TECHNICAL MANUAL

HF RECEIVER

R 8003

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Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this Manual. Whenever practicable corrections will be listed on a correction sheet in the Amendments chapter of this Manual.

CONTENTS

1. INTRODUCTION

The R8003 is a high performance, general purpose, programmable, LF/MF/HF receiver covering the frequency range 10 kHz to 30 MHz. It is designed for surveillance, monitoring and communication applications in fixed and maritime mobile applications.

The Receiver consists of a Receiver Unit and a Control Unit. When the units are combined, they may be placed table-top or 19" rack mounted. The construction of the receiver permits the Control Unit to be separated from the Receiver Unit by up to 100 m thereby increasing installation flexibility and permitting installation in operator consoles where space is at a premium.

The Receiver Unit contains a dual conversion receiver signal path, which provides for reception of upper and lower sideband SSB, ISB, double sideband AM, CW and MCW morse telegraphy, and FSK Radiotelex signals. Duplex operation is facilitated utilizing a novel technique based on automatic front-end attenuator adjustment. A fast tuning synthesizer provides 10 Hz resolution with stability determined by a Master Oscillator, available in different grades grades of stability. The Receiver Unit contains two seperate 600 ohm balanced line outputs for upper and lower sideband respectively. Data output from the built-in FSK demodulator is also provided at the Receiver Unit. Seven control outputs are available, which enable auxiliary equipment to be controlled from the Receiver keyboard. The Receiver is controlled via a micro-processor-based control circuit through a serial interface with rates of 300, 600, 1200 or 2400 Bauds. Power supply is from AC mains or 24 V DC with automatic switch-over to DC in case of AC power failure.

The Control Unit provides the user interface. The logical front panel design is based on a sealed membrane keyboard, insensitive to dust and water, and easy-to-read yellow LED displays. The left-hand display field shows time-of-day or program number and channel number, while the right-hand display shows the frequency. Two bar-graph displays shows line level and signal strength respectively. When the FSK demodulator is in operation, the relative positions of the mark and space frequencies are shown instead of line level.

A flywheel tuning knob is used for search and fine-tuning in 1000 Hz, 100 Hz or 10 Hz steps and for manual scanning. Further, the tuning knob is used for adjustment of the Notch filter, which like the Pass Band Shift facility may be utilized to enhance the quality of the received signals. A speech controlled squelch circuit is included and may be used to mute the audio-output, when no speech signal is present.

A number of advanced operating features are provided, including recall of up to 399 receiver set-ups, 40 scanning programs, and 40 time programs. All from a user-programmable non-volatile memory. Receiver settings are retained during power-down.

The programming facilities of the receiver allows scanning programs to be set up, in which the receiver will automtically scan all channel numbers consecutively between a start channel number amd a stop channel number, or alternatively scan a frequency range defined by a start channel and a stop channel with any selected frequency

step size. It is additionnally possible to enter a freely chosen sequence of channel numbers to be scanned. The speech controlled squelch, the signal strenght, or an external signal may be programmed to hold the scanning for a specified time. A linking facility allows one scanning program to call another, thus making advanced sector scanning possible.

The time programs can control the receiver to automatically recall channel set-ups, recall scan programs or start scanning at selected times in 1 hour or 24 hour cycles. Each program may contain several time-actions.

The FSK demodulator parameters, i.e. mark-space frequencies and data rate may be selected from a number of pre-programmed set-ups, or may be programmed to any desired combination from the keyboard.

Other programming facilities include the beep level of the acoustic keyboard feed-back and a user-programmable tuning rate.
Also available is a function, which will erase all information in the user-programmed memory.

The receiver may be configured for specific applications which require limitations or changes in the operational performance. Configuration change is possible from the keyboard, but is password protected to prevent unintentional or unauthorized changes.

Audio output is available from a built-in loudspeaker or a standard phone jack on the front panel, and from a 600 ohm balanced line output. Additional outputs are available for external speaker and handset earpiece.

Maintenance of the receiver is aided by a self-test programme for fault localization down to module level. No soldering or realignment is required when replacing modules.

2. TECHNICAL DATA

Frequency Range:	100 kHz to 30 MHz (10 kHz to 100 kHz with reduced performance).
Frequency Resolution:	10 Hz.
Frequency Selection:	Flywheel tuning knob with selectable tuning rate. Direct keyboard entry. Recall of 399 user-programmable channels. Automatic scanning. Remote control.
Tuning Rate:	10 Hz, 100Hz, 1000Hz programmable.
Frequency Presentation:	Yellow LED display.
Frequency Stability:	1.5 ppm, 0 to +40 deg.C. 0.8 ppm, -20 to +40 deg.C. (optional) 0.4 ppm, 0 to +40 deg.C. (optional) Ageing less than 1 ppm / year.
Operating Modes:	USB (upper sideband J3E, R3E, H3E) LSB (lower sideband J3E, R3E, H3E) ISB (independent sideband B8E, B7B, B9W) AM (double sideband A3E, H3E) TELEX (F1B, J2B with internal or external AFSK demodulator) CW (A1A)
Antenna Impedance:	50 ohms. Optional below 4 MHz: High Impedance, 10 ohm+250 pF (internally selectable).
Input Protection:	30 V EMF for up to 15 min.
Input Selectivity:	11 pre-set band pass filters, automatically selected.

IF Selectivity:

	6 dB	60 dB
USB:	350 Hz to 2700 Hz	-400 Hz and 3400 Hz
LSB:	-350 Hz to -2700 Hz	400 Hz and -3400 Hz
ISB,USB:	350 Hz to 2700 Hz	-400 Hz and 3400 Hz
ISB,LSB:	-350 Hz to -2700 Hz	400 Hz and -3400 Hz

TELEX, AM, CW:

Wide:	+/- 3000 Hz	+/- 10000 Hz
Intermediate:	+/- 1200 Hz	+/- 1900 Hz
Narrow:	+/- 400 Hz	+/- 850 Hz
Very Narrow:	+/- 125 Hz	+/- 500 Hz

PBS (Pass Band Shift) facillity in USB and LSB modes.

Sensitivity:	Max. antenna input (EMF) for 10 dB SINAD, 50 ohm antenna: SSB (350-2700 Hz): 0.8 uV AM (+/- 3000 Hz): 5 uV, m = 30% CW (+/- 400 Hz): 0.56 uV When RF-AMP is selected, the sensitivity is increased by approx. 6 dB.
Intermodulation:	Two 100 dBuV signals 30 kHz/60 kHz off tune produce less output than an equivalent input signal of 30 dBuV.
Cross Modulation:	An unwanted signal 118 dBuV/30%-400 Hz more than 20 kHz off tune produces cross modulation below -30 dB relative to a wanted signal of 60 dBuV (SSB).
Blocking:	With a wanted signal giving 20 dB SINAD, an unwanted signal 20 kHz off tune 80 dB above the wanted signal level will affect the output level by less than 3 dB or cause a reduction in SINAD of less than 6 dB (SSB). With a wanted signal 60 dBuV, an unwanted signal 20 kHz off tune 110 dBuV will affect the output level by less than 3 dB or cause a reduction of SINAD of less than 6 dB (SSB).
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 Emissions:	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). SSB, CW, MCW, TELEX: Attack time: 2 ms. Recovery time, FAST: 0.2 s. SLOW: 2 s.

BFO/BPS Range: +/- 3 kHz synthesized in 100 Hz steps.

Line Output: Internally adjustable up to +10 dBm/600 ohm, balanced.

Audio Subcarrier Frequency in TELEX mode: 1500 Hz - 2500 Hz configurable in 100 Hz steps.

Audio Squelch: Speech operated.

Notch Filter: 30 dB. Adjustable in range 300 Hz - 3000 Hz. Digital readout of notch frequency.

FSK Demodulator:

Mark and space frequency:
User selectable in the range 1000 - 3000 Hz.
Data rate : 50 - 750 baud.
Polarity: Normal/Reverse.
Data output: Enable/Disable.
Parameters are front panel selectable.
Output level: CCITT Rec. V28.
Diversity: Signals from 2 receivers can be combined.

Scanning:

Up to 40 user-programmable scanning programs
Dwell time: 0.1 - 25 s.
Hold time : 0 - 99 s.
Scan hold sourses: squelch, signal threshold or external signal.
Scanning types:

Consecutive Channel Scanning:
All channels between a start channel number and a stop channel number are scanned.

Frequency Scanning:
The frequency range between a start channel and a stop channel is scanned with the selected frequency step size (10 Hz to 99.99 KHz). Receiver control settings for the scanning sequence are governed by those of the start channel.

Sequential Channel Scanning:
A freely chosen sequence of channel numbers are scanned. Channels may be temporarily skipped from a scanning program during scanning.

Linking: Scanning programs can be interlinked.

Time Programming:	Up to 40 user-programmable time programs. Time cycles: 1 hour and 24 hours. Action types: recall of channel return to previous setting recall of scanning program start of scanning call of another time program
User Configuration:	Password protected facillity for configuration changes from the front panel.
Metering:	LED bar-graphs indicate signal strenght and line output level / FSK mark and space frequencies.
IF Output:	1.4 MHz (with BW Wide +/- 3000 Hz). Nominal 20 mV in 50 Ohms.
Line Outputs:	Seperate outputs for USB, LSB (ISB mode) and monitored channel, internally adjustable up to +10dBm/600 Ohms, balanced. Distortion less than 1%.
Audio Output Power:	Internal loudspeaker 0.5 W at less than 5 % distortion. External loudspeaker 4 W / 8 Ohms at less than 5 % distortion. Headphones 10 mW / 8 Ohm - 3 KOhms.
Extended Local Control:	Control Unit may be placed up to 100 meters from Receiver Unit using an 8 twisted pair cable. Data rate of 300, 600, 1200, or 2400 bauds depending on cable lenght.
Remote Frequency Control:	Serial interface compatible with EIA standard RS-232C for control of receiver frequency. Selectable data format and data rate in the range 300 to 9600 baud. Telex mode may be selected automatically. Re-transmission of Tx commands for control of an associated transmitter is possible.
Full Remote Control: (optional)	Serial interface compatible with EIA standards RS-232C and RS-485. Selectable data format and data rate in range 300 to 9600 baud. Up to 32 receivers may be connected in a group. Any receiver control unit may act as a master to control any of the receivers in then group.
Self Test:	Automatically or manually stepped self-test function with 31 tests.

Power Supply:	110-120/220-240 V AC 50-60 Hz and 24 V DC with automatic changeover to DC on failure of the AC mains supply.
Supply Voltage Variations:	DC: -10% to +30%. AC: +/- 10%. AC Frequency: +/- 5%.
Power Consumption:	24 V battery: approx. 40 W. AC mains: approx. 50 VA.
Full Performance Tempeture Range:	0 to + 40 deg.C.
Operating Temperature Range:	-20 to +55 deg.C.
Environmental Specifications:	Complies with CEPT and MPT 1204.
Mechanical Characteristics:	Height: 132.5 mm Width: 432 mm (482 mm incl. brackets for 19" rack mounting) Depth: 553 mm (incl. handles) Depth into rack: 506 mm (incl. rear side clearance) Depth, Control Unit only: 135 mm (incl. handles) Depth, Receiver Unit only: 418 mm Weight: approx. 16 kg

3. OPERATION

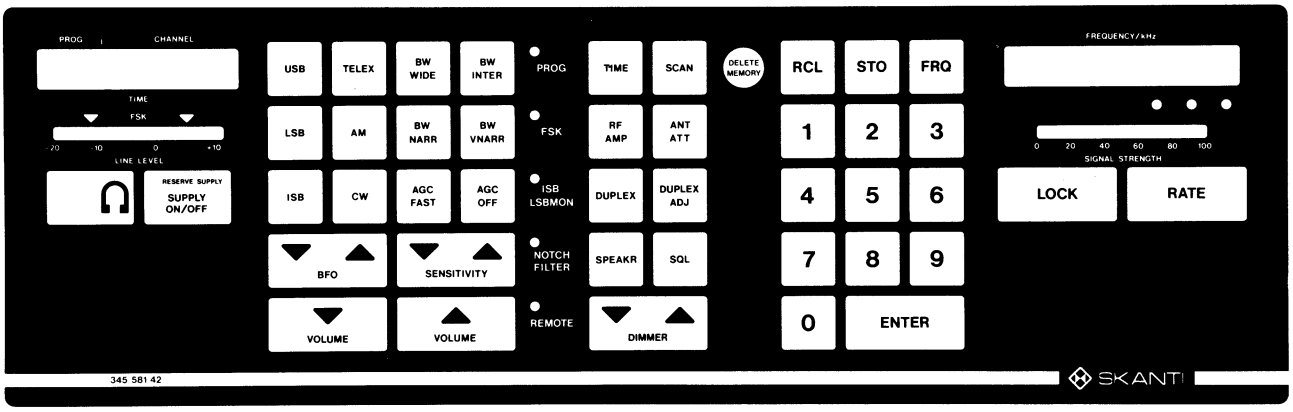


Fig. 3.1

The receiver is operated from the Control Unit (fig. 3.1) and is mainly keyboard controlled.

When supplied from AC mains the mains ON/OFF switch on the rear of the Receiver Unit must be in the ON position.

This chapter is divided into sections describing the following:

3.1 DESCRIPTION OF OPERATING CONTROLS

Switches the receiver ON/OFF. When switched ON the equipment is restored to the state it was in prior to switch OFF. Indicator is ON when the receiver is supplied from battery.

Selects USB mode (upper sideband J3E, R3E, H3E). Indicator is ON when in USB mode. Simultaneously the default bandwidth and AGC type for the mode is selected.

Selects LSB mode (lower sideband J3E, R3E, H3E). Indicator is ON when in LSB mode. Simultaneously the default bandwidth and AGC type for the mode is selected.

Selects ISB mode (independent sideband B8E B7B B9W). Indicator is ON when in ISB mode. Simultaneously the default bandwith and AGC type for the mode is selected and the ISB LSBMON key is enabled.

Selects TELEX mode (F1B, J2B with internal/external AFSK demodulator). Indicator is ON when in TELEX mode. Simultaneously the default bandwidth and AGC type for the mode is selected.

Selects AM Mode (A3E, H3E). Indicator is ON when in AM Mode.
Simultaneously the default bandwidth and AGC type for the mode is selected.

Selects CW mode (A1A morse telegraphy). Indicator is ON when in CW mode.
Simultaneously the default bandwidth and AGC type for the mode is selected.

Selects WIDE IF bandwidth. Disabled in USB and LSB modes. Indicator is ON when IF bandwidth is WIDE.

Selects INTER (Intermediate) IF bandwidth. Disabled in USB and LSB modes. Indicator is ON when IF bandwidth is INTER.

Selects NARROW IF bandwidth. Disabled in USB and LSB modes. Indicator is ON when IF bandwidth is NARROW.

Selects VERY NARROW IF bandwidth. Disabled in SSB modes. Indicator is ON when IF bandwidth is VERY NARROW.

Switches between FAST and SLOW AGC time constant. The indicator is on when AGC time constant is FAST.

Switches the Automatic Gain Control ON or OFF. The indicator is ON when AGC is OFF. When the AGC is switched OFF the IF amplifier gain is maintained on the level it had prior to AGC switch-off and manual gain control via the SENSITIVITY

keys is enabled.

Adjust the BFO frequency up and down in CW mode. The frequency display shows the BFO frequency when either of the keys are pressed.
In USB and LSB mode the keys may be used for PBS (Pass Band Shift) adjustment. By using this facility it is possible to reduce interference from adjacent signals by shifting the IF pass-band slightly up or down in frequency, thus providing clearer reception. The frequency display shows the pass band shift when either of the keys are pressed.
The pass band shift is reset when the mode is changed or when the frequency is changed more than 300 Hz.

For adjustment of receiver IF amplifier gain. Disabled in AGC FAST and AGC SLOW.

For adjustment of receiver AF amplifier gain (sound level in speaker and headphone). Two independent volume regulators are provided to facilitate quick change between two volume settings. Switching between the two regulators is accomplished by pressing both keys simultaneously.

Selects programming mode. The indicator starts flashing when PROG is pressed to indicate that further action is requested. If the PROG display shows "cc" the receiver is in the remote controlled mode. To exit this mode, press PROG.

Enables/Disables FSK data output. The indicator is ON when data output is enabled. Simultaneously the left-hand bar graph is switched to indicate the relative mark/space frequencies of the received signal.

Switches between LSB and USB monitoring in ISB mode. The indicator is ON when the LSB channel is monitored.

Switches Notch Filter ON/OFF. The indicator is ON when the the filter is ON. The notch frequency is adjusted by means of the Tuning Wheel. The notch frequency is shown in the frequency display for two seconds when switching ON the filter and when changing the frequency.

Switches between local/remote operation. Local operation is disabled (except VOLUME, SPEAKR, and DIMMER) whe the indicator is flashing. For remote control operation see appendix 1.

Switches ON/OFF display of the time of day. The indicator is ON when the time is displayed. The time is shown in the left hand display (hours.minutes), with the point in the middle flashing at seconds rate.

Starts/Stops automatic scanning. The indicator will flash when the receiver is in the scanning mode. The scan program number is shown in the PROG display and the channel number in the CHANNEL display. The receiver will automatically scan the programmed sequence of frequencies or set-ups with the programmed Dwell Time. Squelch or signal level or an external signal may be programmed to Hold the scanning in a specified time. During the Hold Time the symbol [(c) is displayed next to the channel number Scanning may be resumed within the Dwell Time/Hold Time by pressing SCAN twice.

Switches the RF Amplifier ON/OFF. The indicator is ON when the RF Amplifier is ON. Use of the RF Amplifier may be an advantage if the received signals are weak.

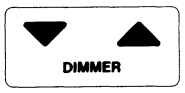
Switches the Antenna Attenuator ON/OFF. The indicator is ON when the Antenna Attenuator is ON. Use of the Antenna Attenuator may be an advantage if the received signals are affected by strong out-of-band signals.

Switches Duplex operation ON/OFF. The indicator is ON when Duplex operation is ON. With Duplex ON the receiver will not be muted when an associated transmitter is keyed. If DUPLEX ADJ has been activated, the Duplex Attenuator will be active when the transmitter is keyed. The speaker is switched off.

Initiates the Duplex Attenuator adjustment routine. The indicator will illuminate during adjustment. (During the adjustment CTL OUT 8 will be low for keying of the associated transmitter. A 1.1 kHz tone will be present at TONE OUT for modulation of the transmitter.) The adjustment routine will automatically adjust the Duplex Attenuator to the optimum setting for the receive and transmit frequencies selected taking into account the actual antenna separation.

Switches internal and/or external loudspeaker ON/OFF. The indicator is ON when the loudspeaker is ON. If headphones are connected via the front panel socket the internal loudspeaker is always switched off.

Switches the Squelch function ON/OFF. The indicator is ON when squelch is ON. The Squelch is use to eliminate noise when no speech signal is received. When Squelch is on the loudspeaker, headphone, and earpiece output is muted until a speech modulated signal with a signal-to-noise ratio above the intelligibility level is received.



For adjustment of the light intensity of the displays and indicators.

Deletes user programmable channels, scanning programs, and time programs when pressed continuously for 5 seconds. Alternating beep tones sounds when deletion takes place.

For recall of stored Channel Set-ups (RCL, number, ENTER), recall of Manual Channel Scanning (RCL, RATE), recall of Scan programs (RCL, SCAN, number, ENTER), and recall of Time programs (RCL, TIME, number, ENTER).

For Setting Time (STO, TIME, number, ENTER), for Storing Channel Set-ups (PROG, STO, number, ENTER), and for skipping channels temporarily from a sequential Channel Scanning Program.

For Direct Frequency Entry (FRQ, number, ENTER) and selection of User Programmed Rate (FRQ, RATE).

Terminates number entries. If an entered number is not valid (out of range) the number will flash. The next ENTER will restore the previous entry and stop flashing.

Enables/disables the Tuning Wheel. The indicator is ON when the Tuning Wheel is disabled.

For selection of Tuning Rate. The rate selected is indicated below the three right hand digits of the Frequency Display. Pressing RATE will shift the Tuning Rate between 1000, 100, and 10 Hz/step. FRQ, RATE selects the User Programmed Rate, and RCL, RATE selects Manual Channel Scanning.

Tuning Wheel — The Tuning Wheel is enabled or disabled by pressing the LOCK key. Dependent on the rate selected, the Tuning Wheel will alter the receiver frequency in steps of 10,100, or 1000Hz or a programmable step size. The Tuning Wheel may also be used for Manual Channel Scanning.

3.2 DESCRIPTION OF DISPLAYS AND INDICATORS

PROG DISPLAY
Consists of the first two digits in the left-hand display field.

Shows:

Scan Program No. while scanning, during recall of a Scan Program, and when setting-up Scanning Programs.

Time Program No. during recall of a Time Program and when setting-up Time Programs.

Remote Control Address No. when reading the address of the remote controlled receiver.

FSK Program No. during recall of a FSK Program and when setting-up FSK Programs.

Program No. when setting programmable functions and when using the verification facilities.

Configuration Function No. when in Configuration Mode.

Remote Control Indicator "cc" when the receiver is in Autotelex or Remote Frequency Selection mode. In this mode all front panel control is inhibited. To enable normal operation, press PROG.

CHANNEL DISPLAY
Consists of the last four digits in the left hand display field.

Shows:

Channel No. when storing/recalling a set-up. The number will remain in the display until a frequency is entered, the frequency is changed by more than +/- 300 Hz, the mode is changed, or another channel number is entered. When TIME is ON the channel number is shown during entry only. A flashing point indicates than entering a channel has not been completed. A flashing number indicates that it is not valid.

Parameter No. when setting-up Scanning Programs, Time Programs and FSK Program 0, and when selecting certain Configuration Functions.

Test No. when running the self test programmes.

Version No. when verifying version and date of Configuration PROM, CU Program and RU Program.

TIME DISPLAY
Consists of the four middle digits in the left-hand display field (hours. minutes). The point in the middle flashes at seconds rate. The TIME key indicator lights when the Time Display is active.

FREQUENCY DISPLAY
Consists of the right-hand display field.

Shows:

Receiver frequency in kHz. A Flashing decimal point indicates if entering a new frequency has not been completed. A flashing number indicates that an illegal frequency has been entered.

BFO frequency in kHz in CW mode and Pass Band Shift in kHz in USB and LSB mode when either of the BFO keys are pressed.

Notch Frequency in kHz when switching ON the Notch Filter and when changing the frequency of the Notch Filter. The Notch frequency is displayed for 2 seconds.

User Programmed Rate in kHz when programming.

Parameter Values when setting-up Scanning, Time Programs, FSK PROGRAM 0, when programming certain functions and when in configuration mode.

RATE INDICATORS
Located below the 1000 Hz, 100 Hz, and 10 Hz digits in the Frequency Display. Indicate the tuning step size. Extinction of all indicators indicates that the User Programmed Rate is selected. Illumination of all Rate Indicators simultaneously indicates that Manual Channel Scanning has been selected.

LINE LEVEL / FSK METER
Located below the left-hand display field. Indicates Line Output Level in dBm of the line output amplifier in the Control Unit, except whe FSK is ON.

When FSK is ON the relative mark-space frequencies of the received signal is shown. When correctly tuned to a FSK signal which corresponds to the demodulator set-up, the illuminated bars of the meter should be centered below the two arrows.

If the the two illuminated bands are too close together or too far apart, the received FSK signal does not correspond to the selected demodulator set-up.

If the illuminated bars are to the left of the arrows then the received mark-space frequencies are lower than the norminal frequencies; if the bars are to the right of the arrows then the received mark-space frequencies are higher. The error can be corrected by adjusting the Tuning Wheel. The frequency difference in Hz per bar approximates one tenth of the data rate setting of the FSK demodulator.

The width of the bands indicates the signal-to-noise ratio of the received signal: the wider, the more noise.

SIGNAL STRENGTH METER
Located below the right-hand display field. Gives a relative indication of the signal strength of the received signal.

RESERVE SUPPLY INDICATOR
Located at the SUPPLY ON/OFF key. Indicator is ON when the receiver is supplied from the 24 V input.

KEY INDICATORS
Located at keys. An indicator is ON when the function shown on the key is selected.

A flashing PROG indicator shows that the receiver is in the Programming Mode. If the PROG display shows "cc" the receiver is in the remote controlled mode. A quick-flashing PROG indicator shows that the receiver is in the Configuration Mode.
A flashing SCAN indicator shows that the receiver is in the Scanning Mode.

AUDIBLE INDICATORS
A beep is generated to give an acoustical feed-back when a key is pressed.

A high-note beep indicates that the key is active.
A low-note beep indicates that the key is not active in the particular sequence or set-up.

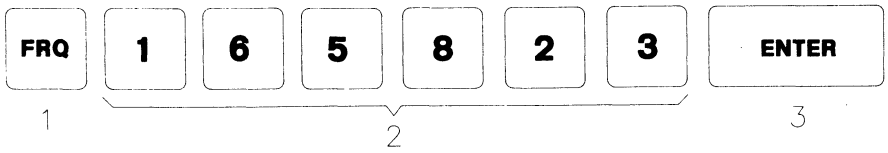
Alternating beep-tones sounding for 4 seconds indicate that the user programmable memory is full, see section 3.4.

3.3 DIRECT KEYBOARD FUNCTIONS

This section gives the operating instructions by visual representation 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.

3.3.1 SETTING RECEIVER FREQUENCY

3.3.1.1 DIRECT ENTRY (e.g. 16582.3 kHz)

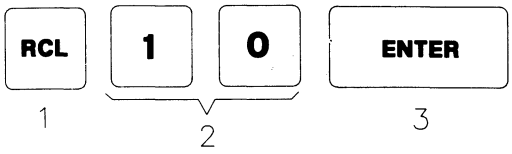


1 Press "FRQ"
The frequency display is erased with the exception of its decimal point which starts flashing.

2 Enter desired frequency in the frequency 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. In this case pressing "ENTER" again will restore the old frequency.

3.3.1.2 RECALLING A STORED SET-UP (e.g. channel 10)



1 Press "RCL"
The CHANNEL display is erased and the point starts flashing.

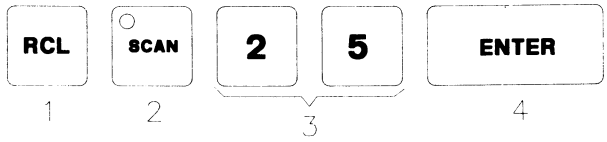
2 Enter the channel number in the CHANNEL display.
User programmable channels 1-399 are available.

3 Press "ENTER"
The receiver starts reception on the specified channel. If the channel number entered does not correspond to a channel number in the memory, the CHANNEL display will start flashing, and the receiver will continue to receive and display the frequency in use prior to the recall operation. Pressing ENTER will restore the CHANNEL display.

The number will remain in the display until either a frequency is entered, the frequency is changed more than +/- 300 Hz, the mode is changed, or another channel number is entered. If the TIME display is active, the channel number is shown during entry only. Recalling "0" will set the frequency to zero and mute the Receiver Unit. When a user programmed memory cell is recalled, the frequency is always recalled. By configuration it may be determined whether mode, bandwidth, AGC FAST/SLOW, BFO, RF AMP, ANT ATT, Duplex, Speaker, Squelch, CTL OUT, and Signal Threshold status are recalled.

When a pre-programmed memory cell (channel number 400-9999, pre-programmed in the Configuration PROM) is recalled, only the frequency is recalled. The same channel number may be used to recall two different frequencies, dependent on the mode setting.

3.3.2 RECALLING A SCAN PROGRAM (e.g. scan program number 25)



1 Press "RCL"
The TIME display is erased

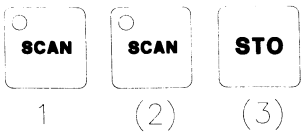
2 Press "SCAN"
The current scan program number is shown in the PROG display

3 To change the scan program number press a number (1-40)
The number is entered in the PROG display

4 Press "ENTER"
The PROG display is restored to its initial state

Recalling a scan program will reset the scan pointer to the start channel number and reinsert skipped frequencies.

3.3.3 START/STOP OF AUTOMATIC SCANNING

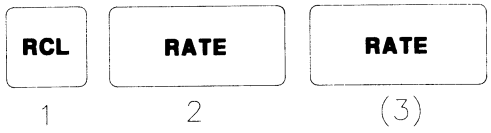


1 Press "SCAN"
The scanning function is switched on/off by pressing the "SCAN" key. If "TIME" is on it will be turned off when "SCAN" is pressed. The "SCAN" annunciator will flash when the receiver is in the scanning mode. The Scan Program number (1-40) is shown in the PROG display. The current channel number is shown in the CHANNEL display.
The receiver will automatically scan the programmed sequence of frequencies or set-ups. During the Hold Time the symbol "[" is displayed in the PROG display next to the Scan Program number.

(2) Press "SCAN"
Scanning may be resumed within the Dwell Time/Hold Time by pressing the "SCAN" key again.

(3) Press "STO"
Frequencies may be temporarily skipped from sequential channel scanning programs by pressing "STO" during the Dwell Time/Hold Time. The full scanning sequence will be resumed the next time a scan program is recalled.

3.3.4 MANUAL CHANNEL SCANNING

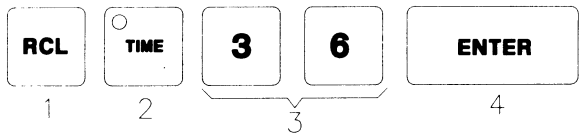


1 Press "RCL"
The TIME display is erased.

2 Press "RATE"
This mode is indicated by illuminating all three rate LEDs. The current channel number will be displayed in the CHANNEL display. Turning the tuning wheel clockwise/counterclockwise will recall the next higher/lower channel number at a rate of 7.5 channels/turn.
The current channel number is defined as the last recalled channel.

(3) Press "RATE"
Pressing "RATE" will reset Frequency Tuning.

3.3.5 RECALLING A TIME PROGRAM
(e.g. time program no. 36)



1 Press "RCL"
The TIME display is erased

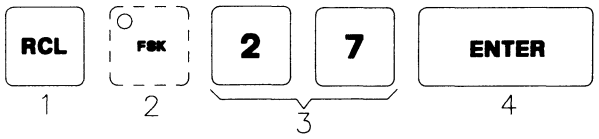
2 Press "TIME"
The current Time Program number is shown in the PROG display

3 To change the Time Program number, press a number (0-40).
The number is entered in the PROG display

4 Press "ENTER"
The number entered is now the current Time Program.
The display is restored to its initial state

The Time Program becomes active when recalled and will change the setting of the receiver at selected times of day as determined by the program. For programming, see 3.4.3. Program number 0 is always unprogrammed and used when no time control is desired.

3.3.6 RECALLING AN FSK DEMODULATOR SET-UP



1 Press "RCL"
Left-hand display field is cleared

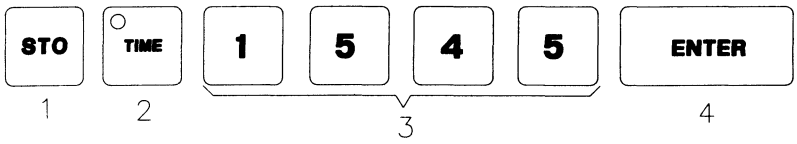
2 Press "FSK"
The current FSK set-up number is shown in the PROG display

3 To change the FSK set-up number, press a number (0-99)

4 Press "ENTER"
The number entered is now the current FSK set-up number

FSK set-up number 0 is user programmable, see section 3.4.4.
All other set-ups are pre-programmed, see section 3.7.

3.3.7 SETTING TIME (e.g. 15.45)



1 Press "STO"
The TIME display is erased and the point starts flashing

2 Press "TIME"
The current setting is shown in the TIME display

3 To change the setting, press a number.
The first two digits are hours. The last two digits are minutes.

4 Press "ENTER"
This will update the clock. If an illegal time is entered, the TIME display will start flashing. Pressing "ENTER" again will restore the old value.

3.4 PROGRAMMING

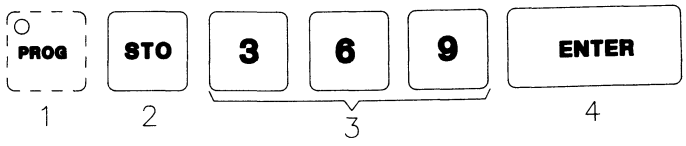
This section specifies the facilities available for programming various functions in the receiver. All key sequences start with "PROG". Pressing the "PROG" key puts the receiver in the programming mode which is indicated by a flashing PROG annunciator. The TIME display will be deactivated, if ON. The receiver will continue operation during programming. The programming mode can be aborted at any time by pressing "PROG".

Please note that memory space is shared between user programmable channels, scanning programs and time programs. If, in an extreme case, all space is used alternating beep-tones will sound for 4 seconds and the last entry is disregarded.

Superfluous channels may be deleted to make room for scanning programs or time programs and vice versa. Following list shows the relative memory space demands.

One user programmable channel:	9
One consecutive channel scanning program:	10
One frequency scanning program:	12
One sequential channel scanning program:	6 + 2 per channel
One time program:	2 + 4 per channel

3.4.1 STORING A SET-UP



1 Press "PROG"
The storage operation may be aborted at any time by pressing "PROG" once more during this sequence.

2 Press "STO"

3 Press a number in the range 1-399

4 Press "ENTER"
The following parameters are stored: Frequency, mode, bandwidth, AGC FAST/SLOW, BFO, RF AMP, ANT ATT, Duplex, Speaker Squelch, CTL OUT, and Signal Threshold status.

When a user attempts to store a set-up in a cell in which modification has been inhibited by configuration, or attempts to store a set-up using a number outside the 1-399 range, no storage will take place, and the CHANNEL display will start flashing.

A stored set-up is deleted when a new set-up is stored on the same number. A memory cell can be cleared by storing the recalled channel "0".

3.4.2 SETTING-UP SCANNING PROGRAMS

A scanning program contains following parameters:

1. Dwell Time, i.e. the time the receiver dwells on each frequency.

2. Hold Time, i.e. the time the receiver will remain on a frequency where a signal has triggered the Hold function.

3. Hold Trigger Source, i.e. squelch, signal threshold or external signal.

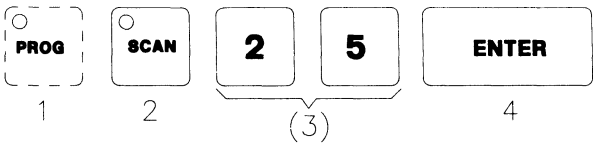
4. Hold Mode, i.e. Hold specified time or Hold during signal plus specified time.

5. Scanning Type, i.e. Consecutive Channel Scanning, Frequency Scanning or Sequential Channel Scanning including Frequency Step size.

6. Start Channel number.

7. Stop Channel number/Next Channel number.

8. Linking, i.e. another Scanning Program can be addressed and thus included in the program.



1 Press "PROG"

2 Press "SCAN"
The current Scan Program number is shown in the PROG display

(3) To change the Scan Program number, press a number in the range 1-40.

4 Press "ENTER"

The Scan Program number is displayed in the PROG display, the parameter number in the CHANNEL display and the value in the FREQUENCY display. A new value may be selected by means of the numeric keys or the value may be accepted by pressing "ENTER". The next parameter will then be displayed and so on. When the last parameter has been accepted the program mode will be terminated. The programming may be terminated at any step by pressing "SCAN".

3.4.2.1 PARAMETER VALUES TO BE ENTERED

1 Dwell Time (0.1 s)	1 - 250
2 Hold Time (s)	0 - 99
Infinite Hold Time	100
3 Trigger Source:	
None	0
Squelch	1
Signal Threshold	2
Squelch or Signal Threshold	3
External Signal	4
4 Hold Mode:	
Hold scanning until Hold Time has elapsed	1
or	
Hold scanning while signal is present and until Hold Time has elapsed after signal disappeared	2

5 Scanning Type:

Consecutive Channel Scanning	0
Frequency Scanning, Step Frequency (10Hz)	1 - 9999
Sequential Channel Scanning	10000

6 Consecutive Channel Scanning and Frequency Scanning:

Start Channel number	1 - 399
or	
Delete program	0
Sequential Channel Scanning Programs:	
First channel number	1 - 399
Delete channel number *	0

7 Consecutive Channel Scanning and Frequency Scanning:

Stop Channel number	1 - 399
Sequential Channel Scanning:	
Next Channel number **	1 - 399
or	
End/Delete Channel number	0

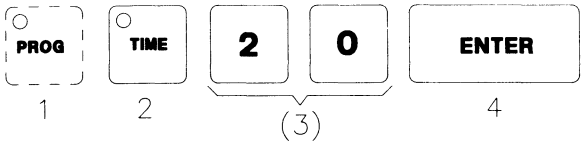
*) When deleted the next channel number in the sequence will be displayed. When all channel numbers are deleted a "0" is displayed. Entering this will delete the program.

**) More Channel numbers can be inserted. Pressing "ENTER" will insert the displayed channel number and recall the next channel number in the sequence. A "0" ends the sequence. Entering this will recall parameter 8.

8 Linked Scanning, Scan Program number	1 - 40
Not linked	0

3.4.3 SETTING-UP TIME PROGRAMS

A Time Program can enable the receiver to automatically recall channel set-ups, recall scan programs, or start scanning at selected times in 1 hour or 24 hour cycles.



1 Press "PROG"

2 Press "TIME"
The current Time Program number is shown in the PROG display

(3) To change the Time Program number, press a number in the range 1-40.

4 Press "ENTER"

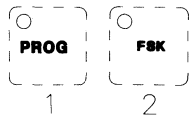
The Time Program number is displayed in in the PROG display, the parameter number is displayed in the CHANNEL display and the value in the FREQUENCY display. A new value may be selected with the numeric keys or the value may be accepted by pressing "ENTER". The next parameter will then be displayed and so on.

