SKANTI

TECHNICAL MANUAL

TRP 8250 D SERIES

**** NOTE. The technical manual for the TRP 8400 series is based on the TRP 8250 D series manual, with all deviations descreibed in the rear AMENDMENTS .***

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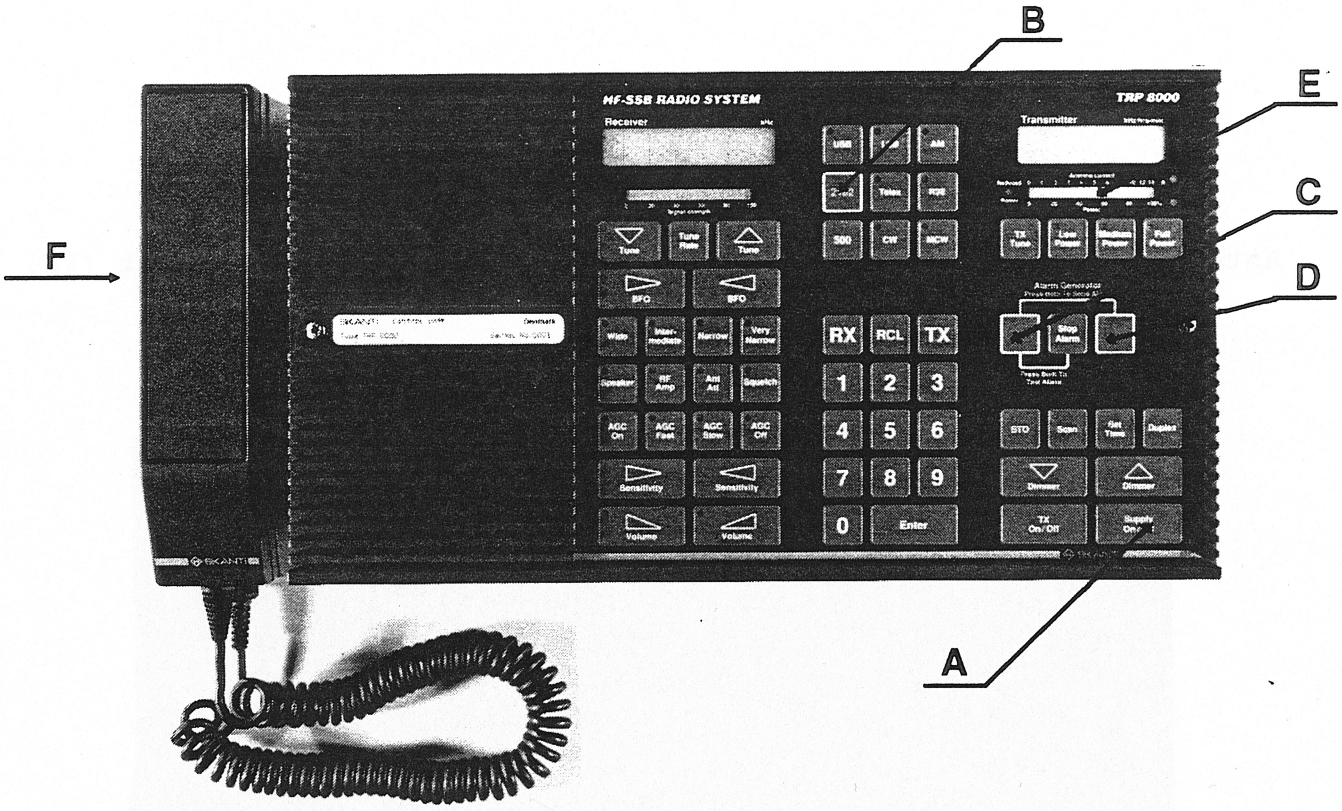
1. DISTRESS OPERATION ON 2182 kHZ



1.1 Transmission of two-tone alarm signal

1. Press "**Supply On/off**" key (A) to turn equipment on.
2. Press "**2182**" key (B).
3. Press **Alarm Generator** keys (C) and (D) simultaneously.

Transmission starts immediately after the automatically initiated tuning sequence and the alarm signal is now transmitted for 45 seconds. The antenna current is displayed on the ANTENNA CURRENT meter (E) and the alarm signal is heard in the loudspeaker.

To repeat the alarm signal transmission just press the ALARM GENERATOR keys (C) and (D) again simultaneously.

An alarm signal transmission may be interrupted at any time by pressing the "**Stop Alarm**" key.

1.2 Transmission of distress message

When the alarm signal ceases press handset key (F), and transmit your distress message by speaking into the handset microphone with a clear and calm voice.

Release handset key and wait for reply.

Repeat the distress message at intervals until a reply is received.

Antenna Tuning Unit (ATU)

Transceiver Unit (TU)

Control Unit (CU)

Fig. 1.1

2. INTRODUCTION

The TRP 8250 D Series is general purpose HF SSB transmitting receiving equipment covering the frequency range 1.6 to 30MHz designed for marine as well as point-to-point applications.

The standard version offers duplex, simplex and semiduplex radiotelephone communication in the maritime mobile bands and is intended for installation in voluntarily or compulsorily fitted vessels.

A selection of optional facilities permits configuring equipment fulfilling various needs, including transmission and reception of LSB, J3E signals, transmission and reception of radiotelex, transmission and reception of CW and MCW morse telegraphy. The equipment is fully transistorized and extensive use is made of the latest microprocessor technology.

The TRP 8250 D consists of a Control Unit, a fully remote controlled Transceiver Unit and an automatic Antenna Tuning Unit. The units can be placed up to 100 m apart using standard 16 x 0.5 mm sq. screened cable. An AC Power Supply Unit is used when the equipment is supplied from AC MAINS.

The Control Unit contains all receiver and transmitter operating controls. It is fully push-button controlled by means of a rugged membrane keyboard, insensitive to dust and water. Separate LED-displays show receive and transmit frequencies, and two bargraph displays show receiver signal strength and transmitter output power respectively. When the transmitter is switched-off, time of day is displayed from a built-in realtime clock, which can also be used to switch on the equipment at a predetermined time.

The keyboard permits the operator to program up to 76 receive and transmit frequency pairs and to recall or scan the frequencies with a few key operations.

When the equipment is switched-off the real-time clock and the memory are supplied from a built-in lithium primary cell having a lifetime of several years. The non volatile memory also stores the current setting of the equipment when switching-off and restores it when switching-on again.

Where required by the authorities transmitter frequencies can be preprogrammed into a PROM having a capacity of 1017 frequencies. Transmitter keying can then only take place on the authorized frequencies. The keyboard permits recall of all the preprogrammed frequencies. The receiver can be tuned in 10 Hz, 100 Hz or 1 kHz steps at the choice of the operator. 5 W audio output is available to the built-in loudspeaker or to external speakers. A squelch circuit is optionally available.

The standard equipment contains the two-tone radiotelephone alarm signal generator and single key selection of 2182 kHz.

The Control Unit provides connection facilities for handset, headphones,

extension speaker, morse-key and telex-equipment. 600 ohms AF input and output terminals are provided with Line Transformers as optional extras.

The Control Unit is housed in a Noryl (PPO) cabinet suitable for tabletop or bulkhead mounting. The front panel can be tilted for convenient operation when the unit is mounted vertically as well as horizontally.

The Transceiver Unit contains all receiver and transmitter RF circuitry. The receiver signal path and the exciter signal path together with two identical fast switching synthesizers are contained in the front door of the unit. All frequencies are fully synthesized and derived from a Master Oscillator. The Master Oscillator is available in different stability versions. These boards are contained in screened compartments of the door of the unit. The door itself is made in moulded Noryl (PPO).

The fully protected solid state 250 W power amplifier is cooled by natural convection. It matches a 50 ohms antenna system but is normally used in connection with the Antenna Tuning Unit matching the transmitter to wire or whip antennas.

In the standard version the transmitter covers the marine bands between 1.6 and 30 MHz but PA-filters are available which in addition give coverage of the 500 kHz marine band or give continuous coverage of the frequency range 1.6 to 30 MHz.

A high efficiency switched mode power supply ensures optimum output power at low power consumption and covers a supply voltage range from 10.8 to 41.6 Volts. The nylon-coated steel cabinet can be tabletop or bulkhead mounted by means of rugged nylon-coated cast brackets.

The fast tuning, microprocessor controlled Antenna Tuning Unit is based on high voltage, high current HF reed-relays. It tunes automatically to all antennas between 7 and 30 meters length and requires no presetting at the installation. Tuning is performed in 0.2 to 1.5 sec.

An optionally available Antenna Relay Board contains a simplex relay system, a dummy load and a grounding relay connecting the antenna to ground when the equipment is switched-off. The simplex antenna relay system is fast enough to permit ARQ-telex on one antenna.

The ATU cabinet is made in Lexan (Polycarbonat).

The AC Power Supply Unit accepts nominal input voltages of 110/120/220/240 V, 50-60 Hz. A built-in switch permits manual switch-over to battery operation.

2.1 **BASIC VERSIONS**

In common : 250 Watt P.E.P. Power Amplifier.
Simplex/Semi-duplex/Full-duplex operation 1.6-30 MHz.

TRP 8250 D : Marine SSB Radiotelephone.
1017 preprogrammable frequencies in Marine Bands.

TRP 8251 D : Marine SSB Radiotelephone.
Free frequency selection Marine Bands.

TRP 8252 D : Marine SSB Radiotelephone.
Free frequency selection Marine Bands.
CW and MCW facilities.

TRP 8253 D : Marine SSB Radiotelephone.
Free frequency selection all bands.

TRP 8254 D : General Purpose SSB Radiotelephone.
Free frequency selection all bands.

TRP 8255 D : General Purpose SSB Radiotelephone.
Free frequency selection all bands.
CW and MCW facilities.

TRP 8256 D : General Purpose SSB Radiotelephone.
Free frequency selection all bands.
As type TRP 8254 D, but simplified keyboard.

TRP 8257 D : Marine SSB Radiotelephone.
Free frequency selection all bands.
CW and MCW facilities.

3. TECHNICAL DATA

Versions complying with the SOLAS 74 convention and the ITU Radio Regulations are available, meeting one or more of the specifications: CEPT, MPT, DOC and FTZ.

3.1 GENERAL

Frequency Generation:	True digital frequency synthesis.
Frequency Selection:	By common keyboard. Single key selection of 2182 kHz. 76 user-programmable frequency pairs. Scanning facilities (may be disabled). Remote control (optional).
Frequency Presentation:	Separate LED displays for receive and transmit frequencies.
Frequency Stability:	1.5 ppm 0.8 ppm (optional) 0.4 ppm (optional)
Operating modes:	Duplex, semiduplex and simplex.

USB:	J3E upper sideband, suppressed carrier.
R3E:	Upper sideband, reduced carrier.
AM:	H3E upper sideband, full carrier.
LSB:	J3E lower sideband, suppressed carrier (optional).
CW:	A1A morse telegraphy.
MCW:	H2A modulated morse telegraphy
TELEX:	F1B with center audio frequency selectable between 1500 and 2500 Hz in 100 Hz steps (optional).

Operating Temperature Range:	-20 deg. C to +55 deg. C
Full Performance Temperature Range:	0 deg. C to +40 deg. C

3.2 RECEIVER CHARACTERISTICS

Frequency Range:	100 kHz to 30 MHz (10 kHz to 100 kHz with reduced performance)

Frequency resolution:	100 Hz by numerical frequency keyboard entry. A search/fine tuning facility is provided with selectable increment steps of 10 Hz, 100 Hz or 1 kHz. In addition a user-programmed step size may be selected.
Antenna Impedance:	Below 4 MHz: 10 ohm in series with 250 pF or 50 ohm (std.) internally selectable. 4 MHz to 30 MHz: 50 ohm
Input Protection:	30 V RMS (EMF) for up to 15 min.
IF Selectivity:	SSB: 350 Hz to 2.7 kHz
	AM: +/- 2.7 kHz or +/- 4 kHz (optional)
	CW/MCW:
	Wide: +/- 2.7 kHz or +/- 4 kHz (optional)
	Inter: +/- 1.2 kHz or +/- 2.7 kHz (optional)
	Narrow: +/- 250 Hz or +/- 500 Hz (optional)
	Very Narrow: As Telex or disabled
	TELEX (optional): +/- 150 Hz or +/- 250 Hz or +/- 400 Hz or +/- 1200 Hz
Sensitivity:	Max. antenna input for 10 dB SINAD, 50 ohm antenna.
	SSB: 1.6 - 30 MHz: 0.8 uV
	AM: 100 kHz - 400 kHz: 7 uV 400 kHz - 30 MHz: 5 uV

	CW (+/- 500 Hz): 100 kHz - 30 MHz: 0.6 uV When RF-AMP is selected, the sensitivity is increased by 6 dB.
Intermodulation: (out-of-band)	100 dB uV per signal more than 30 kHz offset from receiver frequency produces less than an equivalent input signal of 30 dB uV.
Third order intercept point:	+22 dBm.
Cross modulation:	Unwanted signal of 118 dB uV/30 % - 400 Hz more than 20 kHz offset from receiver frequency, produces cross modulation less than -30 dB relative to a vanted signal of 60 dB uV/SSB.
Duplex Operation:	Less than -30 dB cross modulation for Transmitter/Receiver isolation greater than 30 dB and frequency offset more than 1.5 %.
Blocking:	More than 80 dB to cause a 3 dB change in output power when wanted signal gives 20 dB SINAD, and the unwanted signal is offset by more than 20 kHz from the receiver frequency.
Image Rejection:	Greater than 80 dB
IF Rejection:	Greater than 90 dB
Spurious Response Rejection:	Greater than 80 dB below 4 MHz Greater than 70 dB above 4 MHz
Internally generated spurious signals:	Less than 5 dB SINAD (SSB)
Spurious Emission:	Less than 25 pW/50 ohm at antenna connector.
RF-Amplifier:	0 dB or 10 dB
RF-Attenuator:	0 dB or 20 dB
Automatic Gain Control:	Less than 5 dB change in output for 100 dB input signal variation from 20 dB sensitivity level (SSB).
BFO Range:	+/- 3 kHz synthesized in 100 Hz steps

Line output:	Internally adjustable up to +10 dBm/600 ohm. Balanced 600 ohms output (optional).
In-band Intermodulation:	Less than -50 dB
Audio Output Power:	5 W in 8 ohm to internal and/or external loudspeaker. Audio Squelch (optional): Speech operated.

3.3 TRANSMITTER CHARACTERISTICS

Output Power:	250 W PEP +0/-1.4 dB from Transceiver Unit into 50 ohms. Power Reduction: Medium: approx. 60 W PEP Low: approx. 10 W PEP Single-tone max. Power: 250 W PEP for keying duty-cycle less than 55% and modulation rates greater than 3 baud. 3 dB power reduction when continuously keyed during 1 min. Automatic power recovery when muted during 2 min.
Transmitter Frequencies:	TRP 8250 D: Up to 1017 programmable channels, freely distributed in the ranges: 1606.5 to 4800 kHz 6200 to 8950 kHz 12230 to 17650 kHx 18780 to 27100 kHz TRP 8253 D/8254 D/8255 D/8257 D: Free or programmable frequency selection in the range: 1606.5 kHz to 30 MHz.
Spurious Emissions:	Les than -60 dB/PEP
Alarm Generator:	A two-tone alarm generator is incorporated (TRP 8250 D/8253 D/8257 D).
Audio Input Level:	Telex: 0 dBm +10/-16 dB Input impedance: 600 ohm Aux: 0 dBm +10/-16 dB Input impedance: 600 ohm

	Mic:	20 mV to 2.5 V internally adjustable. Input impedance: 100 kohm//6.8 nF. Recommended source impedance: Less than 2.5 kohm.

3.4 ANTENNA TUNING UNIT

Frequency Range:	1.6 - 30 MHz
Antenna Requirements:	7 - 30 m wire and/or whip.
Antenna Tuning:	Fully automatic
Tuning time:	0.2 - 1.5 sec
Input Impedance after tuning:	50 ohm. SWR <= 1.4

Manual setting possible for 2182 kHz

Power Handling Capability:	250 W PEP 125 W Average

3.5 POWER REQUIREMENTS

Supply Voltage:	12-24-32 V DC (-10/+30%) (no presetting) Connection will not earth Supply Battery. 110/120/220/240 V AC (optional external Power Supply Unit, type P 8250).

Power Consumption (approx.)	Receive only:	50 W
	J3E unmodulated:	100 W
	H3E unmodulated:	360 W
	H3E alarm:	420 W
	CW keyed:	640 W
	MCW keyed:	420 W
	ARQ-telex:	330 W

3.6 DIMENSIONS AND WEIGHTS

Control Unit:	Width:	372 mm
	Height:	87 mm
	Depth:	203 mm
	Weight	4 kg, approx.

Transceiver Unit:	Width:	422 mm (500 mm incl mounting brackets).
	Height:	368 mm
	Depth:	280 mm
	Weight:	28.4 kg, approx.
Antenna Tuning Unit:	Width:	330 mm
	Height:	440 mm (535 mm incl antenna horn).
	Depth:	130 mm
	Weight:	5.7 kg, approx.
AC Power Supply Unit (optional):	Width:	241 mm
	Height:	367 mm (440 mm incl attachment rails).
	Depth:	101 mm
	Weight:	17 kg, approx.

4. OPERATION

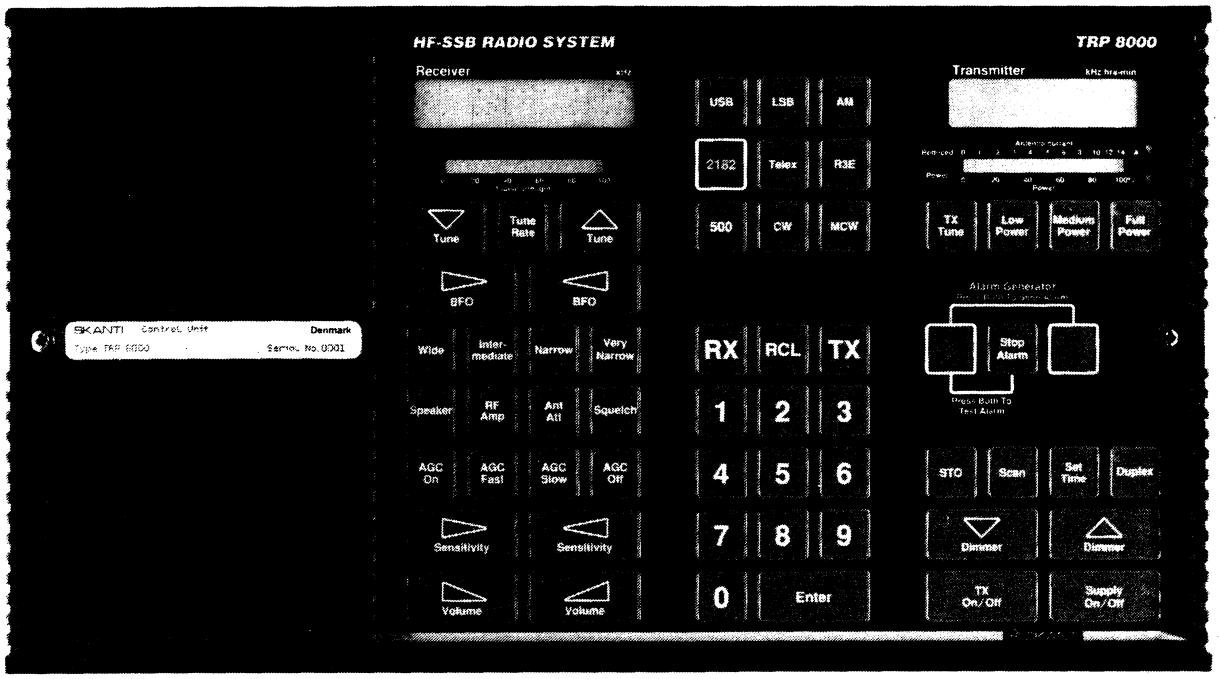
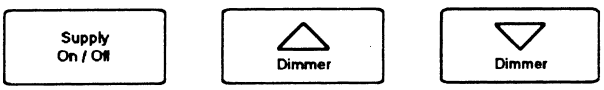


Fig. 4.1

The equipment is operated from the Control Unit (fig. 4.1) and is 100% keyboard controlled. For quick reference section 4.1 gives the operating instructions as pictures of keying sequences, followed by a short description of the action caused by each key. Parentheses around key-numbers indicates that the corresponding keys should only be pressed under the conditions described below. A description of all the keyboard operating controls is foundin section 4.2.

4.1 OPERATING INSTRUCTIONS

4.1.1 SWITCH ON

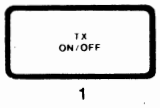


1 Press "SUPPLY ON/OFF"
The equipment will now enter the state it was in before being switched OFF, as indicated by the displays and annunciators.

(2) Increase light intensity of displays and annunciators if too low.

(3) Decrease light intensity of displays and annunciators if too high.

4.1.2 TRANSMITTER ON

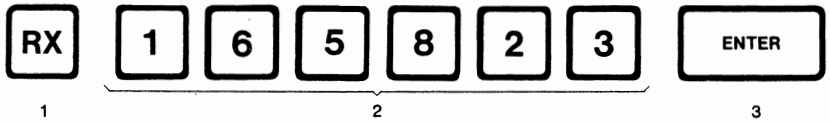


1 Press "TX ON/OFF" if the transmitter is OFF.
The transmitter display will then show the transmitter frequency.

If the transmitter display is showing the time of day, as indicated by the flashing time cursor (3rd digit), the equipment is in the "Receive only" state with all transmitter functions switched OFF.

4.1.3 RECEIVING

4.1.3.1 A. CHANGE RECEIVER FREQUENCY (16582.3 kHz)

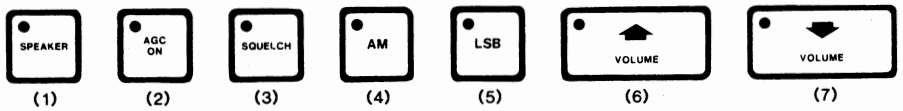


1 Press "RX"
The receiver display is blanked and its decimal point starts flashing.

2 Enter desired frequency in the receiver display via the numeric keys. The last digit is always interpreted as the "100 Hz" digit.

3 Press "ENTER"
The decimal point stops flashing if the frequency is valid. The whole display starts flashing if the frequency is invalid.

4.1.3.2 B. SET RECEIVER (MODE)



(1) Press "SPEAKER" if the loudspeaker is OFF.
Annunciator indicates loudspeaker ON.

(2) Press "AGC ON" if the AGC is OFF.
Annunciator indicates AGC ON.

(3) Press "SQUELCH" if the Squelch is OFF.
Annunciator indicates Squelch ON.

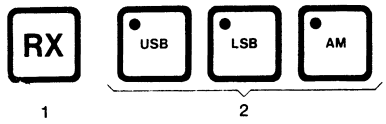
(4) Press "AM" if the received signal is an AM (A3E) signal.

(5) Press "USB" if the received signal is an SSB (J3E) signal.
Annunciators indicate the mode selected.

(6) Increase volume if sound level is too low.

(7) Decrease volume if sound level is too high.

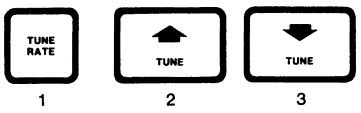
4.1.3.3 C. SELECT SEPARATE RECEIVER MODE



1 Press "RX"
The receiver display is blanked and its decimal point starts flashing.

2 Press "USB", "LSB" or "AM"
If the TX-mode is either USB, LSB, AM, or R3E then the RX-mode is accepted and the receiver display restored. If the TX-mode is neither USB, LSB, AM nor R3E then nothing will happen until either a valid mode-key, a receiver frequency or "ENTER" is pressed.
If the RX-mode is different from the TX-mode then the mode annunciators indicate the mode according to keyline. E.g. if the unit is not keyed then the RX-mode annunciator is turned ON constantly while the TX-mode annunciator is flashing very fast.

4.1.3.4 D. RECEIVER TUNING



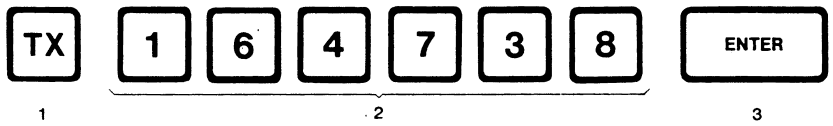
1 Press "TUNE RATE" to change frequency step.
An annunciator below one of the three right hand digits of the receiver display indicates the frequency step selected. 10 Hz, 100 Hz and 1000 Hz steps are possible.

2 Increase receiver frequency in steps selected.

3 Decrease receiver frequency in steps selected.
If "TUNE" is pressed shortly the receiver frequency is changed one step up or down. Holding "TUNE" pressed for more than 0.5 sec. changes the receiver frequency continuously up or down with 10 steps/sec.

4.1.4 TRANSMITTING

4.1.4.1 A. CHANGE TRANSMITTING FREQUENCY (16473.8 kHz)



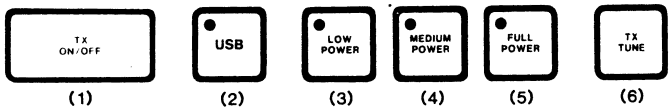
1 Press "TX"
The transmitter display is blanked and its decimal point starts flashing.

2 Enter desired frequency in the transmitter display via the numeric keys.
The last digit is always interpreted as the "100-Hz" digit.

3 Press "ENTER"
If TX is ON then the decimal point stops flashing if both frequency and mode are valid, and the whole display starts flashing if frequency and/or mode is invalid.

If TX is OFF the transmitter display will show the time of day.

4.1.4.2 B. SET TRANSMITTER (Mode-Power-Tune)



(1) Press "TX ON/OFF" if the transmitter is OFF.
The transmitter display will then show the transmitter frequency, flashing if frequency and/or mode is invalid.

(2) Press "USB" to transmit an SSB (J3E) signal.
Annunciators indicate the mode selected, and the transmitter display starts flashing if the mode is invalid.

(3) Press "LOW POWER"

(4) Press "MEDIUM POWER" according to desired power level.

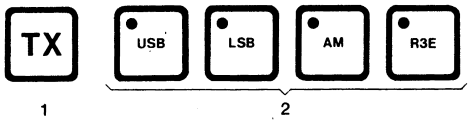
(5) Press "FULL POWER"

Annunciators indicate the power level selected. If the transmitter frequency has been changed the Antenna Tuning Unit will automatically tune its input impedance on the new frequency in less than 1.5 sec when the handset key is pressed, and you are then ready to transmit.

(6) Press "TX TUNE" if the power meter annunciator starts flashing during transmission. This indicates that the Antenna Tuning Unit input SWR is greater than 1:3, and may happen if the antenna impedance has changed due

to external circumstances.

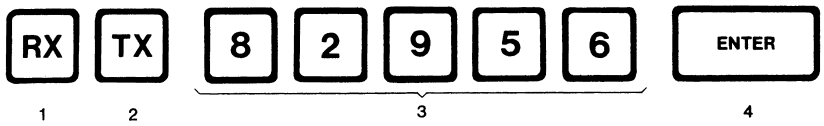
4.1.4.3 C. SELECT SEPARATE TRANSMITTER MODE



1 Press "TX"
The transmitter display is blanked and its decimal point starts flashing.

2 Press "USB", "LSB", "AM" or "R3E"
If the RX-mode is either USB, LSB, or AM then the TX-mode is accepted and the transmitter display restored. If the RX-mode is neither USB, LSB nor AM then nothing will happen until either a valid mode-key, a transmitter frequency or "ENTER" is pressed.
If the TX-mode is different from the RX-mode then the mode annunciators indicate the mode according to keyline. E.g. if the unit is keyed then the TX-mode annunciator is turned ON constantly while the RX-mode annunciator is flashing very fast.

4.1.5 FAST SET-UP FOR SIMPLEX OPERATION (8295.6 kHz)



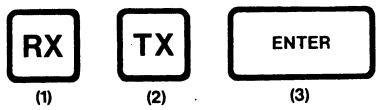
1 Press "RX"

2 Press "TX"
The receiver and transmitter displays are blanked, and their decimal points start flashing.

3 Enter the desired frequency in the receiver and transmitter displays via the numeric keys.

4 Press "ENTER"
If frequency and mode are valid the decimal points stop flashing. Set receiver and transmitter as described previously.

4.1.6 COPYING RX FREQUENCY TO TX FOR SIMPLEX OPERATION

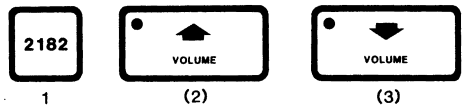


1 Press "RX"
The receiver display will be blanked.

2 Press "TX"
The transmitter display will be blanked.

3 Press "ENTER"
The receiver frequency will be copied to the transmitter display, and the 10 Hz digit on the receiver display will be cleared.

4.1.7 FAST SET-UP FOR 2182 kHz



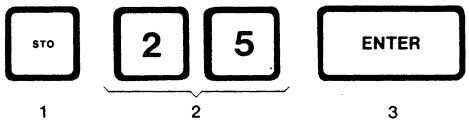
1 Press "2182"
This instantly changes receiver and transmitter frequency to 2182 kHz, selects AM (H3E) mode, selects FULL POWER and enables transmitter function (TX ON). The loudspeaker and AGC are automatically switched ON and RF-AMP, ANT ATT and SQUELCH switched OFF. Antenna current is displayed when transmitting, unless PRESET bit 6 is set (see Second Functions).

(2) Increase volume if sound level is too low.

(3) Decrease volume if sound level is too high.
Press handset key, wait a couple of seconds for the automatic tuning, and you are ready to transmit.

4.1.8 STORING AND RECALLING FREQUENCY CHANNELS

4.1.8.1 STORING RECEIVER/TRANSMITTER FREQUENCY PAIRS AND MODE



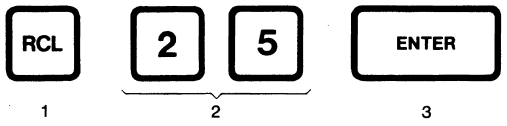
(Channel no. 25)

1 Press "STO"
The receiver and transmitter displays are blanked and their decimal points start flashing. If "STO" is pressed by mistake, just press "ENTER" to escape store mode.

2 Enter the channel-number in the receiver display via the numeric keys. Channels 0-75 are available.

3 Press "ENTER"
If the channel-number is valid the receiver and transmitter displays show the stored frequency-pair. If the channel-number is invalid the receiver display starts flashing.

4.1.8.2 RECALLING RECEIVER/TRANSMITTER FREQUENCY PAIRS AND MODE



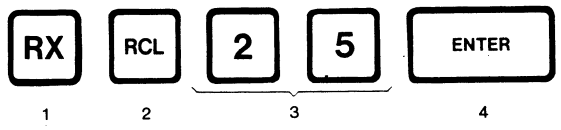
(Channel no. 25)

1 Press "RCL"
The receiver and transmitter displays are blanked and their decimal points start flashing.

2 Enter the channel-number in the receiver display via the numeric keys. Channels 0-75 are available.

3 Press "ENTER"
If the channel-number is valid the receiver and transmitter displays show the recalled frequency-pair, an annunciator shows the recalled mode and the AGC is switched ON. If the channel-number is invalid the receiver display starts flashing.

4.1.8.3 RECALLING RECEIVER FREQUENCY



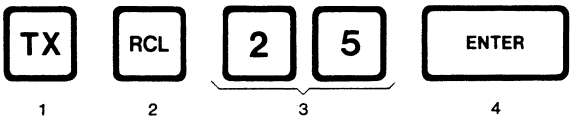
1 Press "RX"
The receiver display is blanked and its decimal point starts flashing.

2 Press "RCL"

3 Enter the channel-number in the receiver display via the numeric keys. Channels 0-75 are available.

4 Press "ENTER"
If the channel-number or frequency is invalid the receiver display starts flashing. If both channel-number and frequency is valid the receiver display shows the recalled frequency.

4.1.8.4 RECALLING TRANSMITTER FREQUENCY



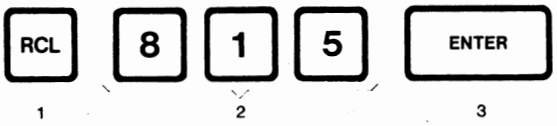
1 Press "TX"
The transmitter display is blanked and its decimal point starts flashing.

2 Press "RCL"

3 Enter the channel-number in the transmitter display via the numeric keys. Channels 0-75 are available.

4 Press "ENTER"
If the channel-number or frequency and/or mode is invalid the transmitter display starts flashing. If both channel-number, frequency and mode is valid the transmitter display shows the recalled frequency if TX is ON, and the time of day if TX is OFF.

4.1.8.5 RECALLING ITU CHANNEL FREQUENCY PAIRS FROM PROM



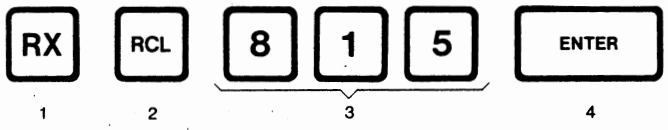
(ITU channel no. 815)

1 Press "RCL"
The receiver and transmitter displays are blanked and their decimal points start flashing.

2 Enter the channel-number in the receiver display via the numeric keys.

3 Press "ENTER"
If the channel-number is invalid the receiver display starts flashing. If the channel-number (according to mode) is valid the receiver display shows the ITU receiver frequency and the transmitter display shows the ITU transmitter frequency if TX is ON, and the time-of-day if TX is OFF.

4.1.8.6 RECALLING ITU CHANNEL RECEIVER FREQUENCY FROM PROM



(ITU channel no. 815)

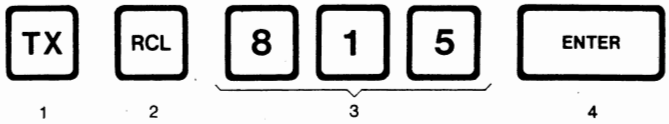
1 Press "RX"
The receiver display is blanked and its decimal point starts flashing.

2 Press "RCL"

3 Enter the channel-number in the receiver display via the numeric keys.

4 Press "ENTER"
If the channel-number is invalid the receiver display starts flashing. If the channel-number (according to mode) is valid the receiver display shows the ITU receiver frequency.

4.1.8.7 RECALLING ITU CHANNEL TRANSMITTER FREQUENCY FROM PROM



(ITU channel no. 815)

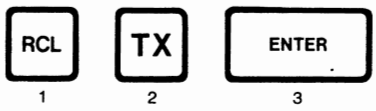
1 Press "TX"
The transmitter display is blanked and its decimal point starts flashing.

2 Press "RCL"

3 Enter the channel-number in the transmitter display via the numeric keys.

4 Press "ENTER"
If the channel-number is invalid the transmitter display starts flashing.
If the channel-number (according to mode) is valid the transmitter display shows the ITU transmitter frequency if TX is ON, and the time-of-day if TX is OFF.

4.1.8.8 RECALLING TRANSMITTER FREQUENCY FROM PROM



1 Press "RCL"
The receiver and transmitter displays are blanked and their decimal points start flashing.

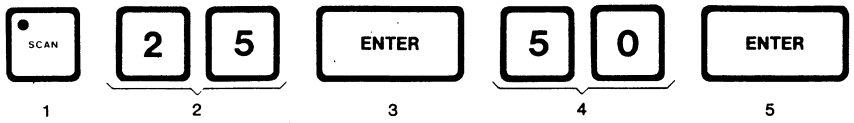
2 Press "TX"
The receiver is reactivated and the first TX PROM frequency is shown in the transmitter display. Repressing "TX" will transfer the next TX PROM frequency to the transmitter display if the PROM location is programmed.

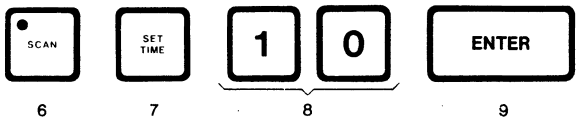
3 Press "ENTER"
If TX is ON then the decimal point stops flashing if both frequency and mode are valid, and the whole display starts flashing if frequency and/or mode is invalid.

If TX is OFF the transmitter display will show the time-of-day.

4.1.9 SCANNING STORED RECEIVER/TRANSMITTER FREQUENCY PAIRS

4.1.9.1 A. SET SCANNING PARAMETERS (Channel 25-50, time 1.0 sec.)





1 Press "SCAN"
The receiver and transmitter displays are blanked and their decimal points start flashing.

2 Enter the start channel-number in the receiver display via the numeric keys.

3 Press "ENTER"
If the channel-number is valid the receiver display is blanked. If not, it starts flashing and you must repeat steps 1, 2 and 3.

4 Enter the stop channel-number (greater than the start channel-number) in the receiver display via the numeric keys.

5 Press "ENTER"
If the channel-number is valid the receiver and transmitter displays are reset to their initial states. If not, the receiver display starts flashing and you must press "SCAN", enter a valid stop channel-number and press "ENTER" again.

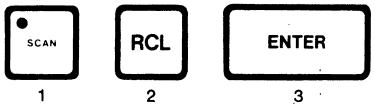
6 Press "SCAN"
The receiver and transmitter displays are blanked and their decimal points start flashing.

7 Press "SET TIME"

8 Enter the dwell time (0.1-9.9 sec.) in the receiver display via the numeric keys.

9 Press "ENTER"
The receiver and transmitter displays are reset to their initial states.

4.1.9.2 B. RECALL SCANNING PARAMETERS AND RESET SCAN POINTER

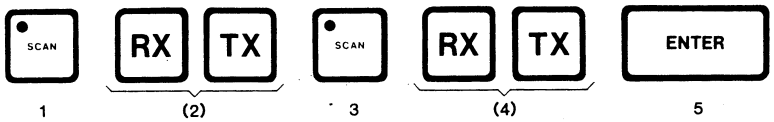


1 Press "SCAN"
The receiver and transmitter displays are blanked and their decimal points start flashing.

2 Press "RCL"
The start and stop channel-number are shown in the receiver display and the dwell time in the transmitter display. The scan pointer is reset to the start channel-number.

3 Press "ENTER"
The receiver and transmitter displays are reset to their initial states.

4.1.9.3 C. START/STOP AUTOMATIC SCANNING



1 Press "SCAN"
The receiver and transmitter displays are blanked and their decimal points starts flashing.

(2) Control external scan port. Press "RX" to open port. Press "TX" to close port. If the port is open the scan s/s signal can be used to start automatic scanning. The port is initially closed.

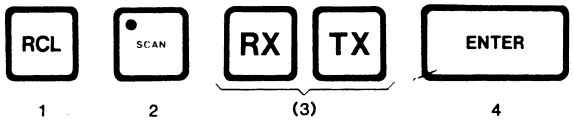
3 Press "SCAN"
The scanning annunciator starts flashing indicating that the equipment is in automatic scanning mode. The receiver/ transmitter frequency pairs stored in each channel between start and stop will be shown in the receiver and transmitter displays for the dwell time set. This is repeated until "ENTER" is pressed. If the scanning parameters has been changed, some time may pass before the start channel frequencies appear in the displays.

(4) Control external scan port. Press "RX" to open port. Press "TX" to close port. If the port is open the scan s/s signal can be used to stop automatic scanning. If neither keys are operated the port-state is as specified in (2).

5 Press "ENTER"
The scanning annunciator stops flashing and the receiver and transmitter are set to the frequencies indicated by the displays.

Note: When OPTION bit 3 is set (see Second Functions), the squelch may be switched on to allow a special scanning in the phone modes (USB, LSB, AM, R3E). Each channel will be muted for 1.5 seconds to provide setting time to the squelch. After this period muting is handled by the squelch in the normal way. If the squelch mutes the signal for more than the dwell time programmed, the scanning will continue.

4.1.9.4 D. MANUAL SCANNING



1 Press "RCL"
The receiver and transmitter displays are blanked and their decimal points start flashing.

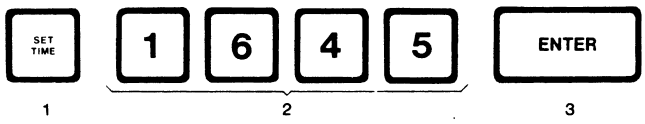
2 Press "SCAN"
The scanning annunciator is turned constantly ON indicating that the equipment is in manual scanning mode. The start or next channel-number frequency pair is recalled and shown in the receiver and transmitter displays until "SCAN" is repressed, which will recall the next pair.

(3) Control external scan port. Press "RX" to open port. Press "TX" to close port. If the port is open the scan s/s signal can be used to step manual scanning to next frequency pair. The port is initially closed.

4 Press "ENTER"
Manual scan is terminated, leaving the displayed frequency pair unchanged.

4.1.10 CLOCK FUNCTIONS

4.1.10.1 SET TIME OF DAY (16 hrs. 45 min.)



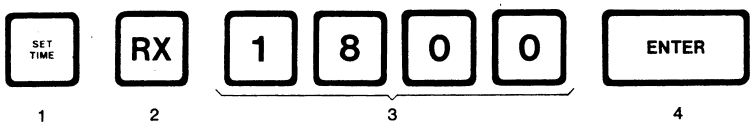
1 Press "SET TIME"
The transmitter display is blanked and the time cursor set (3rd digit).

2 Enter the time of day in the transmitter display via the numeric keys. The first two digits are interpreted as hours and the last two digits as minutes.

3 Press "ENTER"
The transmitter display shows the time of day if TX is OFF and the transmitter frequency if TX is ON. If you set time according to a time signal you must press "ENTER" exactly when the signal is given as this

synchronizes the clock.

4.1.10.2 SET WAKE-UP TIME (18 hrs. 00 min.)



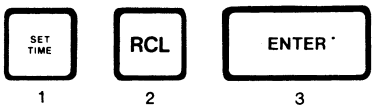
1 Press "SET TIME"
The transmitter display is blanked and the time cursor set (3rd digit).

2 Press "RX"

3 Enter the wake-up time in the transmitter display via the numeric keys. The first two digits are interpreted as hours and the last two digits as minutes.

4 Press "ENTER"
The transmitter display is reset to its initial state.

4.1.10.3 RECALL WAKE-UP TIME

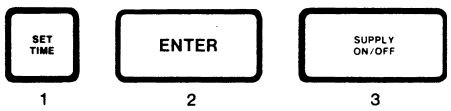


1 Press "SET TIME"
The transmitter display is blanked and the time cursor set (3rd digit).

2 Press "RCL"
The transmitter display shows wake-up time.

3 Press "ENTER"
The transmitter display is reset to its initial state.

4.1.10.4 START DORMANT STATE



1 Press "SET TIME"
The transmitter display is blanked and the time cursor set (3rd digit).

2 Press "ENTER"
The transmitter display is reset to its initial state.

3 Press "SUPPLY ON/OFF"

The equipment is switched OFF, and will automatically be switched ON again at wake-up time recalling the state it was in before being switched OFF.

4.1.11 AUTOTELEX

To select AUTOTELEX mode just make sure that the last keying sequence has been terminated. In this state the CU responds to a frequency command from the ARQ unit by selecting TELEX mode and shifting to a special AUTOTELEX state which is identified by the flashing TELEX annunciator.

In AUTOTELEX mode the following keys are operative:

Switches speaker ON/OFF as described in section 4.2.

Terminates AUTOTELEX mode. The TELEX annunciator will stop flashing and normal CU operation resumed.

If OPTION bit 6 is set this key is disabled. Otherwise it functions exactly as the TELEX key (described above).

In some situations it is desirable to interrupt the ARQ scanning temporarily while making a phone call. In this case OPTION bit 5 should be set and TELEX mode selected manually prior to ARQ scanning. A phone call is then initiated by selecting the appropriate phone mode which will lock out the ARQ frequency commands, thus enabling manual frequency selection. When the phone call is completed the TELEX mode should be reselected to allow further ARQ scanning.

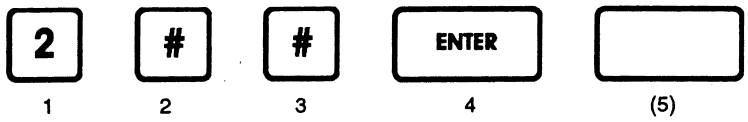
When the "2182" key is pressed, the Control Unit stops listening to the telex terminal until a new transmitter frequency different from 2182 is entered from the keyboard.

AUTOTELEX in MARITEX mode.
TRP 8250 D will protect against erroneous transmitting by not allowing continuous keying in more than 1/2 minute in MARITEX mode. Passed this time limit the transmitter will be switched OFF and the beeper activated until a key is pressed.

4.1.12 SECOND FUNCTIONS

The second function level provides enhanced system control to the advanced user without sacrificing simplicity of the primary keypad functions.
The level consists of 10 menues (pages) each containing a maximum of 10 functions (lines). Operation on this level will always be identified by the non-standard display symbol "┐┘" in the left or right most tab of at least one of the displays.

4.1.12.1 SECOND FUNCTION SYNTAX



1 Press "2".
The transmitter display is blanked and the decimal points start flashing. The receiver display shows "~~" to identify a non-standard display and "2". If "2" was pressed by mistake "ENTER" will terminate second function mode.

2 Press a number.
The number is passed to the receiver display. This number identifies the second function page. If the number was pressed by mistake "ENTER" will terminate second function mode.

3 Press a number.
The number is passed to the receiver display. This number identifies the second function line. If the number was pressed by mistake "2" will restart the second function mode.

4 Press "ENTER".
If page and line numbers are not valid the receiver display starts flashing and the second function mode can be either restarted by pressing "2" or terminated by pressing "ENTER". If both page and line numbers are valid the respective second function is executed and if no further keys are required in the specific function the displays are restored to the state prior to second function execution.

(5) Most second functions require additionally keys to be pressed. Typically "2" will restart second function mode and "ENTER" terminate it. Some second functions require confirmation via the "STO" key. This situation is indicated by a special warning display-flash shifting between "]]]]]]]" and the entered number. Pressing "STO" will execute the function, "2" will restart the second function mode and any other key will terminate it.

Second functions requiring confirmation:

250: Clear RAM
251: Reset system
270-278: "OPTION" register
280-287: Toggle "PRESET" register bit 0-7
290-298: "GUARD" register

4.1.12.2 PAGE 0 (20#) Self test. For detailed information see self test description in chapter 8.

Executable lines:

200: Start automatic stepped self test.
201: Start manually stepped self test.
202: Start automatic stepped self test from an arbitrary test number.
203: Start manually stepped self test from an arbitrary test number.

4.1.12.3 PAGE 4 (24#)

Miscellaneous functions.

Executable lines:

241: Read accumulated on-time. The receiver display will show total operation time of the TRP 8250 S with 1 hour resolution. Pressing "2" or "ENTER" will restart or terminate second function.

242: Read and program receiver tune step. The receiver display shows the present programmable tune step. A new tune step may be entered via the numeric keys.
Tune steps between 100 Hz and 99 kHz are possible.
Pressing "ENTER" will terminate second function.
To use this additional tune step, OPTION bit 4 should be set to 1 (ref. second function 274).
In this case the "TUNE RATE" key will introduce a fourth state indicated by all tune rate annunciators switched off.

243: Read single frequency formats in configuration PROM. The reading address is initialized to PROM address 0. The receiver display shows the programmed frequency if the RX bit = 1. The transmitter display shows the programmed frequency if the TX bit = 1.
The mode annunciators show the programmed modulation(s). Pressing "DIMMER UP" will increase the reading address to the next higher located format if it is not the "LIMITER BYTE".
Pressing "DIMMER DOWN" will decrease the reading address to the next lower located format if the present reading address is higher than PROM address 0.
Keeping either "DIMMER" key pressed will advance the reading address automatically.
Pressing "2" or "ENTER" will restart or terminate second function.
For further PROM format information refer to section 4.10.

244: Control BFO frequency. The receiver display shows the present BFO frequency. The transmitter display shows the stored BFO frequency selected on power-up. Pressing "STO" will store the present frequency. Pressing "RCL" will recall the stored frequency. Pressing "2" or "ENTER" will restart or terminate second function.

245: Read special system parameters in configuration PROM. The receiver display shows the PROM address in decimal initialized to top of PROM = 4095. The transmitter display shows the PROM data in decimal. Pressing "RCL" will change the displayed data to hexadecimal, useful when reading BCD. Since the display decoder is not designed for letters the following symbols are displayed for hexadecimals greater than 9:

A :
B :
C :
D :
E :
F : blank

Pressing "DIMMER DOWN" will show the next lower PROM address.
Pressing "DIMMER UP" will show the next higher PROM address.
Pressing "2" or "ENTER" will restart or terminate second function.

246: Read CU program release date and version. The receiver display shows release date (year/month/day). The transmitter display shows version number.
Pressing "2" or "ENTER" will restart or terminate second function.

247: Read TU program release date and version. The receiver display shows release date (year/month/day). The transmitter display shows version number.
Pressing "2" or "ENTER" will restart or terminate second function.

248: Adjust beeper sound level. A continuous control beeping is started.
Pressing "VOLUME UP" will increase the sound level.
Pressing "VOLUME DOWN" will decrease the sound level.
Pressing "2" or "ENTER" will restart or terminate second function preserving the new beeper sound level.

249: Switch antenna OFF. The antenna and transmitter are switched OFF. The power annunciators are turned OFF to identify antenna OFF and transmitter display shows time of day to identify transmitter OFF. Finally second function is terminated. When "TX ON/OFF" is then pressed both antenna and transmitter are switched ON and power annunciators and transmitter display restored to normal.

4.1.12.4 PAGE 5 (25#) Miscellaneous functions. This page can not be entered when "GUARD" bit 7 is set (see second function page 9).

Executable lines:

250: Clear RAM. The function requires confirmation as described for the syntax key (5). All stored frequency pairs and modes, the "OPTION" register and "GUARD" register will be cleared (=0) and second function terminated.

251: Reset system. The function requires confirmation as described for the syntax key (5). 32 msec after releasing the "STO" key, both CU and TU processors are reset by running the power-up program.

4.1.12.5 PAGE 7 (27#)

Controls an 8-bit "OPTION" register.

Executable lines:

```
270: Toggle "OPTION" bit 0
271:   -   -   -   - 1
272:   -   -   -   - 2
273:   -   -   -   - 3
274:   -   -   -   - 4
275:   -   -   -   - 5
276:   -   -   -   - 6
277:   -   -   -   - 7
278: Clear "OPTION" register
279: Display "OPTION" register (bits 0-3 in transmitter display, bits 4-7
     in receiver display).
```

All lines will display the resulting "OPTION" register.
Pressing "2" or "ENTER" will restart or terminate second function.

"OPTION" bit functions:

BIT	LEVEL	FUNCTION
0	-	Reserved for future use
1	0	Normal
	1	Disable numeric display
2	0	Normal
	1	Disable mode display
3	0	Normal
	1	Enable special squelched scanning in "phone mode"
4	0	Normal
	1	Enable programmable receiver tune rate
5	0	Normal
	1	Enable phone call interrupts in AUTOTELEX mode
6	0	Normal
	1	Disable "ENTER" key during AUTOTELEX mode
7	0	Normal
	1	No time-display "cursor"

4.1.12.6 PAGE 8 (28#) Controls an 8 bit "PRESET" register intended for use in installation only.Special system parameters which are difficult to specify before installation can be changed on location by toggling the respective bit in this non-volatile register. To protect the "PRESET" register against erroneous changes Page 8 can not be entered when "GUARD" bit 7 is set. Toggling any bit requires confirmation as described for the syntax key (5). Further more "PRESET" is excluded from the CLEAR RAM function (250).

Executable lines:

280: Toggle "PRESET" bit 0
281: - - - - 1
282: - - - - 2
283: - - - - 3
284: - - - - 4
285: - - - - 5
286: - - - - 6
287: - - - - 7
289: Display "PRESET" register (bits 0-3 in transmitter display, bit 4-7 in receiver display).

All lines will display the resulting "PRESET" register. Pressing "2" or "ENTER" will restart or terminate second function.

"PRESET" bit functions:

BIT	LEVEL	FUNCTION
0	-	Reserved for future use
1	-	- - - -
2	-	- - - -
3	-	- - - -
4	0	Normal
	1	Enable "Key inhibit"
5	0	Normal
	1	Disable power display (ampere only)
6	0	Normal
	1	Disable ampere display (power only)
7	0	Normal
	1	Complement external scan transitions

4.1.12.7 PAGE 9 (29#) Controls an 8-bit "GUARD" register. This page can not be entered when "GUARD" bit 7 is set (see following explanation).

Executable lines:

290: Toggle "GUARD" bit 0
291: - - - - 1
292: - - - - 2
293: - - - - 3
294: - - - - 4
295: - - - - 5
296: - - - - 6
297: - - - - 7
298: Clear "GUARD" register.
299: Display "GUARD" register (bits 0-3 in transmitter display, bit 4-7 in receiver display).

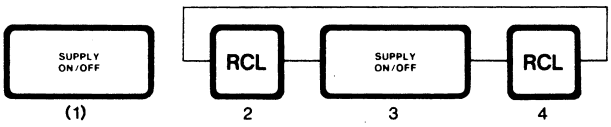
All lines will display the resulting "GUARD" register. Pressing "2" or "ENTER" will restart or terminate second function.

"GUARD" bit functions:

BIT	LEVEL	FUNCTION
0	0	Normal
	1	Inhibit direct entry of RX frequencies
1	0	Normal
	1	Inhibit "RX" key
2	0	Normal
	1	Inhibit direct entry of TX frequencies
3	0	Normal
	1	Inhibit "TX" key
4	0	Normal
	1	Inhibit store function
5	0	Normal
	1	Inhibit "STO" key
6	0	Normal
	1	Inhibit entry of scan parameters
7	0	Normal
	1	Inhibit certain second function pages

If programmed in the Configuration PROM (ref. section 5.12), either of the RX (bit 0 & 1) and TX (bit 2-3) GUARD bits set to 1 will cause the respective display to show channel numbers exclusively. If no channel number applies to the frequency then a "C" will be displayed (e.g. immediately after "SUPPLY ON".

Clear GUARD-bit 7 (PAGE GUARD)



(1) Switch supply OFF.

2 Press "RCL" and keep it.

3 Switch supply ON.

4 Keep "RCL" pressed until the beeper sounds.
Guard-bit 7 is now cleared and all second function pages can be entered.

To prevent unauthorized use this syntax is not described in the User Manual.

4.1.12.8 SECOND FUNCTIONS SUMMARY

200: Start automatically stepped self test
201: Start manually stepped self test
202: Start automatic stepped self test from an arbitrary test number.
203: Start manually stepped self test from an arbitrary test number.

241: Read accumulated on-time
242: Read and program receiver tune step
243: Read single frequency formats
244: Control BFO frequency
245: Read special system parameters
246: Read CU release date and version
247: Read TU release date and version
248: Adjust beeper sound level
249: Turn OFF antenna

250: Clear RAM
251: Reset system

270-277: Toggle "OPTION" register bit 0-7
278: Clear "OPTION" register
279: Read "OPTION" register

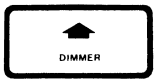
280-287: Toggle "PRESET" register bit 0-7
289: Read "PRESET" register

290-296: Toggle "GUARD" register bit 0-6
297: Set "GUARD" register bit 7
298: Clear "GUARD" register
299: Read "GUARD" register

4.2 DESCRIPTION OF OPERATING CONTROLS

Switches ON/OFF the equipment power supply. When switched ON the equipment enters the state it was in just before being switched OFF.

Switches ON/OFF the transmitter functions. The transmitter display shows the transmitter frequency when switched ON, and the time of day when switched OFF.



Increases and decreases the light intensity in the displays, meters and annunciators.

Storing of receiver/transmitter frequency pairs and mode. When "STO" is pressed the receiver and transmitter displays are blanked and their decimal points start flashing, indicating that a channel number (0-75) must be entered in the receiver display via the numeric keys.

Setting/recalling scanning parameters and start/stop scanning of stored receiver/transmitter frequency pairs. The annunciator is flashing in automatic scanning mode and turned constantly ON in manual scanning mode. (for details see section 4.1)

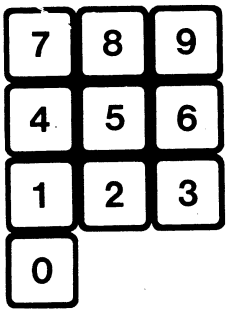
Setting time of day, setting/recalling vake-up time, starting dormant state and setting dvell time in scanning. (for details see section 4.1)

Switches ON/OFF duplex operation of the equipment. Annunciator ON indicates that duplex operation is selected. When duplex is ON, the receiver is constantly active, even vhen keying the transmitter. If transmitter and receiver frequencies are 20 kHz or less apart, the transmitter display and duplex annunciator are flashing.

a) Primary function: Change of receiver frequency. When "RX" is pressed the receiver display is blanked and its decimal point starts flashing, indicating that a new receiver frequency must be entered into the display via the numeric keys.
b) Secondary function: Setting of vake-up time, vhen "RX" is pressed immediately after "SET TIME". Opening of the external scan port (see section 4.1)

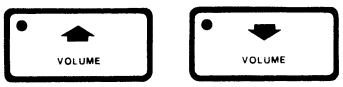
a) Primary function: Change of transmitter frequency. When "TX" is pressed the transmitter display is blanked and its decimal points starts flashing, indicating that a new transmitter frequency must be entered into the display via the numeric keys.
b) Secondary function: Recalling of transmitter frequency from PROM. Closing of the external scan control port (see section 4.1)

a) Primary function: Recalling stored receiver/ transmitter frequencies. When "RCL" is pressed the receiver and transmitter displays are blanked and their decimal points start flashing, indicating that a channel-number (0-75) must be entered into the receiver display via the numeric keys.
b) Secondary function: Recalling wake-up time, when "RCL" is pressed immediately after "SET TIME" and recalling scanning parameters when "RCL" is pressed immediately after "SCAN" (see section 4.1)



Numeric keys
a) Primary functions:
Entering of receiver/transmitter frequencies and channel numbers.
b) Secondary functions:
Setting scanning parameters, time of day, wake up time and sound level of beeper. Refer to section 4.1 for further details.

Terminating keyboard operation. "ENTER" must be pressed to terminate all keyboard operations initiated by the "RX", "TX", "STO", "RCL", "SCAN", "SET TIME" or numeric keys. Generally the displays will then be reset to their initial states if the operating parameters are valid. An exception is the self test mode (see section 7.4)



Adjustment of receiver AF-amplifier gain. (Sound level of internal speaker, handset phone and headphone). Pressing one of the keys turns on the corresponding annunciator, which is turned off again when the key is released or when minimum or maximum sound level is reached.

Adjustment of receiver IF-amplifier gain when the AGC is switched OFF.

Switches ON/OFF the AGC (Automatic Gain Control). The annunciators indicate whether the AGC is ON or OFF. When the AGC is ON the receiver IF-amplifier gain is automatically adjusted and manual control disabled. When the AGC is switched OFF the receiver IF-amplifier gain is maintained on the level it had just before the AGC was switched OFF and manual control via the "SENSITIVITY" keys is enabled. When selecting a new receiver frequency the AGC should always be ON, to ensure that a suitable start level of IF-amplifier gain is set before the AGC is switched OFF for manual adjustment.

Selects AGC time constant, that is the rate at which gain is regulated. Annunciators indicate whether "AGC SLOW" or "AGC FAST" is selected. "AGC SLOW" is automatically selected when switching to the modes SSB, R3E or MCW. "AGC FAST" is automatically selected when switching to the modes AM, TELEX or CW. The settings selected by the system are assumed to give the best reception in the modes concerned but under special circumstances a better reception might be obtained by pressing "AGC FAST" if "AGC SLOW" were selected and vice versa. In the AM and the TELEX-mode only "AGC FAST" is possible.

Switches ON/OFF internal and external loudspeaker. Annunciator ON indicates loudspeaker(s) ON. If headphones are connected via the socket on the rear of the Control Unit, the internal loudspeaker is always switched OFF.

Increases receiver gain 10 dB by activating the RF-amplifier stage. Annunciator ON indicates RF-amplifier ON. The RF-amplifier may be used when the received signal is weak.

Decreases receiver gain 20 dB by inserting the antenna input attenuator. Annunciator ON indicates attenuator ON. The antenna attenuator may be used if the received signal is disturbed by strong out-of-band signals.

Switches ON/OFF Squelch function. Annunciator ON indicates Squelch ON. If the Squelch is ON a speech signal with a signal to noise ratio greater than a certain value is required to pass the signal through the receiver AF-amplifier. The Squelch is used to eliminate noise when there is no speech signal on the receiver frequency. The Squelch Board is optional. When not installed, pressing the key causes no action.

Selects frequency step in receiver tuning. An annunciator below one of the three right hand digits of the receiver display indicates the frequency step selected. 10 Hz, 100 Hz and 1000 Hz steps are possible.

Tuning of receiver frequency up or down in frequency steps selected by the "TUNE RATE" key (see section 4.1)

Adjustment of the BFO frequency down and up in CW mode. Receiver display shows BFO frequency when either of the keys are pressed.

Selects respective IF filters in CW and MCW mode. Annunciator ON indicates selected filter.

Selecting transmission of J3E and reception of J3E and R3E signals in USB (Upper Side Band). Annunciator ON indicates USB-mode selected.

Selecting transmission of J3E and reception of J3E and R3E signals in LSB (Lower Side Band). Annunciator ON indicates LSB-mode selected. If transmission of LSB is illegal and transmitter is ON, the transmitter display is flashing and transmitter function disabled.

Selecting transmission of H3E (Upper Side Band) and reception of H3E and A3E signals. Annunciator ON indicates AM mode selected. If transmission of H3E is illegal and transmitter is ON, the transmitter display is flashing and transmitter function disabled.

Selecting transmission of R3E and reception of R3E and J3E signals (Upper Side Band). Annunciator ON indicates R3E mode selected.

Selecting transmission and reception of Telex in F1B mode. Annunciator ON indicates Telex mode selected. The Telex function is optional.

Fast set up for 2182 kHz. Pressing this key will instantly change receiver and transmitter frequency to 2182 kHz, select AM (H3E) mode, select FULL POWER, and enable transmitter function (TX ON). The loudspeaker(s) and AGC are automatically switched ON and RF-AMP, ANT ATT and SQUELCH switched OFF. Antenna current is displayed when transmitting.

Fast set-up for 500 kHz. Pressing this key will instantly change receiver frequency to 500 kHz and select MCW (H2A) mode. The loudspeaker(s) and AGC are automatically switched ON and RFAMP, ANT ATT and SQUELCH switched OFF. IF FILTER keys are enabled and the intermediate type filter automatically selected.

Selecting transmission and reception of A1A morse telegraphy signals. Annunciator ON indicates CW-mode selected. If transmission of A1A is illegal and transmission is ON, the transmitter display is flashing and transmitter function disabled. IF FILTER keys are enabled and the intermediate type filter automatically selected. BFO is enabled and AGC is switched ON.

