.

. Operating Procedure :(A) Disassembly :

1. Identify the leads terminating in the charger.
2. Unsolder the leads terminating in the charger.
3. Loosen the four attaching screws of the charger by means of the 4 mm screwdriver.
4. Withdraw and remove the charger.

(B) Reassembly :

1. Put the charger back to its initial position.
2. Tighten the four attaching screws of the charger by means of the 4 mm screwdriver.
3. Solder the leads terminating in the charger as per arrangement previously noted.
4. Close the battery unit as explained in section 6, sheet D14.
5. Reassemble the battery unit as explained in section 5, sheet D1.

Assembly : MANPACK Disassembly : Battery Unit Purpose : Opening and Closing the Charger in the Battery Unit"	ASSEMBLY/DISASSEMBLY SHEET
	Number D17 Folio 1/2
	Personnel : 1 electronic technician
	Time :

<u>FACILITIES</u>		
<u>Documents</u>	<u>Meters</u>	<u>Tools</u>
Section 5 - Sheet D1 Section 6 - Sheet D14 Section 6 - Sheet D16 <u>Spare Parts :</u> 1 charger cover, with same part no.	Not applicable	. Tools mentioned in section 6, sheet D14. . Tools mentioned in section 6, sheet D16. . Special device for disassembly and reassembly of the charger cover. . Temperature-controlled heating plate. . 2.5 mm screwdriver. . 150 W soldering iron

<u>PROCEDURE :</u>
. <u>Preliminary Operations - Safety Instructions :</u> 1. Disassemble the battery unit as explained in section 5, sheet D1. 2. Open the battery unit as explained in section 6, sheet D14. 3. Remove the charger as explained in section 6, sheet D16.
. <u>Operating Procedure :</u> (A) <u>Disassembly :</u> 1. Put the special tools for the disassembly and reassembly of the charger cover on the temperature - controlled heating plate. 2. Set the temperature-controlled heating plate between 70 and 80° C. 3. Wait for one hour (approx). 4. Put the charger on the special device for disassembly and reassembly of the charger cover. 5. Screw the two charger attaching screws onto the special device by means of the 2.5 mm screwdriver. 6. Wait for 10 minutes (approx). 7. Withdraw the cover as follows : . Melt the solder securing the cover to the charger by means of the 150 W soldering iron.

- . Separate the cover from the charger proper by pulling the unsoldered ends by means of the 2.5 mm screwdriver.

8. Remove the cover.

(B) Reassembly :

1. Put the new cover in place.
2. Secure the cover onto the charger by soldering the ends by means of the 150 W soldering iron.
3. Loosen the two attaching screws of the charger on the special device by means of the 2.5 mm screwdriver.
4. Withdraw and remove the charger from the special device.
5. Set the temperature-controlled heating plate to off.
6. Wait until the charger panels reach room temperature.
7. Assemble the charger as explained in section 6, sheet D16.
8. Close the battery unit as explained in section 6, sheet D14.
9. Reassemble the battery unit as explained in section 5, sheet D1.

Assembly : MANPACK	ASSEMBLY/DISASSEMBLY SHEET
	Number : D18
	Folio : 1/1
	Personnel : 1 electronic technician
Purpose : Drying of the MANPACK Transceiver	Time :

<u>FACILITIES :</u>		
<u>Documents</u>	<u>Meters</u>	<u>Tools</u>
Plates 2 and 3	Not applicable	. 4 mm Allen key . Dryer . S14 Rhodersil silicone grease.
<u>Spare Parts</u>		
Not applicable		

<u>PROCEDURE :</u>
. <u>Preliminary Operations - Safety Instructions :</u>
CAUTION : Make sure that the MANPACK transceiver is switched off
. <u>Operating Procedure :</u>
1. Unscrew the dummy plug on the front panel of the MANPACK transceiver by means of the 4 mm screwdriver.
2. Unscrew the second dummy plug on the rear panel of the antenna tuning unit by means of the 4 mm Allen key.
3. Plug the dryer into the two nozzles provided for this purpose
4. Blow dry air through the MANPACK transceiver.
5. Grease the dummy plug seals with S14 Rhodersil silicone grease.
6. Unplug the dryer from the two nozzles of the MANPACK transceiver.
7. Screw the dummy plug normally located on the MANPACK transceiver front panel by means of the 4 mm Allen key.
8. Screw the dummy plug normally located on the rear panel of the antenna tuning unit by means of the 4 mm Allen key.