3.4.3.1 PARAMETER VALUES TO BE ENTERED

1 Time:	
1-hour cycles, minutes (last two digits)	8800 - 8859
24-hour cycles, hours.minutes	0 - 2359
End of Program/Delete	99
2 Action:	
Recall Channel	1
Store current set-up	2
Recall stored set-up	3
Recall Scan Program	4
Start Scan Program	5
Recall Time Program	6
3 Channel number/Program number	0 - 399

The next "ENTER" will recall parameter 1 in the next parameter set. After the last set the FREQUENCY display will display "99" and the function will be terminated at the following "ENTER" unless a value is entered. "99" entered as parameter 1 will delete the displayed parameter set. In case of identical time values the actions will be executed in the order entered. A recalled Time Program becomes active at the next minute-update.

3.4.4 SETTING-UP FSK DEMODULATOR



1 Press "PROG"

2 Press "FSK"
Number 0 is shown in the PROG display

The parameter number is displayed in the CHANNEL display and the value in the FREQUENCY display. A new value may be selected with the numeric keys or the value may be accepted by pressing "ENTER". The next parameter will then be displayed.

3.4.4.1 PARAMETER VALUES TO BE ENTERED

1.	Mark Frequency (Hz)	1000-3000
2.	Space Fequency (Hz)	1000-3000
3.	Baudrate (Baud)	50 100 150 - - - 750

3.4.5 SETTING BEEP LEVEL

1 Press "PROG"

2 Press "1"

3 Press "ENTER"
The number is shown in the PROG display and a continuous beeping is started.

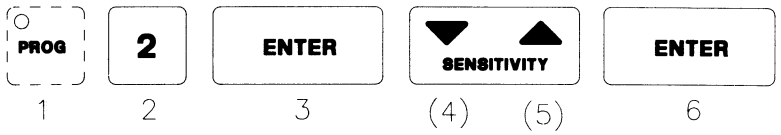
(4) Press "VOLUME DOWN"
Pressing "VOLUME DOWN" will decrease the sound level.

(5) Press "VOLUME UP"
Pressing "VOLUME UP" will increase the sound level.

6 Press "ENTER"
Pressing "ENTER" will preserve the new beep level and terminate the programming function.

3.4.6 SETTING SIGNAL THRESHOLD LEVEL

The signal threshold level may be used as a criterion for holding scanning. This section describes how to view or change the setting of the threshold level. The setting is stored as part of the receiver set-up when the store function is used. The threshold level is thus set individually for each channel in a channel scanning program. In frequency scanning the threshold level of the start channel is determining.



1 Press "PROG"

2 Press "2"

3 Press "ENTER"
The number is shown in the PROG display and the bar that corresponds to the Threshold Level starts flashing in the Signal Strength Meter.

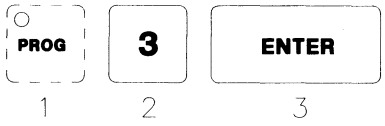
(4) Pressing "SENSITIVITY UP" will move the bar to the left.

(5) Pressing "SENSITIVITY DOWN" will move the bar to the right.

6 Press "ENTER"
Pressing "ENTER" will terminate the programming function.

Note: The setting is stored as part of the receiver set-up when the store function is used.

3.4.7 SETTING CTL OUT 1-7 OUTPUT TERMINALS IN RU 8013

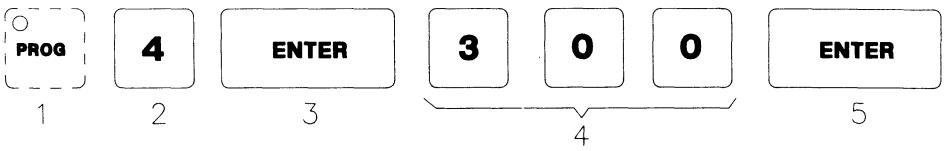


1 Press "PROG"

2 Press "3"

3 Press "ENTER"
The number is shown in the PROG display and the setting is shown in the FREQUENCY display. The 'cursor' will flash the rightmost digit which corresponds to CTL OUT 1 output terminal in RU 8013.
The value may be changed by keying-in 0 or 1 or be accepted by pressing "ENTER". The cursor is then moved to the next digit, corresponding to CTL OUT 2, etc. The function is terminated when value number 7 is accepted. 0 means LOW output level. 1 means HIGH.

3.4.8 SETTING USER-PROGRAMMABLE RATE (e.g. 3.00 kHz)



1 Press "PROG"

2 Press "4"

3 Press "ENTER"
The number is shown in the PROG display, and the rate is shown in the FREQUENCY display.

4 Press the numeric keys to change the value. Rates between 10 Hz and 99990 Hz can be selected.

5 Pressing "ENTER" will terminate the programming function.

3.5 VERIFICATION

This section specifies the verification facilities incorporated in the receiver. The key sequence for all verification functions is: "PROG", "number", "ENTER". The number will be shown in the PROG display and the requested information in the CHANNEL and FREQUENCY displays. The Verification Function is aborted by pressing "PROG" or "ENTER".

3.5.1 SELF TEST

The self test includes two programs:

Program number 10: Automatically Stepped Self Test
Program number 11: Manually Stepped Self Test

Please refer to chapter 7: Trouble Shooting and Service, where a description of the self test programs is found together with a detailed description of each test that is performed in order to ease trouble shooting on the equipment.

3.5.2 ACCUMULATED ON TIME

The FREQUENCY display will show the total number of operating hours with one hour resolution.

3.5.3 CONFIGURATION PROM VERSION AND DATE

The CHANNEL display will show version number and the FREQUENCY display will show release date (year/month/day).

3.5.4 CU PROGRAM VERSION AND DATE

The CHANNEL display will show version number and the FREQUENCY display will show release date (year/month/day).

3.5.5 RU PROGRAM VERSION AND DATE

The CHANNEL display will show version number and the FREQUENCY display will show release date (year/month/day).

3.6 CONFIGURATION

This section specifies the facilities available for changing the configurable parameters of the receiver using the CU 8013 keyboard.

The configuration parameters are pre-programmed in the configuration PROM and copied into the RAM. Parameters may be protected by pre-programming. These values cannot be changed using the Configuration Functions.

The receiver cannot be used normally, when in configuration mode.

A password must be entered to gain access to the configuration functions to prevent unintentional or unauthorized changes.

3.6.1 SELECTING CONFIGURATION MODE

Configuration Mode is selected by pressing:

The number is shown in the PROG display and the FREQUENCY display is cleared. The receiver is now ready for entry of the password.

3.6.2 PASSWORD

The password consists of a sequence of three key-strokes. The default password is 999. The password is not displayed. For each key-stroke a "]" sign is displayed. When the correct password is entered by pressing "ENTER" the PROG LED starts flashing at a quicker rate and the PROG display shows the configuration function number.

Entry of an incorrect password is indicated by a flashing "99" in the PROG display. After five unsuccessful attempts of entering the correct password further attempts are prevented for a period of 60 minutes.

The password may be changed by using configuration function number 99. Any key may be used in the sequence, even disabled keys, "PROG" and "ENTER". The use of the latter, however, is not recommended.

In case the password is forgotten it is possible to reset the user programmable memory hardwarewise (see description of Control and Audio Board 681) whereby the default password is selected. At the same time, however, all user programmed set-ups, scanning programs, etc. are erased and the configurable parameters are set to their default values.

3.6.3 CHANGING CONFIGURABLE PARAMETERS

The function number in question is entered by pressing a number from 1 to 99 followed by ENTER. The number will be displayed in the PROG display and when ENTER is pressed the current value(s) of the configurable parameter(s) is(are) shown in the FREQUENCY display. A parameter number may be shown in the CHANNEL display. The value may be accepted by pressing ENTER or changed by entering a new value. If an illegal value is entered it will flash. An ENTER will stop the flashing, and a new value may be entered.

Where more parameters are displayed simultaneously, the right-most value is accepted/changed first, and at each ENTER the "cursor" (quick-flashing of the digit) is shifted one digit to the left.

When all parameters in the function has been changed the configuration function number is terminated at the last ENTER, and the FREQUENCY display will be blank. A new function number may be entered or the configuration mode may be terminated by pressing PROG. The configuration mode may be aborted at any time by pressing PROG.

3.6.4 CONFIGURATION FUNCTIONS

No.	Function	Parameter	Value
1	USB Key	Disable/Enable	0/1
2	LSB Key	Disable/Enable	0/1
3	AM Key	Disable/Enable	0/1
4	TELEX Key	Disable/Enable	0/1
5	ISB Key	Disable/Enable	0/1
6	CW Key	Disable/Enable	0/1
7	BW WIDE Key	Disable/Enable	0/1
8	BW INTER Key	Disable/Enable	0/1
9	BW NARR Key	Disable/Enable	0/1
10	AGC FAST Key	Disable/Enable	0/1
11	BW VNARR Key	Disable/Enable	0/1
12	AGC OFF Key	Disable/Enable	0/1
13	BFO Keys	Disable/Enable	0/1
14	SENSITIVITY Keys	Disable/Enable	0/1

15	VOLUME Keys	Disable/Enable	0/1
16	TIME Key	Disable/Enable	0/1
17	SCAN Key	Disable/Enable	0/1
18	RF AMP Key	Disable/Enable	0/1
19	ANT ATT Key	Disable/Enable	0/1
20	DUPLEX Key	Disable/Enable	0/1
21	DUPLEX ADJ Key	Disable/Enable	0/1
22	SPEAKR Key	Disable/Enable	0/1
23	SQL Key	Disable/enable	0/1
24	DIMMER Keys	Disable/Enable	0/1
25	Delete Memory Key	Disable/Enable	0/1
26	RCL Key	Disable/Enable	0/1
27	STO Key	Disable/Enable	0/1
28	FRQ Key	Disable/Enable	0/1
29	LOCK Key	Disable/Enable	0/1
30	RATE Key	Disable/Enable	0/1
31	FSK Key	Disable/Enable	0/1
32	ISB LSBMON Key	Disable/Enable	0/1
33	NOTCH FILTER Key	Disable/Enable	0/1
34	REMOTE KEY	Disable/Enable	0/1
45	Display of Frequency	Disable/Enable	0/1
46	Display of all status information	Disable/Enable	0/1
47	Pass Band Shift (PBS)	Disable/Enable	0/1
48	FSK Programming Function	Disable/Enable	0/1
49	"Recall FSK Program" Function	Disable/Enable	0/1
50	"Recall Scan Program" Function (from keyboard)	Disable/Enable	0/1
51	"Recall Time Program" Function (from keyboard)	Disable/Enable	0/1
52	"Set Time" Function	Disable/Enable	0/1
53	"Store" Function	Disable/Enable	0/1
54	"Program Rate" Function	Disable/Enable	0/1
55	"Scan Programming" Function	Disable/Enable	0/1
56	"Time Programming" Function	Disable/Enable	0/1
57	"Beep Level" Function	Disable/Enable	0/1
58	"Signal Threshold Level" Function	Disable/Enable	0/1
59	"CTL OUT 1-7 Setting" Function	Disable/Enable	0/1
60	Omitted		
61	AGC and BW keys in USB Mode *) (Disabled = 0; Enabled = 1)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: AGC OFF	0/1
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
62	AGC and BW keys in LSB Mode *) (Disabled = 0; Enabled = 1)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: AGC OFF	0/1
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1

*) BW indicators are off, if all BWs = disabled.

63	AGC and BW keys in AM Mode *) (Disabled = 0; Enabled = 1)	1: AGC FAST 2: AGC SLOW 3: AGC OFF 4: BW WIDE 5: BW INTER 6: BW NARR 7: BW VNARR	0/1 0/1 0/1 0/1 0/1 0/1 0/1
64	AGC and BW keys in TELEX Mode *) (Disabled = 0; Enabled = 1)	1: AGC FAST 2: AGC SLOW 3: AGC OFF 4: BW WIDE 5: BW INTER 6: BW NARR 7: BW VNARR	0/1 0/1 0/1 0/1 0/1 0/1 0/1
65	AGC and BW keys in ISB Mode(USB) *) (Disabled = 0; Enabled = 1)	1: AGC FAST 2: AGC SLOW 3: AGC OFF 4: BW WIDE 5: BW INTER 6: BW NARR 7: BW VNARR	0/1 0/1 0/1 0/1 0/1 0/1 0/1
66	AGC and BW keys in CW Mode *) (Disabled = 0; Enabled = 1)	1: AGC FAST 2: AGC SLOW 3: AGC OFF 4: BW WIDE 5: BW INTER 6: BW NARR 7: BW VNARR	0/1 0/1 0/1 0/1 0/1 0/1 0/1
67	AGC and BW keys in ISB Mode(LSB) *) (Disabled = 0; Enabled = 1)	1: AGC FAST 2: AGC SLOW 3: AGC OFF 4: BW WIDE 5: BW INTER 6: BW NARR 7: BW VNARR	0/1 0/1 0/1 0/1 0/1 0/1 0/1
68	Direct Frequency Selection	Disabled/Enabled	0/1
69	Storage in Protected Memory Cells Cells programmed while disabled will be unprotected. Cells programmed while enabled will be "protected cells".	Disabled/Enabled	0/1
70	Update of Signal Strenght Meter via RU Data link.	Off Once per second 4 times per second	0 1 2

*) BW indicators are off, if all BWs = disabled.

71	Initial AGC and BW setting in USB mode *) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: not used	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
72	Initial AGC and BW setting in LSB mode *) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: not used	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
73	Initial AGC and BW setting in AM mode *) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: not used	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
74	Initial AGC and BW setting in TELEX mode *) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: not used	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
75	Initial AGC and BW setting in ISB mode (USB) *)) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: AGC OFF	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
76	Initial AGC and BW setting in CW mode (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: not used	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1
77	Initial AGC and BW setting in ISB mode (LSB) (Initial set = 1; Other = 0)	1: AGC FAST	0/1
		2: AGC SLOW	0/1
		3: AGC OFF	
		4: BW WIDE	0/1
		5: BW INTER	0/1
		6: BW NARR	0/1
		7: BW VNARR	0/1

*) If no initial settings are selected the receiver automatically selects the last used setting on the mode in question.

78	omitted			
79	Recall of pre-programmed (ITU) frequencies.		Disabled/Enabled	0/1
80	Settings of Disabled Keys (OFF = 0; ON = 1)	1:	1: RF AMP	0/1
			2: ANT ATT	0/1
			3: DUPLEX	0/1
			4: SPEAKR	0/1
			5: SQL	0/1
			6: LOCK	0/1
			7: FSK	0/1
		2:	1: ISB LSBMON	0/1
			2: REMOTE	0/1
81	Setting of Disabled Rate Key		10 Hz	1
			100 Hz	10
			1000 Hz	100
			Programmable	111
			Channels	0
82	Speaker status in Duplex		OFF	0
			Don't care	1
83	Selection of RCL parameters (Not recalled = 0 Recalled = 1)	1:	1: Mode	0/1
			2: Bandwidth	0/1
			3: AGC	0/1
			4: BFO	0/1
			5: RF AMP	0/1
			6: ANT ATT	0/1
			7: DUPLEX	0/1
		2:	1: SPEAKR	0/1
			2: SQL	0/1
			3: CTL OUT 1-7	0/1
			4: Signal Threshold	0/1
			5: FSK	0/1
85	Scan Hold Input		Hold scan on low/high levels	0/1
86	Squelch routed to CTLOUT 7		Disable/Enable	0/1
87	FSK Input Selection in ISB Mode		USB	1
			LSB	2
			As LSBMON	3
			Opposite LSBMON	4
88	Reverse FSK Data Out		Normal	0
			Inverted	1
89	FSK Data Out when FSK Off		Low	0
			High	1
90	CU-RU Serial Interface *)		Baudrate (Bits/sec)	300
				600
				1200
				2400

*) The supply must be switched OFF/ON to accomplish a change.

91	Audio Subcarrier Frequency in TELEX Mode (Hz)		1500 1600 . . 2500
92	(Full Remote Control only) Remote Control Address Selection (master)	Front Panel Fixed	0 1-99
	(Normally set for 0 for front panel selection of the slave receiver address. A fixed address may be used if only one slave is controlled.)		
	or		
	Address of Master (slave only)	All masters can control the receiver	0
		Only the specified master can control the receiver	1-99
	(When the receiver is used as a slave only, i.e. configuration function 95 = 0, a particular master may be allocated to the receiver.)		
93	Remote Control Serial Interface *)	Baudrate (Bits/sec)	300 600 1200 2400 4800 9600

*) The supply must be switched OFF/ON to accomplish a change.

94 Remote Control Serial Interface Word Selection *)	7 bits even parity 2 stop bits	0
	7 bits odd parity 2 stop bits	1
	7 bits even parity 1 stop bit	2
	7 bits odd parity 1 stop bit	3
	8 bits 2 stop bits	4
	8 bits 1 stop bit	5
	8 bits even parity 1 stop bit	6
	8 bits odd parity 1 stop bit	7

95 (Full Remote Control only) Remote Control Priority	Slave only	0
	Respects REM/LOCAL selection on slave	1
	Respects REM/LOCAL selection on slave but not interruption	2
	Overrides REM/LOCAL selection on slave	3
	Overrides REM/LOCAL selection on slave. Slave remains in REM after remote control	4
	Overrides REM/LOCAL selection on slave. Slave remains in REM and selection of LOCAL on slave not possible after remote control	5

*) The supply must be switched OFF/ON to accomplish a change.

96	Remote Control Type *)	Disabled	0
		Autotelex	1
		Autotelex with TX commands retransmitted	2
		Autotelex with TX commands retransmitted and embedded acknowledge	3
		Remote frequency selection	4
		Full Remote Control	5 **)

97 (Full Remote Control only)
Own Remote Control Address 1-99

(This is the address to which the receiver responds as a slave. Each receiver in a group must have its own inddividual address.)

98 (Full Remote Control only)
Own Remote Control Listen Only Address 0-99

(Normally set to 0. Whwn set to 1-99 the receiver responds to that address as a slave, except that no revertive information and no monitoring audio is sent to the master. The function permits simultaneous operation of diversity receivers.)

*) The supply must be switched OFF/ON to accomplish a change.

**) Full Remote Control is optional.

99 Changing Password	1:	Old password	3 keys
	2:	New password	3 keys
	3:	New password	same

Remarks to the selection of password :
VOLUME, DIMMER, and SPEAKR key functions are not transfered from master to slave in remote control applications. This means that it is possible to make configuration change a local function by selecting a password which contains one or more of the above keys in the sequence.

Notes :

1) When the FSK Board is not installed:
   config. 31 = 0 and config. 80 parameter 1.7 = 0.

2) When the ISB board is not installed:
   config. 32 = 0.

3.7 PRE-PROGRAMMED FSK DEMODULATOR SET-UP's

FSK prog no.	Mark frq [Hz]	Space frq [Hz]	Data Rate [Baud]
1	1475	1525	50
2	1465	1535	50
3	1457.5	1542.5	50
4	1415	1585	50
5	1415	1585	100
6	1330	1670	200
7	1300	1700	200
8	1250	1750	50
9	1250	1750	100
10	1250	1750	150
11	1250	1750	300
12	1075	1925	100
13	1075	1925	150
14	1075	1925	200
15	1075	1925	300
16	1075	1925	600
17	1575	2425	100
18	1575	2425	150
19	1575	2425	300
20	1575	2425	600
21	2525	2575	50
22	2507.5	2592.5	50
23	2465	2635	100
24	2350	2750	200
25	2125	2975	200

4. 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 that the cables are protected from physical damage. Cable bends especially on coaxial cables must not be sharp and a sufficient number of clips or straps should be used for securing the cables.

4.1 MOUNTING THE CONTROL UNIT

The Control Unit may be rack mounted, or it may be mounted directly on the Receiver Unit. In the latter case the unit is bolted to the Receiver Unit through two holes in the cabinet. When attached to each other the units may be regarded as one. This is also called a local control installation. The R 8003 is delivered in this way. Interconnection between the units is by means of a 37 pole ribbon cable which is always fitted when delivered.

When separated, the units may be mounted up to 100 metres from each other. This is called an extended local control installation. A screened 2 x 8 pole cable (not delivered) is then used between the units.

Installation diagrams 995 578 21 and 995 578 31 (at the back of this chapter) show both ways of installing the equipment.

Drawing no. 995 577 21 shows overall dimensions and a drilling plan for the necessary holes for rack mounting of CU 8013/RU 8013. The Rack Flange Kit 107 621 20 may be used for this purpose. An example of rack mounting by using slide rails is shown on drawing 995 577 01 (slide rails are not delivered).

Table-top mounting of the equipment is effected by use of the Mounting Brackets Kit 107 620 24, see drawing 995 577 11.

The CU/RU communication takes place by means of the above mentioned interconnection cable. This is connected to the "INTERCON"-connector at the back of both units. Communication rate is depending of the length of the cable. The rate is factory-set to 2400 baud.

The connectors on the Control Unit may be used for connection to external equipment. The connectors are listed below with a description of signal names and levels. The connectors "INTERCON" and "AUX 1" are equivalent to the connectors with the same names on RU 8013.

CU/RU INTERCONNECTION SOCKET "INTERCON"
37-pole type D connector.

Pin	Name	Remarks
1	GND	To AUX 1 pin 1
2	TXREM	To AUX 1 pin 2
3	RXREM	To AUX 1 pin 3
4	CONTROL IN	To AUX 1 pin 4
5	CONTROL OUT	To AUX 1 pin 5
6	SPEAKER+	To AUX 1 pin 6
7	AF OUT	To AUX 1 pin 7
8	CENTER (LINE)	To AUX 1 pin 8
9	SIGNAL OUT+	To AUX 1 pin 9
10	GND	To AUX 1 pin 10
11	CUDATA	
12	RUDATA	
13	-15V	
14	+24V	
15	BATNEG	
16	AF-	
17	-15V	
18	+15V	
19	GND	
20	SIDETONE IN	To AUX 1 pin 14
21	GND	To AUX 1 pin 15
22	GND	To AUX 1 pin 16
23	GND	To AUX 1 pin 17
24	SCAN S/S	To AUX 1 pin 18
25	SPEAKER-	To AUX 1 pin 19
26	LINE+	To AUX 1 pin 20
27	LINE-	To AUX 1 pin 21
28	SIGNAL OUT-	To AUX 1 pin 22
29	GND	
30	GND	
31	RXRATE	
32	+24V	
33	PWRON	
34	AF+	
35	-15V	
36	+15V	
37	GND	

AUXILIARY SOCKET 1 "AUX 1"
25-pole type D connector.
This is a multipurpose connector used for connection of auxiliary equipment to the Control Unit. The connector is accessible on the Control Unit in Extended Local Control applications. In Local Control applications where the Control Unit is attached to the Receiver Unit the "AUX 1" connector of the Receiver Unit is used.

Pin	Designation	I/O	Signal Level	Description
1	GND			
2	TXREM	In	RS-232-C	Remote Control Data
3	RXREM	Out	RS-232-C	Remote Control Data
4	REMCTL+	I/O	RS-485	Remote Control Data
5	REMCTL-	I/O	RS-485	Remote Control Data
6	SPEAKER+	Out	0 to 5 W	8 ohm load pin 6-19
7	AF OUT	Out	0 to 10 mW	500 ohm load. Controlled by VOL.
8	CENTER (LINE)			Line out center tap
9	REMAF+	I/O	-6 - 0 dBm	Remote Control AF
10	GND			
11	not used			
12	not used			
13	not used			
14	SIDETONE IN	In	0dBm/600 ohm	For 5mW in built-in speaker. Independent of VOLUME.
15	GND			
16	GND			
17	GND			
18	SCAN S/S	In	0/12 V	Scan Hold Signal
19	SPEAKER-	Out	See pin 6	
20	LINE+	Out	0 to 10 dBm	Balanced 600 ohm audio output. Internally adjustable
21	LINE-	Out	0 to 10 dBm	
22	REMAF-	I/O	-6 - 0 dBm	Not used
23	not used			
24	not used			
25	not used			

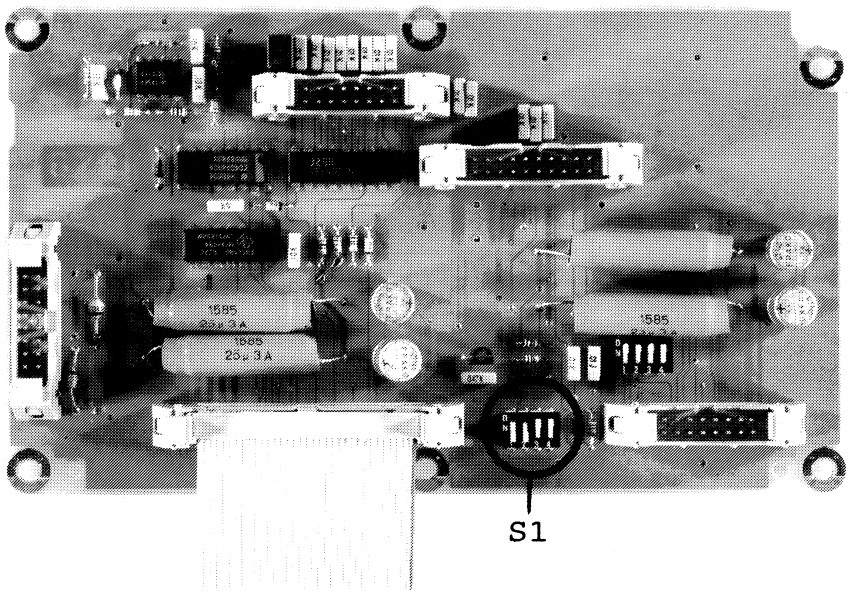
HEADPHONE SOCKET
6.35 mm Jack-socket.

Pin	Designation	I/O	Signal Level	Description
1	-	Out	> 10 mW	Mono or stereo headphones may be used. 4 ohm to 3 kohm Dependent on VOLUME. Built-in speaker is disconnected when jack-plug is inserted.
2	-			
3	-			

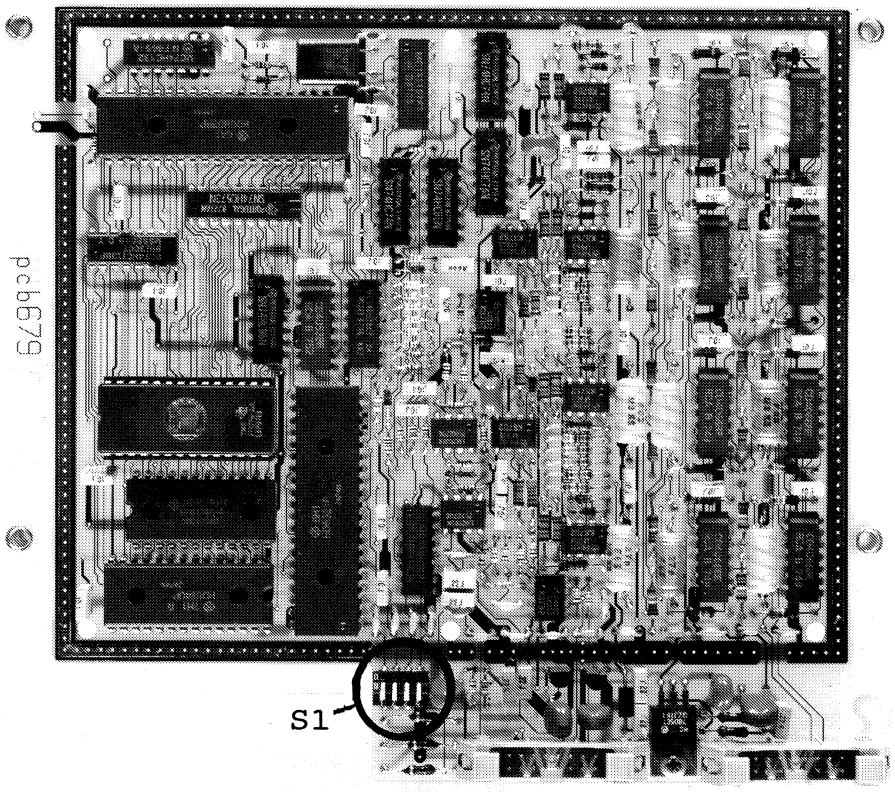
4.2 MOUNTING THE RECEIVER UNIT

The Receiver Unit may be mounted up to 100 metres from the Control Unit using a screened 2 x 8 x 0.25 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 tabletop or rack mounting. Drawings no. 995 577 22 and 995 577 01 show mounting details. It is important to provide sufficient of airspace below and above the unit, for adequate air flow around the equipment and through the heatsink at the back of the unit.

When used in an extended local control installation the RU/CU communication rate must be set to the correct value. In the Control Unit the baud rate is changed from the keyboard by configuration function no 90, see section 3.6.3. In the Receiver Unit the rate is determined by the setting of dip-switches 670-S1 on the RU Interconnection Board and 679-S1 on the FSK Board. Below pictures shows the location on the respective boards. They become accessible by removing the bottom cover of the unit.



RU Interconnection Board 670



FSK Board 679

The baud rate is depending of the maximum cable length between the units as shown below.

Max. cable length (metres)	S1-1	S1-2	Rate (baud)
12.5	OFF	OFF	2400
25	OFF	ON	1200
50	ON	OFF	600
100	ON	ON	300

AUXILIARY SOCKET 2 "AUX 2"
15-pole type D connector.
This connector is used for connecting auxiliary equipment to the Receiver Unit.

Pin	Designation	I/O	Signal Level	Description
1	TX KEYED IN	In	0/10 V	Rx is muted (simplex) or duplex attenuator activated (duplex) when connected to GND
2	GND			
3	CONTROL IN	In	0/5 V	Not used
4	GND			
5	TONE OUT	Out	0 dBm/600ohm	1.1 kHz tone to transmitter for Duplex Adjustment
6	GND			
7	+24 V	Out	Max. 100 mA	+24 V available when Rx is ON.
8	CONTROL OUT 1	Out	-	CTL OUT 1 to 7 controlled by -> "PROG 3"-function
9	CONTROL OUT 2	Out	Open collector outputs. Closed: Max. 2V @ 50mA Open: Min. 100 kohm @ 32V	
10	CONTROL OUT 3	Out		
11	CONTROL OUT 4	Out		
12	CONTROL OUT 5	Out		
13	CONTROL OUT 6	Out		
14	CONTROL OUT 7	Out		
15	CONTROL OUT 8	Out	-	Used to key transmitter for Duplex Adjustment.

AUXILIARY SOCKET 3 "AUX 3"
15-pole type D connector
This connector contains Line Output terminals for ISB applications and FSK Data Output for connection to teletype equipment.

Pin	Designation	I/O	Signal Level	Description
1	GND			
2	CENTER			Center tap, USB Line Output
3	LSB+	Out	0 to 10 dBm	Balanced 600 ohm audio output. Internally adjustable
4	LSB-	Out		
5	not used			
6	not used			
7	GND			
8	GND			
9	USB+	Out	0 to 10 dBm	Balanced 600 ohm audio output. Internally adjustable
10	USB-	Out		
11	CENTER			Center tap, LSB Line Output
12	not used			
13	not used			
14	DIVERSITY	In/ Out		FSK combination point for interconnecting two receivers in diversity
15	FSK DATA	Out	RS-232-C	Data Output from FSK Demodulator

4.2.1 POWER SUPPLY

The R 8003 operates at mains voltages of 110-120 or 220-240 VAC 50-60 Hz, or from a separate 24 VDC reserve supply. The supply cables are connected to the Receiver Unit at the rear of the cabinet.

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.

4.2.2 EARTH CONNECTION

The receiver earth terminal is located at the back of the receiver cabinet and should be connected to earth using a length of 2.5 sq. mm wire. This wire should be connected to a separate earth screw, which must not be shared by any other equipment. The earth lead should be run as far from the transmitter earth lead as is practicable. Other cables should be run as far away from the receiver earth leads as possible and under no circumstances parallel with it, closer than 0.2 metres.

4.2.3 ANTENNA

The antenna should be erected well in the clear, away from any objects whose influence on the antenna could vary, such as derricks etc. Insulators should be of high quality having low leakage even when wet. Stays, wires, steel masts etc. should be either effectively earthed or insulated.

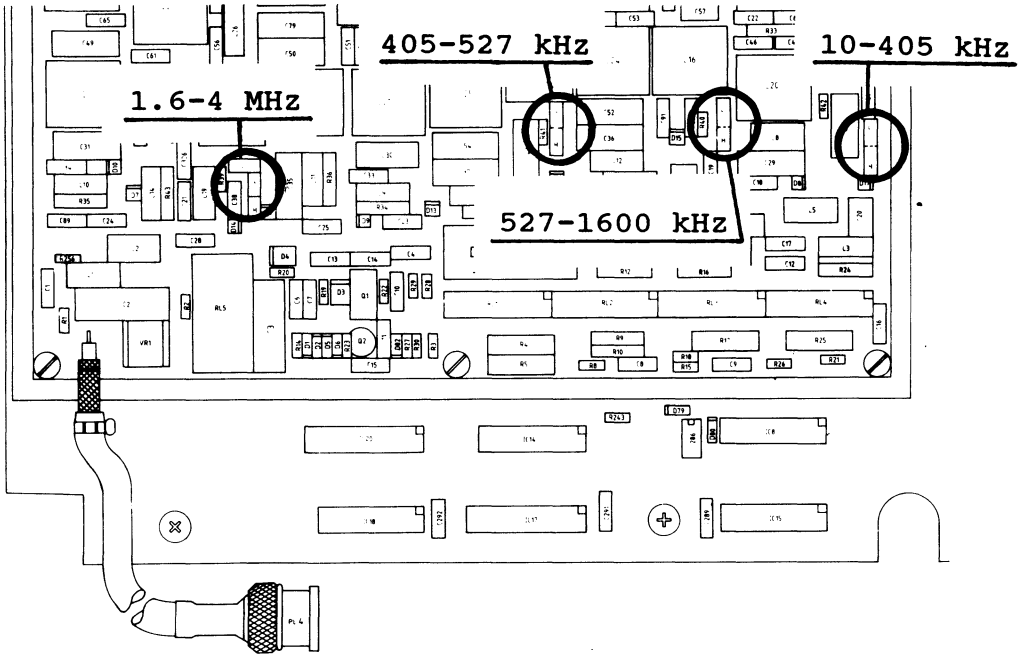
The antenna should be kept as far as possible from electrical equipment in order to minimize noise. Electrical installation such as cable braiding (screens) and instruments in the vicinity of the antenna should be earthed effectively, and the instruments in question should be fitted with noise-interference suppression devices, effective in the range 0.1 MHz to 30 MHz.

Length: 7-30 m. The antenna feed-in should be coaxial cable, which should be as short as possible, especially in the case of short antennas.

If a long cable is used an impedance matching transformer should be inserted at the antenna end of the feeder.

The receiver is normally delivered to 50 ohms input impedance. In the frequency range below 4 MHz it is possible to change the input to high impedance, which can be advantageous when using a short receiving antenna with no impedance matching transformer and a short feed-in.

Selection of high input impedance in the range below 4 MHz is carried out, by means of a soldering iron, by moving the jumper from L to H in the desired frequency range. Below figure shows a section of Receiver signal Path 667 with the location of the jumpers.



4.3 INTERCONNECTION OF UNITS

When the units are mounted together it is called a local control installation. In this case the units are interconnected by the 37-way ribbon cable included with the equipment. See installation diagram no. 995 578 31 for information.

If the installation is to be made with the units separated it is called an extended local control installation. The 37-way ribbon cable is then substituted by a length of 2 x 8 x 0.25 mm sq. screened multiwire cable (max. 100 metres). For further information see installation diagram no. 995 578 21.

4.4 REMOTE CONTROL

Note: This section describes the facilities for remote control of the receiver frequency. These facilities are intended particularly for automatic radiotelex applications. For full Remote Control applications reference is made to Appendix 1.

The receiver is equipped with a serial interface for remote control. The remote control terminals are pin 2 and pin 3 of the "AUX 1" socket. Pin 2, TXREM, is the input terminal. Pin 3, RXREM, is the output terminal, which is used for acknowledge purposes or for re-transmission of commands.

The interface circuit conforms electrically to the EIA standard RS-232-C. Baud rates of 300, 600, 1200, or 2400 bps may be selected by configuration function number 93, whereas word length, parity and number of stop bits are selected by configuration function number 94, see section 3.6.

4.4.1 REMOTE CONTROL TYPES

The remote control input is enabled by selecting the desired type of remote control using configuration function number 96.

1. Autotelex:
   The receiver responds to a receiver command by switching to a remote frequency control mode in which the TELEX mode is automatically selected. A status word is transmitted as an acknowledge.

2. Autotelex with TX commands re-transmitted:
   The receiver responds to a receiver command by switching to a remote frequency control mode in which the TELEX mode is automatically selected. Transmitter commands are transferred to the RXREM output terminal for control of an associated transmitter.

3. Autotelex with TX commands re-transmitted and embedded acknowledge:
   The receiver responds to a receiver command by switching to a remote frequency control mode in which the TELEX mode is automatically selected. Transmitter commands are transferred to the RXREM output terminal for control of an associated transmitter. An embedded status word is transmitted as an acknowledge.

   This remote control type is used if the controller requires an acknowledge. The transmitter must then re-transmit the receiver status word to the controller.

4. Remote frequency selection:
   The receiver responds to a receiver command by switching to a remote frequency control mode. A status word is transmitted as an acknowledge.

When a remote control command is received then "cc" will be displayed in the PROG Display to show that the receiver is in the remote controlled mode. At the same time the PROG Key Indicator is flashing. In this mode all front panel control is inhibited. The receiver will remain in the remote controlled mode until the PROG Key is pressed. This will enable normal operation.

4.4.2 DATA FORMAT

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

Reserved addresses:
C2h/194d : Receiver
C3h/195d : Transmitter

The receiver only responds to receiver commands; transmitter commands are retransmitted dependent on the remote control type selected.

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

Reserved commands:
00h/0d : Reset
The receiver will run the power-up sequence.
14h/20d : Frequency input.
The next 4 words will be interpreted as 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 receiver may, dependent on the remote control type selected, transmit 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 receiver 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.