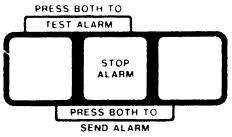
Selecting transmission and reception of H2A modulated morse telegraphy signals. Annunciator ON indicates MCW-mode selected. If transmission of H2A is illegal and transmission is ON, the transmitter display is flashing and transmitter disabled. IF FILTER keys are enabled and the intermediate type filter automatically selected. AGC is switched ON.

Activating Antenna Tuner. Pressing this key will start the automatic tuning procedure in the ATU (Antenna Tuning Unit). Tuning is performed in less than 1.5 sec. Pressing the handset key for the first time after changing transmitter frequency will also start the tuning procedure, and it is therefore not necessary to press "TX TUNE" in this case. "TX TUNE" is normally used when the frequency has been unchanged for some time and the antenna impedance has changed due to external circumstances (see section 4.1).

Selecting low transmitter output power (approx. 10 W PEP). Annunciator ON indicates LOW POWER selected.

Selecting medium transmitter output power (approx. 60 W PEP). Annunciator ON indicates MEDIUM POWER selected.

Selecting full transmitter output power (approx. 250 W PEP). Annunciator ON indicates FULL POWER selected.



Testing and transmitting the two-tone alarm signal. Press "STOP ALARM" and the left key simultaneously and keep pressed to test alarm. The alarm signal is heard in the loudspeaker, and transmitter keying is disabled. If the Dummy Load option is installed the alarm generator and the transmitter is tested on the built-in dummy load of the Antenna Tuning Unit. The Antenna Current Meter indicates current into the dummy load. The Output Power and Antenna Current annunciators are flashing to show that the transmitter is in the test mode. Test on dummy load cannot be performed on 2182 kHz.

Press the left and right keys simultaneously to send alarm. The alarm signal is heard in the loudspeaker and transmitted for 45 sec. on the selected frequency if the transmitter is ON. The alarm signal may be interrupted by pressing "STOP ALARM".

4.2.1 Transmitter Display In its initial state the transmitter display shows the transmitter frequency in kHz if TX is ON or the time of day in hours and minutes if TX is OFF. Time of day is indicated by a flashing time cursor (3rd digit). A steady time cursor indicates that entering or recalling of time has not yet been terminated. A flashing decimal point indicates that entering, storing or recalling of a transmitter frequency has not yet been terminated. Flashing digits indicate that the transmitter frequency and/or mode is unauthorized, i.e. the frequency is outside the specified range and/or not contained in the frequency PROM. The transmitter cannot be keyed if the transmitter display is flashing.

4.2.2 Receiver Display In its initial state the receiver display shows the receiver frequency in kHz. A flashing decimal point indicates that entering, storing or recalling of a receiver frequency or channel-number has not yet been terminated. Flashing digits indicate that the frequency or channel-number is outside the specified range.

4.2.3 Signal Strength meter Gives a relative indication of the signal strength in the received signal.

4.2.4 Output power/Antenna current meter Measures the antenna current during transmission on 2182 kHz and 500 kHz, as indicated by the antenna current annunciator. Gives a relative indication of the transmitter output power during trans- mission on other frequencies by measuring the output peak voltage/current, as indicated by the output power annunciator. A flashing meter indicates a fault in the Transceiver Unit - Antenna Tuning Unit communication.

4.2.5 Output power annunciator Also serves as a mismatch indicator on all frequencies. If the input SWR of the Antenna Tuning Unit exceeds 1:3 the output power annunciator starts flashing, indicating that tuning is required.

4.2.6 Reduced power annunciator If the temperature of the Power Amplifier heatsink and/or the Antenna Tuning Unit exceeds their maximum levels, the output power is reduced by 5 dB which is indicated by the reduced power annunciator. This may occur due to extreme environmental and/or working conditions.

5. INSTALLATION

Correct installation of the equipment is important for maximum performance and reliability. Antennas and earth connections must be installed with the greatest care using corrosion resistant materials. Cable routing shall be made so the cables are protected from physical damage. Cable bends especially on coaxial cables may not be sharp and a sufficient number of clips or straps should be used for securing the cables. Before installing the equipment make sure that the Configuration PROM is properly programmed, see section 5.12.

5.1 Mounting the Control Unit

The Control Unit can be tabletop or bulkhead mounted. Fig. 5.1 shows overall dimensions and a drilling plan for the necessary holes. The unit is bolted through two holes on the bottom part of the cabinet. The unit must be opened when bolting. Loosen the two front panel screws and lift off the front panel. The front panel is hinged to the bottom part by means of two flexible straps. To enable cable entry from either side of the unit, the bottom part of the cabinet may be turned 180 degrees relative to the front panel. To alter the position, open the unit and loosen the screws of the hinges in the bottom part of the cabinet and release the hinges. Turn the front panel and fix the hinges in the opposite side of the cabinet bottom. Be careful not to damage any components or to drop any conducting objects onto the printed circuit boards of the unit. The front panel can be tilted for convenient operation. To adjust the angle loosen the two front panel screws and open the unit. Move the two stop pins in each side of the unit to the appropriate holes and refit the front panel.

5.2 Mounting the Transceiver Unit

The Transceiver Unit may be mounted up to 100 metres from the Control Unit using a screened 16 x 0.5 mm sq. multiwire cable for interconnection. The unit should be installed in a dry place and consideration should be given to accessibility for servicing. The brackets supplied allow for bulkhead or bench mounting. Fig. 5.2 shows mounting details. It is important to provide plenty of airspace below and above the unit, for adequate air circulation through the heatsink at the back of the unit.

5.3 Mounting the Antenna Tuning Unit

The Antenna Tuning Unit may be mounted up to 100 metres from the Transceiver Unit using RG-213/U (RG-8A/U) coaxial cable and a screened 16 x 0.5 mm sq. multiwire cable for interconnection. The unit should be installed near the antenna feed point. Fig. 5.3 shows mounting details.

5.4 **Power Supply**

The TRP 8250 D operates at voltages between 10.6 and 41.6 VDC and is to be powered from a 12, 24 or 32 volt battery or from a separate AC Power Supply Unit. The supply leads are connected to the Transceiver Unit through the cable entry at the rear of the cabinet.
The supply terminal strip is adapted for screened power supply cable as required by some administrations. The screen of the cable is connected to the center terminal. The terminal strip may be removed from the chassis for easier access.
Attention should be paid to CCIR Rec. 218-1 which recommends that cables in the vicinity of the receiving antennas or the radio receiving room, and cables within the radio room, are screened by enclosing them in metal conduits, unless the cables themselves are effectively screened.
The earth connection of the equipment will not cause the battery to be earthed. Maximum permissible peak voltage between the battery terminals and earth is 100 V.
Note that fuses must be provided in the supply leads. Installation diagram fig. 5.3 shows the necessary cable cross sections and external fuse ratings.

5.5 **Earth Connections**

5.5.1 Antenna Tuning Unit

As the earth connection of a transmitter is part of the total antenna system, it is of the utmost importance that the earth connection to the Antenna Tuning Unit is constructed to have the lowest possible RF-impedance. Losses in the earth connection will result in a decrease in radiated power which means that the range of the transmitter will be reduced.
In steel ships a 100 x 0.5 mm copper strap as short as possible is connected between the earth terminal at the bottom of the Antenna Tuning Unit and two 1/2" or M12 bolts welded to the superstructure.
Vessels constructed of non-conducting materials must be equipped with a copper earth plate having a minimum area of 1 square metre mounted below the water line. From a copper earth bolt hard soldered to the earth plate a 100 x 0.5 mm copper strap is run, preferably uninterrupted to the earth terminal at the bottom of the Antenna Tuning Unit.
Should it be necessary to break the copper strap, for example to pass through a deck, two 1/2" or M12 bolts should be used for this feed through.
The copper strap may not be passed through iron pipes and should be kept at minimum distance of 0.5 m from iron parts of some extent. If this minimum distance cannot be kept the copper strap must be effectively connected to these parts using a strap having the same dimensions.
On wooden ships having a superstructure of metal, this superstructure should also be effectively connected to the copper strap by using stainless steel bolts and preferably pieces of stainless steel strips between the metal parts.

5.5.2 Other Units

All other units must be grounded separately to the ships metal in the shortest possible way. The Control Unit is connected to ground from the ground frame at the cable entries using a 2.5 mm sq. wire. In the Transceiver Unit a ground strap is connected to the ground terminal at the cable entry.
On vessels with no metallic superstructure the ground connection at the Control Unit and the Transceiver Unit may be omitted.

5.6 Antennas

The standard equipment is used with separate transmitting and receiving antennas. If, however, the Antenna Tuning Unit is fitted with the optional Antenna Relay Board 641 a common antenna may be used for transmission and reception. The antennas should be erected well in the clear, away from any objects whose influence on the antenna may vary, such as derricks etc. Insulators should be of the best type having low leakage even when wet. Stays, wires, steel masts etc. should be either effectively earthed or insulated. The receiving antenna should be kept as far as possible from electrical equipment in order to minimize noise. Electrical installation such as cable braiding (screens) and instruments in the vicinity of the receiving antenna should be earthed effectively, and the instruments in question should be fitted with noise-interference suppression devices, effective in the range 0.1 MHz to 30 MHz.

5.6.1 Transmitter Antenna The Antenna Tuning Unit will tune on any frequency in the range 1.6 to 30 MHz to wire and/or whip antennas of 7 to 30 metres total length. A long antenna is preferable with regard to radiated power. The antenna is terminated at the insulator at the top of the Antenna Tuning Unit. The insulator must be relieved from mechanical stress by using max. 1 metre flexible wire between the insulator and a support.

5.6.2 Receiver Antenna Length: 7-30 m. The antenna feed-in should be coaxial cable. The receiver antenna terminal is a UHF-connector (PL 259 type) located in the Transceiver Unit. If a long cable is used an impedance matching transformer should be inserted at the antenna end of the feeder. In one antenna installations using the optional Antenna Relay Board 641 this transformer is built-in.

5.7 Interconnection of Units

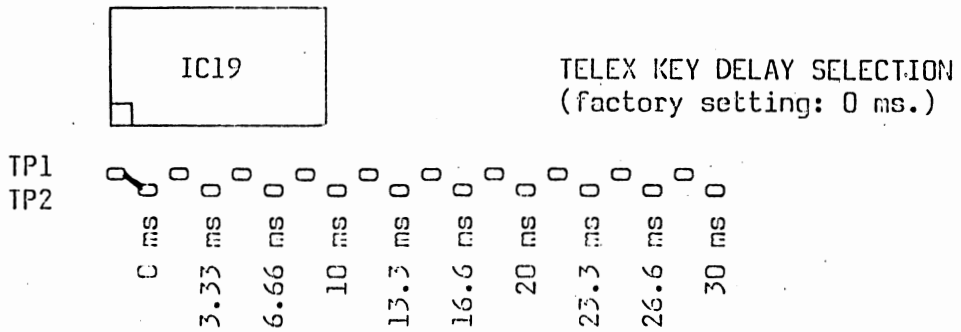
5.7.1 Control Unit-to-Transceiver Unit connections The units are interconnected by a length of 16 x 0.5 mm sq. screened multiwire cable (max. 100 metres). In order to connect the cable to the Control Unit the front panel is removed. The cable is entered through the threaded cable entry and the wires are then connected to the terminal strip marked 601-TS2 Transceiver Unit. NOTE: Wire ends should be fitted with cable end sleeves before mounting. The screen is connected to the ground frame at the cable entry. To connect the cable to the Transceiver Unit the front must be opened. The cable is entered through the cable entry at the back of the unit and the wires are connected to the terminal strip marked 620-TS3 Control Unit. The screen must be connected to the chassis bracket. For connections see installation diagram fig. 5.3.

5.7.2 Transceiver Unit-to-Antenna Tuning Unit connections The units are interconnected by an RG-213/U (RG-8A/U) coaxial cable and a 16 x 0.5 mm sq. screened multiwire cable (max. 100 metres). In one-antenna installations using the optional Antenna Relay Board 641 an additional RG-213/U coaxial cable is used. The coaxial cables are terminated in UHF-connectors (PL 259 type). The sockets in the Transceiver Unit may be removed from the chassis for easier access. The multiwire cable is mounted in the same way in the Transceiver Unit as the cable from the Control Unit. The wires are connected to the terminal strip marked 620-TS1 Antenna Tuning Unit, see fig. 5.3. NOTE: If the TRP 8250 D is not operated with an ATU 8250 Antenna Tuning Unit a strap must be placed between terminal no. 6 (TUNE) and terminal no. 7 (TPR) of 620-TS1. A missing strap will cause the Power Meter display to flash 11 sec. after a TUNE sequence has been initiated. The cables enter the Antenna Tuning Unit through the threaded cable entries at the bottom of the unit. The wires must be connected as shown in fig. 5.3. The screen of the multiwire cable must be connected to the receptacle at the grounding tab next to the terminal strip. NOTE: Wire ends of the multiwire cable should be fitted with cable end sleeves before mounting. In installations with long earth straps to the Antenna Tuning Unit, high RF voltages may be present on the ATU ground terminal. To avoid this voltage being coupled to the Transceiver Unit the interconnection cables must be run from the Transceiver Unit to the point where the copper strap from the Antenna Tuning Unit is connected to earth. From this point the cables must follow the copper strap to the Antenna Tuning Unit. The cables should be placed upon the center of the copper strap to ensure good coupling. The part of the cable-run between earth and the Transceiver Unit must not be run in parallel with the earth strap within a distance of at least 1 metre.

5.8 Connection of External Equipment

Auxiliary terminals in the Control Unit and the Transceiver Unit allows various external equipment to be connected to the TRP 8250 D. In tables 5.2 and 5.5 terminal assignments are listed for the Control Unit and the Transceiver Unit respectively. Screened cable should be used with the screen connected to ground frame or chassis.

5.8.1 Timing of TELEX KEY signal The transmitter pre-keying time should be approx. 7 ms. not less. Telex modems with programmable pre-keying time must be programmed to this value. In case of telex modems with a fixed pre-keying time longer than 7 ms. a time delay may be introduced by the TELEX KEY DELAY circuit on PCB 601 in the Control Unit. The leading edge of the TELEX KEY signal may be delayed by up to 30 ms. in steps of 3.33 ms. by moving a strap to the appropriate position.

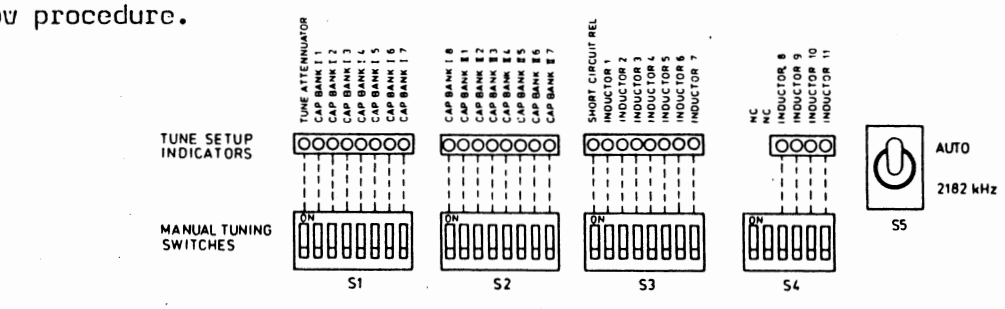


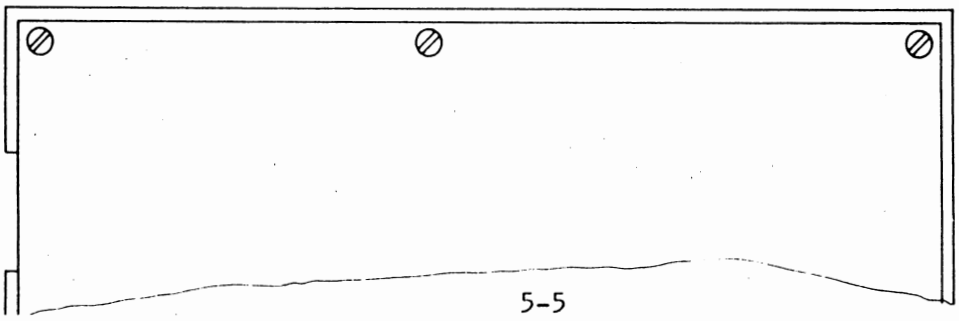
Telex modem pre-keying time minus selected telex key delay time must be equal to 7 ms. or more.

5.9 Final Installation Check

5.9.1 For operation of the equipment please refer to chapter 3. Note that an appropriate programmed Configuration PROM must be installed in the Control Unit, see section 5.12. The Antenna Tuning Unit will tune automatically to the transmitter antenna when the equipment is keyed or the TUNE button is pressed. The standing wave ratio (SWR) at the input of the tuning unit is automatically measured after the tuning sequence. If the SWR exceeds approx. 3 the Power Annunciator on the Control Unit will flash, indicating that correct tuning has not been obtained. In this case, investigate the antenna installation and control that the antenna length is within the boundaries.

5.9.2 <u>2182 kHz Manual Tune Set-up</u> To enable manual tuning on 2182 kHz the Manual Tuning Switches in the Antenna Tuning Unit must be preset on the final antenna installation. Remove the cover of the Antenna Tuning Unit and follow below procedure.





Control that all Manual Switches are in position off. With the switch AUTO/2182 kHz (S5) in position "AUTO", a normal tuning procedure is performed on 2182 kHz. The Manual Tuning Switches are then switched "ON", as indicated by light in the Tune Set-up Indicators. Ensure that the transmitter is not keyed. Check correct setting of the Manual Tuning Switches by switching S5 to position 2182 kHz and simultaneously control that none of the Tune Set-up Indicators change. If any of the indicators change, repeat the procedure. When S5 is switched back to "AUTO" the Tune Set-up will be reset.

5.10 **Remote Frequency Control**

TRP 8250 D is equipped with a serial interface for remote telex operation. That is, the receiver and/or transmitter frequencies may be remote controlled whereas telex mode will be automatically selected.
The remote control terminals are the 601-TS1 Auxiliary Terminals no. 1 to 4, see Table 5.2. The interface, when used, has to be enabled by the appropriate Configuration PROM programming, see section 5.12. PROM addr. FEDh/4077d AUTOTELEX.

The interface circuit conforms electrically to the EIA standard RS-232C using the following:

Baud rate	:	2400 bps
Parity	:	Odd
Word length	:	8 bits
Start bits	:	1
Stop bits	:	1

DATA FORMAT

Address word: This word, when transmitted to TRP 8250 D, initiates the command cycle. To identify the address word bits 6 and 7 shall both be set to 1. Thus, any other word types used will have to be less than C0h/192d.

Reserved addresses:
C2h/194d : Receiver
C3h/195d : Transmitter
FFh/255d : Broadcast

Command word: The word immediately following the address word contains the command.

Reserved commands:
00h/0d : Reset.
The TRP 8250 D will run the power-up sequence.
14h/20d : Frequency input.
The next 4 words will be interpreted as a frequency.

Frequency words: After a frequency command 4 words are used to specify the frequency in packed BCD:

1.	10 MHz	1 MHz
2.	100 kHz	10 kHz
3.	1 kHz	100 Hz
4.	10 Hz	0

Status word: After having received the frequency command and all four frequency words, the TRP 8250 D transmits a status word having the following format:

Bit

7 : Interface error. When set to 1 this bit identifies either a parity, framing, overrun or data format error. The command cycle must be repeated.

6 : Always 0.

5 : Busy. When set to 1 this bit identifies that the TRP 8250 D is not ready. The command cycle must be repeated.

0-4 : Address echo. This field contains the five LSB's of the received address word.

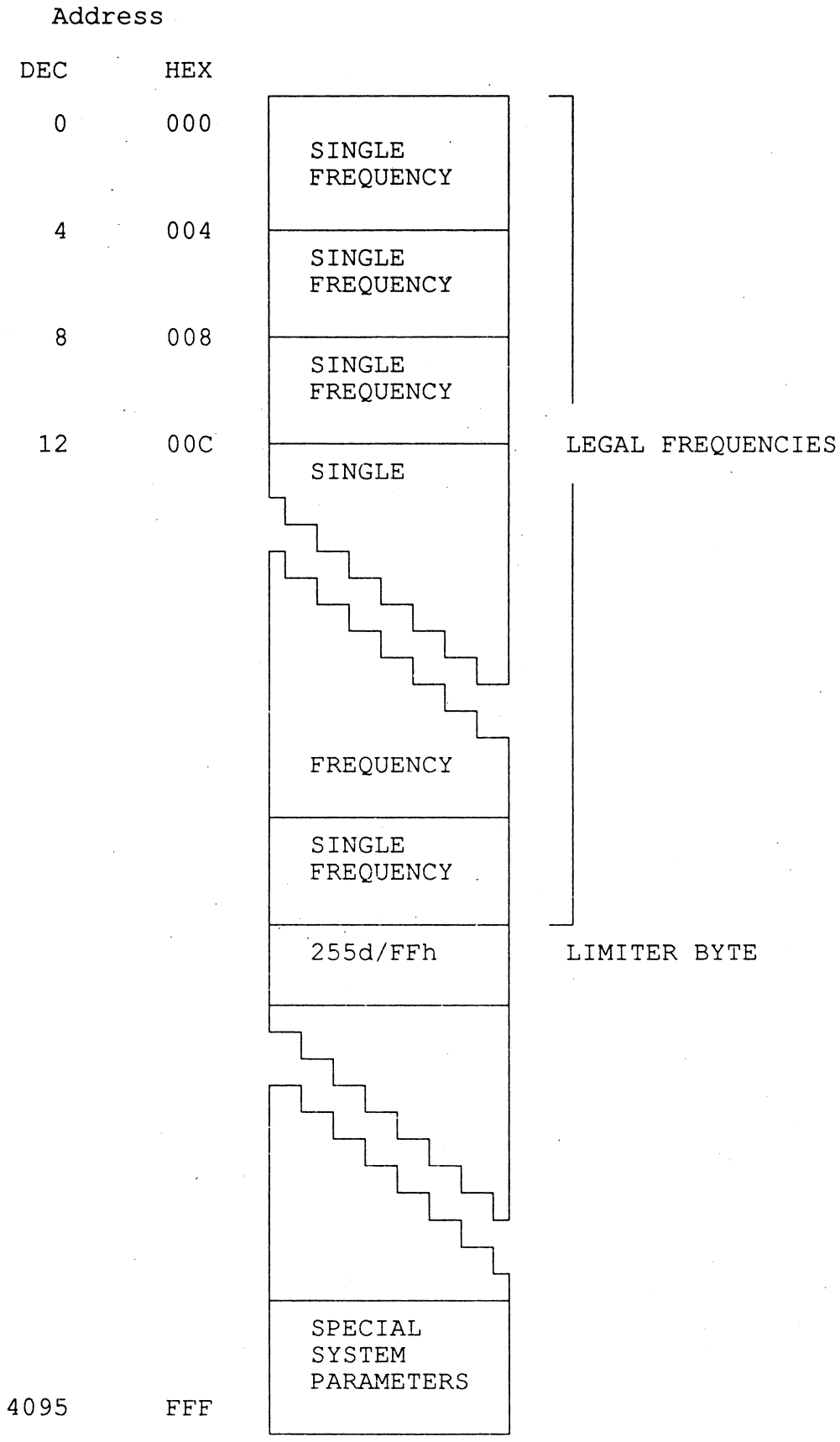
5.11 Configuration PROM Programming

The Configuration Prom contains 4 kbytes in which legal frequencies, frequency bands and special system parameters can be programmed for customizing the equipment. Legal frequencies and frequency bands are stacked in the lower part of the Prom together with legal modulation beginning at Prom address 0 and progressing upward in 4 byte steps until a limiter byte containing the data 255d/FFh are located. Special system parameters are stacked in the higher part of the Prom beginning at Prom address 4095d/FFFh progressing downward.

5.11.1 APPLICABLE PROMS

TEXAS:	TMS2532JL
	TMS25L32JL
HITACHI:	HN462532
	HN462532G
	HN462532G-2

5.11.2 CONFIGURATION PROM MAP



5.11.3 SINGLE FREQUENCY FORMAT

	D7	D6	D5	D4	D3	D2	D1	D0
ADDR n	TX	RX	ITU	ITU-BAND	BCD x 10 MHz			
n + 1	BCD x 1 MHz				BCD x 100 kHz			
n + 2	BCD x 10 kHz				BCD x 1 kHz			
n + 3	BCD x 100 Hz				MODULATION			

5.11.3.1 MODULATION HEXADECIMAL

0 : J3E
1 : R3E
2 : H3E
3 : A1A
4 : H2A
5 : F1B
6 : LSB
7 : J3E & R3E
8 : reserved for future use
9 : reserved for future use
A : reserved for future use
B : reserved for future use
C : reserved for future use
D : reserved for future use
E : reserved for future use
F : don't care

5.11.3.2 RX AND TX BITS

0 : Frequency and modulation do not apply to RX or TX respectively.
1 : Frequency and modulation apply to RX or TX respectively.
Both bits may be programmed in the same array.

5.11.3.3 ITU BIT

0 : ITU channel apply to programmed frequency in accordance with selected channel-number.
1 : ITU channel do not apply to programmed frequency.

5.11.3.4 ITU BAND-BIT

0 : The programmed frequency is within the band specified by the short-number.
1 : The programmed frequency is 1 MHz above the band specified by the shortnumber.

5.11.3.5 ITU CHANNELS

When programming a "LEGAL FREQUENCY" table consisting of the ITU channel frequencies and/or other frequencies to be selected by the "RECALL ITU - - -" syntaxes, it is necessary to consider the search-algorithm used. This algorithm initiates the search at PROM addr. 0 and progresses until either the "LIMITER BYTE" (255d/FFh) or the desired "SINGLE FREQUENCY" is found. The "RECALL ITU FREQUENCY PAIRS FROM PROM" syntax utilizes 2 separate searches to obtain the pair.

Having entered "RX"-"RCL"-"8"-"1"-"5"-"ENTER" the desired frequency is found as the 15th "SINGLE FREQUENCY" in the 8 MHz band (if ITU BAND-BIT = 0) having the RX-BIT = 1, ITU-BIT = 0 and the modulation nibble validating the present receiver mode.

5.11.4 FREQUENCY BAND FORMAT

The single frequency format may be used in pairs to form a frequency band format as shown below. This format is used to additionally limit the transmitter frequency range. When programmed, transmission outside this band is not possible. More than one band may be programmed. Please note that the bit- and modulation nibbles must be 0.

	D7 D6 D5 D4	D3 D2 D1 D0	
ADDR n	always 0	BCD x 10 MHz	
n + 1	BCD x 1 MHz	BCD x 100 kHz	lower frequency
n + 2	BCD x 10 kHz	BCD x 1 kHz	
n + 3	BCD x 100 Hz	always 0	
n + 4	always 0	BCD x 10 MHz	
n + 5	BCD x 1 MHz	BCD x 100 kHz	upper frequency
n + 6	BCD x 10 kHz	BCD x 1 kHz	
n + 7	BCD x 100 Hz	always 0	

5.11.5 SPECIAL SYSTEM PARAMETERS

ADDR	**DATA**	**DESCRIPTION**
4095d/FFFh		**Telex audio center frequency**
		Display of assigned frequency
	21d/15h :	1500 Hz
	22d/16h :	1600 Hz
	:	:
	:	:
	37d/25h :	2500 Hz

4095d/FFFh **Display of carrier frequency**

149d/95h : 1500 Hz
150d/96h : 1600 Hz
: :
: :
153d/99h : 1900 Hz
160d/A0h : 2000 Hz
: :
: :
165d/A5h : 2500 Hz

When assigned frequency display is used, an input at the programmed audio center frequency will be transmitted at the displayed frequency. When carrier frequency display is used, an input at the programmed audio center frequency will be used as an USB signal at the displayed fequency + the audio center frequency.
Any other data are defaulted to 23d/17h

4094d/FFEh **Transmitter frequency status**

165d/A5h : Free transmitter frequencies
255d/FFh : Only transmitter frequencies contained in lower part of the Prom
Any other data are defaulted to 255d/FFh

4093d/FFDh **Dummy load during alarm test**

0d/00h : Enable dummy load incl. 2182 kHz
180d/B4h : Enable dummy load excl. 2182 kHz
255d/FFh : Disable dummy load
Any other data are defaulted to 255d/FFh

4092d/FFCh **Morse**

4d/04h : Enable 500, CW, MCW, FILTER and BFO keys.
Disable transmitter in MCW mode above 1605 kHz.
195d/C3h : Disable 500, CW, MCW, FILTER and BFO keys
255d/FFh : Enable - - - - - - - -
Any other data are defaulted to 255d/FFh

4091d/FFBh **AGC and Sensitivity**

195d/C3h : Disable AGC and Sensitivity keys
255d/FFh : Enable - - - - - -
Any other data are defaulted to 255d/FFh

4090d/FFAh **RF Amplifier and Antenna Attenuator**

195d/C3h : Disable RF-AMP and ANT-ATT keys
255d/FFh : Enable - - - - - -
Any other data are defaulted to 255d/FFh

4089d/FF9h **Alarm**

195d/C3h : Disable 500, 2182 and ALARM keys
0d/00h : Enable 500,2182 and ALARM keys plus continuous alarm
255d/FFh : Enable 500, 2182 and ALARM keys
Any other data are defaulted to 255d/FFh

4088d/FF8h **R3E**

195d/C3h : Disable R3E key
255d/FFh : Enable - -
Any other data are defaulted to 255d/FFh

4087d/FF7h **LSB**

195d/C3h : Disable LSB key
255d/FFh : Enable - -
Any other data are defaulted to 255d/FFh

4086d/FF6h **SCAN**

210d/D2h : Enable SCAN key
255d/FFh : Disable - -
Any other data are defaulted to 255d/FFh

4085d/FF5h **Fast AGC & Slow AGC**

210d/D2h : Enable AGC-SLOW and AGC-FAST keys
255d/FFh : Disable - - - - - -
Any other data are defaulted to 255d/FFh

4084d/FF4h **LSB Transmitting**

6d/06h : Enable transmitter in LSB mode
255d/FFh : Disable - - - - -
Any other data are defaulted to 255d/FFh

4083d/FF3h **H3E Transmitting**

2d/02h : enable transmitter in H3E mode
255d/FFh : disable - - - - -
Any other data are defaulted to 255d/FFh

4082d/FF2h **VERY NARROW FILTER**

195d/C3h : Disable VERY-NARROW key
255d/FFh : Enable - - - -
Any other data are defaulted to 255d/FFh

4081d/FF1h **Antenna in TX-Off-State**

180d/B4h : Antenna disconnected
255d/FFh : Antenna connected
Any other data are defaulted to 255d/FFh

4080d/FF0h **Distress mode**

0d/00h : Select J3E when "2182" is pressed
255d/FFh : Select H3E when "2182" is pressed
Any other data are defaulted to 255d/FFh

4079d/FEFh **Numeric keyboard type**

32d/20h : CCITT. Top left key = "1"
255d/FFh : Standard. Top right key = "9"
Any other data are defaulted to 255d/FFh

4078d/FEEh **Alarm Band.**

22d/16h : Disable alarm below 1605 kHz.
255d/FFh : Enable alarm in all bands.
Any other data are defaulted to 255d/FFh.

4077d/FEDh **Autotelex**

82d/52h : Enable Autotelex interface.
210d/D2h : Enable Maritex interface.
255d/FFh : Disable telex interface.
Any other data are defaulted to 255d/FFh

4076d/FECh **Receiver frequency status**

32d/20h : Only receiver frequencies contained in lower part of the Prom
255d/FFh : Free receiver frequencies
Any other data are defaulted to 255d/FFh

4075d/FEBh **Frequency Display**

195d/C3h : Disable frequency display. Only channel numbers can be entered and displayed except using special procedure.
255d/FFh : Enable frequency display
Any other data are defaulted to 255d/FFh

4074d/FEAh **Maximum output power**

255d/FFh : Full output power range
BCD : Programming a packed BCD number will limit the maximum output power to 10 times the programmed value

Ex: Data	Output power
16d/10h	100 W
24d/18h	180 W

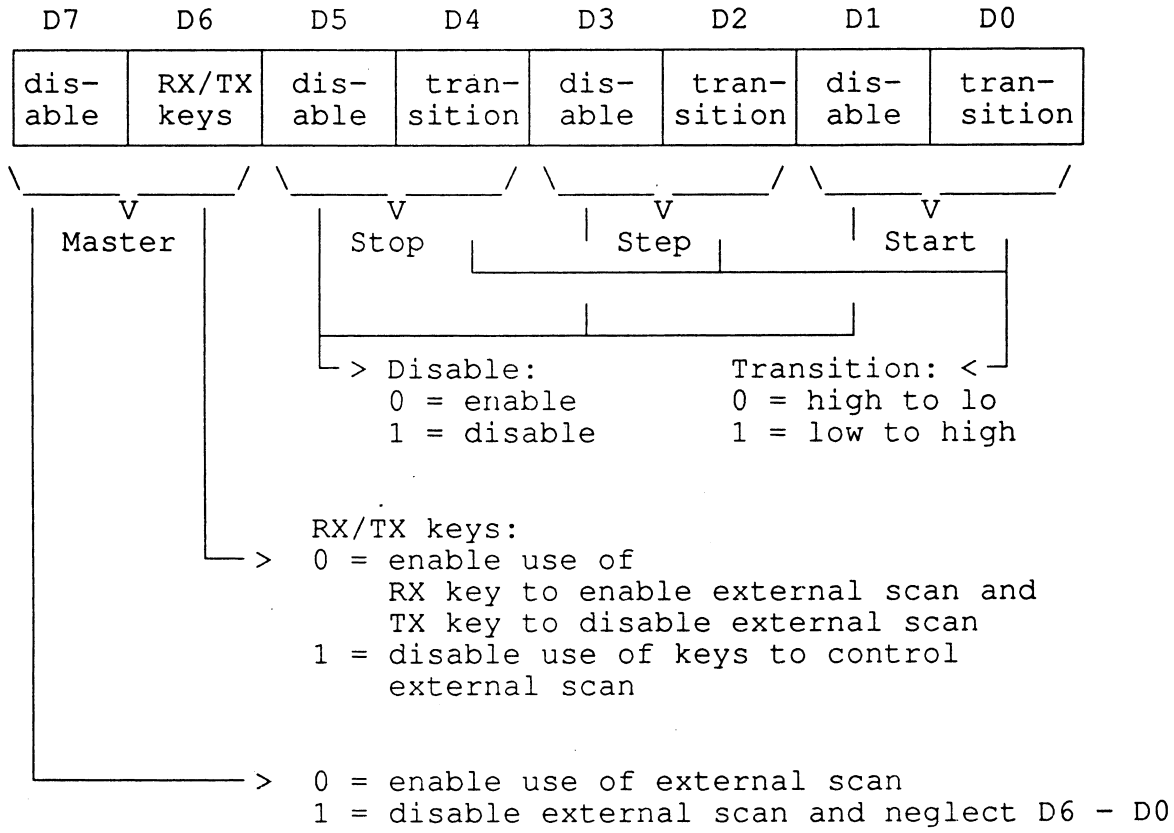
Any non-BCD data or BCD-data outside the range 10 - 25 are defaulted to 255d/FFh

4073d/FE9h **Reduced output power between 1.6 and 4 MHz**

117d/75h : Output power reduced to 150 W when the transmitter frequency is between 1.6 and 4 MHz

255d/FFh : No output power reduction
Any other data are defaulted to 255d/FFh

4072d/FE8h **External scan control**



Terminal No.	Designation	Direction	Signal level	Remarks
1	TX REM	Input	RS-232C	Remote Control Serial Data.
2	GND	-		
3	RX REM	Output	RS-232C	Remote Control Serial Data.
4	GND	-		
5	2182 SEL	Output	74LS00	High when 2182 is selected.
6	GND	-		
7	SCAN S/S	Input	0/12 V	Start/Stop of scanning (user programmable).
8	GND	-		
9	TELEX KEY	Input	0/12 V	Keyes Tx in TELEX mode when LOW.
10	GND	-		
11	AUX KEY	Input	0/12 V	Keyes Tx in USB, LSB, AM or R3E modes when LOW.
12	GND	-		
13	TELEX IN	Input	-16 to +10 dBm	600 ohms audio input. Open in TELEX mode. *
14	GND	-		
15	AUX IN	Input	-16 to +10 dBm	600 ohms audio input. Open in USB, LSB, AM or R3E modes when AUX KEY is LOW. *
16	GND	-		
17	LINE OUT	Output	-10 to +10 dBm	600 ohms audio output. Internally adjustable. *
18	GND	-		
19	SPEAKER -	Output	0 to 5 W	Load impedance 8 ohms.
20	SPEAKER +	-	-	
21	KEY INHIBIT	Input	0/12 V	Inhibit keying when LOW. **
22	GND	-		
23	OPTIONAL IN	Input	0/12 V	Reserved for future use.
24	GND	-		

* An optional Line Transformer Board 603 is available providing balanced input/output.

** KEY INHIBIT input is applicable only when Preset bit 4 = "1", see second function 284.

601-TS1 AUXILIARY TERMINALS, CONTROL UNIT
Table 5.2

HANDSET SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	MIC	Input	50 mV - 1 V	Internally adjustable +/-8 dB.
2	GND	-		
3	EARPIECE	Output	0 - 10 mW	500 ohms, Controlled by VOLUME.
4	+ 12 V	Output	+ 12 V	Supply for MIC. Amplifier.
5	HANDSET KEY	Input	0/12 V	Keyes Tx in USB, LSB, AM or R3E when LOW.

HEADPHONE SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	-	Output	0 TO 10-160 mW	Mono or stereo headphones may be used. 8 ohm - 5 kohm Built-in speaker is disconnected when jack is inserted
2	-			
3	- LS			

MORSE KEY SOCKET:

Terminal No.	Designation	Direction	Signal level	Remarks
1	MORSE KEY	Input	0/12 V	Keyes Tx in CW or MCW when LOW
2	GND	-		

EXTERNAL CONNECTIONS, CONTROL UNIT

Table 5.3

Terminal No.	Designation	Direction	Remarks
1	+	Input	Supply from 12/24/32 V battery or P 8250
2	GND	-	Screen
3	-	Input	Supply from 12/24/32 V battery or P 8250

TS 1 SUPPLY TERMINALS, TRANSCEIVER UNIT

Table 5.4

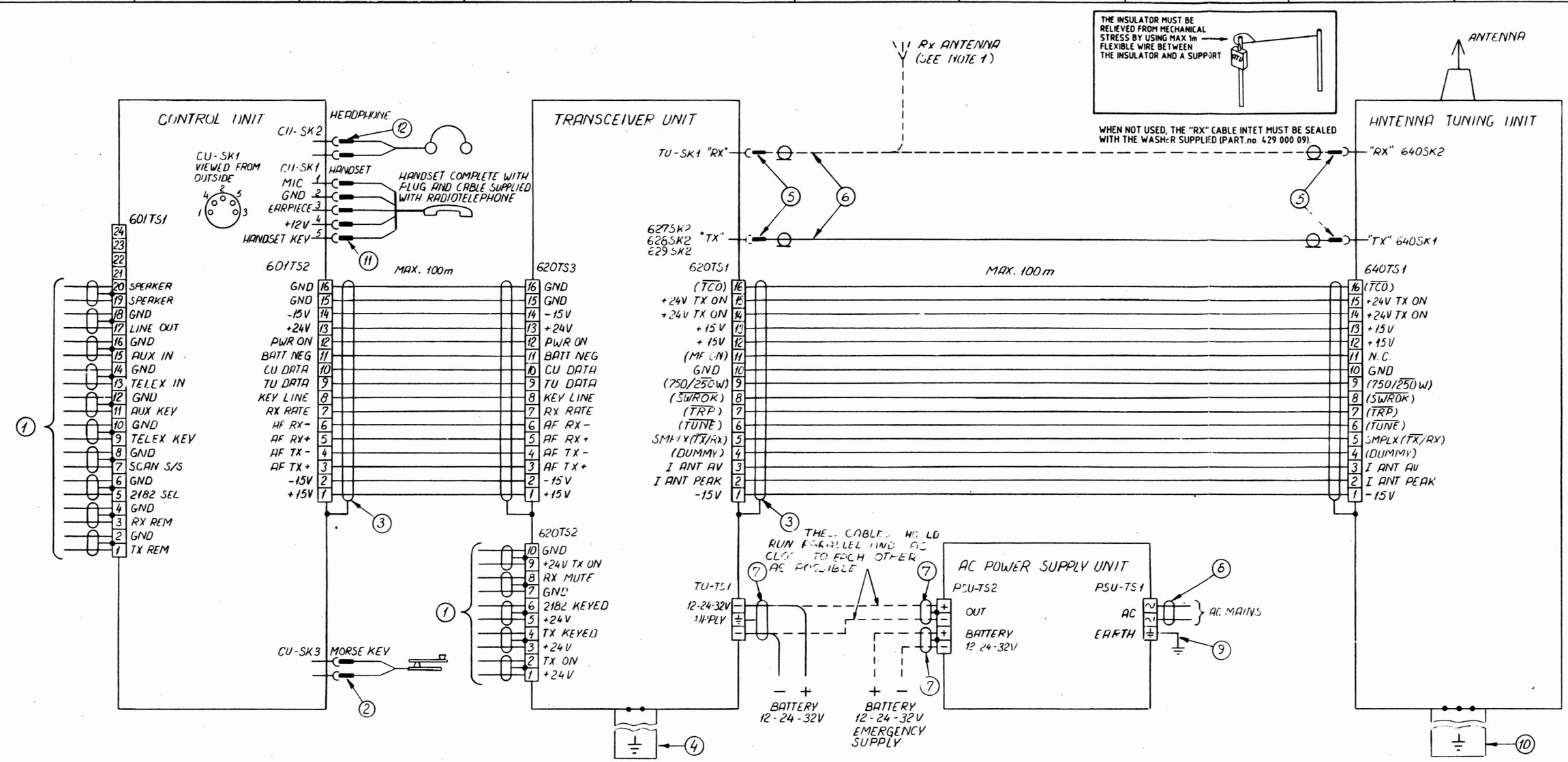
Terminal No.	Designation	Direction	Max. Current	Remarks
1	+ 24 V	Output	Note 1	+ 24 V available when equipment is ON.
2	TX ON	Output	250 mA	Open collector, low when TX on.
3	+ 24 V	Output	Note 1	+ 24 V available when equipment is ON.
4	TX KEYED	Output	250 mA	Open collector, low when TX KEYED.
5	+ 24 V	Output	Note 1	+ 24 V available when equipment is ON.
6	2182 KEYED	Output	250 mA	Open collector, low when TX KEYED on 2182 kHz.
7	GND	-		
8	RX MUTE	Input	0/12 V.	Rx is muted when connected to GND.
9	+ 24 V	Output	Note 1	+ 24 V available when TX is ON.
10	GND	-		

Note 1: Max. total current 1000 mA

620 TS 2 AUXILIARY TERMINALS, TRANSCEIVER UNIT

Table 5.5

993 626 5X



POS	CONNECTORS AND CABLE TYPES
1	SCREENED CABLE 2 × 0.25mm – 2 × 1.5 mm Sq *
2	2-POLE JACK PLUG ø 6.35
3	SCREENED MULTIWIRE CABLE 16 × 0.5mm Sq
4	COPPER STRAP 50 × 0.5mm
5	CONNECTOR TYPE PL 259
6	COAXIAL CABLE TYPE RG-213/U OR RG-8A/U
7	SCREENED CABLE (SEE NOTE 3)
8	CABLE (SEE NOTE 2)
9	WIRE 1 × 2.5mm Sq
10	COPPER STRAP 100 × 0.5 mm
11	5-POLE CONNECTOR (DIN 41524)
12	2 OR 3-POLE JACK PLUG ø 6.35
	*MULTIWIRE CABLE MAY BE USED IF CONVENIENT

NOTE 1

THE EQUIPMENT MAY BE USED WITH SEPARATE TRANSMITTING AND RECEIVING ANTENNAS.
IF, HOWEVER, THE ANTENNA TUNING UNIT IS FITTED WITH THE OPTIONAL ANTENNA RELAY BOARD 641 A COMMON ANTENNA MAY BE USED FOR TRANSMISSION AND RECEPTION.

NOTE 2

AC-MAINS	CONDUCTOR AREA	EXTERNAL FUSES
110 - 120V	2 × 1.5mm Sq	20A
220 - 240V	2 × 1.5mm Sq	15A

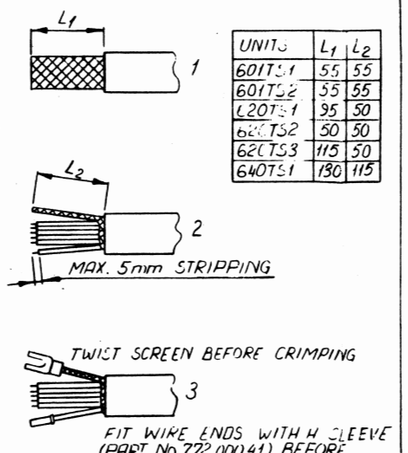
SEE DIAGRAM OF P.8250 FOR SUPPLY VOLTAGE SETTING

NOTE 3

BATTERY VOLTAGE	MAX. CABLE LENGTH TO BATTERY	RECOMMENDED CONDUCTOR AREA	EXTERNAL FUSES
12V	2.5m 4.3m	2 × 16 mm Sq 2 × 25 mm Sq *	100A
24V	7.2m 12.0m 19.0m	2 × 6 mm Sq 2 × 10 mm Sq 2 × 16 mm Sq	50A
32V	12.0m 20.0m 34.0m	2 × 6 mm Sq 2 × 10 mm Sq 2 × 16 mm Sq	40A

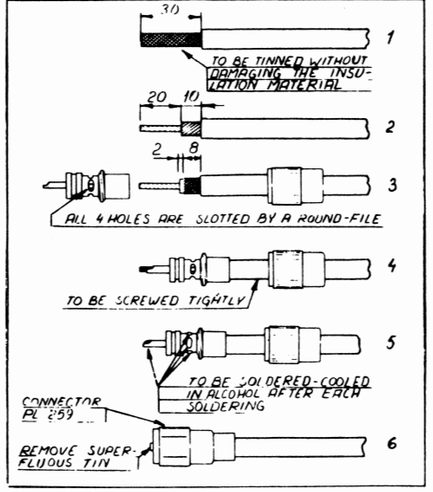
* USE PIN TERMINAL ADAPTER (PART No. 343 428 1X)

PREPARATION OF MULTIWIRE CABLE



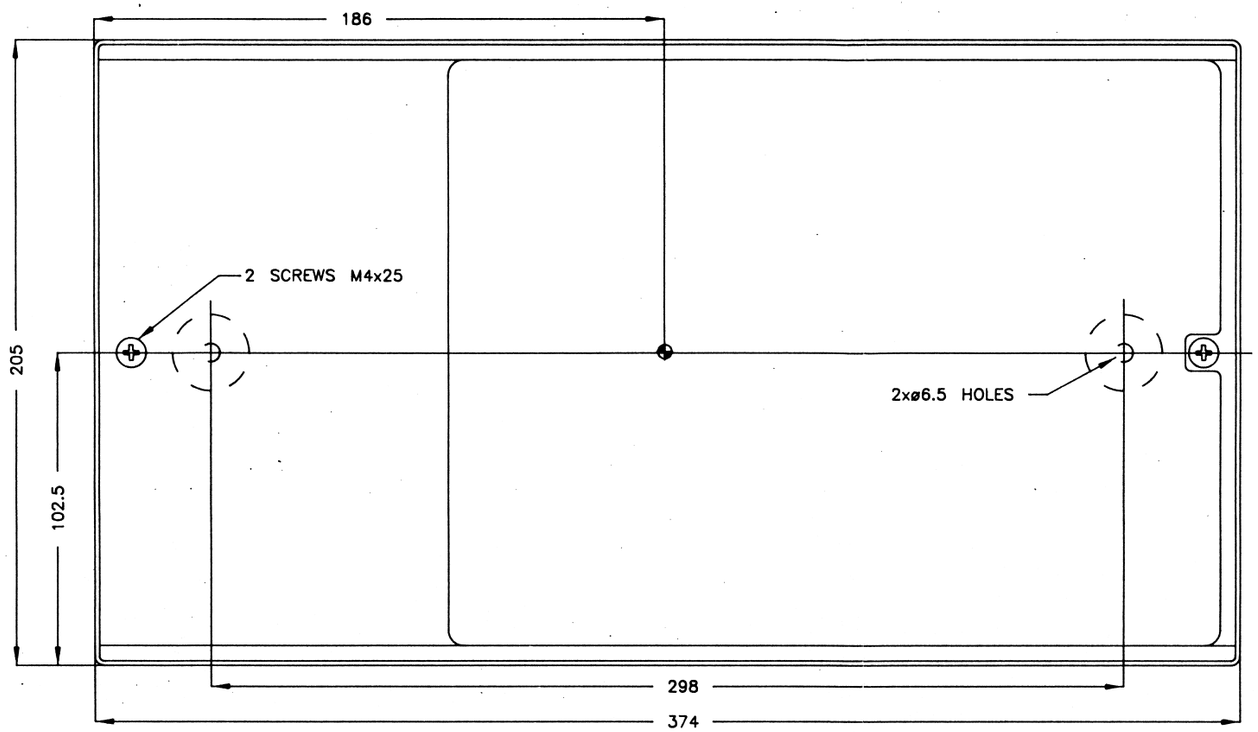
UNITS	L_1	L_2
601TS1	55	55
601TS2	55	55
620TS1	95	50
620TS2	50	50
620TS3	115	50
640TS1	180	115

CONNECTOR TO CABLE ASSEMBLY

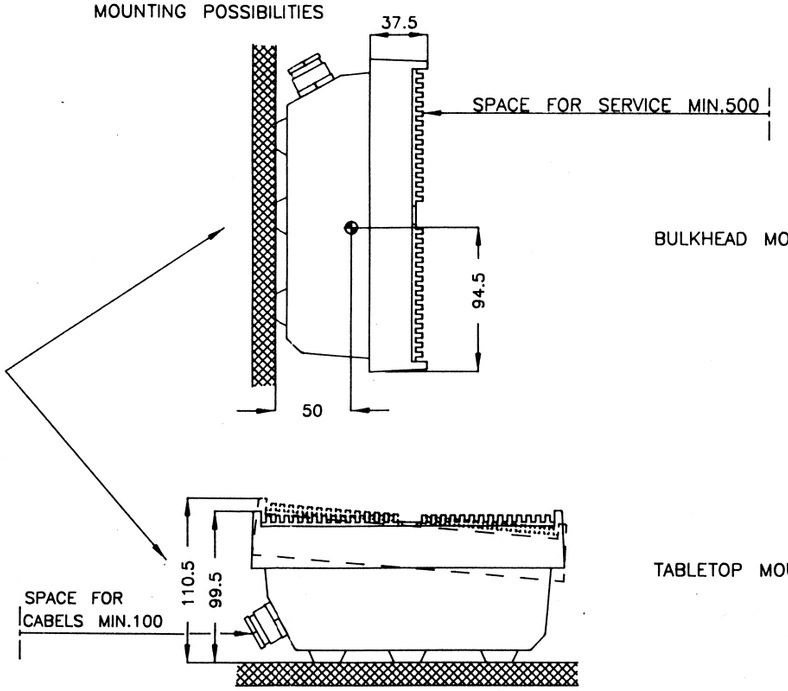


INSTALLATION WIRING DIAGRAM FOR RADIOTELEPHONE TRP 825X S/D.

DRILLING PLAN FOR CONTROL UNIT 8000



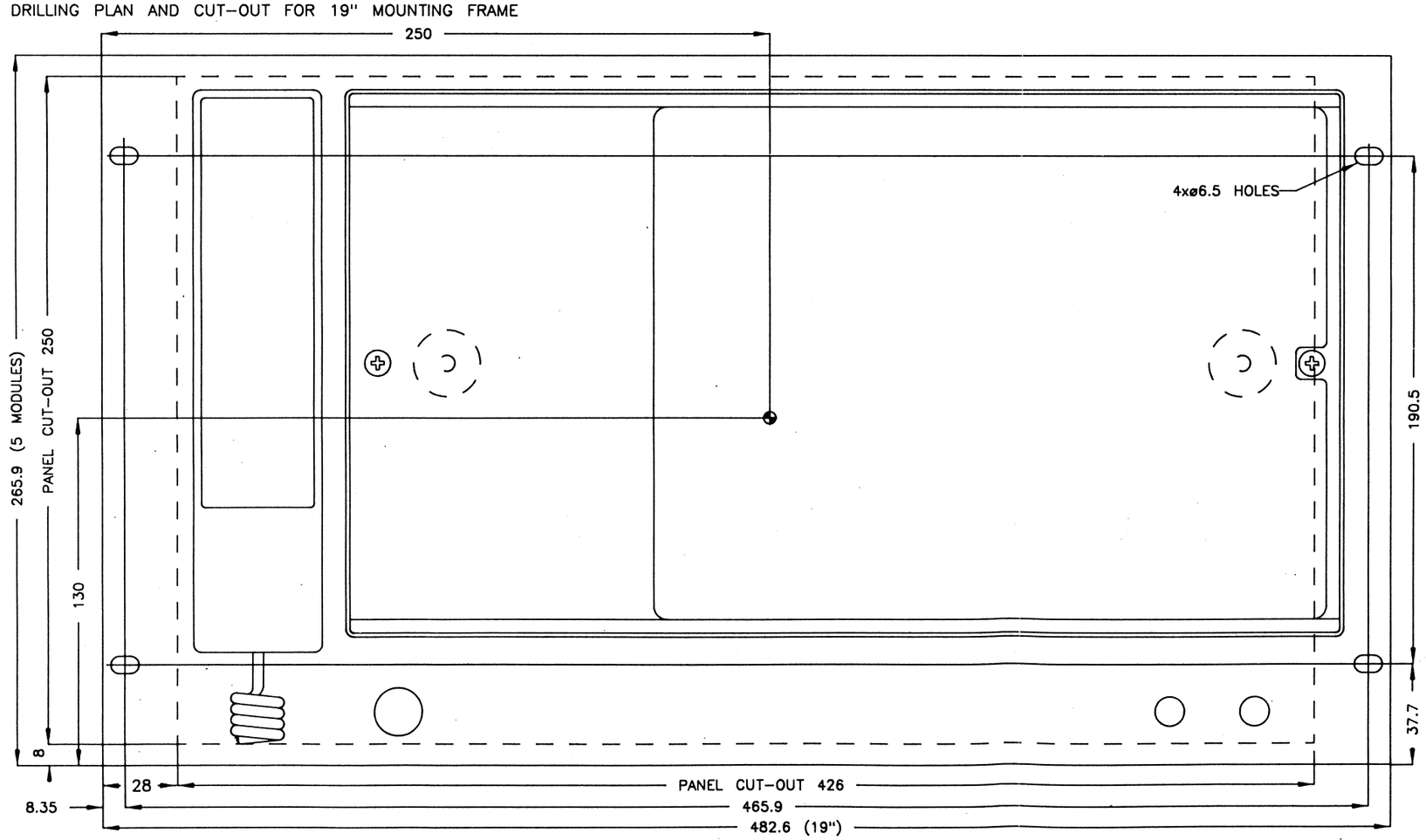
MOUNTING POSSIBILITIES

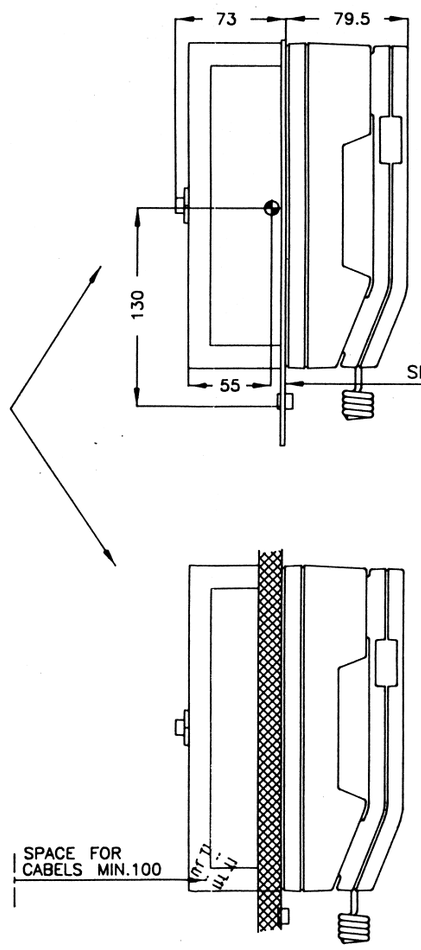


BULKHEAD MOUNTING

TABLETOP MOUNTING

DRILLING PLAN AND CUT-OUT FOR 19" MOUNTING FRAME





RACK MOUNTING
USING 19" MOUNTING

PANEL MOUNTING
USING 19" MOUNTING FRAME

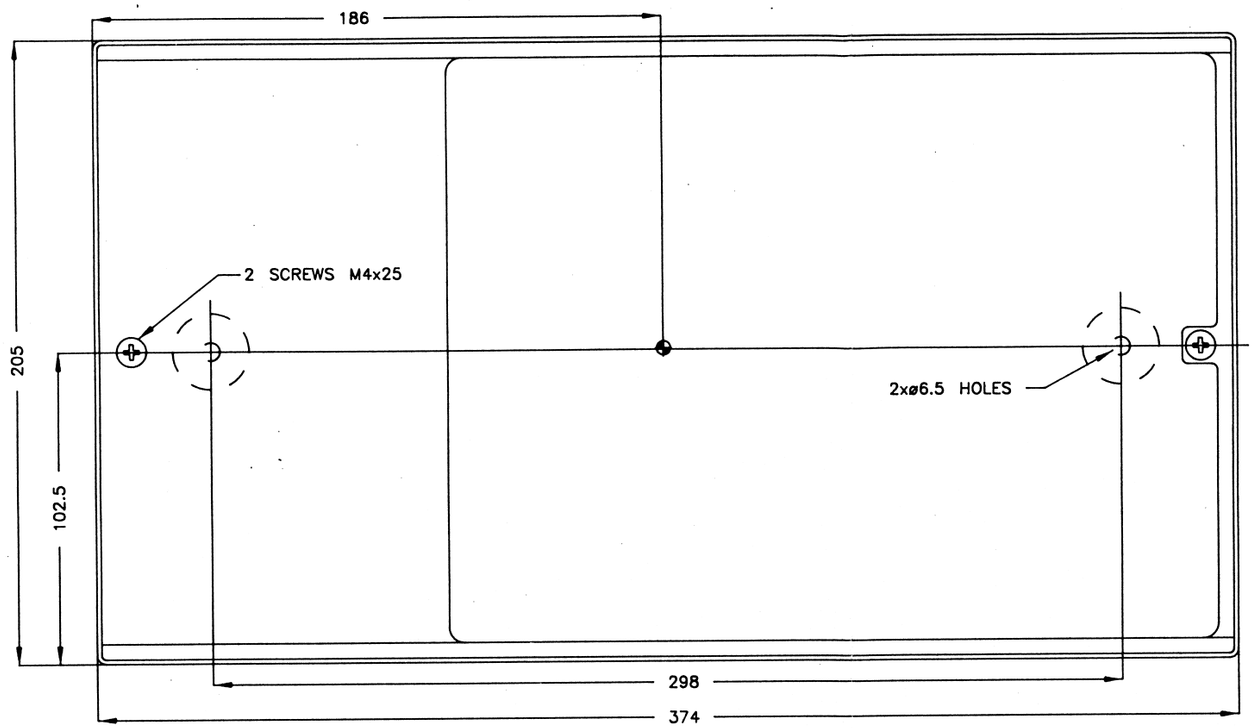
TYPE	APPROX WEIGHT:
CONTROL UNIT 8000	4.0 Kg.
19"MOUNTING FRAME 108 600 00	1.0 Kg

DIMENSIONS ARE IN MM
TOLERANCE ±1
⊕ CENTRE OF GRAVITY

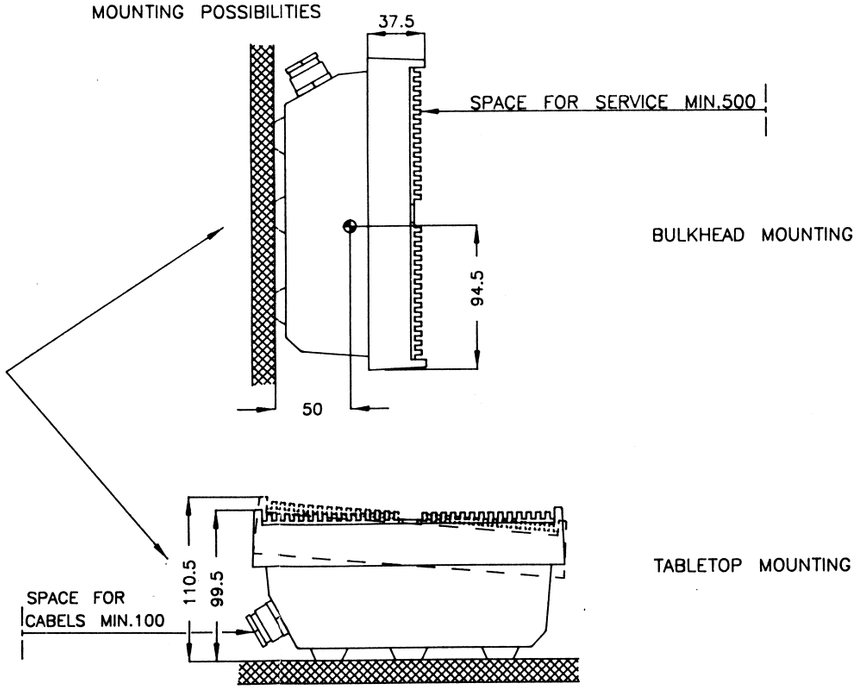
MOUNTING OF CONTROL UNIT 8000

M363061A

DRILLING PLAN FOR CONTROL UNIT 8000



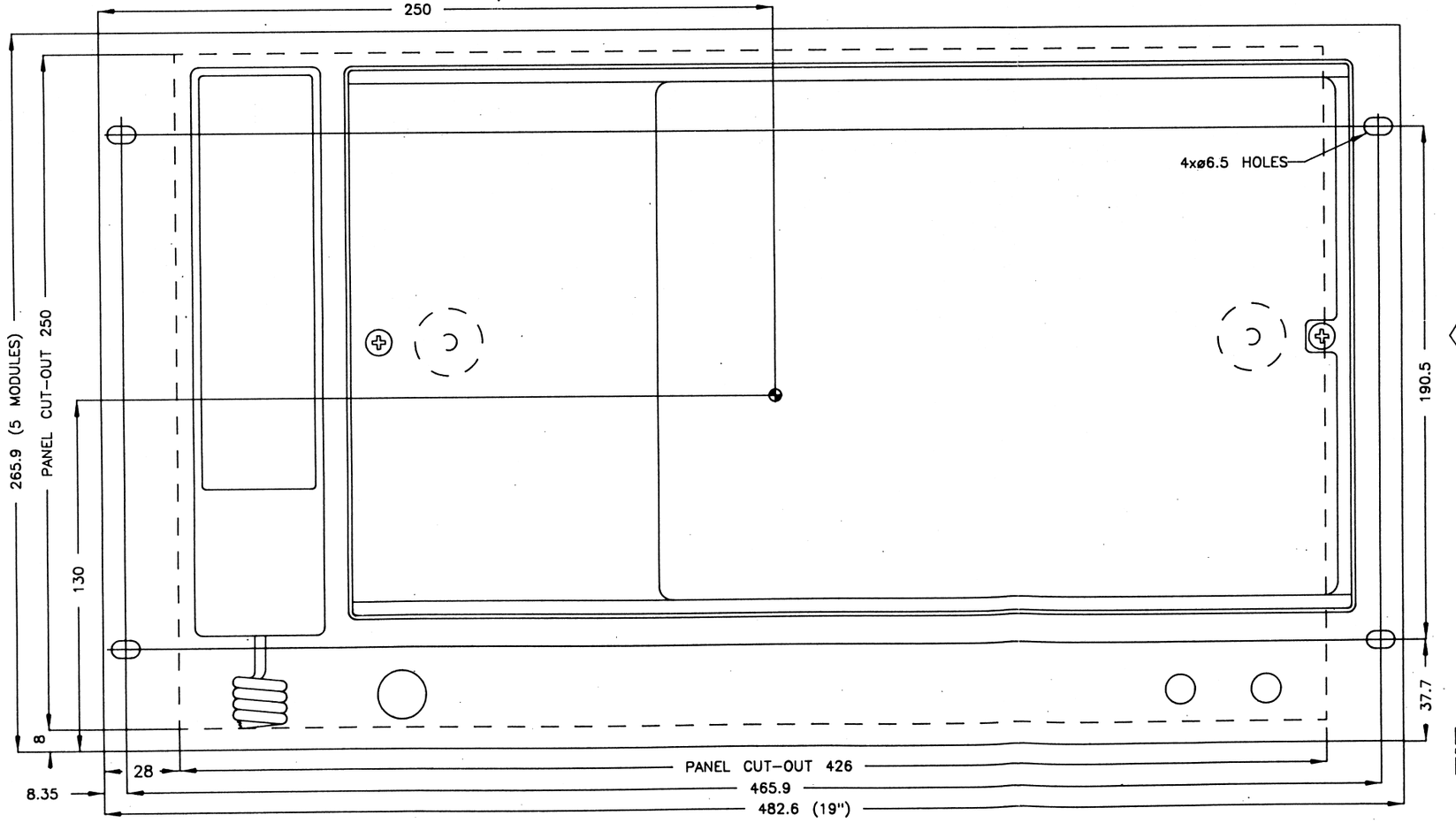
MOUNTING POSSIBILITIES

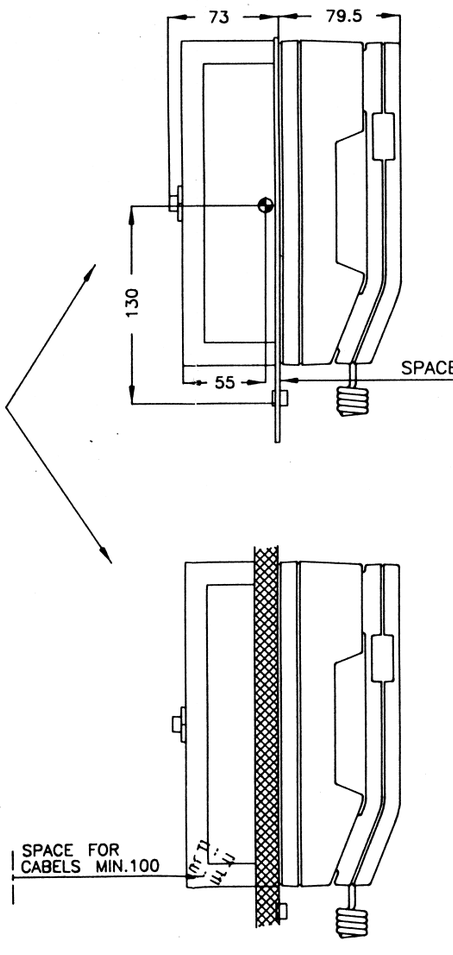


BULKHEAD MOUNTING

TABLETOP MOUNTING

DRILLING PLAN AND CUT-OUT FOR 19" MOUNTING FRAME





RACK MOUNTING
USING 19" MOUNTING

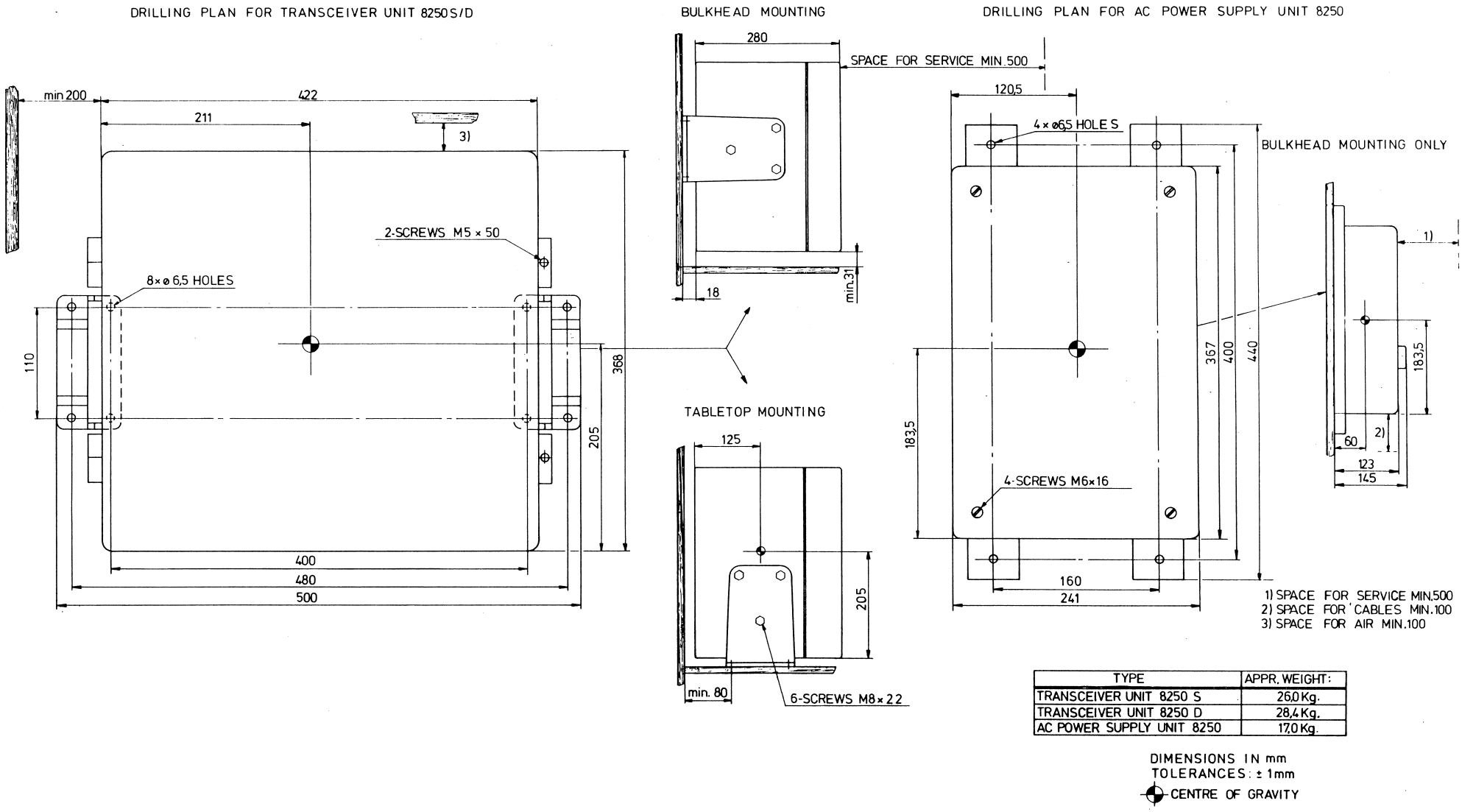
PANEL MOUNTING
USING 19" MOUNTING FRAME

TYPE	APPROX WEIGHT:
CONTROL UNIT 8000	4.0 Kg.
19"MOUNTING FRAME 108 600 00	1.0 Kg

DIMENSIONS ARE IN MM
TOLERANCE ±1
CENTRE OF GRAVITY

MOUNTING OF CONTROL UNIT 8000

M3630061A

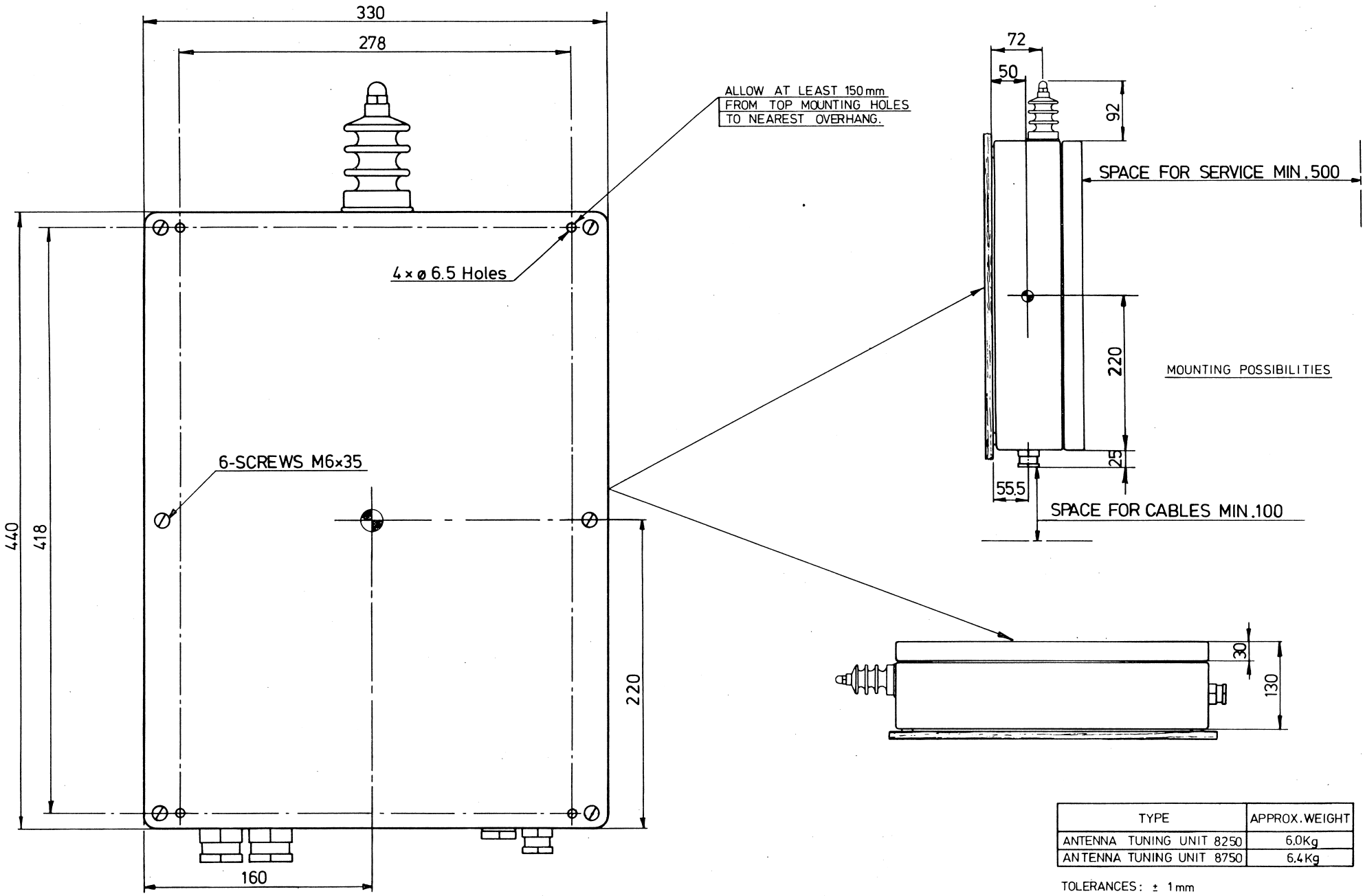


TYPE	APPR. WEIGHT:
TRANSCEIVER UNIT 8250 S	26,0 Kg.
TRANSCEIVER UNIT 8250 D	28,4 Kg.
AC POWER SUPPLY UNIT 8250	17,0 Kg.

DIMENSIONS IN mm
TOLERANCES: ± 1mm
⊕ CENTRE OF GRAVITY

MOUNTING OF TRANSCEIVER UNIT 8250 S/D AND AC POWER SUPPLY UNIT 8250

DR 3 PLAN FOR MOUNTING PLATE WITH ANTENNA TUNING 3250/8750

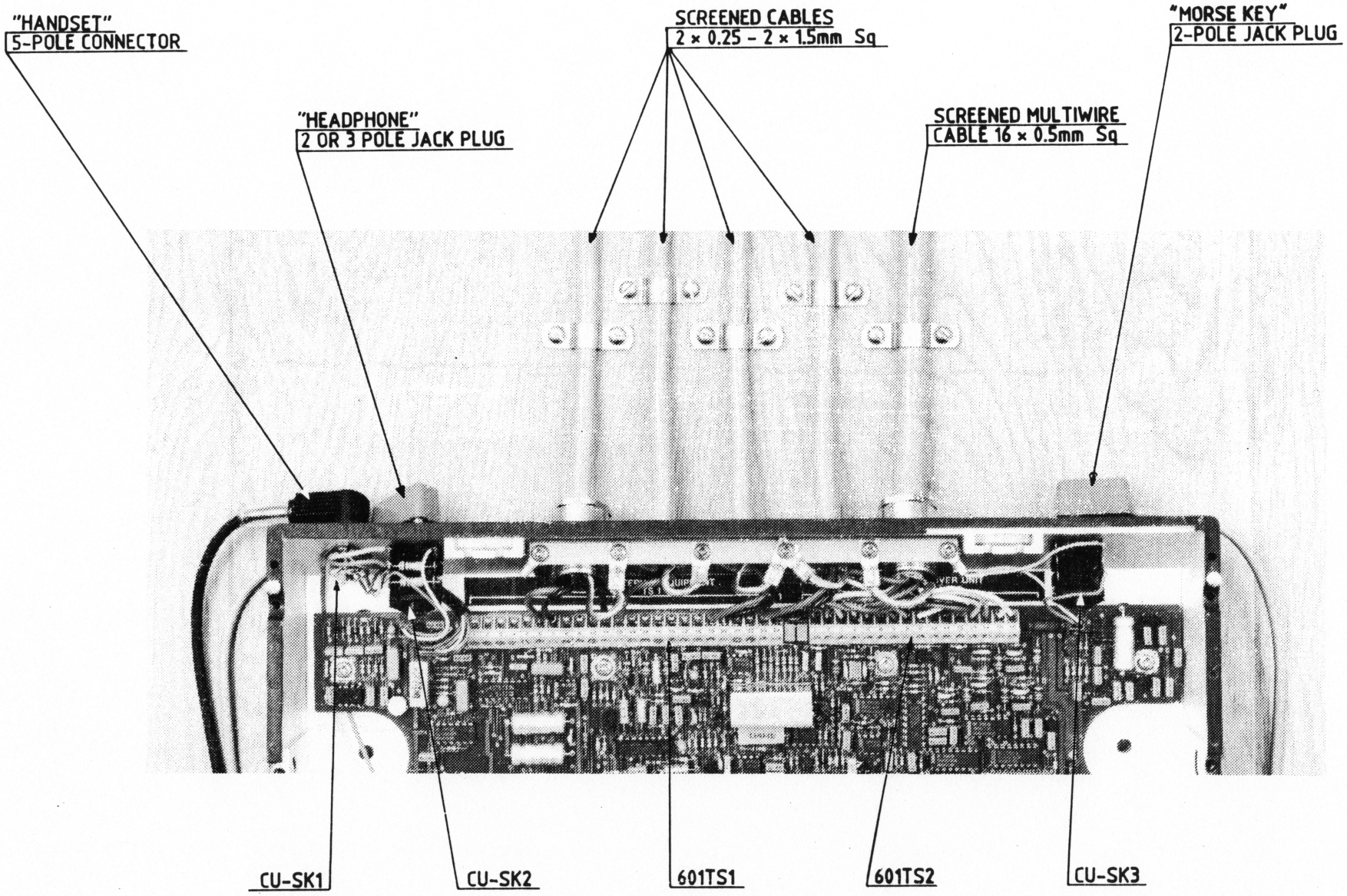


TYPE	APPROX. WEIGHT
ANTENNA TUNING UNIT 8250	6.0Kg
ANTENNA TUNING UNIT 8750	6.4Kg

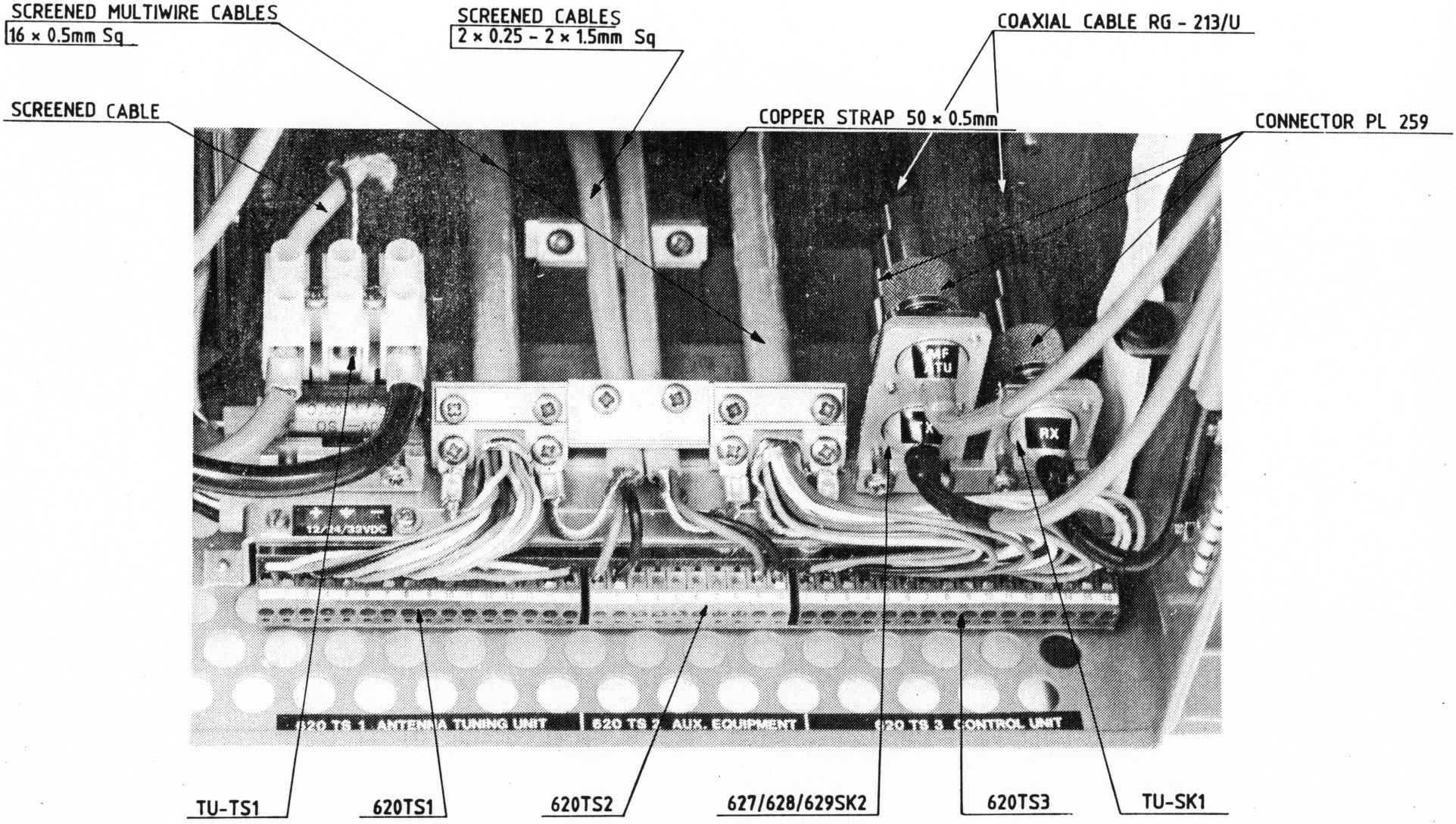
TOLERANCES: ± 1 mm
DIMENSIONS IN mm
⊕ CENTRE OF GRAVITY

993 630 72

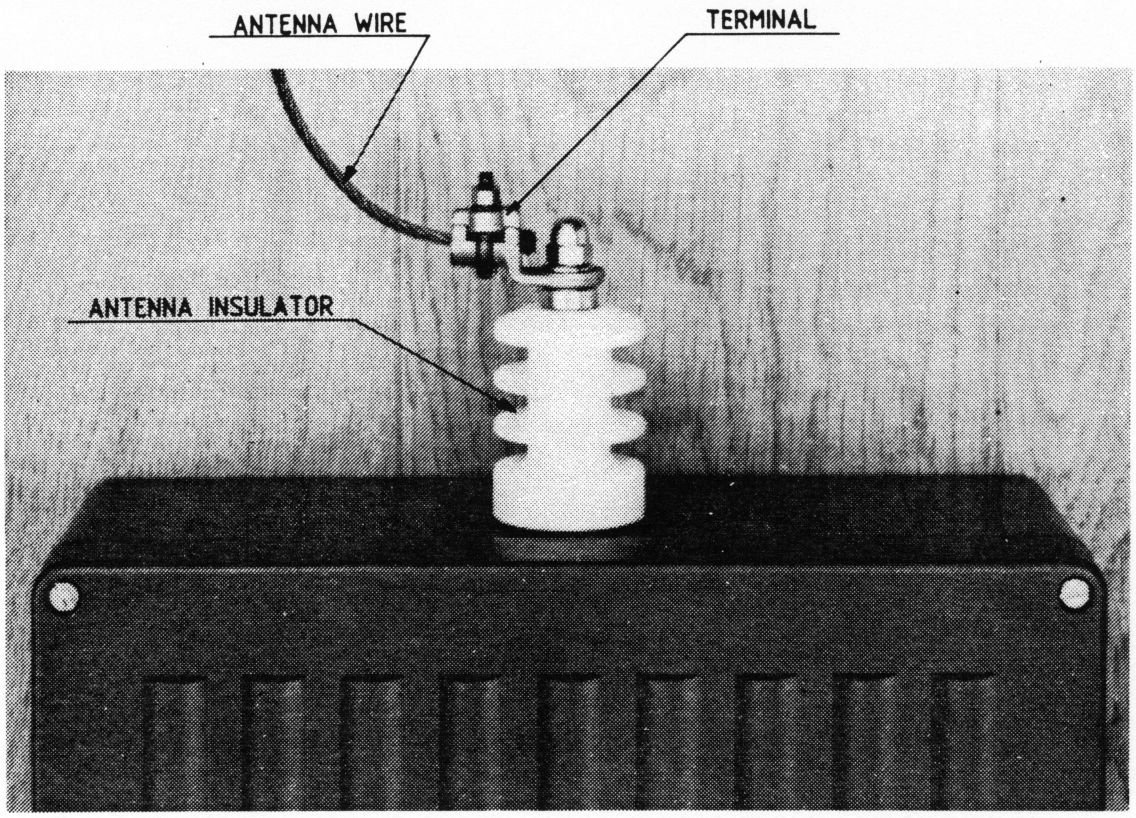
MOUNTING OF ANTENNA TUNING UNIT 8250/8750

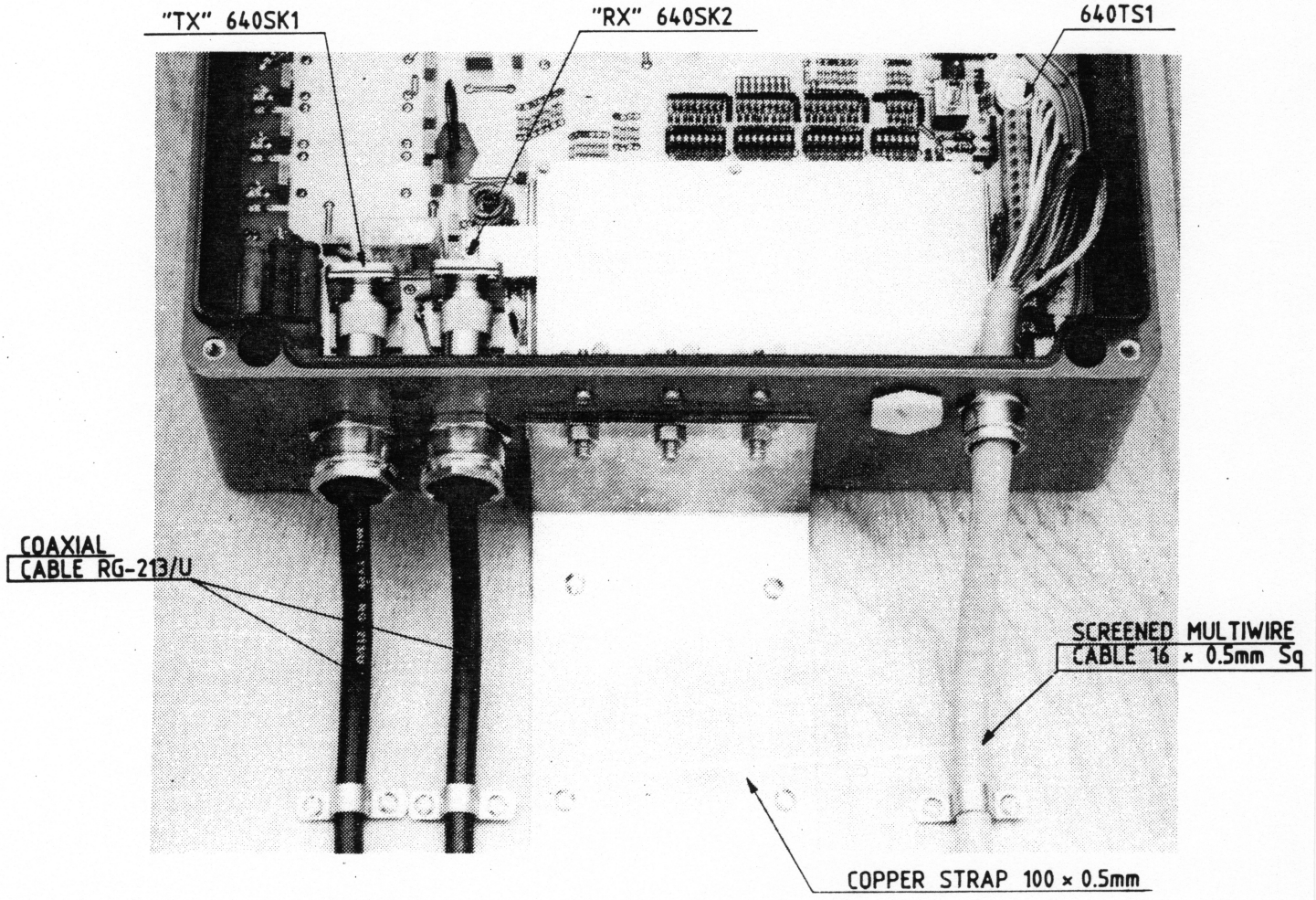


INSTALLATION WIRING OF CONTROL UNIT 8000

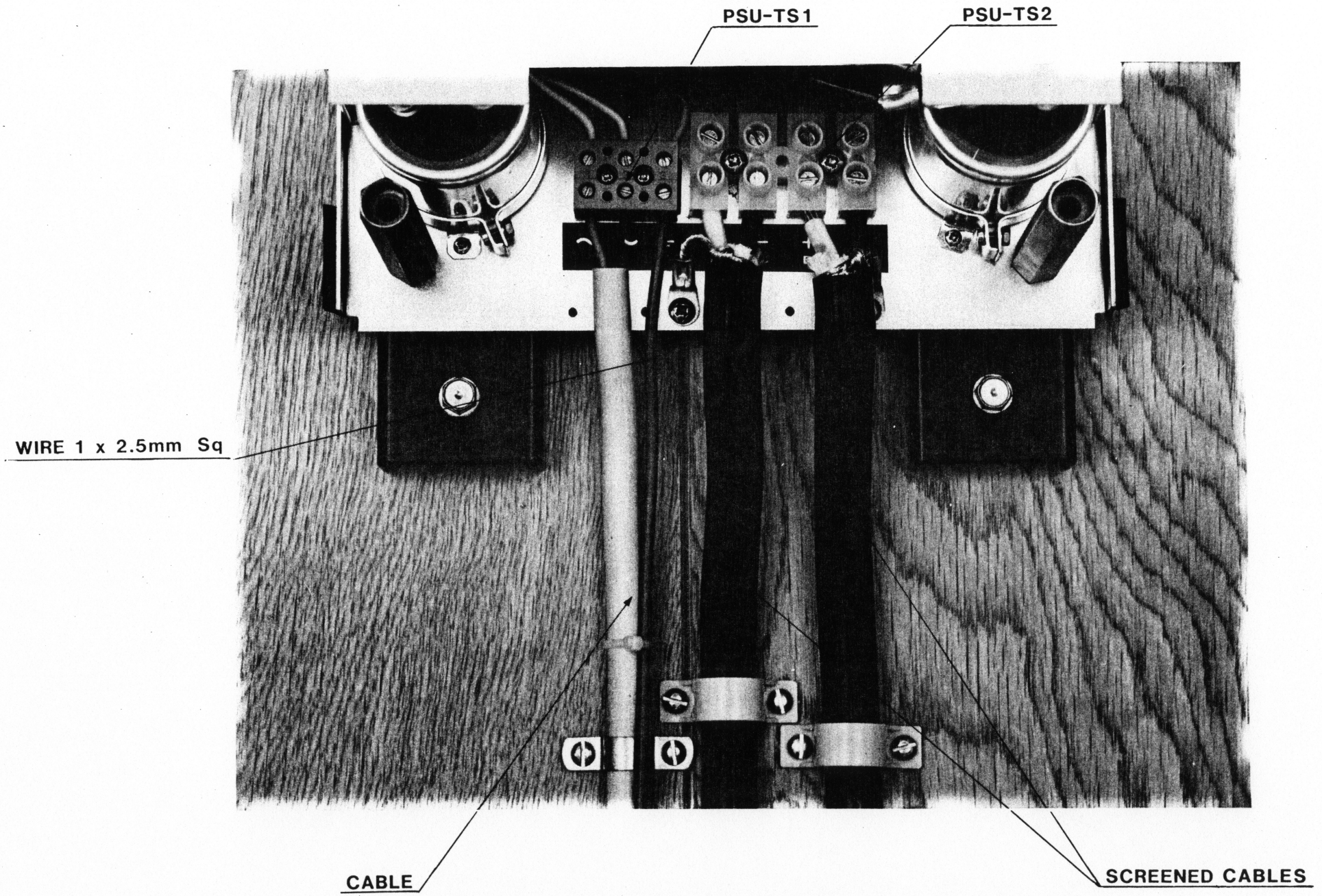


INSTALLATION WIRING OF TRANSCEIVER UNIT 8250





INSTALLATION WIRING OF ANTENNA TUNING UNIT 8250



INSTALLATION WIRING OF AC POWER SUPPLY UNIT 8250

6. TECHNICAL DESCRIPTION

6.1 Control Unit

The Control Unit contains a loudspeaker, two printed circuit boards, Control Board 600 and Audio Processing Board 601 and a membrane keyboard. In addition an optional Squelch Board 602 and an optional Line Transformer Board 603 may be installed. It furthermore contains connections for handset, headphones, extension speaker, morse-key and telex-equipment. The Block Diagram of the Control Unit illustrates the functions of each circuit board while the Interconnection Diagram shows the interconnections between the boards (see chapter 8 for diagrams). The Control Unit is housed in a Noryl (PPO) cabinet suitable for tabletop or bulkhead mounting. The front panel can be tilted for convenient operation when the unit is mounted vertically as well as horizontally.

6.2 Transceiver Unit

The Rx/Tx Assembly of the Transceiver Unit contains the Receiver Signal Path 618 , the Exciter Signal Path 619 , a Master Oscillator 612 (or 613 , 614) and two Synthesizer Boards 611 , one controlling the receiver the other controlling the exciter. These boards are located in the lower door of the unit. The cabinet it self contains a Switched Mode Power Supply which converts the battery voltage to a stabilized 40 V voltage supplying the Power Amplifier and the Voltage Converter Board 621 . The Voltage Converter produces various supply voltages necessary in the equipment and provides galvanic isolation from the battery. Supply voltages, signal and control voltages are distributed via the Interconnection Board 620 to external units and to the Transceiver Control Board 624 which performs the central control of the Transceiver Unit. The exciter output signal from the Rx/Tx Assembly is routed to the Power Amplifier Board 626 the output from which is filtered by the harmonic filters on P.A. Filters 627 (or 628 , 629).

6.3 Antenna Tuning Unit

The ATU consists of a Tuning Network, a Measuring System and a Microprocessor Part. During the tune sequence a 6 dB Attenuator is switched in to keep the load of the Power Amplifier at approx. 50 ohms. The MPU will set up the Tuning Network to give the best obtainable SWR, on basis of the measuring system. The Tuning Network comprises Capacitor Bank I, Capacitor Bank II and an Inductor Bank. With these it is possible to form either an L or a pi matching network. The capacitor Banks and the Inductor Bank are built up by binary related capacitors respectively binary related coils. The setting of the Capacitors and Coils is accomplished by relays.

6.4 AC Power Supply Unit

The P 8250 is a combined AC/DC Power Supply especially developed for powering the TRP 8250 Series. The input power for P 8250 is AC, and the output is an unregulated 32 V DC voltage. Where a battery is required as a reserve source of electrical energy to the radiotelephone equipment, it can be connected via the P 8250 power supply. By means of the switch on the front panel it is possible to select between AC or Battery operation.

6.5 ALC and Protection system

6.5.1 Automatic Level Control (ALC) The Transceiver Unit has an advanced microprocessor controlled automatic level system, which ensures that the optimum power is delivered to the Antenna Tuning Unit. The Tune Sequence, which is initiated either by pressing TUNE on the Control Unit front panel or by keying the transmitter after a frequency change has been carried out, is terminated by a CW pulse of full power with a duration of 70 ms. The signal level at the output of the Transceiver Unit is measured by means of a voltage and current peak-detector placed at the output of the P.A. Filter Assembly 627 , 628 or 629 . The detector voltage (9.0 V at 250 W output power) is applied to the Transceiver Control Board 624 , PL3-9 (FILPEAK), and compared with the output voltage (8.62 V) of the "SETPOINT REGISTER" in IC42-3,2. The error signal ALC is fed to the Exciter Signal Path 619 , PL1-12 driving a voltage controlled attenuator placed in the exciter signal path. Finally the ALC voltage is compared in IC42-5,6 with a ramp voltage generated by the "ALCHOLD REGISTER" and the corresponding DAC (IC24). When the two voltages equals, the ramp is stopped and switch IC44-10,11 is closed. The ALC voltage is now constant generated by the "ALCHOLD REGISTER" and thereby the gain of the Transmitter Signal Path is independent of the modulating signal. When MEDIUM POWER is selected, the ALC voltage generated by the "ALCHOLD REGISTER" is increased by 0.93 V. In LOW POWER a 14 dB attenuator placed on the Power Amplifier Assembly 626 controlled by PAATT is activated and the ALC voltage is equal to the Full Power preset value.

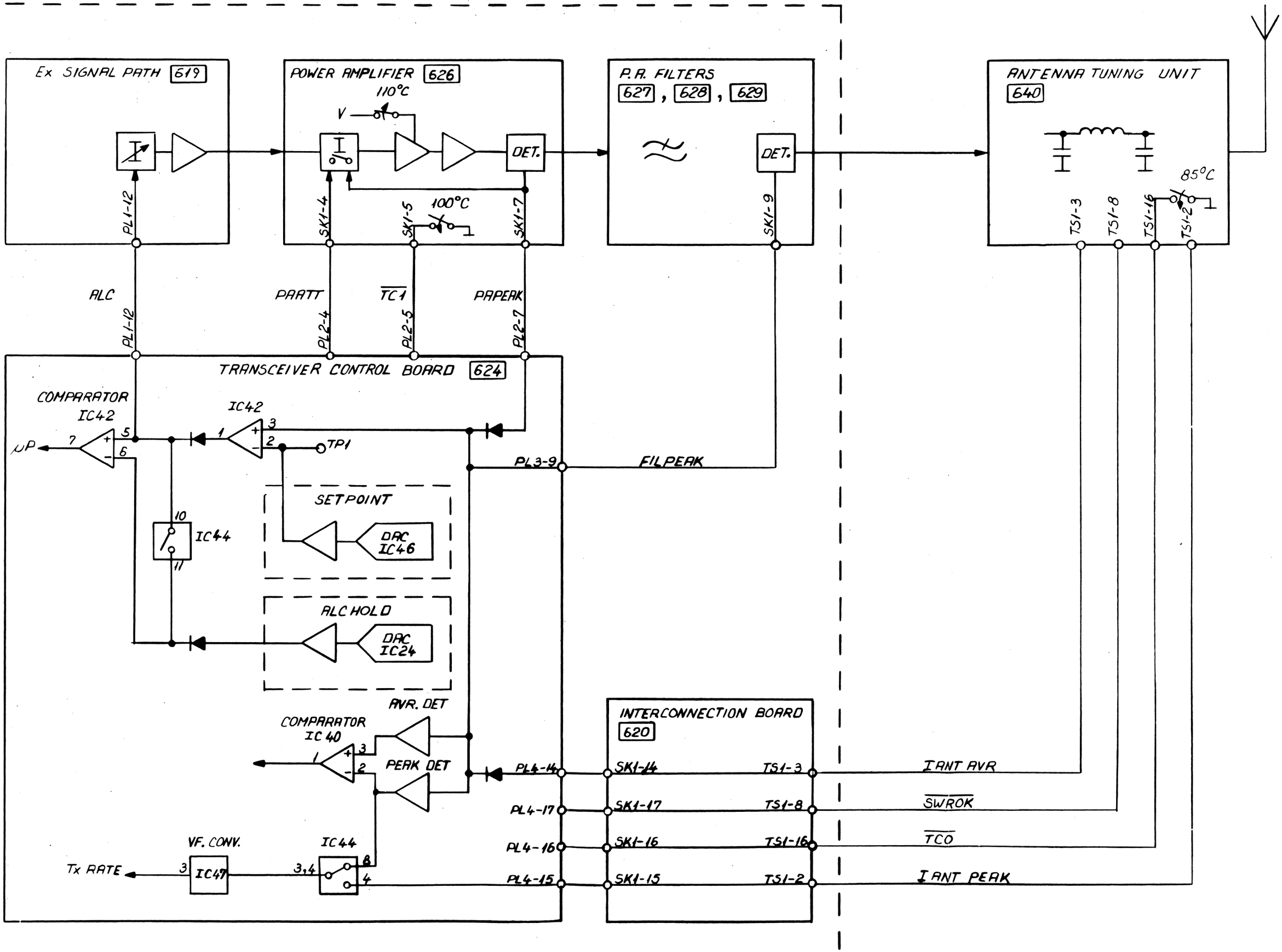
6.5.2 Protection Circuits

6.5.2.1 Power Amplifier Protection The Power Amplifier Protection can be divided into two main groups, SWR protection and thermal protection. The SWR protection contains a reflected power and output voltage detector placed at the output of the Power Amplifier Assembly 626 . The output of the detector (PAPEAK) is connected to the Transceiver Control Board 624 , PL2-7 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly 627 , 628 or 629 . Now, if the SWR at the output of the Power Amplifier Assembly 626 increases during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power within 1 ms to a permissible level. The output of the reflected power and output voltage detector is also used to make an independent local protection of the Power Amplifier by activating the 14 dB attenuator if the detector voltage exceeds 10 V. This ensures fully protection of the Power Amplifier if the ALC loop should be faulty or disconnected. To reset the attenuator it is necessary to turn off

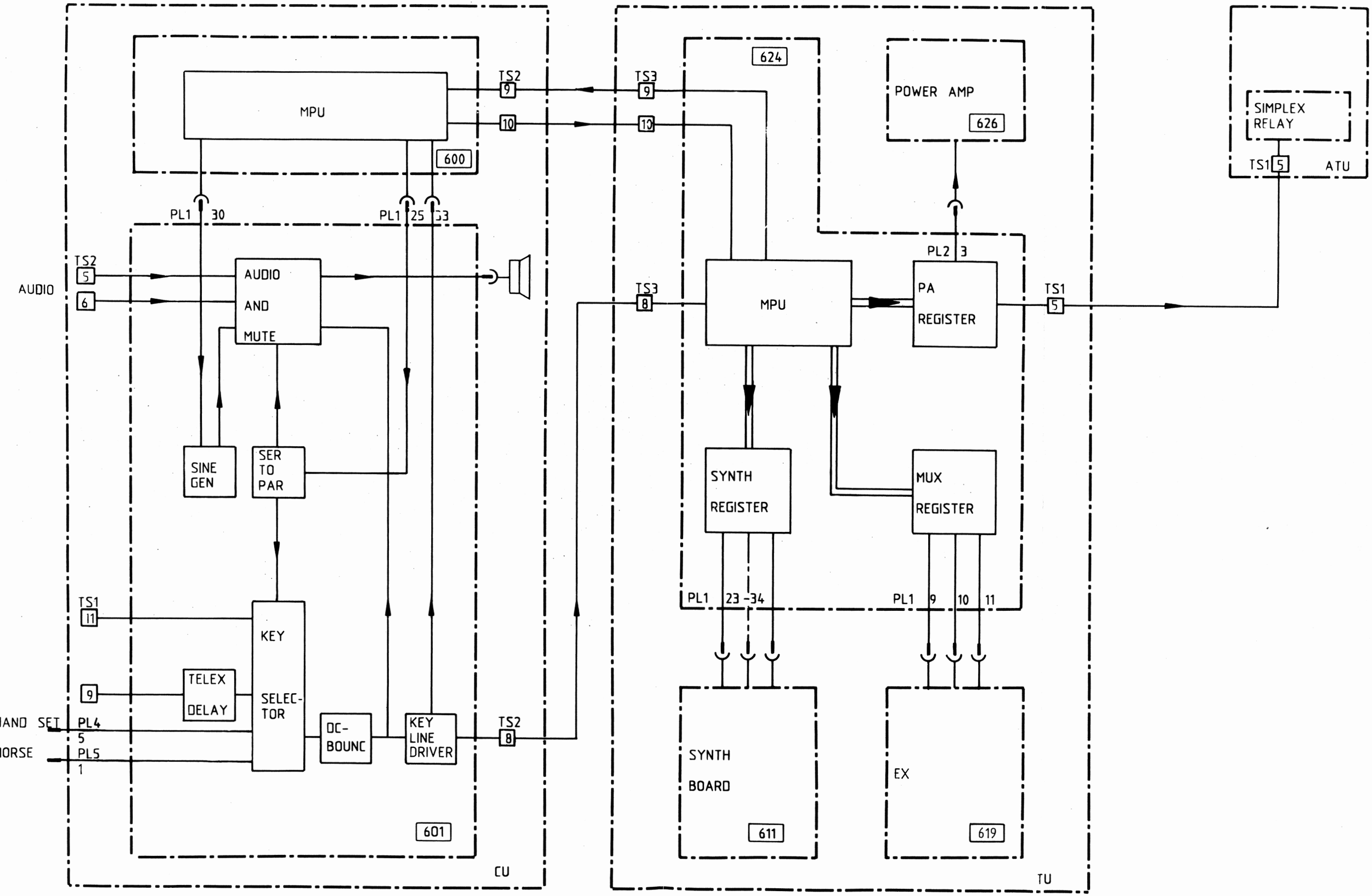
the main power of the Transceiver in a few seconds. The thermal protection consists of two thermoswitches mounted on the heatsink of the Power Amplifier Assembly and an average/peak power detector. One thermoswitch is activated if the heatsink temperature exceeds 100 deg. C. Thereby logical signal TC1 fed to the Transceiver Control Board 624 , PL2-5 goes low and the output power is reduced by 5 dB. This is carried out by changing the reference voltage from the "SETPOINT REGISTER" to 4.36 V and increasing the voltage from the "ALCHOLD REGISTER" by 0.82 V relative to the Full Power preset value. The other thermoswitch is activated if the temperature of the heatsink exceeds 110 deg. C. In this case the supply voltage to the preamplifier is cut off. The average power and the peak power are compared in IC41-3,2. If, in a Full Power transmission, the average power exceeds the peak power minus 3 dB, the logical signal at IC41-1 goes high. If this condition has been present during one minute, e.g. by transmitting CW with continuous key-down or broadcast mode telex, the output power will be reduced by 3 dB (SETPOINT voltage 5.71 V, ALCHOLD voltage increased by 0.54 V relative to Full Power preset value). The power will recover to Full Power level when the transmitter has been muted during two minutes. To enable Full Power ARQ Telex Transmission the system accepts keying dutycycles less than 50 % and modulation rates greater than 3 baud without power reduction.

6.5.2.2 ATU Protection To protect the Antenna Tuning Unit against excess current, for instance if the antenna is shortcircuited , an average current detector is provided. The output of the detector IANTAVR is connected to the Transceiver Control Board 624 , PL4-14 and is OR'ed together with the FILPEAK voltage from the P.A. Filter Assembly 627 , 628 or 629 . Now, if the average current exceeds 6 A during a transmission an error voltage is generated at IC42-1 exceeding the voltage generated by the "ALCHOLD REGISTER" thereby increasing the ALC voltage and reducing the output power and thereby the average current. If the SWR at the input of the Antenna Tuning Unit exceeds 1:3 logical signal SWROK goes high and Power Display Annunciator on Control Unit front panel starts flashing informing the operator that a better antenna match might be obtained by carrying out a new Tune Sequence. To prevent overheating of the Antenna Tuning Unit a temperature sensor is incorporated. If the internal temperature of the Antenna Tuning Unit exceeds 85 deg. C, logical signal TC0 goes low and the output power is reduced by 5 dB. (SETPOINT voltage 4.36 V, ALCHOLD voltage increased by 0.82 V relative to Full Power preset value).

6.5.2.3 Reduced Power-Indication In case of 5 dB reduced power condition due to thermal protection the annunciator "Reduced Power" on the Control Unit front panel is lit. The annunciator "Reduced Power" will also turn on if the average power, in a full power transmission, exceeds the peak power minus 3 dB during one minute. In this condition the power is reduced by 3 dB.



TRP 825X D ALC AND PROTECTION SYSTEM



993 751 71 A

TRP 825X D KEYING SIMPLIFIED DIAGRAM

7. PREVENTIVE MAINTENANCE

Due to the modern design of the TRP 8250 D preventive maintenance can be reduced to a minimum provided the equipment is correctly installed. To ensure maximum performance and minimum repair trouble we recommend you to follow below stated headlines for preventive maintenance.

1. The condition of the battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with destilled water (liquid should be 5 to 10 mm above the plates).

2. Check the condition of antenna installation, ground connection and cables at regular intervals.

3. Keep antenna feed-through insulators clean and dry.

4. Ensure that no objects are obstructing the free airflow through the cooling fins at the back of the Transceiver Unit and keep the units free of dust accumulation to prevent overheating.

5. Keep the ATU antenna insulator clean and free of salt.

7.1 Realignment of Master Oscillator 612 613 614

The Master Oscillator frequency should be checked at least once a year. The Master Oscillator determines the exact transmit and receive frequencies of the equipment. The oscillator tends to age very slowly with time, typically with the highest drift rate the first year. The check should be performed by a qualified technician with the necessary test equipment at his disposal.

1. Measuring Equipment:

1.1 Frequency Counter:	Frequency range >= 100 MHz Input impedance = 50 ohm Sensitivity at least > 0.2 V Accuracy better than 1 Hz
1.2 Thermometer:	Range 0-50 deg. Celcius

2. Preparations:

2.1 Switch on the power at least 30 minutes before adjustment.

2.2 Open the front door of the Transceiver Unit and remove the shielding cover of the Exciter Signal Path. Disconnect all sockets from the shielding cover of the Master Oscillator. Remove the shielding cover by unscrewing the 4 screws.

2.3 Note if the TCXO is marked with a frequency offset.

2.4 Connect all sockets again.

2.5 Measure the temperature close to the Master Oscillator and take the neccessary arrangements to keep it between 20 and 30 deg. Celsius. Be sure that thermal equilibrium has taken place before adjustment.

3. Realignment of Master Oscillator:

3.1 Disconnect the socket from PL2 on the Exciter Signal Path 619 carrying the injection signal to the 1st. mixer. Connect the frequency counter to the socket.

3.2 Key-in USB mode and a receiver frequency of 26.68000 MHz on the Control Unit.

3.3 Adjust R1 until the counter reads f = 71.680000 MHz +/- 1 Hz. If the TCXO is marked with a frequency offset, multiply the offset by 7 and add to the frequency stated above. For example:

Frequency offset +2 Hz
Add 7 * 2 = 14 Hz
Adjust to f = 71.680014 MHz +/- 1 Hz

3.4 Replace all covers and sockets again.

7.2 **Realignment of Master Oscillator 615, 616**

The Master Oscillator frequency should be checked at least once a year. The Master Oscillator determines the exact transmit and receive frequencies of the equipment. The oscillator tends to age very slowly with time, typically with the highest drift rate the first year. The check should be performed by a qualified technician with the necessary test equipment at his disposal.

1. Measuring Equipment:

Frequency Counter: Frequency range > 100 MHz
Input impedance = 50 ohm
Sensitivity at least > 0.2 Vrms
Accuracy better than 0.005ppm

2. Preparations:

2.1 Switch on the power at least one hour before adjustment.

2.2 Remove the front shielding cover of the RX/EX Assembly.

2.3 Open the front door of the Transceiver Unit and locate Master Oscillator 615/616. Disconnect all socket from the shielding cover of the Master Oscillator. Do not remove the two sockets mounted directly on the PCB in front of the cover.

2.4 Remove the shielding cover of the Master Oscillator by unscrewing the 4 screws.

2.5 Connect all sockets again.

2.6 The ambient temperature should be within 10 to 30 deg. Celsius. Do not adjust the Master Oscillator shortly after long keying sequences of the transmitter. Be sure that thermal equilibrium has taken place before adjustment.

3. Realignment of Master Oscillator:

3.1 Disconnect the socket from PL2 on the RX/EX Signal Path 610 carrying the injection signal to 1st. mixer. Connect the frequency counter to the socket.

3.2 Key-in USB mode and a receiver frequency of 25.0000 MHz on the Control Unit.

3.3 Locate the Master Oscillator adjustment hole in the top end of metal box mounted in the middle of the PCB 615/616. Use a small screwdriver to gently adjust the frequency.

3.4 Adjust the frequency as close as possible to 70.000 000 MHz.

Adjustment tolerance:

Master Oscillator 615:	+/- 3Hz
Master Oscillator 616:	+/- 1Hz

3.5 Replace all sockets and both covers again.

7.3 **Replacement of backup battery**

The lithium backup battery should be changed within four years after its installation in the equipment. The expiration date is marked on the battery. If the time is exceeded the battery voltage may become too low which causes the real-time clock to default to 00:00 and the contents of the user programmable memory to get lost when the equipment is switched OFF. The battery is located in the Control Unit on Control Board 600 and should be changed by a qualified technician.

NOTE! A replacement of the backup battery will leave the system set-up, defined in the second function "pages", in a random and undefined state, and the equipment may not have the same features as prior to the battery replacement. After replaceing the backup battery, the second function GUARD-bit and the OPTION-register must be cleared, and the second function pages should be re-entered, as descreibed in the "SECOND FUNCTION SYNTAX" part of this technical manual.

8. TROUBLE SHOOTING AND SERVICE

8.1 Malfunction

If the equipment is not functioning correctly a check should be made that is being operated properly, see chapter 4.

8.2 Replacement of FUSES

The Transceiver Unit contains two replaceable fuses located at the front of the Switched Mode Power Supply. The fuses become accessible when the front door is opened. Spare fuses are placed on the Switched Mode Power Supply.

The AC Power Supply Unit contains a fuse located at the front of the unit. Spare fuses are located behind the cover.

Fuse ratings are given in table 8.1 below. Fuses with marked ratings within 5 percent of the ratings must be used. Note that fast or slow blowing fuses must be used as specified.

Location	Fuse Rating	Function	Symptom if fuse is blown
Transceiver Unit	4 A fast	+48 V to Voltage Converter	Equipment dead, but Main Relay operates when Supply switch is activated. Voltage-indicator lamp in Switched Mode Power Supply is lit when power is on.
	15 A fast	48 V to Power Amplifier	No RF output power
AC Power Supply Unit	110/120 V: 12.5 A slow 220/240 V: 6.3 A slow	Mains input	No light in DC OUTPUT LAMP with mains switch position MAINS ON

Table 8.1

8.3 MANUALLY TUNING TO 2182 kHz IN CASE OF FAILURE IN THE ATU

How to manually tune the Antenna Tuning Unit to 2182 kHz in case of failure in the automatic tuning system:

1. Switch SUPPLY OFF on Control Unit.

2. Remove cover from Antenna Tuning Unit.

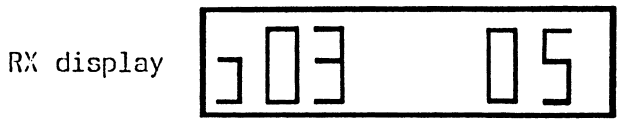
3. Locate AUTO/2182 kHz toggle switch and switch it to 2182 kHz (downwards).

4. Refit the cover.

5. The radiotelephone is now ready for operation on 2182 kHz only.

8.4 DESCRIPTION OF SELF TEST FUNCTIONS

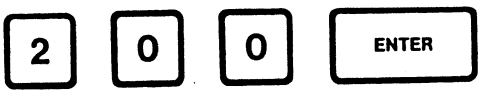
Self test can be done in two different modes, auto mode and step mode. Auto mode is intended for a quick verification of all functions, it will execute all tests in sequence and stop if a malfunction is detected. Step mode is intended for service purposes, it allows step by step testing and gives the operator the possibility to make measurements during the tests and to repeat tests. Thus it can be used as a built-in signal generator for many purposes. The results of the tests are displayed on the RX display at the Control Unit. The result consists of a test number, indicating which test has been performed, and an error code indicating if the test was OK. Please note that the transmitter must be turned ON before executing the self test, otherwise the synthesizer, exciter and transmitter tests will fail. Various tests will refer to Receiver Synthesizer and Exciter Synthesizer respectively. Both Synthesizers are of the PCB 611 type. The Receiver Synthesizer is located at the outer side of the Transceiver Unit door, the Exciter Synthesizer is located at the inner side of the door.



The error codes are to be interpreted as follows:

Error code	Meaning
00	The test has passed.
01 02 - - 97	A malfunction has been detected, refer to specific test description for precise information.
98	Communication error The test failed due to communication error between CU and TU.
99	The test can not be executed due to missing options (special IF filters etc.)

8.4.1 EXECUTION OF SELF TEST IN AUTO MODE The self test is executed by pressing:



The test will take several seconds, during which various sounds may be heard.

The test will stop when all tests have been executed, or the first time an error is detected. When the test stops, a test number and an error-code will be displayed. If the error-code is 00 no faults has been detected. If the error-code is different from 00, an error has been detected, refer to description of specific tests for information on the fault and for appropriate actions. The test result will be displayed for 10 seconds, thereafter the Transceiver will return to normal operation.

8.4.2 EXECUTION OF SELF TEST FROM AN ARBITRARY TEST NUMBER (AUTO MODE)

The test number is entered via the numeric keys into the receiver display. Pressing "ENTER" will start self test from the specified test number if possible. Pressing other keys than "ENTER" or numerics will resume normal operation as will pressing an invalid test number. Execution of the self test will progress as described in above passage.

8.4.3 EXECUTION OF SELF TEST IN STEP MODE The self test is executed by pressing:

The test will start by executing test number 1 and displaying the test number and the error code. The test setup will remain until the operator presses "DIMMER UP", then it will proceed to the next test. The last test can be repeated by pressing "DIMMER DOWN". If the operator presses any key but "DIMMER UP" or "DIMMER DOWN", the Transceiver will return to normal operation. The Transceiver will return to normal operation when the last test has been executed.

8.4.4 EXECUTION OF SELF TEST FROM AN ARBITRARY TEST NUMBER (STEP MODE)

The test number is entered via the numeric keys into the receiver display. Pressing "ENTER" will start self test from the specified test number if possible. Pressing other keys than "ENTER" or numerics will resume normal operation as will pressing an invalid test number. Execution of the self test will progress as described in above passage.

8.4.5 TEST 1

Test 1 will test Audio Processing Board [601], reception signal path. Microprocessor tone generator is set to no tone, AF switch is set to microprocessor tone generator, and speaker is set ON.
AF AMP is checked for silence.
The test is OK if $\overline{\text{CHECK 1}}$ = "1"

Error code	Meaning
00	The test was OK
01	Error. $\overline{\text{CHECK 1}}$ was "0" Possible cause: Fault on [601] Audio Processing Board or [600] Control Board or cable connecting [600] and [601]

8.4.6 TEST 2

Test 2 will test Audio Processing Board [601], reception signal path. Microprocessor tone generator is set to 800 Hz, AF switch is set to microprocessor tone generator, and speaker is set ON.
AF AMP is checked for tone.
The test is OK if $\overline{\text{CHECK 1}}$ = "0"
A clear tone is heard during the test.

Error code	Meaning
00	The test was OK
01	Error. $\overline{\text{Check 1}}$ was "1" Possible cause: Fault on [601] Audio Processing Board or [600] Control Board or cable connecting [600] and [601] or loudspeaker shortcircuited

8.4.7 TEST 3

Test 3 will test Audio Processing Board [601], transmission signal path. The input selector is grounded, the compressor is checked for silence. The execution of this test takes 5 seconds.
The test is OK if CHECK 2 = "0"

Error code	Meaning
00	The test was OK

01	Error. CHECK 2 was "1" Possible cause: Fault on [601] Audio Processing Board or [600] Control Board or cable connecting [600] and [601]

8.4.8 TEST 4

Test 4 will test Audio Processing Board [601], transmission signal path.
The microprocessor tone generator is set to 800 Hz, input selector is set to microprocessor tone, the compressor is checked for compression.
The test is OK if CHECK 2 = "1"

Error code	Meaning
00	The test was OK
01	Error. CHECK 2 was "0" Possible cause: Fault on [601] Audio Processing Board or [600] Control Board or cable connecting [600] and [601]

8.4.9 TEST 5

Display test.
This test will turn all displays, annunciators and bargraph's ON for 10 seconds.
The microprocessor can not test the displays, the operator must inspect the displays visually.

Error code	Meaning
00	The test was OK, the microprocessor can not detect any faults in this test

If some displays, annunciators or bar-graph's do not turn ON, exchange or repair [600] Control Board.