Embedded acknowledge: Dependent on the remote control type selected the status word may be preceded by the following words:

C3h/195d (address word)
11h/17d (command word)

POS.	CONNECTORS AND CABLE TYPES
1	2 OR 3-POLE JACK PLUG ø6.35. PART NO. 750 000 55
2	25-POLE D-SUB CONNECTOR PART NO. 751 000 62
3	BNC-MALE CONNECTOR COAX-CABLE. SEE NOTE C
4	15-POLE D-SUB CONNECTOR: SEE NOTE D. PART NO. 751 000 61
5	AC MAINS. SEE NOTE A
6	BATTERY. SEE NOTE B
7	EARTH CONNECTOR 2,5mm Sq

NOTE A

AC Mains: Cable 3 × 0,75mm Sq

Fuse ratings:

110v – 2 pcs. 2 Amp
220v – 2 pcs. 1 Amp

See also document 98557451

NOTE B

Battery:
Screened cable 2 × 1,5mm Sq

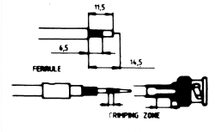
Pin 1: –

Pin 3: ⏚

Pin 4: +

See also document 98557461

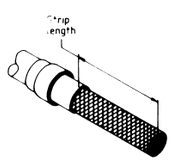
NOTE C



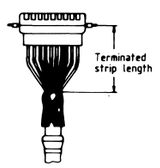
CRIMPING TOOLS

CRIMP PLIERS	DIE REFERENCE 590 CABLES
BUCHANAN 612 648 (MIL - T - 22910/3 - 1)	612 700 OR 600 195
THOMAS AND BETTS (TOOLS WITH FIXED DIES)	WT 300
ERMA 29991	29291

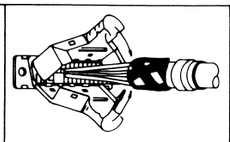
NOTE D



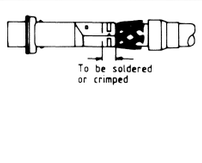
Slide a suitable ferrule onto the cable smaller diameter first
Strip the cable jacket. Then fold the braid back over the cable jacket, and trim off any exposed foil
Strip dimensions
15 and 25 positions - 33mm
37 positions - 43mm



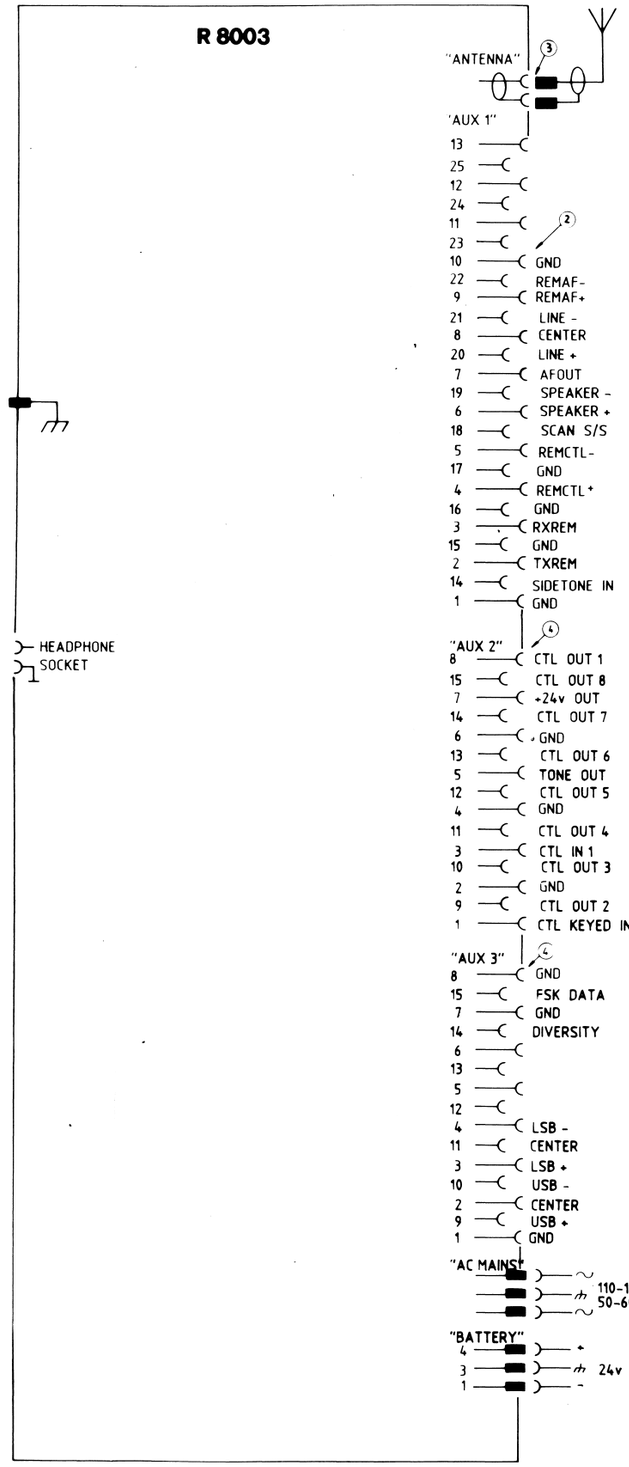
Solder the wires into the contacts
Measure the terminated strip length, it should be
15 and 25 positions - 33mm
37 positions - 41mm.



Insert the hinge tabs of the inner shield into the matching slots of the connector shell, and rotate housing 90°
Insert the hinge tabs of the outer shield into the matching slots of the connector shell
Close the outer shield until it latches on the inner shield



Slide the braid over the braid crimp area
Slide the ferrule forward against the shield assembly
Solder or crimp the ferrule



INSTALLATION WIRING DIAGRAM FOR RECEIVER R 8003 LOCAL CONTROL

POS.	CONNECTORS AND CABLE TYPES
1	2 OR 3-POLE JACK PLUG ø6.35 PART NO. 750 000 55
2	SEE NOTE D. 37-POLE D-SUB CONNECTOR PART NO.751 000 63
3	25-POLE D-SUB CONNECTOR PART NO. 751 000 62
4	BNC-MALE CONNECTOR COAX-CABLE SEE NOTE C
5	15-POLE D-SUB CONNECTOR. SEE NOTE D PART NO. 751 000 61
6	AC MAINS. SEE NOTE A
7	BATTERY. SEE NOTE B
8	EARTH CONNECTOR 2,5mm Sq

NOTE A

AC Mains Cable 3 x 0,75mm Sq

Fuse ratings

110v - 2 pcs. 2 Amp
220v - 2 pcs. 1 Amp

See also document 98557451

NOTE B

Battery:
Screened cable 2 x 1,5mm Sq

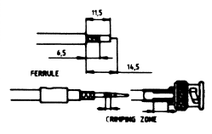
Pin 1: —

Pin 3:

Pin 4: +

See also document 98557461

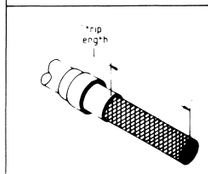
NOTE C



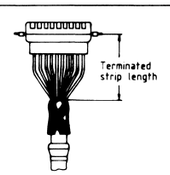
CRIMPING TOOLS

CRIMP PLIERS	DIE REFERENCE 50Ω CABLES
BUCHANAN 612 668 (MIL - T - 22990/7 - 1)	612 700 OR 600 195
THOMAS AND BETTS (TOOLS WITH FIXED DIES)	WT 300
ERMA 29991	29291

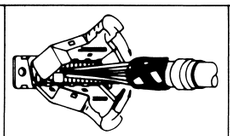
NOTE D



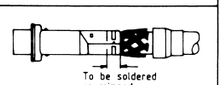
Slide a suitable ferrule onto the cable smaller diameter first. Strip the cable jacket. Then fold the braid back over the cable jacket and trim off any exposed foil.
Strip dimensions
15 and 25 positions - 33mm
37 positions - 43mm



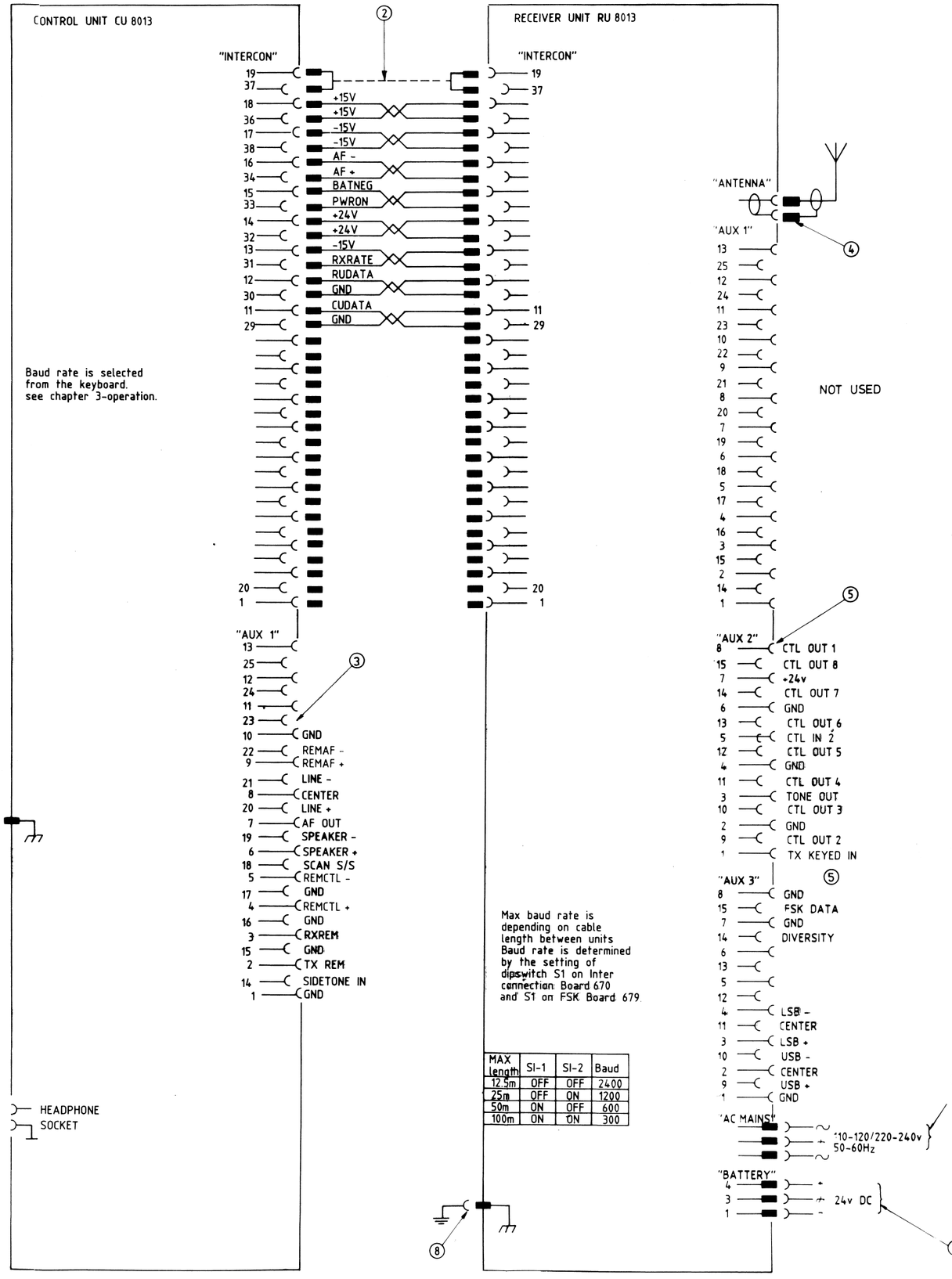
Solder the wires into the contacts
Measure the terminated strip length, it should be
15 and 25 positions - 33mm
37 positions - 43mm



Insert the hinge tabs of the inner shield into the matching slots of the connector shell, and rotate housing 90°
Insert the hinge tabs of the outer shield into the matching slots of the connector shell
Close the outer shield until it latches on the inner shield

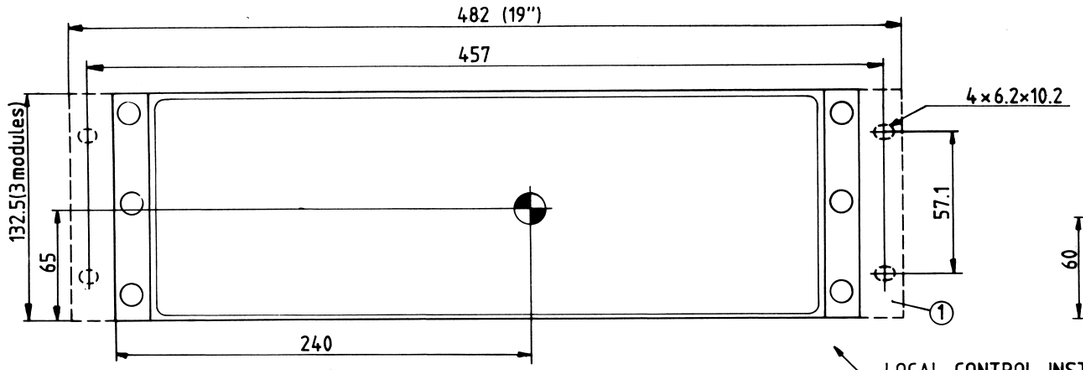


Slide the braid over the braid crimp area
Slide the ferrule forward against the shield assembly
Solder or crimp the ferrule

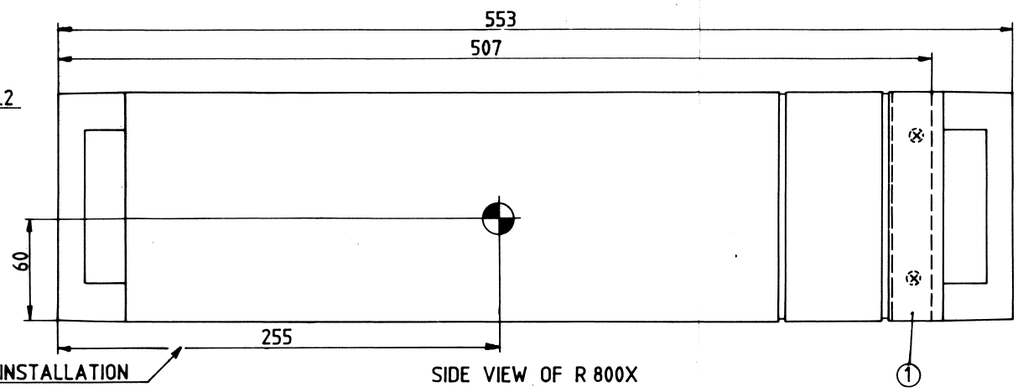


MAX length	SI-1	SI-2	Baud
12.5m	OFF	OFF	2400
25m	OFF	ON	1200
50m	ON	OFF	600
100m	ON	ON	300

INSTALLATION WIRING DIAGRAM FOR RECEIVER R 8003 EXTENDED LOCAL CONTROL

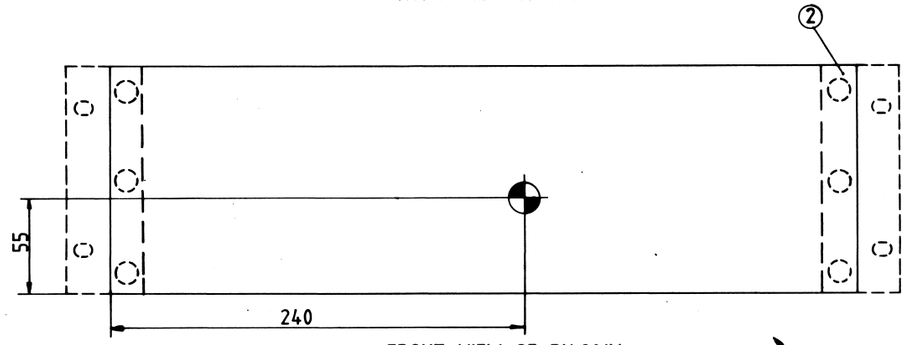


FRONT VIEW OF R 800X

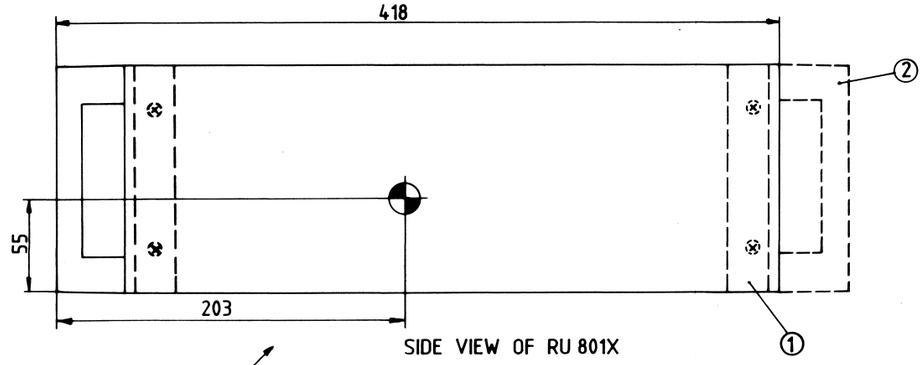


SIDE VIEW OF R 800X

LOCAL CONTROL INSTALLATION

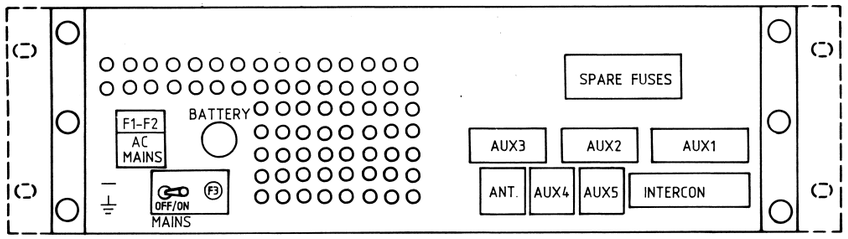


FRONT VIEW OF RU 801X

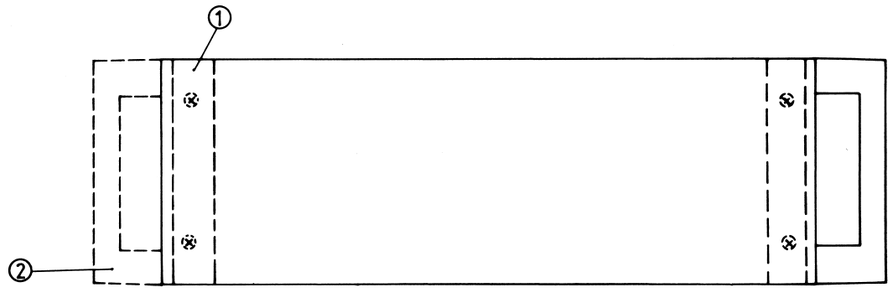


SIDE VIEW OF RU 801X

EXTENDED LOCAL CONTROL INSTALLATION

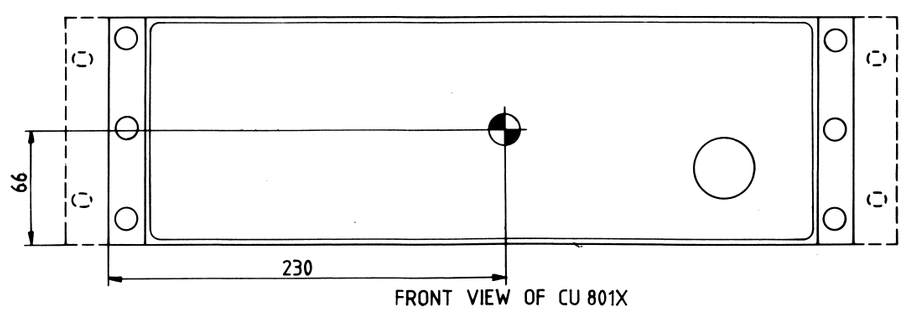


REAR VIEW OF RU 801X

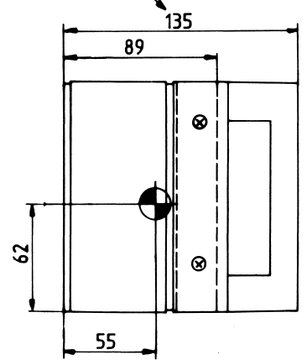


SIDE VIEW OF RU 801X

EXTENDED LOCAL CONTROL INSTALLATION



FRONT VIEW OF CU 801X



SIDE VIEW OF CU 801X

NOTE ① ACCESSORY RACK FLANGE KIT FOR 19" RACK MOUNTING PART NO. 107 621 20

NOTE ② ACCESSORY HANDLES KIT PART NO. 107 621 50

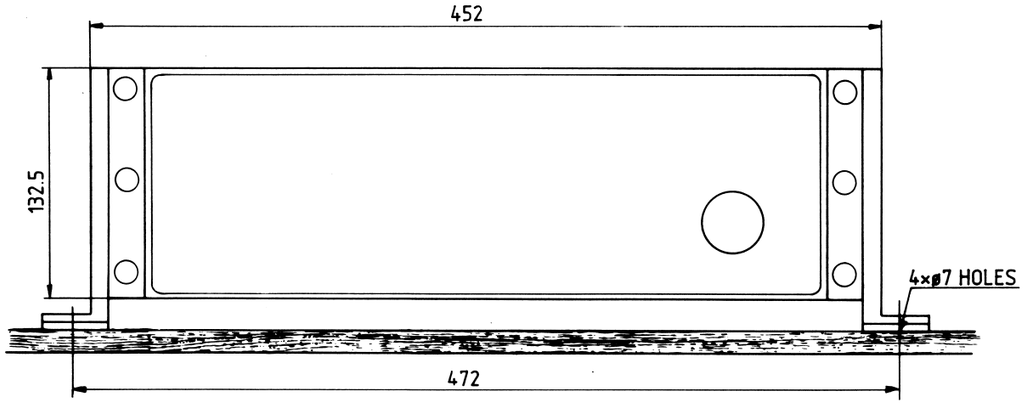
UNIT	Kg approx
R800X	15.5
RU8010	12.2
CU8010	3.3

See example of slide rails for 19" rack installation on drawing no. 995 577 0X.
Dimensions are in mm.
Tolerances : ±1mm.

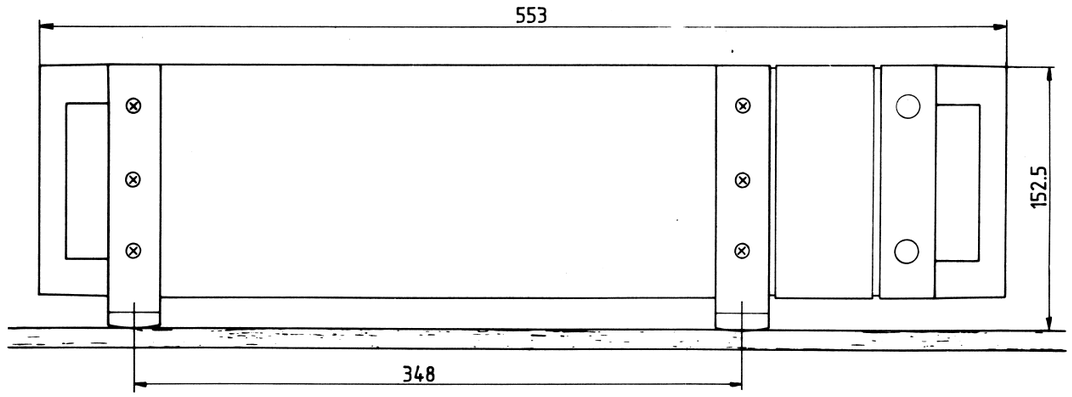
Centre of gravity.

19" RACK MOUNTING OF R 800X

995 577 21

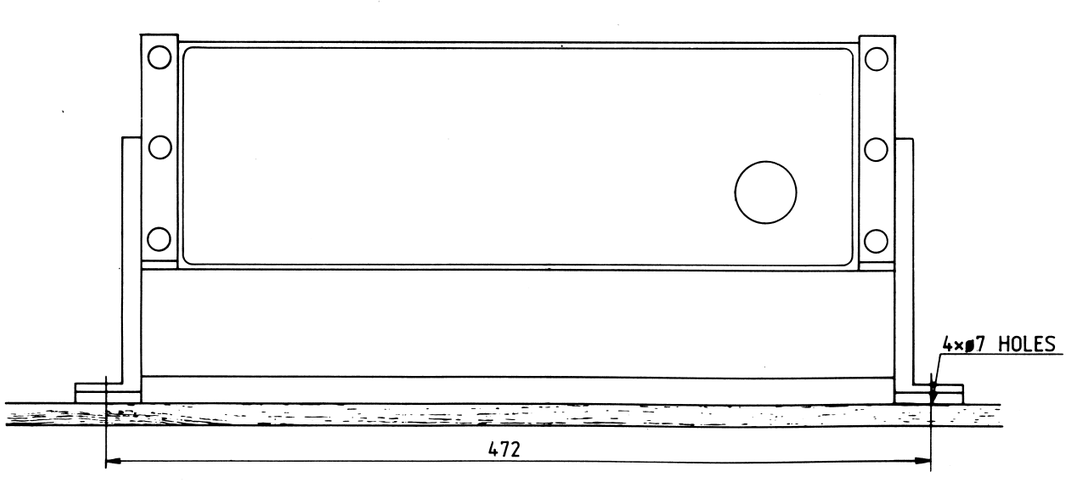


FRONT VIEW OF R800X

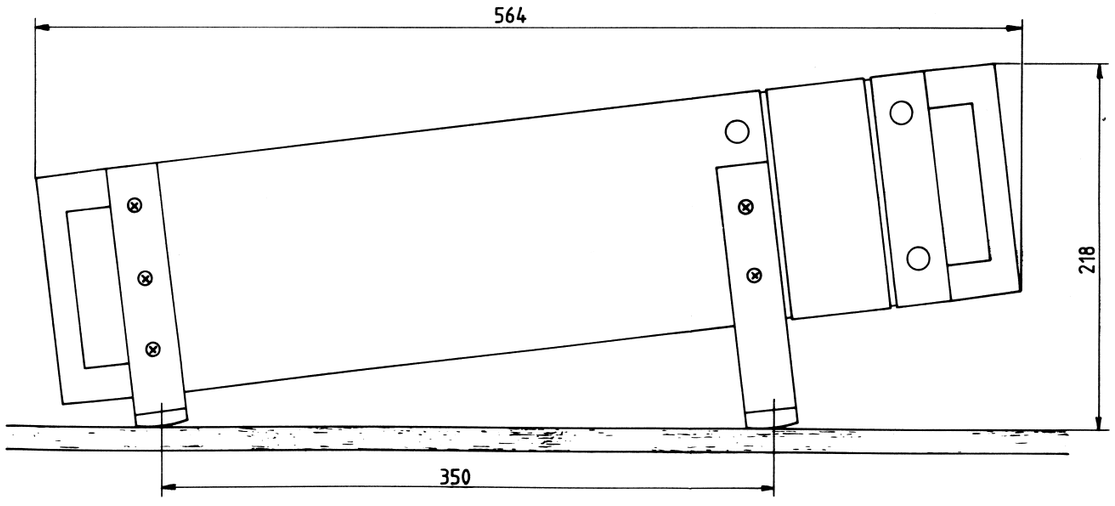


SIDE VIEW OF R800X

LOCAL CONTROL INSTALLATION



FRONT VIEW OF R800X IN TILTED POSITION



SIDE VIEW OF R800X IN TILTED POSITION

UNIT	Kg approx
R800X	15.5

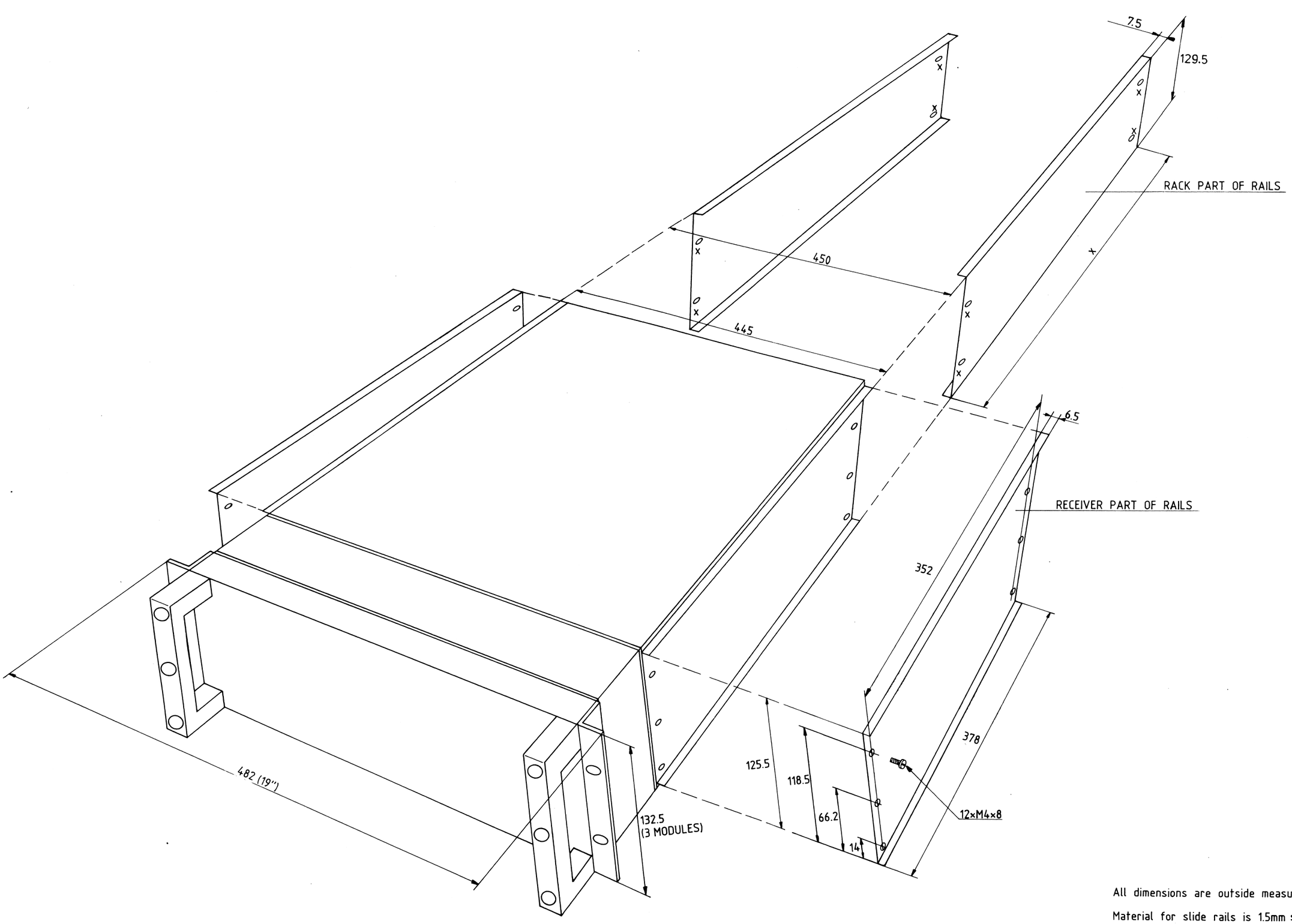
Centre of gravity see drawing nr. 995 577 01

Dimensions are in mm
Tolerances : ±1mm

TABLE - TOP MOUNTING OF R800X

995 577 11

DATE 21-5-87 lhn



All dimensions are outside measures in mm.

Material for slide rails is 1.5mm steel plate.

Dimensions and holes marked with an "x" must be fitted to the rack.

EXAMPLE OF SLIDE RAILS FOR 19" RACK INSTALLATION

5. TECHNICAL DESCRIPTION

5.1 CONTROL UNIT 8013

The Control Unit consists of Audio and Control Board 681, Notch filter and Remote Control Board 680, Display Board 675, and Sensor Board 676.

The Control and Audio Board comprises the AF signal path except the Notch Filter the squelch circuit. The audio output signal is fed to the built-in loudspeaker and to an external speaker output available at the "AUX1" connector as well as the "HEADPHONE" socket on the front of the unit. The microprocessor part of the Audio and Control Board communicates via an RS-232C interface with its counterpart on RU Control Board in the Receiver Unit. The rate can be configured to 300, 600, 1200 or 2400 baud dependent on the length of the interconnection cable between the Control and Receiver Unit.

The Notch Filter and Remote Control Board contains a switched capacitor notch filter, the frequency of which is adjustable by varying the synthesized clock frequency. For use in remote control applications the board also contains an AF switching circuit which serves to connect the receiver to a common AF bus, and an RS-485/ RS-232 conversion circuit.

The Display Board carries the 7-segment LED displays and the LED indicators and contains the associated decoders and drivers. It also contains the keyboard interface. Further, the board contains the speach controlled Squelch circuit.

The Sensor Board detects the turning of the tuning wheel. The signals produced here are fed to the microprocessor part of Audio and Control Board.

The Control Unit is power supplied via the interconnection cable from the Receiver Unit.

5.2 RECEIVER UNIT 8013

The Receiver Unit contains the Receiver Signal Path 667 and the Synthesizer Board 611. These are located in the top half of the cabinet, screened from the bottom part which contains RU Interconnection Board 670, RU Control Board 674, ISB Board 678, FSK Board 679, the Power Supply Assembly and the Master Oscillator Board.

The Power Supply Assembly produces various supply voltages neccessary in the equipment. Supply voltages, signals and control voltages are distributed via the RU Interconnection Board.

The RU Control Board performs the central control of the Receiver Unit and communicates with the Control Unit via an RS-232 interface.

The Master Oscillator supplies the frequency reference to the Synthesizer Board of the receiver.

The ISB Board contains a separate IF signal path for LSB and provides for simultaneous operation in upper and lower sideband.

The FSK Board contains a demodulator for frequency shift keyed telex signals. The demodulator is controlled via an onboard microprocessor.

CONTROL AND AUDIO BOARD

NOTCH FILTER AND REMOTE CONTROL BOARD

PART OF DISPLAY BOARD

"INTERCON" CONNECTOR TO RECEIVER UNIT

AF

+15 V
+24 V
-15 V

CURRENT LIMITERS

VOLTAGE REGULATORS

+5 V
+6 V
+12 V
-12 V

AFOUTPUT AMPLIFIER SUPPLY

FRQ SYNTH

SQUELCH

VOLUME CONTROL

AFOUT
HEADPHONE
EXT. SPEAKER
SIDETONE IN
LINE

LEVEL DETECTOR

V/F

BEEP

SERIAL/ PARALLEL

4.9152 MHZ OSC

÷2

MPU

RU DATA
CU DATA

RS 232

RATE MUX

RX RATE
PWR ON

PROG PROM

CONFIG PROM

RAM

REAL TIME CLOCK

32.768 KHZ OSC

TIMER

TUNING WHEEL TIMER

DECODER

KEYBOARD DISPLAY CONTROLLER

REMOTE CONTROL INTERFACE

RS 232

REMAF

RS - 485

REMCTL

PART OF NOTCH FILTER AND REMOTE CONTROL BOARD

RS - 232

RX REM
TX REM

SENSOR BOARD

OPTO SENSOR

KEYBOARD

3/8 DECODER

DISPLAY BOARD

7-SEGM. DECODER

SEGM. DRIVERS

8

LED DRIVER

4/16 DECODER

DIGIT DRIVERS

995 583 11

BLOCK DIAGRAM
CONTROL UNIT CU 8013

RECEIVER SIGNAL PATH
11 BP FILTERS
45 MHz
1,4 MHz FILTER BANK
AM/SSB DET
CONTROL LOGIC
MUTING
AGC
MGCU
45 - 75 MHz
43,6 MHz + 7 KHz - 8 KHz
1,4 MHz + 7,9 KHz - 4,8 KHz
"AUX 5" IF OUT
MASTER OSCILLATOR
12.24 MHz TCXO
- 8
- 250
1,28 MHz
40,96 KHz
SYNTHESIZER BOARD
45-75 MHz VCO
- N
N+1
FRQ
D/A
ACC
14,533 KHz VCXO
X3
- P
P+1
- 10
5,6 MHz VCO
- 4
- R
- 3200
ISB BOARD
1,4 MHz
SSB DET
USB
LSB
MGCU
AGC
MGC
"AUX 3" CONNECTOR
RU CONTROL BOARD
2.4576 MHz OSC
MPU
RS 232
PROM
RAM
MGC REG.
SIGN. PATH REG.
CTL REG.
SYNTH REG.
MUX
V/F
MGC LOOP
D/A
RX RATE
MGC
MUTING
FRQ
FSK BOARD
A/D
FSK DATA
DIVERSITY
RS 232
MPU
8 MHz
FRQ SYNTH
BAUD RATE SELECT
POWER SUPPLY ASSEMBLY
110 - 120/220 - 240v AC
24v DC
+ 7,5 v
+ 15 v
+ 24 v
- 15 v
DC ON SENSOR
ON/OFF CONTR.
DC SUPPLY INDICATION
300/600/1200/2400 BAUD RATE SELECT
TONE GEN
SERIAL/ PARALLEL
BUFFERS
AF
RX RATE
RU DATA
CU DATA
PWR ON
+ 15 v
+ 24 v
- 15 v
TONE OUT
8 CTL OUTPUTS
TX KEYED INPUT
CTL INPUT
"INTERCON" CONNECTOR TO CONTROL UNIT
"AUX 2" CONNECTOR
RU INTERCONNECTION BOARD

BLOCK DIAGRAM RECEIVER UNIT RU 8013

995 583 21

6. PREVENTIVE MAINTENANCE

Due to the modern design of the R 8003 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 the procedures below for preventive maintenance.