8.4.10 TEST 6

Test 6 will test Master Oscillator and reference dividers on board [612], [613] or [614].
Test 6 will test that M.O.CHECK = "1"

Error code	Meaning
00	The test was OK

01	Error. M.O.CHECK was "0" Fault on: [612], [613] or [614] Master Oscillator or cable connecting [611] and [612] or [611] Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.11 TEST 7

Test 7 will test both Synthesizer Boards [611].
It will set all synthesizers mid range and test for lock.
Both 1.LO's are set to 50 MHz range = 45-52.5 MHz
Both 2.LO's are set to 43.6 MHz
Both 3.LO's are set to 1.4 MHz
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.12 TEST 8

Test 8 will test both Synthesizer Boards [611].
It will bring 1.LO's out of lock to check that they can be controlled by the microprocessor.
The test is OK if SYNCHECK 0 = "0" and
SYNCHECK 1 = "0"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "1" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "1" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "1" and SYNCHECK 1 was "1" Fault on: [624] Transceiver Control Board or cable connecting [624] and [611]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.13 TEST 9

Test 9 will test both Synthesizer Boards [611].
It will set 1.LO's to 45 MHz to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board

02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.14 TEST 10

Test 10 will test both Synthesizer Boards [611].
It will set 1.LO's to 52.5 MHz, using the 45-52.5 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.15 TEST 11

Test 11 will test both Synthesizer Boards [611].
It will set 1.LO's to 52.5 MHz, using the 52.5-60 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.16 TEST 12

Test 12 will test both Synthesizer Boards [611].
It will set 1.LO to 60 MHz, using the 52.5-60 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board

02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.17 TEST 13

Test 13 will test both Synthesizer Boards [611].
It will set 1.LO's to 60 MHz, using the 60-67.5 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.18 TEST 14

Test 14 will test both Synthesizer Boards [611].
It will set 1.LO's to 67.5 MHz, using the 60-67.5 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
90	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.19 TEST 15

Test 15 will test both Synthesizer Boards [611].
It will set 1.LO's to 67.5 MHz, using the 67.5-75 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board

02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.20 TEST 16

Test 16 will test both Synthesizer Boards [611].
It will set 1.LO's to 75 MHz, using the 67.5-75 MHz band, to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.21 TEST 17

Test 17 will test both Synthesizer Boards [611].
It will set 2.LO's to 43.597 MHz to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.22 TEST 18

Test 18 will test both Synthesizer Boards [611].
It will set 2.LO's to 43.603 MHz to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board

02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.23 TEST 19

Test 19 will test both Synthesizer Boards [611].
It will set 3.LO's out of lock to check if they can be controlled by the microprocessor.
The test is OK if SYNCHECK 0 = "0"
SYNCHECK 1 = "0"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "1" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "1" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "1" and SYNCHECK 1 was "1" Fault on: [624] Transceiver Control Board or cable connecting [624] and [611]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.24 TEST 20

Test 20 will test both Synthesizer Boards [611].
It will set 3.LO's to 1.3955 MHz to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.25 TEST 21

Test 20 will test both Synthesizer Boards [611].
It will set 3.LO's to 1.403 MHz to check if they can lock.
The test is OK if SYNCHECK 0 = "1" and
SYNCHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: [611] Receiver Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board

02	Error. SYNCHECK 1 was "0" Fault on: [611] Exciter Synthesizer Board or cable connecting [611] and [624] or [624] Transceiver Control Board
03	Error. SYNCHECK 0 was "0" and SYNCHECK 1 was "0" Fault on: [624] Transceiver Control Board or cable connecting [611] and [624]
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.26 TEST 22

Test 22 will test Exciter Signal Path [619].
It will set [619] to J3E reception and test that EX OUT CHECK and EX AF CHECK is LOW, this will prove that the signal path is controlled by the microprocessor.
The test is OK if EX AF CHECK = "0"
and EX OUT CHECK = "0"

Error code	Meaning
00	The test was OK
01	Error, EX AF CHECK was "1" Fault on: [619] Exciter Signal Path or cable connecting [619] and [624] or [624] Transceiver Control Board
02	Error, EX OUT CHECK was "1" Fault on: [619] Exciter Signal Path or cable connecting [619] and [624] or [624] Transceiver Control Board
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.27 TEST 23

Test 23 will test Exciter Signal Path [619].
It will set [619] to A1 (CW) transmission and test EX OUT CHECK, this will prove that the transmission signal path is OK for A1 mode. The frequency is 14.250 MHz.
The test is OK if EX OUT CHECK = "1"

Error code	Meaning
00	The test was OK
01	Error, EX OUT CHECK was "0", Exciter generates no RF. Fault on: [619] Exciter Signal Path or cable connecting [619] and [611] or [611] Exciter Synthesizer Board or cable connecting [619] and [624] or [624] Transceiver Control Board
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.20 TEST 24

Test 24 will test Exciter Signal Path [619].
It will set [619] to J3E (USB) transmission and test EX OUT CHECK and EX AF CHECK, this will prove that the signal path is OK for J3E mode, the CU will generate a 919 Hz tone to modulate the exciter. The carrier frequency is 14.250 MHz.
The test is OK if EX AF CHECK and EX OUT CHECK is "1"

Error code	Meaning
00	The test was OK
01	Error, EX AF CHECK was "0" no AF modulation is detected Fault on: cable connecting CU and TU or [601] Audio Processing Board or [619] Exciter Signal Path or cable connecting [619] and [624] or [624] Transceiver Control Board
02	Error, EX OUT CHECK was "0" no RF is generated on [619] Fault on: [619] Exciter Signal Path or cable connecting [619] and [611] or [611] Exciter Synthesizer Board or cable connecting [619] and [624] or [624] Transceiver Control Board
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.29 TEST 25

Test 25 will test Receiver Signal Path [618].
It will set [618] to J3E (USB) reception and set the synthesizer to make a 1 kHz beat frequency, AGC voltage and AF signal level will be tested by the CU unit.
The synthesizer frequencies are: 1.LO = 45.0 MHz, 2.LO = 43.601 MHz, 3.LO = 1.4 MHz.
A clear 1 kHz tone will be heard during this test.
The test is OK if RX RATE ([624]) < 9.1 kHz
and $\overline{\text{CHECK 0}}$ ([601]) = "0"
and $\overline{\text{CHECK 1}}$ ([601]) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, $\overline{\text{CHECK 0}}$ was "1" no AF signal on [601] Audio processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, $\overline{\text{CHECK 1}}$ was "1" no AF signal on loudspeaker Fault on: [601] Audio Processing Board
99	The test can not be executed because either: filter X5 is not installed or this is not a standard version
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.30 TEST 26

Test 26 will test Receiver Signal Path [618].
It will set [618] to H3E (AM) reception and set the synthesizer to generate an unmodulated carrier. The CU will test AGC voltage and that no AF signal is detected.
The synthesizer frequencies are: 1.LO = 45 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz
The test is OK if RX RATE ([624]) < 9.1 kHz
and $\overline{\text{CHECK 0}}$ ([601]) = "1"
and $\overline{\text{CHECK 1}}$ ([601]) = "1"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, $\overline{\text{CHECK 0}}$ was "0" AF was detected on [601] Audio Processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, $\overline{\text{CHECK 1}}$ was "0" AF was detected on loudspeaker Fault on: [601] Audio Processing Board
98	Error, no response from TU Fault on: [624] Transceiver Control Board
99	The test can not be executed because this is a special version

8.4.31 TEST 27

Test 27 will test Receiver Signal Path [618].
It will set [618] to telex reception and set the synthesizer to generate a 1500 Hz tone. The CU will check AGC voltage and AF signal.
The synthesizer frequencies are: 1.LO = 45.0005 MHz, 2.LO = 43.002 MHz and 3.LO = 1.4 MHz.
The test is OK if RX RATE ([624]) < 9.1 kHz
and CHECK 0 ([601]) = "0"
and CHECK 1 ([601]) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, CHECK 0 was "1" no AF signal on [601] Audio processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: [601] Audio Processing Board
99	The test can not be executed because either filter X4 is not installed or this is not a standard version
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.32 TEST 28

Test 28 will test Receiver Signal Path [618].
It will set [618] to CW reception and set the synthesizer to generate a 1 kHz tone. The CU will check AGC voltage and AF signals. A clear 1 kHz tone will be heard during this test.
The synthesizer frequencies are: 1.LO = 45 MHz, 2.LO = 43.601 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE ([624]) < 9.1 kHz
and $\overline{\text{CHECK 0}}$ ([601]) = "0"
and $\overline{\text{CHECK 1}}$ ([601]) = "1"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, $\overline{\text{CHECK 0}}$ was "1" no AF signal on [601] Audio processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, $\overline{\text{CHECK 1}}$ was "1" no AF signal on loudspeaker Fault on: [601] Audio Processing Board
99	The test can not be executed because either filter X2 is not installed or this is a special version.
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.33 TEST 29

Test 29 will test Receiver Signal Path [618].
It will set [618] to CW reception, narrow bandwidth, and set the synthesizer to generate a 1 kHz tone. The CU will check AGC voltage and AF signals. A clear 1 kHz tone will be heard during this test.
The synthesizer frequencies are 1.LO = 45 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE ([624]) < 9.1 kHz
and $\overline{\text{CHECK 0}}$ ([601]) = "0"
and $\overline{\text{CHECK 1}}$ ([601]) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, $\overline{\text{CHECK 0}}$ was "1" no AF signal on [601] Audio processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, $\overline{\text{CHECK 1}}$ was "1" no AF signal on loudspeaker Fault on: [601] Audio Processing Board
99	The test can not be executed because either filter X3 is not installed or X3 has a center frequency of 1.3985 MHz or this is a special version
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.34 TEST 30

Test 30 will test Receiver Signal Path [618].
It will set [618] to CW reception, narrow bandwidth, and set the synthesizer to generate a 1.5 kHz tone. The CU will check AGC voltage and AF signals. A clear 1.5 kHz tone will be heard during the test.
The synthesizer frequencies are: 1.LO = 45.0005 MHz, 2. LO = 43.602 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE ([624]) < 9.1 kHz
and $\overline{\text{CHECK 0}}$ ([601]) = "0"
and $\overline{\text{CHECK 1}}$ ([601]) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 9.1 kHz AGC voltage is too low Fault on: [618] Receiver Signal Path or [624] Transceiver Control Board or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [600] Control Board
02	Error, $\overline{\text{CHECK 0}}$ was "1" no AF signal on [601] Audio processing Board Fault on: [618] Receiver Signal Path or cable connecting [618] and [611] or cable connecting [611] and [624] or cable connecting CU and TU or [601] Audio Processing Board or [600] Control Board
03	Error, $\overline{\text{CHECK 1}}$ was "1" no AF signal on loudspeaker Fault on: [601] Audio Processing Board
99	The test can not be executed because filter X3 is not installed or has a center frequency of 1.4 MHz or this is a special version
98	Error, no response from TU Fault on: [624] Transceiver Control Board

8.4.35 **TEST 31**

Test 31 is a listening test at 2.0 MHz. The purpose of this test is not to test anything. The operator should listen to this frequency before proceeding with the transmitter tests. The transmitter tests will transmit at this frequency, therefore the operator must listen to ensure that this frequency is not occupied by others.
If the frequency is free proceed to next test by pressing "DIMMER UP".
If the frequency is occupied, wait until it becomes free or abort the test by pressing any key but "DIMMER UP" or "DIMMER DOWN".
NOTE: This test can be executed in step mode only.

Error code	Meaning
00	Is always returned

8.4.34 **TEST 32**

Test 32 will test Power Amplifiers [626] , P.A. Filters and Antenna Tuning Unit. It will transmit at 2 MHz CW mode and test that ALCCHECK is OK, SWROK is OK, Power is OK and that IANT (antenna current) is OK. The 1.6-2.3 MHz filter is used in this test.
NOTE: This test can be executed in step mode only.
The test is OK if ALCCHECK = "1"
and SWROK ([640]) = "0"
and Power = 90 %
and IANT = 1A

Error code	Meaning
00	The test was OK
01	Error, ALCCHECK was "0" Fault on: [624] Transceiver Control Board or cable connecting [624] and [626] or [626] Power Amplifier
02	Power was < 90 % Fault on: [626] Power Amplifier or [627] , [628] , [629] P.A. Filters or cable connecting [619] and [626] or cable connecting [626] and [627] [628] [629] or antenna too short for full power on 2 MHz
03	Error, SWROK was "1" SWR was > 3 Fault on: [640] Antenna Tuning Unit or antenna

04	Error, IANT was < 1 A Fault on: [640] Antenna Tuning Unit or antenna

8.4.37 TEST 33

Test 33 will test PA-filters [627], [628] or [629].
It will select the 2.31-3.33 MHz filter and transmit at 2 MHz.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was < 90 % Fault on: [627], [628], [629] PA-filters

8.4.38 TEST 34

Test 34 will test PA-filters [627], [628], [629].
It will select the 3.3-4.8 MHz filters at continuous coverage transceiver, and transmit at 2 MHz. Marine bands transceivers can not execute this test.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was < 90 % Fault on: [629] PA-filters
99	This is a marine bands transceiver, this unit can not execute the test

8.4.39 TEST 35

Test 35 will test PA-filters [627], [628], [629].
It will select the 4.8-6.9 MHz filter for continuous coverage transceivers or the 3.3-4.8 MHz filter for marine bands transceivers.
NOTE: This test can be executed in step mode only.
The test was OK if Power > 90 %

Error code	Meaning
00	The test was OK
01	Error, Power was < 90 % Fault on: [627], [628], [629] PA-filters

8.4.40 TEST 36

Test 36 will test PA-filters [627], [628], [629].
It will select the 6.9-10 MHz filter for continuous coverage transceivers or the 6.2-8.45 MHz filter for marine bands transceivers. It will transmit at 2 MHz.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was > 90 % Fault on: [627], [628], [629] PA-filters

8.4.41 TEST 37

Test 37 will test PA-filters [627], [628], [629].
It will select the 10-14.4 MHz filter for continuous coverage transceivers or the 12-17 MHz filter for marine bands transceivers. It will transmit at 2 MHz.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was > 90 % Fault on: [627], [628], [629] PA-filters

8.4.42 TEST 38

Test 38 will test PA-filters [627], [628], [629].
It will select the 14-20 MHz filters at continuous coverage transceiver, and transmit at 2 MHz. Marine bands transceivers can not execute this test.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was < 90 % Fault on: [629] PA-filters
99	This is a marine bands transceiver, this unit can not execute the test

8.4.43 TEST 39

Test 39 will test PA-filters [627], [628], [629].
It will select the 20-30 MHz filter for continuous coverage transceivers or the 14-27 MHz filter for marine bands transceivers. It will transmit at 2 MHz.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was > 90 % Fault on: [627], [628], [629] PA-filters

8.4.44 TEST 40

Test 40 is a listening test at 491 kHz. The purpose of this test is not to test anything, but the operator should listen at this frequency before proceeding to the transmitter test. Test 41 will transmit at this frequency, therefore the operator must listen to ensure that this frequency is not occupied by others.

If the frequency is free proceed to test 41 by pressing "DIMMER UP".
If the frequency is occupied, wait until it becomes free, or abort the test by pressing any key but "DIMMER UP" or "DIMMER DOWN".
NOTE: This test can be executed in step mode only.

Error code	Meaning
00	The listening test is executing
99	This transceiver is not a marine bands version with 400-525 kHz filter, this test can not be executed

8.4.45 TEST 41

Test 41 will test PA-filters [628].
It will select 400-525 kHz filter and transmit at 491 kHz.
NOTE: This test can be executed in step mode only.
The test is OK if Power > 90 %.

Error code	Meaning
00	The test was OK
01	Error, Power was < 90 % Fault on: [628] PA-filters

99	This is not a marine bands version with 400-525 kHz filter, the test can not be executed

8.4.46 LIST OF TESTS

TEST#	TESTS	REMARKS	
01	Audio Processing Board [601]	receiver signal path	
02	Audio Processing Board [601]	receiver signal path	
03	Audio Processing Board [601]	transmitter signal path	
04	Audio Processing Board [601]	transmitter signal path	
05	Display test		
06	Master Oscillator [612]		
07	Synthesizers [611]	all synthesizers mid range	
08	Synthesizers [611]	1.LO out of lock	
09	Synthesizers [611]	1.LO = 45 MHz 45-52.5 MHz range	
10	Synthesizers [611]	1.LO = 52.5 MHz 45-52.5 MHz range	
11	Synthesizers [611]	1.LO = 52.5 MHz 52.5-60 MHz range	
12	Synthesizers [611]	1.LO = 60 MHz 52.5-60 MHz range	
13	Synthesizers [611]	1.LO = 60 MHz 60-67.5 MHz range	
14	Synthesizers [611]	1.LO = 67.5 MHz 60-67.5 MHz range	
15	Synthesizers [611]	1.LO = 67.5 MHz 67.5-75 MHz range	
16	Synthesizers [611]	1.LO = 75 MHz 67.5-75 MHz range	
17	Synthesizers [611]	2.LO = 43.597 MHz	
18	Synthesizers [611]	2.LO = 43.603 MHz	
19	Synthesizers [611]	3.LO out of lock	
20	Synthesizers [611]	3.LO = 1.3955 MHz	
21	Synthesizers [611]	3.LO = 1.403 MHz	
22	Exciter Signal Path [619]	no signal	
23	Exciter Signal Path [619]	A1 mode	
24	Exciter Signal Path [619]	J3E mode	
25	Receiver Signal Path [618]	J3E mode	
26	Receiver Signal Path [618]	AM mode	
27	Receiver Signal Path [618]	F1B mode	
28	Receiver Signal Path [618]	CW inter	
29	Receiver Signal Path [618]	CW narrow	
30	Receiver Signal Path [618]	CW narrow	
31	Listening test (2 MHz)	Marine-band	Continuous
32	PA-filters, ATU	1.6-2.3 MHz	1.6-2.3 MHz
33	PA-filters	2.3-3.3 MHz	2.3-3.3 MHz
34	- -	- -	3.3-4.8 MHz
35	- -	3.3-4.8 MHz	4.8-6.9 MHz
36	- -	6.2-8.9 MHz	6.9-10 MHz
37	- -	12-17 MHz	10-14 MHz
38	- -	- -	14-20 MHz
39	- -	19-27 MHz	20-30 MHz
40	Listening test (491 kHz)		
41	PA-filters	400-525 kHz	

8.5 SPARE PARTS LIST, TRP 8250 D SERIES

CONTROL UNIT:	
[600] Control Board (configuration Prom not included) (specify program version when ordering)	107 560 01
[601] Audio Processing	107 560 11
[602] Squelch Board (optional)	107 560 21
[603] Line Transformer Board (optional)	107 560 31
Membrane Keyboard (excl. graphics overlay)	343 590 5X
Loudspeaker	860 600 00
Lithium back-up battery	890 000 02
HANDSET:	
[450] Microphone Amplifier	107 445 01
Handset complete, incl. Microphone Amplifier	107 400 60
TRANSCEIVER UNIT:	
[611] Synthesizer Board	107 561 11
[612] Master Oscillator, 1.5 ppm	107 561 21
[613] Master Oscillator, 0.8 ppm (optional)	107 561 31
[614] Master Oscillator, 0.4 ppm (optional)	107 561 41
[618] Receiver Signal Path incl. filters	107 561 81
[619] Exciter Signal Path	107 561 91
40 Lead Flat Ribbon Cable	373 590 21
2 Lead Cable	106 600 50
Coaxial Cable	106 600 00
Coaxial Cable	106 600 10
Coaxial Cable	106 600 30
Coaxial Cable	106 600 40
Coaxial Cable	106 602 90
[620] Interconnection Board	107 562 01
Voltage Converter Assembly	107 600 90
Switched Mode Power Supply	107 600 20
[624] Transceiver Control Board (specify program version when ordering)	107 562 41
Power Amplifier Assembly	107 600 10
Power Amplifier Assembly, FCC	107 603 40
P.A. Filter Assembly, Marine Bands (TRP 8250 D/8251 D/8252 D) (without PCB [624] and cover)	107 601 70
P.A. Filter Assembly, Continuous Coverage (TRP 8253 D/8254 D/8255 D), (without PCB [624] and cover)	107 601 90
P.A. Filter Assembly, Marine Bands incl. 500 kHz (optional)	107 601 80
[630] 50 ohm Antenna Relay (optional)	107 563 01
ANTENNA TUNING UNIT:	
[640] ATU Board	107 564 01
[641] Antenna Relay Board	107 564 11

AC POWER SUPPLY UNIT:

Transformer	383 597 31
Electrolytic capacitor 10000 uF/63 V	652 910 51
Lamp 24 V	754 000 04
Diode PH70	831 007 00

CONTROL UNIT	1
PCB 600 CONTROL BOARD	2
PCB 601 AUDIO PROCESSING BOARD	3
PCB 602 SQUELCH BOARD	4
PCB 603 LINE TRANSFORMER BOARD	5
TRANSCEIVER UNIT	6
PCB 611 SYNTHESIZER BOARD	7
PCB 612 / 613 / 614 / 615 / 616 MASTER OSCILLATOR AND PCB 699 TCXO HEATER BOARD	8
PCB 618 RECEIVER SIGNAL PATH BOARD	9
PCB 619 EXCITER SIGNAL PATH BOARD	10
PCB 620 INTERCONNECTION BOARD	11
PCB 621 VOLTAGE CONVERTER BOARD	12
SMPS AND PCB'S 622 CONTROL BOARD AND 623 DRIVER BOARD	13
PCB 624 TRANSCEIVER CONTROL BOARD	14
PCB 626 / 631 POWER AMPLIFIER BOARD	15
PCB 627 / 628 P.A. FILTERS, MARINE BANDS	16
PCB 629 P.A. FILTERS, CONTINUOUS COVERAGE	17
PCB 630 50 OHMS ANTENNA RELAY BOARD	18
PCB 695 CONNECTOR BOARD	19
ANTENNA TUNING UNIT	20
PCB 640 ANTENNA TUNING UNIT BOARD AND 641 ANTENNA RELAY BOARD	21
PCB 644 50 OHMS ATU RELAY BOARD	22
AC POWER SUPPLY UNIT P 8250	23
HANDSET / HOLDER ASSEMBLY	24
PCB 707 AF AMPLIFIER AND PCB 709 T-CONNECTION	25

9. CIRCUIT DESCRIPTION AND DIAGRAMS

9.1 Symbol Explanation

9.1.1 Arrows A black arrow on a line indicates in which direction an AC signal flows. A white arrow on a line indicates in which direction the information of a DC signal flows. An exception from this rule is the supply lines and their connections, which are always indicated by a supply voltage level or its associated label.

9.1.2 Logic circuits A small circle at an external input means that the specific input is active LOW, i.e. it produces the desired function, in conjunction with other inputs if its voltage is the lower of the two logic levels in the system, otherwise the specific input is HIGH. A clock input is indicated by an open triangle. A small circle at a clock input means that the outputs change on the HIGH to LOW clock transition. A small circle at an output indicates that when the function designated is true, the output is LOW. Inputs and outputs are labelled with mnemonic letters as described in table 9.1.

9.1.3 Logic Functions Logic functions are labelled with mnemonic letters in brackets. An active LOW function is given a bar over the label.

9.1.4 Voltages Typical DC voltages are indicated on the circuit diagrams next to the points to which they refer and are marked with a "V". Typical logic levels are indicated in brackets (LOW/HIGH) on the circuit diagrams next to the point to which they refer and are marked with a "V". Typical AC voltages are likewise indicated on the circuit diagrams. They are marked with "Vpp" or "mVpp" and values are in RMS unless otherwise stated.

9.2 ABBREVIATIONS

A = ampere, amperes
B = battery, motor
C = capacitor
Car. = carbon
Cer. = ceramic
CR = tyristor
D = diode
F = farad, fan
FS = fuse
H = henry
IC = integrated circuit
k = kilo or 10^3
L = inductor
LED = light emitting diode
LS = loudspeaker
lin. = linear
log. = logarithmic
m = milli or 10^-3
M = mega or 10^6
ME = instrument
MF = metal film
Mi = mica
MO = metallic oxide
MP = metallized paper
u = micro or 10^-6
n = nano or 10^-9
NPO = temp. coefficient 0
N150 = temp. coefficient -150
NTC = neg. temp. coefficient
p = pico or 10^-12
PL = connector (plug or cable with plug)
Polyes. = polyester
Polyst. = polystyrene
Pot. = potentiometer
PTC = pos. temp. coefficient
Q = transistor
R = resistor
RL = relay
SK = connector (socket or cable with socket)
SL = lamp
Sol. al. = solid aluminium
SW = switch
T = transformer
Tan. = tantalum electrolytic capacitor
V = working voltage DC or volts
Vac. = working voltage AC
Var. = variable
Varicap = variable capacitance diode
Vl = valve

Vpp = peak to peak voltage
VR = neon lamp
ww = wire wound
W = watt, watts
W.alum. = wet aluminium electrolytic
X = crystal, crystal osc. or crystal filter

Table 9.1

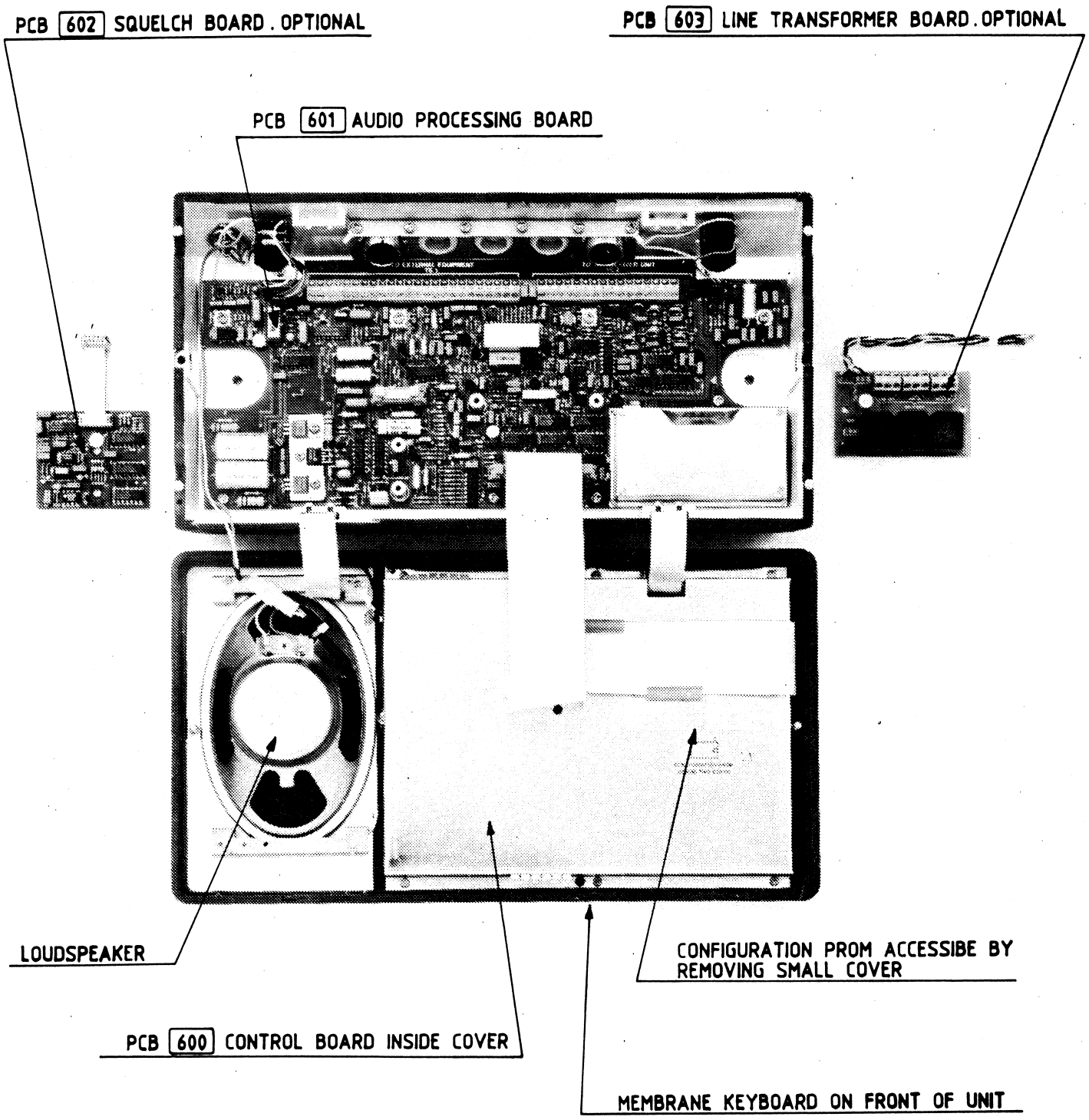
Label	Short for	Meaning
A	Trig Input	triggers one-shot on falling edge
Ax	Address	selects a memory location (data word) or a multiplexer input
B	Trig Input	triggers one-shot on rising edge
B/D	Binary /Decimal	selects counting mode (modulus 16 or 10)
BI	Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display)
CxY	Control Signal	programmable bidirectional hand-shake signal to/from peripheral
CEP, CET	Clock Enable	enables clock signal to counter
CP	Clock Pulse	edge activated input for updating synchronous circuit
CSx	Chip Select	selects a memory or peripheral circuit (bus slave)
Dx	Data	input to D flip-flop and register or bidirectional information path for bus connected device
E	Enable Input	enables clock signal
EO	Enable Output	activates output(s) from combinatorical circuit
EQ	Enable Output	activates output(s) from sequential circuit
HLT	Halt	suspends MPU activity and releases busses
IxY	Input Data	input for combinatorical circuit
IRQy	Interrupt Request	wired-OR flag from peripheral to MPU indicating interrupt detected
J, K	Data	input to J-K flip-flop
Kx	Mode Select	selects counting mode for programmable counter
LE	Latch Enable	updates latching register
LT	Lamp Test	activates all outputs on BCD-to-7 segment decoder
MR	Master Reset	input for initializing MPU or clearing programmable registers in peripheral circuit
MRDY	Memory Ready	hand-shake flag to MPU indicating new bus cycle may be started

Table 9.1 continued

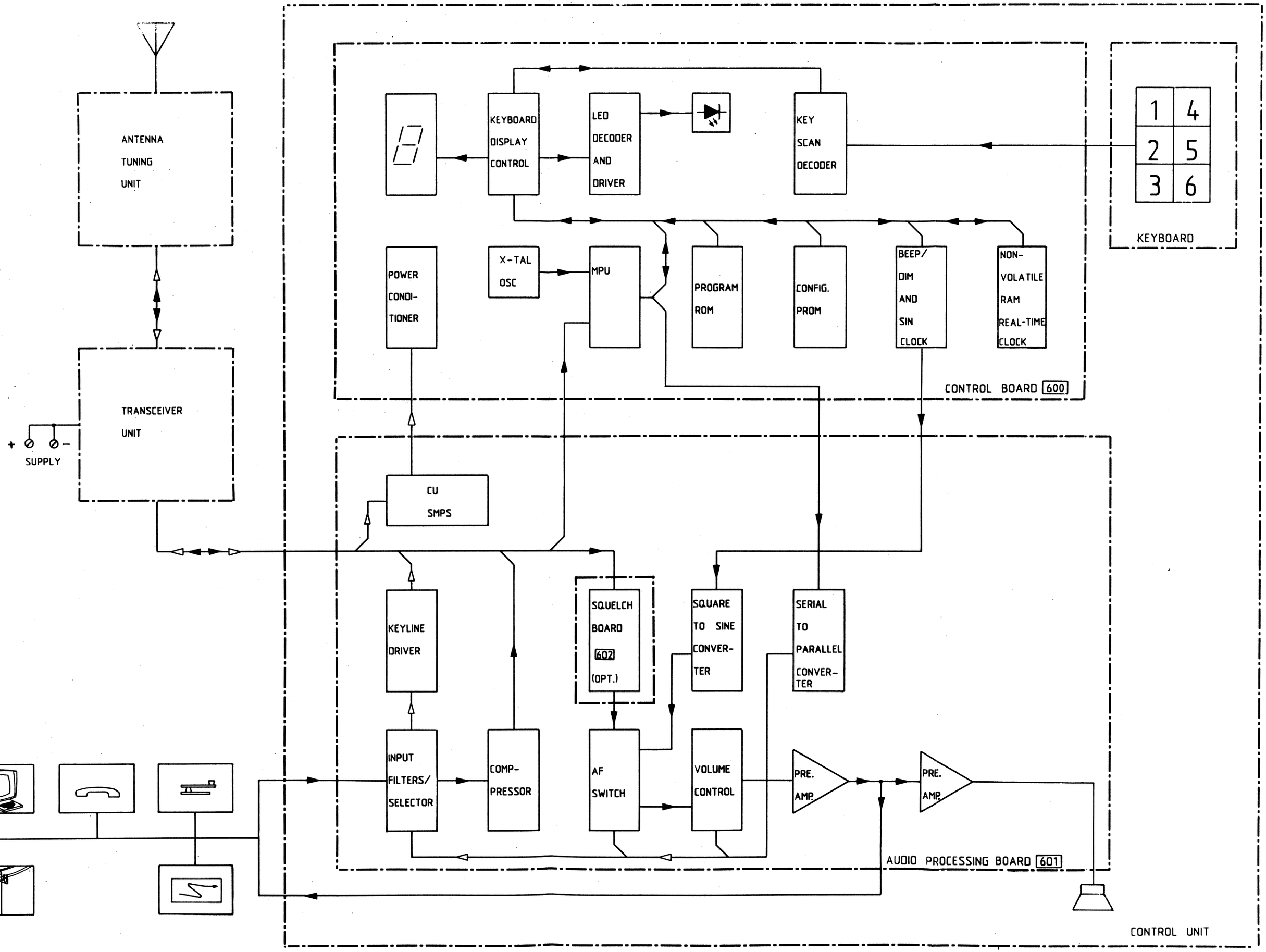
NMI	Non-maskable Interrupt	flag to MPU, which cannot be masked softwarewise indicating interrupt detected
Ox	Output	output from combinatorical circuit
PxY	Data (bidirectional)	input to programmable counter or programmable bidirectional signal to/from peripheral
PE	Parallel Enable	loads Px data into programmable counter
Qx	Output	output from sequential circuit
R	Reset	forces flip-flop(s) to LOW state
RBI	Ripple Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display) if data correspond to leading zero, when decoders are cascaded
RSx	Register Select	addresses programmable registers in peripheral circuit
S	Set	forces flip-flop(s) to HIGH state
Sy	Select Data	selects data path through multiplexer
SYNC	Synchronize	issued from bus master (MPU) to synchronize data transfer
TC	Terminate Count	output from counter indicating new cycle started (corresponds to carry or borrow depending on counting direction)
U/D	Up/Down	selects counting direction
VMA	Valid Memory Address	issued from bus master (MPU) to indicate stable address bus
WI	Write Input	input to bus slave to make it accept data from master
WQ	Write Output	output from master (MPU) when it is a data source

(1) "x" is a numerical index (zero origin indexing) corresponding to bit position

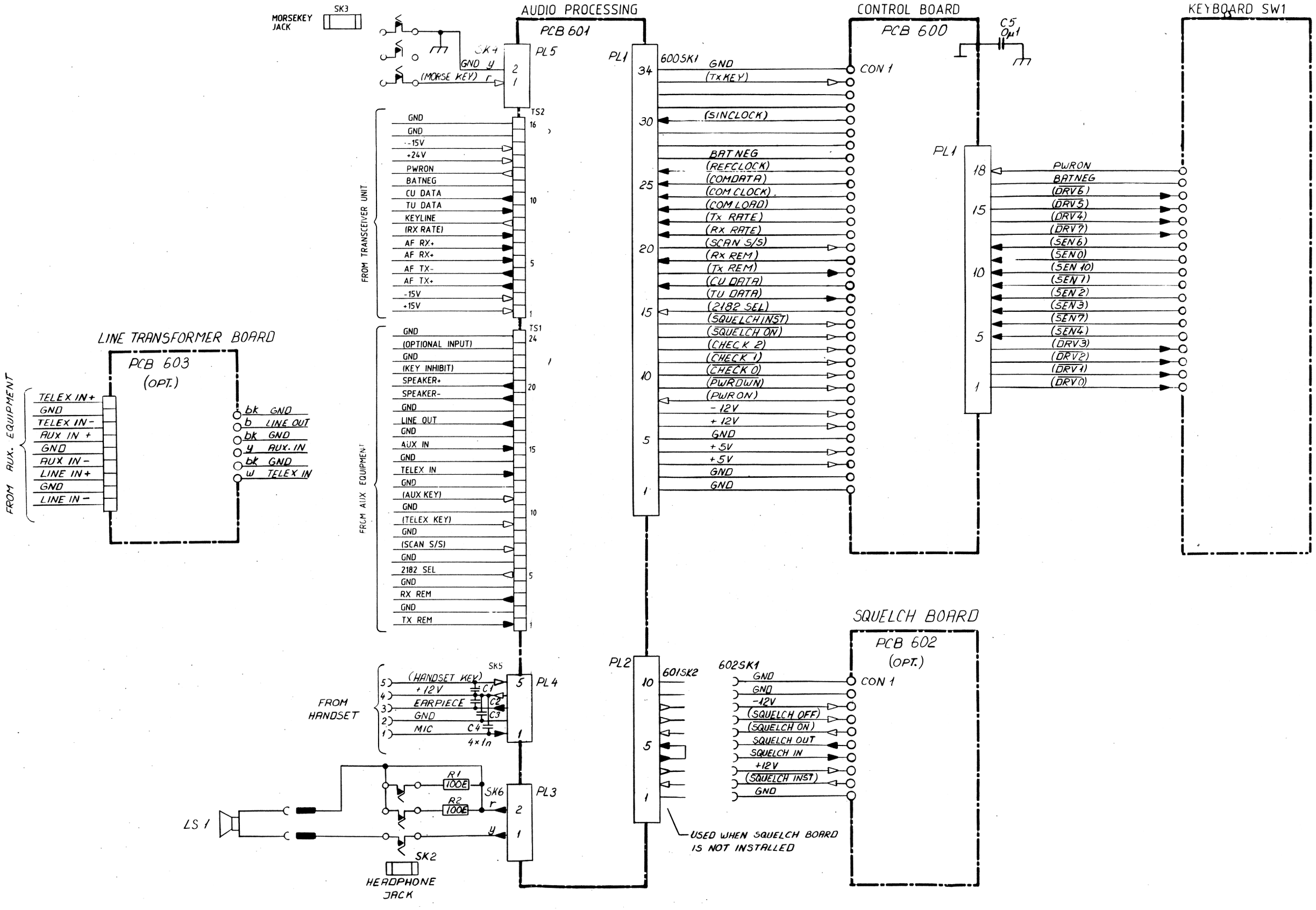
(2) "y" is an alphabetical index used for multiple ports



CONTROL UNIT 8000 DISASSEMBLE

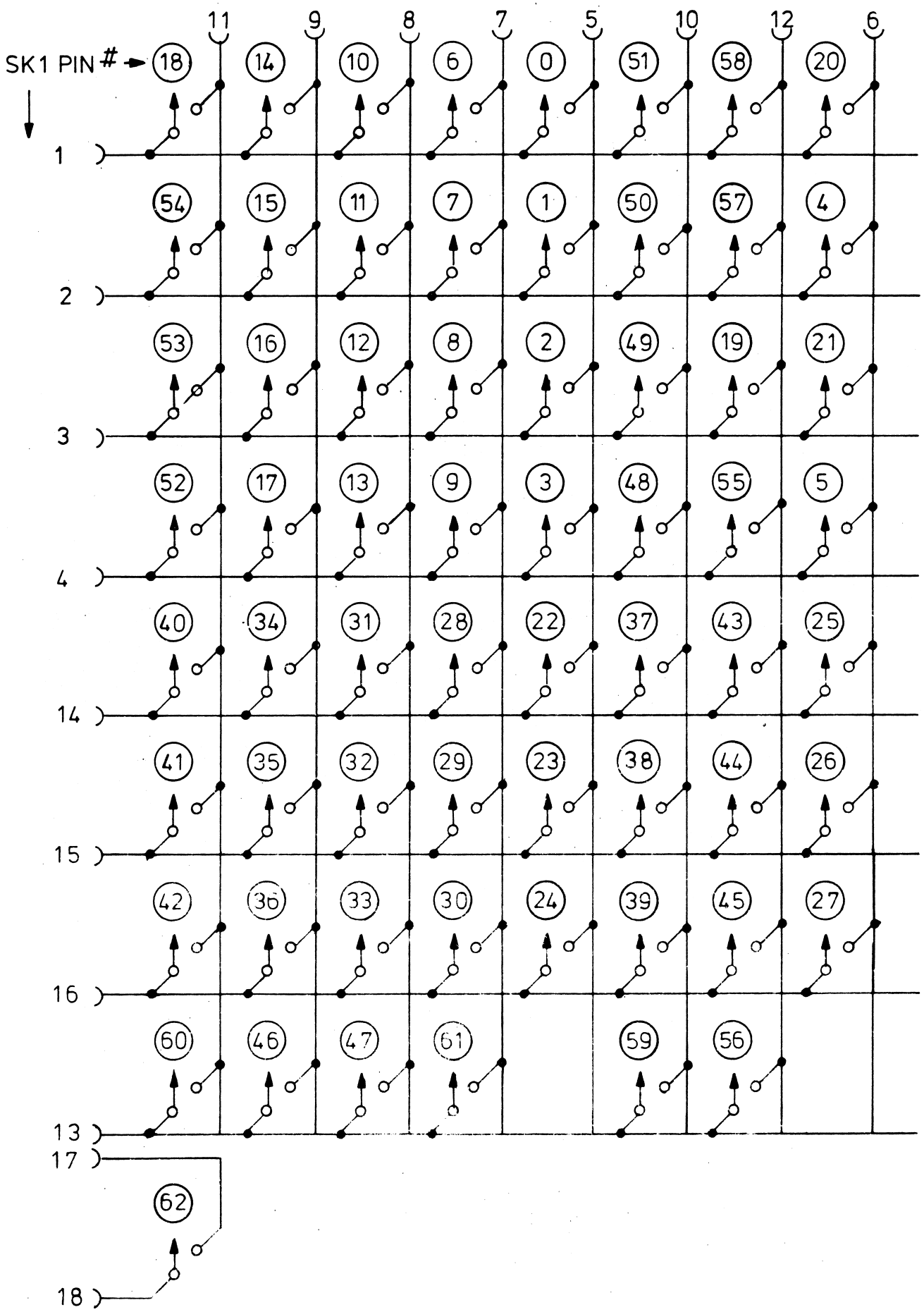


TRP 8XX0 BLOCK DIAGRAM,CONTROL UNIT
VERSION 2A



993 694 7X

INTERCONNECTION DIAGRAM
CONTROL UNIT VERSION A3



KEYBOARDMDIAGRAM
VERSION 1A

993 695 7X

PARTS LIST FOR CONTROL UNIT

Control Unit complete					108 600 00
PCB 600 Control Board					107 560 02
PCB 601 Audio Processing Board					107 560 11
PCB 602 Squelch Board					107 560 21
PCB 603 Line Transformer Board					107 560 31
Keyboard					343 590 53
R1,2	100 ohm	5%	1/2W	Car.	502 210 00
C5	0.1 uF	10%	63V	Polyes.	622 510 00
LS1	Loudspeaker 15 ohm				860 000 09
SK2,3	Jack socket				750 000 46
SK5	5-pole socket incl. cable				106 603 20

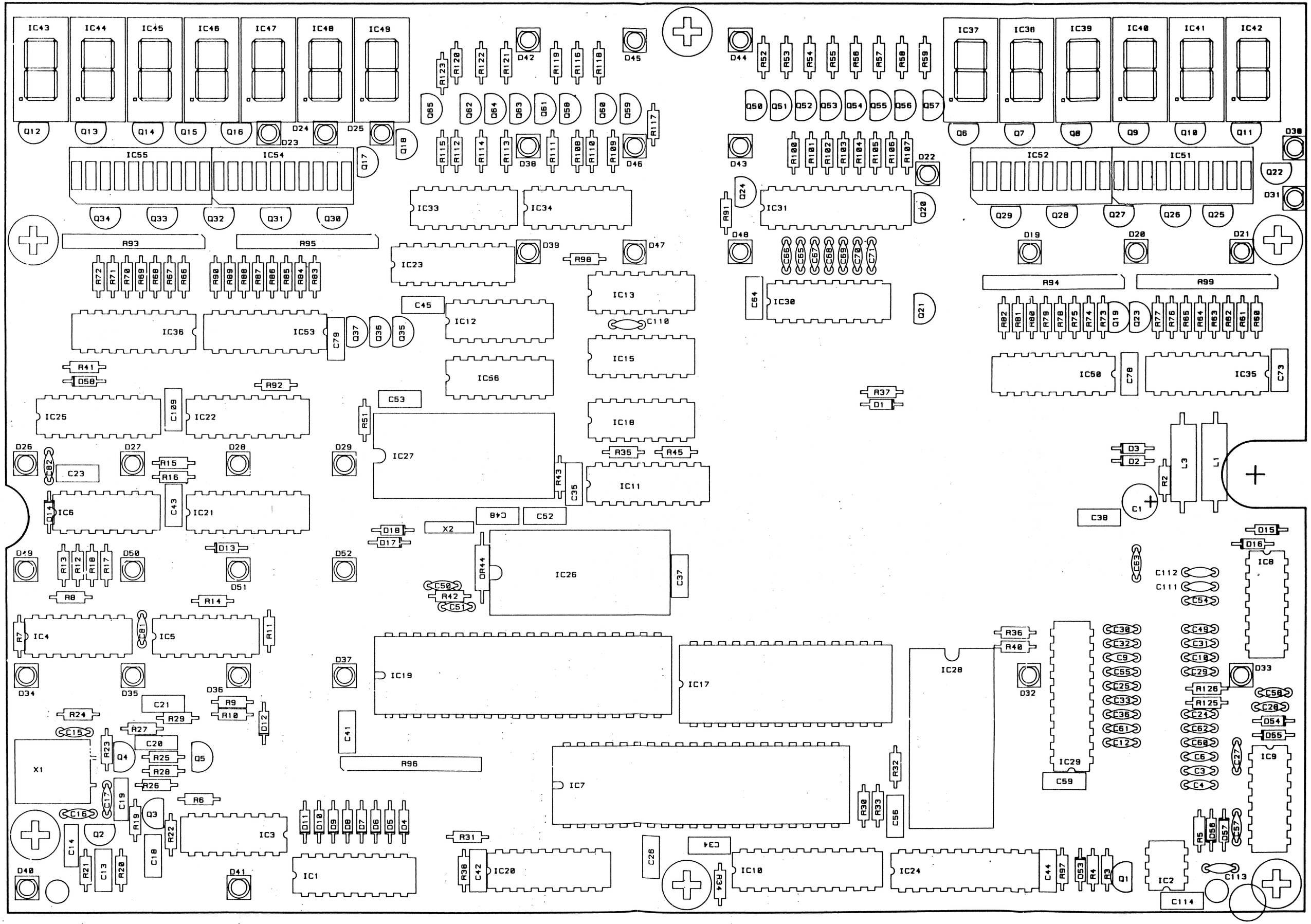
TECHNICAL DESCRIPTION

PCB [600] CONTROL BOARD

The primary functions of this module are to support the man/machine interface via keyboard and displays, control Audio Processing [601] and communicate with Transceiver Control Board [624] as a master by transmitting commands and receiving acknowledge and status messages in ASCII code according to a fixed protocol. This is accomplished through an embedded computer consisting of a microprocessor ("MPU") with the following onchip facilities: 8 bits CPU, 128 bytes RAM used as buffer area and for saving internal variables, 2 ports of which one handles the transfer of a 16 bits packet to [601] controlling loudspeaker volume, selection of keying and audio signals using the signals (COMDATA), (COMCLOCK) and (COMLOAD), while the other is connected to a serial, asynchronous interface used for communicating at 300 baud via "RS 232C INTERFACE" with [624] using the signals (TUDATA) and (CUDATA), and finally a 16 bits timer used for generating 64 Hz real-time interrupts to switch the microprocessor from back to foreground processing simultaneously measuring the period of the telemetry signals received from [624] representing signal strength and output power (i. e. (RXRATE) and (TXRATE) respectively) through "RATE MULTIPLEXER". The processor is clocked by a signal coming from "4 MHz XTAL OSCILLATOR" and is initialized by "MASTER CLEAR" combined with "MODE SWITCH". Due to "ADDRESS LATCH" being connected to the multiplexed 8 bits wide data/address bus a full 16 bits wide address bus is available for the "MAP DECODER" to select between the connected memories and peripherals, which are the following: "PROGRAM ROM" (up to 16 kbytes of object code in EPROM), "CONFIGURATION PROM" (up to 4 kbytes in EPROM containing a list of up to 1017 permitted TX frequencies and status code for enabled options of the equipment), "NON-VOLATILE RAM" (1 knibbles used for saving up to 76 RX/TX frequency pairs with corresponding modes and the present status of the equipment) powered by a lithium battery during power-off condition together with "REAL TIME CLOCK" which controlled by a 32.768 kHz crystal implements the watch function. By programming the latter it is possible to switch on the entire equipment automatically using the "OPTO COUPLER" to generate the galvanically isolated signal PWRON, which activates SMPS Control [622].

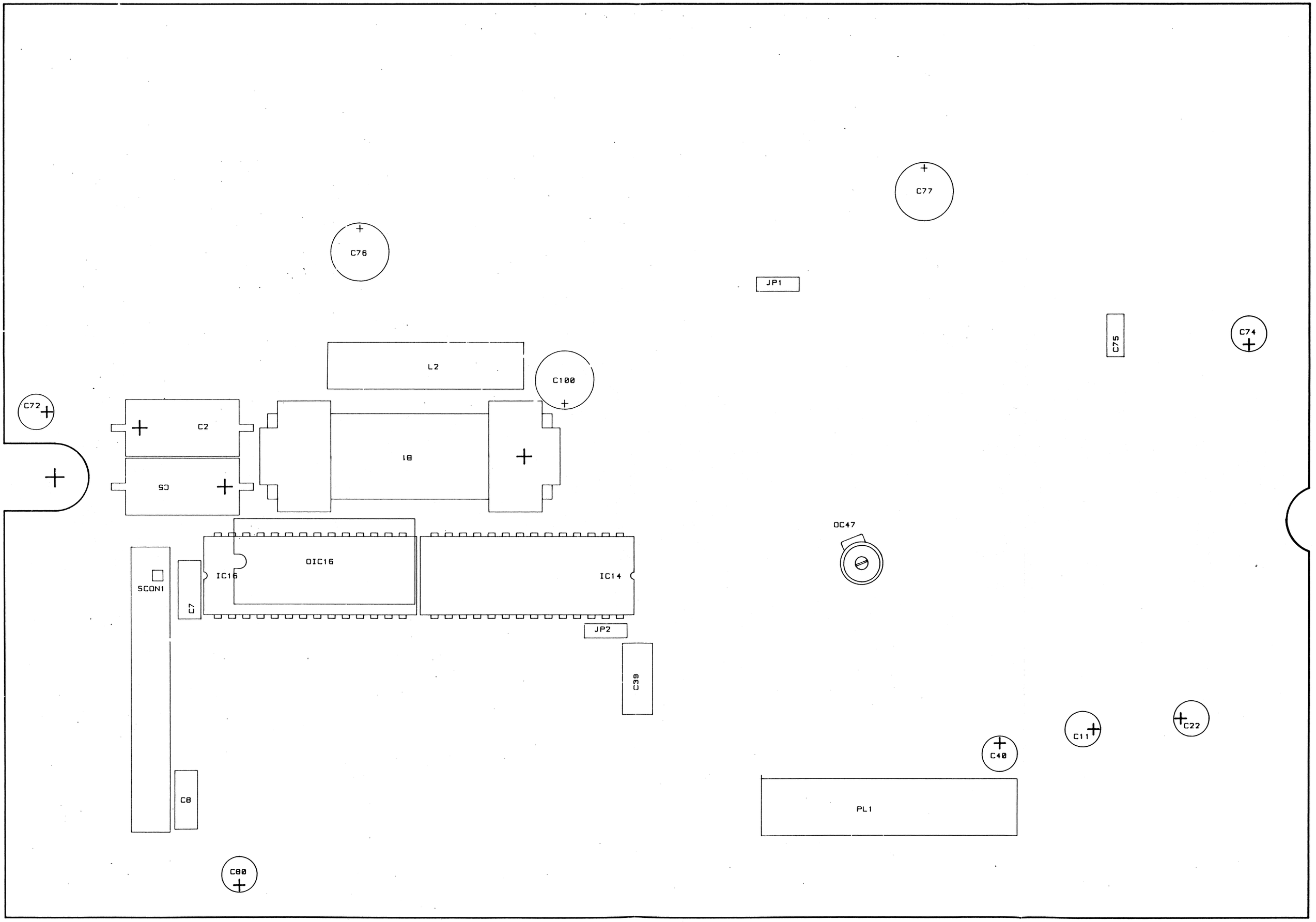
Another peripheral circuit is the "KEYBOARD DISPLAY CONTROLLER", which constantly scans the membrane keyboard (organized as an 8x8 matrix) through "KEY SCAN DECODER" using the signals (DRV0--7) and (SEN0--7), while it simultaneously refreshes the entire display at a rate of 588 Hz (duty cycle 1/16) by utilizing "LED DECODER/LED DRIVER" and "DISPLAY DIGIT DECODER/DISPLAY DIGIT DRIVER" for multiplexing the annunciators and seven segment displays respectively. The segments are driven from "DISPLAY SEGMENT DRIVER" and "DISPLAY SEGMENT DECODER" (performing the conversion from BCD-code). The displays may be dimmed through the last peripheral, "BEEP DIM REGISTER", by pulse width modulation via "PWM COUNTER". "BEEP DIM REGISTER" is also capable of controlling "PROGRAMMABLE DIVIDER" generating the signal SINCLOCK used by [601] to synthesize sinusoidal signals for modulation purposes and "beeping" (acoustic feedback to the operator signaling a key closure). In order to permit remote control, another "RS 232C INTERFACE" is available connected to a serial, asynchronous interface implemented by "ACIA". Both serial interfaces

are clocked by "BAUD RATE DIVIDER", which is fed by a 1 MHz clock from "MPU". Baud rate may be set to 300 or 2400 bits/s selectable by jumper setting.



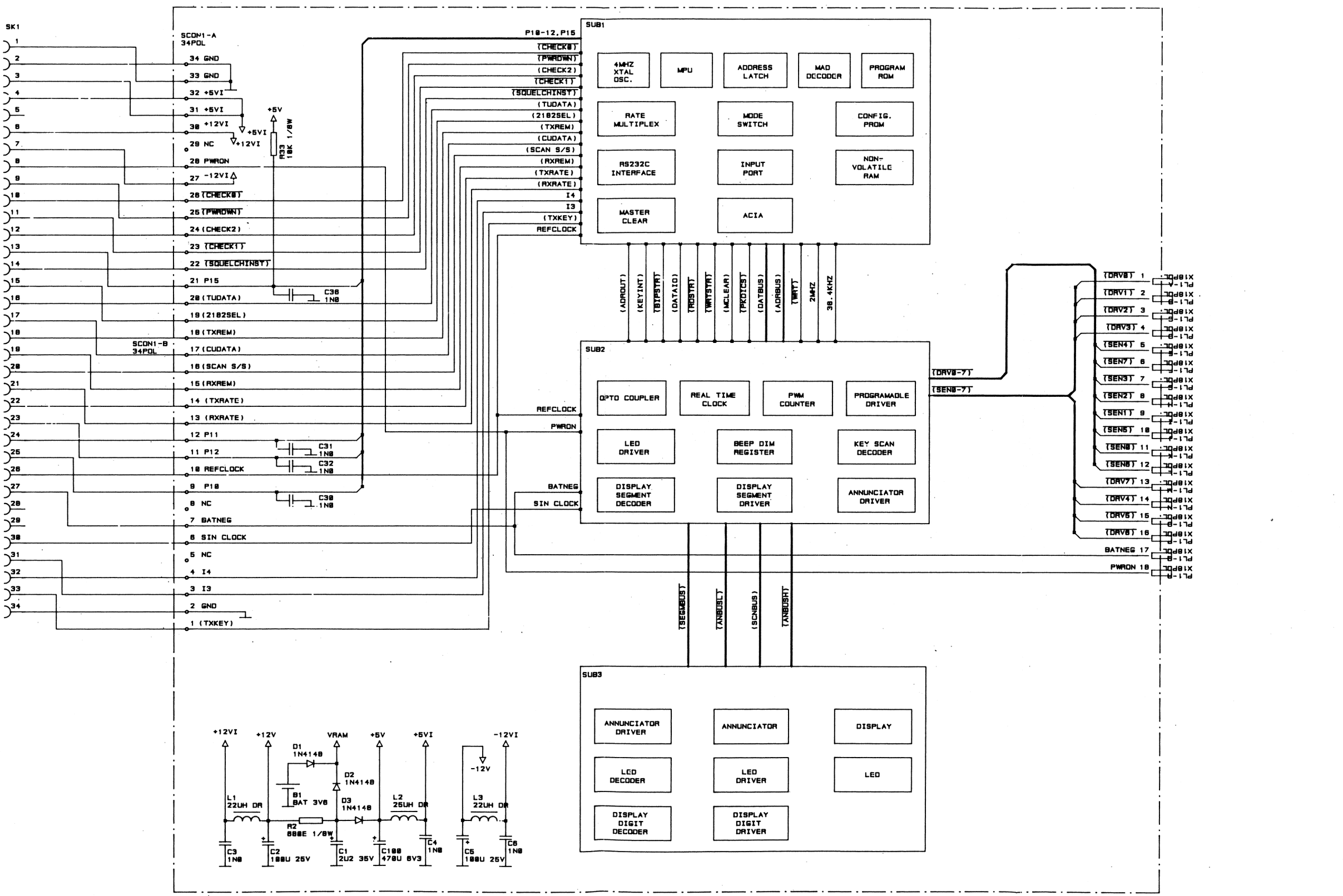
CONTROL BOARD 600
VERSION B2
VIEWED FROM TOP SIDE

993 560 0X COMP



CONTROL BOARD 600
VERSION B2
VIEWED FROM BOTTOM SIDE

993 560 0X COMP



PCB 600 CONTROL BOARD
VERSION B2 MAIN DIAGRAM

993 560 0X MAIN

4MHZ XTAL OSCILLATOR
ADDRESS LATCH
MAP DECODER
PROGRAM ROM
CONFIGURATION PROM
2MHZ
(PKOICS)
(ADRBUS)
MPU
CPT
IC7 MC6803
IC3-A 74LS74
IC18 74HC373
IC11 74HC138
IC14 27128-4
IC16 27128-4
EPROM 16K X 8
JP2
(KEYINT)
(SCAN S/S)
(RXRATE)
(TXRATE)
(SQUELCHINST)
REFCLOCK
(PWRDWN)
(MCLEAR)
(TUDATA)
(TXREM)
I3
I4
(CHECK0)
(CHECK1)
(CHECK2)
(TXKEY)
RATE MULTIPLEXER
MODE SWITCH
IC4-A 74HCT88
IC4-B 74HCT88
IC4-C 74HCT88
IC4-D 74HCT88
IC6-A CD4066
IC6-B CD4066
IC6-C CD4066
IC6-D CD4066
MASTER CLEAR
IC5-A 4093
IC5-B 4093
IC5-C 4093
IC5-D 4093
IC9-A 1489
IC9-C 1489
IC9-D 1489
INPUT PORT
IC29 74HCT541
RS 232C INTERFACE
ACIA
IC28 6850
IC15-C 74LS84
IC13-B 74LS132
IC13-A 74LS132
IC18-D 74LS85
IC18-A 74LS85
IC15-A 74LS84
IC13-C 74LS132
IC15-D 74LS84
IC8-D 1488
IC8-C 1488
IC12-B 74LS08
IC12-C 74LS08
IC8-A 1488
IC8-B 1488
NON-VOLATILE RAM
VRAM
SRAM 8K X 8
IC17 6564
(PROGSEL)
(ADROUT)
(WRTSTR)
(RDSTR)
(DATAIO)
(WRT)
(DATBUS)
P18-12,P15
(BIPSTR)
(2102SEL)
(CUDATA)
38.4KHZ
(RXREM)
(MAIN)
(SUB 2)

PCB 600 CONTROL BOARD
VERSION B2 SUBDIAGRAM 1 OF 3

993 560 0X SUB1

OPTOCOUPLER
REAL-TIME CLOCK
KEYBOARD/DISPLAY CONTROLLER
PWM COUNTER
BEEP/DIM REGISTER
PROGRAMABLE DIVIDER
KEY SCAN DECODER
DISPLAY SEGMENT DECODER
DISPLAY SEGMENT DRIVER
ANNUNCIATOR DRIVER

IC2 CNY17-4
IC1 74HC42
IC18 8279 KBDI *
IC19 RTC 146818
IC20 4516 CTR4
IC21 4516 CTR4
IC22 74C161 CTR4
IC23 4040 CTR12
IC24 74HCT374
IC25 4584 U/U
IC26 4516 CTR4
IC27 74HC4859 CTRDIn
IC31 74HCT541
IC33 74HCT08
IC34 74HCT08
IC36 74LS48 BCD/7SEG
IC3-B 74LS74
IC10-B 74LS05
IC10-E 74LS05
IC10-F 74LS05
IC12-A 74LS08
IC12-D 74LS08
IC13-D 74LS132
IC15-B 74LS04
IC15-F 74LS04
IC16-C 74LS05
IC56-A 74HCT27
IC56-B 74HCT27
IC56-C 74HCT27

Q1 BC327
Q51–Q58 BC337
Q59–Q67 BC337

D53 1N4148
D11 1N4148
D16 1N4148
D17 1N4148
D4 1N4148
D5 1N4148
D6 1N4148
D7 1N4148
D8 1N4148
D9 1N4148
D10 1N4148
D58 SD101

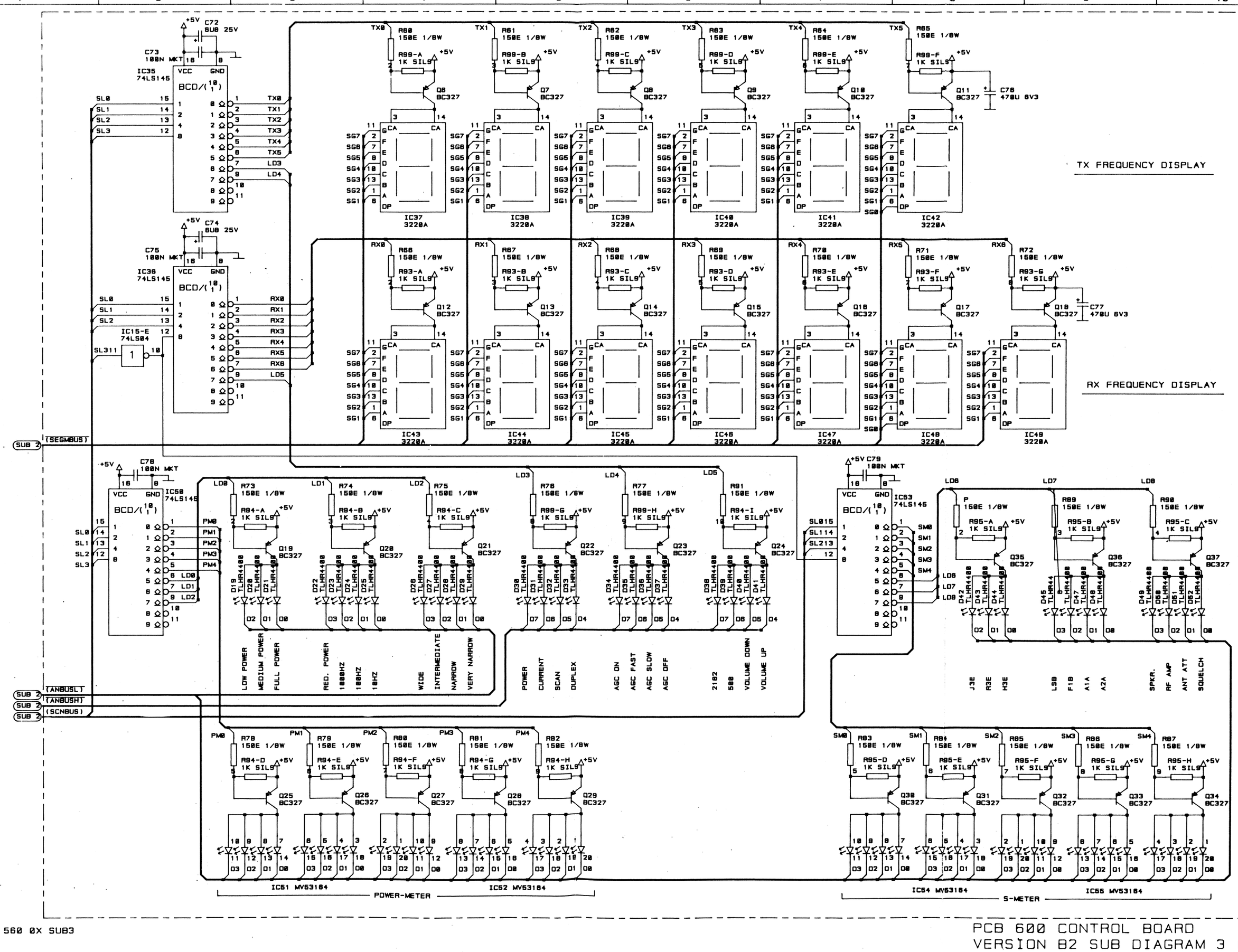
JP1

(SCNBUS) SUB 3
(BIPSTRT) SUB 1
2MHZ MAIN
(DRV 0-7) MAIN
38.4KHZ SUB 1
SIN CLOCK MAIN
REFCLOCK SUB 1
SEGBUS SUB 3
(ANBUSHT) SUB 3
(UNBUSLT) SUB 3

(ADROUT) SUB 1
(SEN 0-7) MAIN
(KEYINT) SUB 1
(DATAIO) SUB 1
(RDSTR) SUB 1
(WRTSTR) SUB 1
(MCLEAR) SUB 1
(PKDICS) SUB 1
(DATBUS) SUB 1
(ADRBUS) SUB 1
(PROGSEL) SUB 1
(WRT) SUB 1

993 560 0X SUB2

PCB 600 CONTROL BOARD
VERSION B2 SUB DIAGRAM 2 OF 3



993 560 0X SUB3

PCB 600 CONTROL BOARD
VERSION B2 SUB DIAGRAM 3 OF 3

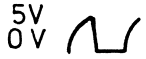
TEST POINTS FOR 600 CU CONTROL BOARD.

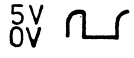
(1) 12V

(2) 5 V

(3) 5V @ POWER ON
3V @ POWER OFF

(4) -12V

(5) 4MHz 

(6) 1MHz, 50% d.c. 

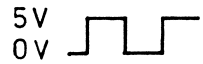
(7) 1MHz 25% d.c.

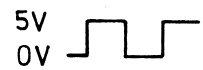
(8) -11V (passive state)

(9) -12V (passive state when connected to TU)

(10) -11V (passive state)

(11) 5V (passive state)

(12) 8192 Hz 50% d.c. 

(13) 38462 Hz 50% d.c. 

(14) 2404 Hz 50% d.c.

(15) 2 MHz 50% d.c.

993 702 21

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

Printed Circuit Board Complete 600 (specify program version when ordering)					107 560 01
B1	Lithium Battery 3.6V with cable tie				107 612 90
C1	2.2 uF	20%	35V	Tan.	652 622 01
C10	1 nF	10%	63V	Cer.	602 310 02
C100	470 uF	+50-10%	6.3V	W.alum.	650 847 01
C109	0.1 uF	10%	63V	Polyes.	622 510 00
C11	22 uF	20%	16V	W.alum.	651 722 01
C110	33 pF	2%	63V	Cer.	602 133 01
C111	1 nF	10%	63V	Cer.	602 310 02
C112	1 nF	10%	63V	Cer.	602 310 02
C113	10 nF	10%	63v	Cer.	602 410 01
C114	0.1 uF	10%	63V	Polyes.	622 510 00
C12	1 nF	10%	63V	Cer.	602 310 02
C13	0.1 uF	10%	63V	Polyes.	622 510 00
C14	10 nF	10%	63V	Polyes.	622 410 01
C15	39 pF	2%	63V	N150	602 139 01
C16	180 pF	10%	63V	Cer.	602 218 00
C17	1.2 nF	10%	100V	Cer.	602 312 00
C18	0.1 uF	10%	63V	Polyes.	622 510 00
C19	10 nF	10%	63V	Polyes.	622 410 01
C2	100 uF	+50-10%	25V	W.alum.	652 810 00
C20	10 nF	10%	63V	Polyes.	622 410 01
C21	0.1 uF	10%	63V	Polyes.	622 510 00
C22	6.8 uF	20%	25V	Sol.al.	652 668 01
C23	0.1 uF	10%	63V	Polyes.	622 510 00
C24	1 nF	10%	63V	Cer.	602 310 02
C25	1 nF	10%	63V	Cer.	602 310 02
C26	0.1 uF	10%	63V	Polyes.	622 510 00
C27	220 pF	10%	63V	Cer.	602 222 00
C28	1 nF	10%	63V	Cer.	602 310 02
C29	1 nF	10%	63V	Cer.	602 310 02
C3	1 nF	10%	63V	Cer.	602 310 02
C30	1 nF	10%	63V	Cer.	602 310 02
C31	1 nF	10%	63V	Cer.	602 310 02
C32	1 nF	10%	63V	Cer.	602 310 02
C33	1 nF	10%	63V	Cer.	602 310 02
C34	0.1 uF	10%	63V	Polyes.	622 510 00
C35	0.1 uF	10%	63V	Polyes.	622 510 00
C36	1 nF	10%	63V	Cer.	602 310 02
C37	0.1 uF	10%	63V	Polyes.	622 510 00
C38	0.1 uF	10%	63V	Polyes.	622 510 00
C39	1 uF	10%	63V	MKT	622 610 02
C4	1 nF	10%	63V	Cer.	602 310 02
C40	6.8 uF	20%	25V	Sol.al.	652 668 01
C41	0.1 uF	10%	63V	Polyes.	622 510 00
C42	0.1 uF	10%	63V	Polyes.	622 510 00
C43	0.1 uF	10%	63V	Polyes.	622 510 00
C44	0.1 uF	10%	63V	Polyes.	622 510 00
C45	0.1 uF	10%	63V	Polyes.	622 510 00
C47	2-18 pF		63V	Var.	683 118 00
C48	0.1 uF	10%	63V	Polyes.	622 510 00

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

C49	1 nF	10%	63V	Cer.	602 310 02
C5	100 uF	+50-10%	25V	W.alum.	652 810 00
C50	18 pF	2%	63V	N150	602 118 00
C51	33 pF	2%	63V	Cer.	602 133 01
C52	0.1 uF	10%	63V	Polyes.	622 510 00
C53	0.1 uF	10%	63V	Polyes.	622 510 00
C54	470 pF	10%	63V	Cer.	602 247 00
C55	1 nF	10%	63V	Cer.	602 310 02
C56	0.1 uF	10%	63V	Polyes.	622 510 00
C57	220 pF	10%	63V	Cer.	602 222 00
C58	1 nF	10%	63V	Cer.	602 310 02
C59	0.1 uF	10%	63V	Polyes.	622 510 00
C6	1 nF	10%	63V	Cer.	602 310 02
C60	1 nF	10%	63V	Cer.	602 310 02
C61	1 nF	10%	63V	Cer.	602 310 02
C62	1 nF	10%	63V	Cer.	602 310 02
C63	1 nF	10%	63V	Cer.	602 310 02
C64	0.1 uF	10%	63V	Polyes.	622 510 00
C65	2.7 nF			Cer.	602 327 00
C66	2.7 nF			Cer.	602 327 00
C67	2.7 nF			Cer.	602 327 00
C68	2.7 nF			Cer.	602 327 00
C69	2.7 nF			Cer.	602 327 00
C7	10 nF	10%	250V	Polyes.	624 410 01
C70	2.7 nF			Cer.	602 327 00
C71	2.7 nF			Cer.	602 327 00
C72	6.8 uF	20%	25V	Sol.al.	652 668 01
C73	0.1 uF	10%	63V	Polyes.	622 510 00
C74	6.8 uF	20%	25V	Sol.al.	652 668 01
C75	0.1 uF	10%	63V	Polyes.	622 510 00
C76	470 uF	+50-10%	6.3V	W.alum.	650 847 01
C77	470 uF	+50-10%	6.3V	W.alum.	650 847 01
C78	0.1 uF	10%	63V	Polyes.	622 510 00
C79	0.1 uF	10%	63V	Polyes.	622 510 00
C8	10 nF	10%	250V	Polyes.	624 410 01
C80	6.8 uF	20%	25V	Tan.	652 668 00
C81	1 nF	10%	63V	Cer.	602 310 02
C82	1 nF	10%	63V	Cer.	602 310 02
C9	1 nF	10%	63V	Cer.	602 310 02
CON1/SK1	34 Pol.	RIBBON CABLE			373 604 0X
D1	1N4148				830 414 80
D10	1N4148				830 414 80
D11	1N4148				830 414 80
D12	SD101C				830 010 10
D13	1N4148				830 414 80
D14	1N4148				830 414 80
D15	1N4148				830 414 80
D16	1N4148				830 414 80
D17	1N4148				830 414 80
D18	1N4148				830 414 80
D19	LED (RED)				823 000 00
D2	1N4148				830 414 80

D20	LED (RED)	823 000 00
D21	LED (RED)	823 000 00
D22	LED (RED)	823 000 00
D23	LED (RED)	823 000 00
D24	LED (RED)	823 000 00
D25	LED (RED)	823 000 00
D26	LED (RED)	823 000 00
D27	LED (RED)	823 000 00
D28	LED (RED)	823 000 00
D29	LED (RED)	823 000 00
D3	1N4148	830 414 80
D30	LED (RED)	823 000 00
D31	LED (RED)	823 000 00
D32	LED (RED)	823 000 00
D33	LED (RED)	823 000 00
D34	LED (RED)	823 000 00
D35	LED (RED)	823 000 00
D36	LED (RED)	823 000 00
D37	LED (RED)	823 000 00
D38	LED (RED)	823 000 00
D39	LED (RED)	823 000 00
D4	1N4148	830 414 80
D40	LED (RED)	823 000 00
D41	LED (RED)	823 000 00
D42	LED (RED)	823 000 00
D43	LED (RED)	823 000 00
D44	LED (RED)	823 000 00
D45	LED (RED)	823 000 00
D46	LED (RED)	823 000 00
D47	LED (RED)	823 000 00
D48	LED (RED)	823 000 00
D49	LED (RED)	823 000 00
D5	1N4148	830 414 80
D50	LED (RED)	823 000 00
D51	LED (RED)	823 000 00
D52	LED (RED)	823 000 00
D53	1N4148	830 414 80
D54	1N4148	830 414 80
D55	1N4148	830 414 80
D56	1N4148	830 414 80
D57	1N4148	830 414 80
D58	SD101C	830 010 10
D6	1N4148	830 414 80
D7	1N4148	830 414 80
D8	1N4148	830 414 80
D9	1N4148	830 414 80
IC1	74HC42	850 744 21
IC10	74HC373	857 437 31
IC11	74H138	857 413 81
IC12	74LS08	850 740 80
IC13	74LS132	857 413 21
IC14	TMS27256-45 (XX denotes program version number)	383 65X X1

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

IC15	74LS04	850 740 41
IC16	27128-4 (unprogrammed)	852 712 84
IC17	5564	850 556 40
IC18	74LS05	850 740 51
IC19	8279-5	850 827 90
IC2	CNY17-4	825 000 01
IC20	CD4516BC	850 451 60
IC21	CD4516BC	850 451 60
IC22	74C161	857 416 11
IC23	CD4040BC	850 404 00
IC24	74HCT374	857 437 42
IC25	4504	850 450 40
IC26	146818	851 468 18
IC27	74HC4059	857 440 59
IC28	6850	850 685 00
IC29	74HCT541	857 454 10
IC3	74LS74	850 747 40
IC30	74LS48	850 744 81
IC31	74HCT541	857 454 10
IC32	ULN2803	850 280 30
IC33	74HCT08	850 740 82
IC34	74HCT08	850 740 82
IC35	74LS145	857 414 50
IC36	74LS145	857 414 50
IC37	DISPLAY (RED)	824 000 02
IC38	DISPLAY (RED)	824 000 02
IC39	DISPLAY (RED)	824 000 02
IC4	74HCT00	850 740 05
IC40	DISPLAY (RED)	824 000 02
IC41	DISPLAY (RED)	824 000 02
IC42	DISPLAY (RED)	824 000 02
IC43	DISPLAY (RED)	824 000 02
IC44	DISPLAY (RED)	824 000 02
IC45	DISPLAY (RED)	824 000 02
IC46	DISPLAY (RED)	824 000 02
IC47	DISPLAY (RED)	824 000 02
IC48	DISPLAY (RED)	824 000 02
IC49	DISPLAY (RED)	824 000 02
IC5	4093BC	850 409 30
IC50	74LS145	857 414 50
IC51	BAR-GRAPH (RED)	824 000 01
IC52	BAR-GRAPH (RED)	824 000 01
IC53	74LS145	857 414 50
IC54	BAR-GRAPH (RED)	824 000 01
IC55	BAR-GRAPH (RED)	824 000 01
IC56	74HCT27	850 742 71
IC6	CD4066BC	850 406 60
IC7	6803	850 680 30
IC8	1488P	850 148 80
IC9	1489P	850 148 90
JP1	consisting of PLUG and SOCKET	750 000 45 750 000 31

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

JP2	consisting of PLUG		750 000 45
	and SOCKET		750 000 31
L1	22 uH		740 122 00
L2	25 uH	3A	740 125 00
L3	22 uH		740 122 00
PL1	18 Pol.		751 001 25
Q1	BC327		840 032 70
Q10	BC327		840 032 70
Q11	BC327		840 032 70
Q12	BC327		840 032 70
Q13	BC327		840 032 70
Q14	BC327		840 032 70
Q15	BC327		840 032 70
Q16	BC327		840 032 70
Q17	BC327		840 032 70
Q18	BC327		840 032 70
Q19	BC327		840 032 70
Q2	BF240		840 024 00
Q20	BC327		840 032 70
Q21	BC327		840 032 70
Q22	BC327		840 032 70
Q23	BC327		840 032 70
Q24	BC327		840 032 70
Q25	BC327		840 032 70
Q26	BC327		840 032 70
Q27	BC327		840 032 70
Q28	BC327		840 032 70
Q29	BC327		840 032 70
Q3	BF240		840 024 00
Q30	BC327		840 032 70
Q31	BC327		840 032 70
Q32	BC327		840 032 70
Q33	BC327		840 032 70
Q34	BC327		840 032 70
Q35	BC327		840 032 70
Q36	BC327		840 032 70
Q37	BC327		840 032 70
Q4	BF240		840 024 00
Q5	BF240		840 024 00
Q50	BC337-40		840 033 70
Q51	BC337-40		840 033 70
Q52	BC337-40		840 033 70
Q53	BC337-40		840 033 70
Q54	BC337-40		840 033 70
Q55	BC337-40		840 033 70
Q56	BC337-40		840 033 70
Q57	BC337-40		840 033 70
Q58	BC337-40		840 033 70
Q59	BC337-40		840 033 70
Q6	BC327		840 032 70
Q60	BC337-40		840 033 70

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

Q61	BC337-40				840 033 70
Q62	BC337-40				840 033 70
Q63	BC337-40				840 033 70
Q64	BC337-40				840 033 70
Q65	BC337-40				840 033 70
Q7	BC327				840 032 70
Q8	BC327				840 032 70
Q9	BC327				840 032 70
R10	22 kohm	5%	1/8W	MF	500 422 00
R100	390 ohm	5%	1/8W	MF	500 239 00
R101	390 ohm	5%	1/8W	MF	500 239 00
R102	390 ohm	5%	1/8W	MF	500 239 00
R103	390 ohm	5%	1/8W	MF	500 239 00
R104	390 ohm	5%	1/8W	MF	500 239 00
R105	390 ohm	5%	1/8W	MF	500 239 00
R106	390 ohm	5%	1/8W	MF	500 239 00
R107	390 ohm	5%	1/8W	MF	500 239 00
R108	390 ohm	5%	1/8W	MF	500 239 00
R109	390 ohm	5%	1/8W	MF	500 239 00
R11	470 kohm	5%	1/8W	MF	500 547 00
R110	390 ohm	5%	1/8W	MF	500 239 00
R111	390 ohm	5%	1/8W	MF	500 239 00
R112	390 ohm	5%	1/8W	MF	500 239 00
R113	390 ohm	5%	1/8W	MF	500 239 00
R114	390 ohm	5%	1/8W	MF	500 239 00
R115	390 ohm	5%	1/8W	MF	500 239 00
R116	22 ohm	5%	1/8W	MF	500 122 00
R117	22 ohm	5%	1/8W	MF	500 122 00
R118	22 ohm	5%	1/8W	MF	500 122 00
R119	22 ohm	5%	1/8W	MF	500 122 00
R12	15 kohm	5%	1/8W	MF	500 415 00
R120	22 ohm	5%	1/8W	MF	500 122 00
R121	22 ohm	5%	1/8W	MF	500 122 00
R122	22 ohm	5%	1/8W	MF	500 122 00
R123	22 ohm	5%	1/8W	MF	500 122 00
R125	330 ohm	5%	1/8W	MF	500 233 00
R126	330 ohm	5%	1/8W	MF	500 233 00
R13	56 kohm	5%	1/8W	MF	500 456 00
R14	12 kohm	5%	1/8W	MF	500 412 00
R15	56 kohm	5%	1/8W	MF	500 456 00
R16	15 kohm	5%	1/8W	MF	500 415 00
R17	10 kohm	5%	1/8W	MF	500 410 00
R18	10 kohm	5%	1/8W	MF	500 410 00
R19	10 kohm	5%	1/8W	MF	500 410 00
R2	680 ohm	5%	1/8W	MF	500 268 00
R20	10 kohm	5%	1/8W	MF	500 410 00
R21	10 kohm	5%	1/8W	MF	500 410 00
R22	1 kohm	5%	1/8W	MF	500 310 00
R23	3.3 kohm	5%	1/8W	MF	500 333 00
R24	100 ohm	5%	1/8W	MF	500 210 00
R25	330 ohm	5%	1/8W	MF	500 233 00
R26	6.8 kohm	5%	1/8W	MF	500 368 00
R27	220 ohm	5%	1/8W	MF	500 222 00

R28	3.9 kohm	5%	1/8W	MF	500 339 00
R29	820 ohm	5%	1/8W	MF	500 282 00
R3	10 kohm	5%	1/8W	MF	500 410 00
R30	10 kohm	5%	1/8W	MF	500 410 00
R31	3.3 kohm	5%	1/8W	MF	500 333 00
R32	3.3 kohm	5%	1/8W	MF	500 333 00
R33	10 kohm	5%	1/8W	MF	500 410 00
R34	220 ohm	5%	1/8W	MF	500 222 00
R35	1 kohm	5%	1/8W	MF	500 310 00
R36	10 kohm	5%	1/8W	MF	500 410 00
R37	1 kohm	5%	1/8W	MF	500 310 00
R38	4.7 kohm	5%	1/8W	MF	500 347 00
R4	2.7 kohm	5%	1/8W	MF	500 327 00
R40	10 kohm	5%	1/8W	MF	500 410 00
R41	4.7 kohm	5%	1/8W	MF	500 347 00
R42	470 kohm	5%	1/8W	MF	500 547 00
R43	12 kohm	5%	1/8W	MF	500 412 00
R44	10 Mohm	5%	1/4W	Car.	501 710 00
R45	12 kohm	5%	1/8W	MF	500 412 00
R5	100 ohm	5%	1/8W	MF	500 210 00
R51	47 kohm	5%	1/8W	MF	500 447 00
R52	33 ohm	5%	1/8W	MF	500 133 00
R53	33 ohm	5%	1/8W	MF	500 133 00
R54	33 ohm	5%	1/8W	MF	500 133 00
R55	33 ohm	5%	1/8W	MF	500 133 00
R56	33 ohm	5%	1/8W	MF	500 133 00
R57	33 ohm	5%	1/8W	MF	500 133 00
R58	33 ohm	5%	1/8W	MF	500 133 00
R59	33 ohm	5%	1/8W	MF	500 133 00
R6	2.2 kohm	5%	1/8W	MF	500 322 00
R60	150 ohm	5%	1/8W	MF	500 215 00
R61	150 ohm	5%	1/8W	MF	500 215 00
R62	150 ohm	5%	1/8W	MF	500 215 00
R63	150 ohm	5%	1/8W	MF	500 215 00
R64	150 ohm	5%	1/8W	MF	500 215 00
R65	150 ohm	5%	1/8W	MF	500 215 00
R66	150 ohm	5%	1/8W	MF	500 215 00
R67	150 ohm	5%	1/8W	MF	500 215 00
R68	150 ohm	5%	1/8W	MF	500 215 00
R69	150 ohm	5%	1/8W	MF	500 215 00
R7	47 kohm	5%	1/8W	MF	500 447 00
R70	150 ohm	5%	1/8W	MF	500 215 00
R71	150 ohm	5%	1/8W	MF	500 215 00
R72	150 ohm	5%	1/8W	MF	500 215 00
R73	150 ohm	5%	1/8W	MF	500 215 00
R74	150 ohm	5%	1/8W	MF	500 215 00
R75	150 ohm	5%	1/8W	MF	500 215 00
R76	150 ohm	5%	1/8W	MF	500 215 00
R77	150 ohm	5%	1/8W	MF	500 215 00
R78	150 ohm	5%	1/8W	MF	500 215 00
R79	150 ohm	5%	1/8W	MF	500 215 00
R8	47 kohm	5%	1/8W	MF	500 447 00
R80	150 ohm	5%	1/8W	MF	500 215 00
R81	150 ohm	5%	1/8W	MF	500 215 00

PARTS LIST FOR CONTROL BOARD 600 VERSION B2

R82	150 ohm	5%	1/8W	MF	500 215 00
R83	150 ohm	5%	1/8W	MF	500 215 00
R84	150 ohm	5%	1/8W	MF	500 215 00
R85	150 ohm	5%	1/8W	MF	500 215 00
R86	150 ohm	5%	1/8W	MF	500 215 00
R87	150 ohm	5%	1/8W	MF	500 215 00
R88	150 ohm	5%	1/8W	MF	500 215 00
R89	150 ohm	5%	1/8W	MF	500 215 00
R9	68 ohm	5%	1/8W	MF	500 168 00
R90	150 ohm	5%	1/8W	MF	500 215 00
R91	150 ohm	5%	1/8W	MF	500 215 00
R92	10 kohm	5%	1/8W	MF	500 410 00
R93	9x1 kohm			SIL.	530 000 10
R94	9x1 kohm			SIL.	530 000 10
R95	9x1 kohm			SIL.	530 000 10
R96	9x12 kohm			SIL.	530 000 09
R97	220 kohm	5%	1/8W	Car.	500 522 00
R98	2.2 kohm	5%	1/8W	MF	500 322 00
R99	9x12 kohm			SIL.	530 000 09
X1	4MHz	CRYSTAL			812 000 00
X2	32.768KHz	CRYSTAL			812 000 01

TECHNICAL DESCRIPTION

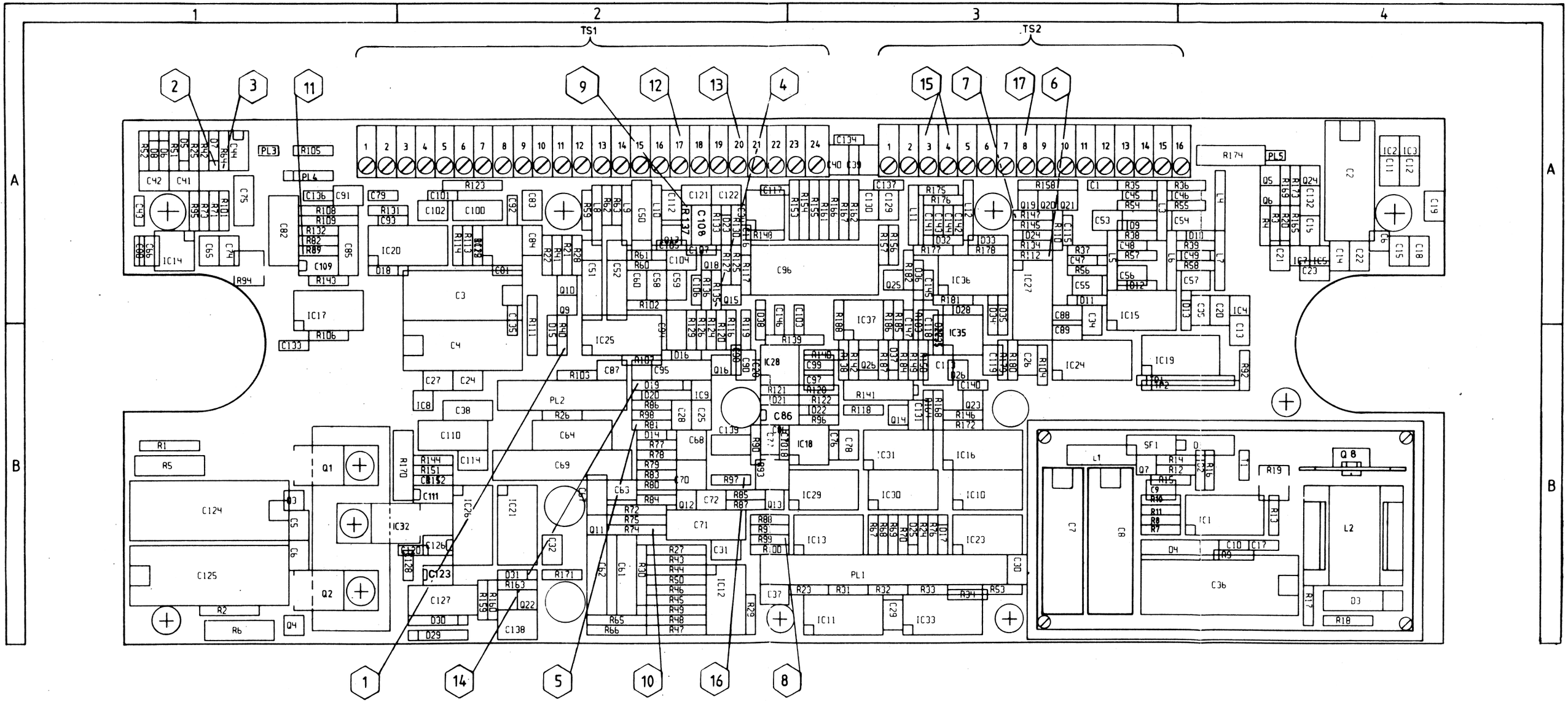
PCB [601] AUDIO PROCESSING BOARD

All power supply regulation in the Control Unit is performed on this board. Voltages of +24 V, -15 V, +15 V, -15 V are supplied from the Transceiver Unit. The +15 V and one -15 V line are current limited to approximately 0.7 A before supplying the audio power amplifier in order not to disturb the function of the equipment in case of irregularities on the loudspeaker lines. For the same reason the current from the loudspeaker is returned in these -15 V wires and not via the "GND" wire. All other circuits are supplied from the +24 V and the second -15 V voltage. To obtain the necessary regulation and isolation between the circuits, these voltages are stabilized in several small 0.1 A regulators, supplying +/-12 V and +6 V for receiver AF-circuits, +/-12 V and +6 V for transmitter AF-circuits and +/-12 V for the digital circuits. +5 V to the Control Board [600] is derived from +24 V by means of a switching regulator, capable of delivering 2 A. All functions on [601] are controlled by the microprocessor on [600] through a 3 wire serial interface. The 5V microprocessor signals are level-shifted to the 12 V logical level used on [601] and converted to a 16-bit parallel code. 3 bits control the key selector and the input selector. Before the signals enter the selectors, they pass through the filters, where they are filtered, limited and shaped (keysignals only). The microphone signal further passes through the microphone amplifier where the gain can be set from 0 to 15 dB by means of a potentiometer. A delay circuit makes it possible to delay the positive edge of the telex key signal from 0 to 30 ms in steps of 3.33 ms. The negative edge remains unaffected. Accuracy of the delay time will be within one period of the reference clock signal from the microprocessor (0.42 ms). The selectors are controlled as follows:

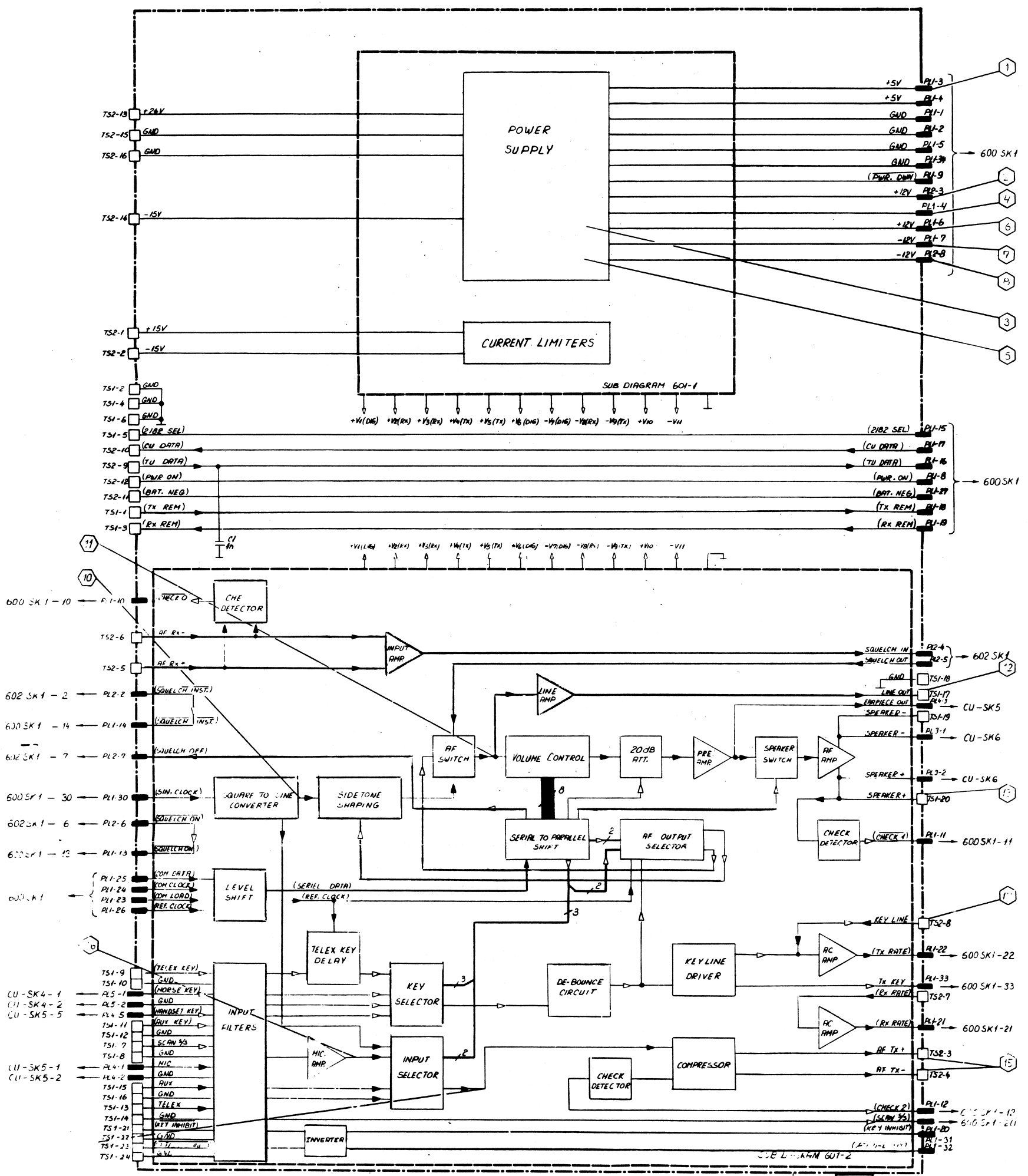
Mode	Keyselector	Inputselector
AM/R3E USB/LSB	Handset/aux.	Mic./aux.
CW	Morse	off
MCW	Morse	Sinetone
TELEX	Telex	Telex
ALARM SEND	Constant keyed	Sinetone
ALARM TEST	off	Sinetone

In the AM/SSB modes a keying signal from the handset will open the microphone input, and a signal from the aux. key input will open the aux. input. If both keying inputs are activated, the analog signals will be mixed. The sinetone to the input selector is derived from a clocksignal produced by the microprocessor on [600]. The squarewave is converted in the square-to-sine converter circuit to a sinewave with a frequency 16 times lower than the clock frequency. The sinetone frequency is 919 Hz in MCW mode and 1300 Hz/2200 Hz in the alarm-modes. From the input selector the signal is led to the compressor circuit, where it is levelled to a 0 dBm (0.775 V RMS) balanced signal before transmission to the Transceiver Unit. A check detector circuit informs the control board [600] when the input signal is compressed (in the -3 dBm -0 dBm range). From the key selector the signal is led to the debounce circuit, which will cancel any bounce on the edges of the keying signal within

approximately 10 ms from first level-shift. The signal is separated from the keyline to the Transceiver Unit by a class B driver stage. The signal is also transmitted to the control board [600]. The keyline also carries a frequency modulated signal from the Transceiver Unit to the Control Unit with information about the transmitter RF output power. The RX-RATE line carries a similar signal representing signal strength. These signals are amplified in two equal amplifiers before they continue to the control board [600]. The RX signal path on [601] starts with a check-detector, which registrates if the balanced lines from the Transceiver Unit carries a signal greater than approx. 0.5 V RMS (nominal line level is 0.775 V RMS). The input amplifier converts the differential signal to a single signal of the same level before it is fed to the Squelch Board [602] if provided. When it returns from [602] (or from the bypass socket in PL2) it enters the AF-switch. Here it is possible to select either the RX signal or the sidetone from the shaping circuit. Both shaping and AF-switch is controlled by the AF-output selector which combines RX/TX mode and keyline to obtain correct switch-timing (e.g. a 45 ms break-in time in CW and MCW modes). The clock reference is the same as for the telex key delay circuit. From the AF-switch the signal enters volume control and line amplifier. The line output signal can be adjusted from 0 to approx. 2.4 V RMS (+10 dBm) by means of a potentiometer. The volume control is build around an 8-bit digital-to-analog converter followed by a 20 dB attenuator in order to control the audio volume by the control board processor. The RX signal path further consists of a preamplifier, which also drives the earpiece, a speaker on/off switch and the audio power amplifier. The signal to the loudspeaker is monitored by a check-detector.

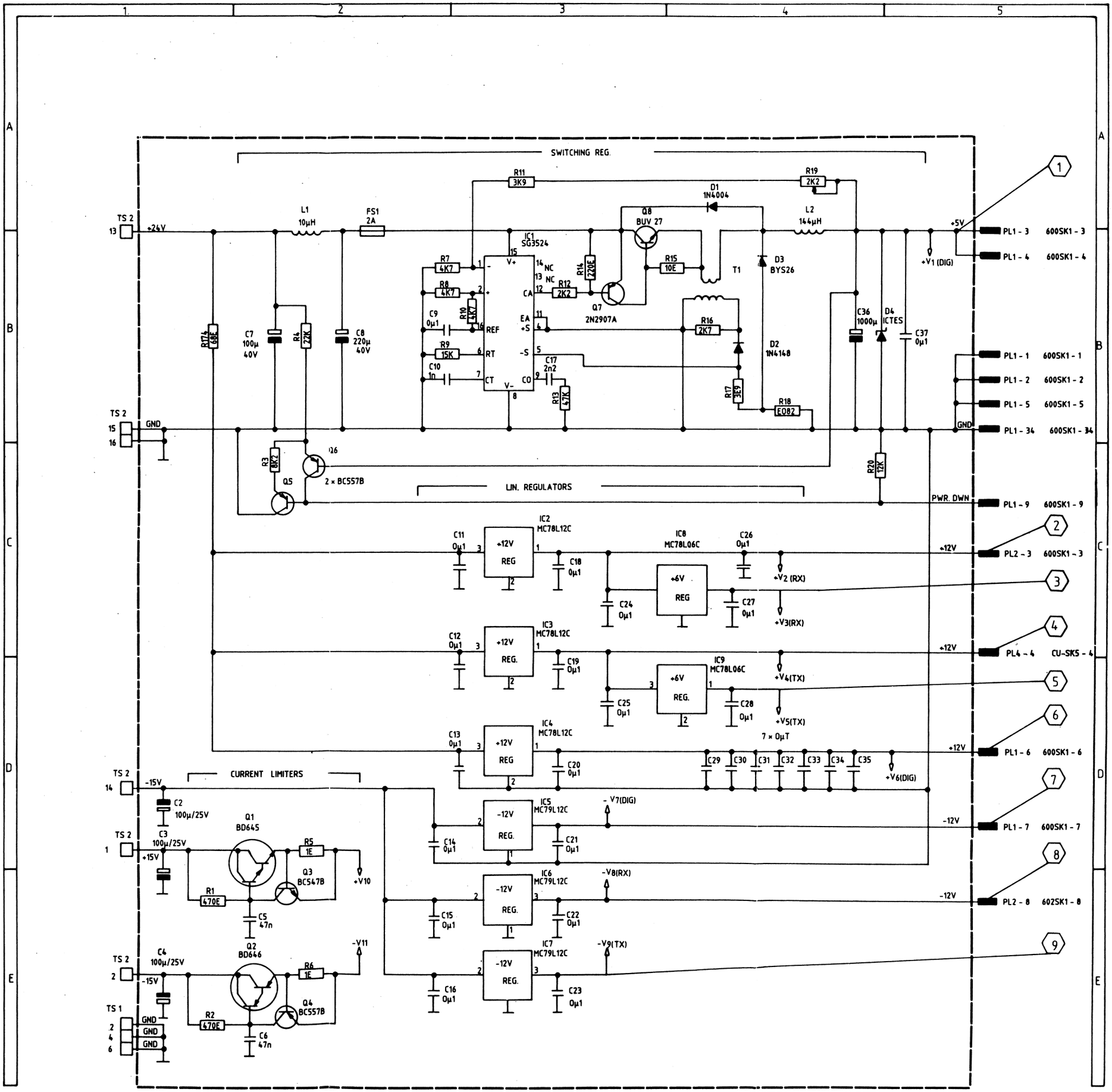


PCB 601 VERSION 4A
AUDIO PROCESSING BOARD
VIEWED FROM COMPONENT SIDE



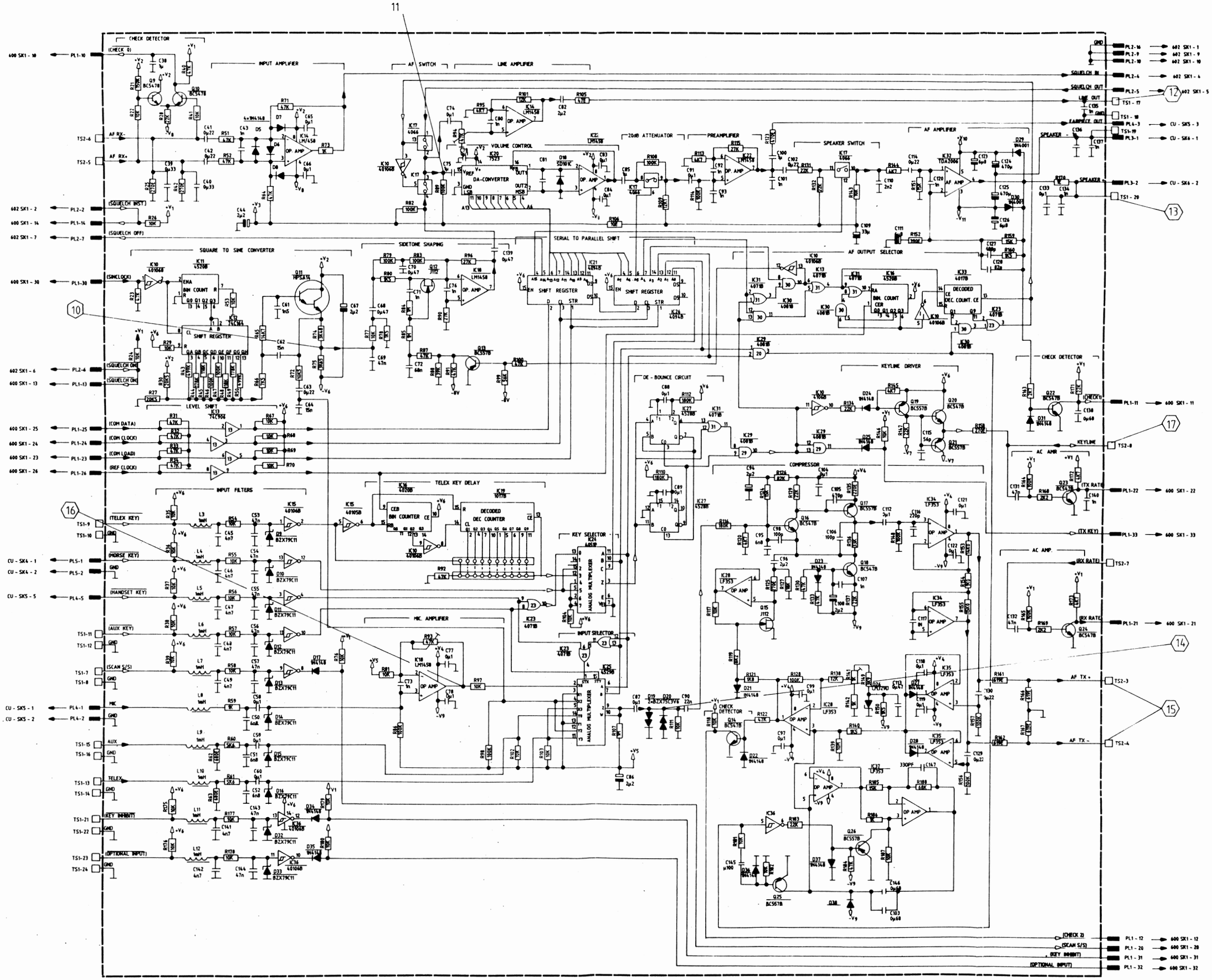
993 560 1X MAIN

PCB 601 AUDIO PROCESSING BOARD
VERSION 4A. MAIN DIAGRAM



993 560 1X SUB1

PCB 601 AUDIO PROCESSING BOARD
VERSION 4A SUBDIAGRAM 1 OF 2



993 560 1X SUB2

PCB 601 AUDIO PROCESSING BOARD
VERSION 4A SUBDIAGRAM 2 OF 2

TEST POINTS FOR PCB 601 AUDIO PROCESSING BOARD

(1) + 5V DC

(2) +12V DC

(3) +6 V DC

(4) +12V DC

(5) +6 V DC

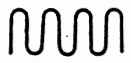
(6) +12V DC

(7) -12V DC

(8) -12V DV

(9) -12V DC

In self test # 2 following is measured:

(10)  1.8Vpp 800Hz

(11) 2.2Vpp 800Hz

(12) 4.5Vpp 800Hz

(13) 22Vpp 800Hz

In self test # 4 following is measured:

(14) 1.8Vpp 800Hz

(15) 1Vpp 800Hz

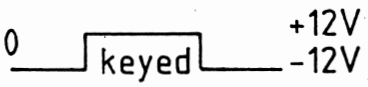
The two signals must be in phase opposition.

SSB check

SSB-mode is selected. Key-in a TX frequency (the signal route between exciter and transmitter may be removed),talk into the microphone and check the signal in:

(16) ca. 1-5Vpp

(15) ca. 1Vpp

(17) 

CW check — check that the morse key can activate the keyline (17) as above.

MCW check

(15) 1Vpp shaped when keyed from morse key.

PARTS LIST FOR AUDIO PROCESSING BOARD 601 VERSION 4A

Printed Circuit Board Complete 601			107 560 11
IC1	SG3524		850 352 40
IC2-4	UH78L12AC	12V	850 781 21
IC5-7	LM79L12C	12V	850 791 21
IC8-9	UH78L06C	6V	850 780 61
IC10,15,36	CD40106B		854 010 60
IC11,16	CD4520B		850 452 00
IC12	74C164		857 416 40
IC13	74C906		857 490 60
IC14,18,22	MC1458N		850 145 81
IC17	CD4066BC		850 406 60
IC19,33	4017B		850 401 70
IC20	AD7523JN		850 752 30
IC21,26	4094B		850 409 40
IC23,31	4071B		850 407 10
IC24	4051B		850 405 10
IC25	4529B		850 452 90
IC27	4528B		850 452 80
IC28,34,37	LF353		850 035 30
IC29-30	4081B		850 408 10
IC32	TDA2006H		850 200 60
IC35	LF353		850 035 31
Q1	BD645		842 064 50
Q2	BD646		842 064 60
Q3,9-10,14,16, 18,20,22-24	BC547B		840 054 70
Q4-6,13,17,19,21, 25,26	BC557B		840 055 70
Q7	2N2907A		840 290 70
Q8	BUV27		842 002 70
Q11	MPSA14		840 001 40
Q12,15	J112		843 011 20
D1	10D4		831 010 40
D2,5-8,17,21-25, 27-28,31,34-38	1N4148		830 414 80
D3	BYS26		831 002 60
D4	ICTE-5		839 000 51
D9-16,32-33	BZX79C11		832 791 10
D18	SD101C		830 010 10
D19-20	BZX75C3V6		832 753 60
D26	LM329DZ		830 032 90
D29-30	10D05		831 100 51

PARTS LIST FOR AUDIO PROCESSING BOARD 601 VERSION 4A

R1-2	470 kohm	5%	1/4W	MF	502 247 00
R3,119	8.2 kohm	5%	1/8W	MF	500 382 00
R4,28,129,131, 132,134,137,147, 171,183	22 kohm	5%	1/8W	MF	500 422 00
R5-6,170	1 ohm	5%	2W	ww	525 010 00
R7-8,10,95,113,120, 144-145,172-173	4.7 kohm	5%	1/8W	MF	500 347 00
R9,124,151,159,185	15 kohm	1%	1/8W	MF	500 415 00
R11,149	3.9 kohm	5%	1/8W	MF	500 339 00
R12,168-169	2.2 kohm	5%	1/8W	MF	500 322 00
R13,23,31-34,40, 51-52,64,71,87, 91-92,100,122, 130,133,184	47 kohm	5%	1/8W	MF	500 447 00
R14,135	220 ohm	5%	1/8W	MF	500 222 00
R15,106	10 ohm	5%	1/8W	MF	500 110 01
R16,163	2.7 kohm	5%	1/8W	MF	500 327 00
R17	3.9 ohm	5%	1/8W	MF	500 039 00
R18	0.082 ohm		1W	ww	523 000 80
R19	2.2 kohm			Pot.	583 322 00
R20,120,138	12 kohm	5%	1/8W	MF	500 412 00
R21	150 kohm	5%	1/8W	MF	500 515 00
R22,24,26,29, 35-39,41,53-58, 67-70,76-77,81, 97,102-104,117-118, 143,146,175-182, 187	10 kohm	5%	1/8W	MF	500 410 00
R25,42,125	270 ohm	5%	1/8W	MF	500 227 00
R27,30	20.5 kohm	1%		MF	511 420 50
R43,50	499 kohm	1%		MF	511 549 90
R44,49	178 kohm	1%		MF	511 517 80
R45,48	118 kohm	1%		MF	511 511 80
R46-47,108	100 kohm	1%		MF	511 510 00
R59,73,142,186	1 kohm	5%	1/8W	MF	500 310 00
R60-61	5.6 kohm	5%	1/8W	MF	500 356 00
R62-63	680 ohm	5%	1/8W	MF	500 268 00
R65	14.7 kohm	1%		MF	511 414 70
R66	7.5 kohm	1%		MF	511 375 00
R72	10.5 kohm	1%		MF	511 410 50
R74	3.48 kohm	1%		MF	511 334 80
R75	3.65 kohm	1%		MF	511 336 50

PARTS LIST FOR AUDIO PROCESSING BOARD 601 VERSION 4A

R78,80,140, 150,160	1.5 kohm	5%	1/8W	MF	500 315 00
R79,82-83,86,89, 98,114,128,148, 156-157,164-165	100 kohm	5%	1/8W	MF	500 510 00
R84-85,107	1 Mohm	5%	1/8W	MF	500 610 01
R88	39 kohm	5%	1/8W	MF	500 439 00
R90,96,115	27 kohm	5%	1/8W	MF	500 427 01
R93-94	47 kohm			Pot.	583 447 01
R99	56 kohm	5%	1/8W	MF	500 456 00
R105	47 ohm	5%	1/8W	MF	500 147 00
R109	12.1 kohm	1%		MF	511 412 10
R110,112,116	180 kohm	5%	1/8W	MF	500 518 00
R111	10 kohm			MF	511 410 00
R121	1.8 kohm	5%	1/8W	MF	500 318 00
R123	470 ohm	5%	1/4W	Car.	501 247 00
R126	82 kohm	5%	1/8W	MF	500 482 00
R127	18 kohm	5%	1/8W	MF	500 418 00
R136	33 kohm	5%	1/8W	MF	500 433 00
R139	10 Mohm	5%	1/4W	Car.	501 710 00
R141	1 kohm			Pot.	581 310 00
R152	390 ohm	5%	1/8W	MF	500 239 00
R153	14.0 kohm	1%		MF	511 414 00
R154	1.0 kohm	1%		MF	511 310 00
R155	15.0 kohm	1%		MF	511 415 00
R158	270 ohm	5%	1/4W	Car.	501 227 00
R161-162,166-167	619 ohm	1%		MF	511 261 90
R174	68 ohm	5%	1.6W	MF	525 168 00
R188	68 kohm	1%	1/8W	MF	500 468 00
C1,10,43,73,76,80, 81,92-93,101,107, 117,120,134-137,140	1 nF	10%	63V	Cer.	602 310 02
C2-4	100 uF		25V	W.alum.	652 810 00
C5-6,53-57, 131-132,143,144	47 nF	20%	63V	Polyes.	622 447 01
C7	100 uF	-10+50%	40V	W.alum.	651 810 04
C8	220 uF	-10+50%	40V	W.alum.	651 822 02
C9,11-16,18-35, 37,58-60,65-66,74, 77-79,83-84,87-89, 91,97,99,104,112, 118-119,121-122, 133,145	0.1 uF	20%	63V	Polyes.	622 510 00

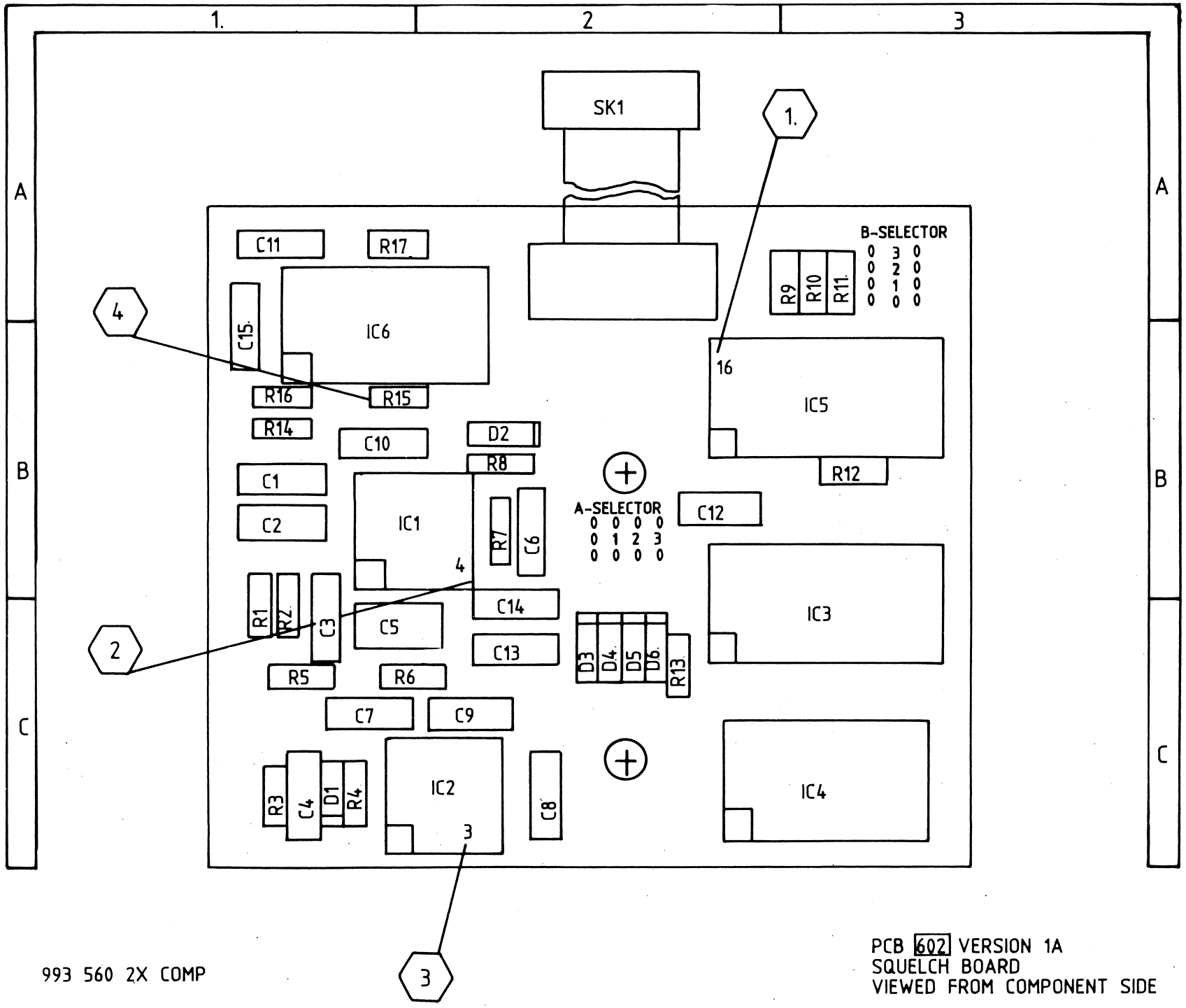
PARTS LIST FOR AUDIO PROCESSING BOARD 601 VERSION 4A

C17	2.2 nF	10%	63V	Cer.	602 322 00
C36	1000 uF		16V	W.alum.	651 910 00
C38,75,85,100	1 uF	10%	63V	Polyes.	622 610 02
C39-40	0.33 uF	20%	63V	Polyes.	622 533 01
C41-42,63,102, 114,129-130	0.22 uF	20%	63V	Polyes.	622 522 01
C44,67,86,94,108	2.2 uF		35V	Tan.	652 622 01
C45-49,141-142	4.7 nF	10%	63V	Cer.	602 347 02
C50-52,95	6.8 nF	1%	63V	Polyst.	612 368 00
C61	1.5 nF	1%	160V	Polyst.	613 315 01
C62,64	15 nF	1%	63V	Polyst.	612 415 00
C68,70,113,139	0.47 uF	10%	63V	Polyes.	622 547 01
C69	47 nF	1%	160V	Polyst.	613 447 00
C71	1 nF	1%	125V	Polyst.	613 310 02
C72	68 nF	20%	63V	Polyes.	622 468 00
C82	2.2 uF	10%	63V	Polyes.	622 622 00
C90	22 nF	20%	63V	Polyes.	622 422 00
C96	2.2 uF	20%	250V	Polyes.	624 622 02
C98,106	100 pF	2%	63V	N150	602 210 00
C103,146	0.68 uF	10%	63V	Polyes.	622 568 02
C105	470 pF	10%	63V	Cer.	602 247 00
C109	33 uF	-20+40%	10V	Tan.	651 733 00
C110	2.2 nF	1%	125V	Polyst.	613 322 00
C111	6.8 uF	-20+40%	25V	Tan.	652 668 00
C115	56 pF	2%	63V	N150	602 156 00
C116	220 pF	10%	63V	Cer.	602 222 00
C123,126	6.8 uF		25V	Sol.al.	652 688 01
C124-125	470 uF		40V	Tan.	652 847 00
C127	680 pF	1%	250V	Polyst.	614 268 00
C128	82 pF	2%	63V	N150	602 182 00
C147	330 pF	10%	63V	Cer.	602 233 00
L1	10 uH				740 110 00
L2	144 uH				383 576 7X
L3-12	1 mH	5%			740 310 03
T1	TRANSFORMER				103 576 81
TS1	TERMINAL STRIP			10 pcs	770 000 19
FS1	2A/125V				720 320 02
PL1	34 POL HEADER				756 034 01
PL2	10 POL HEADER				756 010 02
PL3,5	5 POL				751 001 42
PL4	2 POL				751 001 41

TECHNICAL DESCRIPTION

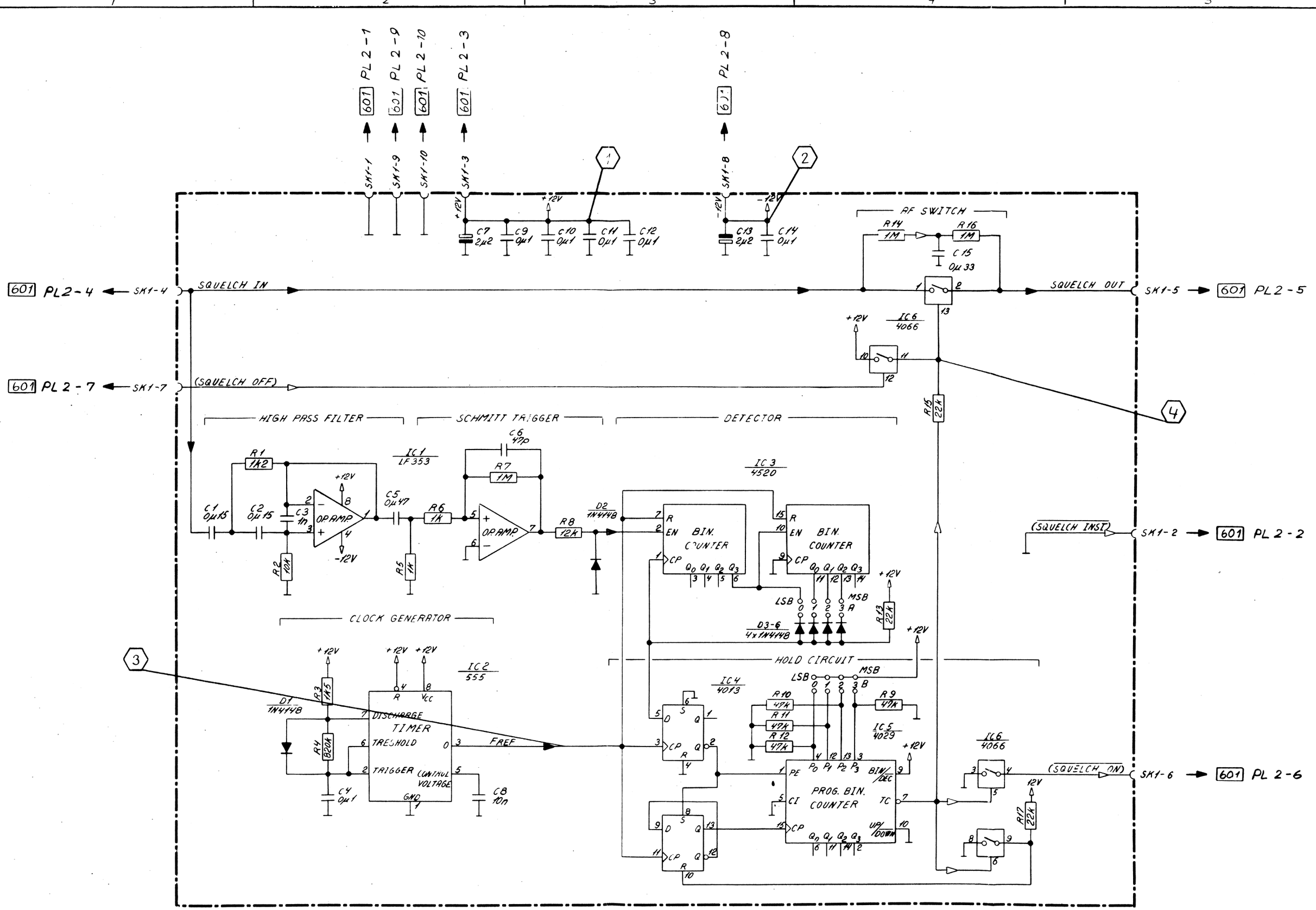
PCB [602] SQUELCH BOARD

The Squelch Circuit is operating exclusively on the received AF signal knowing its spectral distribution with and without the presence of speech. The AF signal is fed to the AF switch, which carries out the squelch function by turning on and off the AF signal. The AF signal is also fed to the input of the High Pass Filter which prevents hum and low frequency noise from disturbing the Detector. The high pass filter output signal is converted into a squarewave by the Schmitt Trigger, and the resulting signal is led to the input of the Detector. The Clock Generator produces a reference frequency for both Detector and Hold Circuit. In the presence of speech the mean frequency of the AF signal is lowered and becomes smaller than the detector frequency limit set by the reference frequency and the A-selector. This causes the Detector via the Hold Circuit to turn on the AF signal. When speech ceases the AF signal consists of noise only which increases the mean frequency above the detector frequency limit. The detector now triggers the Hold Circuit, which turns off the AF signal after a certain hold time, set by the reference frequency and the B-selector.