1. The condition of the supply battery should be checked at frequent intervals. The battery must always be fully charged and should be topped up frequently with distilled 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.

6.1 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 receive frequency 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 0.04 ppm.

   1.2 Thermometer: Range 0-50 deg. Celcius.

2. Preparations:

   2.1 Switch on the power at least 30 minutes before adjustment.
   2.2 Remove the bottom plate and the top cover of the Receiver Unit. Disconnect all sockets from the shielding cover of the Master Oscillator, which is located in the bottom half of the cabinet. 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 at 25 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 Synthesizer Board 611 carrying the injection signal to the 1st. mixer on 667. Connect the frequency counter to PL2 on 611.
   3.2 Key-in AM mode, WIDE BW and a receiver frequency of 26.68000 MHz on the Control Unit.

3.3 Adjust R1 on Master Oscillator Board 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.

6.2 Replacement of backup battery

The lithium backup battery should be changed within ten years after its date of manufacture. The date of manufacture 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 be erased when the equipment is switched OFF. The battery is located in the Control Unit on Control and Audio Board 681 and should be changed by a qualified technician.

7. TROUBLE SHOOTING AND SERVICE

7.1 MALFUNCTION

If the equipment is not functioning correctly a check should be made that it is being operated properly, see chapter 3. The power lamp on the rear of the Receiver Unit must be illuminated. If not, the cause could be a blown fuse.

7.2 REPLACEMENT OF FUSES

The Receiver Unit contains three replaceable fuses located at the back of the Power Supply Assembly. The two fuses are placed in the mains power inlet, and one fuse is used for the 24 VDC Battery input.

Fuse ratings:

Input Voltage	Fuse (slow)
AC Mains input: 110-120 VAC 220-240 VAC	 2 x 2 Amp. 2 x 1 Amp.
Battery input: 24 VDC	 6.3 Amp.

Spare fuses are located on the rear of the Receiver Unit.

7.3 SELF TEST FUNCTIONS

Self test can be done in two different modes, auto mode and step mode.

The 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.

The manually stepped mode is intended for service purposes. It allows step-by-step testing from an arbitrary test number and makes it possible to take measurements during the test and to repeat tests.

If the self test can't even be executed, the possible cause could be either a defective Control and Audio Board 681, a defective RU Interconnection Board 670 or the interconnection cable RU 8013/CU 8013.

7.3.1 AUTOMATICALLY STEPPED SELF TEST

The self test is executed by pressing:

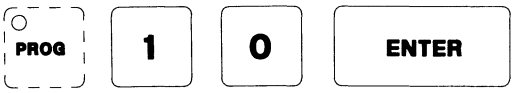
During the test the CHANNEL display will show the Test Number, indicating which test has been performed, and the FREQUENCY display will show the Error Code, indicating the result of the test.

The error codes are to be interpreted as follows:

Error Code	Meaning
0	The test has passed
1	}
2	} A malfunction has been detected,
-	} refer to specific test description
-	} for precise information.
97	}
98	Communication Error The test has failed due to communication error between CU and RU.
99	The test cannot be executed due to missing options. (special filters etc.)

7.3.2 MANUALLY STEPPED SELF TEST

The self test mode is selected by pressing:



Test Numbers and Error Codes are displayed as in the auto mode. The desired Test Number may be entered from the numeric keyboard. The test set-up will remain until "DIMMER" is pressed. Then the next test will be performed. Pressing "ENTER" will repeat the test. The receiver will return to normal operation when "PROG" is pressed.

7.3.3 TEST 1

Test 1 will test Control and Audio Board 681, audio signal path. Microprocessor beep generator is set to no tone, AF input switch is set to OFF, and speaker is set ON.
AF AMP is checked for silence.
The test is OK if CHECK 1 = "1"

Error code	Meaning
00	The test was OK
01	Error. CHECK 1 was "0" Possible cause: Fault on Control and Audio Board 681

7.3.4 TEST 2

Test 2 will test Control and Audio Board 681 , audio signal path. Microprocessor tone generator is set to ON, AF input switch is set to OFF, and speaker is set ON.
AF AMP is checked for tone.
The test is OK if CHECK 1 = "0"
A tone is heard during the test.

Error code	Meaning
00	The test was OK
01	Error. Check 1 was "1" Possible cause: Fault on Control and Audio Board 681 or loudspeaker shortcircuited

7.3.5 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 Display Board 675.

7.3.6 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: Master Oscillator 612, 613 or 614 or cable connecting 611 and 612 or Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.7 TEST 7

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

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.8 TEST 8

Test 8 will test Synthesizer Board 611.
It will bring 1.LO out of lock to check that it can be controlled by the microprocessor.
The test is OK if SYNCHECK 0 = "0"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "1" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.9 TEST 9

Test 9 will test Synthesizer Board 611.
It will set 1.LO to 45 MHz to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.10 TEST 10

Test 10 will test Synthesizer Board 611.
It will set 1.LO to 52.5 MHz, using the 45-52.5 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.11 TEST 11

Test 11 will test Synthesizer Board 611.
It will set 1.LO to 52.5 MHz, using the 52.5-60 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.12 TEST 12

Test 12 will test Synthesizer Board 611.
It will set 1.LO to 60 MHz, using the 52.5-60 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.13 TEST 13

Test 13 will test Synthesizer Board 611.
It will set 1.LO to 60 MHz, using the 60-67.5 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.14 TEST 14

Test 14 will test Synthesizer Board 611.
It will set 1.LO to 67.5 MHz, using the 60-67.5 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.15 TEST 15

Test 15 will test Synthesizer Board 611.
It will set 1.LO to 67.5 MHz, using the 67.5-75 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.16 TEST 16

Test 16 will test Synthesizer Board 611.
It will set 1.LO to 75 MHz, using the 67.5-75 MHz band, to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.17 TEST 17

Test 17 will test Synthesizer Board 611.
It will set 2.LO to 43.597 MHz to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.18 TEST 18

Test 18 will test Synthesizer Board 611.
It will set 2.LO to 43.603 MHz to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.19 TEST 19

Test 19 will test Synthesizer Board 611.
It will set 3.LO out of lock to check if it can be controlled by the microprocessor.
The test is OK if SYNCHECK 0 = "0"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "1" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.20 TEST 20

Test 20 will test Synthesizer Board 611.
It will set 3.LO to 1.3955 MHz to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.21 TEST 21

Test 21 will test Synthesizer Board 611.
It will set 3.LO to 1.403 MHz to check if it can lock.
The test is OK if SYNCHECK 0 = "1"

Error code	Meaning
00	The test was OK
01	Error. SYNCHECK 0 was "0" Fault on: Synthesizer Board 611 or cable connecting 611 and 674 or RU Control Board 674
98	Error, no response from RU Fault on: RU Control Board 674

7.3.22 TEST 25

Test 25 will test Receiver Signal Path 667.
It will set 667 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.
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 (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (681) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or RU Control Board 674 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: Display Board 675 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
99	The test can not be executed because either: filter X5 is not installed or this is not a standard version

7.3.23 TEST 26

Test 26 will test Receiver Signal Path 667.
It will set 667 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 (674) < 6.6 kHz
and CHECK 0 (681) = "1"
and CHECK 1 (681) = "1"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or 674 RU Control Board or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "0" AF was detected on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "0" AF was detected on loudspeaker Fault on: Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
99	The test can not be executed because this is a special version

7.3.24 TEST 27

Test 27 will test Receiver Signal Path 667.
It will set 667 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 = 43.602 MHz and 3.LO = 1.4 MHz.
The test is OK if RX RATE (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (681) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or RU Control Board 674 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: Display Board 675 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
99	The test can not be executed because either filter X3 is not installed or this is not a standard version

7.3.25 TEST 28

Test 28 will test Receiver Signal Path 667.
It will set 667 to CW reception, intermediate 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 = 43.601 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (681) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or RU Control Board 674 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: Display Board 675 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
99	The test can not be executed because either filter X5 is not installed or this is a special version.

7.3.26 TEST 29

Test 29 will test Receiver Signal Path 667.
It will set 667 to CW reception, wide 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 = 1.401 MHz.
The test is OK if RX RATE (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (681) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or RU Control Board 674 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: Display Board 675 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
99	The test can not be executed because this is a special version

7.3.27 TEST 30

Test 30 will test Receiver Signal Path 667.
It will set 667 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 (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (681) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: Receiver Signal Path 667 or RU Control Board 674 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: Receiver Signal Path 667 or cable connecting 667 and 611 or cable connecting 611 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on: Display Board 675 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674
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

7.3.28 TEST 45

Test 45 will test ISB Board 678.
It will select ISB mode and monitor LSB, and set the synthesizer to generate a signal in the upper sideband. The CU will check AGC voltage. No signal should be present.
The synthesizer frequencies are: 1.LO = 44.999 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE (674) > 6.6 kHz

Error code	Meaning
00	The test was OK
01	Error, RX RATE < 6.6 kHz AGC voltage is too high Fault on: ISB Board 678 or RU Control Board 674 or cable connecting 678 and 674 or Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674 or FSK Board 679
99	The test cannot be executed because either jumper on Receiver Signal Path 667 is not installed or this is a special version.

7.3.29 TEST 46

Test 46 will test ISB Board 678.
It will select ISB mode and monitor LSB, and set the synthesizer to generate a signal in the lower sideband.
The CU will check AGC voltage and AF signals.
A clear 1kHz tone will be heard during this test.
The synthesizer frequencies are: 1.LO = 45.001 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if RX RATE (674) < 6.6 kHz
and CHECK 0 (681) = "0"
and CHECK 1 (667) = "0"

Error code	Meaning
00	The test was OK
01	Error, RX RATE > 6.6 kHz AGC voltage is too low Fault on: ISB Board 678 or RU Control Board 674 or cable connecting 678 and 674 or Receiver Signal Path 667 or cable connecting 667 and 674 or cable connecting CU and RU or Control and Audio Board 681
02	Error, CHECK 0 was "1" no AF signal on Control and Audio Board 681 Fault on: ISB Board 678 or RU Control Board 674 or cable connecting 678 and 674 or Receiver Signal Path 667 or cable connecting 667 and 674 or cable connecting CU and RU or Control and Audio Board 681
03	Error, CHECK 1 was "1" no AF signal on loudspeaker Fault on Control and Audio Board 681
98	Error, no response from RU Fault on: RU Control Board 674 or FSK Board 679
99	The test cannot be executed because either jumper on Receiver Signal Path 667 is not installed or this is a special version.

7.3.30 TEST 47

Test 47 will test FSK Board 679.
It will select telex mode, narrow bandwidth, and set the synthesizer to generate a signal on the mark frequency. The FSK Demodulator set-up will be: mark frequency = 1415 kHz, space frequency = 1585 kHz, data rate = 200 Baud.
The synthesizer frequencies are: 1.LO = 44.99859 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if FSK Data Out is "1" and FSK Bargraph data are correct.

Error code	Meaning
00	The test was OK
01	Error, FSK Data Out was "0" Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670
02	Error, FSK Bargraph data was wrong Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670
98	Error, no response from RU Fault on: RU Control Board 674 or FSK Board 679

7.3.31 TEST 48

Test 48 will test FSK Board 679.
It will select telex mode, narrow bandwidth, and set the synthesizer to generate a signal on the space frequency. The FSK Demodulator set-up will be: mark frequency = 1415 kHz, space frequency = 1585 kHz, data rate = 200 Baud.
The synthesizer frequencies are: 1.LO = 44.99841 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if FSK Data Out is "0" and FSK Bargraph data are correct.

Error code	Meaning
00	The test was OK
01	Error, FSK Data Out was "1" Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670
02	Error, FSK Bargraph data was wrong Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670
98	Error, no response from RU Fault on: RU Control Board 674 or FSK Board 679

7.3.32 TEST 49

Test 49 will test FSK Board 679.
It will select ISB mode, LSB channel, and set the synthesizer to generate a signal on the space frequency. The FSK Demodulator set-up will be: mark frequency = 1415 kHz, space frequency = 1585 kHz, data rate = 200 Baud.
The synthesizer frequencies are: 1.LO = 45.00159 MHz, 2.LO = 43.6 MHz, 3.LO = 1.4 MHz.
The test is OK if FSK Data Out is "0" and FSK Bargraph data are correct.

Error code	Meaning
00	The test was OK
01	Error, FSK Data Out was "1" Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670 or ISB Board 678 or cable connecting 678 and 679
02	Error, FSK Bargraph data was wrong Fault on: FSK Board 679 or Interconnection Board 670 or cable connecting 679 and 670 or ISB Board 678 or cable connecting 678 and 679
98	Error, no response from RU Fault on: RU Control Board 674 or FSK Board 679
99	The test cannot be executed because either jumper on Receiver Signal Path 667 is not installed or this is a special version.

7.3.33 TEST 50

Test 50 will test the Notch Filter and Remote Control Board 680.
It will set the synthesizers to generate a 1 kHZ beat frequency.
AF signal levels will be tested by the CU.
The test is OK if CHECK 0 (681) = "0"
CHECH 1 (681) = "1"

Error code	Meaning
00	The test was OK.
02	Error, CHEK 0 was "1". No AF signal on Control and Audio Board 681. Fault on: Receiver Signal Path 667. or cable connecting 667 and 674 or cable connecting CU and RU or Control and Audio Board 681.
03	Error, CHECK 1 was "0". AF was detected on loudspeaker. Fault on: Notch Filter board 680 or Contro and Audio board 681.
98	Error, no responce from RU. Fault on RU Control Board 674 or FSK Board 679.
99	The test cannot be executed because this is a special version.

7.3.34 LIST OF TESTS

TEST#	TESTS	REMARKS
01	Control and Audio Board 681	
02	Control and Audio Board 681	
05	Display test	
06	Master Oscillator 612/613/614	
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
25	Receiver Signal Path 667	J3E mode
26	Receiver Signal Path 667	AM mode
27	Receiver Signal Path 667	F1B mode
28	Receiver Signal Path 667	CW inter
29	Receiver Signal Path 667	CW wide
30	Receiver Signal Path 667	CW narrow
45	ISB Board 678	
46	ISB Board 678	
47	FSK Board 679, Mark frequency, TELEX mode	
48	FSK Board 679, Space frequency, TELEX mode	
49	FSK Board 679, Space frequency, ISB mode, LSB channel	
50	Notch Filter and Remote Control Board 680	

7.4 Spare Parts List

CONTROL UNIT (CU 8013):

CU 8013 complete	108
Loudspeaker	860 000 10
Membrane Keyboard	345 571 01
Keyboard Overlay	
Ribbon cable 675/681	375 573 01
Notch Filter and Remote Control Board 680	107 568 01
Control and Audio Board 681	107 568 11
Display Board 675	107 567 51
Sensor Board 676	107 567 61
Lithium Battery	890 000 02

RECEIVER UNIT (RU 8013):

37-conductor wiring "Intercon"/"Aux1"	375 572 73
Ribbon cable 34-conductor 670/674	375 572 92
15-conductor wiring "Aux2"	375 572 81
Fuse 1 Amp 250 Volt slow 5 x 20 mm	720 310 03
Fuse 2 Amp 250 Volt slow 5 x 20 mm	720 320 03
Fuse 6.3 Amp 250 Volt slow 5 x 20 mm	720 363 03
Coax cable 2.LO Signal Path	106 606 50
Coax cable 2+3.LO Reference	106 600 30
Coax cable 1.LO Reference	106 600 40
Power Supply Assembly (PSA)	107 620 00
PSA Chassis Subassembly	107 621 60
PSA Boards Subassembly	107 621 70
Interconnection Board 670	107 567 01
Receiver Signal Path incl. filters 667	107 566 71
Synthesizer Board 611	107 561 11
15-conductor wiring "AUX 3"	375 580 21
Ribbon cable 40-conductor 674/611/667/678	375 580 01
Ribbon cable 16-conductor 670/678/679	375 580 11
Master Oscillator, 1.5 ppm 612	107 561 21
Master Oscillator, 0.8 ppm 613 (optional)	107 561 31
Master Oscillator, 0.4 ppm 614 (optional)	107 561 41
RU Control Board 674	107 567 41
ISB Board 678	107 567 81
FSK Board 679	107 567 91

Interconnection cable RU 8013/CU 8013 37-conductor	375 575 03

PSA Chassis Subassembly	PSA Boards Subassembly
107 621 60	107 621 70

8. CIRCUIT DESCRIPTION AND DIAGRAMS

8.1 Symbol Explanation

8.1.1 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.

8.1.2 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 labeled with mnemonic letters as described in table 8.1.

8.1.3 Logic Functions

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

8.1.4 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.

8.2 ABBREVIATIONS

The following table applies to PCB's 611, 612, 613, 614, 667 and 674.

A	= ampere, amperes
C	= capacitors
Car.	= carbon
Cer.	= ceramic
CR	= thyristor
D	= diode
F	= farad
FS	= fuse
H	= henry
IC	= integrated circuit
k	= kilo or 10^3
L	= inductors
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
n = nano or 10^-9
NP0 = 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 = transistors
R = resistors
RL = relay
SK = connector (socket or cable with socket)
SL = lamp
Sol. al. = solid aluminum
SW = switch
T = transformers
Tan. = tantalum electrolytic capacitor
u = micro or 10^-6
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 = watts
W.alum. = wet aluminum electrolytic
X = crystal, crystal osc. or crystal filter

The following table applies to PCB's 670, 671, 672, 675, 676 and 681. Component designators as well as diagram symbols are in accordance with IEC standard, series 617.

A = amperes, assemblies, subassemblies
B = batteries, loudspeakers, earphones
C = capacitors
Cer. = ceramic
D = binary elements, delay devices, storage devices
E = miscellaneous devices not specified elsewhere in this table
F = farad, fuses
H = henry
K = relays
k = kilo or 10^3
L = inductors
lin. = linear

log. = logarithmic
m = milli or 10^-3
M = motors, mega or 10^6
Mi = mica
u = micro or 10^-6
N = operational amplifiers, hybrid analogue/digital device
n = nano or 10^-9
NP0 = temp. coefficient 0
N150 = temp. coefficient -150
NTC = neg. temp. coefficient
p = pico or 10^-12
Polyes. = polyester
Polyst. = polystyrene
Pot. = potentiometer
PTC = pos. temp. coefficient
R = resistors
S = switches, selectors
Sol. al. = solid aluminum
T = transformers
Tan. = tantalum electrolytic capacitor
V = diodes, transistors, thyristors, working voltage DC or volts
Vac. = working voltage AC
Var. = variable
Varicap = variable capacitance diode
Vpp = peak to peak voltage
ww = wire wound
W = cables
W.alum. = wet aluminum electrolytic capacitor
X = terminals, plugs, sockets
Z = crystals, crystal filters

Table 8.1

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

Table 8.1 continued

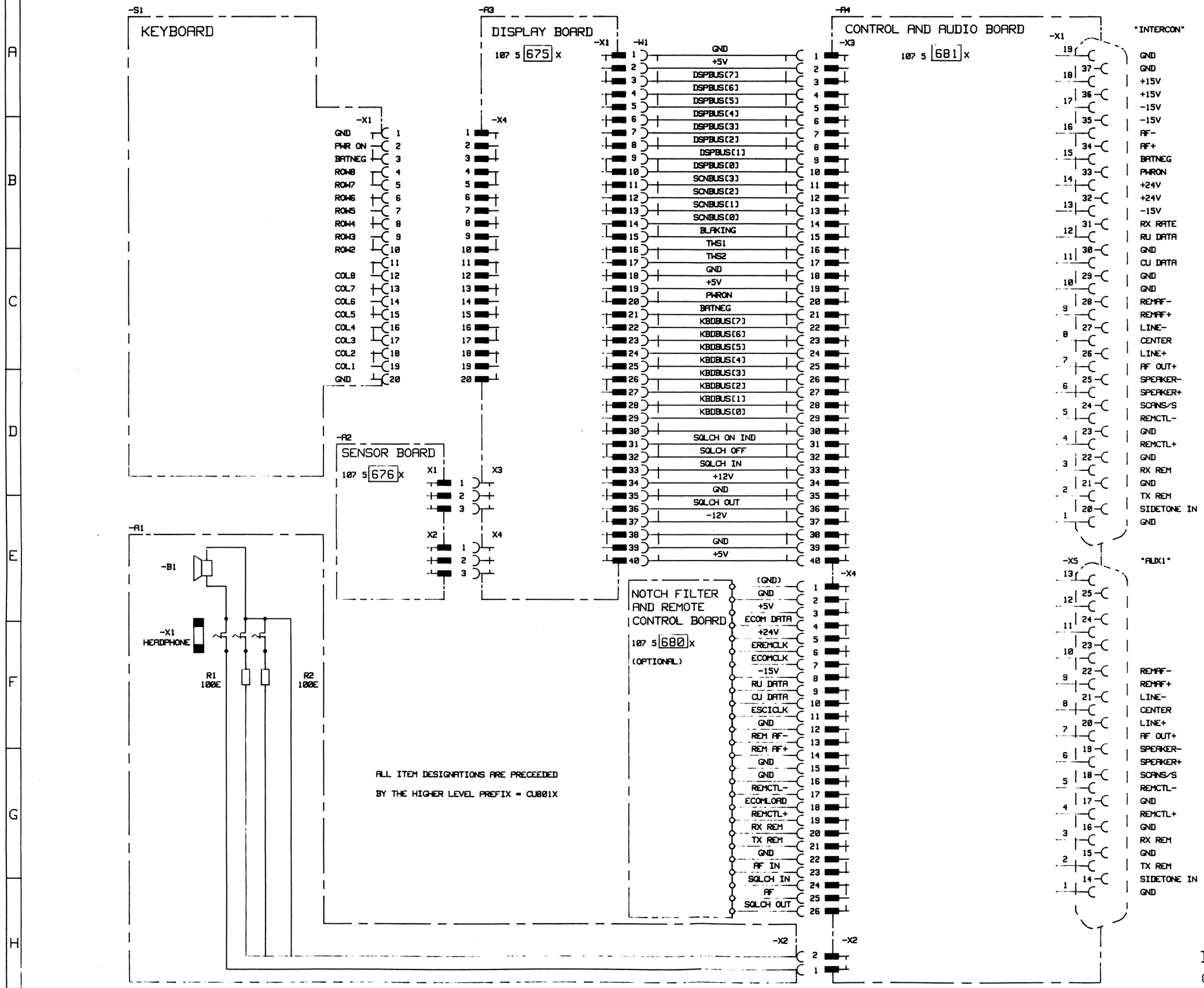
Label	Short for	Meaning
Kx	Mode Select	selects counting mode for programmable counter
LE	Latch Enable	updates latching register
LT	Lamp Test	activates all outputs on BCD-to-7 segment decoder
MR	Master Reset	input for initializing MPU or clearing programmable registers in peripheral circuit
MRDY	Memory Ready	hand-shake flag to MPU indicating new bus cycle may be started
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

Table 8.1 continued

Label	Short for	Meaning
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

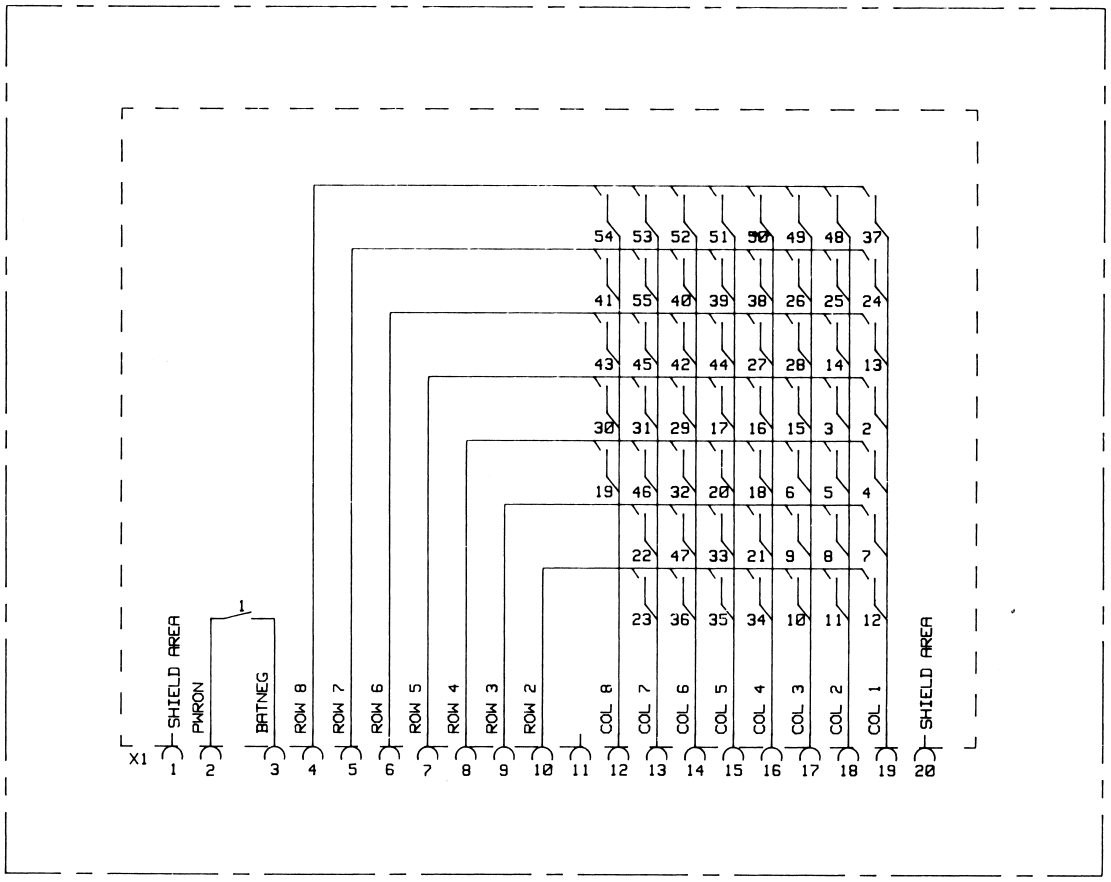
(2) "y" is an alphabetical index used for multiple ports



INTERCONNECTION DIAGRAM
CONTROL UNIT CU8013

995 583 31 A

M558331A 3.4.91



KEYBOARD
VERSION 1
MAIN DIAGRAM

PARTS LIST FOR CONTROL UNIT 8013

Control Unit 8013 complete	108 620 30
PCB 675 Display Board	107 567 51
PCB 676 Sensor Board	107 567 61
PCB 680 Notch Filter and Remote Control Board	107 568 01
PCB 681 Control and Audio Board	107 568 11
Keyboard	345 571 02
40 Wire Ribbon Cable (PCB 675-681)	375 573 01
Loudspeaker 50 ohm	860 000 10

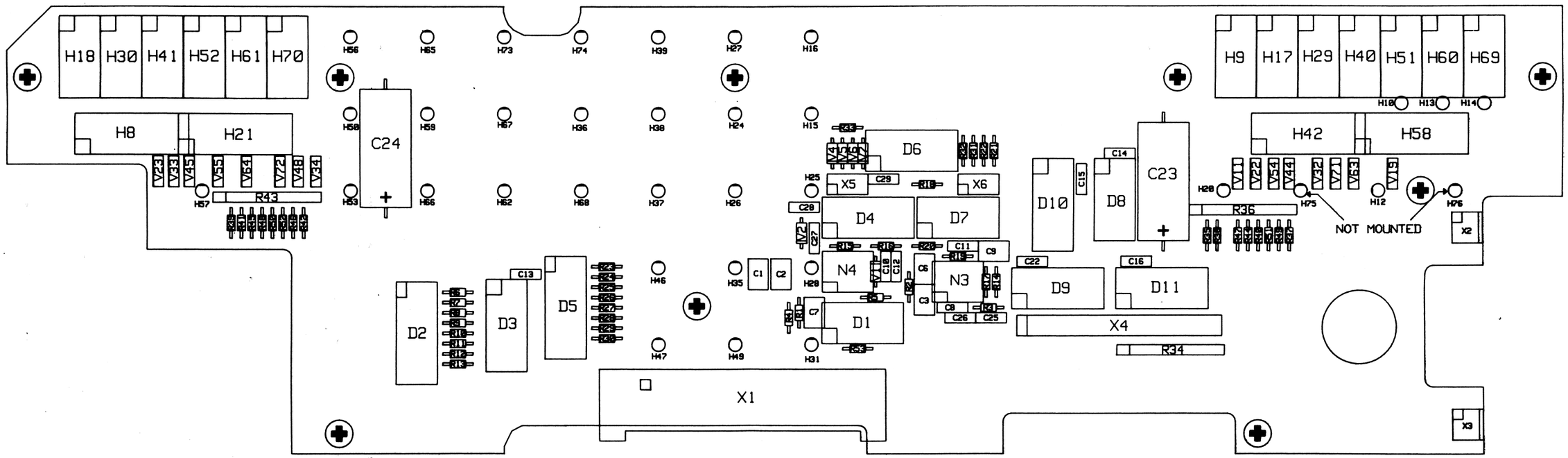
TECHNICAL DESCRIPTION

Display Board 675

The Display Board consists of two separate circuits: a squelch circuit and a keyboard/display interface.

The keyboard/display interface decodes the control signals coming from the keyboard/display controller on Audio and Control Board. Display and keyboard multiplexing is done by 4-16 and 3-8 decoding respectively of the "SCAN" bus. A binary 7-segment decoder controls the displays and a driver controls the led's and the bar-graphs.

The squelch circuit receives its AF input from the Audio and Control Board. After filtering the signal is fed through a schmitt trigger to a counter. If the average output frequency of the counter exceeds 1103 Hz the squelch opens. After 1.4 sec. absence of the AF signal the squelch will close again (hold-time). The average frequency as well as the hold-time are preset in the printed circuit. The values mentioned may be changed by means of strapping. Values in the intervals 138-2069 Hz and 0.116-1.740 sec. respectively may be selected.



995 567 5X COMP

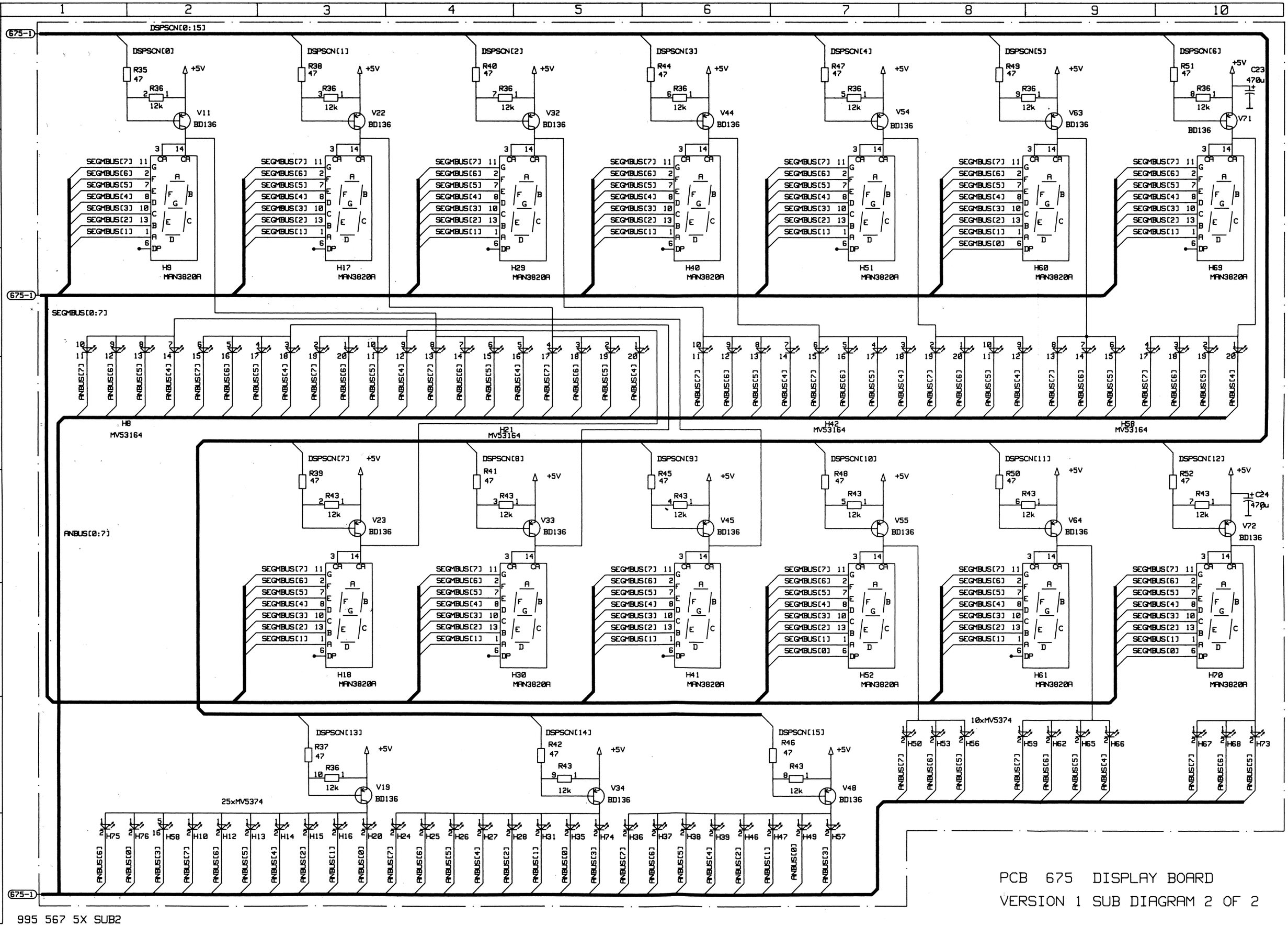
PCB ASSEMBLY DRAWING

675 VERSION 1

PCB 675 DISPLAY BOARD
VERSION 1 SUB DIAGRAM 1 OF 2

995 567 5X SUB1

FILNAVN pc675_1 20-5-87


DSPSCN[0:15]
675-1
DSPSCN[0]
DSPSCN[1]
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DSPSCN[5]
DSPSCN[6]
R35 47
R38 47
R40 47
R44 47
R47 47
R49 47
R51 47
C23 470u
R36 12k
+5V
V11 BD136
V22 BD136
V32 BD136
V44 BD136
V54 BD136
V63 BD136
V71 BD136
SEGMBUS[7]
SEGMBUS[6]
SEGMBUS[5]
SEGMBUS[4]
SEGMBUS[3]
SEGMBUS[2]
SEGMBUS[1]
SEGMBUS[0]
H9 MAN3820A
H17 MAN3820A
H29 MAN3820A
H40 MAN3820A
H51 MAN3820A
H60 MAN3820A
H69 MAN3820A
SEGMBUS[0:7]
ANBUS[7]
ANBUS[6]
ANBUS[5]
ANBUS[4]
H8 MV53164
H21 MV53164
H42 MV53164
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ANBUS[0:7]
DSPSCN[7]
DSPSCN[8]
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DSPSCN[10]
DSPSCN[11]
DSPSCN[12]
R39 47
R41 47
R45 47
R48 47
R50 47
R52 47
C24 470u
R43 12k
V23 BD136
V33 BD136
V45 BD136
V55 BD136
V64 BD136
V72 BD136
H18 MAN3820A
H30 MAN3820A
H41 MAN3820A
H52 MAN3820A
H61 MAN3820A
H70 MAN3820A
DSPSCN[13]
DSPSCN[14]
DSPSCN[15]
R37 47
R42 47
R46 47
R36 12k
R43 12k
V19 BD136
V34 BD136
V48 BD136
25xMV5374
10xMV5374
H75
H76
H58
H10
H12
H13
H14
H15
H16
H20
H24
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H74
H36
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H57
H50
H53
H56
H59
H62
H65
H66
H67
H68
H73
PCB 675 DISPLAY BOARD
VERSION 1 SUB DIAGRAM 2 OF 2
995 567 5X SUB2
FILNAVN: nc675_2 21-5-87

PARTS LIST FOR DISPLAY BOARD 675 VERSION 1

Printed Circuit Board Complete 675					107 567 51
C1	0.33uF	20%	63V	poly	622 533 01
C2	0.33uF	20%	63V	poly	622 533 01
C3	0.15uF	20%	63V	poly	622 515 00
C6	0.15uF	20%	63V	poly	622 515 00
C7	0.33uF	20%	63V	poly	622 533 01
C8	1nF	20%	63V	Cer	602 310 02
C9	0.47uF	20%	63V	poly	622 547 01
C10	0.1uF	20%	63V	poly	622 510 00
C11	47pF	10%	63V	cer	602 147 00
C12	10nF	20%	63V	Cer	622 410 01
C13	0.1uF	20%	63V	poly	622 510 00
C14	0.1uF	20%	63V	poly	622 510 00
C15	0.1uF	20%	63V	poly	622 510 00
C16	0.1uF	20%	63V	poly	622 510 00
C22	0.1uF	20%	63V	poly	622 510 00
C23	470uF		16V	W.Alu	651 847 00
C24	470uF		16V	W.Alu	651 847 00
C25	0.1uF	20%	63V	poly	622 510 00
C26	0.1uF	20%	63V	poly	622 510 00
C27	0.1uF	20%	63V	poly	622 510 00
C28	0.1uF	20%	63V	poly	622 510 00
C29	0.1uF	20%	63V	poly	622 510 00
D1	4066B	Switch			850 406 60
D2	ULN2803	Annunciator Driver			850 280 30
D3	74LS48	Segment Decoder			850 744 81
D4	4520B	Detector Counter			850 452 00
D5	ULN2803	Segment Driver			850 280 30
D6	4029B	Counter			850 402 90
D7	4013B	D-Flip Flop			850 401 30
D8	74HC00	4 x 2 input nand gate			850 740 04
D9	74LS156	Scan Decoder			857 415 60
D10	74LS145	Scan Decoder			857 414 50
D11	74LS145	Scan Decoder			857 414 50
H8	MV53164	Bargraph			823 000 05
H9	MAN3820A	Display			824 008 20
H10	MV5374	LED			823 000 04
H12	MV5374	LED			823 000 04
H13	MV5374	LED			823 000 04
H14	MV5374	LED			823 000 04
H15	MV5374	LED			823 000 04
H16	MV5374	LED			823 000 04
H17	MAN3820A	Display			824 008 20
H18	MAN3820A	Display			824 008 20
H20	MV5374	LED			823 000 04
H21	MV53164	Bargraph			823 000 05
H24	MV5374	LED			823 000 04
H25	MV5374	LED			823 000 04
H26	MV5374	LED			823 000 04
H27	MV5374	LED			823 000 04
H28	MV5374	LED			823 000 04
H29	MAN3820A	Display			824 008 20
H30	MAN3820A	Display			824 008 20
H31	MV5374	LED			823 000 04
H35	MV5374	LED			823 000 04