993 560 2X COMP

PCB 602 VERSION 1A
SQUELCH BOARD
VIEWED FROM COMPONENT SIDE



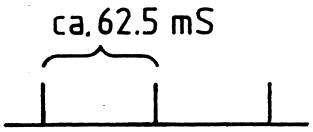
PCB 602 SQUELCH BOARD
VERSION 1A MAIN DIAGRAM

TEST POINTS FOR [602] SQUELCH BOARD

(1) + 12V

(2) − 12V

(3) ≃ 16 Hz



(4) + 12V WHEN SQUELCH OFF

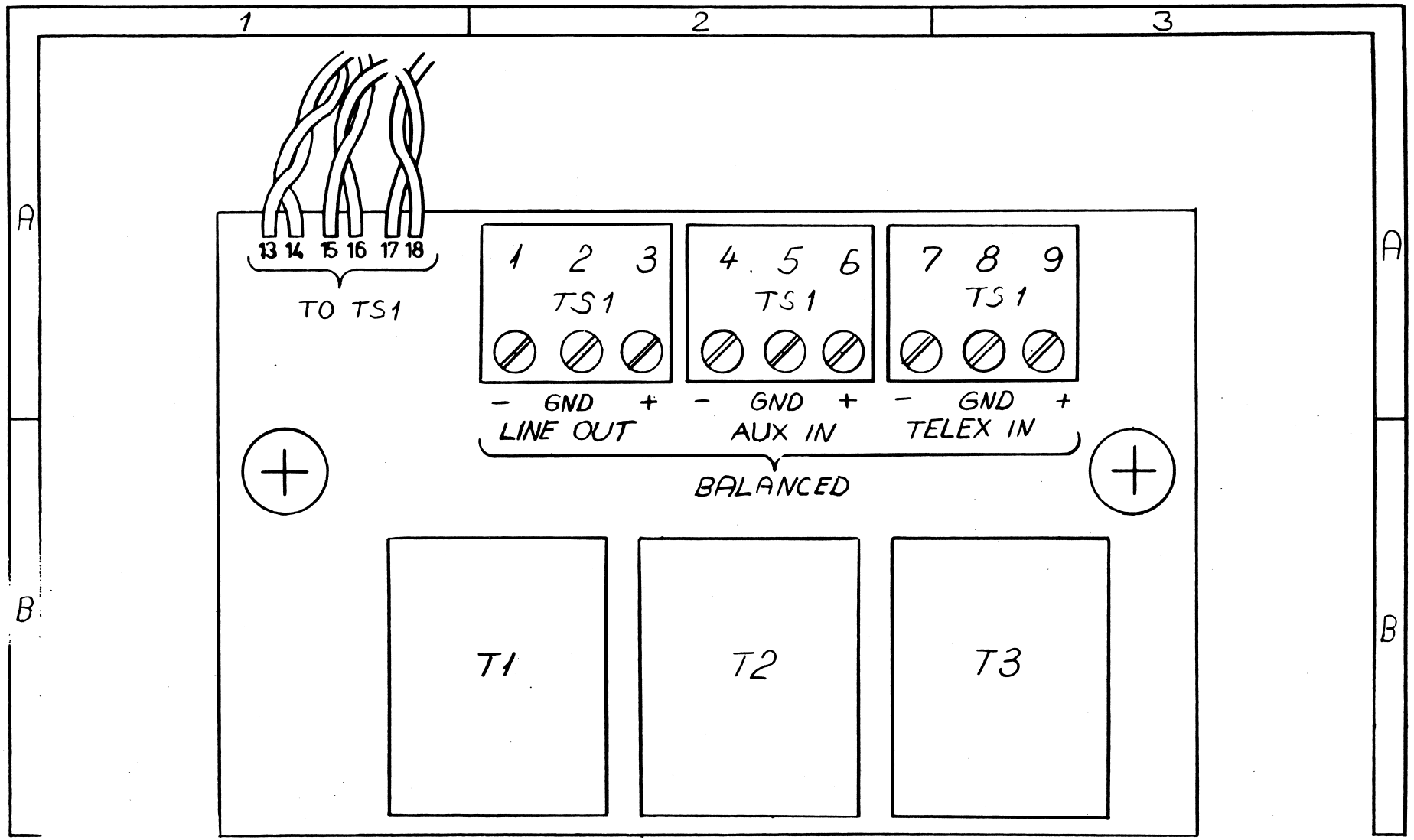
PARTS LIST FOR SQUELCH BOARD 602 VERSION 1A

Printed Circuit Board Complete 602					107 560 21
IC1	LF353				850 035 30
IC2	NE555				850 055 50
IC3	CD4520B				850 452 00
IC4	4013B				850 401 30
IC5	CD4029B				850 402 90
IC6	CD4066BC				850 406 60
D1-6	1N4148				830 414 80
R1	1.2 kohm	5%	1/8W	MF	500 312 00
R2	10 kohm	5%	1/8W	MF	500 410 00
R3	1.5 kohm	5%	1/8W	MF	500 315 00
R4	820 kohm	5%	1/8W	MF	500 582 00
R5,6	1 kohm	5%	1/8W	MF	500 310 00
R7,14,16	1 Mohm	5%	1/8W	MF	500 610 00
R8	12 kohm	5%	1/8W	MF	500 412 00
R9-12	47 kohm	5%	1/8W	MF	500 447 00
R13,15,17	22 kohm	5%	1/8W	MF	500 422 00
C1,2	0.15 uF	10%	63V	Polyes.	622 515 00
C3	1 nF	10%	63V	Cer.	602 310 02
C4,9-12,14	0.1 uF	10%	63V	Polyes.	622 510 00
C5	0.47 uF	10%	63V	Polyes.	622 547 01
C6	47 pF	+-2%	63V	Cer.	602 147 00
C7,13	2.2 uF	20%	25V	Tan.	652 622 02
C8	10 nF	-20+50%	63V	Cer.	602 410 01
C15	0.33 uF	20%	63V	Polyes.	622 533 01

TECHNICAL DESCRIPTION

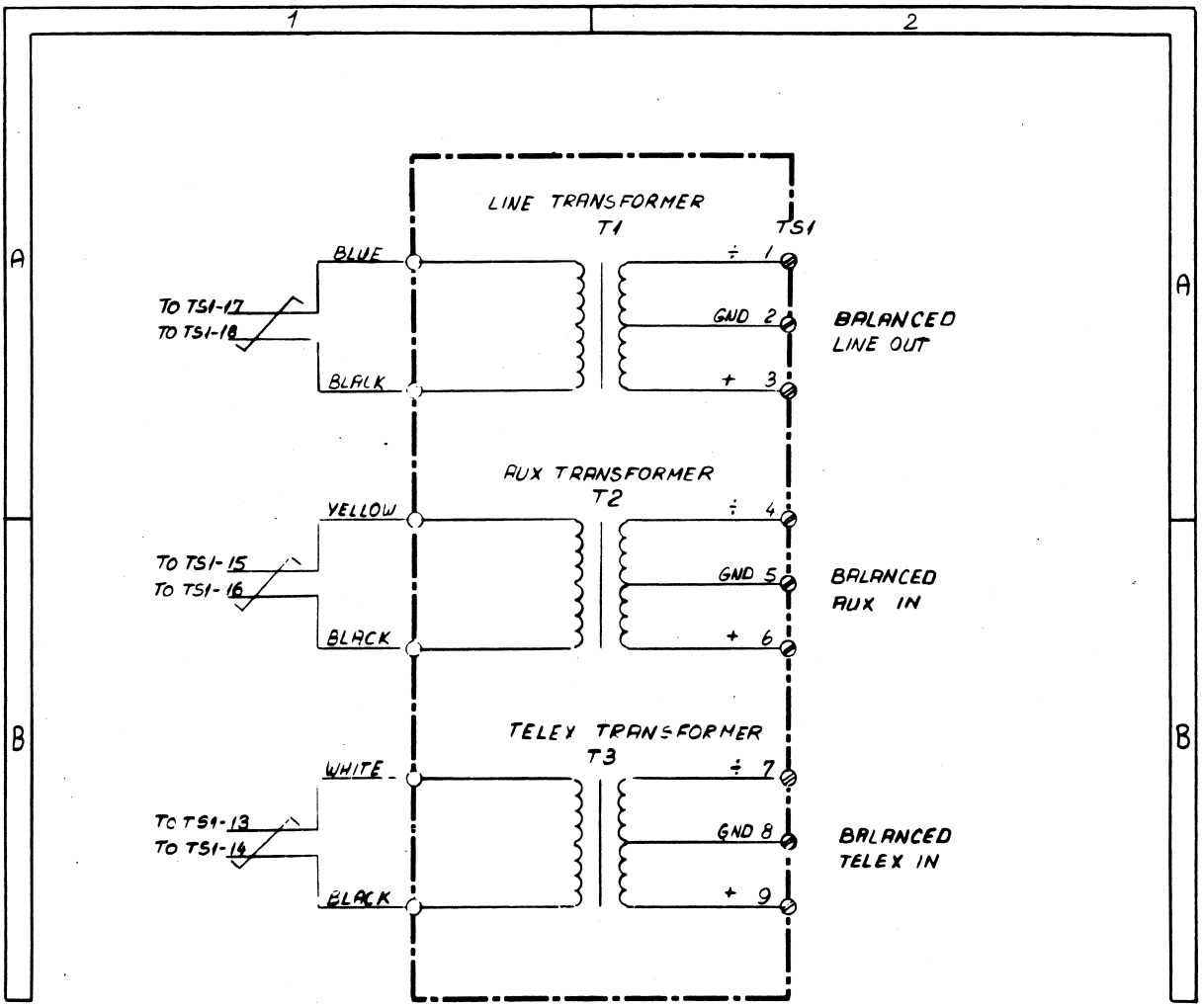
PCB [603] LINE TRANSFORMER BOARD

The Line Transformer Board is an optional available board which, when installed, is housed in the Control Unit and connected to 601-SK1. The Line Transformer Board, consisting of 3 transformers, converts the signals LINE OUT, AUX IN and TELEX IN to 600 ohms balanced lines, which enables external balanced peripherals to be connected to the equipment.



PCB 603 VERSION 1A.
LINE TRANSFORMER BOARD
VIEWED FROM COMPONENT SIDE

993 560 3X COMP

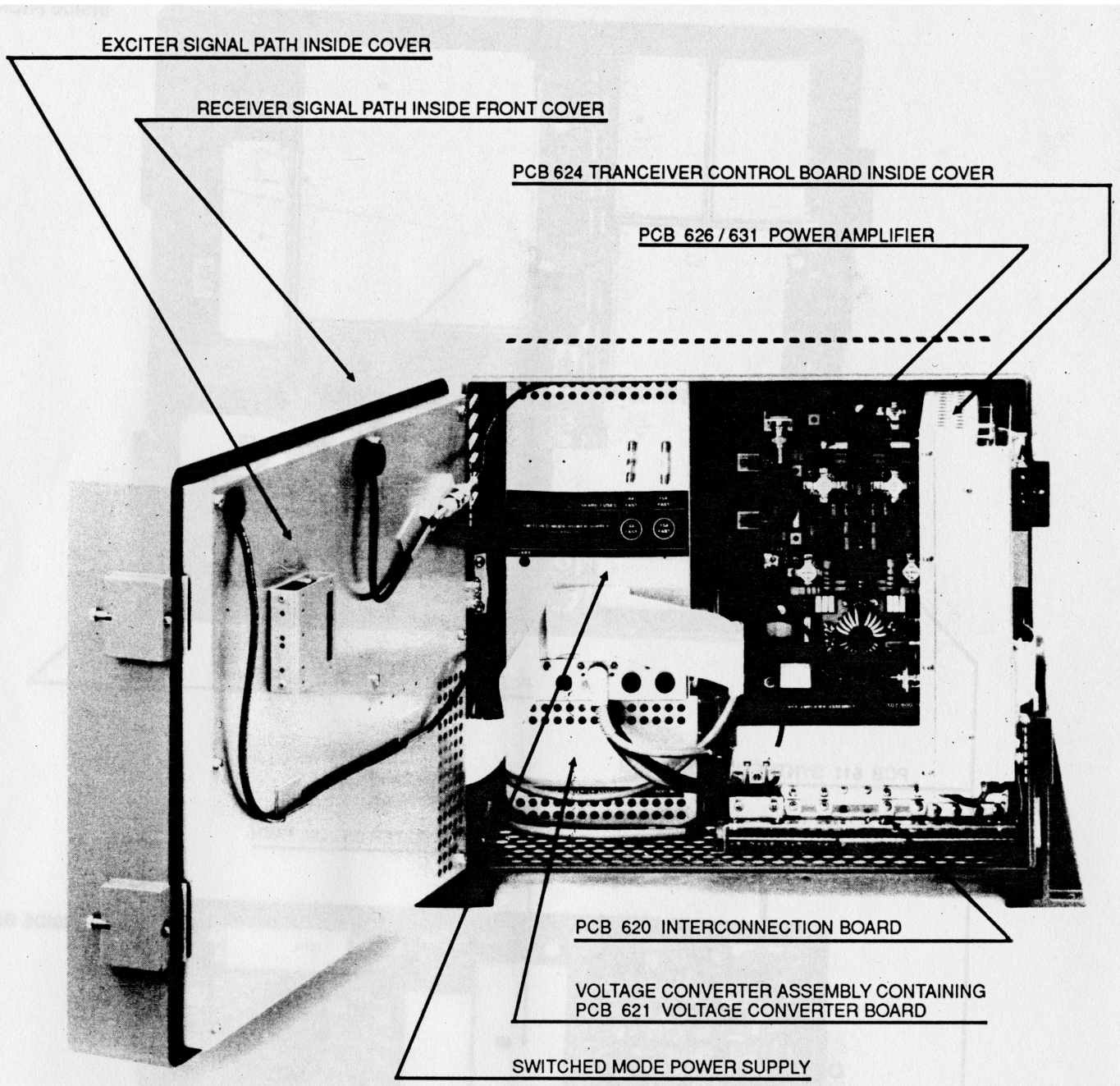


993 560 3X MAIN

PCB 603 LINE TRANSFORMER BOARD
VERSION 1A. MAIN DIAGRAM.

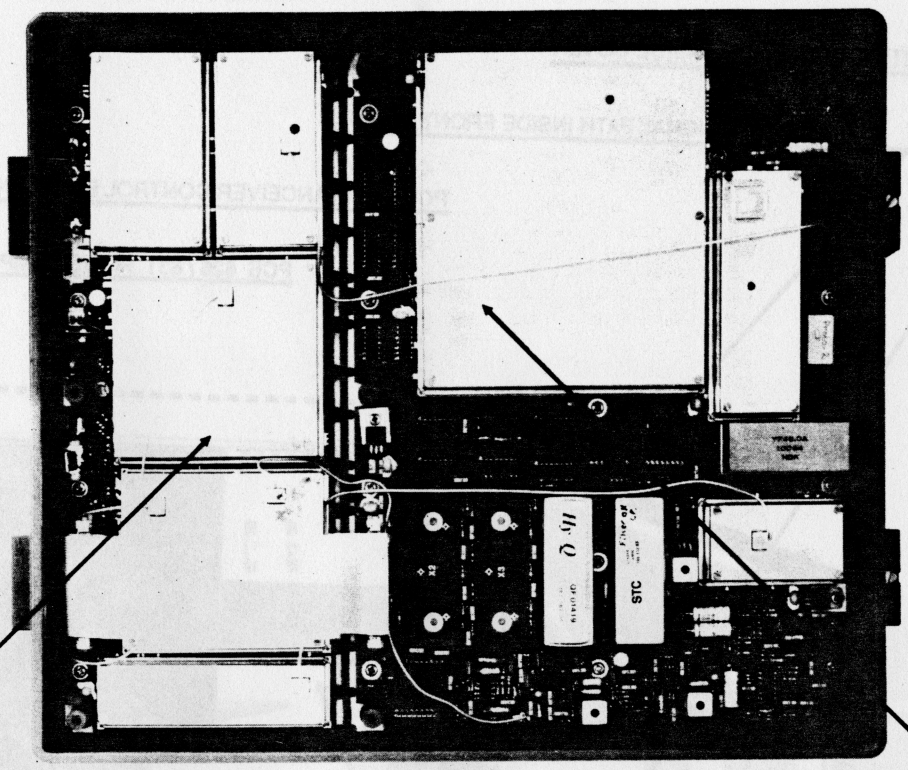
PARTS LIST FOR LINE TRANSFORMER BOARD 603 VERSION 1A

Printed Circuit Board Complete 603		107 560 31
TS1	TERMINAL STRIP	770 000 30
T1-3	TRANSFORMER TD3293	802 000 00



TRANSCEIVER UNIT 8250 D WITH FONT DOOR OPENED

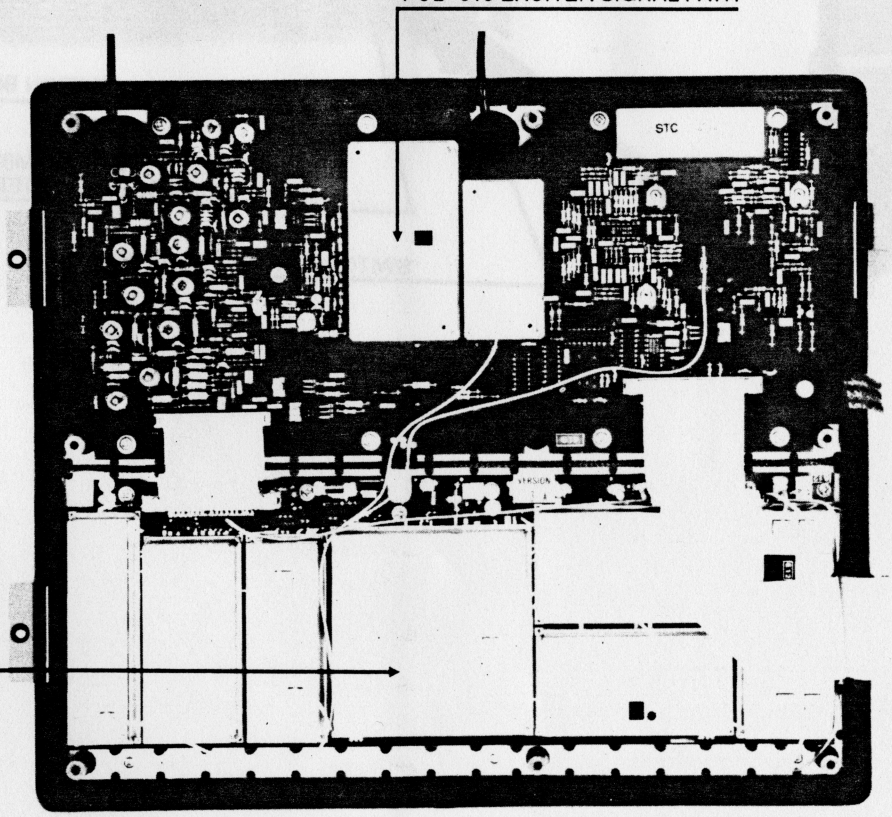
INSIDE FRONT COVER



PCB 618 RECEIVER SIGNAL PATH

PCB 611 SYNTHESIZER BOARDS

PCB 619 EXCITER SIGNAL PATH



INSIDE BACK COVER

INTERIOR OF TRANSCEIVER UNIT FRONT DOOR

ANTENNA TUNING UNIT

ALC/ MGC AND RX/EX KEY

SYNTH. STROBE DATA REGISTER

XTAL OSC AND WATCH DOG

PA/LP REGISTER AND RELAY DRIVERS

POWER CONDI-TIONER

MPU

PROGRAM ROM

TRANSCEIVER CONTROL BOARD 624

FILTER 1.6 – 2.31 MHz

FILTER 2.31 – 3.33 MHz

FILTER 3.33 – 4.80 MHz

FILTER 6.80 – 8.95 MHz

FILTER 12.23 – 17.65 MHz

FILTER 18.75 – 27.10 MHz

FILTER SHIFT

FILTER SHIFT

CEPT FILTER 627

DRIVER 1

DRIVER 2

DRIVER 3

POWER AMP.

BIAS DRIVER 3

BIAS POWER AMP.

DUPLEX ONLY

BALUN

RX/EX SIGNAL PATH

SYNTHE-SIZER(8)

MASTER-OSCILLA-TOR

RX/EX ASSEMBLY

INTERCONNECTION BOARD

620

SMPS CONTROL 622

SMPS DRIVER 623

INPUT FILTER AND MAINS RELAY

POWER CIRCUIT

OUTPUT FILTER

SWICHED MODE POWER SUPPLY

RECTI-FIER AND OUTPUT FILTER

POWER CIRCUIT

PROTEC-TION CIRCUIT

CONVER-TER DRIVER

VOLTAGE CONVERTER BOARD 621

KEYING CIRCUIT

THERMAL PROTECTION

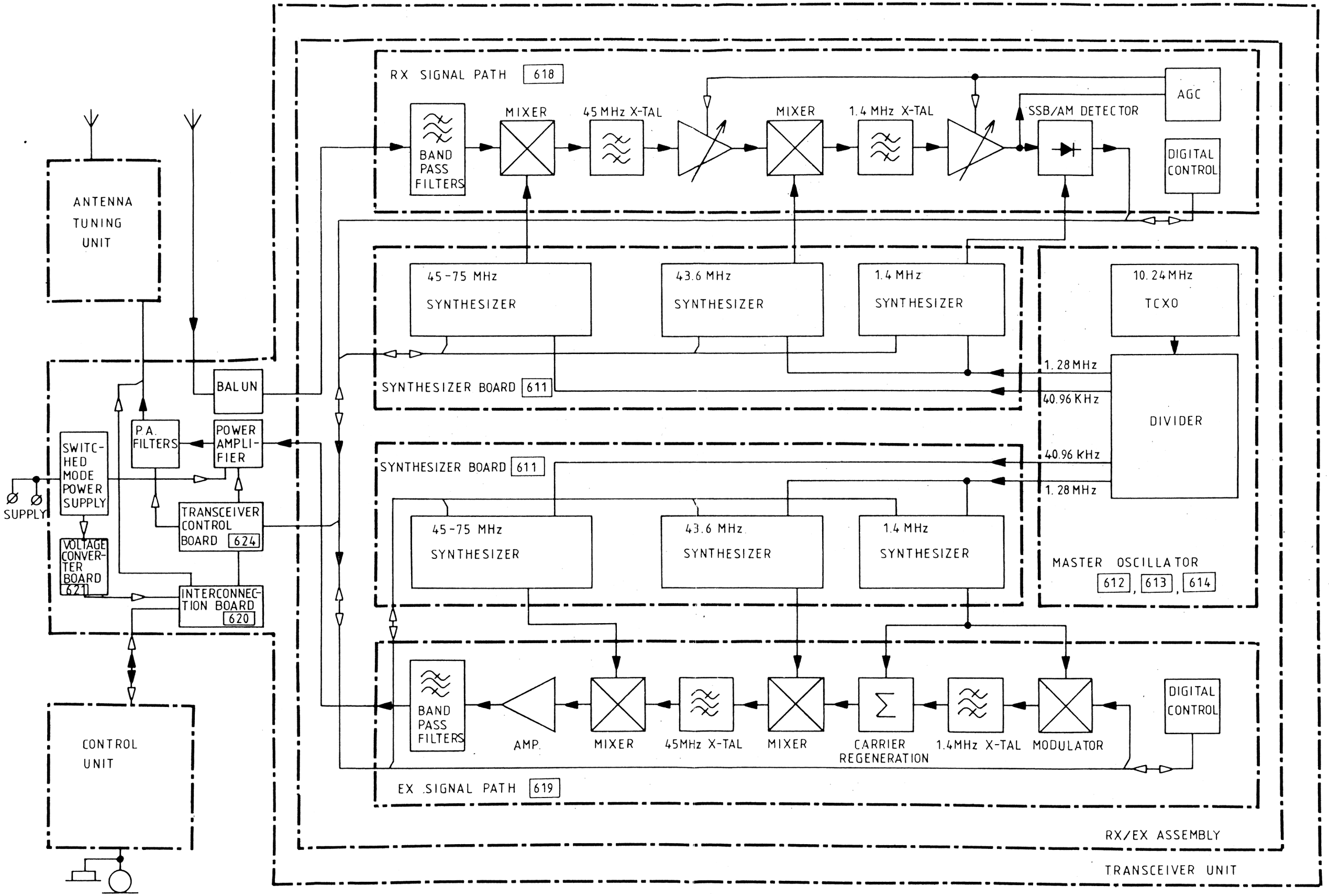
POWER AMPLIFIER 626

CONTROL UNIT

SUPPLY

TRANSCEIVER UNIT

TRP 825X S/D BLOCK DIAGRAM, TRANSCEIVER UNIT VERSION 1A.



TRP 8XXX D BLOCK DIAGRAM,
RX/EX ASSEMBLY, VERSION 1A

FROM RX/EX ASSEMBLY

PL1

TRANSCEIVER CONTROL BOARD
PCB 624

SWITCHED MODE
POWER SUPPLY

12/24/32V SUPPLY

TU-TS1

TU-C1

TU-C2

TU-C3

621PL1

SK12

GND
ENABLE
BATNEG
+48V

VOLTAGE
CONVERTER BOARD
PCB 621

GND
+5V
0V
PWRON
BATNEG

SK11

PL2

621SK1

PL1

-15V
+7V5
+15V
+24V
GND
GND

INTERCONNECTION BOARD
PCB 620

PL4

620SK1

SK1

TS1

TS2

TS3

FROM ANTENNA TUNING UNIT

FROM AUX. EQUIPMENT

FROM CONTROL UNIT

FOR MASTER OSCILLATOR 621 SK1
615,616 ONLY

FROM 621

-15V
+7.5V
+15V
+24V
GND
GND

PL1 SK1

TO 620 PL1

CONNECTOR BOARD
PCB 695

SK2

+15V
GND
-15V
GND

TO MASTER OSCILLATOR
615,616

621SK2

0V
+5V
GND

BATNEG

+48V

SK10

SK9

PL3

PL2

PL1

FROM EXCITER
(PL4 IMPULSE IN
619PL1 DUPLEX)

SK2

RF INPUT

POWER
AMPLIFIER BOARD
PCB 626
PCB 631

PL3

PL4

(ALCCHECK)
(PA PEAK)
(TC1)
(PAATT)
(PAKEY)
(TX ON/OFF)
GND

SK3

RF OUTPUT

627PL1

627SK1

GND
FIL PEAK
(FIL SEL -)
(FIL TYP 3)
(FIL SEL 2)
(FIL TYP 2)
(FIL SEL 1)
(FIL TYP 1)
(FIL SEL 0)
(FIL TYP 0)

R.F. FILTERS
PCB 627
PCB 628
PCB 629

"Tx"
627/628/629 SK2

AF OUT

TO ANTENNA
TUNING UNIT OR
50 OHM ANTENNA
OR 50 OHM
ANTENNA RELAY
630 PL1 (OPTIONAL)

MF-OUT
(PCB 628 ONLY)

628SK3

SIMPLEX ONLY

630 PL1

TO 627/628/
629 SK2

TO Rx/Ex
SIGNAL PATH
610 SK1

50 OHM ANTENNA
RELAY
PCB 630
(OPTIONAL)

PL2

SK1

TU-PL1

"ANT/ATU"
TU-SK1

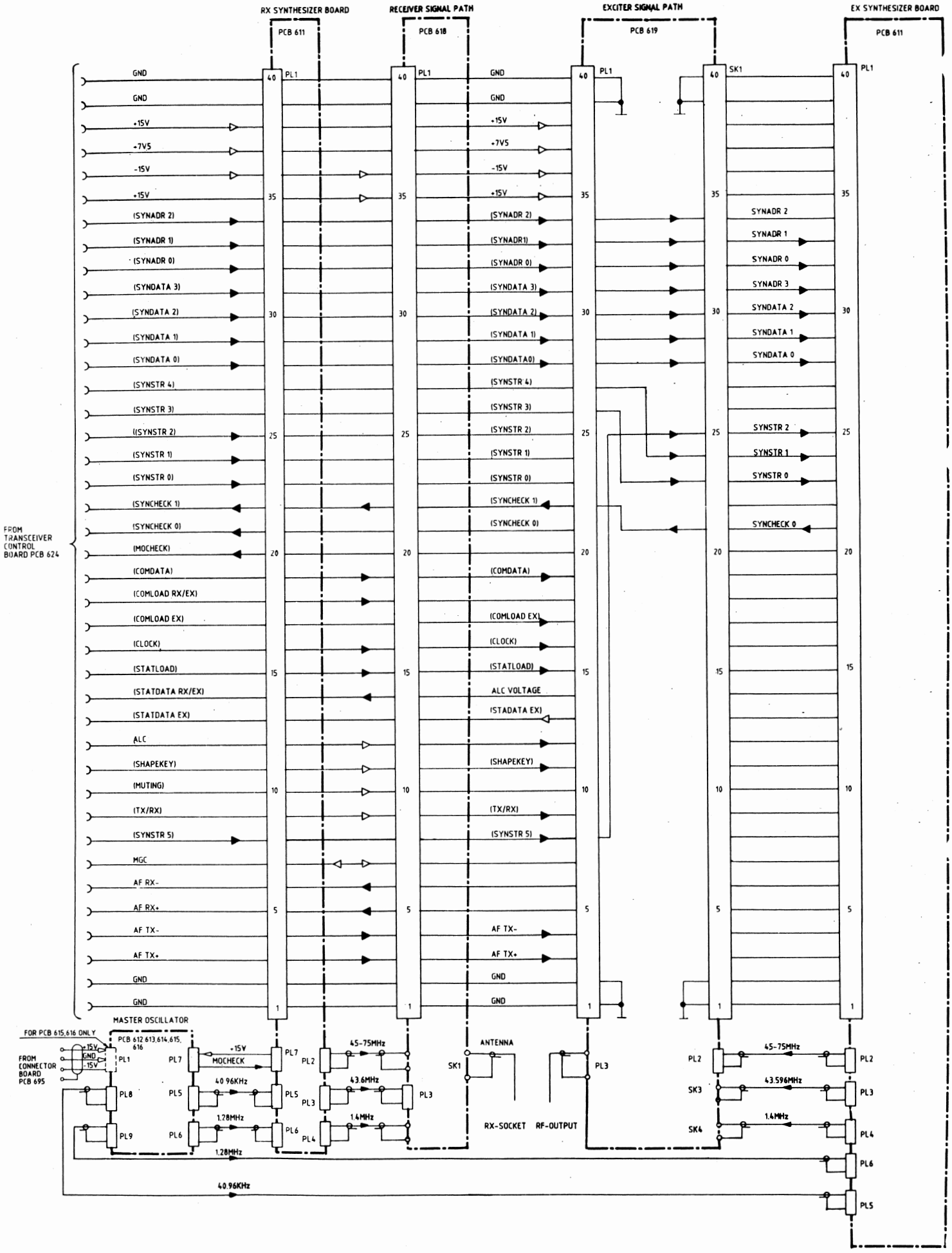
TO ANTENNA
TUNING UNIT OR
50 OHM ANTENNA

TO 620 TS 1 - 12 y
TO 620 TS 2 - 4 y
TO 620 TS 2 - 10 bk

+15V
TX KEYED
GND

993 695 1X B

TRP 825X S/D INTERCONNECTION DIAGRAM
TRANSCEIVER UNIT VERSION 1A



INTERCONNECTION DIAGRAM
TRANSCEIVER UNIT, Rx/Ex ASSEMBLY DUPLEX VERSION

993 694 6X C

PARTS LIST FOR TRANSCEIVER UNIT

Transceiver Unit complete					108 600 10
RX/EX Assembly					107 605 00
PCB 620 Interconnection Board					107 562 01
PCB 624 Transceiver Control Board					107 562 42
Power Amplifier Assembly					107 600 10
Switched Mode Power Supply SMPS					107 600 20
Voltage Converter Assembly					107 600 90
Flat ribbon cable for Power Amplifier Assembly					373 571 63
TU-C1,2	6.8 uF	10%	100V	Polyes.	623 668 01
TU-C3	10 uF	10%	63V	Polyes.	622 710 00
TU-SK1	UHF-socket and cable				106 602 90
TU-TS1	Terminal strip 3-pole				770 000 21

PARTS LIST FOR TRANSCEIVER UNIT, RX/EX ASSEMBLY

RX/EX Assembly complete		107 605 00
PCB 611 Synthesizer Board	2 pcs.	107 561 11
PCB 612 Master Oscillator		107 561 21
PCB 618 Receiver Signal Path		107 561 81
PCB 619 Exciter Signal Path		107 561 91
Ribbon cable 40-lead		373 638 23
Coax cable 2+3 LO reference		106 600 30
Coax cable 1.LO reference		106 600 40
Cable for synthesizer		106 600 50
Coax cable		106 606 10
Coax cable		106 606 20
Coax cable		106 606 30
Coax cable		106 606 50

TECHNICAL DESCRIPTION

PCB [611] SYNTHESIZER BOARD

45-75 MHz Synthesizer

The 45-75 MHz Synthesizer is of the Fractional-N type and has a frequency resolution of 10 Hz. The 40.96 kHz reference frequency derived from the Master Oscillator [612] is fed to both Phase Comparator and Phase/Frequency Comparator. Likewise the output signal of the Loop Divider is fed to both comparators. When the loop is locked the Phase/Frequency Comparator is turned off and there exists no difference in frequency, but a definite and time varying phase difference between the reference signal and the Loop Divider output signal. The Phase Comparator compares the phase of the two signals and if it differs from the steady state value, the Phase Comparator will produce a correction signal, which via the Loop Filter corrects the frequency and phase of the VCO until the steady state phase difference is reestablished. If the phase difference exceeds the limits of the Phase Comparator, for example during change of the synthesizer output frequency, the Phase/Frequency Comparator is automatically turned on. It will override the Phase Comparator by producing a correction signal which via the Loop Filter will alter the frequency and phase of the VCO until the difference between the reference signal and the Loop Divider output signal is well inside the working limits of the Phase Comparator. After a short amount of time the Phase/Frequency Comparator is turned off and the Phase Comparator takes over again ending up with the steady state locked condition. The Loop Filter is capable of changing parameters when required by means of four diodes. When the loop is locked the diodes are turned off, and in this condition the Loop Filter is designed to prevent noise modulation of the VCO and to give the loop a good dynamic response. During a major change in the synthesizer output frequency the diodes are turned on, and in this case the Loop Filter is designed to give the loop a fast dynamic response. The VCO covers a frequency range of 45-75 MHz which is divided in 4 bands. The bands are selected by the microprocessor on the Transceiver Control Board [624]. The amplitude stabilized output signal of the VCO is split between two buffer amplifiers. One for the output signal of the synthesizer, which is led to the 1st mixer on the Rx/Ex Signal Path [610], the other buffer amplifier drives the input of the Loop Divider. The Transceiver Control Board determines the output frequency of the synthesizer by loading the corresponding division ratio into the Loop Divider and the Binary Accumulator. The integer part of the division ratio is stored in the Loop Divider and the fractional part is fed to the one input of the Binary Accumulator. The 12-bit Binary Accumulator enables 10 Hz resolution of the synthesizer output frequency. The output of the Binary Accumulator is fed back to one of it's own inputs and in that way added to the fractional division ratio fed to the other input. The sum is transferred to the output of the Binary Accumulator when it receives an Accumulator Clock Signal. This happens in every period of the loop divider output frequency. When the sum exceeds the maximum capacity (4095) of the Binary Accumulator, it produces an Accumulator Carry Signal, and the remainder of the contents is kept for the next addition. The carry signal increases the division ratio of the Loop Divider by one. The loop will respond to this increase by producing an output frequency

corresponding to the fractional division ratio. The time varying phase difference between the reference signal and the loop divider output signal, caused by the said increase in the division ratio, is a function of the fractional division ratio. This function is derived from the output of the Binary Accumulator and converted into a current by the DA-Converter. The current is fed to the Phase Comparator where it cancels the signal produced by the time varying phase difference and thus preventing modulation of the VCO. The frequency information, loaded by the microprocessor on the Transceiver Control Board [624], is fed to the Ramp Current Generator, resulting in a current directly proportional to the output frequency of the synthesizer. As the Ramp Current controls the gain of the Phase Comparator, the dynamic response of the loop is held constant over the entire frequency range of the synthesizer. If the said cancellation of the time varying phase difference isn't complete, the Ramp Current Correction circuit measures the error at the Phase Comparator output and automatically adjusts the Ramp Current Generator until cancellation is obtained. Two signals derived from the Phase Comparator and the Phase/Frequency Comparator are combined in a check circuit with the check signals from the 43.6 MHz and 1.4 MHz Synthesizer resulting in a final check signal led to the Transceiver Control Board.

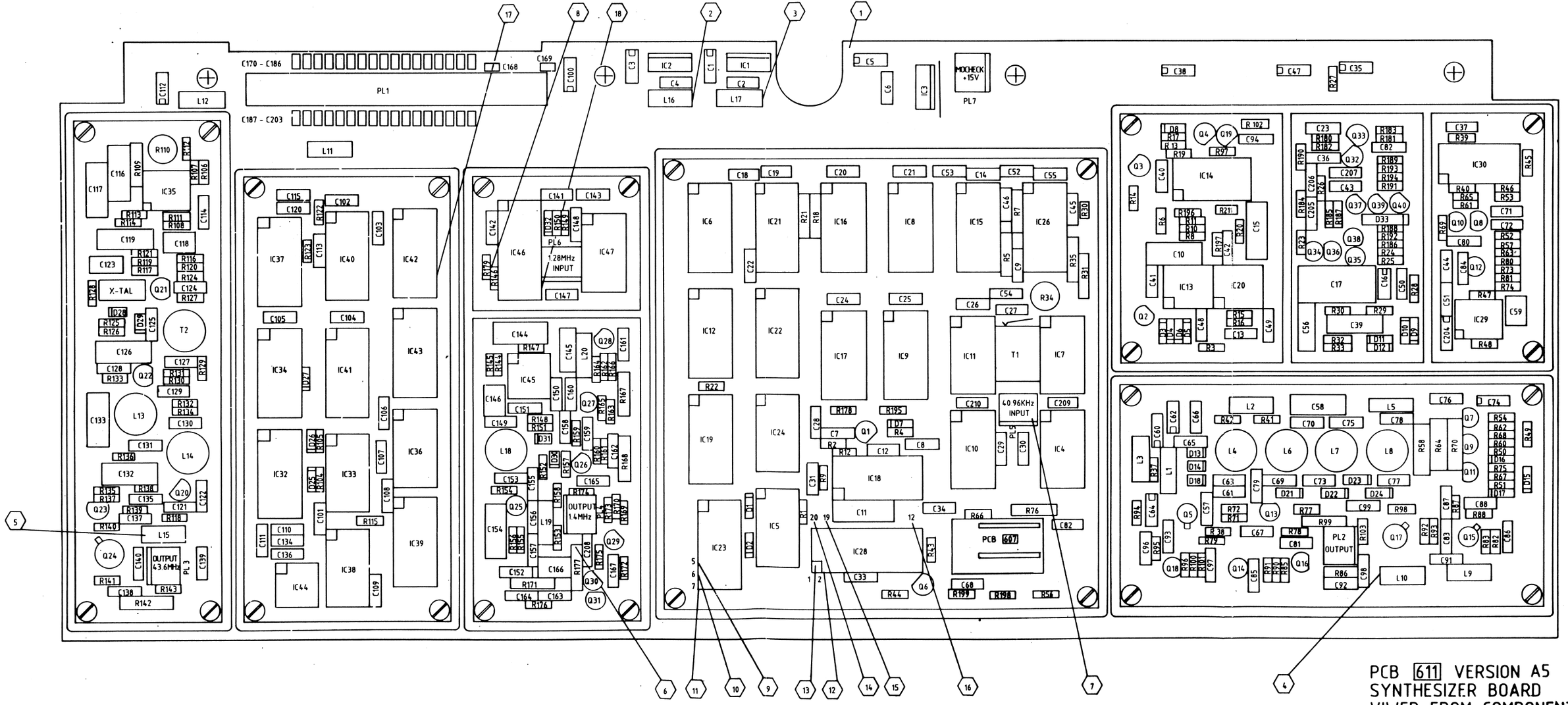
43.6 MHz Synthesizer

The synthesizer used is of the fractional-N type, which refers to the fact that the smallest step in output frequency is not equal to the reference frequency but a fractional part of this. From the Master Oscillator [612] a 1.28 MHz signal is led to the Reference Divider which divides the signal by 10 having a 128 kHz reference frequency at the input of the Phase/Frequency Comparator. The 128 kHz reference frequency and the output frequency of the Loop Divider are compared in the Phase/Frequency Comparator. When the loop is locked there exists no difference in frequency but a definite and time varying phase difference between the two signals. If the loop is out of lock the Phase/Frequency Comparator will produce a correction voltage which will alter the frequency and phase of the VCXO until the loop is back in the locked condition. The Loop Filter is designed to give the loop a good dynamic response and to stop noise modulation of the VCXO. The VCXO covers a frequency range of 14.53333 MHz +1.333 kHz/-1 kHz. The output signal of the VCXO is fed to the Tripler where the frequency is multiplied by 3, resulting in a synthesizer frequency of 43.6 MHz + 4 kHz - 3 kHz. The signal from the Tripler is amplified in the Buffer Amplifier and the level-stabilized output signal is led to the 2nd Mixer on the Rx/Ex Signal Path [610]. Another signal derived from the Buffer Amplifier is fed to the input of the Loop Divider. A 7-bit Binary Accumulator is incorporated in order to obtain a fractional division ratio in the loop, giving a 1 kHz step capability of the synthesizer output frequency. By loading the fractional division ratio into the input of the Binary Accumulator, the microprocessor on Transceiver Control Board determines the output frequency of the synthesizer. The other input of the Binary Accumulator is connected to its output. The two inputs are added and the sum is transferred to the output when the Binary Accumulator is clocked. The clock input is connected to the output of the Loop Divider. When the sum exceeds the maximum capacity (127) of the Binary Accumulator it produces an Accumulator Carry Signal which increases the ratio of the Loop Divider by one,

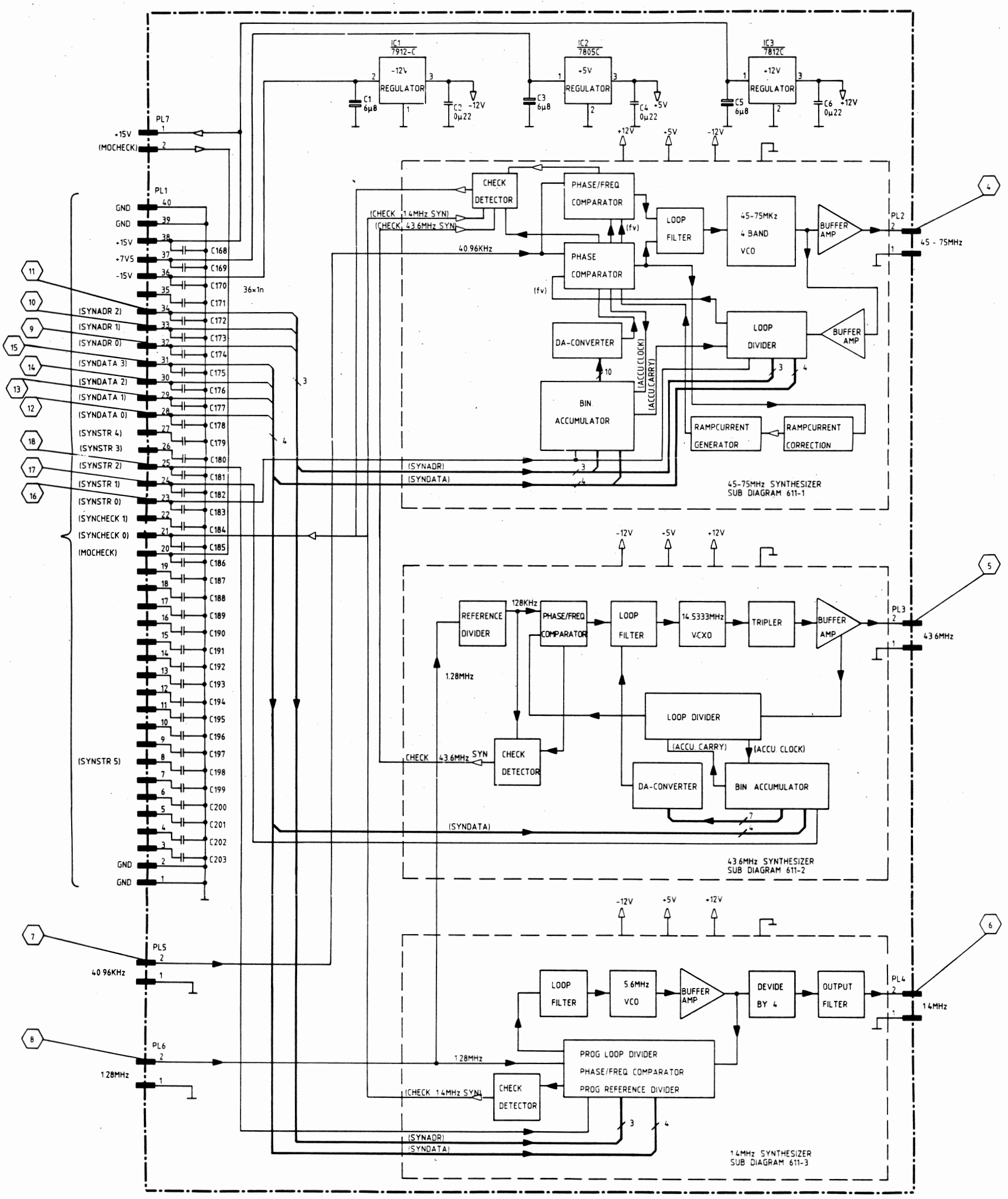
and the remainder of the accumulator contents is kept for the next addition. The loop responds to this increase by producing an output frequency corresponding to the fractional division ratio. As a result of the variation in the division ratio, the phase difference between the reference frequency and the output frequency of the Loop Divider will be varying and a function of the fractional division ratio. This function is derived from the output of the Binary Accumulator and converted into a voltage by the DA-converter. The output signal of the Phase/Frequency Comparator caused by time varying phase difference is canceled at the input of the Loop Filter by the output voltage of the DA-converter, and thus preventing modulation of the VCXO. The 128 kHz reference frequency and a signal derived from Phase/Frequency Comparator are combined in the Check Detector to give information of the synthesizer lock status.

1.4 MHz Synthesizer

The synthesizer consists of a Loop Filter, a 5.6 MHz VCO, a Buffer Amplifier and a single integrated circuit which contains both Reference Divider, Loop Divider and Phase/Frequency Comparator. The division ratio of the Reference Divider and the Loop Divider are controlled by the microprocessor on the Transceiver Control Board [624]. A 1.28 MHz signal from the Master Oscillator [612] is fed to the input of the Reference Divider and divided by 3200, thus obtaining a reference frequency of 400 Hz as well as a frequency step size of 400 Hz for the synthesizer loop. The reference frequency and the Loop Divider output frequency are compared in the Phase/Frequency Comparator. In the locked condition there exists no difference between the two signals neither in frequency nor in phase. If a difference occurs, say during a change of the synthesizer output frequency, the Phase/Frequency Comparator will produce a correction voltage which will correct the frequency and phase of the VCO until the locked condition is obtained again. The Loop Filter is designed to give the loop a proper dynamic response and to prevent noise from modulating the VCO. The 5.6 MHz VCO covers the frequency range from 5.582 MHz to 5.612 MHz. The output signal of the VCO is amplified in the Buffer Amplifier and then split into two, one for the input of the Loop Divider and one for the Divide-by-4 circuit. The output frequency range of the Divide-by-4 circuit is 1.4 MHz + 3 kHz/4.5 kHz and the frequency step size is 100 Hz. The output signal of the Divide-by-4 circuit is fed to the Output Filter where the harmonics of the signal are reduced and the exact output level is set. The output signal is led to the 3rd Mixer on the Rx/Ex Signal Path [610]. A check detector is incorporated to indicate the lock status of the synthesizer.

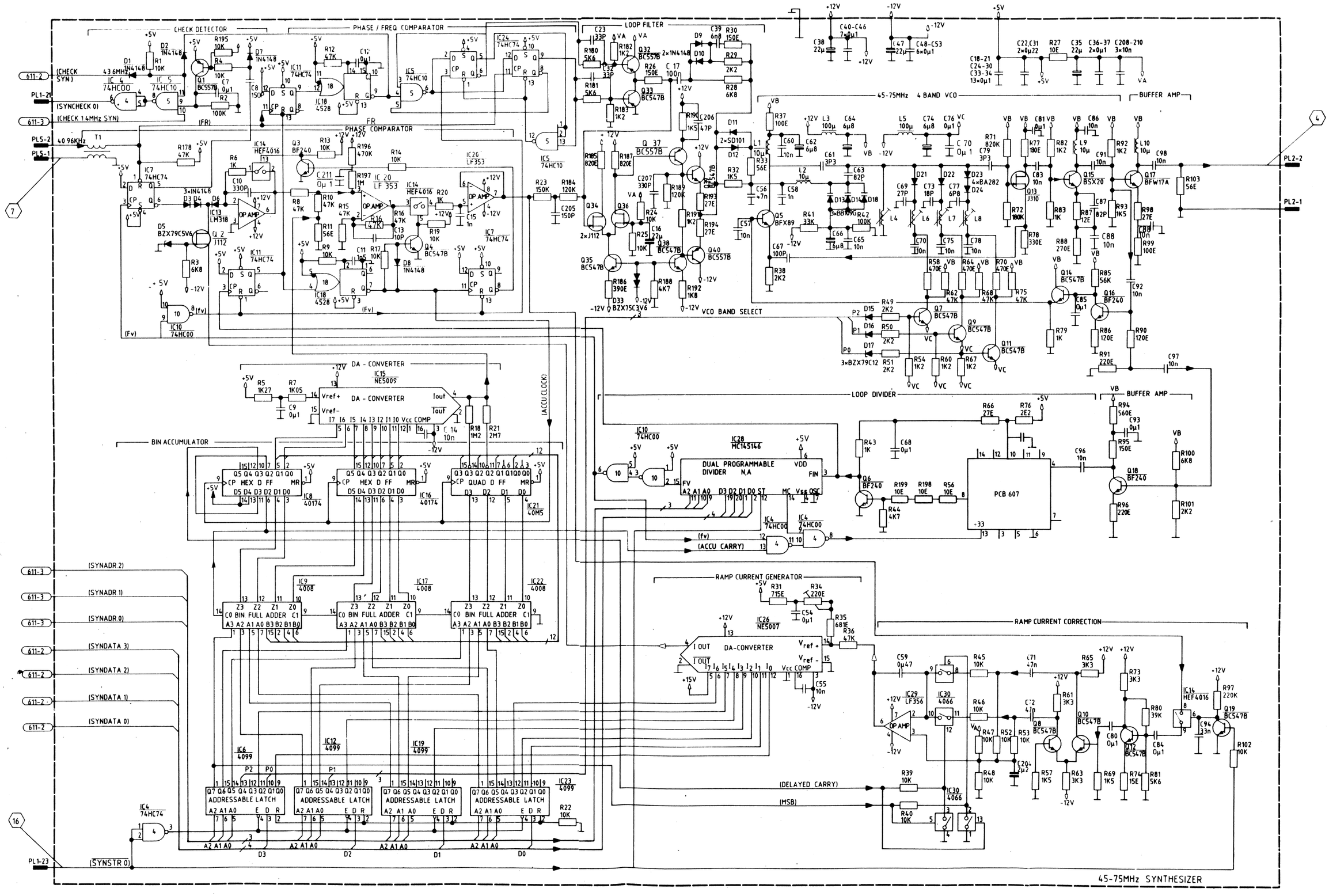


993 561 1X COMP



993 561 1X MAIN

PCB 611 SYNTHESIZER BOARD
VERSION A5 MAIN DIAGRAM



PCB 611 SYNTHESIZER BOARD
VERSION A5 SUBDIAGRAM 1 OF 3

993 561 1X SUB1

14.5333MHz VCXO

TRIPLER

BUFFER AMP

REFERENCE DIVIDER

PHASE/FREQ COMPARATOR

LOOP FILTER

LOOP DIVIDER

BIN. ACCUMULATOR

CHECK DETECTOR

DA-CONVERTER

43.6MHz

128MHz

(CHECK 436MHz SYN)

(ACCUMULATOR CLOCK)

(ACCUMULATOR CARRY)

(SYNSTR 1)

(SYNDATA 3)

(SYNDATA 2)

(SYNDATA 1)

(SYNDATA 0)

436MHz SYNTHESIZER

PCB 611 SYNTHESIZER BOARD
VERSION A5 SUBDIAGRAM 2 OF 3

+5V
L16 22µ
C141 0µ22
C142 0µ1
C143 0µ1
+5V

+12V
L17 100µ
C147 0µ22
C150 0µ1
+12V

-12V
-12V
C151 0µ1

LOOP FILTER
5.6MHz VCO
BUFFER AMPLIFIER
DIVIDE BY4
OUTPUT FILTER

+12V
R153 470E
C152 47n
L19 220µ
R155 100K
R157 27K
C153 47n
C153 82P
Q25 BF240
R159 2K7
R162 39K
C158 10n
Q26 BF240
R160 150E
R164 1K5
Q27 BF240
L20 100µ
+5V
C160 0µ1
Q28 BF240

C144 6n8
R147 270K
C145 47n
+12V
R146 12K
R144 22K
OP AMP
IC45 LF356
R148 18K
R151 100K
C149 10n
-12V
C146 0µ47
R145 5K6
2×BB109G
D30
D31
R152 68K
L18

C154 1n2
R154 22K
R156 15K
C156 4n7
R158 10K
R161 560E
R163 10K
R165 150E
R166 680E

IC47 74HC74
D CP S R Q
C161 33n
R167 4K22
R168 4K22
C162 27P

+12V
R169 220K
R172 10K
C167 0µ1
C208 2P7
Q30
3×BF240
Q29
Q31
C163 10n
R171 2K49
C164 33P
C166 0µ33
R177 48K7
1.4MHz
6
PL4 - 2
PL4 - 1
R173 220E
R170 68K
C165 47n
R174 3K9
R175 3K9
R176 390E

8
611-2
PL6-2
PL6-1
611-1
PL1-25
611-1
611-1
611-1
611-1
611-1
611-1
611-1
611-1

IC46 MC145145
CP_R CP_V OSC_OUT F_REF OUT V_DD V_SS
PD_OUT
F_REF
F_IN
PROG. LOOP DIVIDER
PHASE/FREQ. COMPARATOR
PROG. REFENCE DIVIDER
LD ST A2 A1 A0 D3 D2 D1 D0
5.6MHz
1.28MHz
R179 47K
+5V
CHECK DETECTOR
R149 220K
R150 1K
D32 1N4148
C148 0µ22
(CHECK 1.4MHz SYN)
(SYNSTR 2)
(SYNADR 2)
(SYNADR 1)
(SYNADR 0)
(SYNDATA 3)
(SYNDATA 2)
(SYNDATA 1)
(SYNDATA 0)

1.4MHz SYNTHESIZER

PCB 611 SYNTHESIZER BOARD
VERSION A5 SUBDIAGRAM 3 OF 3

TESTPOINTS FOR 611 SYNTHESIZER BOARD

(1) - 12V DC

(2) +5V DC

(3) +12V DC

(4) OUTPUT 1.LO. 45-75Mhz synthesizer 1,5 Vpp

SELF TEST #	F OUT
9	45 Mhz
10	52.5Mhz
11	52.5Mhz
12	60 Mhz

SELF TEST #	F OUT
13	60 Mhz
14	67.5 Mhz
15	67.5 Mhz
16	75 Mhz

(5) OUTPUT 2.LO. 43.6Mhz SYNTHESIZER
SELF TEST # 17 F OUT = 43.597 Mhz 2 Vpp
SELF TEST # 18 F OUT = 43.603 Mhz 2 Vpp

(6) OUTPUT 3.LO. 1.4 Mhz SYNTHESIZER
SELF TEST # 20 F OUT = 1.3955 Mhz 650 mVpp
SELF TEST # 21 F OUT = 1.403 Mhz 650 mVpp

(7) 40,96 KHz FROM MASTER OSCILLATOR

(8) 1.28 Mhz 5Vpp FROM MASTER OSCILLATOR

(9) SYNADR 0 (IC 23 PIN 5)

(10) SYNADR 1 (IC 23 PIN 6)

(11) SYNADR 2 (IC 23 PIN 7)

(12) SYNDATA 0 (IC 28 PIN 2)

(13) SYNDATA 1 (IC 28 PIN 1)

(14) SYNDATA 2 (IC 28 PIN 20)

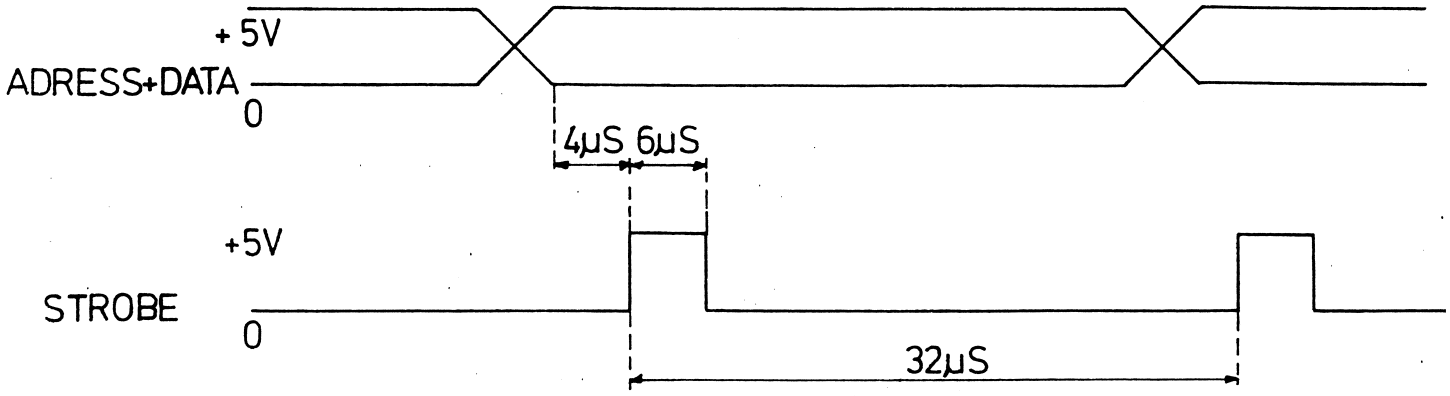
(15) SYNDATA 3 (IC 28 PIN 19)

(16) SYNSTR 0 (IC 28 PIN 12)

(17) SYNSTR 1 (IC 42 PIN 9)

(18) SYNSTR 2 (IC 46 PIN 11)

TIMING DIAGRAM



The strobe pulse is generated at each update of the frequency. e.g. the self test's # 9 to 21. or by repeating the test by pressing "DIMMER DOWN".