PARTS LIST FOR DISPLAY BOARD 675 VERSION 1

H36	MV5374	LED		823 000 04
H37	MV5374	LED		823 000 04
H38	MV5374	LED		823 000 04
H39	MV5374	LED		823 000 04
H40	MAN3820A	Display		824 008 20
H41	MAN3820A	Display		824 008 20
H42	MV53164	Bargraph		823 000 05
H46	MV5374	LED		823 000 04
H47	MV5374	LED		823 000 04
H49	MV5374	LED		823 000 04
H50	MV5374	LED		823 000 04
H51	MAN3820A	Display		824 008 20
H52	MAN3820A	Display		824 008 20
H53	MV5374	LED		823 000 04
H56	MV5374	LED		823 000 04
H57	MV5374	LED		823 000 04
H58	MV53164	Bargraph		823 000 05
H59	MV5374	LED		823 000 04
H60	MAN3820A	Display		824 008 20
H61	MAN3820A	Display		824 008 20
H62	MV5374	LED		823 000 04
H65	MV5374	LED		823 000 04
H66	MV5374	LED		823 000 04
H67	MV5374	LED		823 000 04
H68	MV5374	LED		823 000 04
H69	MAN3820A	Display		824 008 20
H70	MAN3820A	Display		824 008 20
H73	MV5374	LED		823 000 04
H74	MV5374	LED		823 000 04
N3	LF353	Op Amp		850 035 30
N4	NE555	Clock Generator		850 055 50
R1	1Mohm	CR16	MF	500 610 01
R2	1.2Kohm	CR16	MF	500 312 00
R3	10Kohm	CR16	MF	500 410 00
R4	1Mohm	CR16	MF	500 610 01
R5	22Kohm	CR16	MF	500 422 00
R6	18ohm	CR16	MF	500 118 00
R7	18ohm	CR16	MF	500 118 00
R8	18ohm	CR16	MF	500 118 00
R9	18ohm	CR16	MF	500 118 00
R10	18ohm	CR16	MF	500 118 00
R11	18ohm	CR16	MF	500 118 00
R12	18ohm	CR16	MF	500 118 00
R13	18ohm	CR16	MF	500 118 00
R14	1Kohm	CR16	MF	500 310 00
R15	1.5Kohm	CR16	MF	500 315 00
R16	820Kohm	CR16	MF	500 582 00
R17	1Kohm	CR16	MF	500 310 00
R18	22Kohm	CR16	MF	500 422 00
R19	1Mohm	CR16	MF	500 610 01
R20	12Kohm	CR16	MF	500 412 00
R21	47Kohm	CR16	MF	500 447 00
R22	47Kohm	CR16	MF	500 447 00
R23	18ohm	CR16	MF	500 118 00
R24	18ohm	CR16	MF	500 118 00
R25	18ohm	CR16	MF	500 118 00

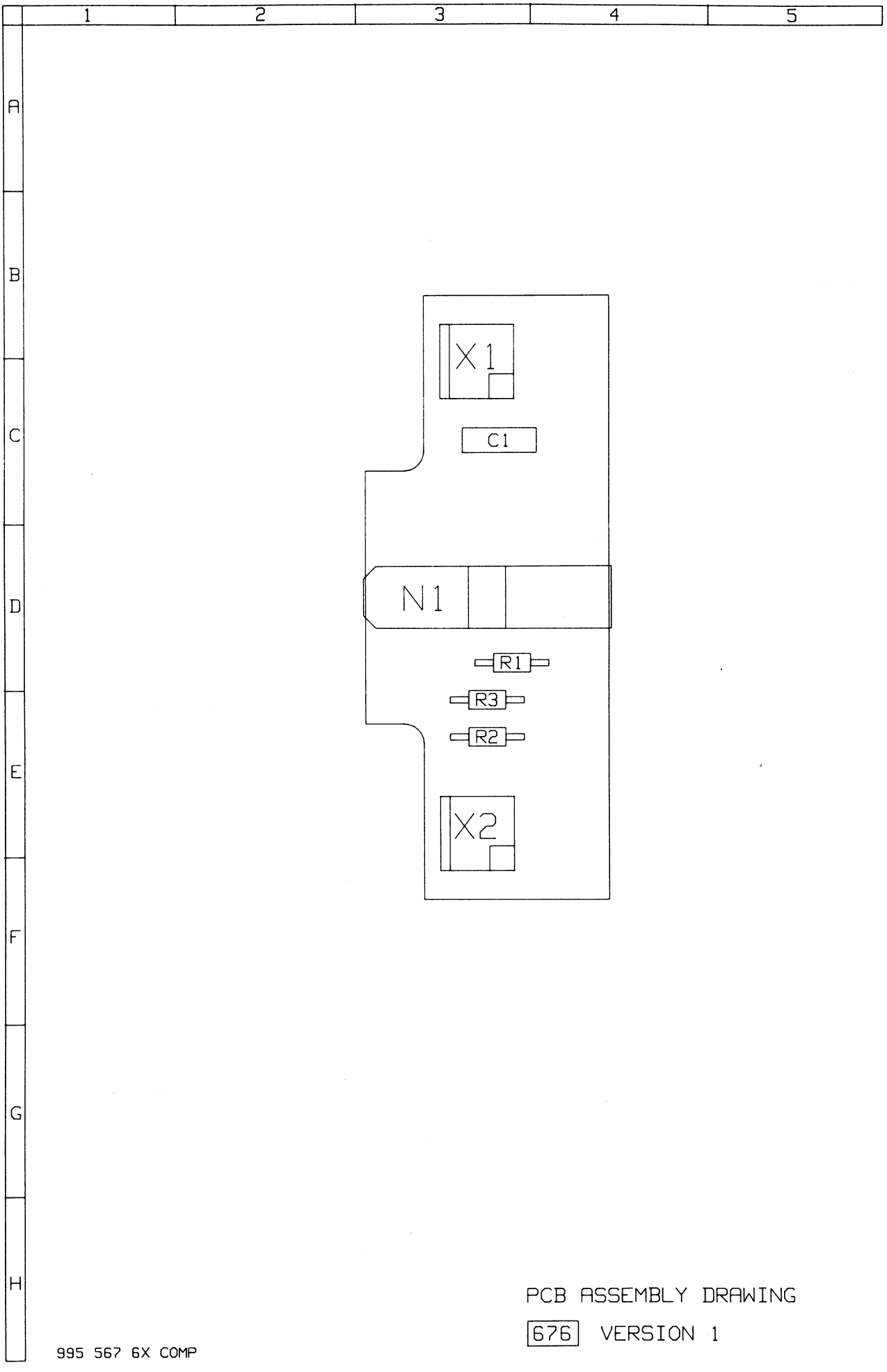
PARTS LIST FOR DISPLAY BOARD 675 VERSION 1

R26	18ohm	CR16	MF		500 118 00
R27	18ohm	CR16	MF		500 118 00
R28	18ohm	CR16	MF		500 118 00
R29	18ohm	CR16	MF		500 118 00
R30	18ohm	CR16	MF		500 118 00
R31	47Kohm	CR16	MF		500 447 00
R32	47Kohm	CR16	MF		500 447 00
R33	22Kohm	CR16	MF		500 422 00
R34	9x12Kohm	Sil			530 000 09
R35	47ohm	CR16	MF		500 147 00
R36	9x12Kohm	Sil			530 000 09
R37	47ohm	CR16	MF		500 147 00
R38	47ohm	CR16	MF		500 147 00
R39	47ohm	CR16	MF		500 147 00
R40	47ohm	CR16	MF		500 147 00
R41	47ohm	CR16	MF		500 147 00
R42	47ohm	CR16	MF		500 147 00
R43	9x12Kohm	Sil			530 000 09
R44	47ohm	CR16	MF		500 147 00
R45	47ohm	CR16	MF		500 147 00
R46	47ohm	CR16	MF		500 147 00
R47	47ohm	CR16	MF		500 147 00
R48	47ohm	CR16	MF		500 147 00
R49	47ohm	CR16	MF		500 147 00
R50	47ohm	CR16	MF		500 147 00
R51	47ohm	CR16	MF		500 147 00
R52	47ohm	CR16	MF		500 147 00
R53	47Kohm	CR16	MF		500 447 00
V1	1N4148	Diode			830 414 80
V2	1N4148	Diode			830 414 80
V4	1N4148	Diode			830 414 80
V5	1N4148	Diode			830 414 80
V6	1N4148	Diode			830 414 80
V7	1N4148	Diode			830 414 80
V11	BD136	Transistor			842 013 60
V19	BD136	Transistor			842 013 60
V22	BD136	Transistor			842 013 60
V23	BD136	Transistor			842 013 60
V32	BD136	Transistor			842 013 60
V33	BD136	Transistor			842 013 60
V34	BD136	Transistor			842 013 60
V44	BD136	Transistor			842 013 60
V45	BD136	Transistor			842 013 60
V48	BD136	Transistor			842 013 60
V54	BD136	Transistor			842 013 60
V55	BD136	Transistor			842 013 60
V63	BD136	Transistor			842 013 60
V64	BD136	Transistor			842 013 60
V71	BD136	Transistor			842 013 60
V72	BD136	Transistor			842 013 60
X1	Male connector		40 pol	3M	756 040 05
X2	Male connector		3 pol	Molex	750 000 60
X3	Male connector		3 pol	Molex	750 000 60
X4	Male connector		20 pol	3M	751 001 25

TECHNICAL DESCRIPTION

Sensor Board 676

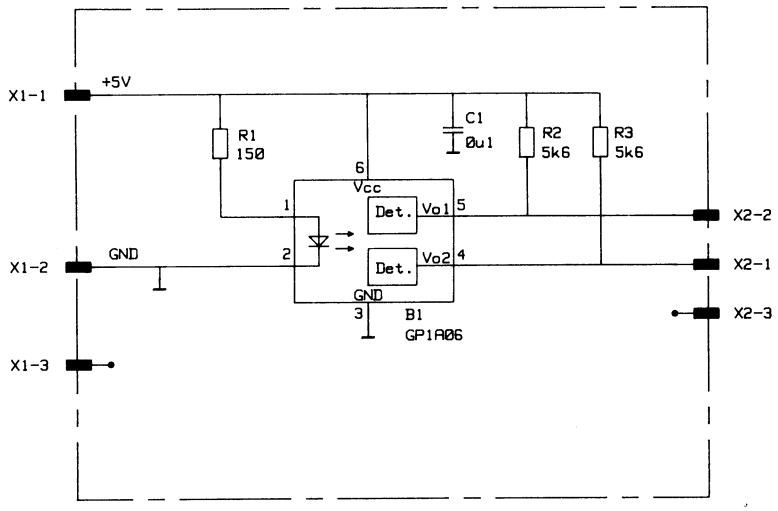
The Sensor Board detects the turning of the opto-mechanical tuning wheel. This is achieved by means of two optical sensors producing two phase shifted pulse trains. The pulse trains are fed via the Display Board to Control and Audio Board where the on-board processor performs the necessary change in frequency.



PCB ASSEMBLY DRAWING

676 VERSION 1

995 567 6X COMP



PCB 676 SENSORBOARD
VERSION 1 DIAGRAM

995 567 6X

FILNAVN pcb676 20-5-87

PARTS LIST FOR SENSOR BOARD 676 VERSION 1

Printed Circuit Board Complete				107 567 61
C1	0.1uF	63v 20%	poly.	622 510 00
N1	GP1A06	Optocoupler		850 010 60
R1	150ohm	MF	CR16	500 215 00
R2	5.6Kohm	MF	CR16	500 356 00
R3	5.6Kohm	MF	CR16	500 356 00
X1		3pol Molex connector		750 000 59
X2		3pol Molex connector		750 000 59

TECHNICAL DESCRIPTION

Notch Filter and Remote Control Board 680

The board performs following functions: notch filtering, remote control AF switching, and RS 232/RS 485 conversion including send/receive switching.

The notch filter is implemented as a 4. order switched capacitor filter consisting of ICx and ICx. The clock frequency for the switched capacitor filter is 100 times the notch frequency. The clock frequency is generated in a PLL frequency synthesizer consisting of the VCO circuit ICx and the frequency synthesizer circuit ICx. This integrated circuit contains a phase/frequency detector, a reference counter, a variable counter, and serial-to-parallel shift registers and latches for the counters. The reference frequency is the EREMCLK signal which frequency is 16 times the bit rate of the remote control serial interface. The reference counter is set up during initialization to produce a divided reference frequency of 960 Hz.

The purpose of the remote control AF switching circuit is to connect the receiver to the common balanced AF line when the receiver acts as a master or a slave in a remote control situation.
If the receiver is master it receives audio from the common line via REMAF+ and REMAF- and the balanced-to-unbalanced amplifier ICx. The audio is connected to AFIN through the analog switch ICx.
If the receiver is slave it outputs audio to the common line. In this case the switches in ICxx are ON. The circuit consisting of the diode Dxx to Dxx secures minimum loading to the common AF line when the receiver is switched off.

The RS-232/RS-485 conversion circuit consists of the RS-232 line driver and receiver ICxx and the RS-485 bidirectional differential bus transceiver ICxx. Send/receive switching of the latter is controlled by the the TX/RX switching circuit. Each time a start bit is detected on ICxx pin 15 the DRIVER ENABLE signal goes high and remains high for the duration of a byte, corresponding to 160 or 176 EREMCLK cycles, depending on the 10/11 bits control signal.

Two jumpers, Xx and Xx, allow cross coupling of TXREM and RXREM. The jumpers are shown in the normal position. By shifting both jumpers one position TXREM is connected to the RS-485 driver and RXREM is connected to the RS-485 receiver. With the jumpers in this position the circuit will serve as an RS-232/RS-485 converter between the RS-232 serial interface port of the receiver and the RS-485 port. By using this facility in one of the receivers in a group of receiver interconnected by means of the RS-485 bus, the group of receivers may be controlled via an RS-232 interface.

TECHNICAL DESCRIPTION

Notch Filter and Remote Control Board 680

The board performs following functions: notch filtering, remote control AF switching, and RS 232/RS 485 conversion including send/receive switching.

The notch filter is implemented as a 4. order switched capacitor filter consisting of ICx and ICx. The clock frequency for the switched capacitor filter is 100 times the notch frequency.
The clock frequency is generated in a PLL frequency synthesizer consisting of the VCO circuit ICx and the frequency synthesizer circuit ICx. This integrated circuit contains a phase/frequency detector, a reference counter, a variable counter, and serial-to-parallel shift registers and latches for the counters. The reference frequency is the EREMCLK signal which frequency is 16 times the bit rate of the remote control serial interface. The reference counter is set up during initialization to produce a divided reference frequency of 960 Hz.

The purpose of the remote control AF switching circuit is to connect the receiver to the common balanced AF line when the receiver acts as a master or a slave in a remote control situation.
If the receiver is master it receives audio from the common line via REMAF+ and REMAF- and the balanced-to-unbalanced amplifier ICx.
The audio is connected to AFIN through the analog switch ICx.
If the receiver is slave it outputs audio to the common line. In this case the switches in ICxx are ON. The circuit consisting of the diode Dxx to Dxx secures minimum loading to the common AF line when the receiver is switched off.

The RS-232/RS-485 conversion circuit consists of the RS-232 line driver and receiver ICxx and the RS-485 bidirectional differential bus transceiver ICxx. Send/receive switching of the latter is controlled by the the TX/RX switching circuit. Each time a start bit is detected on ICxx pin 15 the DRIVER ENABLE signal goes high and remains high for the duration of a byte, corresponding to 160 or 176 EREMCLK cycles, depending on the 10/11 bits control signal.

Two jumpers, Xx and Xx, allow cross coupling of TXREM and RXREM. The jumpers are shown in the normal position. By shifting both jumpers one position TXREM is connected to the RS-485 driver and RXREM is connected to the RS-485 receiver. With the jumpers in this position the circuit will serve as an RS-232/RS-485 converter between the RS-232 serial interface port of the receiver and the RS-485 port. By using this facility in one of the receivers in a group of receiver interconnected by means of the RS-485 bus, the group of receivers may be controlled via an RS-232 interface.

NOTCH FILTER

REMOTE CONTROL OF SWITCHING

TX/RX SWITCHING

RS 232/RS 485 CONVERSION

NOTCH FILTER AND REMOTE CONTROL BOARD 680
VERSION A2

995 568 0X

PCB680-2

C15 C14 C17 C16 C12 C18

D1 D3 D8 D6 D4 D7

C3 R3 R34 R35 R6 R7 R50 R24 R8 R5 R4 R44

C8 C19 C25 C34 C32

D2 D5 D10 D9

R33 R32 R26 R25 C11 C24 R58 R15 V6

C10

R1 R16 R2 R9 C2 C27 C21 C33

X1

C36 C31 C3

N7

R55 V3 C35 R12 R13 R14 R11 R27 R28 R29 C9 C4

R39 R38 R37 R46 R45 R36 V4 C20 R56 R54 R48 R49 R53 C22

N6

R10 R52 V8 V9 V7 X2 C30 C13 C28

C37

N8

V10 V1 V2 R51 R31 R30 R41 V5

N5

N4

R43 R42 C23

R19 R21 R22 R17 R18 R20 C6 C7 R23 R57

C26 C5 C1

N3 N2 N1

C29

995 568 01 A COMP

PCB 680 VERSION A2
NOTCH FILTER AND
REMOTE CONTROL BOARD

PARTS LIST FOR NOTCH FILTER AND REMOTE CONTROL BOARD 680
VERSION A2

Printed Circuit Board Complete 680					107 568 01
C1	0.22 uF	10%	63V	Poly	622 522 01
C2	0.22 uF	10%	63V	Poly	622 522 01
C3	0,22 uF	10%	63V	Poly	622 522 01
C4	0.1 uF	10%	63V	Poly	622 510 00
C5	0.22 uF	10%	63V	Poly	622 522 01
C6	0.1 uF	10%	63V	Poly	622 510 00
C7	0.1 uF	10%	63V	Poly	622 510 00
C8	1 uF	20%	63V	Poly	622 610 03
C9	120 pF	2%	63V	N150	602 212 00
C10	10 nF	10%	63V	Poly	622 410 01
C11	39 pF	10%			602 139 00
C12	0.1 uF	10%	63V	Poly	622 510 00
C13	1 uF	20%	63V	Poly	622 610 03
C14	0.1 uF	10%	63V	Poly	622 510 00
C15	0.1 uF	10%	63V	Poly	622 510 00
C16	0.1 uF	10%	63V	Poly	622 510 00
C17	0.1 uF	10%	63V	Poly	622 510 00
C18	0.1 uF	10%	63V	Poly	622 510 00
C19	0.1 uF	10%	63V	Poly	622 510 00
C20	0.1 uF	10%	63V	Poly	622 510 00
C21	0.1 uF	10%	63V	Poly	622 510 00
C22	0.1 uF	10%	63V	Poly	622 510 00
C23	0.1 uF	10%	63V	Poly	622 510 00
C24	0.1 uF	10%	63V	Poly	622 510 00
C25	0.1 uF	10%	63V	Poly	622 510 00
C26	0.1 uF	10%	63V	Poly	622 510 00
C27	0.1 uF	10%	63V	Poly	622 510 00
C28	1 uF	20%	63V	Poly	622 610 03
C29	1 uF	20%	63V	Poly	622 610 03
C30	1 uF	20%	63V	Poly	622 610 03
C31	1 uF	20%	63V	Poly	622 610 03
C32	0.1 uF	10%	63V	Poly	622 510 00
C33	0.1 uF	10%	63V	Poly	622 510 00
C34	0.1 uF	10%	63V	Poly	622 510 00
C35	0.1 uF	10%	63V	Poly	622 510 00
C36	0.1 uF	10%	63V	Poly	622 510 00
C37	0.1 uF	10%	63V	Poly	622 510 00
C38	100 pF	2%	63V	N150	602 210 01
D1	MC145157				851 451 57
D2	4046				850 404 60
D3	4094				850 409 40
D4	4040				850 404 40
D5	74HC74				850 747 42
D6	4077				850 407 70
D7	4082				850 408 20
D8	74HC10				850 741 03
D9	145406				851 454 06
D10	LTC485				857 517 60

PARTS LIST FOR NOTCH FILTER AND REMOTE CONTROL BOARD 680
VERSION A2

N1	78L12			850 781 21
N2	78L05			850 780 52
N3	79L05			850 790 50
N4	MF10			850 001 00
N5	1458			850 145 80
N6	4066			850 406 60
N7	1458			850 145 80
N8	4066			850 406 60
R1	150ohm	5%	1/2W	502 215 00
R2	100Kohm	5%	1/8W	500 510 00
R3	56Kohm	5%	1/8W	500 456 00
R4	68Kohm	5%	1/8W	500 468 00
R5	56Kohm	5%	1/8W	500 456 00
R6	47Kohm	5%	1/8W	500 447 00
R7	47Kohm	5%	1/8W	500 447 00
R8	47Kohm	5%	1/8W	500 447 00
R9	100Kohm	5%	1/8W	500 510 00
R10	100Kohm	5%	1/8W	500 510 00
R11	46K4ohm	1%	1/4W	511 446 40
R12	3K48ohm	1%	1/4W	511 334 80
R13	27K4ohm	1%	1/4W	511 427 40
R14	3K48ohm	1%	1/4W	511 334 80
R15	1K5ohm	5%	1/8W	500 315 00
R16	10ohm	5%	1/2W	502 110 00
R17	20K5ohm	1%	1/4W	511 420 50
R18	20K5ohm	1%	1/4W	511 420 50
R19	10K0ohm	1%	1/4W	511 410 00
R20	10K0ohm	1%	1/4W	511 410 00
R21	82K5ohm	1%	1/4W	511 482 50
R22	10K0ohm	1%	1/4W	511 410 00
R23	100Kohm	5%	1/8W	500 510 00
R24	100Kohm	5%	1/8W	500 510 00
R25	100Kohm	5%	1/8W	500 510 00
R26	10Kohm	5%	1/8W	500 410 00
R27	10K0ohm	1%	1/4W	511 410 00
R28	20K5ohm	1%	1/4W	511 420 50
R29	20K5ohm	1%	1/4W	511 420 50
R30	127Kohm	1%	1/4W	511 515 70
R31	1Kohm	5%	1/8W	500 310 00
R32	10Kohm	5%	1/8W	500 410 00
R33	1K5ohm	5%	1/8W	500 315 00
R34	100Kohm	5%	1/8W	500 510 00
R35	100Kohm	5%	1/8W	500 510 00
R36	100Kohm	5%	1/8W	500 510 00
R37	100Kohm	5%	1/8W	500 510 00
R38	47Kohm	5%	1/8W	500 447 00
R39	47Kohm	5%	1/8W	500 447 00
R40	22Kohm	5%	1/8W	500 422 00
R41	47Kohm	5%	1/8W	500 447 00
R42	47Kohm	5%	1/8W	500 447 00
R43	47Kohm	5%	1/8W	500 447 00
R44	22Kohm	55	1/8W	500 422 00
R45	47Kohm	5%	1/8W	500 447 00

PARTS LIST FOR NOTCH FILTER AND REMOTE CONTROL BOARD 680 VERSION A2

R46	47Kohm	5%	1/8W	500 447 00
R47	100Kohm	5%	1/8W	500 510 00
R48	47Kohm	5%	1/8W	500 447 00
R49	1Kohm	5%	1/8W	500 310 00
R50	100Kohm	5%	1/8W	500 510 00
R51	100Kohm	5%	1/8W	500 510 00
R52	100Kohm	5%	1/8W	500 510 00
R53	100Kohm	5%	1/8W	500 510 00
R54	220ohm	5%	1/8W	500 222 00
R55	220ohm	5%	1/8W	500 222 00
R56	100Kohm	5%	1/8W	500 510 00
R57	100Kohm	5%	1/8W	500 510 00
R58	100Kohm	5%	1/8W	500 510 00
V1	1N4148			830 414 80
V2	SD101C			830 010 10
V3	SD101C			830 010 10
V4	BZX79 C9V1			832 799 11
V5	BZX79 C9V1			832 799 11
V6	1N4148			830 414 80
V7	BC547B			840 054 70
V8	BC547B			840 054 70
V9	BC547B			840 054 70
V10	BC547B			840 054 70
X1	26 Wire Ribbon Cable			375 582 31
X2	5 Terminal Plug			751 001 25
	Jumper for X2			750 000 31

TECHNICAL DESCRIPTION

Control and Audio Board 681

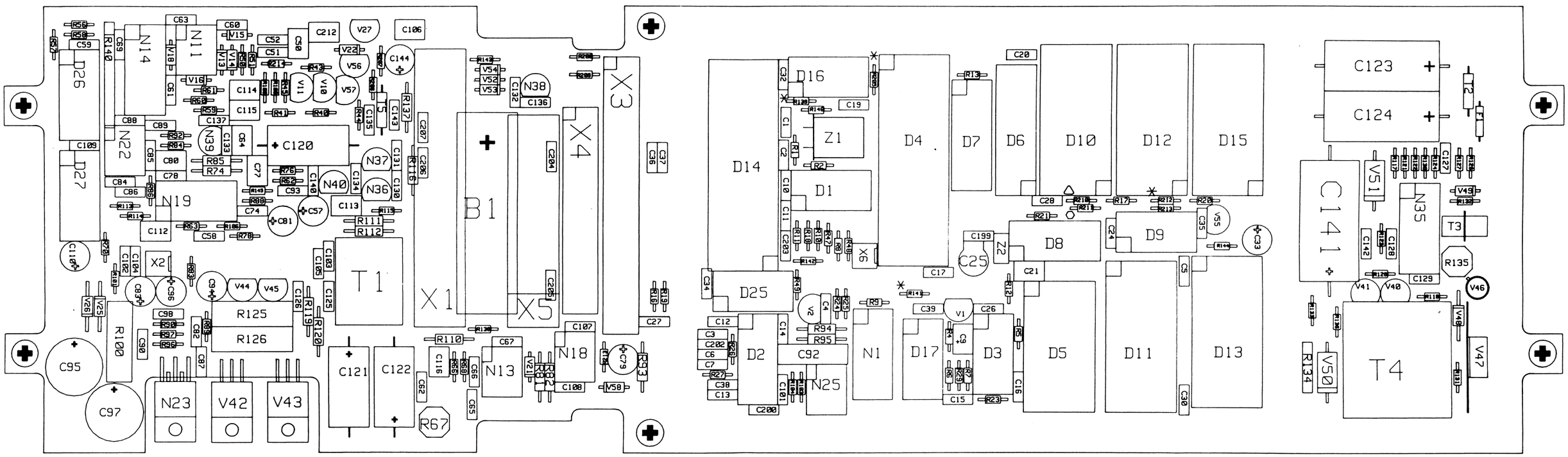
The Audio and Control Board is divided into three parts: an audio part, a microprocessor part and a power converter part. The audio part (sub diagram 2) contains the AF signal path. The AF signal is from the Receiver Unit fed via a balanced amplifier to the squelch circuit on the Display Board and to a line amplifier. The output level from the line amplifier is after rectifying, integration and voltage-to-frequency conversion led to the microprocessor which sets the line level metre in accordance with the signal strength. An automatic calibration of the metre (at 0 dBm) takes place within an interval of approx. 30 minutes. This is done by switching to a DC reference signal instead of the AF signal. The program running on the microprocessor then makes the necessary corrections. The logarithmic conversion is controlled by the software too.

The signal returning from the squelch circuit on the Display Board is then via a switch fed to a digital volume control. Then the signal is fed through a 20 dB attenuator, which may be shunted by a switch, to the output amplifier and then the loudspeaker. The switches are controlled by two serial shift registers which in turn are controlled by the microprocessor.

The microprocessor part mainly consists of CMOS IC's. The oscillator works at a clock rate of 4.9152 MHz which through an external and internal division makes the internal clock cycle frequency of 614.4 kHz. By changing the x-tal and the strapping of the external divider, an increase of the clock rate is possible.

D10 is the Program PROM and D12 is the Configuration PROM. When installing new PROMs the memory must be reset.

The memory may be reset by temporarily shorting the terminals of X6.



* OPTION

△ 677 ONLY

○ 681 ONLY

995 567 7X COMP

995 568 1X COMP

CONTROL AND AUDIO BOARD 677 / 681
VERSION 3
VIEWED FROM COMPONENT SIDE

995 567 7X SUB1
995 568 1X SUB1

✳ OPTION
△ 677 ONLY
○ 681 ONLY

CONTROL AND AUDIO BOARD 677 / 681
VERSION 3 SUB DIAGRAM 1 OF 3

FIL pc6773_1 10-88

INPUT AMPLIFIER

LINE AMPLIFIER

VOLUME CONTROL

PRE AMPLIFIER

20dB Att.

CHECK 0

AFRX-

AFRX+

SQUELCH IN

SQUELCH OUT

AF

ECOM LOAD

ECOM CLK

BEEP

AF IN

COM DATA

COM CLOCK

COM LOAD

KB IRQ

REMCLK

IRQ

SCICLK

SIGNAL OUT-

SIGNAL OUT+

SQUELCH OFF

ESCICLK

EREMCLK

BUS[0:7]

LINE-

CENTER

LINE+

SIDETONE IN

LINE RATE

AF OUT

SPEAKER-

SPEAKER+

ECOM DATA

P21

P 21

X OPTION
△ 677 ONLY
○ 681 ONLY

995 567 7X SUB2
995 568 1X SUB2

CONTROL AND AUDIO BOARD 677 / 681
VERSION 3 SUB DIAGRAM 2 OF 3

FIL PCB773_P... 1-11-88

SWITCHING REG.

LIN. REGULATORS

CURRENT LIMITERS

C204 1n
C206 10n
X1-14
X1-32
+24V
T2 10uH
F1 2A
C128 1n
R123 15K
R128 47K
C129 2n2
R121 4K7
N35 SG3524
R129 220E
R130 3K9
R135 2K2
V48 1N4004
V47 BUV27
R131 10E
V46 2N2907A
R127 2K2
T4 144uH
+5V
X3-2
X3-19
X3-40
X4-3
+V1(DIG)
V50 BYS26
T3
R132 2K7
V49 1N4148
R133 3E9
R134 E082
C141 1000u
V51 ICTE5
C142 0u1
X1-1
X1-10
X1-21
X1-22
X1-23
X1-29
X1-30
GND
AGND
R116 68E
C123 100u
R117 22K
C124 220u
R122 4K7
R124 4K7
C127 0u1
X1-19
X1-37
R118 8K2
V41 BC557B
V40 BC557B
R136 12K
X3-1
X3-2
X3-18
X3-19
X3-35
X3-39
X3-40
X4-1
X4-2
X4-11
X4-12
X4-15
X4-16
X4-22
X4-23
X4-25
X4-26
X5-1
X5-10
X5-15
X5-16
X5-17
X6-2
PWR.DWN
677-1
+15V
X4-4
+12V
X3-34
-12V
X3-37
-15V
X4-8
N36 78L12
C130 0u1
C134 0u22
N37 78L12
C131 0u1
C135 0u1
+12V(DIG)
N40 78L06
6V
C140 0u1
+6V
+12V
V54 1N4148
T5 22uH
R137 680E
C143 0.1u
C144 2u2
V52 1N4148
V53 1N4148
E1 3V4
VRAM
R138 100E
N38 79L12
-12V(DIG)
C132 0u1
C136 0u1
N39 79L12
C133 0u1
C137 0u1
-12V
X1-13
-15V
C120 100u/25V
X1-18
+15V
X1-36
C121 100u/25V
V42 BD645
R125 1E
+VC
R119 470E
V44 BC547B
C125 47n
X1-17
-15V
X1-35
C122 100u/25V
V43 BD646
R126 1E
-VC
R120 470E
V45 BC557B
C126 47n

995 567 7X SUB3

995 568 1X SUB3

PCB773_3 U4 1-11-00

CONTROL AND AUDIO BOARD 677 / 681
VERSION 3 SUB DIAGRAM 3 OF 3

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

Printed Circuit Board Complete					107 567 71
B1	3v4	TL2100	Lit.Batteri		890 000 02
C1	56pF	n150		Cer	602 156 00
C2	56pF	n150		Cer	602 156 00
C3	1nF	63v	10%	cer.	602 310 02
C4	1nF	63v	10%	cer.	602 310 02
C5	0.1uF	63v	20%	poly	622 510 00
C6	1nF	63v	10%	cer.	602 310 02
C7	1nF	63v	10%	cer.	602 310 02
C9	22uF	25v		tantal	652 722 00
C10	0.1uF	63v	20%	poly	622 510 00
C11	10nF	63v	20%	poly	622 410 01
C12	0.1uF	63v	20%	poly	622 510 00
C13	0.1uF	63v	20%	poly	622 510 00
C14	0.1uF	63v	20%	poly	622 510 00
C15	1nF	63v	10%	cer.	602 310 02
C16	0.1uF	63v	20%	poly	622 510 00
C17	0.1uF	63v	20%	poly	622 510 00
C19	0.1uF	63v	20%	poly	622 510 00
C20	0.1uF	63v	20%	poly	622 510 00
C21	1uF	63v	10%	poly	622 610 03
C24	0.1uF	63v	20%	poly	622 510 00
C25	2-18pF	63V		Var	683 118 00
C26	0.1uF	63v	20%	poly	622 510 00
C27	47nF	63v		poly.	622 447 00
C28	0.1uF	63v	20%	poly	622 510 00
C30	0.1uF	63v	20%	poly	622 510 00
C31	0.1uF	63v	20%	poly	622 510 00
C32	0.1uF	63v	20%	poly	622 510 00
C33	6.8uF	25v		S.Alu	652 668 01
C34	0.22uF	63v	20%	poly	622 522 01
C35	0.1uF	63v	20%	poly	622 510 00
C36	1nF	63v	10%	cer.	602 310 02
C37	1nF	63v	10%	cer.	602 310 02
C38	1nF	63v	10%	cer.	602 310 02
C39	0.1uF	63v	20%	poly	622 510 00
C50	1uF	63v	10%	poly	622 610 03
C51	0.22uF	63v	20%	poly	622 522 01
C52	0.22uF	63v	20%	poly	622 522 01
C57	2.2uF	25v		S.Alu	652 622 03
C58	10nF	63v	20%	poly	622 410 01
C59	0.1uF	63v	20%	poly	622 510 00
C60	0.1uF	63v	20%	poly	622 510 00
C61	0.1uF	63v	20%	poly	622 510 00
C62	0.1uF	63v	20%	poly	622 510 00
C63	0.1uF	63v	20%	poly	622 510 00
C64	1uF	63v	10%	poly	622 610 03
C65	0.1uF	63v	20%	poly	622 510 00
C66	1nF	63v	10%	cer.	602 310 02
C67	0.1uF	63v	20%	poly	622 510 00
C69	1nF	63v	10%	cer.	602 310 02
C74	2.2nF	63v	10%	cer.	602 322 00
C77	1uF	63v	10%	poly	622 610 03
C78	0.1uF	63v	20%	poly	622 510 00
C79	6.8uF	25v		S.Alu	652 668 01

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

C80	1uF	63v	10%	poly	622 610 03
C81	33uF	10v		S.Alu	651 733 01
C82	0.22uF	63v	20%	poly	622 522 01
C83	6.8uF	25v		S.Alu	652 668 01
C84	0.1uF	63v	20%	poly	622 510 00
C85	1nF	63v	10%	cer.	602 310 02
C86	1nF	63v	10%	cer.	602 310 02
C87	1nF	63v	10%	cer.	602 310 02
C88	0.1uF	63v	20%	poly	622 510 00
C89	1nF	63v	10%	cer.	602 310 02
C90	680pF	63v	10%	cer.	602 268 00
C92	2.2nF	125v	1%	Mpoco	613 322 00
C93	0.22uF	63v	20%	poly	622 522 01
C94	6.8uF	25v		S.Alu	652 668 01
C95	470uF	40v		Elyt	652 847 01
C96	6.8uF	25v		S.Alu	652 668 01
C97	470uF	40v		Elyt	652 847 01
C98	82pF	63v	2% N150	cer.	602 182 00
C101	10nF	63v	20%	poly	622 410 01
C102	1nF	63v	10%	cer.	602 310 02
C103	1nF	63v	10%	cer.	602 310 02
C104	0.1uF	63v	20%	poly	622 510 00
C105	1nF	63v	10%	cer.	602 310 02
C106	0.68uF	63v	20%	poly	622 568 02
C107	0.1uF	63v	20%	poly	622 510 00
C108	0.1uF	63v	20%	poly	622 510 00
C109	0.1uF	63v	20%	poly	622 510 00
C110	22uF	25v		tantal	652 722 00
C112	1uF	63v	10%	poly	622 610 03
C113	1uF	63v	10%	poly	622 610 03
C114	0.33uF	63v	20%	poly	622 533 01
C115	0.33uF	63v	20%	poly	622 533 01
C116	0.22uF	63v	20%	poly	622 522 01
C120	100uF	25v		Elyt	652 810 00
C121	100uF	25v		Elyt	652 810 00
C122	100uF	25v		Elyt	652 810 00
C123	100uF	40v		Elyt	651 810 04
C124	220uF	40v		Elyt	651 822 02
C125	47nF	63v		poly.	622 447 00
C126	47nF	63v		poly.	622 447 00
C127	0.1uF	63v	20%	poly	622 510 00
C128	1nF	63v	10%	cer.	602 310 02
C129	2.2nF	63V	10%	cer.	602 322 00
C130	0.1uF	63v	20%	poly	622 510 00
C131	0.1uF	63v	20%	poly	622 510 00
C132	0.1uF	63v	20%	poly	622 510 00
C133	0.1uF	63v	20%	poly	622 510 00
C134	0.22uF	63v	20%	poly	622 522 01
C135	0.1uF	63v	20%	poly	622 510 00
C136	0.1uF	63v	20%	poly	622 510 00
C137	0.1uF	63v	20%	poly	622 510 00
C140	0.1uF	63v	20%	poly	622 510 00
C141	1000uF	16V		W.alu.	651 910 00
C142	0.1uF	63v	20%	poly	622 510 00
C143	0.1uF	63v	20%	poly	622 510 00
C144	2.2uF	25v		S.Alu	652 622 03