Printed Circuit Board Complete 611		107 561 11
PCB	Prescaler PCB 607	107 560 71
IC1	7912CU	850 791 20
IC2	MA7805	850 780 50
IC3	MA7812	850 781 20
IC4,10,36	MC74HC00N	850 740 04
IC5	MC74HC10N	850 741 03
IC6,12,19,23	CD4099BCN	850 409 90
IC7,11,24,38,47	MC74HC74N	850 747 42
IC8,16,41,42	CD40174BCN	854 017 40
IC9,17,22,40,43	CD4008BCN	850 400 80
IC13	LM318N	850 031 80
IC14	HEF4016BP	850 401 60
IC15	NE5009N	850 500 90
IC18	CD4528B	850 452 80
IC20,35	LF353	850 035 30
IC21	CD40175BCN	854 017 50
IC26,37	NE5007	850 500 70
IC28	MC145146P	851 451 46
IC29,45	LF356	850 035 60
IC30	CD4066BC	850 406 60
IC32	74C160	857 416 01
IC33	CD4013B	850 401 30
IC34	CD4046B	850 404 60
IC39	MC74HC161N	857 416 10
IC44	MC3393P	850 339 30
IC46	MC145145P	851 451 45
Q1,32,37,40	BC557B	840 055 70
Q2	J112	843 011 20
Q3,6,16,18,20-23,25-31	BF240	840 024 00
Q4,7-12,14,19,33,35,38,39	BC547B	840 054 70
Q5	BFX89	840 089 00
Q13	J310	840 031 03
Q15	BSX20	840 002 00
Q17,24	BFW17A	840 001 70
Q34,36	J112 MATCHED	843 011 21

PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 5A

D1-4,6-10,25-27,32	1N4148				830 414 80
D5	BZX79C5V6				832 795 61
D11,12	SD101C				830 010 10
D13,14,18,28-31	BB109				833 010 90
D15-17	BZX79C12				832 791 21
D21-24	BA282				830 028 20
D33	BZX75C3V6				832 753 60
X1	14.5333MHZ				383 570 71
R1,4,9,13,14,17,19,22,24,25,39,40,45-48,52-53,102,106-108,115,118,136,158,163,172,195	10 kohm	5%	1/8W	MF	500 410 01
R2,42,111,126,128,151,155	100 kohm	5%	1/8W	MF	500 510 00
R3,28,100	6.8 kohm	5%	1/8W	MF	500 368 00
R5	1.27 kohm	1%	1/4W	MF	511 312 70
R6,20,43,79,83,150	1 kohm	5%	1/8W	MF	500 310 00
R7	1.05 kohm	1%	1/4W	MF	511 310 50
R8,10,12,15,16,36,62,68,75,117,178,179	47 kohm	5%	1/8W	MF	500 447 00
R11,33,103,143	56 ohm	5%	1/8W	MF	500 156 00
R18	1.2 Mohm	5%	1/4W	MF	501 612 00
R21	2.7 Mohm	5%	1/4W	MF	501 627 00
R23	150 kohm	5%	1/8W	MF	500 515 00
R26,30,95,160,165	150 ohm	5%	1/8W	MF	500 215 00
R27,56,141,198,199	10 ohm	5%	1/8W	MF	500 110 01
R29,38,49,50-51,101,133	2.2 kohm	5%	1/8W	MF	500 322 00
R31	715 ohm	1%	1/4W	MF	511 271 50

PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 5A

R32,57,69,93, 164,190	1.5 kohm	5%	1/8W	MF	500 315 00
R34	220 ohm			Pot.	583 222 00
R35	681 ohm	1%	1/4W	MF	511 268 10
R37,112,129,134, 137	100 ohm	5%	1/8W	MF	500 210 00
R41,114,116	33 kohm	5%	1/8W	MF	500 433 00
R185,187	820 ohm	5%	1/8W	MF	500 282 00
R54,60,67,82, 92,182,183,191	1.2 kohm	5%	1/8W	MF	500 312 00
R153	470 ohm	5%	1/8W	MF	500 247 00
R58,64,70	470 ohm	5%	1/2W	Car.	502 247 00
R61,63,65,73, 140,175	3.3 kohm	5%	1/8W	MF	500 333 00
R66,98,193,194	27 ohm	5%	1/8W	MF	500 127 00
R71	820 kohm	5%	1/8W	MF	500 582 00
R72	180 kohm	5%	1/8W	MF	500 518 00
R74	15 ohm	5%	1/8W	MF	500 115 00
R76	2.2 ohm	5%	1/4W	Car.	501 022 00
R77	180 ohm	5%	1/8W	MF	500 218 01
R78	330 ohm	5%	1/8W	MF	500 233 00
R80,162	39 kohm	5%	1/8W	MF	500 439 00
R81,105,135,145, 180,181	5,6 kohm	5%	1/8W	MF	500 356 00
R85	56 kohm	5%	1/8W	MF	500 456 00
R86,90	120 ohm	5%	1/8W	MF	500 212 00
R87	12 ohm	5%	1/8W	MF	500 112 00
R88	270 ohm	5%	1/8W	MF	500 227 00
R91,96,121,139, 173	220 ohm	5%	1/8W	MF	500 222 00
R166	680 ohm	5%	1/8W	MF	500 268 00
R97,149,169	220 kohm	5%	1/8W	MF	500 522 00
R99	100 ohm	5%	1/4W	Car.	501 210 00
R104	680 kohm	5%	1/4W	MF	500 568 00
R109	237 kohm	1%	1/4W	MF	511 523 70
R110	47 kohm			Pot.	583 447 01
R113,125,196	470 kohm	5%	1/8W	MF	500 547 00
R119,130,170,152	68 kohm	5%	1/8W	MF	500 468 00
R120,156	15 kohm	5%	1/8W	MF	500 415 00
R122-123,159	2.7 kohm	5%	1/8W	MF	500 327 00

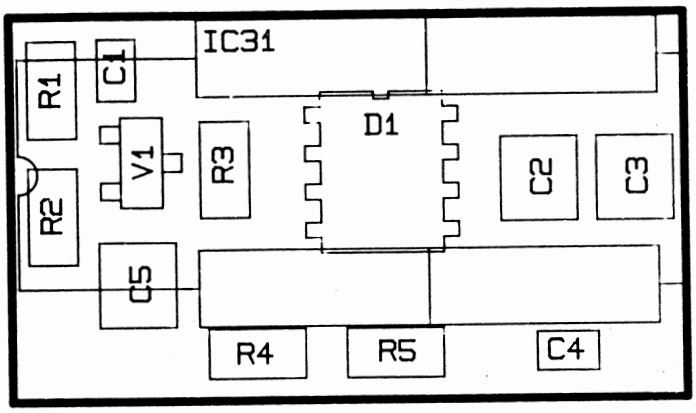
PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 5A

R44,124,132,188	4.7 kohm	5%	1/8W	MF	500 347 00
R127,146	12 kohm	5%	1/8W	MF	500 412 00
R131,144,154	22 kohm	5%	1/8W	MF	500 422 00
R138	47 ohm	5%	1/8W	MF	500 147 00
R142	150 ohm	5%	1/2W	Car.	502 215 00
R147	270 kohm	5%	1/8W	MF	500 527 00
R148	18 kohm	5%	1/8W	MF	500 418 00
R157	27 kohm	5%	1/8W	MF	500 427 00
R94,161	560 ohm	5%	1/8W	MF	500 256 00
R167,168	4.22 kohm	1%	1/4W	MF	511 342 20
R171	2.49 kohm	1%	1/4W	MF	511 234 90
R174	3.9 kohm	5%	1/8W	MF	500 339 00
R176,186	390 ohm	5%	1/8W	MF	500 239 00
R177	48.7 ohm	1%	1/4W	MF	511 148 70
R184,189	120 kohm	5%	1/8W	MF	500 512 00
R192	1.8 kohm	5%	1/8W	MF	500 318 00
R197	1 Mohm	5%	1/8W	MF	500 610 00
C1,3,5	6.8 uF	-20+50%	25V	Sol.al.	652 668 01
C2,4,6,22,31, 141,147,148	0.22 uF	10%	63V	Polyes.	622 522 01
C7,9,12,18-21, 24-30,33,34, 36-37,40-46, 48-54,68,76, 80-82,84-85, 93,101-111,113-115, 139,142-143, 150-151,160,167,211	0.1 uF	10%	63V	Polyes.	622 510 00
C8,205	150 pF	2%	63V	N150	602 215 00
C10	330 pF	1%	125V	Microp.	613 233 00
C11	1.5 nF	1%	500V	Microp.	613 315 00
C14,55,57,60, 65,70,75,78,83, 86,88,91,92,96, 99,120,138,157, 159,163,208-210	10 nF	-20+50%	100V	Cer.	602 410 01
C13	10 pF	2%	63V	N150	602 110 00
C15,58,119	1 nF	1%	125V	Microp.	613 310 00
C16,35,38,47, 112	22 uF	20%	25V	Tan.	652 722 00
C17	100 nF	10%	250V	MKP	624 510 02
C23,32,164	33 pF	2%	63V	N150	602 133 01

C39,144	6.8 nF	1%	63V	Microp.	612 368 00
C56,145	47 nF	10%	250V	Polyes.	624 447 01
C59,118,123,146	0.47 uF	10%	63V	Polyes.	622 547 01
C61,79	3.3 pF	+/-0.25pF	63V	NPO	602 033 01
C62,64,66,74,100	6.8 uF	-20+50%	25V	Tan.	652 668 00
C63	82 pF	2%	63V	N150	602 182 01
C67	100 pF	2%	63V	N150	602 210 01
C69	27 pF	2%	63V	N150	602 127 01
C71-72,152,155, 165	47 nF	10%	63V	Polyes.	622 447 00
C73	18 pF	2%	63V	N150	602 118 01
C77	6.8 pF	+/-0.25pF	63V	N150	602 068 01
C87,153	82 pF	2%	63V	N150	602 182 00
C94,161	33 nF	20%	63V	Polyes.	622 433 00
C116	4.7 nF	1%	63V	Microp.	612 347 00
C117	680 pF	1%	125V	Microp.	613 268 00
C121,122,127,128, 137,140,156	4.7 nF	10%	100V	Cer.	602 347 02
C124,130	15 nF	20%	63V	Polyes.	622 415 01
C125	56 pF	2%	63V	N150	602 156 00
C126	1.8 nF	1%	125V	Microp.	613 318 00
C129	100 pF	2%	63V	N150	602 210 00
C131,208	2.7 pF	+/-0.25pF	63V	NPO	602 027 00
C132	180 pF	1%	500V	Microp.	615 218 00
C133	220 pF	1%	125V	Microp.	613 222 00
C134,136	220 pF	10%	63V	Cer.	602 222 00
C135	22 nF	20%	63V	Polyes.	622 422 00
C149	10 nF	20%	63V	Polyes.	622 410 01
C154	1.2 nF	1%	125V	Microp.	613 312 00
C162	27 pF	2%	63V	N150	602 127 00
C166	0.33 uF	20%	63V	Polyes.	622 533 01
C168-203	1 nF	+/-10%	100V	Cer.	603 310 00
C204	2.2 uF	20%	25V	Tan.	652 622 02
C206	47 pF	2%	63V	N150	602 147 00
C207	330 pF	10%	63V	Cer.	602 233 00
L1,2,9,10,15	10 uH				740 110 01
L3,5,12,17,20	100 uH				740 210 07
L4	Var.			Coil	103 577 02
L6	Var.			Coil	103 577 32
L7	Var.			Coil	103 577 22
L8	Var.			Coil	103 577 12
L11,16	22 uH				740 122 03
L13,14	Var.			Coil	103 577 52
L18	Var.			Coil	103 577 62
L19	220 uH				740 222 01

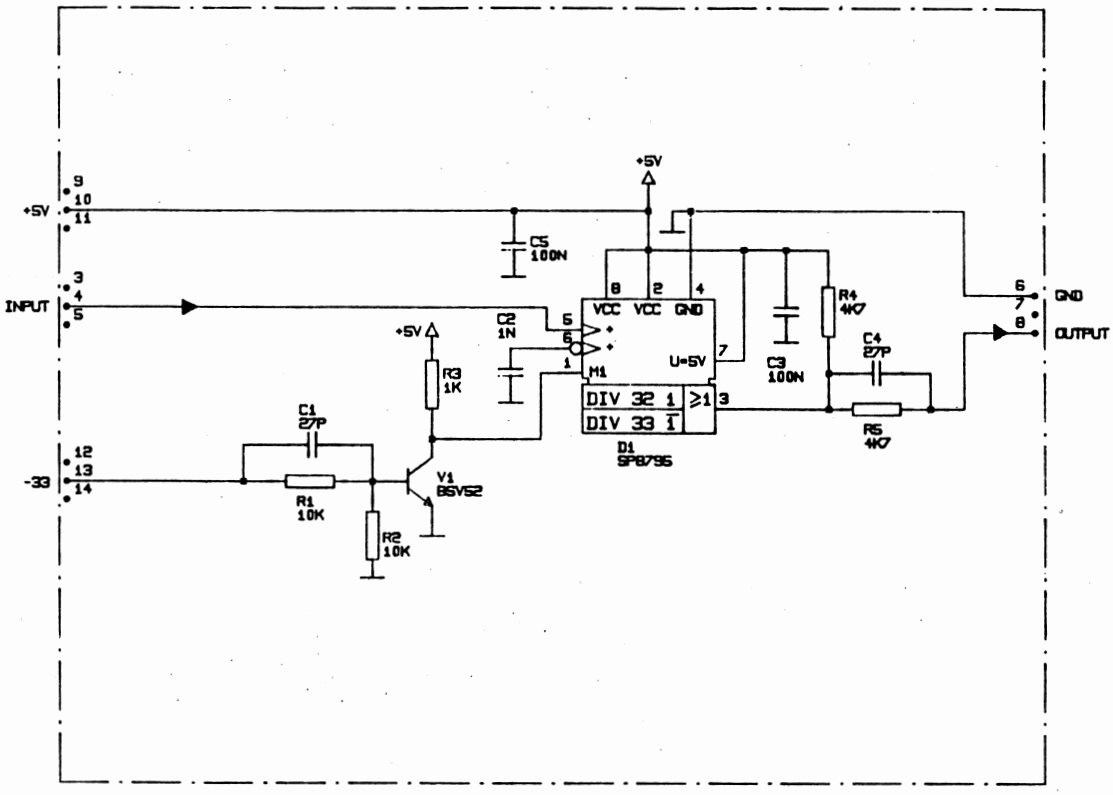
PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 5A

T1			103 577 72
T2			103 577 42
PL1	40POL	MOLEX	756 040 04
PL2-6	2POL	3M	750 001 45
PL7	2POL	MOLEX	750 001 46



PCB 607 VERSION A1
PRESCALER BOARD
VIEWED FROM COMPONENT SIDE

993 560 7X COMP



REPLACEMENT FOR IC31 SAA1059

PCB 607 PRESCALER BOARD
VERSION A1 MAINDIAGRAM

PARTS LIST FOR PRESCALER BOARD 607 VERSION A1

C1	CAP	CER	27P	2%	50V	NP0	0805	67005900
C2	CAP	CER	1.0NF	2%	50V	NP0	1210	67003200
C3	CAP	SMD	100NF	10%		X7R	1210	67101100
C4	CAP	CER	27P	2%	50V	NP0	0805	67005900
C5	CAP	SMD	100NF	10%		X7R	1210	67101100
D1	COUNTER		SP8795					85990400
R1	RES	SMD	10K	5%	0.25W		1206	57002800
R2	RES	SMD	10K	5%	0.25W		1206	57002800
R3	RES	SMD	1K0	5%	0.25W		1206	57001800
R4	RES	SMD	4K7	5%	0.25W		1206	57002400
R5	RES	SMD	4K7	5%	0.25W		1206	57002400
V1	TRANS		BSV52	NPN	20V		SOT23	84720600

TECHNICAL DESCRIPTION

PCB 612/613/614 MASTER OSCILLATOR

The three Master Oscillators all consist of the same circuits but have different frequency stabilities determined by the 10.24 MHz Temperature Compensated Crystal Oscillator (TCXO) used.The output signal of the TCXO is split between two reference dividers. One for the 45-75 MHz Synthesizer and one for the 43.6 and 1.4 MHz Synthesizers. The Reference Divider, 45-75 MHz Synthesizer, divides the 10.24 MHz TCXO signal by 250 having a 40.96 kHz reference frequency at two outputs.

The Reference Divider, 43.6 and 1.4 MHz Synthesizer, divides the 10.24 MHz TCXO signal by 8, obtaining a 1.28 MHz signal fed to two outputs. The output signals of the divider are fed to the Check Detector to detect the presence of both. The resulting check signal MO-Check is via the Synthesizer Board 611 fed to the Transceiver Control Board 624.

For Master Oscillator 613 a heater (TCXO Heater 699) is incorporated in order to keep the TCXO ambient temperature above 0 deg. Celcius.

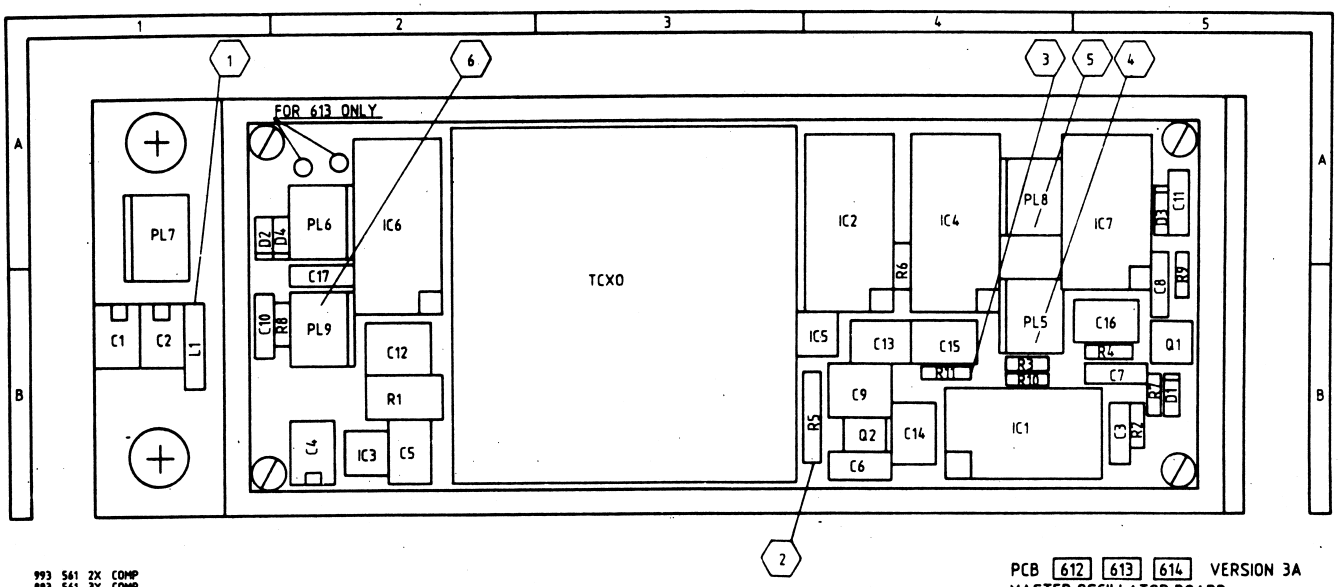
PCB 615/616 MASTER OSCILLATOR

Master Oscillator 615 and 616 produces enhanced frequency stabilities of +/-0.35ppm and +/-0.1ppm respectively. A highly stable oven controlled crystal oscillator (PCB 608 or PCB 609) is mounted in a shielding box on top of the Master Oscillator board. On Master Oscillator 615, PCB 608 is mounted and on 616, PCB 609 is mounted, giving the higher stability.
The crystal oscillators produces a temperature stable 20.480000MHz signal giving a total frequency stability of less than either 10Hz or 3Hz for the Transceiver.

The oscillator signal is led to PCB 615/616 where it is divided by 2. This 10.24MHz signal is split between to divider chains dividing with 250 and 8 resulting in two reference frequencies of 40.96kHz and 1.28MHz respectively.

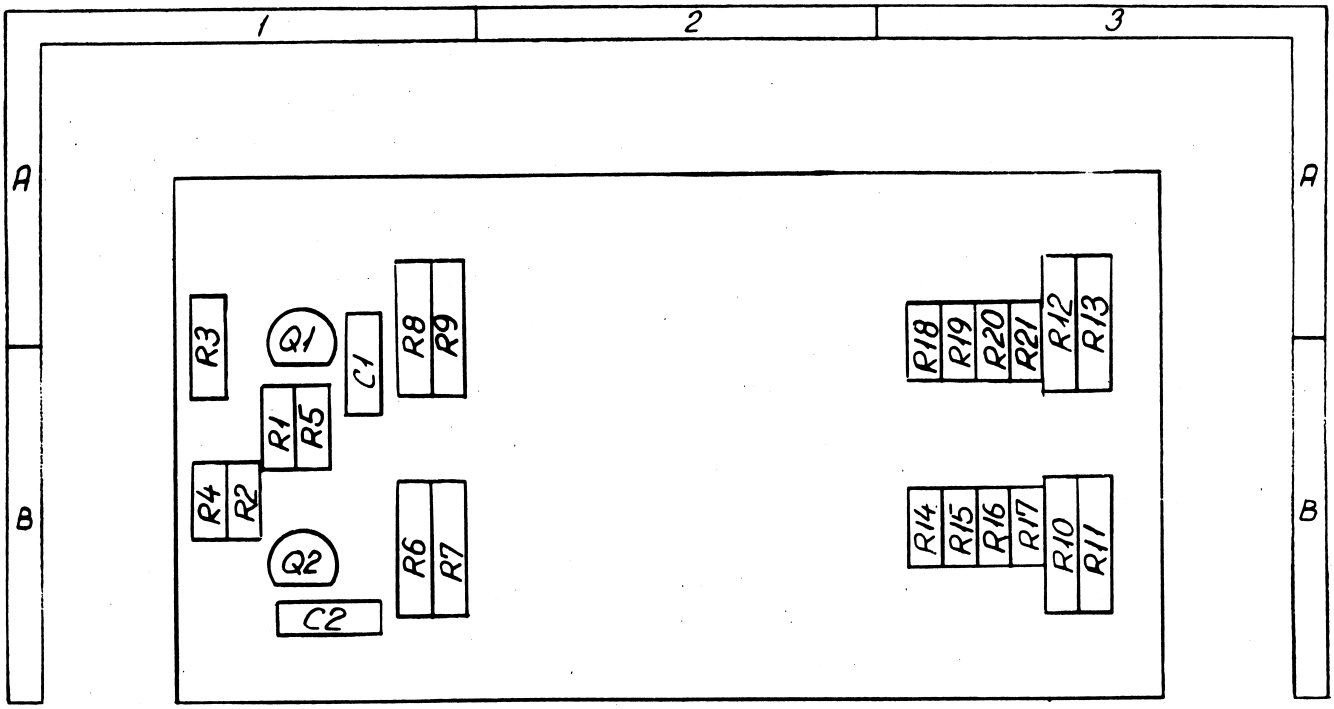
The 40.96kHz signal is led to PL5 and PL8 and is used as a reference frequency for the 45 to 75MHz synthesizer. Likewise the 1.28MHz signal is led to PL6 and PL9 and is used as reference frequencies for the 43.6MHz and the 1.4MHz synthesizer.

The output signals of the two divider chains are monitored and combined in a check detector, producing a check signal (MO-Check) which via Synthesizer Board 611 is led to the Transceiver Control Board 624. The check signal is used during self-test.



993 561 2X COMP
993 561 3X COMP
993 561 4X COMP

PCB 612 613 614 VERSION 3A
MASTER OSCILLATOR BOARD
VIEWED FROM COMPONENT SIDE



993 569 9X COMP

PCB 699 VERSION 1A
ASSEMBLY DRAWING

611 PL7 - 1

+15V
L1 33µH
C1-C2 2×6µ8
C4 6µ8
IC3 78L12AC
+12V REG.
+12V
C5 22µ
C6 0µ1
R5 180E
C9 0µ33
IC5 78L05AC
+5V REG.
C12-C16 5×0µ47
+5V

REFERENCE DIVIDER 45-75MHz SYNTHESIZER

IC1 74HC00
R2 1K
C3 100P
IC2 74HC161
MR P3 P2 P1 P0 CET CEP TC PROG.BIN. COUNTER PE Q3 Q2 Q1 Q0 CP
R6 10K
IC4 74HC161
MP P3 P2 P1 P0 CET CEP TC PROG.BIN. COUNTER PE Q3 Q2 Q1 Q0 CP

IC7 74HC00
PL5
40.96KHz → 611 PL5
PL8
40.96KHz → NOT USED

IC1 74HC00
C7 100P
D1 1N4148
R7 1K

CHECK DETECTOR
C11 150P
Q1 BC557B
R9 10K
D3 1N4148
R11 10K
IC1 74HC00
R10 47K
Q2 BC547B
R4 100K
C8 0µ1
D2 1N4148
R8 330K
C10 10n
D4 1N4148
C17 100P
PL7
(M.O. CHECK) → 611 PL7-2

R3 1K

+12V
10.24MHz TCXO
R1

REFERENCE DIVIDER 1.4MHz AND 43.6MHz SYNTHESIZER

IC6 74HC161
MR P3 P2 P1 P0 CET CEP TC PROG.BIN. COUNTER PE Q3 Q2 Q1 Q0 CP
PL6
1.28MHz → 611 PL6
PL9
1.28MHz → NOT USED

FOR PCB 613 ONLY

C1 1n
R3 1K
Q1 BC557
R5 180K
R6-13 1K
R14-21 1K8
R1 22K
R4 47K
Q2 MPSA14
R2 47K
C2 1n

TCXO HEATER
PCB 699 VERSION 1A

PCB	TCXO TYPE	R1
612	STC	2K
	HY-Q	2K
	NDK	5K
613	STC	2K
	HY-Q	2K
	NDK	5K
614	STC	2K
	HY-Q	2K
	NDK	5K

993 561 2X MAIN
993 561 3X MAIN
993 561 4X MAIN
993 569 9X MAIN

PCB 612 613 614 MASTER OSCILLATOR
VERSION 3A MAIN DIAGRAM

PARTS LIST FOR MASTER OSCILLATOR BOARD 612 VERSION 3A

nted Circuit Board Complete 612					107 561 21
IC1,7	MC74HC00N				850 740 04
IC2,4,6	MC74HC161N				857 416 10
IC3	LM78L12ACP				850 741 20
IC5	LM78L05ACP				850 780 52
Q1	BC557B				840 055 70
Q2	BC547B				840 054 70
D1-4	1N4148				830 414 80
R2-3,7	1 kohm	5%	1/8W	MF	500 310 00
R4	100 kohm	5%	1/8W	MF	500 510 00
R5	180 ohm	5%	1/4W	Car.	501 218 00
R6,9,11	10 kohm	5%	1/8W	MF	500 410 00
R8	330 kohm	5%	1/8W	MF	500 533 00
R10	47 kohm	5%	1/8W	MF	500 447 00
C1,2,4	6.8 uF	-20+50%	25V	Sol.al.	652 668 01
C3,7,17	100 pF	2%	63V	N150	602 210 00
C5	22 uF	20%	25V	Tan.	652 722 00
C6,8	0.1 uF	10%	63V	Polyes.	622 510 00
C9	0.33 uF	20%	63V	Polyes.	622 533 01
C10	10 nF	-20+50%	63V	Cer.	602 410 01
C11	150 pF	2%	63V	N150	602 215 00
C12-16	0.47 uF	10%	63V	Polyes.	622 457 01
L1	33 uH				740 133 01
rCXO	10.24 MHz				383 570 11
PL5,6,8,9	2 POL				750 001 45
PL7	2 POL				750 001 46

PARTS LIST FOR MASTER OSCILLATOR BOARD 613 VERSION 3A

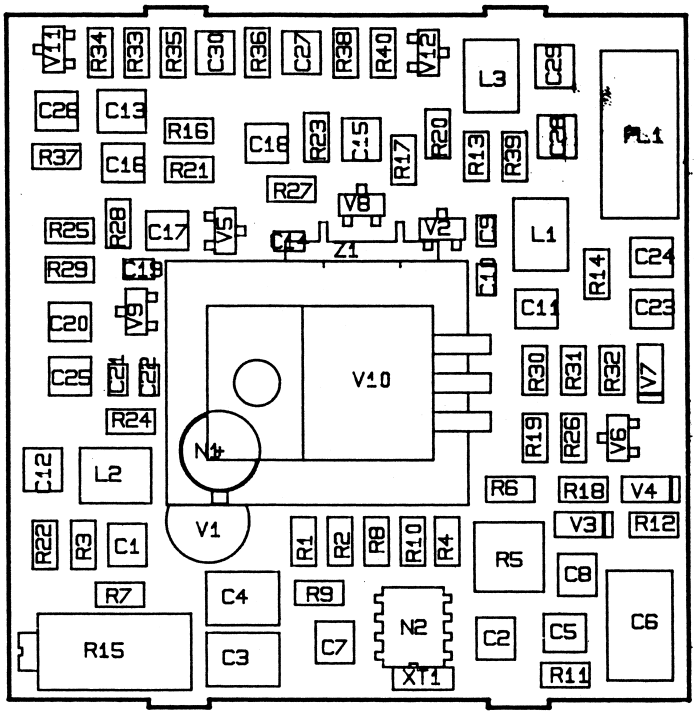
Printed Circuit Board Complete 613					107 561 31
IC1,7	MC74HC00N				850 740 04
IC2,4,6	MC74HC161N				857 416 10
IC3	LM78L12ACP				850 741 20
IC5	LM78L05ACP				850 780 52
Q1	BC557B				840 055 70
Q2	BC547B				840 054 70
D1-4	1N4148				830 414 80
R2-3,7	1 kohm	5%	1/8W	MF	500 310 00
R4	100 kohm	5%	1/8W	MF	500 510 00
R5	180 ohm	5%	1/4W	Car.	501 218 00
R6,9,11	10 kohm	5%	1/8W	MF	500 410 00
R8	330 kohm	5%	1/8W	MF	500 533 00
R10	47 kohm	5%	1/8W	MF	500 447 00
C1,2,4	6.8 uF	-20+50%	25V	Sol.al.	652 668 01
C3,7,17	100 pF	2%	63V	N150	602 210 00
C5	22 uF	20%	25V	Tan.	652 722 00
C6,8	0.1 uF	10%	63V	Polyes.	622 510 00
C9	0.33 uF	20%	63V	Polyes.	622 533 01
C10	10 nF	-20+50%	63V	Cer.	602 410 01
C11	150 pF	2%	63V	N150	602 215 00
C12-16	0.47 uF	10%	63V	Polyes.	622 457 01
L1	33 uH				740 133 01
TCXO	10.24 MHz				383 570 21
TCXO HEATER PCB 699					107 569 91
PL5,6,8,9	2 POL				750 001 45
PL7	2 POL				750 001 46

PARTS LIST FOR MASTER OSCILLATOR BOARD 614 VERSION 3A

nted Circuit Board Complete 614						107 561 41
IC1,7	MC74HC00N					850 740 04
IC2,4,6	MC74HC161N					857 416 10
IC3	LM78L12ACP					850 741 20
IC5	LM78L05ACP					850 780 52
Q1	BC557B					840 055 70
Q2	BC547B					840 054 70
D1-4	1N4148					830 414 80
R2-3,7	1 kohm	5%	1/8W	MF		500 310 00
R4	100 kohm	5%	1/8W	MF		500 510 00
R5	180 ohm	5%	1/4W	Car.		501 218 00
R6,9,11	10 kohm	5%	1/8W	MF		500 410 00
R8	330 kohm	5%	1/8W	MF		500 533 00
R10	47 kohm	5%	1/8W	MF		500 447 00
C1,2,4	6.8 uF	+50-20%	25V	Sol.al.		652 668 01
C3,7,17	100 pF	2%	63V	N150		602 210 00
C5	22 uF	20%	25V	Tan.		652 722 00
C6,8	0.1 uF	10%	63V	Polyes.		622 510 00
C9	0.33 uF	20%	63V	Polyes.		622 533 01
C10	10 nF	-20+50%	63V	Cer.		602 410 01
C11	150 pF	2%	63V	N150		602 215 00
C12-16	0.47 uF	10%	63V	Polyes.		622 457 01
L1	33 uH					740 133 01
TCXO (0.4 ppm)	10.24 MHz					383 570 31
PL5,6,8,9	2 POL					750 001 45
PL7	2 POL					750 001 46

PARTS LIST FOR TCXO HEATER PCB 699 VERSION 1A

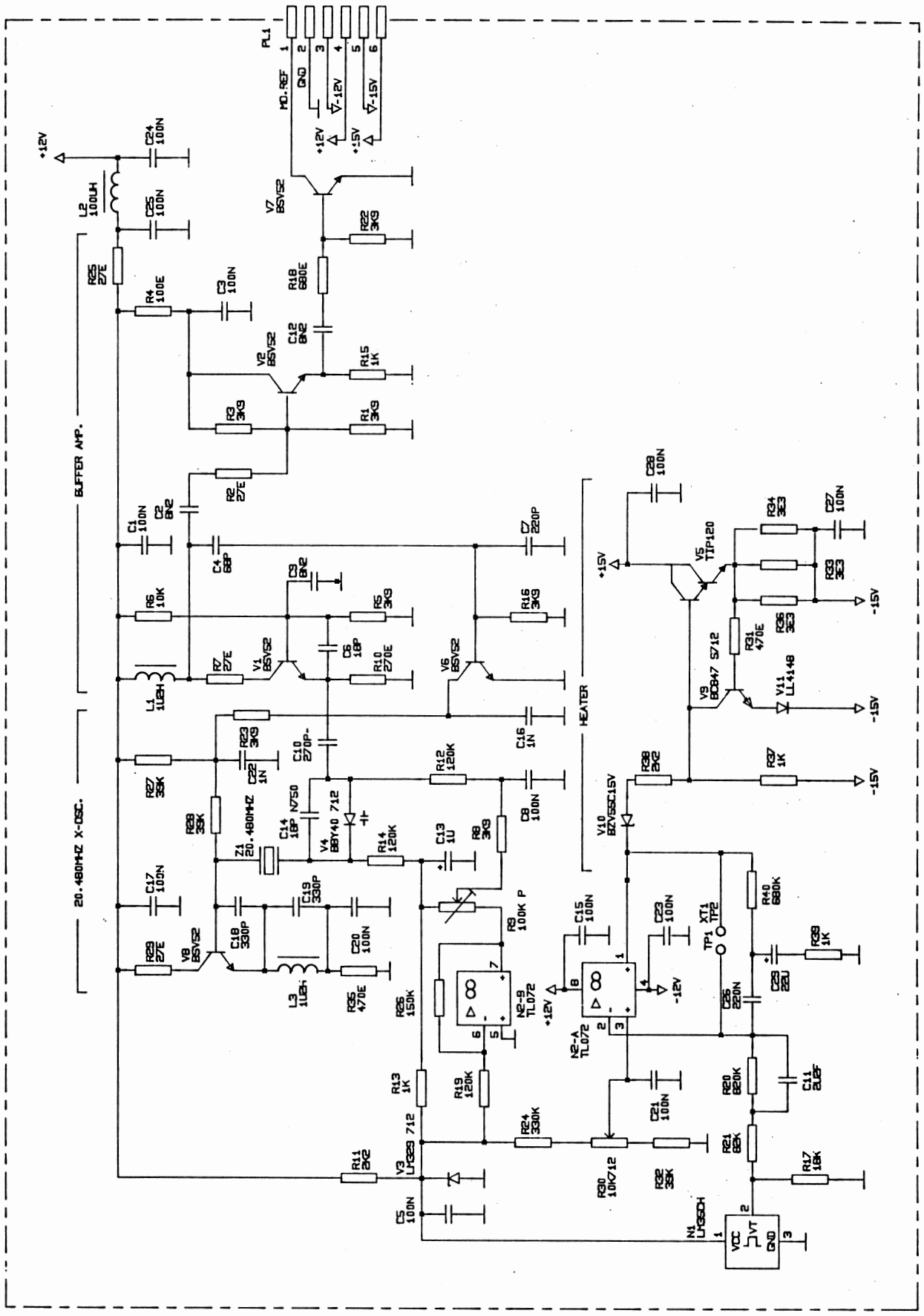
Printed Circuit Board Complete 699					107 569 91
Q1	BC557B				840 055 70
Q2	MPSA14				840 001 40
R1	22 kohm	5%	1/8W	MF	500 422 00
R2,4	47 kohm	5%	1/8W	MF	500 447 00
R3	1 kohm	+-10%		NTC	591 310 00
R5	180 kohm	5%	1/8W	MF	500 518 00
R6-13	1 kohm	5%	1/8W	MF	501 310 00
R14-21	1.8 kohm	5%	1/8W	MF	500 318 00
C1-2	1 nF	10%	100V	Cer.	602 310 02



PCB 608 / 609 VERSION A1
MASTER OSCILLATOR
VIEWED FROM COMPONENT SIDE

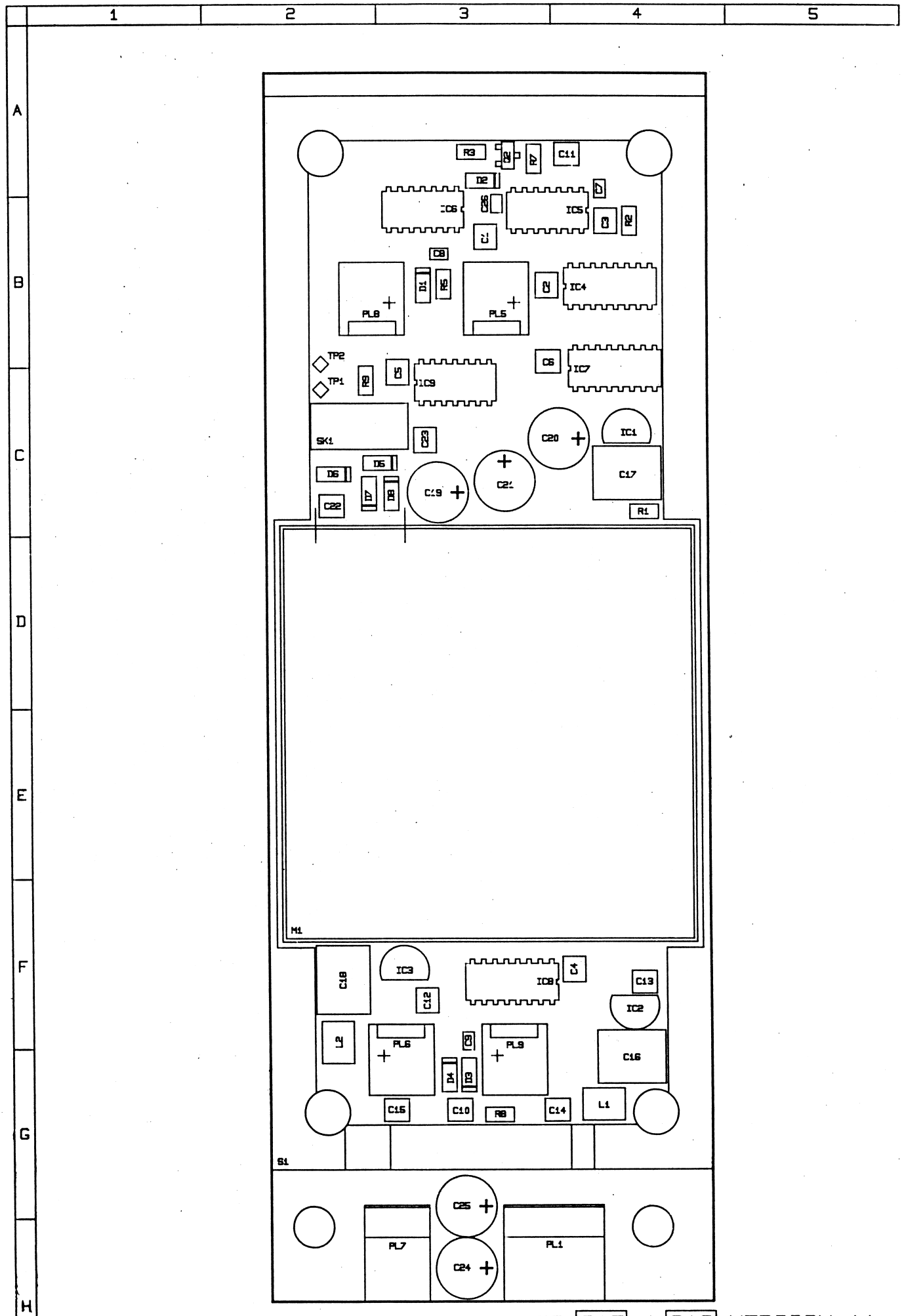
993 560 8X COMP

S=2:1



PCB 608 / 609 MASTER OSCILLATOR
VERSION A1 DIAGRAM

993 560 8X DIA



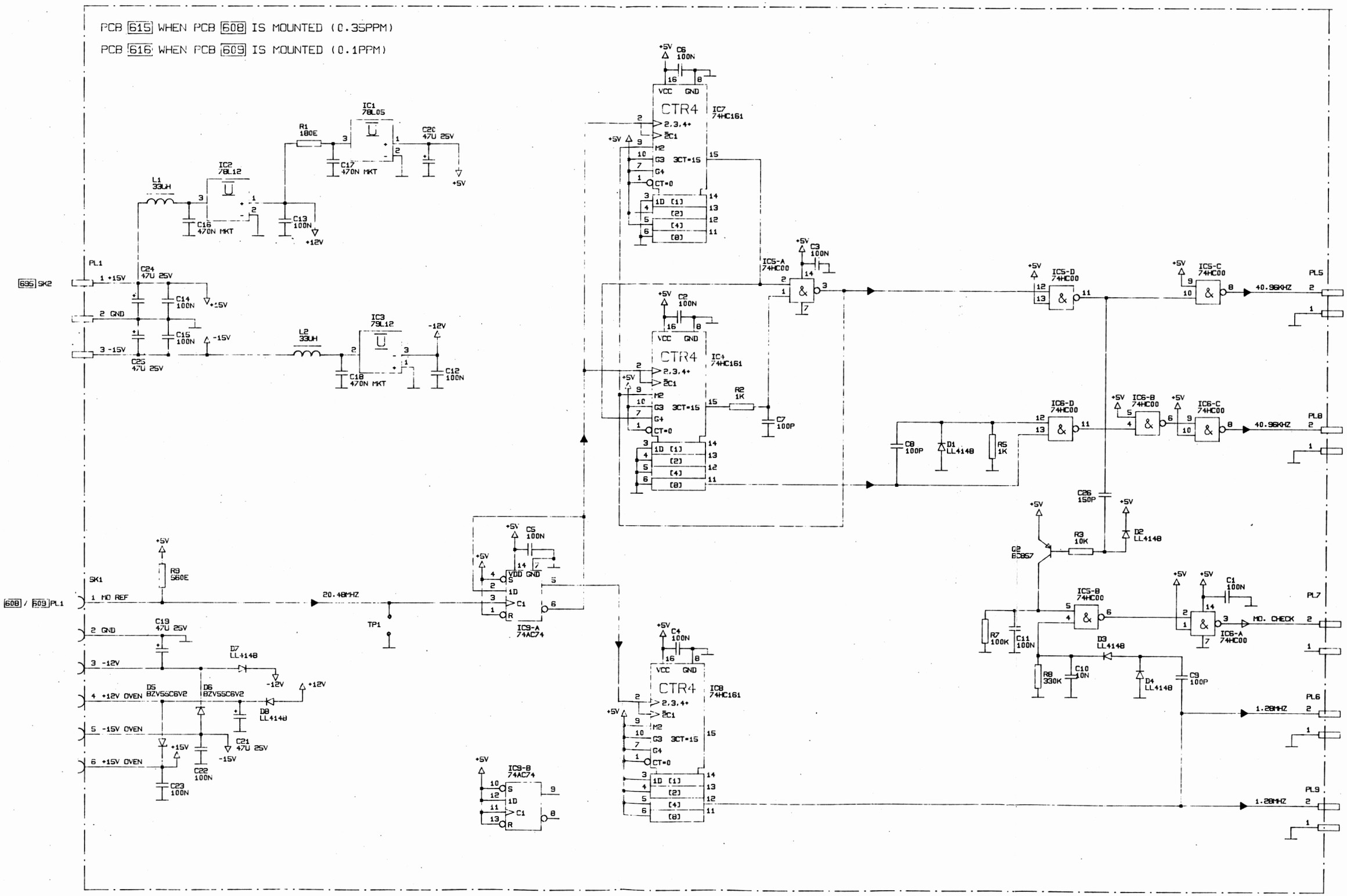
PCB 615 / 616 VERSION A1
REFERENCE DIVIDER
VIEWED FROM COMPONENT SIDE

993 561 5X COMP

9-9:5

PCB 615 WHEN PCB 608 IS MOUNTED (0.35PPM)

PCB 616 WHEN PCB 609 IS MOUNTED (0.1PPM)



993 561 5X DIA

PCB 615 / 616 REFERENCE DIVIDER
VERSION A1 DIAGRAM

PARTS LIST FOR PCB 608 / 609 MASTER OSCILLATOR

PCB 608	10761300	PRINTED CIRCUIT BOARD COMPLETE	
C1	67101100	CAP SMD 1210 100NF 10% X7R	13
C3			
C5			
C8			
C15			
C17			
C20			
C21			
C23			
C24			
C25			
C27			
C28			
C10	67008200	CAP SMD 1210 270P 2% NP0	1
C11	62262201	WIMA 2.2UF	1
C13	67700100	TANTAL B 1.0UF	1
C14	602xxxxx	CERAMIC CAPACITOR 18PF CL1	1
C16	67003200	CAP SMD 1210 1.0NF 2%	2
C22			
C18	67006800	CAP SMD 0805 330P NP0	2
C19			
C2	67007100	CAP SMD 1210 8.2NF 2%	3
C9			
C12			
C26	67102000	CAP SMD 7.3X6 220NF	1
C29	67700800	TANTAL D 22UF 16V SMD	1
C4	67006600	CAP SMD 0805 68PF	1
C6	67004000	CAP SMD 0805 18PF	1
C7	67006400	CAP SMD 0805 220P NP0	1
L1	74100200	SMD CHOKE-B 1.2UH 10%	2
L3			
L2	74101600	SMD CHOKE-B 100UH 10%	1
N1	85000350	SENSOR LM35CH	1
N2	85810400	IC LF353 2XOPAM/JFET SO8	1
PL1	37378501	RIBBON CABLE PCB712/PCB713	1
R1	57002300	SMD RESISTOR 3K9 5%	7
R3			
R5			
R8			
R16			
R22			
R23			
R10	57001400	SMD RESISTOR 270E 5%	1

PARTS LIST FOR PCB 608 / 609 MASTER OSCILLATOR

R11	57002000	SMD RESISTOR 2K2 5%	2
R38			
R12	57004200	SMD RESISTOR 120K 5%	3
R14			
R19			
R13	57001800	SMD RESISTOR 1K0 5%	4
R15			
R37			
R39			
R17	57003000	SMD RESISTOR 18K 5%	1
R18	57007300	SMD RESISTOR 680E 5%	1
R2	57000400	SMD RESISTOR 27E 5%	4
R7			
R25			
R29			
R20	57005900	SMD RESISTOR 820K 5%	1
R21	57003800	SMD RESISTOR 82K 5%	1
R24	57004400	SMD RESISTOR 330K 5%	1
R26	57003900	SMD RESISTOR 150K 5%	1
R27	57003400	SMD RESISTOR 39K 5%	3
R28			
R32			
R30	57300100	POTENTIOMETER SMD 10K	1
R31	57001500	SMD RESISTOR 470E 5%	2
R35			
R33	57006700	SMD RESISTOR 3E3 5%	3
R34			
R36			
R4	57001000	SMD RESISTOR 100E 5%	1
R40	57007600	SMD RESISTOR 680K 5%	1
R6	57002800	SMD RESISTOR 10K 5%	1
R9	58251000	MULTITURN 100K	1
V1	84720600	TRANS BSV52 NPN 20V SOT23	3
V6			
V8			
V10	83730500	DIODE SOD80 BZV55C15V ZENER	1
V11	83710000	DIODE LL4148 GEN-PUR SOD80	1
V2	84720600	TRANS BSV52 NPN 20V SOT23	2
V7			
V3	83003290	ZENERDIODE LM329	1
V4	83750100	CAP. DIODE BBY40	1
V5	84201200	DARLINGTON TRANSISTOR TIP120	1
V9	84720000	TRANSISTOR BC847	1
Z1	38373551	CRYSTAL SPEC.20.48000MHZ	1

PARTS LIST FOR PCB 615 / 616 REFERENCE DIVIDER

PCB 615	10756151	PRINTED CIRCUIT BOARD COMPLETE	
C1	67101100	CAP SMD 1210 100NF 10% X7R	13
C2			
C3			
C4			
C5			
C6			
C11			
C12			
C13			
C14			
C15			
C22			
C23			
C10	67102200	CAP SMD 1210 10NF 10%	1
C16	62254701	MKT FILM CAPACITOR 470NF	3
C17			
C18			
C19	65274702	CAPACITOR 47U 25V	5
C20			
C21			
C24			
C25			
C26	67004900	CAP SMD 0805 150PF	1
C7	67005500	CAP SMD 0805 100PF	3
C8			
C9			
D1	83710000	DIODE LL4148 GEN-PUR SOD80	6
D2			
D3			
D4			
D7			
D8			
D5	83730800	DIODE SOD80 BZV55C6V2 ZENER	2
D6			
IC1	85078052	IC LM78L05 VOLTREG	1
IC2	85078121	IC LM78L12 VOLTREG	1
IC3	85079121	IC LM79L12 VOLTREG	1
IC4	85980700	COUNTER, 4-BIT 74HC161T	3
IC7			
IC8			
IC5	85980000	QUAD 2-INPUT NAND 74HC00T	2
IC6			
IC9	85984200	DUAL D-TYPE FLIP-FLOP 74AC74	1
L1	74103400	SMD CHOKE-B 33UH 10%	2
L2			

PARTS LIST FOR PCB 615 / 616 REFERENCE DIVIDER

PL1	75100177	3POL PLUG W.FRICT LOCK	1
PL5	75000145	2POL MOLEX PCB CON.	4
PL6			
PL8			
PL9			
PL7	75000146	2POL MOLEX W.FRICTION LOCK	1
Q2	84710000	TRANS SOT23 BC857B 45V	1
R1	57005400	SMD RESISTOR 180E 5%	1
R2	57001800	SMD RESISTOR 1K0 5%	2
R5			
R3	57002800	SMD RESISTOR 10K 5%	1
R7	57004100	SMD RESISTOR 100K 5%	1
R8	57004400	SMD RESISTOR 330K 5%	1
R9	57001600	SMD RESISTOR 560E 5%	1
SK1	75100162	6 POL MICRO MATCH	1

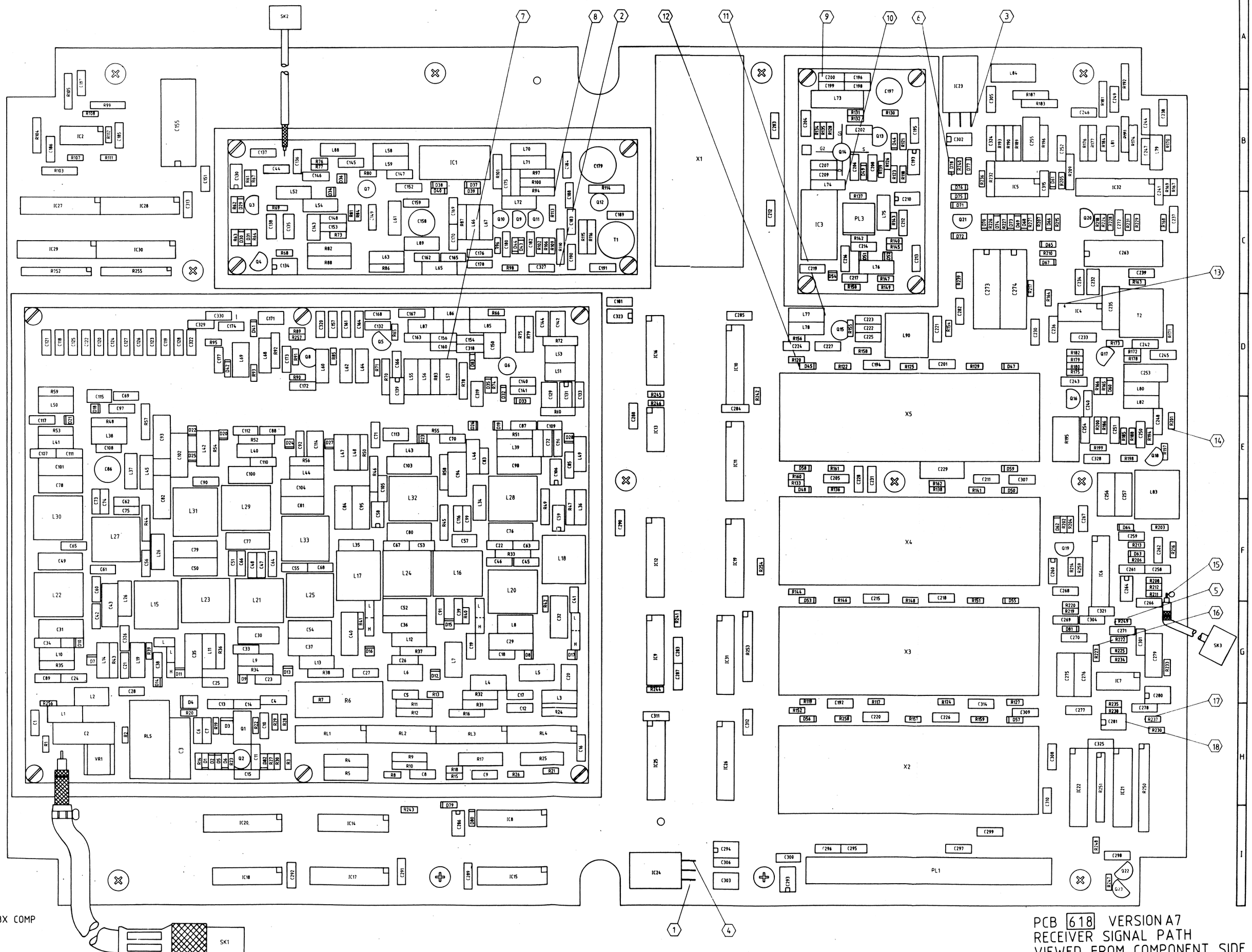
TECHNICAL DESCRIPTION

PCB [618] RECEIVER SIGNAL PATH

The antenna RF signal is led through coax connector SK1 to the protection circuit, which protects the receiver against excessive RF voltages and static electricity discharges, appearing on the antenna. Through the switchable attenuator the RF signal is led to the preselector consisting of eleven fixed-tuned bandpass filters. The bandpass filters covers the frequency bands 10-405 kHz, 405-527 kHz, 527-1600 kHz, 1.6-4 MHz, 4-5.246 MHz, 5.246-7.27 MHz, 7.27-10.383 MHz, 10.383-14.695 MHz, 14.695-19.571 MHz, 19.571-24.424 MHz, 24.424-30 MHz. A change in receiver frequency will be followed by automatic selection from among the bandpass filters. The automatic selection is controlled from the Transceiver Control Board [624] via the serial data bus. The RF signal goes via the switchable RF amplifier to the high level double balanced Schottky diodes mixer, where it is mixed with the 45-75 MHz synthesizer signal from the Synthesizer Board [611] to generate the first intermediate frequency signal of 45 MHz. Before the signal is applied to the first mixer, the signal level is detected by the broadband detector. The 45 MHz IF signal is amplified in the grounded gate JFET amplifier and then filtered in the 45 MHz double sideband crystal filter, determining the overall AM selectivity. Before being fed to the 2nd mixer, the IF signal is passing through the MOSFET amplifier which has a variable gain controlled by the delayed AGC voltage. The 2nd mixer converts the 45 MHz IF signal to the 1.4 MHz IF signal by mixing with a 43.6 MHz synthesizer signal from the Synthesizer Board [611]. After amplification in the grounded gate JFET amplifier, the 1.4 MHz signal is fed to the Information filter bank. Depending on the version (i.e. crystal filter options) and the selected mode, the 1.4 MHz signal is routed through one of the filters X2, X3, X4, X5 or the wide filter, controlled by the Transceiver Control Board [624] via the serial data bus. The now filtered 1.4 MHz signal is amplified in the 1.4 MHz amplifier strip IC4, Q14 and Q15. The voltage gain of the amplifier strip is controlled partly by the AGC voltage applied to IC4 and partly by the control line "IF-GAIN", which, when in logical high condition, increases the gain of Q14 with approx. 8 dB. From the IF strip the signal is fed to the Signal Detector IC6. The integrated circuit of the Signal Detector contains a balanced mixer and a high gain limiting amplifier. The IF signal is applied to the one input port of the mixer. In the modes H3E and H2A, the IF signal is also fed to the amplified input. This signal is amplified and clipped to constant amplitude and internally connected to the other input port of the mixer where it is mixed with the modulated signal. The difference frequency contains the wanted AF signal. In other modes but H3E and H2A a 1.4 MHz signal, derived from the Synthesizer Board [611], is applied to the amplifier input. The unbalanced AF signal is filtered and converted to a balanced signal before it is fed to the flat cable connector PL1.

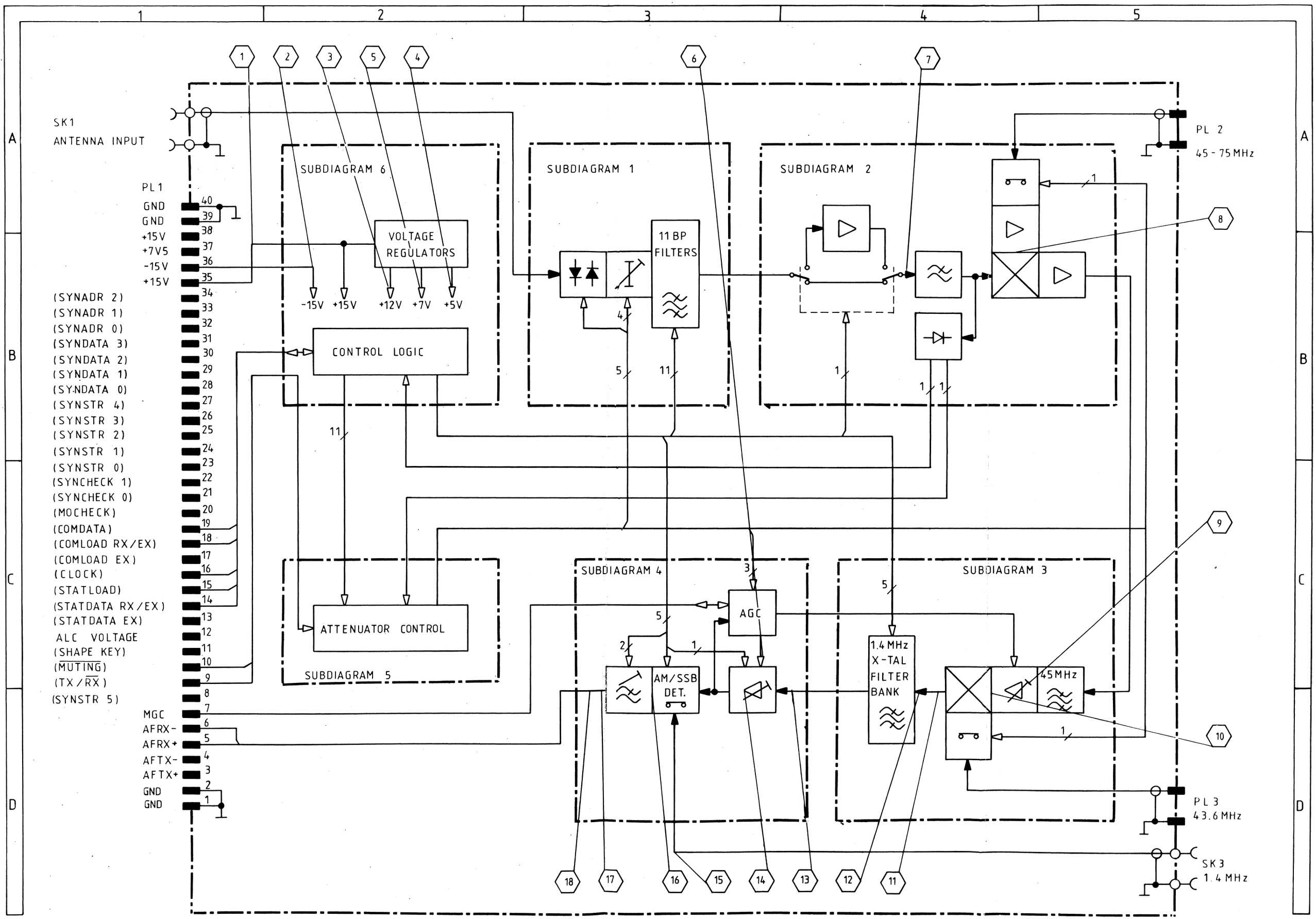
From the IF strip the signal is also fed to the AGC Detector consisting of two transistors in the integrated array IC20. The signal, which is now rectified to a DC voltage, is applied to the AGC Timing Circuit. The AGC voltage from the AGC Timing Circuit controls the overall gain of the receiver. The AGC voltage is also fed to the Transceiver Control Board [624], where it is used in

self test routines and, by means of a voltage to frequency converter, fed to the Control Unit controlling the signal strength meter on the front panel. When manual gain control (MGC) is selected the Transceiver Control Board 624 generates a DC voltage which is fed to the receiver signal path instead of the AGC voltage. Subdiagram 5 shows the control circuits for the board and Subdiagram 6 shows the interface circuits to the serial data busses.

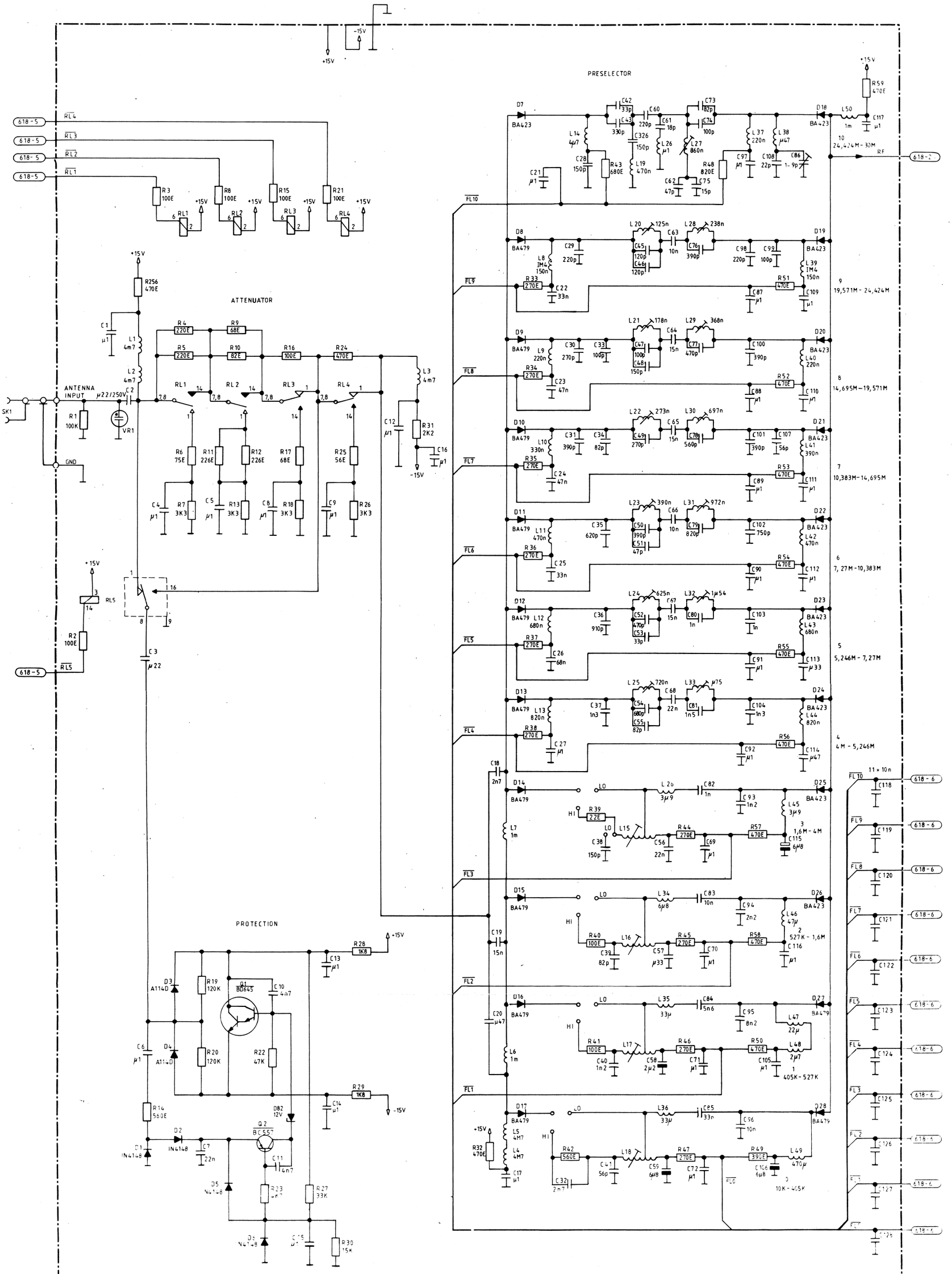


993 561 8X COMP

PCB 618 VERSION A7
RECEIVER SIGNAL PATH
VIEWED FROM COMPONENT SIDE

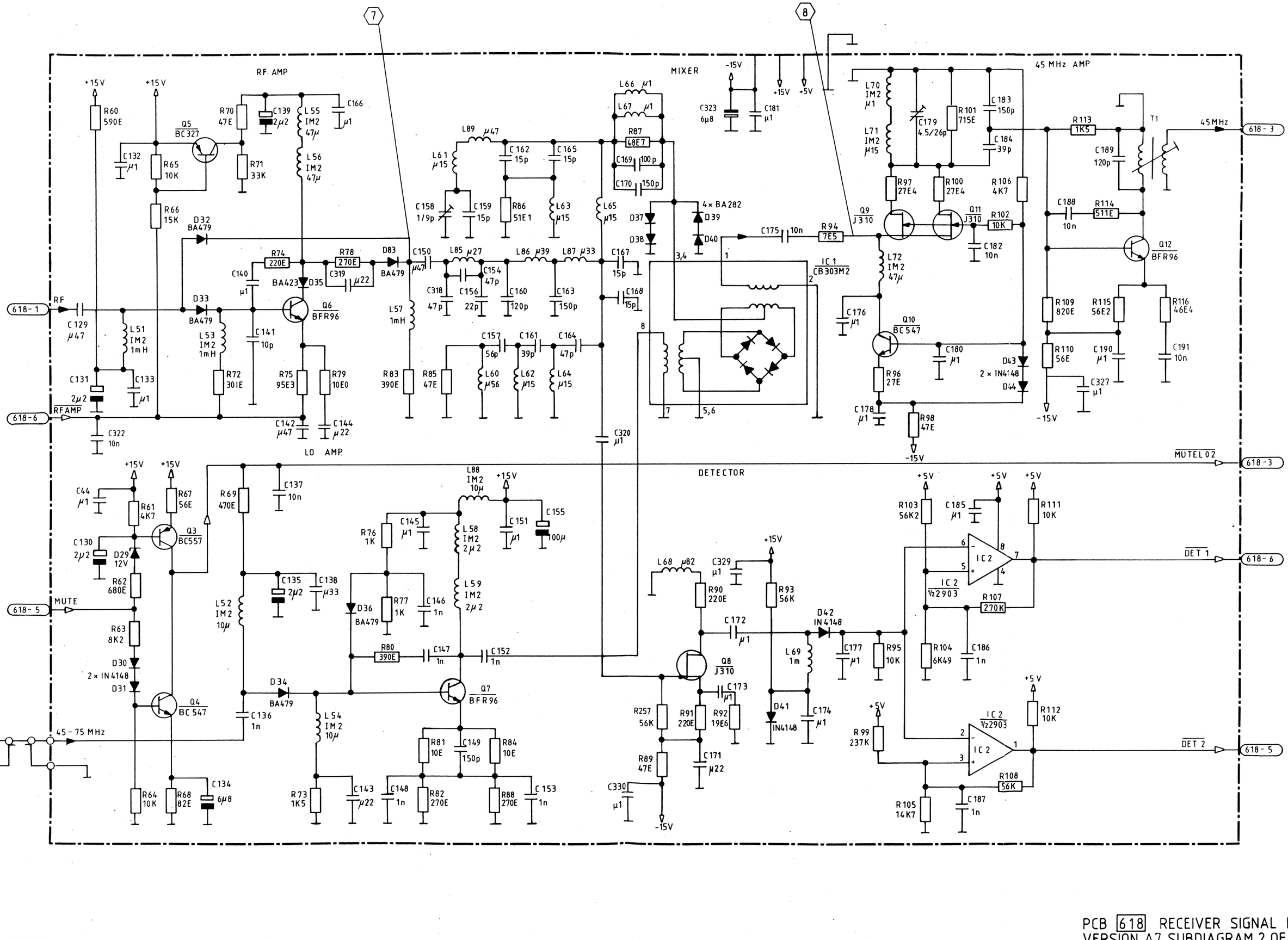


PCB 618 RECEIVER SIGNAL PATH, MAIN DIAGRAM. VERSION A7



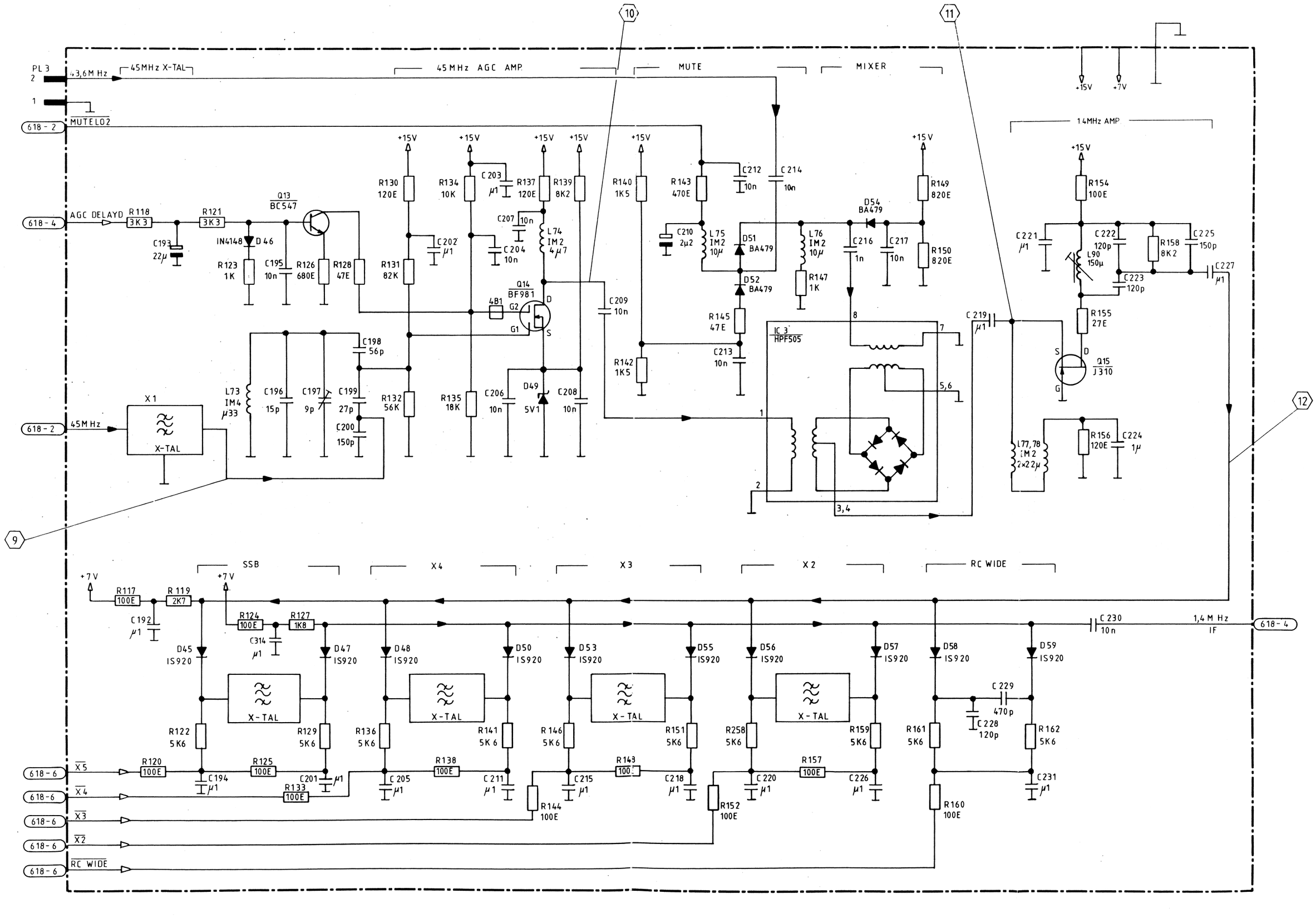
PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 1 OF 6

993 561 8X SUB 1



993 561 8X SUB 2

PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 2 OF 6



PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 3 OF 6

1.4 MHz IF AMP

ATTENUATOR

AF OUTPUT

SIGNAL-DET

AGC DET.

AGC TIMING

GND

1,4 MHz

GND

618 - 6 AMDET

618 - 3 1,4 MHz IF

618 - 6 IF GAIN

618 - 5 MUTE

618 - 5 FAST

618 - 5 H3E/MGCI

618 - 5 MGCRSTI

AUBW1 618 - 6

AUBW2 618 - 6

AF RX PL1-6

AF RX PL1-5

AGC DELAYED 618 - 3

MGC PL1-7

+15V -15V +7V +12V

IC4 MC1350

IC6 TBA120T

IC7 ½ 1458N

IC5 ½ 1458N

IC32 ⅕ ULN2083

T2

D60 IN4148

D61 IN4148

D62 IN4148

D63 IS920

D64 IS920

D65 IN4148

D66 IN4148

D67 IN4148

D68 2× IN4148

D69 2× IN4148

D70,71,72 3× IN4148

D73 IN 4148

D74 IN4148

D75,76 2× IN4148

D77 IN4148

D78 BZX79B5V6

Q16 BC547

Q17 BF 240

Q18 BF 240

Q19 BC547

Q20 BC557

Q21 BC557

R163 270E

R164 33K

R165 8K2

R166 10K

R167 10K

R168 10K

R169 2K2

R170 4K7

R171 100E

R172 2K2

R173 2K7

R174 10E

R175 1K8

R177 33E2

R178 27E

R179 100E

R180 220E

R181 562E

R182 560E

R183 825E

R184 4K7

R185 3K9

R186 100E

R187 3K48

R188 1K8

R189 10K0

R190 10K

R191 5K62

R192 1K87

R193 82K5

R194 56E

R195 4K7

R196 82K5

R197 27E

R198 220E

R199 1K

R200 27E

R201 100E

R202 12K

R203 3K3

R204 100K

R205 5K6

R206 56E

R207 47K

R208 1K8

R209 1M5

R210 10K

R211 47E

R212 2E8

R213 1K

R214 390E

R215 470K

R216 100E

R217 1K

R218 100K

R219 1K

R220 56E

R221 1K

R222 33K

R223 100K

R224 100K

R225 68K

R226 4K7

R227 680E

R228 100K

R229 10K

R230 22E

R231 5K6

R232 10M

R233 47K

R234 33K

R235 82K

R236 470K

R237 270E

R238 270E

R239 220E

R240 33K

C232 22µ

C233 µ1

C234 10n

C235 220p

C236 100p

C238 µ1

C239 µ1

C240 10n

C241 1n

C242 10n

C243 µ1

C244 µ1

C245 µ1

C246 µ1

C247 µ1

C247 10n

C248 10n

C249 µ1

C250 10p

C251 µ1

C252 1n

C253 470p

C254 µ1

C255 2n2

C256 1n2

C257 220p

C258 µ1

C259 10n

C260 1µ

C261 µ1

C262 µ1

C263 10µ

C264 22µ

C266 µ1

C267 µ1

C268 10n

C269 µ1

C270 22n

C271 1n

C272 µ22

C273 10µ

C274 10µ

C275 330p

C276 820p

C277 22n

C278 µ1

C279 910p

C280 6µ8

C281 6µ8

C282 10n

C315 µ1

C321 10n

C324 µ1

C328 10n

L79 IM2 220µ

L80 IM2 4µ7

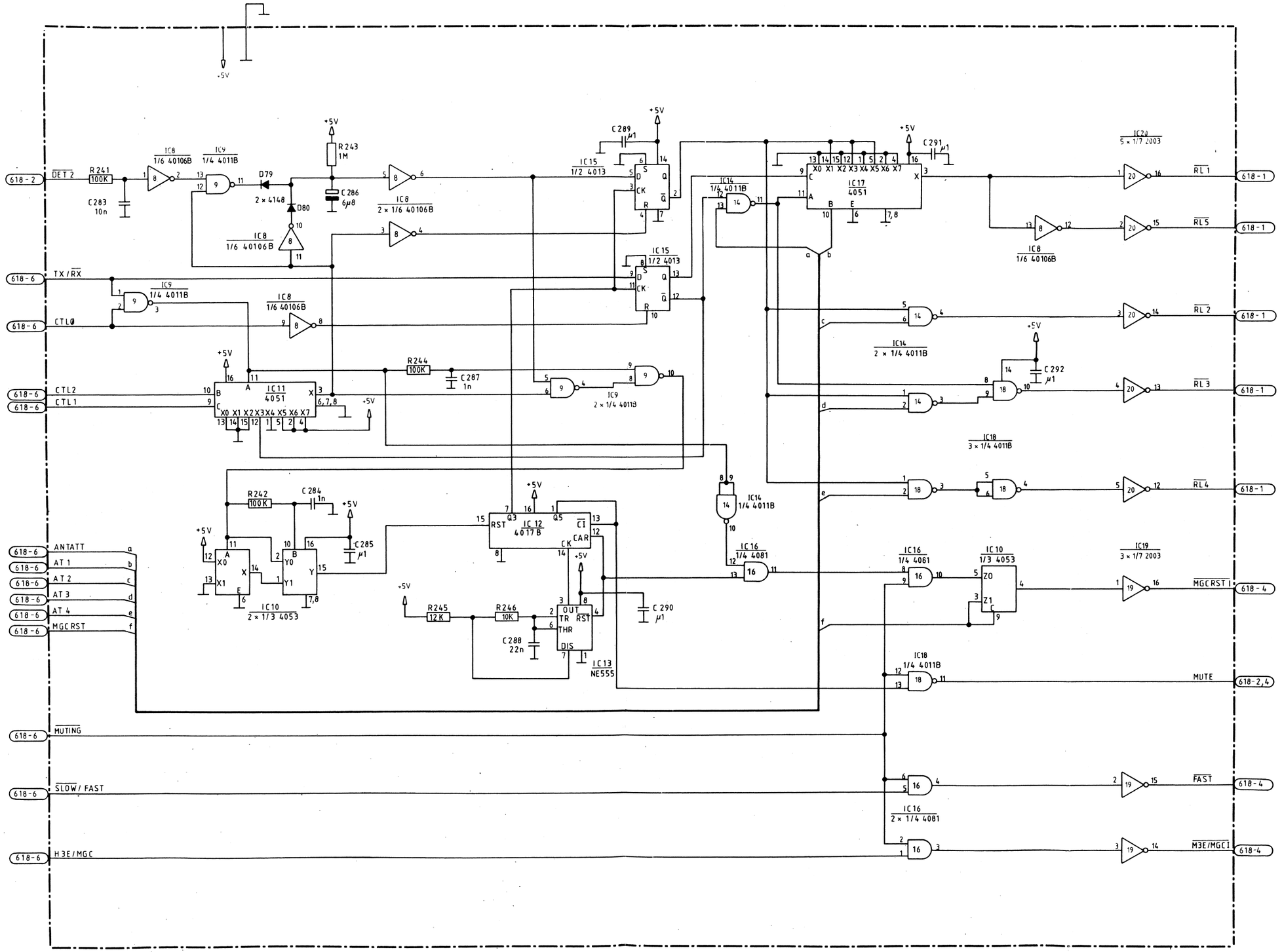
L81 IM2 220µ

L82 22µH IM2

L83 75µ

13 14 15 16 17 18 6

PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 4 OF 6



993 561 8X SUB5

PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 5 OF 6

-15V +15V +12V +7V +5V

PL1-36 PL1-35

C293 6µ8 C300 0µ1 C294 6µ8 C301 µ1 C302 6µ8 C303 µ47 C305 µ1 C306 µ1 C304 µ1

L84 470µH

IC23 MA7812 12V REG +12V

IC24 MA7805 5V REG +5V

R249 1K8 D81 6V8 +7V

SERIAL TO PARALLEL IN

PARALLEL TO SERIAL OUT

PL1-16 CLOCK
PL1-18 COM LOAD
PL1-19 COM DATA

C295 470p C296 470p

IC25 4094B C311 µ1 IC26 4094B C312 µ1 IC27 4094B C313 µ1 IC28 4094B

PL1-15 STAT LOAD C297 470p

IC21 74C165 IC22 74C165

R250 47K VERSION JUMPERS

R251 56K C325 µ1

SSB TELEX X3 X2 C307-C310 4×µ1

Q22 BC547 Q23 BC557 R247 1K8 R248 270E C298 470pF

PL1-9 TX / $\overline{RX}$
PL1-10 $\overline{RX\ MUTE}$ C299 470p

IC30 ¼ 2003 IC24 6×¼ 2003 IC29 ¼ 2003 IC19 7×¼ 2003

R252 56K R255 56K R253 56K R254 56K

NOTE: ON 2003 PIN 8 IS GND AND PIN 9 IS V_{CC}

AUBW

ANTATT	618-5
AT4	618-5
AT3	618-5
AT2	618-5
AT1	618-5
CTL2	618-5
CTL1	618-5
CTL0	618-5
$\overline{FL2}$	616-2
$\overline{FL4}$	618-1
$\overline{FL1}$	618-1
$\overline{FL7}$	618-1
$\overline{FL10}$	618-1
$\overline{FL6}$	618-1
$\overline{FL8}$	618-1
$\overline{FL3}$	618-1
$\overline{SLOW/FAST}$	618-5
$\overline{RF\ AMP}$	618-1
$\overline{FL9}$	618-1
$\overline{FL5}$	618-1
MGC/$\overline{RST}$	618-5
H3E/$\overline{MGC}$	618-5
$\overline{FL0}$	618-1
$\overline{DET\ 1}$	618-2
AMDET	618-4
$\overline{X2}$	618-3
$\overline{X3}$	618-3
$\overline{X4}$	618-3
$\overline{AUBW\ 1}$	618-4
$\overline{AUBW\ 2}$	618-4
IF GAIN	618-4
$\overline{X5}$	618-3
$\overline{RC\ WIDE}$	618-3
TX/$\overline{RX}$	618-5
$\overline{RX\ MUTE}$	618-5
STAT DATA	PL1-14

PCB 618 RECEIVER SIGNAL PATH
VERSION A7 SUBDIAGRAM 6 OF 6

TEST POINTS FOR PCB [618] RECEIVER SIGNAL PATH.

(1) + 15V DC

(2) - 15V DC

(3) + 12V DC

(4) + 5V DC

(5) + 6.8V DC

(6) SELF TEST # 22 7V
—— " —— 23-24 2.9V
—— " —— 25-30 9.8V

(7) (8) (9) (10) (11) ONLY FOR USE WITH SIGNAL GENERATOR

(12) SELF TEST # 25 $50mV_{pp}$
—— " —— 26-30 $40mV_{pp}$

(13) SELF TEST # 25-30 $30mV_{pp}$

(14) SELF TEST # 25-30 $450mV_{pp}$ SINEWAVE 1.4 MHz

(15) SELF TEST # 22-30 $650mV_{pp}$ —— " —— 1.4 MHz

(16) (17) SELF TEST # 25 $1.7V_{pp}$ - 1 kHz

NOTE: KEEP GROUNDCORD ON PROBE AS SHORT AS POSSIBLE..

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

Printed Circuit Board Complete 618		107 561 81
IC1	CB303M2 Balanced mixer	850 030 30
IC2	LM2903	850 290 30
IC3	HPF505 Balanced mixer	850 000 11
IC4	MC1350	850 135 00
IC5,7	MC1458N	850 145 80
IC6	TBA 120 T	850 012 01
IC8	CD40106B	850 010 60
IC9,14,18	4011B	850 401 10
IC10	CD4053B	850 405 30
IC11,17	CD4051B	850 405 10
IC12	4017B	850 401 70
IC13	NE555	850 055 50
IC15	4013B	850 401 30
IC16	4081B	850 408 10
IC19,20,29,30,31	2003A	850 200 30
IC21,22	74C165	850 416 50
IC23	MA7812	850 781 20
IC24	MA7805	850 780 50
IC25,26,27,28	4094B	850 409 40
IC32	ULN2083A	850 208 30
Q1	BC327	840 032 70
Q2,17,18,20,22	BC557B	840 055 70
Q3,9,11,16,18,19	BC547B	840 054 70
Q4,5,10	BFR96	840 009 60
Q6,13	J310	840 031 03
Q7	J310 2 pcs. matched	840 031 02
Q12	BF981	843 098 10
Q14,15	BF240	840 024 00
Q21	BD645	842 064 50
D1,2,5,6,30,31, 41-44,46,60-62, 65-77,79,80	1N4148	830 414 80
D3,4	388A 114A	830 011 40
D7,18-26,35	BA423	830 042 30
D8-17,27-28,32-34, 36,51,52,54,83	BA479	833 047 90
D29	BZX79C12	832 791 21
D37-40	BA282	830 028 20
D45,47,48,50,53, 55-59,63,64	1S920	830 192 00
D49	BZX79B5V1	832 795 11
D78	BZX79B5V6	832 795 60

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

D81	BZX79C6V8				832 796 80
VR1	NEON LAMP				722 000 00
X1	45 HHz	Filter 2.7 kHz			383 571 01
X2	LSB Filter	1.4 MHz 1 kohm			385 112 03
RL1-4	Relay	12V	DIL		780 000 25
RL5	Relay	12V	DR-12V		780 000 38
R1,204,218,223, 224,228,241,242, 244	100 kohm	5%	1/8W	Car.	500 510 00
R2,3,8,15,21,40, 41,117,120,124-125,133,138,144, 148,152,154,157, 160,171,179,186, 201,216	100 ohm	5%	1/8W	Car.	500 210 00
R4,5	220 ohm	5%	1.5W	MO	544 222 00
R6	75 ohm	5%	5W	MO	547 175 00
R7,13,18,26, 118,121,203	3.3 kohm	5%	1/8W	Car.	500 333 00
R9	68 ohm	5%	1/4W	Car.	501 168 00
R10	82 ohm	5%	1/4W	Car.	501 182 00
R11,12	226 ohm	1%	1/4W	MF	511 222 60
R14,42,182	560 ohm	5%	1/8W	Car.	500 256 00
R16	100 ohm	1%	1/4W	MF	511 210 00
R17	68 ohm	5%	1.5W	MO	544 168 00
R19,20	120 kohm	5%	1/8W	Car.	500 512 00
R22,207,233	47 kohm	5%	1/8W	Car.	500 447 00
R23,61,106,170, 184,226	4.7 kohm	5%	1/8W	Car.	500 347 00
R24,32,50-59	470 ohm	5%	1/4W	Car.	501 247 00
R25	56 ohm	5%	1.5W	MO	544 156 00
R27,71,164,222, 234,240	33 kohm	5%	1/8W	Car.	500 433 00
R28,29,127,175, 188,208,247,249	1.8 kohm	5%	1/8W	Car.	500 318 00
R30,66	15 kohm	5%	1/8W	Car.	500 415 00
R31	2.2 kohm	5%	1/4W	Car.	501 322 00

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

R33-38,44-47, 78	270 ohm	5%	1/4W	Car.	501 227 00
R39,230	22 ohm	5%	1/8W	Car.	500 122 00
R43,62	680 ohm	5%	1/4W	Car.	501 268 00
R48	820 ohm	5%	1/4W	Car.	501 282 00
R49,83	390 ohm	5%	1/4W	Car.	501 239 00
R60	590 ohm	1%	1/4W	MF	511 259 00
R64,65,95,102, 111,112,134, 166-168,210,229, 246	10 kohm	5%	1/8W	Car.	500 410 00
R119,173	2.7 kohm	5%	1/8W	Car.	500 327 00
R63,139,158,165	8.2 kohm	5%	1/8W	Car.	500 382 00
R67,194,206,220	56 ohm	5%	1/8W	Car.	500 156 00
R68	82 ohm	5%	1/8W	Car.	500 182 00
R69,143,215,236	470 kohm	5%	1/8W	Car.	500 547 00
R70	47 ohm	5%	1/4W	Car.	501 147 00
R72	301 ohm	1%	1/4W	MF	511 230 10
R73,113,140,142	1.5 kohm	5%	1/8W	Car.	500 315 00
R74,90,91,180, 198,239	220 ohm	5%	1/8W	Car.	500 222 00
R75	90.3 ohm	1%	1/8W	MF	511 195 30
R76,77,123,147, 199,213,217,219, 221	1 kohm	5%	1/8W	Car.	500 310 00
R79,174	10 ohm	1%	1/4W	MF	511 110 00
R80,214	390 ohm	5%	1/8W	Car.	500 239 00
R81,84	10 ohm	5%	1/8W	Car.	500 110 01
R82,88	270 ohm	5%	1/2W	Car.	502 227 00
R85,89,98, 128,145,211	47 ohm	5%	1/8W	Car.	500 147 00
R86	51.1 ohm	1%	1/4W	MF	511 151 10
R87	48.7 ohm	1%	1/4W	MF	511 148 70
R92	19.6 ohm	1%	1/4W	MF	511 119 60
R93,108,132, 254,257	56 kohm	5%	1/8W	Car.	500 456 00
R94	7.5 ohm	1%	1/4W	MF	511 075 00

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

R96,155,178,197, 200	27 ohm	5%	1/8W	Car.	500 127 00
R97,100	27.4 ohm	1%	1/4W	MF	511 127 40
R99	237 kohm	1%	1/4W	MF	511 523 70
R101	715 ohm	1%	1/4W	MF	511 271 50
R103	56.2 kohm	1%	1/4W	MF	511 456 20
R104	6.49 kohm	1%	1/4W	MF	511 364 90
R105	14.7 kohm	1%	1/4W	MF	511 414 70
R107	270 kohm	5%	1/8W	Car.	500 527 00
R109,149,150	820 ohm	5%	1/8W	Car.	500 282 00
R110	56 ohm	5%	1/4W	Car.	501 156 00
R114	511 ohm	1%	1/4W	MF	511 251 10
R115	56.2 ohm	1%	1/4W	MF	511 156 20
R116	46.4 ohm	1%	1/4W	MF	511 146 40
R122,129,136,141, 146,151,159,161, 162,205,231,258	5.6 kohm	5%	1/8W	Car.	500 356 00
R126,227	680 ohm	5%	1/8W	Car.	500 268 00
R130,137,156	120 ohm	5%	1/8W	Car.	500 212 00
R131,235	82 kohm	5%	1/8W	Car.	500 482 00
R135	18 kohm	5%	1/8W	Car.	500 418 00
R163,237,238,248	270 ohm	5%	1/8W	Car.	500 227 00
R169,172,259	2.2 kohm	5%	1/8W	Car.	500 322 00
R176,192	1.87 kohm	1%	1/4W	MF	511 318 70
R177	33.2 ohm	1%	1/4W	MF	511 133 20
R181	562 ohm	1%	1/4W	MF	511 256 20
R183	825 ohm	1%	1/4W	MF	511 282 50
R185	3.9 kohm	5%	1/8W	Car.	500 339 00
R187	3.48 kohm	1%	1/4W	MF	511 334 80
R191	5.62 kohm	1%	1/4W	MF	511 356 20
R193,196	82.5 kohm	1%	1/4W	MF	511 482 50
R195	4.7 kohm			Pot.	582 347 00
R202,245	12 kohm	5%	1/8W	Car.	500 412 00
R209	1.5 Mohm	5%	1/4W	Car.	501 615 00
R189,190	10 kohm	1%	1/4W	MF	511 410 00
R225	68 kohm	5%	1/8W	Car.	500 468 00
R232	10 Mohm	5%	1/4W	Car.	501 710 00
R243	1 Mohm	5%	1/8W	Car.	500 610 00
R250	9x47 kohm			Sil.	530 000 07
R251-253,255	7x56 kohm			Sil.	530 000 13

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

C1,4-6,8,9, 12-17,21,27,44, 69-72,87-92,97, 105,109-112,116, 117,132,133,140, 145,151,166,172-174,176-178,180, 185,190,192,194, 201-203,205,211, 215,218-221,224, 226,227,231,233, 238,239,243-247, 249,251,254,258, 261,262,266,267, 269,278,285,289-292,300,301,304-315,320,324,325, 327,329,330	0.1 uF	10%	63V	Polyes.	622 510 00
C2,3	0.22 uF	10%	250V	Polyes.	624 522 01
C7,56,68,181, 270,277,288	22 nF	10%	63V	Polyes.	622 422 00
C10,11	4.7 nF		63V	Cer.	602 347 02
C18	2.7 nF	10%		Cer.	602 327 00
C19,64,65,67	15 nF	20%	63V	Polyes.	622 415 01
C20,114,129, 142,150,303	0.47 uF	10%	63V	Polyes.	622 547 01
C22,25,63,85	33 nF	20%	63V	Polyes.	622 433 00
C23,24	47 nF	10%	63V	Polyes.	622 447 00
C26	68 nF	20%	63V	Polyes.	622 468 00
C28,38,149,163, 170,183,200, 225,326	150 pF	2%	63V	N150	602 215 00
C29,98,235,257	220 pF	1%	500V	Polyst.	615 222 00
C30,60	270 pF	1%	500V	Polyst.	615 227 00
C31,50,76,100, 101	390 pF	1%	500V	Polyst.	615 239 00
C32	2.7 nF	1%	125V	Polyst.	613 327 00
C33,47,48,74,99, 169,236	100 pF	2%	63V	N150	602 210 00
C34,39,55,73	82 pF	2%	63V	N150	602 182 00

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

C35	620 pF	1%	250V	Polyst.	614 262 00
C36,279	910 pF	1%	500V	Polyst.	615 291 00
C37,104	1.3 nF	1%	160V	Polyst.	613 313 00
C40,93,256	1.2 nF	1%	500V	Polyst.	615 312 00
C41,107,157,198	56 pF	2%	63V	N150	602 156 00
C42,53	33 pF	2%	63V	N150	602 133 01
C43,275	330 pF	1%	500V	Polyst.	615 233 00
C45,46,160,189, 222,223,228	120 pF	2%	63V	N150	602 212 00
C49,52,77,229, 253	470 pF	1%	630V	Polyst.	615 247 00
C51,62,154,164, 318	47 pF	2%	63V	N150	602 147 00
C57,113,138	0.33 uF	20%	63V	Polyes.	622 533 01
C58,130,131,135, 139,210	2.2 uF		25V	Sol. al.	652 622 03
C59,106,115,134, 280,281,286	6.8 uF	20%	25V	Tan.	652 668 00
C61	18 pF	2%	63V	N150	602 118 00
C66,83,96, 118-128,137,175, 182,188,191,195, 204,206-209,212, 213,214,217,230,234, 237,240,242,248, 259,268,282,284, 321,322,328	10 nF	10%	63V	Polyes.	622 410 01
C75,159,162,165, 167,168,196	15 pF	2%	63V	N150	602 115 00
C78	560 pF	1%	500V	Polyst.	615 256 00
C79,276	820 pF	1%	500V	Polyst.	615 282 00
C80,82,103	1 nF	1%	500V	Polyst.	615 310 01
C81	1.5 nF	1%	500V	Polyst.	615 315 00
C84	5.6 nF	1%	125V	Polyst.	613 356 00
C94,255	2.2 nF	1%	125V	Polyst.	613 322 00
C95	8.2 nF	1%	125V	Polyst.	613 382 00
C102	750 pF	1%	500V	Polyst.	615 275 00
C108,156	22 pF	2%	63V	N150	602 122 00

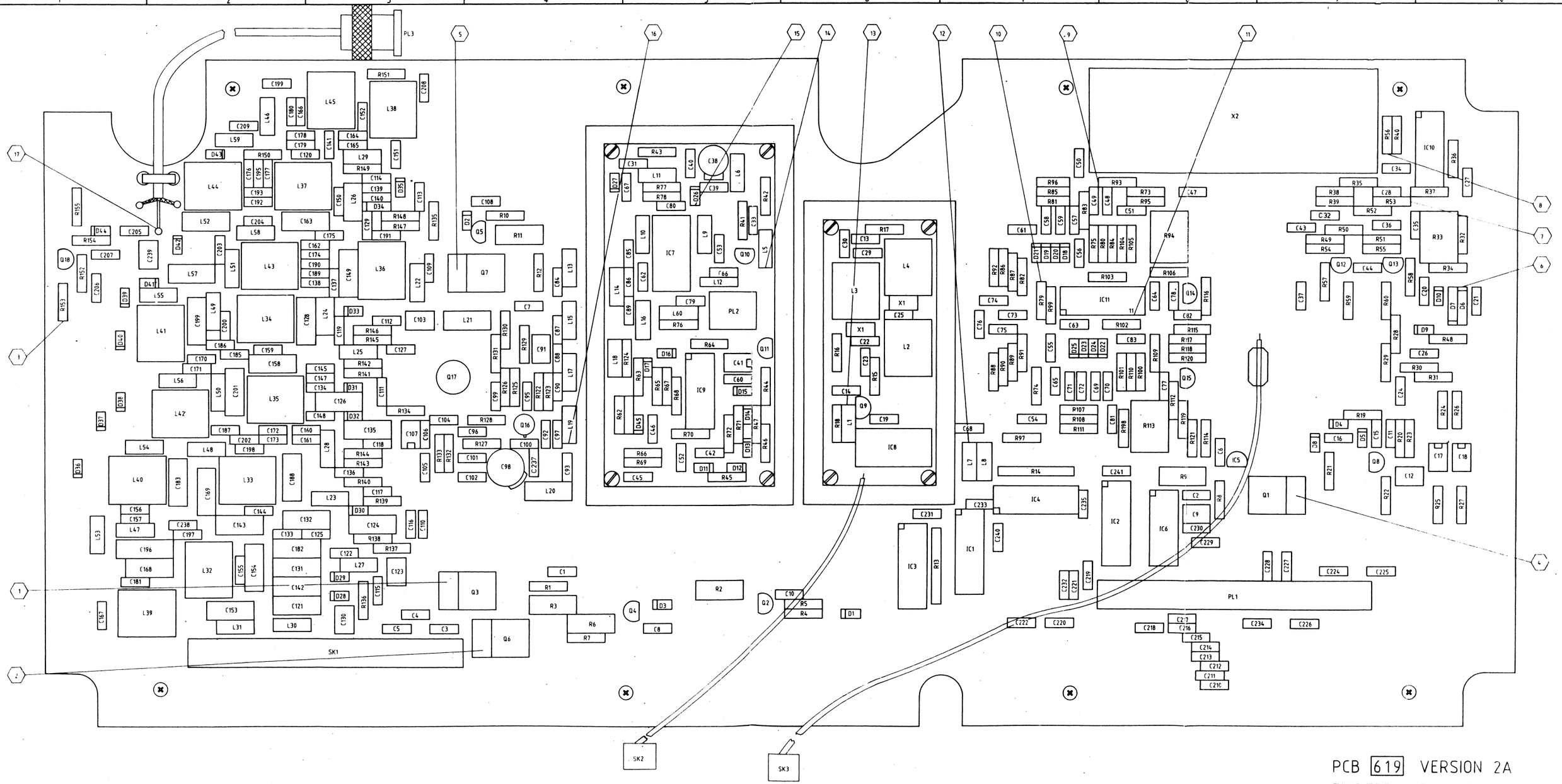
PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 618 VERSION A7

C136,146,147, 148,152,153,186, 187,216,241,252, 271,283,287	1 nF	10%	63V	Cer.	602 310 02
C141,250	10 pF	2%	63V	N150	602 110 00
C143,144,171, 272,319	0.22 uF	10%	63V	Polyes.	622 522 01
C155	100 uF		25V	Sol. al.	652 810 00
C158,314	2-9 pF		100V	Var.	683 009 00
C161,184	39 pF	2%	63V	N150	602 139 01
C179	4.5-26 pF			Var.	683 126 00
C193,232,264	22 uF		16V	Tan.	651 722 01
C199	27 pF	2%	63V	N150	602 127 00
C260	1 uF		35V	Tan.	652 610 01
C263,273,274	10 uF		63V	Sol. al.	652 710 02
C293,294,302,323	6.8 uF		25V	Sol. al.	652 668 01
C295-299	470 pF	10%	63V	Cer.	602 247 00
L1-5	4.7 mH	5%	RF Choke		740 347 00
L6,7,50,51,53, 57,69	1000 uH	10%	RF Choke	IM2	740 310 04
L8,39	0.15 uH	20%	RF Choke	IM4	740 001 51
L9,37,40	0.22 uH	10%	RF Choke	IM2	740 002 21
L10,87	0.33 uH	10%	RF Choke	IM2	740 003 30
L11,19,38	0.47 uH	10%	RF Choke	IM2	740 004 70
L12,43	0.68 uH	10%	RF Choke	IR2	740 006 81
L13,44,68	0.82 uH	10%	RF Choke	IM2	740 008 20
L14,74,80	4.7 uH	10%	RF Choke	IM2	740 047 02
L26,66,67,70	0.1 uH	10%	RF Choke	IM2	740 001 00
L34	6.8 uH	10%	RF Choke	IM2	740 068 01
L35,36	33 uH		RF Choke		740 133 01
L41,86	0.39 uH	10%	RF Choke	IM2	740 003 90
L45	3.9 uH	10%	RF Choke	IM2	740 039 00
L46,55,56,72	47 uH	10%	RF Choke	IM2	740 147 03
L47,77,78,82	22 uH	10%	RF Choke	IM2	740 122 02
L48	2.7 uH	10%	RF Choke	IM2	740 027 00
L49	470 uH	10%	RF Choke	IM2	740 247 02
L52,54,75,76,88	10 uH	10%	RF Choke	IM2	740 110 04
L58,59	2.2 uH	10%	RF Choke	IM2	740 022 02
L60	0.56 uH	10%	RF Choke	IM2	740 005 60
L61-65,71	0.15 uH	10%	RF Choke	IM2	740 001 50
L73	0.33 uH	10%	RF Choke	IM4	740 003 31
L79,81	220 uH	10%	RF Choke	IM2	740 222 02
L84	470 uH	5%	RF Choke		740 247 01
L85	0.27 uH	5%	RF Choke	IM2	740 002 71

TECHNICAL DESCRIPTION

PCB [619] EXCITER SIGNAL PATH

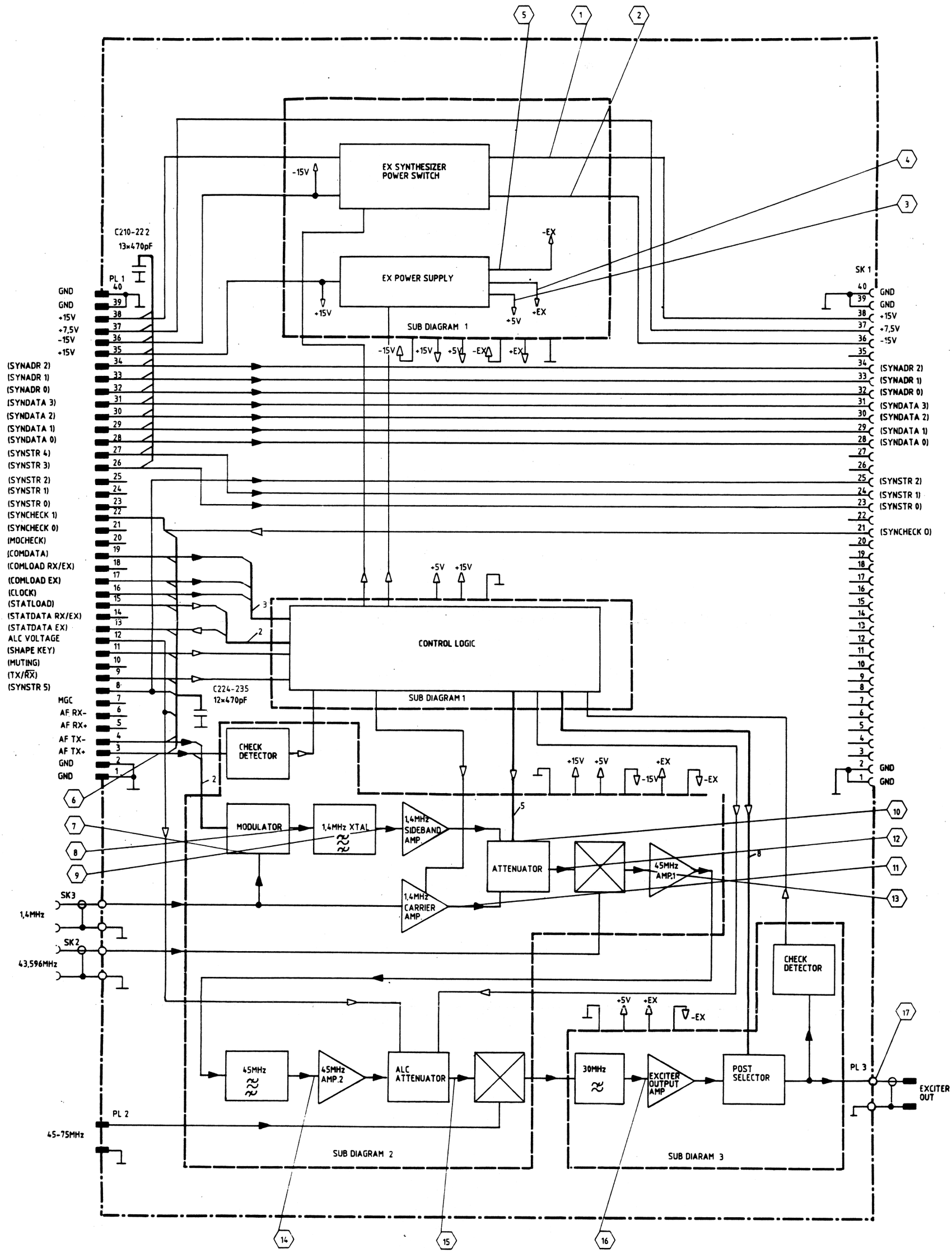
The exciter converts the AF signal to a RF signal of the right frequency, level and modulation. The frequency conversion is controlled by the exciter Synthesizer Board [611]. The balanced AF signal with a level of 0 dBm/600 ohm from Audio Processing Board [601] is led to the double balanced mixer IC10. The 1.4 MHz LO signal from the Synthesizer Board [611] is amplified in the limiter and applied to the mixer producing a 1.4 MHz double sideband suppressed carrier output signal which is filtered in the 1.4 MHz lower sideband crystal filter. The 1.4 MHz LO signal amplified in the 1.4 MHz Carrier Amp. and the output signal of the crystal filter amplified in the 1.4 MHz Sideband Amp. are adjusted by two attenuators and combined in the common 1.4 MHz Amp. The setting of the attenuators depends on the selected operation mode and is controlled by the Transceiver Control Board [624] via the serial-to-parallel converter IC1 and IC2. In this way the peak-to-peak voltage of the combined signal is held independent of the operation mode. The combined 1.4 MHz signal is applied to a passive double balanced mixer where it is mixed with a 43.596 MHz signal from the Synthesizer Board [611] producing a IF frequency of 44.996 MHz. The IF signal is amplified in the 45 MHz Amp. 1, filtered in the 45 MHz monolithic crystal filter and further amplification takes place in 45 MHz Amp. 2. The IF signal is then led to the ALC attenuator which is the amplitude controlling element of the ALC system. The attenuation is controlled by a DC voltage generated by the Transceiver Control Board [624]. The attenuated IF signal is mixed with a 45-75 MHz signal from the Synthesizer Board [611] in a passive double balanced mixer to form the final RF signal at the actual transmitting frequency. The RF signal is led through a 30 MHz lowpass filter and applied to the Exciter Output Amp. Finally the RF signal is filtered in the Post Selector which consists of one lowpass-, six bandpass- and one highpass filter. The filter selection is carried out by the Transceiver Control Board [624] via the serial-to-parallel converter. The output signal of the exciter is applied to the Power Amplifier. For use in the self test routines two check detectors are incorporated. One at the AF input and one at the RF output. The check detectors confirm the presence of the AF- and the RF signal.



PCB 619 VERSION 2A

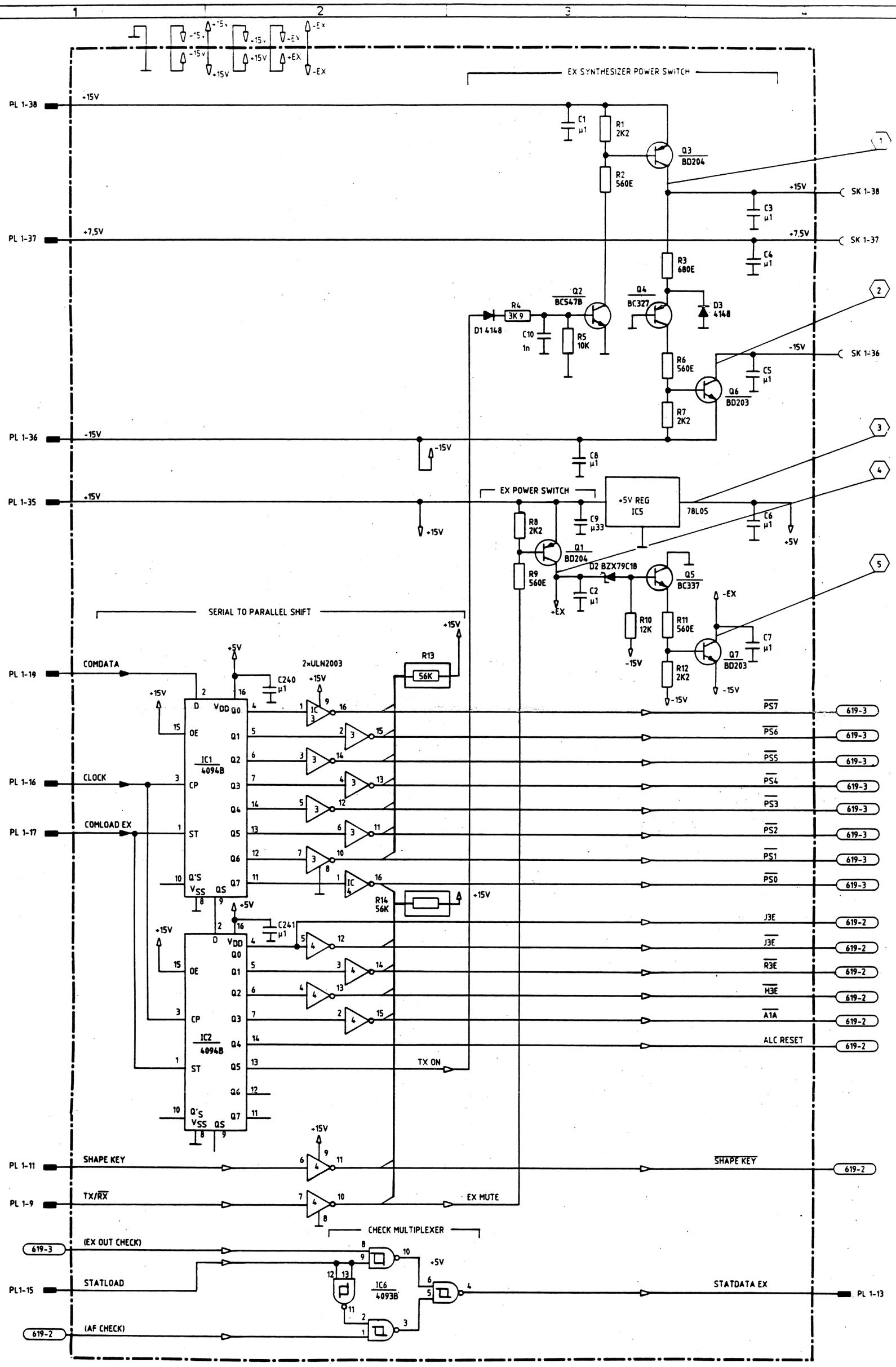
EXCITER SIGNAL PATH
VIEWED FROM COMPONENT SIDE

993 5619X COMP



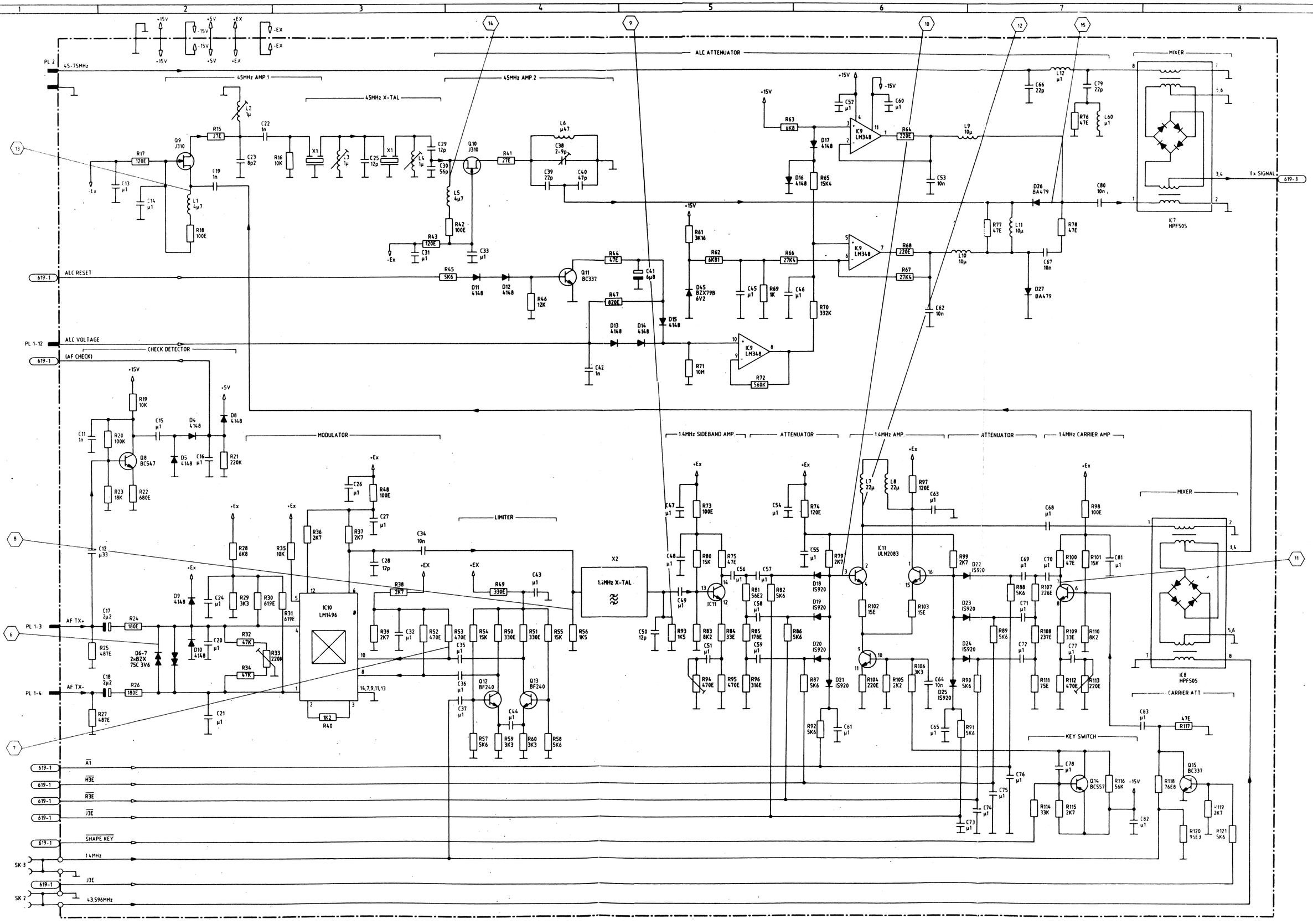
993 561 9X MAIN

PCB 619 EXCITER SIGNAL PATH
VERSION 2A. MAIN DIAGRAM



PCB 619 EXCITER SIGNAL PATH
VERSION 2A. SUBDIAGRAM 1 OF 3

993 561 9X SUB 1



993 561 9X SUB2

PCB 619 EXCITER SIGNAL PATH
VERSION 2A SUBDIAGRAM 2 OF 3

+5V +Ex -Ex -Ex +5V +Ex

POST SELECTOR

+FX

R135 680E L22 470µ D28 BA479 C108 µ1 C109 µ1

C121 1n0 L30 68µ L31 1µ5 C153 82Cp C167 68p D36 BA479 400kHz - 2.500MHz PS0

R136 56E C115 µ1 C130 µ33

EX OUTPUT AMP.

R129 47E C91 µ47 R122 3K9 R126 330E R130 1K2 L21 470µ R125 470E C95 µ1 C99 10n C103 µ33 C92 µ1 Q16 BFX89 Q17 BFW17A C104 120p R123 1K5 R127 10E C100 82p R131 470E R132 18E R134 56E C96 µ15 R128 270E C101 µ15 C102 µ1 R133 27E C105 µ1 C106 µ1 C107 2µ2 -EX -EX -EX -EX

D29 BA423 L27 1µ8 C122 150p C131 820p C142 820P L32 µ967 C154 560p C155 56P C168 820P C181 47P C182 560P C196 8n2 L53 1µ2 D37 BA423 2.500MHz - 5.246MHz PS1 L47 33µ C197 µ1 L39 12µ2 R137 820E R138 820E C116 µ1 C123 µ33

+EX C208 µ1 R151 680E L59 220µ C209 µ1

D30 BA423 L23 µ56 C125 68P C124 1n C132 220p L33 µ716 C133 68p C143 470p C144 47p C183 820P L54 1µ8 D38 BA423 5.246MHz - 7.270MHz PS2 L40 5µ11 C156 150p C157 82p C169 390p C238 56p L48 22µ C198 µ1 R139 820E R140 820E C110 µ1 C117 µ1

D31 BA423 L25 µ47 C126 560p C134 22p C145 150P L34 µ498 C147 47p C158 330p C159 33p C170 150p C171 12p C185 150p C186 150p C199 470p L55 1µ2 D39 BA423 7.270MHz - 10.383MHz PS3 L41 3µ8 L49 33µ C200 10n R141 820E R142 820E C111 µ1 C127 33n C239 µ33

16 17 PL 3 EXCITER OUT

30MHz FILTER

L13 µ33 L15 µ39 L17 µ27 L19 µ1 C84 150p C87 22p C88 120p C90 47p C93 18p C97 39p L20 1µ2 C237 10p C98 4,5-26p

619-2 EX SIGNAL

C85 47p C86 39p C89 56p L14 µ15 L16 µ15 L18 µ56 R124 47E

D32 BA423 L28 µ33 C135 330p C148 82p C160 120p L35 µ362 C161 18p C172 150p C173 100p C187 120p C188 220p C201 330p L56 µ82 D40 BA423 10.383MHz - 14.695MHz PS4 L42 2µ51 L50 22µ C202 4n7 R143 820E R144 820E C118 µ1 C136 33n

D33 BA423 L24 µ22 C128 330p C137 82p L36 µ284 C138 10p C149 180p C162 82p C174 12p C175 150p C189 150p C190 100p C191 39p L57 µ68 D41 BA423 14.695MHz - 19.571MHz PS5 L43 1µ57 L51 15µ C203 4n7 R145 820E R146 820E C112 µ1 C119 15n

CHECK DETECTOR

-5V R152 270K C206 µ1 C205 µ1 R153 47K R154 10K (EX OUT CHECK) 619-1 D44 4148 Q18 BC 547B R155 4K7 C207 10n

D34 BA423 L26 µ15 C139 150p C140 150p C150 68p L37 µ160 C163 220p C176 39p C177 100p C192 120p C193 12p C195 27p L52 µ68 D42 BA423 19.571MHz - 24.424MHz PS6 L44 2µ04 L58 10µ C204 4n7 R147 820E R148 820E C113 µ1 C129 10n

D35 BA423 C151 100p C164 100p C178 150p C165 82p C179 56p C152 150p C166 33p C180 27p L29 µ22 C141 10n L38 µ411 L45 µ895 L46 µ68 C199 150p D43 BA423 24.424MHz - 30.0MHz PS7 R149 820E R150 820E C114 1n C120 µ1

619-1 PS0 619-1 PS1 619-1 PS2 619-1 PS3 619-1 PS4 619-1 PS5 619-1 PS6 619-1 PS7

PCB 619 EXCITER SIGNAL PATH
VERSION 2A. SUBDIAGRAM 3 OF 3

PARTS LIST FOR EXCITER SIGNAL PATH BOARD 619 VERSION 2A

Printed Circuit Board Complete 619					107 561 91
IC1,2	4094B				850 409 40
IC3,4	ULN2003				850 200 30
IC5	78L05ACP				850 780 52
IC6	4093B				850 409 30
IC7,8	HPF505				850 000 11
IC9	LM348				850 034 80
IC10	LM1496				850 149 60
IC11	ULN2083				850 208 30
Q1,3	BD204				842 020 40
Q2,8,18	BC547B				840 054 70
Q4	BC327				840 032 70
Q5,11,15	BC337				840 033 70
Q6,7	BD203				842 020 30
Q9,10	J310				840 031 03
Q12,13	BF240				840 024 00
Q14	BC557B				840 055 70
Q16	BFX89				840 089 00
Q17	BFW17A				840 001 70
D1,3-5,8-17,44	1N4148				830 414 80
D2	BZX79C18V				832 791 80
D6,7	BZX75C3V6				832 753 60
D18-25	1S920				830 192 00
D26-28,36	BA479				833 047 90
D29-35,37-43	BA423				830 042 30
D45	BZX79B6V2				832 796 20
X1	45 MHz	Filter 45N20B (Matched)			810 452 00
X2	1.4 MHz	LSB Filter			385 112 03
R1,7,8,12,105	2.2 kohm	5%	1/4W	Car.	501 322 00
R2,6,9,11	560 ohm	5%	1/2W	Car.	502 256 00
R3	680 ohm	5%	1/2W	Car.	502 268 00
R4,122	3.9 kohm	5%	1/4W	Car.	501 339 00
R5,16,19,35,154	10 kohm	5%	1/4W	Car.	501 410 00
R10,46	12 kohm	5%	1/4W	Car.	501 412 00
R13,14	56 kohm			Sil	530 000 13
R15,41,133	27 ohm	5%	1/4W	Car.	501 127 00
R17,43,74,97	120 ohm	5%	1/4W	Car.	501 212 00
R18,42,48,73,98	100 ohm	5%	1/4W	Car.	501 210 00
R20	100 kohm	5%	1/4W	Car.	501 510 00
R21	220 kohm	5%	1/4W	Car.	501 522 00
R22,135,151	680 ohm	5%	1/4W	Car.	501 268 00
R23	18 kohm	5%	1/4W	Car.	501 418 00
R24,26	180 ohm	5%	1/4W	Car.	501 218 00
R25,27	487 ohm	1%	1/4W	MF	511 248 70
R28,63	6.8 kohm	5%	1/4W	Car.	501 368 00

PARTS LIST FOR EXCITER SIGNAL PATH BOARD 619 VERSION 2A

R29,59,60,106	3.3 kohm	5%	1/4W	Car.	501 333 00
R30,31	619 ohm	1%	1/4W	MF	511 261 90
R32,34,153	47 kohm	5%	1/4W	Car.	501 447 00
R33	220 kohm			Pot.	582 522 00
R36-39,79,99, 115,119	2.7 kohm	5%	1/4W	Car.	501 327 00
R40,130	1.2 kohm	5%	1/4W	Car.	501 312 00
R44,75-78,100, 117,124,129	47 ohm	5%	1/4W	Car.	501 147 00
R45,57,58,82, 86-92,121	5.6 kohm	5%	1/4W	Car.	501 356 00
R47,137-150	820 ohm	5%	1/4W	Car.	501 282 00
R49-51,126	330 ohm	5%	1/4W	Car.	501 233 00
R52,53,95,112, 125,131	470 ohm	5%	1/4W	Car.	501 247 00
R54,55,80,101	15 kohm	5%	1/4W	Car.	501 415 00
R56,93,123	1.5 kohm	5%	1/4W	Car.	501 315 00
R61	3.16 kohm	1%	1/4W	MF	511 331 60
R62	6.81 kohm	1%	1/4W	MF	511 368 10
R64,68,104	220 ohm	5%	1/4W	Car.	501 222 00
R65	15.4 kohm	1%	1/4W	MF	511 415 40
R66,67	27.4 kohm	1%	1/4W	MF	511 427 40
R69	1 kohm	1%	1/4W	MF	511 310 00
R70	332 kohm	1%	1/4W	MF	511 533 20
R71	10 Mohm	5%	1/4W	Car.	501 710 00
R72	560 kohm	5%	1/4W	Car.	501 556 00
R81	56.2 ohm	1%	1/4W	MF	511 156 20
R83,110	8.2 kohm	5%	1/4W	Car.	501 382 00
R84,109	33 ohm	5%	1/4W	Car.	501 133 00
R85	178 ohm	1%	1/4W	MF	511 217 80
R94	470 ohm			Pot.	582 247 00
R96	316 ohm	1%	1/4W	MF	511 231 60
R102,103	15 ohm	5%	1/4W	Car.	501 115 00
R107	226 ohm	1%	1/4W	MF	511 222 60
R108	237 ohm	1%	1/4W	MF	511 223 70
R111	75 ohm	1%	1/4W	MF	511 175 00
R113	220 ohm			Pot.	582 222 00
R114	33 kohm	5%	1/4W	Car.	501 433 00
R116	56 kohm	5%	1/4W	Car.	501 456 00
R118	76.8 ohm	1%	1/4W	MF	511 176 80
R120	95.3 ohm	1%	1/4W	MF	511 195 30
R127	10 ohm	5%	1/4W	Car.	501 110 00
R128	270 ohm	5%	1/4W	Car.	501 227 00
R132	18 ohm	5%	1/4W	Car.	501 118 00

PARTS LIST FOR EXCITER SIGNAL PATH BOARD 619 VERSION 2A

R134,136	56 ohm	5%	1/4W	Car.	501 156 00
R152	270 kohm	5%	1/4W	Car.	501 527 00
R155	4.7 kohm	5%	1/4W	Car.	501 347 00
C1-8,13-16,20,21, 24,26,27,31-33, 35-37,43-49,51, 52,54-61,63,65, 68-78,81-83,92, 95,102,105-106, 108-118,120,197, 198,205,206,208, 209,240,241	0.1 uF	10%	63V	Polyes.	622 510 00
C9,12,103,123, 130,239	0.33 uF	20%	63V	Polyes.	622 533 01
C10,11,22,42	1 nF	10%	63V	Cer.	602 310 02
C17,18	2.2 uF		35V	Tan.	652 622 01
C23	8.2 pF	+-0.25	63V	N150	602 082 00
C25,28,29,50, 171,174,193	12 pF	2%	63V	N150	602 112 00
C30,89,155, 179,238	56 pF	2%	63V	N150	602 156 00
C34,53,62,67,80, 99	10 nF	-20+50%		Cer.	602 410 01
C38	2-9 pF		100V	Var.	683 009 00
C39,66,79,87, 134	22 pF	2%	63V	N150	602 122 00
C40,85,90,144, 147,181	47 pF	2%	63V	N150	602 147 00
C41	6.8 uF		25V	Tan.	652 668 00
C64,129,141, 200,207	10 nF	10%	63V	Polyes.	622 410 01
C84,122,139-140, 145,152,156,170, 172,175,178,185, 186,189,199	150 pF	2%	63V	N150	602 215 00
C86,97,176,191	39 pF	2%	63V	N150	602 139 01

PARTS LIST FOR EXCITER SIGNAL PATH BOARD 619 VERSION 2A

C88,104,160, 187,192	120 pF	2%	63V	N150	602 212 00
C91	0.47 uF	10%	63V	Polyes.	622 547 01
C93,161	18 pF	2%	63V	N150	602 118 00
C96,101	0.15 uF	10%	63V	Polyes.	622 515 00
C98	4.5-26 pF			Var.	683 126 00
C100,137,148, 157,162,165	82 pF	2%	63V	N150	602 182 00
C107	2.2 uF		25V	Sol.al.	652 622 03
C119	15 nF	1%	160V	Polyst.	613 415 00
C121,124	1 nF	1%	500V	Polyst.	615 310 01
C125,133,150,167	68 pF	2%	63V	N150	602 168 00
C126,154,182	560 pF	1%	500V	Polyst.	615 256 00
C127,136	33 nF	10%	63V	Polyes.	622 433 00
C128,135,158,201	330 pF	1%	500V	Polyst.	615 233 00
C131,142,153, 168,183	820 pF	1%	500V	Polyst.	615 282 00
C132,163,188	220 pF	1%	500V	Polyst.	615 222 00
C138,237	10 pF	2%	63V	N150	602 110 00
C143,199	470 pF	1%	500V	Polyst.	615 247 00
C149	180 pF	1%	500V	Polyst.	615 218 00
C151,164,173, 177,190	100 pF	2%	63V	N150	602 210 00
C159,166	33 pF	2%	63V	N150	602 133 01
C169	390 pF	1%	500V	Polyst.	615 239 00
C180,195	27 pF	2%	63V	N150	602 127 00
C196	8.2 nF	1%	160V	Polyst.	613 382 00
C202-204	4.7 nF	10%	100V	Cer.	602 347 02
C210-222,224-235	470 pF	10%	63V	Cer.	602 247 00
L1,5	4.7 uH	10%	RF Choke	IM2	740 047 02
L2-4	1 uH				103 636 61
L6	0.47 uH	10%	RF Choke	IM2	740 004 70
L7,8,48,50	22 uH	10%	RF Choke	IM2	740 122 02
L9,10,11,58	10 uH	10%	RF Choke	IM2	740 110 04
L12,19,60	0.1 uH	10%	RF Choke	IM2	740 001 00
L13	0.33 uH	10%	RF Choke	IM2	740 003 30
L14,16	0.15 uH	10%	RF Choke	IM2	740 001 50
L15	0.39 uH	10%	RF Choke	IM2	740 003 90
L17	0.27 uH	10%	RF Choke	IM2	740 002 70
L18	0.56 uH	10%	RF Choke	IM2	740 005 60
L20	1.2 uH	10%	RF Choke	IM4	740 012 00
L21	470 uH	10%	RF Choke	IM4	740 247 01
L22	470 uH	10%	RF Choke	IM2	740 247 02

PARTS LIST FOR EXCITER SIGNAL PATH BOARD 619 VERSION 2A

L23	0.56 uH	5%	RF Choke	IM2	740 005 61
L24,29	0.22 uH	5%	RF Choke	IM2	740 002 23
L25	0.47 uH	5%	RF Choke	IM2	740 004 71
L26	0.15 uH	5%	RF Choke	IM2	740 001 52
L27,54	1.8 uH	5%	RF Choke	IM2	740 018 01
L28	0.33 uH	5%	RF Choke	IM2	740 003 32
L30	68 uH	10%	RF Choke	IM2	740 168 02
L31	1.5 uH	10%	RF Choke	IM2	740 015 00
L32	0.967 uH				103 636 7X
L33	0.716 uH				103 636 9X
L34	0.498 uH				103 637 1X
L35	0.362 uH				103 637 3X
L36	0.284 uH				103 637 5X
L37	0.16 uH				103 637 7X
L38	0.411 uH				103 637 9X
L39	12.2 uH				103 636 8X
L40	5.11 uH				103 637 0X
L41	3.8 uH				103 637 2X
L42	2.51 uH				103 637 4X
L43	1.57 uH				103 637 6X
L44	2.04 uH				103 637 8X
L45	0.895 uH				103 638 0X
L46,52,57	0.68 uH	5%	RF Choke	IM2	740 006 82
L47,49	33 uH		RF Choke		740 133 01
L51	15 uH	10%	RF Choke	IM2	740 115 00
L53,55	1.2 uH	5%	RF Choke	IM2	740 012 02
L56	0.82 uH	5%	RF Choke	IM2	740 008 21
L59	220 uH	10%	RF Choke	IM2	740 222 02
PL1	40-pole plug				756 040 04
PL2	2-pole connector				750 001 45
PL3	Coax cable				373 638 32
SK1	Flat ribbon cable				373 638 52
SK2	Coax cable				106 606 70
SK3	Coax cable				106 606 60