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

C199	xxpF	n150 option		Cer	602 xxx 00
C200	0.1uF	63v	20%	poly	622 510 00
C202	1nF	63v	10%	cer.	602 310 02
C203	1nF	63V	10%	cer.	602 310 02
C204	1nF	63V	10%	cer.	602 310 02
C205	1nF	63V	10%	cer.	602 310 02
C206	10nF	63V	20%	poly	622 410 01
C207	1nF	63V	10%	cer.	602 310 02
C208	1nF	63V	10%	cer.	602 310 02
C209	1nF	63V	10%	cer.	602 310 02
C212	1uF	63V	10%	poly	622 610 03
D1	74HCU04	HEX Inverter			850 740 43
D2	145406	RS-232 Interface			851 454 06
D3	4093	Schmitt Trigger			850 409 30
D4	6303RP	MPU Cmos			850 630 30
D5	6850P	ACIA			850 685 00
D6	PAL20L8A	PLA			850 020 80
D7	74HC573	Add.latch			857 457 30
D8	M3003	Real time clock			850 300 30
D9	74LS12	3X3 Input Nand			850 741 20
D11	6340P	TIMER			850 634 00
D13	6340P	TIMER			850 634 00
D14	8279-5	Keyb./disp.Controller			850 827 90
D15	TC5564	RAM			850 556 40
D16	74HC74	Dual D flip-flop			850 747 42
D17	74HC74	Dual D flip-flop			850 747 42
D25	74C906	Level Translator			857 490 60
D26	CD4094	Shift Register			850 409 40
D27	CD4094	Shift Register			850 409 40
F1	2Amp/125V	Fuse			720 320 02
M1	Heat sink				343 603 01
M2	28pin	IC socket			751 001 39
M3	28pin	IC socket			751 001 39
N1	CD4053	Analog Multiplexer			850 405 30
N11	LM1458	Dual OPamp			850 145 80
N13	LM1458	Dual OPamp			850 145 80
N14	AD7523	D/A-converter			850 752 30
N18	LM1458	Dual OPamp			850 145 80
N19	CD4066	Quad Switch			850 406 60
N22	LM1458	Dual OPamp			850 145 80
N23	TDA2006	poweramp			850 200 60
N25	NE555	Timer			850 055 50
N35	SG3524	Switching Reg.			850 352 40
N36	MC78L12	12v REG.			850 781 21
N37	MC78L12	12v REG.			850 781 21
N38	MC79L12	-12v REG.			850 791 21
N39	MC79L12	-12v REG.			850 791 21
N40	MC78L06	6v REG.			850 780 61
R1	1.5Kohm		CR16	MF	500 315 00
R2	47Kohm		CR16	MF	500 447 00
R4	1Kohm		CR16	MF	500 310 00
R5	4.7Kohm		CR16	MF	500 347 00
R6	12Kohm		CR16	MF	500 412 00
R7	12Kohm		CR16	MF	500 412 00
R8	3.3Kohm		CR16	MF	500 333 00
R9	3.3Kohm		CR16	MF	500 333 00

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

R10	10Kohm		CR16	MF	500 410 00
R11	10Kohm		CR16	MF	500 410 00
R12	470Kohm		CR16	MF	500 547 00
R13	220ohm		CR16	MF	500 222 00
R16	100Kohm		CR16	MF	500 510 00
R17	4.7Kohm		CR16	MF	500 347 00
R18	4.7Kohm		CR16	MF	500 347 00
R19	2.2Kohm		CR16	MF	500 322 00
R20	12Kohm		CR16	MF	500 412 00
R21	12Kohm		CR16	MF	500 412 00
R23	10Kohm		CR16	MF	500 410 00
R24	10Kohm		CR16	MF	500 410 00
R25	10Kohm		CR16	MF	500 410 00
R26	2.2Kohm		CR16	MF	500 322 00
R27	1Kohm		CR16	MF	500 310 00
R29	100Kohm		CR16	MF	500 510 00
R40	150Kohm		CR16	MF	500 515 00
R41	10Kohm		CR16	MF	500 410 00
R43	47Kohm		CR16	MF	500 447 00
R44	22Kohm		CR16	MF	500 422 00
R45	10Kohm		CR16	MF	500 410 00
R47	47Kohm		CR16	MF	500 447 00
R48	47Kohm		CR16	MF	500 447 00
R49	47Kohm		CR16	MF	500 447 00
R50	47Kohm		CR16	MF	500 447 00
R51	47Kohm		CR16	MF	500 447 00
R56	10Kohm		CR16	MF	500 410 00
R57	10Kohm		CR16	MF	500 410 00
R58	10Kohm		CR16	MF	500 410 00
R59	47Kohm		CR16	MF	500 447 00
R60	47Kohm		CR16	MF	500 447 00
R61	1Kohm		CR16	MF	500 310 00
R62	100Kohm		CR16	MF	500 510 00
R63	100Kohm		CR16	MF	500 510 00
R66	3.9Kohm		CR16	MF	500 339 00
R67	47Kohm	Potm.			583 447 02
R68	22Kohm		CR16	MF	500 422 00
R70	100Kohm		CR16	MF	500 510 00
R74	100Kohm	1%	MR25		511 510 00
R76	10ohm		CR16	MF	500 110 01
R78	22Kohm		CR16	MF	500 422 00
R81	14Kohm	1%	MR25		511 414 00
R82	36K5ohm		MR25	MF	511 436 50
R83	4.7Kohm		CR16	MF	500 347 00
R84	4.7Kohm		CR16	MF	500 347 00
R85	12K1ohm	1%	MR25		511 412 10
R86	100Kohm		CR16	MF	500 510 00
R88	22Kohm		CR16	MF	500 422 00
R89	15Kohm		CR16	MF	500 415 00
R90	390ohm		CR16	MF	500 239 00
R92	27Kohm		CR16	MF	500 427 00
R93	27K4ohm		MR25	MF	511 427 40
R94	61K9ohm	1%	MR25		511 461 90
R95	31K6ohm	1%	MR25		511 431 60
R96	15Kohm		CR16	MF	500 415 00
R97	1.5Kohm		CR16	MF	500 315 00

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

R100	1ohm 2W	5%		ww	525 010 00
R101	2.7Kohm		CR16	MF	500 327 00
R103	1Kohm		CR16	MF	500 310 00
R104	1Kohm		CR16	MF	500 310 00
R106	47Kohm		CR16	MF	500 447 00
R108	270ohm		CR16	MF	500 227 00
R109	270ohm		CR16	MF	500 227 00
R110	56ohm		CR25	Car.	501 156 00
R111	270ohm		CR25	Car.	501 227 00
R112	270ohm		CR25	Car.	501 227 00
R113	100Kohm		CR16	MF	500 510 00
R114	560ohm		CR16	MF	500 256 00
R115	470ohm		CR16	MF	500 247 00
R116	68ohm	5%	1.6W		525 168 00
R117	22Kohm		CR16	MF	500 422 00
R118	8.2Kohm		CR16	MF	500 382 00
R119	470ohm		CR25	Car.	501 247 00
R120	470ohm		CR25	Car.	501 247 00
R121	4.7Kohm		CR16	MF	500 347 00
R122	4.7Kohm		CR16	MF	500 347 00
R123	15Kohm		CR16	MF	500 415 00
R124	4.7Kohm		CR16	MF	500 347 00
R125	1ohm	5%	2W	ww	525 010 00
R126	1ohm	5%	2W	ww	525 010 00
R127	2.2Kohm		CR16	MF	500 322 00
R128	47Kohm		CR16	MF	500 447 00
R129	220ohm		CR16	MF	500 222 00
R130	3.9Kohm		CR16	MF	500 339 00
R131	10ohm		CR16	MF	500 110 01
R132	2.7Kohm		CR16	MF	500 327 00
R133	3.9ohm		CR16	MF	500 039 00
R134	0.082ohm		1W	ww	523 000 80
R135	2.2Kohm	Potm.			583 322 00
R136	12Kohm		CR16	MF	500 412 00
R137	680ohm		CR25	MF	501 268 00
R138	100ohm		CR16	MF	500 210 00
R140	47Kohm	SIL			530 000 07
R142	1Kohm		CR16	MF	500 310 00
R143	22Kohm		CR16	MF	500 422 00
R144	10Kohm		CR16	MF	500 410 00
R145	10Kohm		CR16	MF	500 410 00
R146	0ohm	option	CR16	MF	501 000 00
R206	100Kohm		CR16	MF	500 510 00
R207	100Kohm		CR16	MF	500 510 00
R208	10Kohm		CR16	MF	500 410 00
R209	10Kohm		CR16	MF	500 410 00
R210	0ohm	option	CR16	MF	501 000 00
R212	0ohm	option	CR16	MF	501 000 00
R213	47Kohm		CR16	MF	500 447 00
R214	0ohm	option	CR16	MF	501 000 00
T1	6530	600-600ohm transformer			802 000 00
T2	10uH	IM4	Inductor		740 110 00
T3			Transformer		103 576 81
T4	144uH		Inductor		383 576 7X
T5	22uH	IM4	Inductor		740 122 02
V1	BC557B	PNP Transistor			840 055 70

PARTS LIST FOR CONTROL AND AUDIO BOARD 681 VERSION 1

V2	BC547	NPN Transistor	840 054 70
V10	BC547	NPN Transistor	840 054 70
V11	BC547	NPN Transistor	840 054 70
V13	1N4148	Diode	830 414 80
V14	1N4148	Diode	830 414 80
V15	1N4148	Diode	830 414 80
V16	1N4148	Diode	830 414 80
V18	SD101C	Diode	830 010 10
V21	1N4148	Diode	830 414 80
V22	1N4148	Diode	830 414 80
V25	1N4004	Diode	831 010 40
V26	1N4004	Diode	831 010 40
V27	BC547	NPN Transistor	840 054 70
V40	BC557	PNP Transistor	840 055 70
V41	BC557	PNP Transistor	840 055 70
V42	BD645	NPN Transistor	842 064 50
V43	BD646	PNP Transistor	842 064 60
V44	BC547	NPN Transistor	840 054 70
V45	BC557	PNP Transistor	840 055 70
V46	2N2907	PNP Transistor	840 290 70
V47	BUV27	NPN Transistor	842 002 70
V48	1N4004	Diode	831 010 40
V49	1N4148	Diode	830 414 80
V50	BYS26	Diode	831 002 60
V51	ICTE-5	Diode	839 000 51
V52	1N4148	Diode	830 414 80
V53	1N4148	Diode	830 414 80
V54	1N4148	Diode	830 414 80
V55	BC547B	NPN Transistor	840 054 70
V56	BC547B	NPN Transistor	840 054 70
V57	BC547B	NPN Transistor	840 054 70
X1	connector	D-sub 37pol	751 001 54
X2	connector	Molex 2 pol	751 001 41
X3	connector	3M 40 pol	756 040 04
X4	connector	3M 26 pol	756 026 00
X5	connector	D-sub 25pol	751 001 53
X6	connector	Molex 2 pol	751 001 41
Z1	4.9152M	HC18/u Crystal	812 000 03
Z2	32768Hz	Crystal type 1	812 000 01

"ANTENNA" - X1
"AUX 5" - X2
IF OUT
- A6PL2
- A6PL4
-A6 RECEIVER SIGNAL PATH 107 5 667 x

- W1 "INTERCON"
-X2: 19 GND, 37 GND, 18 +15V, 36 +15V, 17 -15V, 35 -15V, 16 AF-, 34 AF+, 15 BATNEG, 33 PWRON, 14 +24V, 32 +24V, 13 -15V, 31 Rx RATE, 12 RU DATA, 30 GND, 11 CU DATA, 29 GND
-X3: 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

"AUX1" -X1
13 25 12 24 11 23 10 10 22 26 9 9 21 27 8 8 20 26 7 7 19 25 6 6 18 24 5 5 17 23 4 4 16 22 3 3 15 21 2 2 14 20 1 1

-W2 "AUX2"
-X1: 8 CTL OUT 1, 15 CTL OUT 8, 7 +24V OUT, 14 CTL OUT 7, 6 GND, 13 CTL OUT 6, 5 TONE OUT, 12 CTL OUT 5, 4 GND, 11 CTL OUT 4, 3 CTL IN, 10 CTL OUT 3, 2 GND, 9 CTL OUT 2, 1 TX KEYED IN
-X2: 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

-A2 RU INTERCONNECTION BOARD 107 5 670 x
-X1: 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
-X4: 34 GND, 33 GND, 32 -15V, 31 +24V, 30 +24V, 29 +15V, 28 +15V, 27 +7,5V, 26 +7,5V, 25 CUDATA, 24 RUDATA, 23 RATE, 22 Rx RATE, 21, 20 CTLCLOCK, 19 SEL 0, 18 SEL 1, 17 CTLIN, 16, 15, 14 BATON, 13 CTL, 12 CTLDATA, 11, 10 CTLLOAD, 9 Rx MUTE, 8 GND, 7 AFRx-, 6 AFRx+, 5, 4, 3 GND, 2 GND, 1

-W3
-A3 RU CONTROL BOARD 107 5 674 x
PL4: 34 GND, 33 GND, 32 -15V, 31 +24V, 30 +24V, 29 +15V, 28 +15V, 27 +7,5V, 26 +7,5V, 25 CUDATA, 24 RUDATA, 23 RATE, 22 Rx RATE, 21, 20 CTLCLOCK, 19 SEL 0, 18 SEL 1, 17 CTLIN, 16, 15, 14 BATON, 13 CTL, 12 CTLDATA, 11, 10 CTLLOAD, 9 Rx MUTE, 8 GND, 7 AFRx-, 6 AFRx+, 5, 4, 3 GND, 2 GND, 1
NOT USED PL3

-W4 40
PL1: 40 GND, 39 GND, 38 +15V, 37 +7.5V, 36 -15V, 35 +15V, 34 SYNADR 2, 33 SYNADR 1, 32 SYNADR 0, 31 SYNDATA 3, 30 SYNDATA 2, 29 SYNDATA 1, 28 SYNDATA 0, 27, 26, 25 SYNSTR 2, 24 SYNSTR 1, 23 SYNSTR 0, 22, 21 SYNCHECK, 20 MOCHECK, 19 COMDATA, 18 COMLOAD, 17 LSBMON, 16 CLOCK, 15 STATLOAD, 14 STATDATA, 13, 12, 11 MGCRST, 10 MUTING, 9 Tx/Rx, 8 FAST, 7 MGC, 6 AFRx-, 5 AFRx+, 4, 3 GND, 2 GND, 1

-A5 SYNTHESIZER BOARD 107 5 611 x
PL1: 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
PL1: 40 39 38 37 -15V, 36 +15V, 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 COMDATA, 19 COMLOAD, 18 17 CLOCK, 16 STATLOAD, 15 STATDATA, 14 13 12 11 MUTING, 10 Tx/Rx, 9 8 MGC, 7 AFRx-, 6 AFRx+, 5 MGCU, 4 AGC DELAYED, 3 GND, 2 GND, 1

"AC MAINS 110-120/220-240V 50-60Hz"
"BATTERY 24V DC"

-A1 POWER SUPPLY ASSEMBLY 107 620 00
-X1, -X2, -X3
-A1-A2X10 -X3: GND, GND, +7.5V, +7.5V, +15V, +15V, +15V, BATON, PWRON, BATNEG, -15V, -15V, +24V, +24V, GND, GND — 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

-X5: 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
-W9: GND, CUDATA, RUDATA, CDATA, RDATA, CTL, AF-, AF+, AFRX-, AFRX+, -15V, +15V, +7.5V, GND
-X9 RU8013-2
-X4 RU8013-2
16

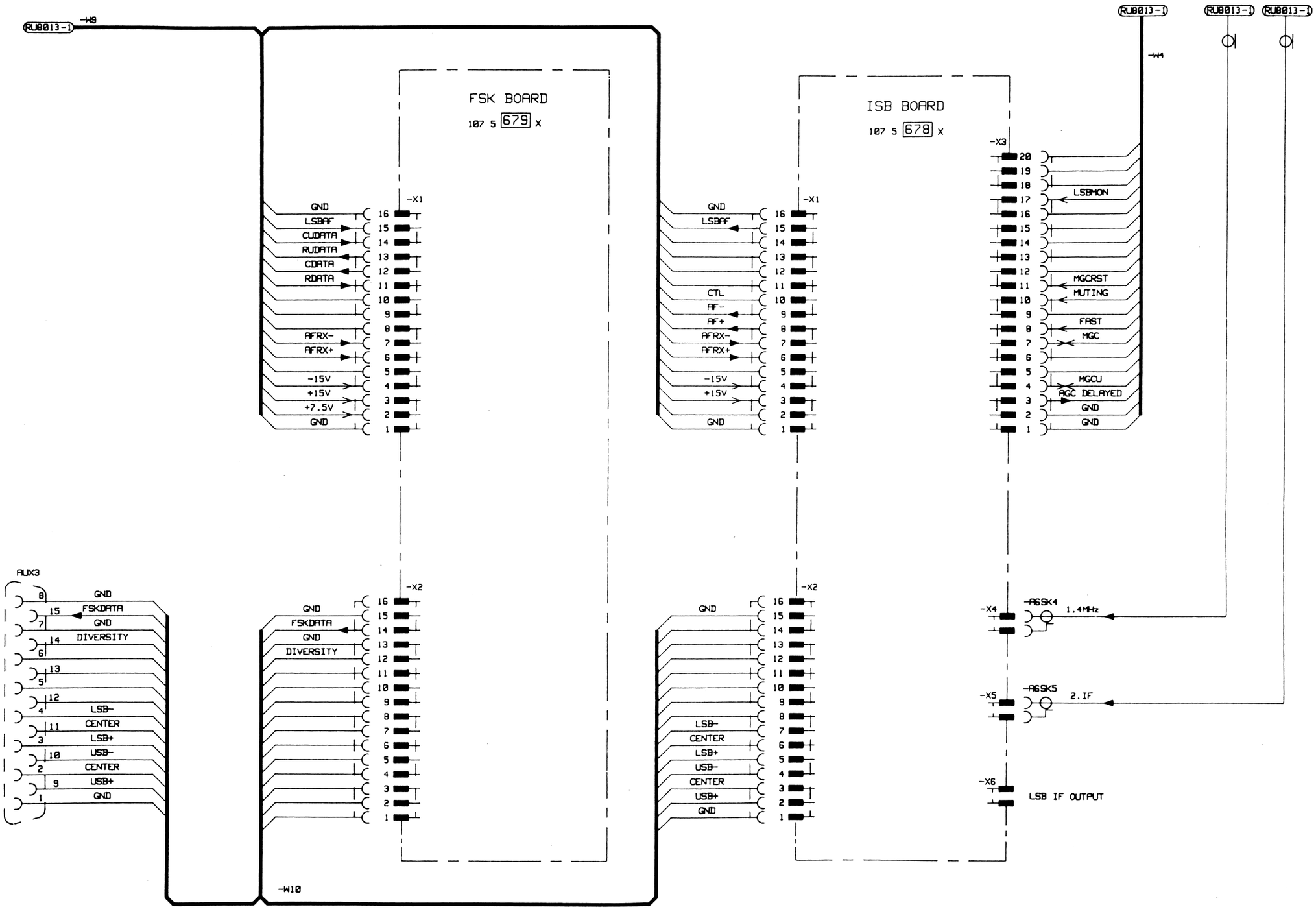
-A4 MASTER OSCILLATOR 107 5 612 x
PL7 -W5 +15V MOCHECK PL7
PL5 -W6 40.96kHz PL5
PL6 -W7 1.28MHz PL6
PL8 NOT USED
PL9 NOT USED

-A6SK2 45-75MHz PL2
PL3 -W8 43.6MHz PL3
PL4 1.4MHz
-A6SK3
1.4MHz
2.IF
RU8013-2 RU8013-2

ALL ITEM DESIGNATIONS ARE PRECEEDED BY THE HIGHER LEVEL PREFIX = RU8012

INTERCONNECTION DIAGRAM
RECEIVER UNIT RU8013
SUB DIAGRAM 1 OF 2

995 583 4X SUB 1



INTERCONNECTION DIAGRAM
RECEIVER UNIT RU8013
SUB DIAGRAM 2 OF 2

995 583 4X SUB2

2RU8012 14-2-88

PARTS LIST FOR RECEIVER UNIT 8013

Receiver Unit 8013 complete		108 620 40
PCB 611 Synthesizer Board		107 561 11
PCB 612 Master Oscillator Board		107 561 21
PCB 667 Receiver Signal Path		107 566 71
PCB 670 Interconnection Board		107 567 01
PCB 674 Control Board		107 567 41
PCB 678 ISB Board		107 567 81
PCB 679 FSK Board		107 567 91
Power Supply Assembly		107 620 00
37 Wire Ribbon Cable	(RU-670)	375 572 73
15 Wire Ribbon Cable	(RU-670)	375 572 81
34 Wire Ribbon Cable	(670-674)	375 572 92
40 Wire Ribbon Cable	(669-611-674-678)	375 580 03
16 Wire Ribbon Cable	(670-678-679)	375 580 12
15 Wire Ribbon Cable	(AUX3-678-679)	375 580 22

TECHNICAL DESCRIPTION

Synthesizer Board 611

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 RU Control Board 674 . 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 of the Receiver Signal Path 667. The other buffer amplifier drives the input of the Loop Divider.

The RU 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 RU Control Board 674, 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 RU 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 of the Receiver Signal Path 667.

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 RU 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:

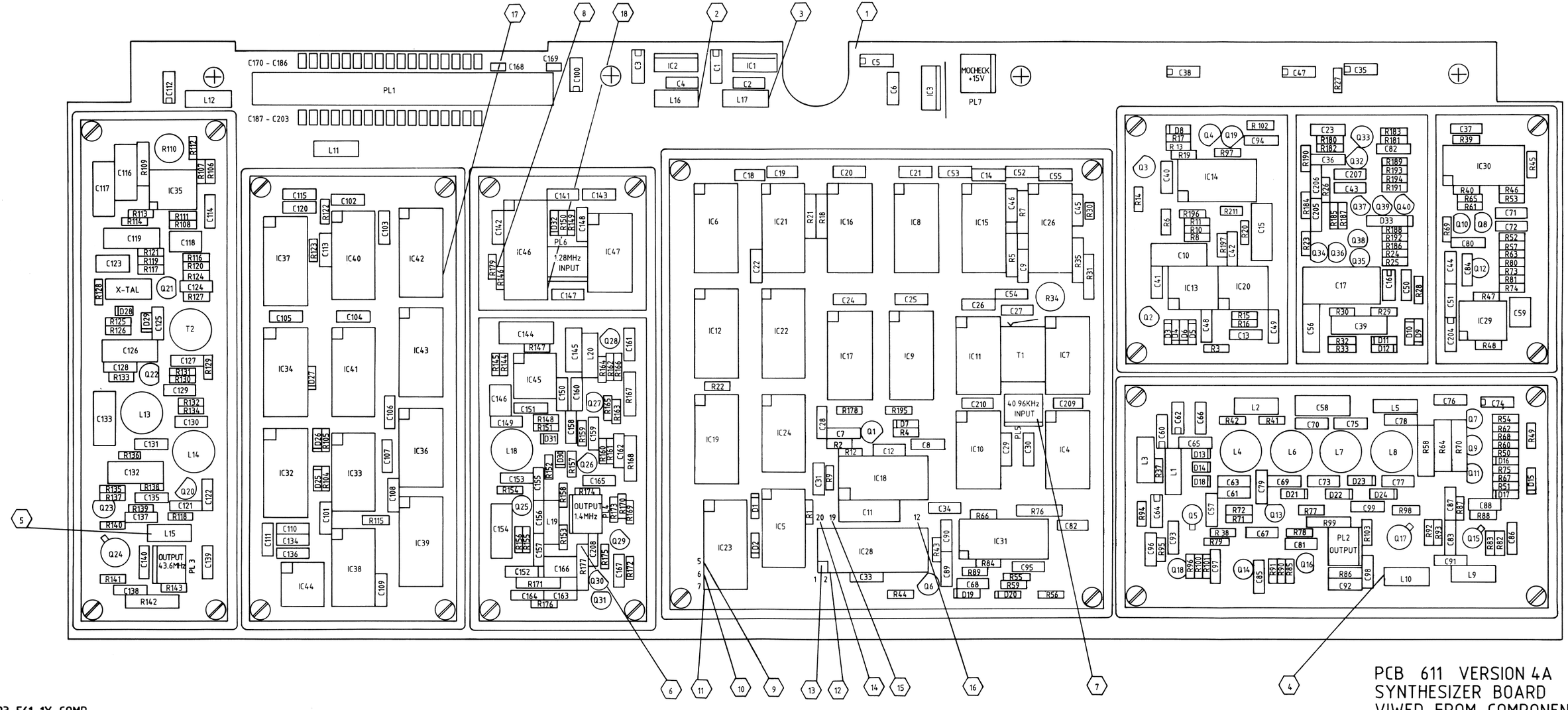
The synthesizer consists of a Loop Filter, a 5.6 MHz VCO, a Buffer Amplifier and a single integrated circuit which contains both Reference Divider, Loop Divider and Phase/Frequency Comparator. The division ratio of the Reference Divider and the Loop Divider are controlled by the microprocessor on the RU Control Board 674.

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

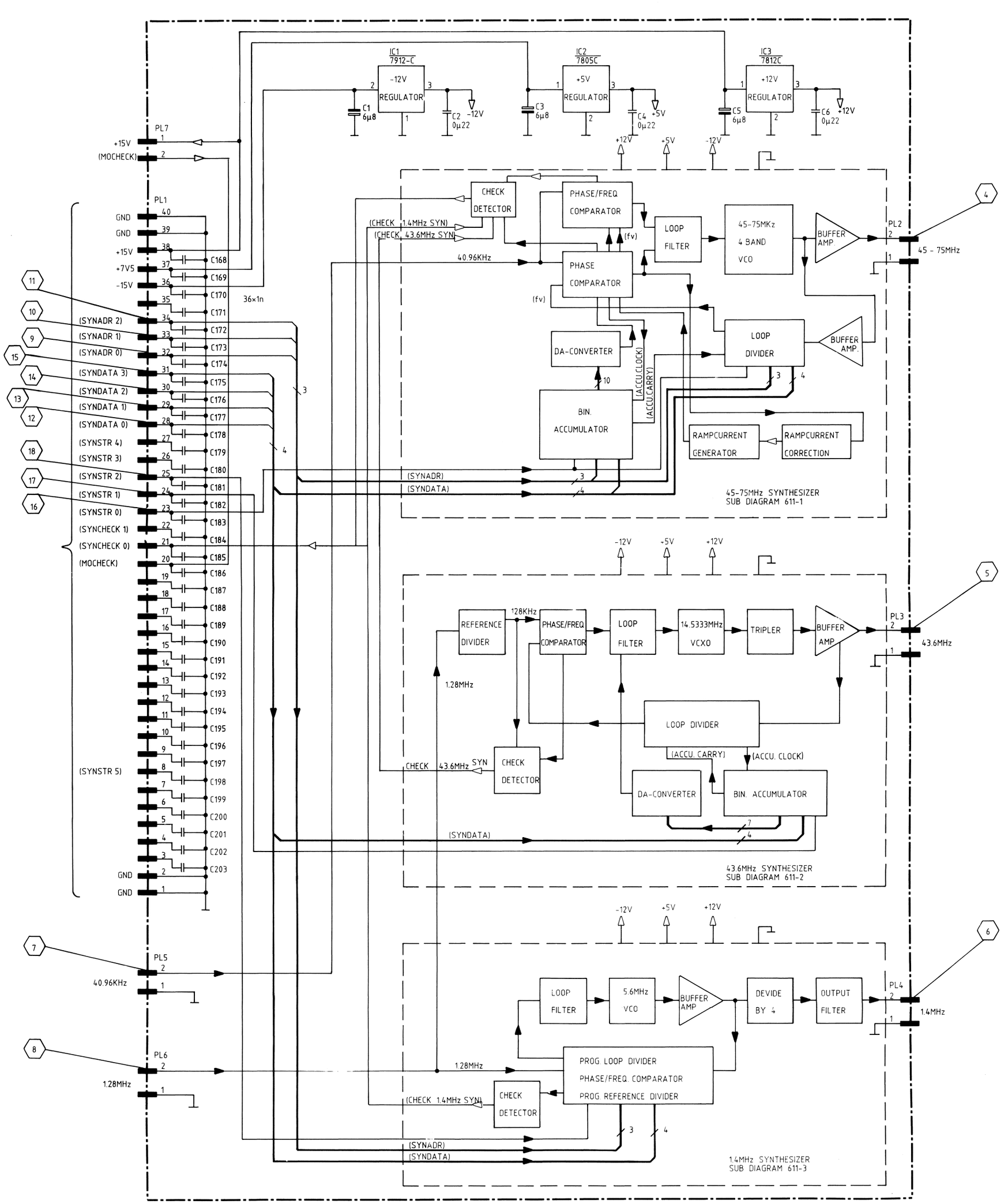
response and to prevent noise from modulating the VCO. The 5.6 MHz VCO covers the frequency range from 5.582 MHz to 5.612 MHz. The output signal of the VCO is amplified in the Buffer Amplifier and then split into two, one for the input of the Loop Divider and one for the Divide-by-4 circuit.

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 of the Receiver Signal Path 667. A check detector is incorporated to indicate the lock status of the synthesizer.



993 561 1X COMP

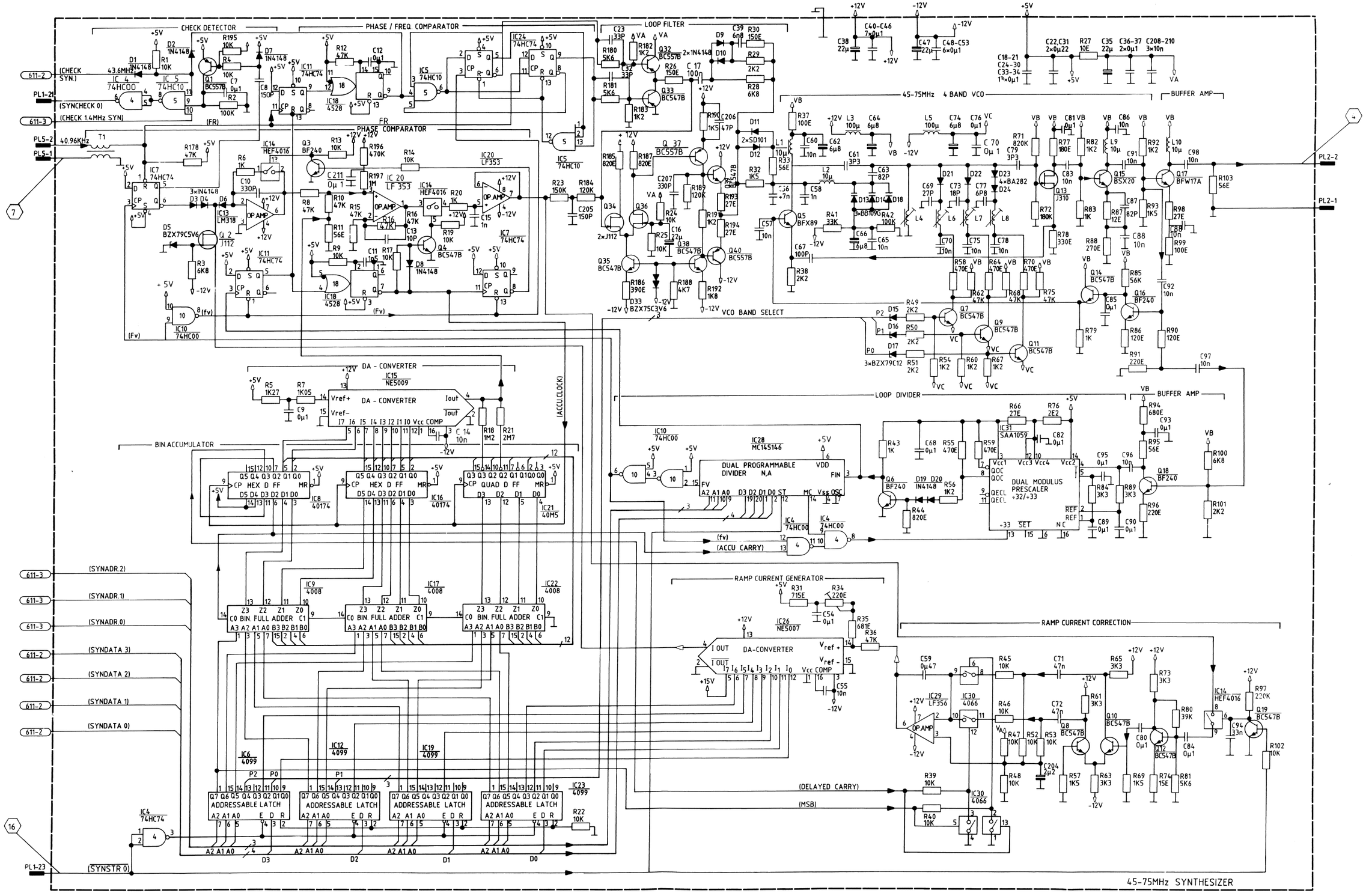
PCB 611 VERSION 4A
SYNTHESIZER BOARD
VIWED FROM COMPONENT SIDE



993 561 1X MAIN

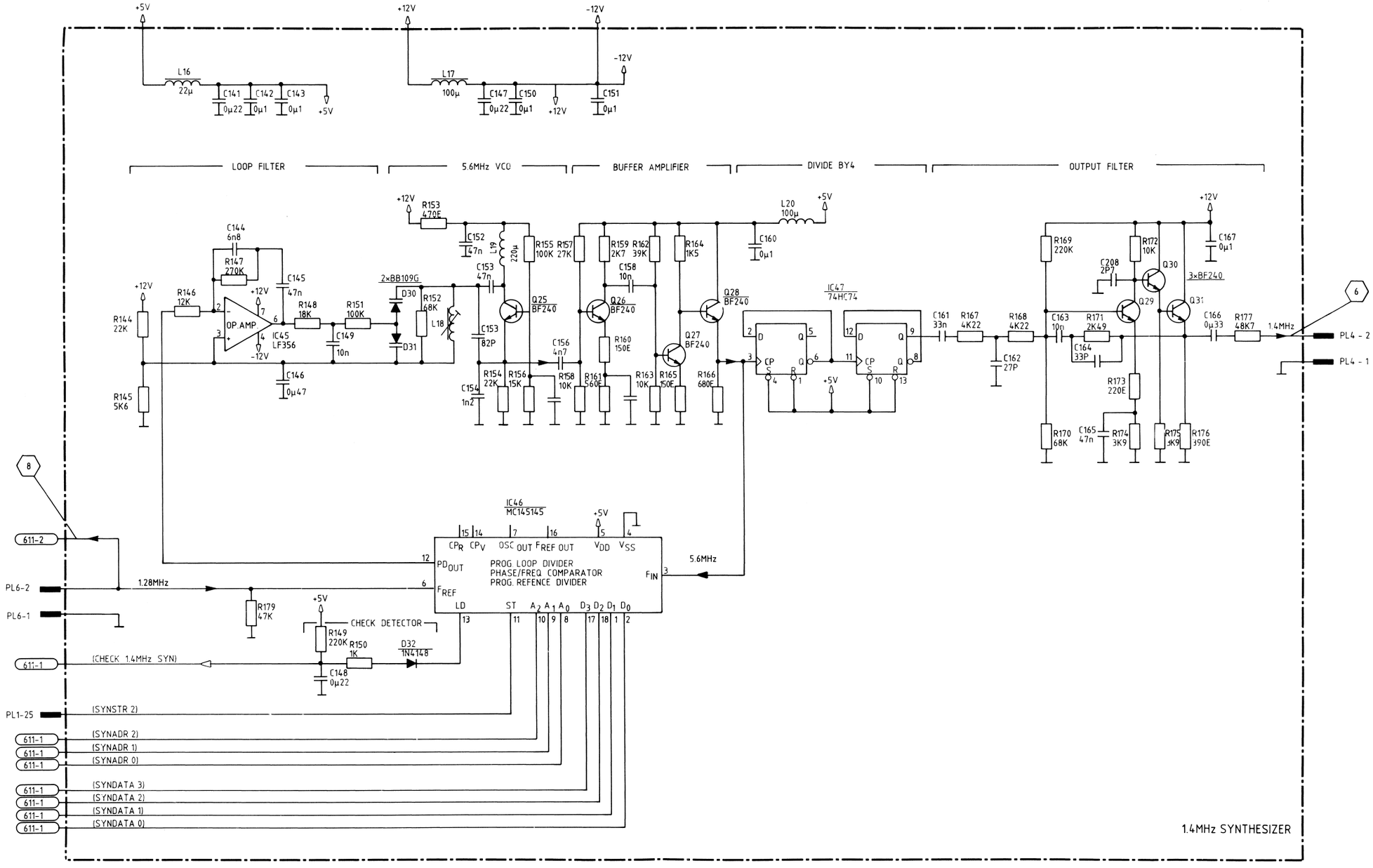
PCB 611 SYNTHESIZER BOARD VERSION 4A. MAIN DIAGRAM

993 561 1X MAIN



PCB 611 SYNTHESIZER BOARD
VERSION 4A SUBDIAGRAM 1 OF 3

14.5333MHz VCXO
TRIPLER
BUFFER AMP
REFERENCE DIVIDER
PHASE/FREQ COMPARATOR
LOOP FILTER
LOOP DIVIDER
CHECK DETECTOR
DA-CONVERTER
BIN. ACCUMULATOR
43.6MHz SYNTHESIZER
PCB 611 SYNTHESIZER BOARD
VERSION 4A. SUBDIAGRAM 2 OF 3
993 561 1X SUB 2



1.4MHz SYNTHESIZER

993 561 1X SUB3

PCB 611 SYNTHESIZER BOARD
VERSION 4A. SUBDIAGRAM 3 OF 3

PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 4A

Printed Circuit Board Complete 611		107 561 11
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
IC31	SAA1059P	850 105 90
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 4A

D1-4,6-10, 19,20,25-27, 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
R11,33,95,103,143	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
R26,30,160,165	150 ohm	5%	1/8W	MF	500 215 00
R27,141	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 4A

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
R44,185,187	820 ohm	5%	1/8W	MF	500 282 00
R54,56,60,67,82, 92,182,183,191	1.2 kohm	5%	1/8W	MF	500 312 00
R55,59,153	470 ohm	5%	1/8W	MF	500 247 00
R58,64,70	470 ohm	5%	1/2W	Car.	502 247 00
R61,63,65,73,84, 89,140,175	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
R94,166	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 4A

R124,132,188	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
R161	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, 89-90,93,95, 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

PARTS LIST FOR SYNTHESIZER BOARD 611 VERSION 4A

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 4A

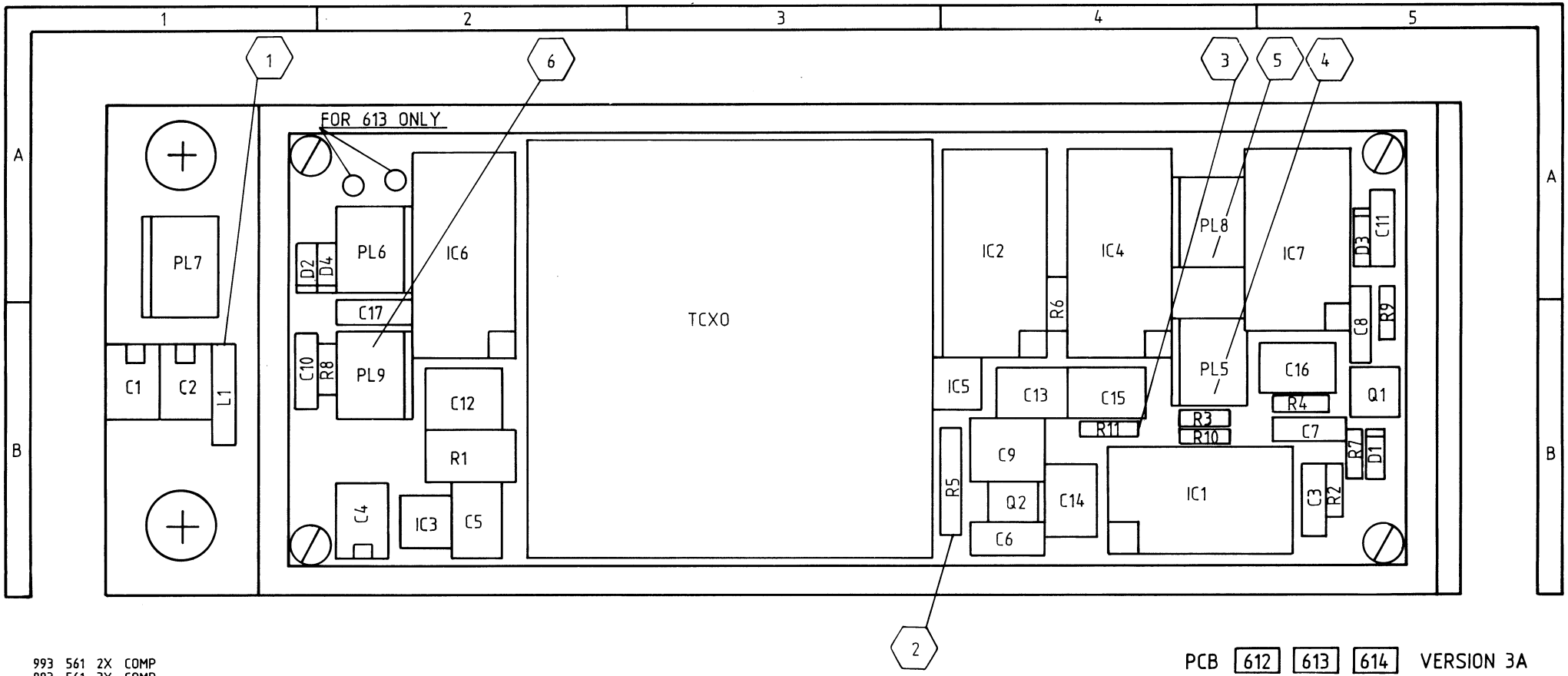
T1			103 577 72
T2			103 577 42
PL1	40POL	MOLEX	756 040 04
PL2-6	2POL	3M	750 001 45
PL7	2POL	MOLEX	750 001 46

TECHNICAL DESCRIPTION

Master Oscillator 612, 613, 614 and TCXO Heater 699

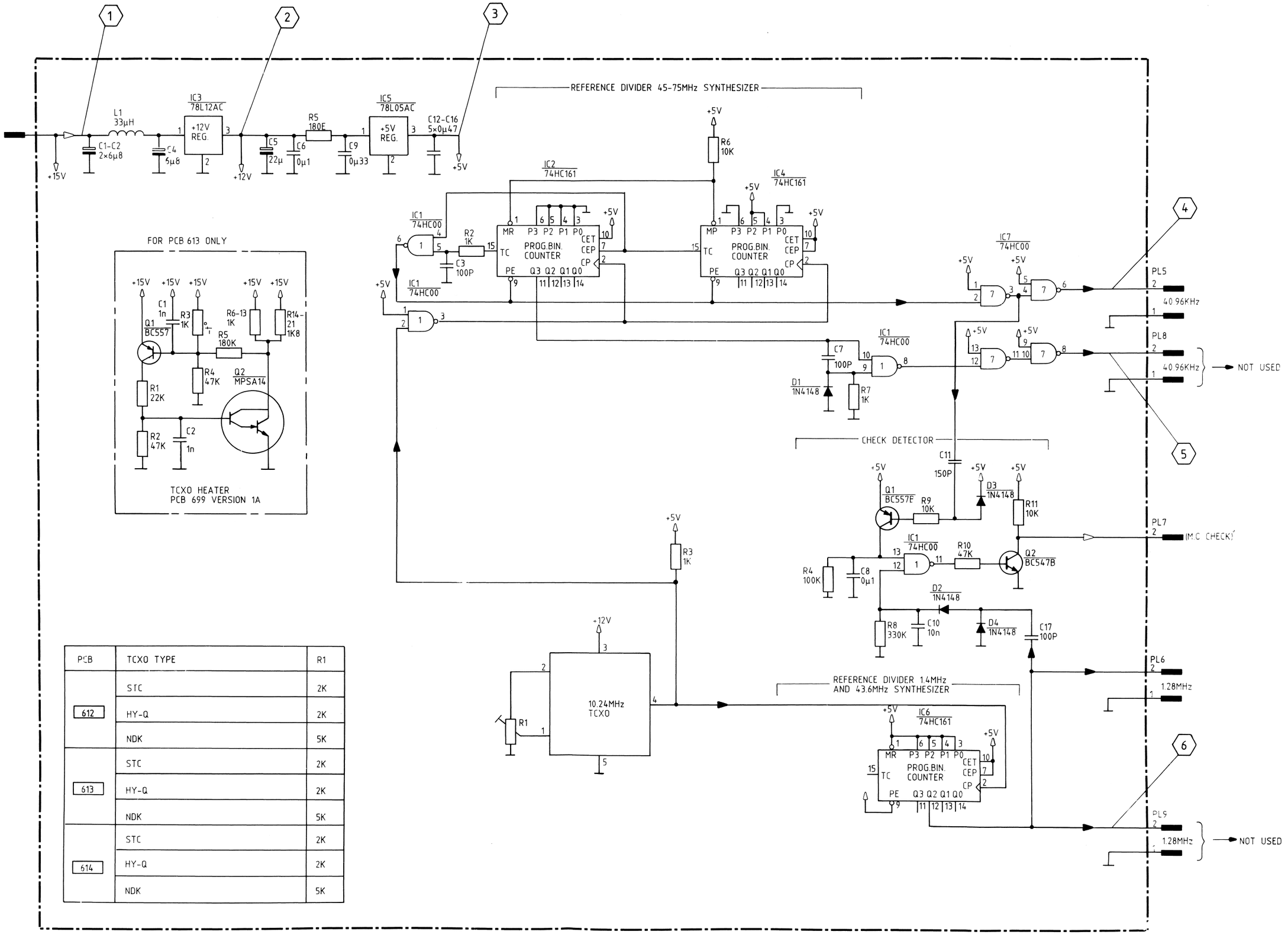
The three Master Oscillators available all consist of the same circuits but have different frequency stabilities determined by the 10.24 MHz Temperature Compensated Crystal Oscillator (TCXO) used.

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 RU Control Board 674. For Master Oscillator 613 a heater (TCXO Heater 699) is incorporated in order to keep the TCXO ambient temperature above 0 deg. Centigrade.



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



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

Printed 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
TCXO	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

Printed 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

TECHNICAL DESCRIPTION

Receiver Signal Path 667

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 RU Control Board 674 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 passes 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 RU Control Board 674 via the serial data bus.

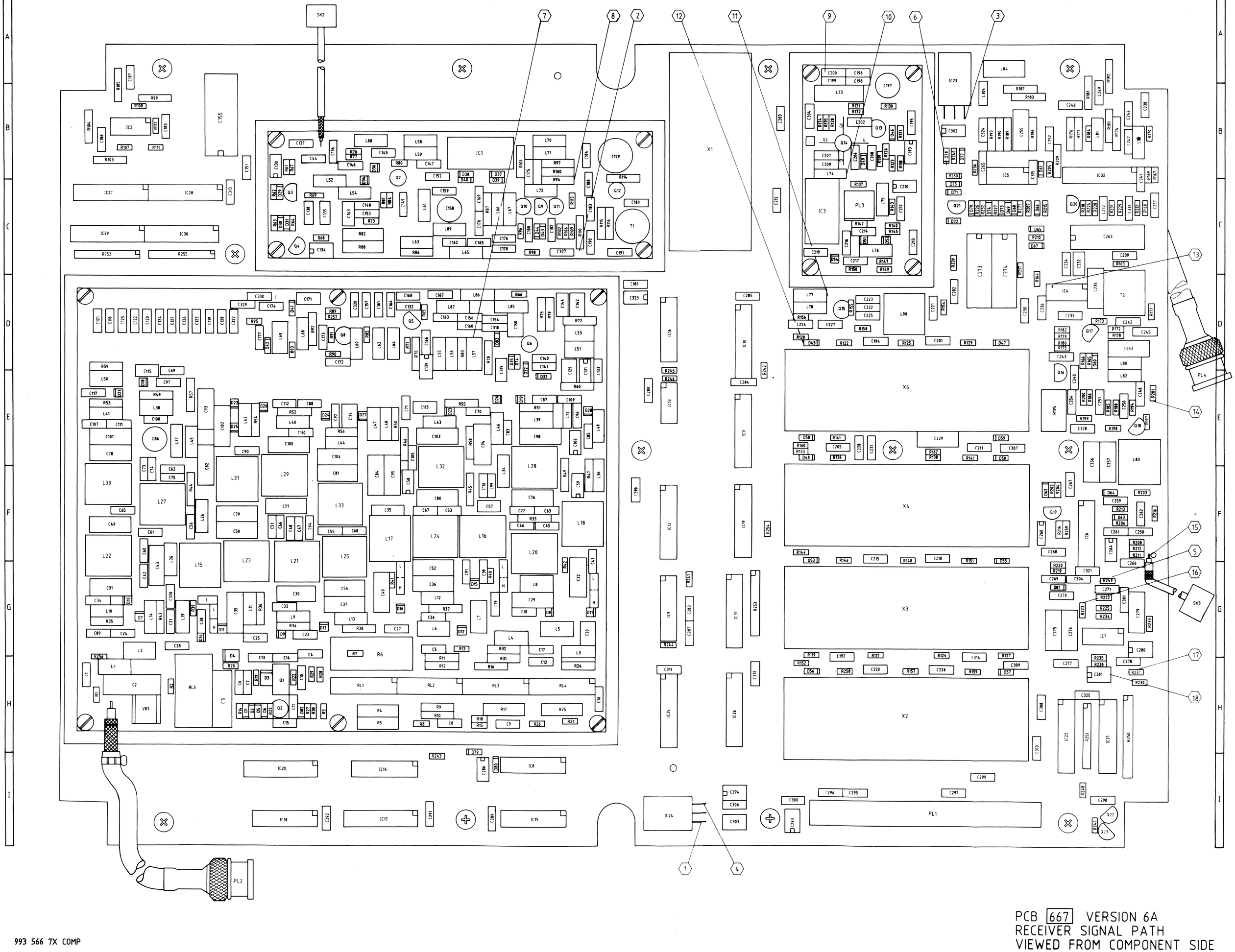
The now filtered 1.4 MHz signal is amplified in the 1.4 MHz amplifier strip IC4, Q14 and Q15. The voltage gain of the amplifier strip is controlled partly by the AGC voltage applied to IC4 and partly by the control line "IF-GAIN", which, when in logical high condition, increases the gain of Q14 with 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

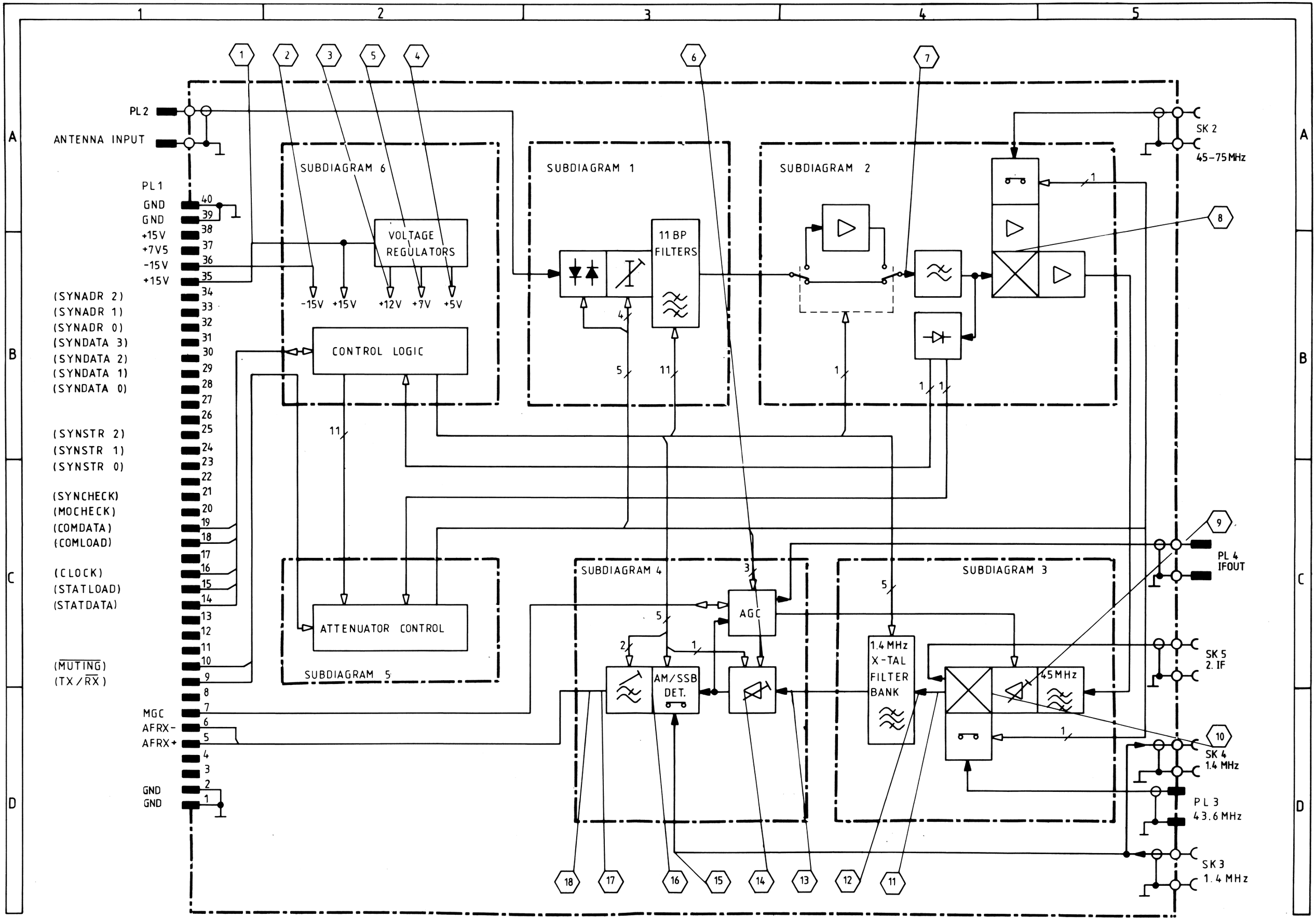
Synthesizer Board 611, is applied to the amplifier input. The unbalanced AF signal is filtered and converted to a balanced signal before it is fed to the flat cable connector PL1.

From the IF strip the signal is also fed to the AGC Detector consisting of two transistors in the integrated array IC28. 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 RU Control Board 674, 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 RU Control Board 674 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.

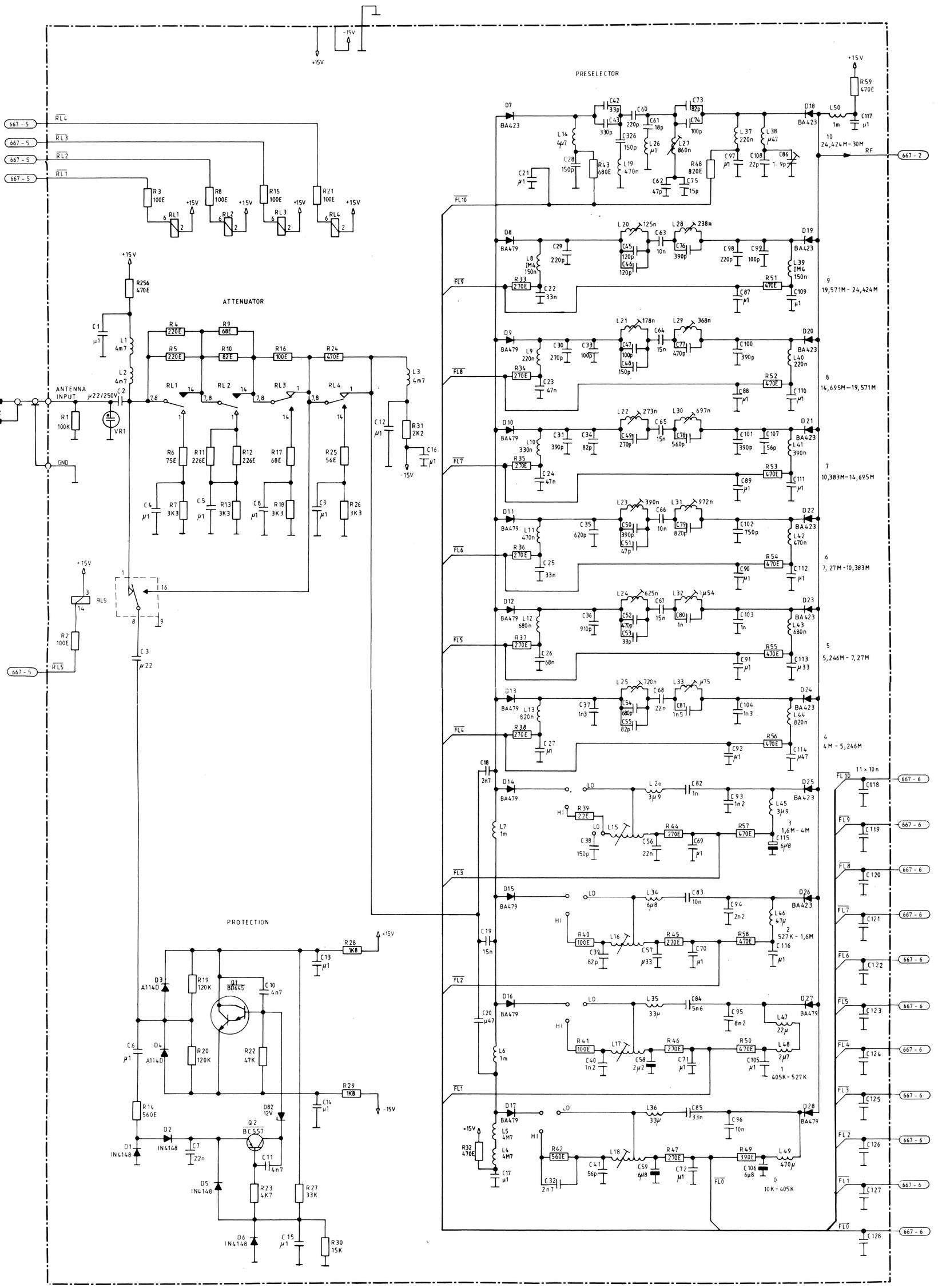


993 566 7X COMP

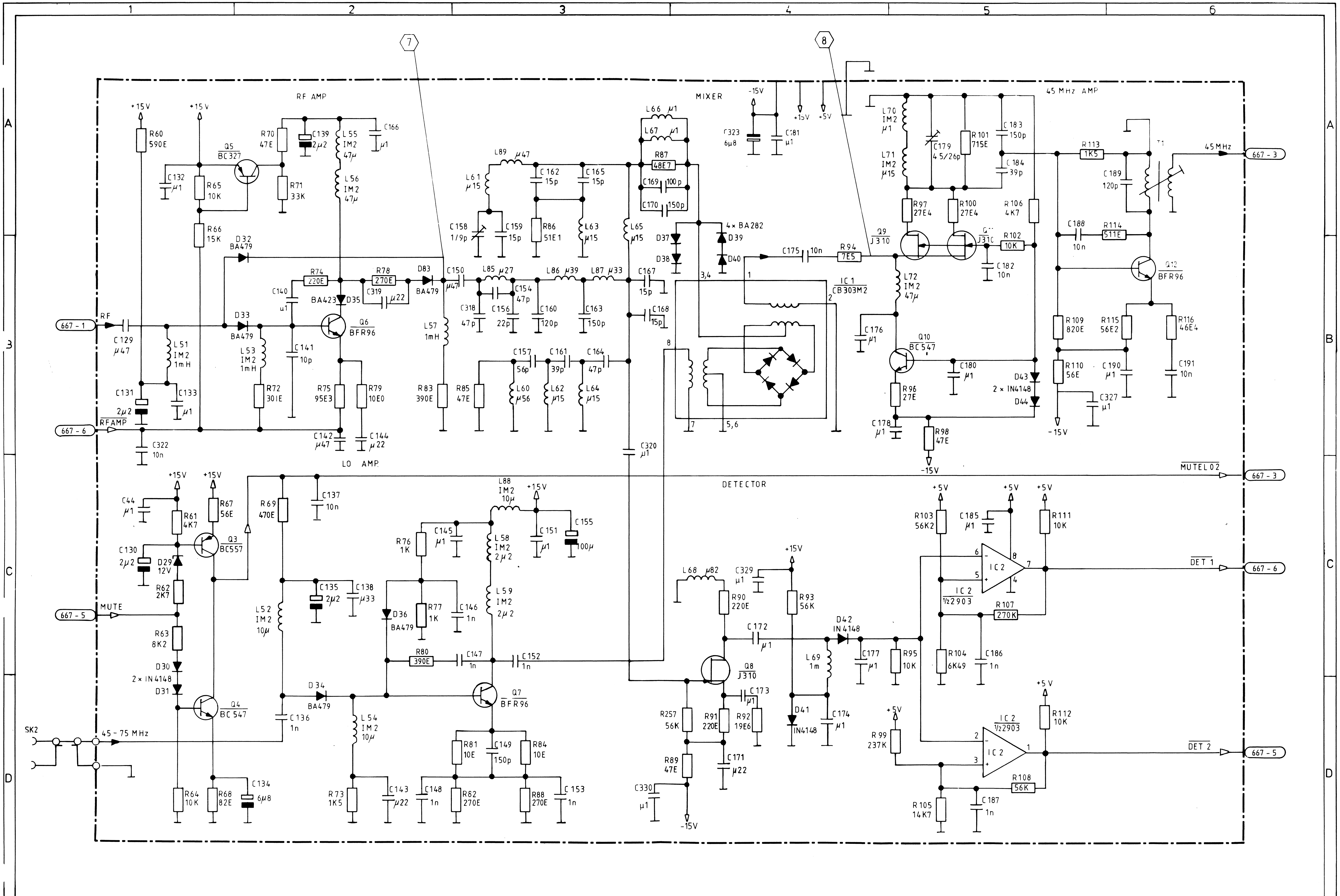
PCB 667 VERSION 6A
RECEIVER SIGNAL PATH
VIEWED FROM COMPONENT SIDE



PCB 667 RECEIVER SIGNAL PATH, MAIN DIAGRAM. VERSION 6A



PCB 667 RECEIVER SIGNAL PATH
VERSION 6 A SUBDIAGRAM 1 OF 6

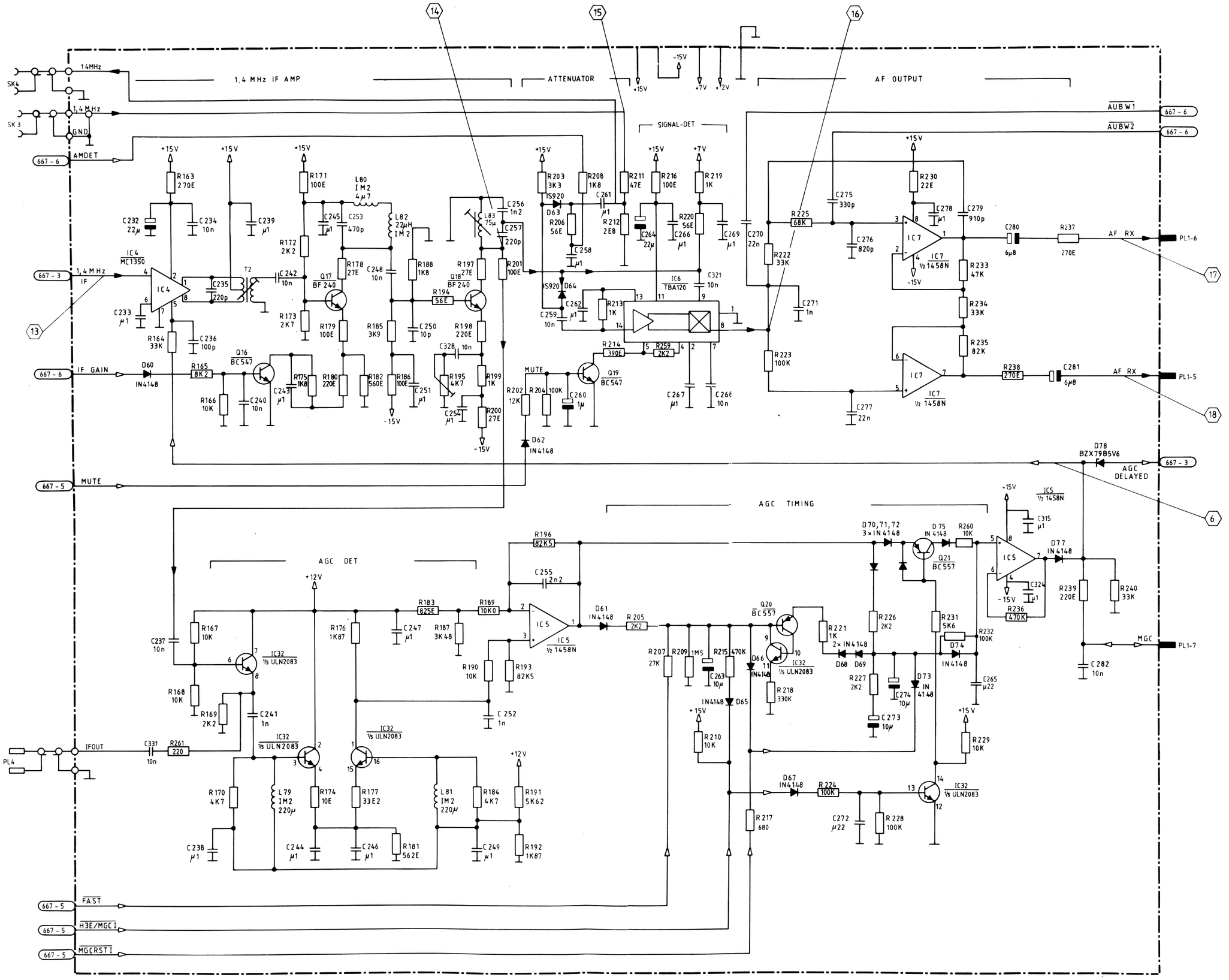


993 566 7X SUB 2

PCB 667 RECEIVER SIGNAL PATH
VERSION 6A SUBDIAGRAM 2 OF 6

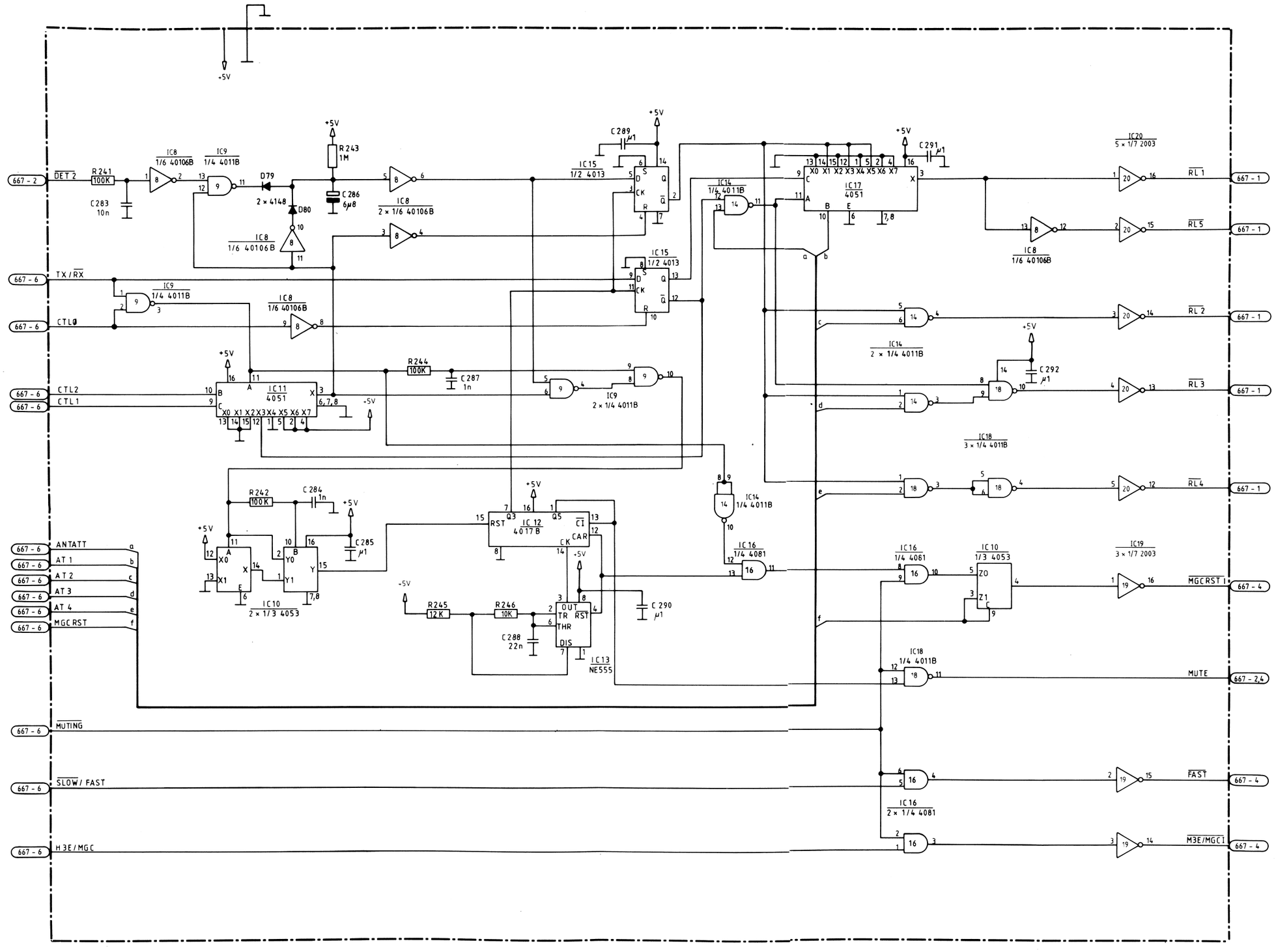
PL 3
2
1
667 - 2
MUTELO2
.3,6 M Hz
45 MHz X-TAL
45 MHz AGC AMP
MUTE
MIXER
14MHz AMP
+15V
+7V
AGC DELAYD
667 - 4
R118 3K3
R121 3K3
C193 22µ
Q13 BC547
IN4148 D46
R123 1K
C195 10n
R126 680E
R128 47E
R130 120E
R131 82K
R134 10K
C202 µ1
C203 µ1
R137 120E
R139 8K2
C207 10n
C204 10n
L74 IM2 4µ7
Q14 BF981
4B1
G2
G1
D
S
C209 10n
R140 1K5
R142 1K5
R143 470E
C212 10n
C214 10n
C210 2µ2
L75 IM2 10µ
D51 BA479
D52 BA479
L76 IM2 10µ
R147 1K
C216 1n
C217 10n
D54 BA479
R149 820E
R150 820E
R145 47E
C213 10n
IC 3 HPF505
8
7
5,6
1
2
3,4
C198 56p
L73 IM4 µ33
C196 15p
C197 9p
C199 27p
C200 150p
R132 56K
R135 18K
C206 10n
D49 5V1
C208 10n
X1
667 - 2
45 MHz
X-TAL
9
10
11
12
R154 100E
C221 µ1
C222 120p
L90 150µ
C223 120p
R158 8K2
C225 150p
C227 µ1
C219 µ1
R155 27E
Q15 J310
S
D
G
L77,78 IM2 2×22µ
R156 120E
C224 1µ
X5
X4
X3
X2
RC WIDE
R117 100E
R119 2K7
C192 µ1
R124 100E
C314 µ1
R127 1K8
D45 IS920
D47 IS920
D48 IS920
D50 IS920
D53 IS920
D55 IS920
D56 IS920
D57 IS920
D58 IS920
D59 IS920
X-TAL
R122 5K6
R129 5K6
R136 5K6
R141 5K6
R146 5K6
R151 5K6
R258 5K6
R159 5K6
R161 5K6
R162 5K6
C229 470p
C228 120p
C230 10n
1,4 M Hz IF
667 - 4
X5
X4
X3
X2
RC WIDE
667 - 6
R120 100E
R125 100E
R138 100E
R148 100E
R157 100E
C194 µ1
C201 µ1
R133 100E
C205 µ1
C211 µ1
C215 µ1
C218 µ1
C220 µ1
C226 µ1
C231 µ1
R144 100E
R152 100E
R160 100E

PCB 667 RECEIVER SIGNAL PATH
VERSION 6A SUBDIAGRAM 3 OF 6



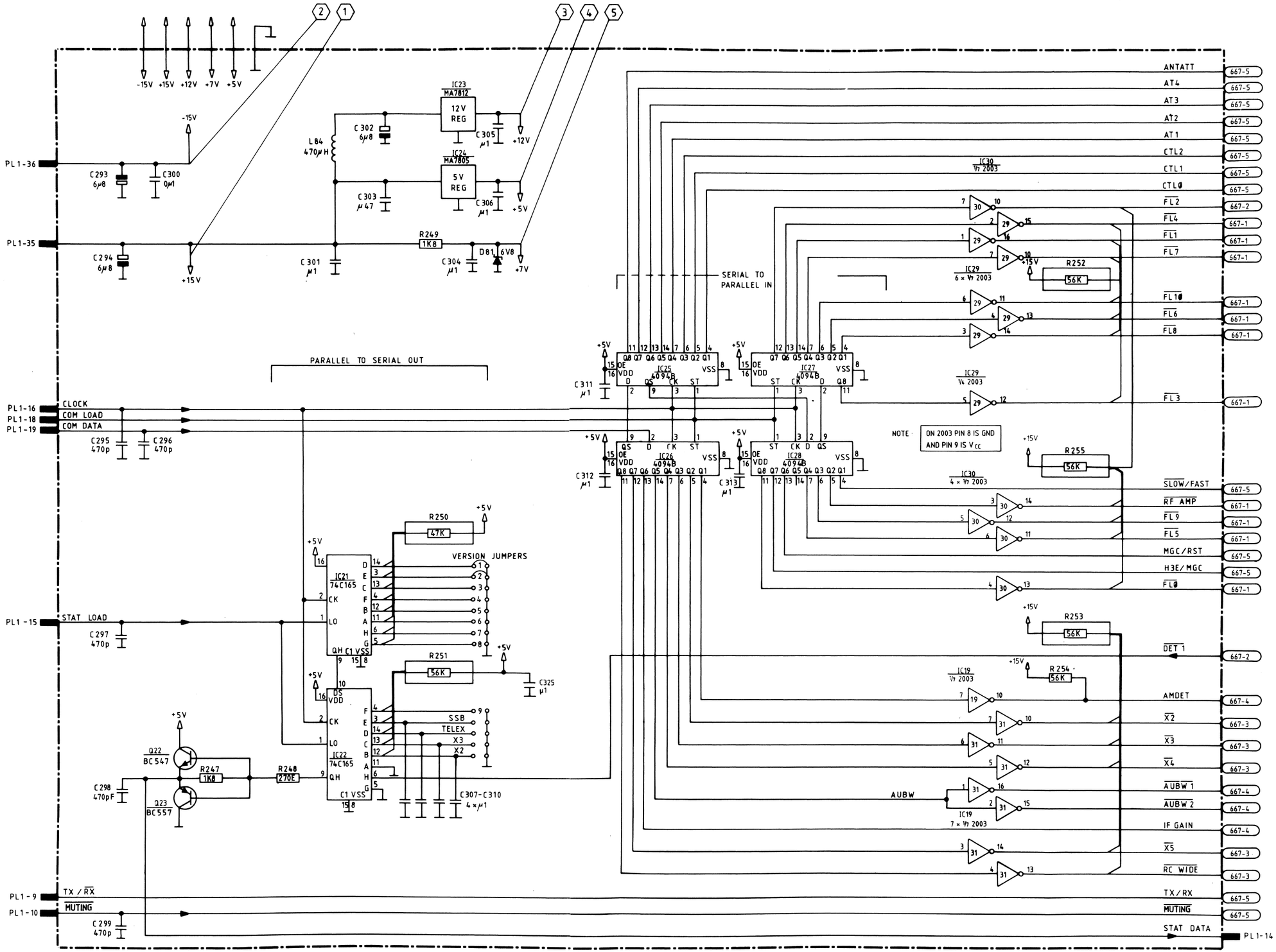
993 566 7X SUB 4

PCB 667 RECEIVER SIGNAL PATH
VERSION 6A SUBDIAGRAM 4 OF 6



993 566 7X SUB 5

PCB 667 RECEIVER SIGNAL PATH
VERSION 6A SUBDIAGRAM 5 OF 6



PCB 667 RECEIVER SIGNAL PATH
VERSION 6A SUBDIAGRAM 6 OF 6

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 667 VERSION 1

Printed Circuit Board Complete 667		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, 65-75,77,79,80	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 667 VERSION 1

D81	BZX79C6V8				832 796 80
VR1	NEON LAMP				722 000 00
X1	45 HHz	Filter 2.7 kHz			383 571 01
X4	Very Narrow Filter +/- 125 Hz				383 629 41
X5	LSB Filter 1.4 MHz 1 kohm				385 112 03
X3	Narrow Filter +/- 400 Hz				385 201 71
RL1-4	Relay	12V	DIL		780 000 25
RL5	Relay	12V	DR-12V		780 000 38
R1,204,223,224, 228,332,241,242, 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
R22,233	47 kohm	5%	1/8W	Car.	500 447 00
R23,61,106,170, 184	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

PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 667 VERSION 1

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, 162,231,258	5.6	kohm	5%	1/8W	Car.	500 356 00
R126,217	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
R169,172,205,226 227,259	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
R207	27	kohm	5%	1/8W	Car.	500 427 00
R209	1.5	Mohm	5%	1/4W	Car.	501 615 00
R218	330	kohm	5%	1/8W	Car.	500 533 00
R189,190	10	kohm	1%	1/4W	MF	511 410 00
R225	68	kohm	5%	1/8W	Car.	500 468 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 667 VERSION 1

R31	2.2 kohm	5%	1/4W	Car.	501 322 00
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	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, 260	10 kohm	5%	1/8W	Car.	500 410 00
R62,119,173	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, 198,239,261	220 ohm	5%	1/8W	Car.	500 222 00
R75	90.3 ohm	1%	1/8W	MF	511 195 30
R76,77,123,147, 199,213,219, 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 667 VERSION 1

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 667 VERSION 1

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, 321,322,328,331	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

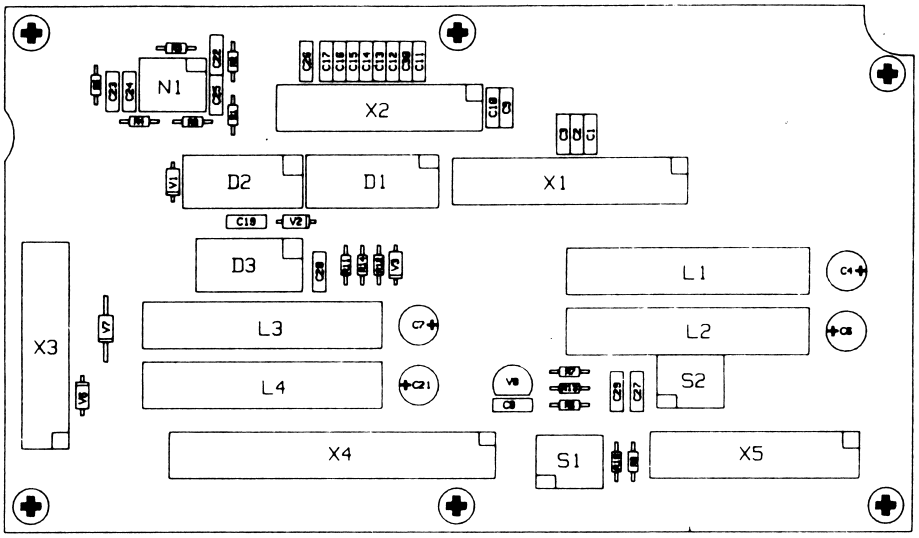
PARTS LIST FOR RECEIVER SIGNAL PATH BOARD 667 VERSION 1

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
C265	0.22 uF	10%	63V	Polyes.	622 522 00
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

RU Interconnection Board 670

The RU Interconnection Board acts as interface between RU, CU and PSA. A sawtooth generator on-board is used for duplex adjustment. It also contains a serial shift-register controlling the outputs from the option-board. Two dip-switches are located on the RU Interconnection Board. One is for baud rate setting in the RU/CU communication, please refer to the Installation-chapter in this manual. The other switch is used for redirection of AF-signals. Finally the board contains a level-shift circuit which converts the RX-RATE signal for detection when used in remote mode.



S1 SETTING

Baudrate	S1-1	S1-2
2400	OFF	OFF
1200	OFF	ON
600	ON	OFF
300	ON	ON

S2 SETTING

	S2-1	S2-2	S2-3	S2-4
R8001	ON	ON	ON	ON
R8003	OFF	OFF	OFF	OFF

995 567 0X COMP

RU INTERCONNECTION BOARD 670
VERSION 2
VIEWED FROM COMPONENT SIDE

Filenavn ...d00B/colo670

S1-1	S1-2	BAUDRATE
OFF	OFF	2400
OFF	ON	1200
ON	OFF	600
ON	ON	300

RU INTERCONNECTION BOARD 670
VERSION 2 MAIN DIAGRAM

995 567 0X MAIN

R8000D/PCB670D 15-2-88

PARTS LIST FOR RU INTERCONNECTION BOARD 670 VERSION 1

Printed Circuit Board Complete				107 567 01
C1	10nF	20%	poly.	622 410 00
C2	10nF	20%	poly.	622 410 00
C3	10nF	20%	poly.	622 410 01
C4	47uF	10%	Elyt.	652 747 01
C6	47uF	10%	Elyt.	652 747 01
C7	47uF	10%	Elyt.	652 747 01
C8	47nF	20%	poly.	622 447 00
C9	10nF	20%	poly.	622 410 01
C10	10nF	20%	poly.	622 410 01
C11	10nF	20%	poly.	622 410 01
C12	10nF	20%	poly.	622 410 01
C13	10nF	20%	poly.	622 410 01
C14	10nF	20%	poly.	622 410 01
C15	10nF	20%	poly.	622 410 01
C16	10nF	20%	poly.	622 410 01
C17	10nF	20%	poly.	622 410 01
C19	100nF	20%	poly.	622 510 00
C20	100nF	20%	poly.	622 510 00
C21	47uF	10%	Elyt.	652 747 01
C22	100nF	20%	poly.	622 510 00
C23	100nF	20%	poly.	622 510 00
C24	1nF	20%	Cer.	602 310 02
C25	100nF	20%	poly.	622 510 00
C26	1uF	20%	poly.	622 610 03
C27	10nF	20%	poly.	622 410 01
C29	10nF	20%	poly.	622 410 01
C30	10nF	20%	poly.	622 410 01
D1	ULN2803	Driver		850 280 30
D2	CD4094	Shift register		850 409 40
D3	1489	RS-232 Driver		850 148 90
L1	25uH	10%	1585	740 125 00
L2	25uH	10%	1585	740 125 00
L3	25uH	10%	1585	740 125 00
L4	25uH	10%	1585	740 125 00
N1	1458	Dual op-amp		850 145 80
P1	Print			375 567 01
R1	180Kohm	MF	CR16	500 518 00
R2	10Kohm	MF	CR16	500 410 00
R3	390Kohm	MF	CR16	500 539 00
R4	560Kohm	MF	CR16	500 556 00
R5	47Kohm	MF	CR16	500 447 00
R6	270Kohm	MF	CR16	500 527 00
R7	10Kohm	MF	CR16	500 410 00
R8	560ohm	MF	CR16	500 256 00
R9	12Kohm	MF	CR16	500 412 00
R10	12Kohm	MF	CR16	500 412 00
R11	1Kohm	MF	CR16	500 310 00
R12	2.2Kohm	MF	CR16	500 322 00
R13	2.2Kohm	MF	CR16	500 322 00
R14	12Kohm	MF	CR16	500 412 00
S1	KTD04	Switch		762 000 26
S2	KTD04	Switch		762 000 26
V1	1N4148	Diode		830 414 80
V2	39V	Zener Diode	BZX79C39	832 793 90

PARTS LIST FOR RU INTERCONNECTION BOARD 670 VERSION 1

V3	4.7V	Zener diode	BZX79C4V7	832 794 71
V4	15V	Zener Diode	BZT03C15	832 031 50
V5	15V	Zener Diode	BZT03C15	832 031 50
V6	9.1V	Zener Diode	BZX79C9V1	832 799 11
V7	27V	Zener Diode	BZT03C27	832 032 70
V8	BC547B	Transistor		840 054 70
X1	3M	Male connector	20pol	756 020 03
X2	3M	Male connector	16pol	756 016 00
X3	3M	Male connector	16pol	756 016 00
X4	3M	Male connector	34pol	756 034 01
X5	3M	Male connector	16pol	756 016 00

TECHNICAL DESCRIPTION

Power Supply Assembly (PSA)

The Power Supply Assembly is a 50 Watts DC-DC converter which offers output voltages of +24 V, +15 V, +7.5 V and -15 V. The converter is supplied from 110/220 VAC mains which is transformed and rectified or it is supplied from a 24 VDC reserve battery. Both inputs are equipped with noise filters. The converter will automatically switch to battery power in case of mains power failure.

The PSA includes two printed circuit boards, Converter Board 671 and Control Board 672, connected by a ribbon cable.

A relay switches between AC and DC input, thus the DC input is only loaded in case of mains power absence.

The converter is supplied via a bistable relay controlled by an on/off circuit which in turn is controlled from the keyboard.

The bistable function works as an on/off memory preserving the state of the converter after the recovery from a power interruption.

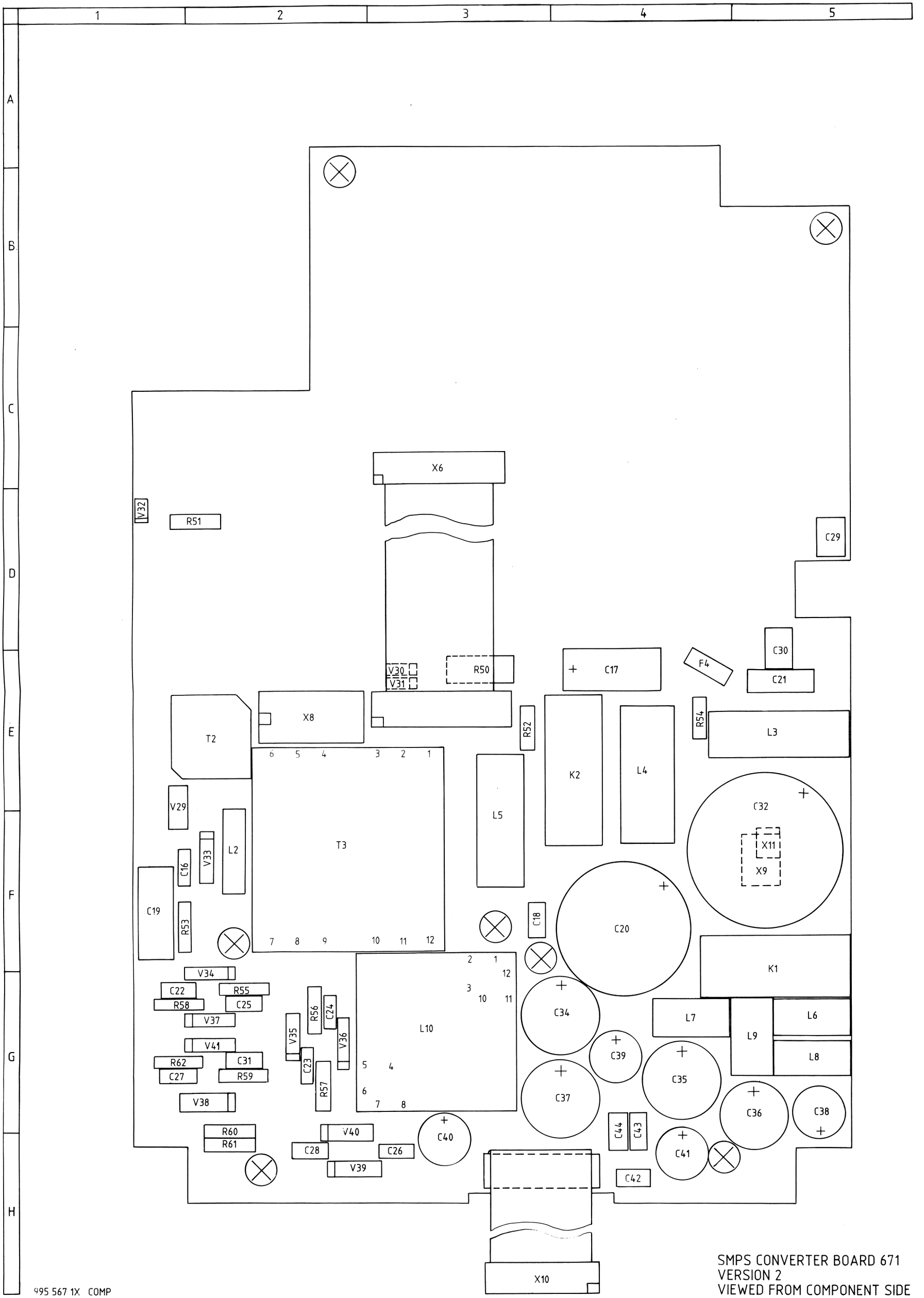
The on/off circuit may be disabled by moving the jumper on the solderside of Converter Board 671. The on/off circuit is disabled when the jumper shortcircuits the traces, and the converter is in ON-state in this condition. This is only used for service purposes.

The converter is of the forward type with pulse amplitude modulation. Functionally it consists of three parts: a modulator circuit, a switch and transformer-circuit and finally a part handling rectification and output filtering.

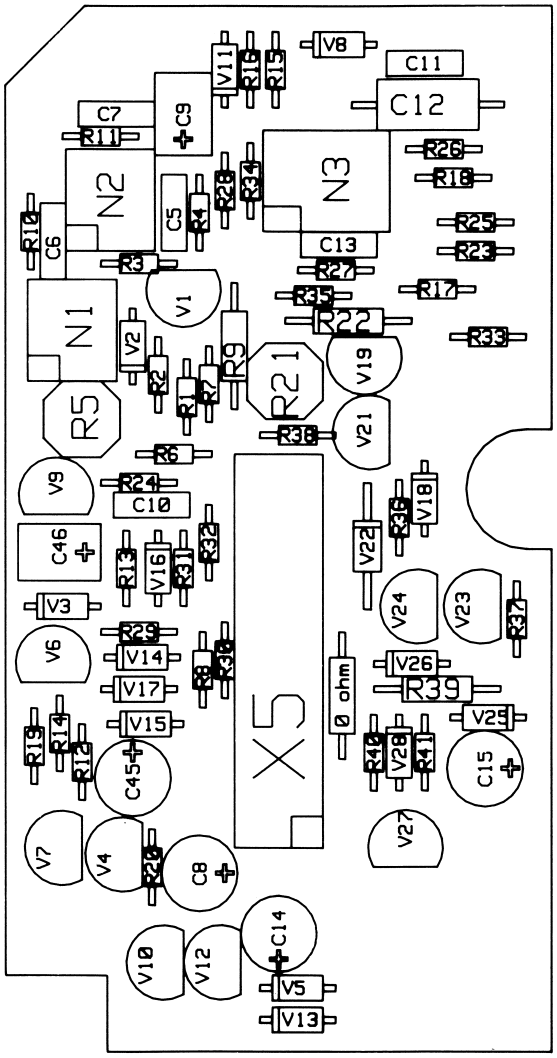
The modulator circuit incorporates an oscillator (approx. 38 kHz), a turn-off circuit, a driver and a voltage stabilizer. The oscillator and turn-off circuits control the duty-cycle, since the switch-on time is locked by the oscillator and switch-off time is controlled by the turn-off circuit.

The modulator circuit contains an overvoltage protection which interrupts the input power to the modulator by detection of more than 34 Volts at the +/-15 Volts outputs. Recovery of the converter is then only possible when the power supply inputs has been disconnected for at least 20 seconds.

The Power Supply Assembly is protected against reverse polarisation at the input, doing so will only blow the fuse F3.



SMPS CONVERTER BOARD 671
VERSION 2
VIEWED FROM COMPONENT SIDE



SMPS CONTROL BOARD 672
VERSION 2
VIEWED FROM COMPONENT SIDE

995 567 2X COMP

PCB 671 SMPS CONVERTER BOARD VERSION 2

PCB 672 SMPS CONTROL BOARD VERSION 2

-A1

-A2

X1 F1 F2 L1 S1 T1 C1

X2 F3 C2 u47 C4 1u C3 1u X3

V20 BY260

X7 X8

V30 4148 V31 4148 R52 10E +C17 10u K2

R54 10E F4 U C21 1u L3 C29 u22 C30 u22

X5 X6

R29 1k V15 1N4148 V17 1N4148 V14 BZX79C18 +C45 100u BATNEG

V7 BC547 R19 27k V10 BC547 V4 BC547 R14 27k V12 BC547

R12 10k R20 470E C8 100u C14 100u R8 820E V5 1N4148 V13 1N4148 R30 820E

R31 3k3 R32 4k7 V3 BZX79C22 V6 BC547 R13 1k8 BATNEG

V9 BC557 C10 0u1 R24 820E +1u C46 V16 BZX79C10 BATNEG

V25 BZX79C15 R25 12k R23 100k R33 100k R37 10k +C15 2u2 R41 22k V27 BC636 R40 82E V28 BZX79C2V7

R17 82k R18 33k C11 330p C12 330p R26 33k N3 LM393 V18 1N4148 V8 1N4148

V23 BC639 R39 3E3 V24 BC636 V26 BZX79C15 V22 BYV27

R1 39E V2 BZX79C33 N1 TLP641G C6 0u1 R10 15k

R2 2k7 R3 1k C5 100n N2 CNY17-4 C7 100n R11 8k2 R15 82k R21 OPTION R16 10k R28 100k R34 10k R36 82k

R22 2k7 C13 1n R27 1k5 N3 LM393 R35 1k V19 BC639 V21 BC636 R38 1k

V1 TL431 R5 1k R6 1k8 R7 39k R9 30k9 C9 1u V11 1N4148

R51 1k C18 0u1 V32 TLR224 V33 BYV28 C19 47n R53 10E C16 10n L2 6uH V29 BUZ21

T2 R50 3E9

T3 C22 2n2 R55 100E V34 BYV28 R56 100E C23 2n2 V35 BYV28 C24 2n2 R57 100E V36 BYV28 C26 2n2 R60 100E V37 BYV28 R58 100E C25 2n2

R62 100E V41 BYV28 C31 2n2 C28 2n2 V40 BYS26 R61 100E V39 BYS26 R59 100E V38 BYS26 C27 2n2

L10 L6 L7 L8 L9 +C34 470u +C38 220u C42 0u1 +C35 470u C39 220u C43 0u1 +C36 640u C40 220u +C37 470u C41 220u C44 0u1

L4 C20 2200u L5 C32 3300u

X9 X11

X10

GND	16
GND	15
+7.5V	14
+7.5V	13
+15V	12
+15V	11
+15V	10
BATON	9
BATNEG	8
PWRON	7
-15V	6
-15V	5
+24V	4
+24V	3
GND	2
GND	1

POWER SUPPLY ASSEMBLY

VERSION 1 MAIN DIAGRAM

995 576 8X

FILNAVN ps2 12-11-87

PARTS LIST FOR SMPS CONVERTER BOARD 671 VERSION 2

Printed Circuit Board Complete					107 567 11
C16	10nF		63V	Poly	602 410 01
C17	10uF		63V	Elyt	652 710 02
C18	100nF		100V	Poly	623 510 03
C19	47nF		400V	Poly	624 447 02
C20	2200uF		40V	Elyt	652 922 02
C21	1uF		63V	poly	622 610 02
C22	2.2nF		63V	poly	602 322 00
C23	2.2nF		63V	poly	602 322 00
C24	2.2nF		63V	poly	602 322 00
C25	2.2nF		63V	poly	602 322 00
C26	2.2nF		63V	poly	602 322 00
C27	2.2nF		63V	poly	602 322 00
C28	2.2nF		63V	poly	602 322 00
C29	0.22uF		100V	poly	623 522 01
C30	0.22uF		100V	poly	623 522 01
C31	2.2nF		63V	poly	602 322 00
C32	4700uF		40V	Elyt	652 947 04
C34	470uF		40V	Elyt	652 847 01
C35	470uF		40V	Elyt	652 847 01
C36	640uF		25V	Elyt	652 864 00
C37	470uF		40V	Elyt	652 847 01
C38	220uF		40V	Elyt	652 822 03
C39	220uF		40V	Elyt	652 822 03
C40	220uF		40V	Elyt	652 822 03
C41	220uF		40V	Elyt	652 822 03
C42	100nF		100V	Poly	623 510 03
C43	100nF		100V	Poly	623 510 03
C44	100nF		100V	Poly	623 510 03
F4	Varistor		47V		839 000 00
K1	Bistable relay		9V	10A	780 000 39
K2	Relay		32.5V	10A	780 000 40
L2	6uH	2A		RF choke	740 060 00
L3				inductor	375 577 82
L4				inductor	375 577 51
L5				inductor	375 577 51
L6				inductor	375 577 61
L7				inductor	375 577 61
L8				inductor	375 577 61
L9				inductor	375 577 61
L10				inductor	375 577 71
R50	3.9ohm	PR37	PF	1.6W	514 039 00
R51	1kohm	PR37	PF	1.6W	514 310 00
R52	10ohm	CR25	CF		501 110 00
R53	10ohm	CR25	CF		501 110 00
R54	10ohm	NTC			591 110 00
R55	100ohm	CR25	CF		501 210 00
R56	100ohm	CR25	CF		501 210 00
R57	100ohm	CR25	CF		501 210 00
R58	100ohm	CR25	CF		501 210 00
R59	100ohm	CR25	CF		501 210 00

PARTS LIST FOR SMPS CONVERTER BOARD 671 VERSION 2

R60	100ohm	CR25	CF	501 210 00
R61	100ohm	CR25	CF	501 210 00
R62	100ohm	CR25	CF	501 210 00
T2	current transformer			385 577 91
T3	switch transformer			385 578 01
V29	BUZ21	power mos fet		843 002 10
V30	1N4148	diode		830 414 80
V31	1N4148	diode		830 414 80
V32	TLR224	LED		823 000 08
V33	BYV28	diode		831 002 80
V34	BYV28	diode		831 002 80
V35	BYV28	diode		831 002 80
V36	BYV28	diode		831 002 80
V37	BYV28	diode		831 002 80
V38	BYS26	diode		310 269 00
V39	BYS26	diode		310 269 00
V40	BYS26	diode		310 269 00
V41	BYV28	diode		831 002 80
X8	connector	5 pol molex		751 001 55
X9	connector	1/12 36 pol (3 pol)		751 001 25
X11	connector	2 pin shuntconn.		750 000 31

PARTS LIST FOR SMPS CONTROL BOARD 672 VERSION 2

Printed Circuit Board Complete					107 567 21
C5	100nF		63V	Poly	622 510 00
C6	100nF		63V	Poly	622 510 00
C7	100nF		63V	Poly	622 510 00
C8	100uF		25V	Elyt	652 810 02
C9	1uF		40V	S.Alu	652 610 03
C10	100nF		63V	Poly	622 510 00
C11	330pF		63V	Poly	602 233 00
C12	330pF	1%	125V	Poly	613 233 00
C13	1nF		63V	Poly	602 310 02
C14	100uF		25V	Elyt	652 810 02
C15	2.2uF		25V	S. Alu	652 622 03
C45	100uF		25V	Elyt	652 810 02
C46	1uF		40V	S.Alu	652 610 03
N1	TLP641	opto thyristor			850 064 10
N2	CNY17F	opto coupler			825 000 02
N3	LM393	Dual Comparator			850 039 30
R1	39ohm		SFR16	MF	500 139 00
R2	2.7kohm		SFR16	MF	500 327 00
R3	1kohm		SFR16	MF	500 310 00
R4	56kohm		SFR16	MF	500 456 00
R5	1kohm			Potm.	583 310 01
R6	1.8kohm		SFR16	MF	500 318 00
R7	39kohm		SFR16	MF	500 439 00
R8	820ohm		SFR16	MF	500 282 00
R9	30k9ohm		MR25	MF	511 430 90
R10	15kohm		SFR16	MF	500 415 00
R11	8.2kohm		SRF16	MF	500 382 00
R12	10kohm		SFR16	MF	500 410 00
R13	1.8kohm		SFR16	MF	500 318 00
R14	27kohm		SFR16	MF	500 427 00
R15	82kohm		SFR16	MF	500 482 00
R16	10kohm		SFR16	MF	500 410 00
R17	82kohm		SFR16	MF	500 482 00
R18	33kohm		SFR16	MF	500 433 00
R19	27kohm		SFR16	MF	500 427 00
R20	470ohm		SFR16	MF	500 247 00
R21	option			Potm.	
R22	2.7kohm		SFR16	MF	500 327 00
R23	100kohm		SFR16	MF	500 510 00
R24	820ohm		SFR16	MF	500 282 00
R25	12kohm		SFR16	MF	500 412 00
R26	33kohm		SFR16	MF	500 433 00
R27	1.5kohm		SFR16	MF	500 315 00
R28	100kohm		SFR16	MF	500 510 00
R29	1kohm		SFR16	MF	500 310 00
R30	820ohm		SFR16	MF	500 282 00
R31	3.3kohm		SFR16	MF	500 333 00
R32	4.7kohm		SRF16	MF	500 347 00
R33	100kohm		SFR16	MF	500 510 00
R34	10kohm		SFR16	MF	500 410 00
R35	1kohm		SFR16	MF	500 310 00
R36	82kohm		SFR16	MF	500 482 00

PARTS LIST FOR SMPS CONTROL BOARD 672 VERSION 2

R37	10kohm	SFR16	MF	500 410 00
R38	1kohm	SFR16	MF	500 310 00
R39	3.3ohm	CR25	CF	501 033 00
R40	82ohm	SFR16	MF	500 182 00
R41	22kohm	SFR16	MF	500 422 00
R42	0ohm		jumper	501 000 00

V1	TL431	contr. zenerdiode	850 043 10
V2	33V BZX79C	zenerdiode	832 793 30
V3	22V BZX79C	zenerdiode	832 792 20
V4	BC547	npn transistor	840 054 70
V5	1N4148	diode	830 414 80
V6	BC547	npn transistor	840 054 70
V7	BC547	npn transistor	840 054 70
V8	1N4148	diode	830 414 80
V9	BC557	pnp transistor	840 055 70
V10	BC547	npn transistor	840 054 70
V11	1N4148	diode	830 414 80
V12	BC547	npn transistor	840 054 70
V13	1N4148	diode	830 414 80
V14	18V BZX79C	zenerdiode	832 791 80
V15	1N4148	diode	830 414 80
V16	10V BZX79C	zenerdiode	832 791 00
V17	1N4148	diode	830 414 80
V18	1N4148	diode	830 414 80
V19	BC639	npn transistor	840 063 90
V21	BC636	pnp transistor	840 063 60
V22	BYV27	diode	831 272 00
V23	BC639	npn transistor	840 063 90
V24	BC636	pnp transistor	840 063 60
V25	15V BZX79C	zenerdiode	832 791 50
V26	15V BZX79C	zenerdiode	832 791 50
V27	BC636	pnp transistor	840 063 60
V28	2.7V BZX79C	zenerdiode	832 792 70

X5	stik	16 pol molex	756 016 00

TECHNICAL DESCRIPTION

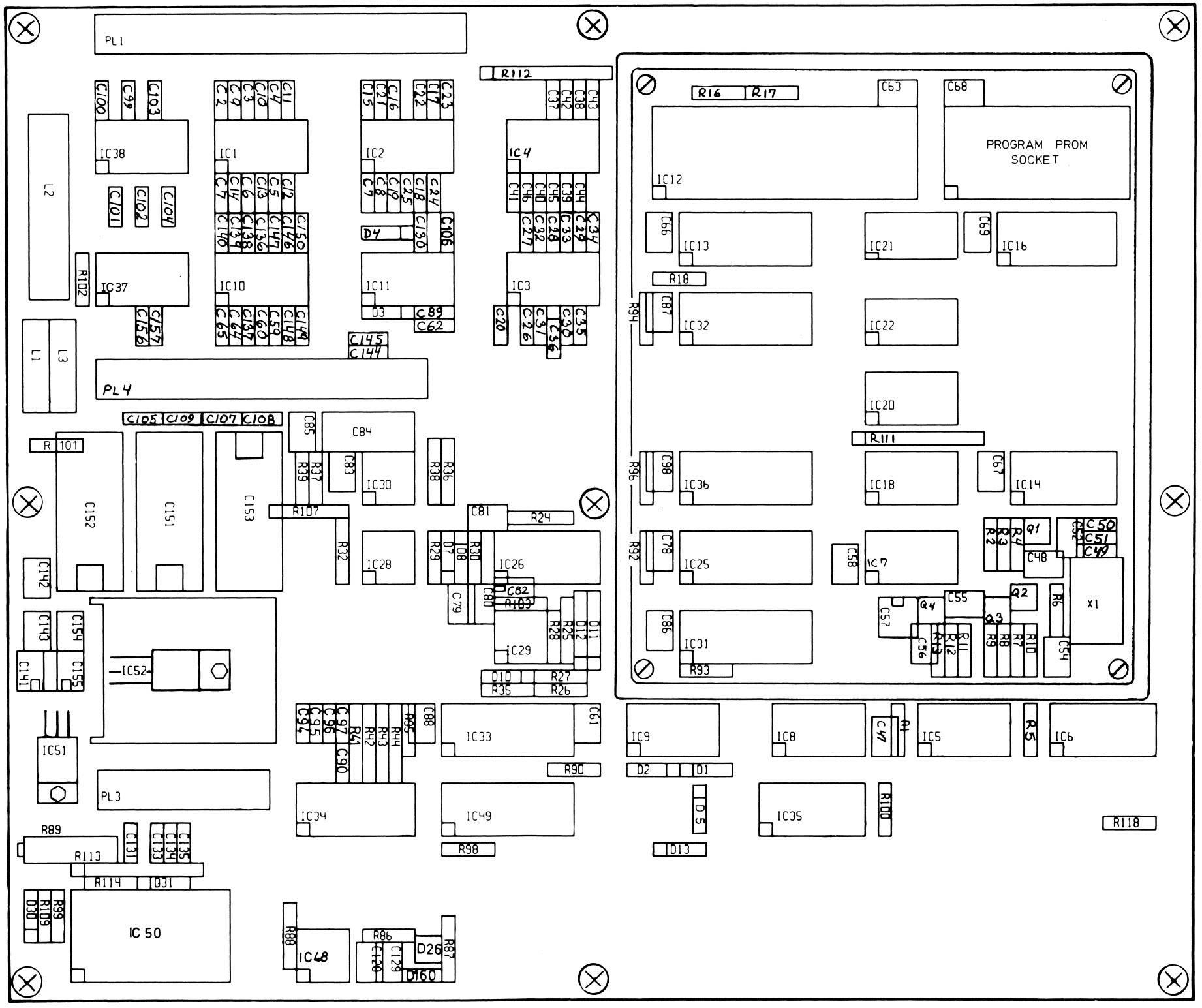
RU Control Board 674

This module implements the following functions: Communication with Control and Audio Board 681 as a slave by receiving and executing command messages in order to control Receiver Signal Path 667, Synthesizer Board 611 and by transmitting acknowledge and status messages back to 681.

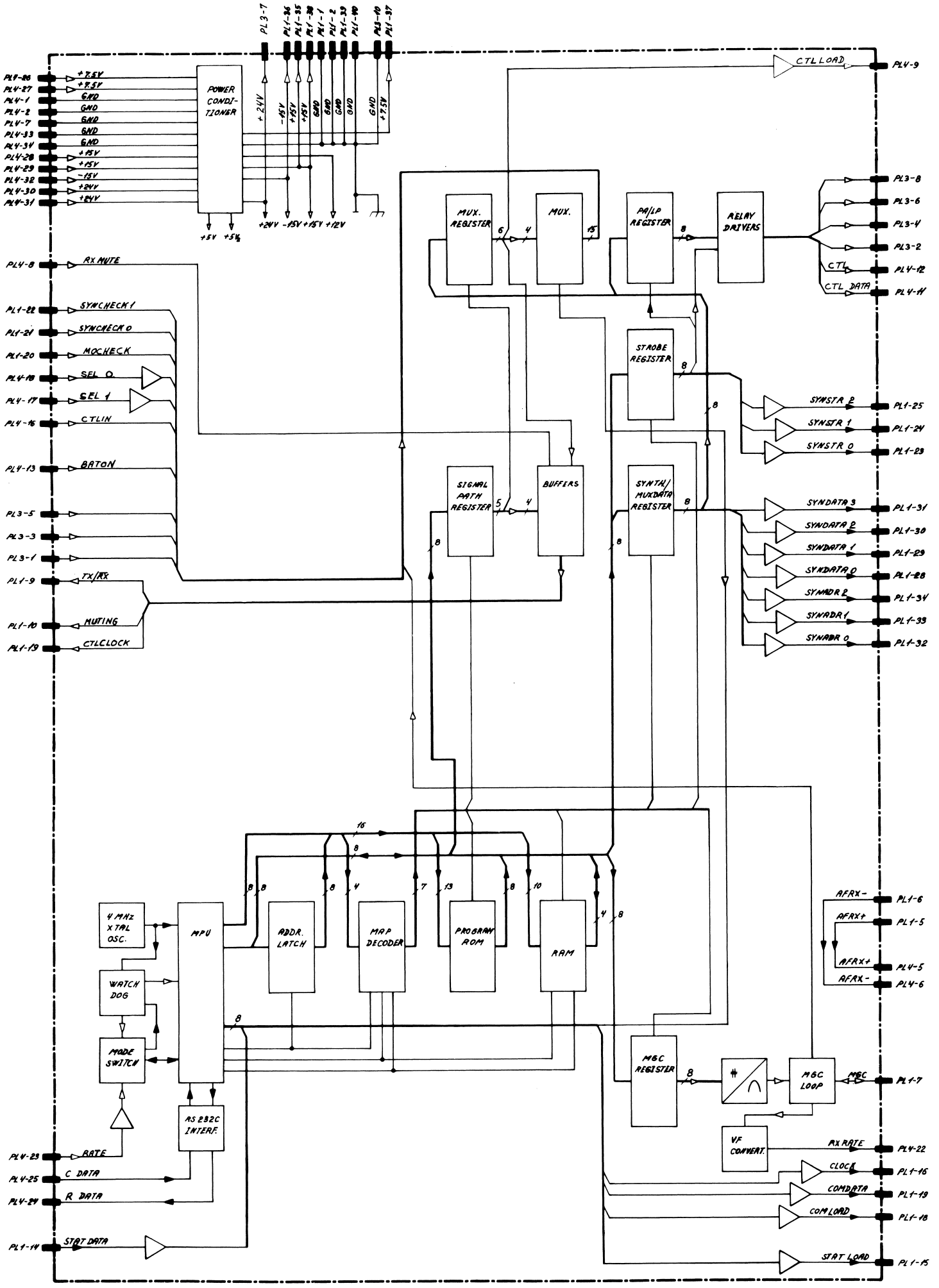
The RU Control Board communicates with Control and Audio Board in the Control Unit via an RS 232C interface.

The outputs PL4-9 (CTLLOAD), PL4-19 (CTLCLOCK) and PL4-20 (CTLDATA) controls the serial/parallel shift-register on the RU Interconnection Board. The input PL4-13 (BATON) is used for indicating battery operation. PL4-16 (CTLIN) is an external control input.

PL4-23 (RATE) is connected to RXRATE via the RU Interconnection Board. Signal strength information may then be transferred via the serial interface.

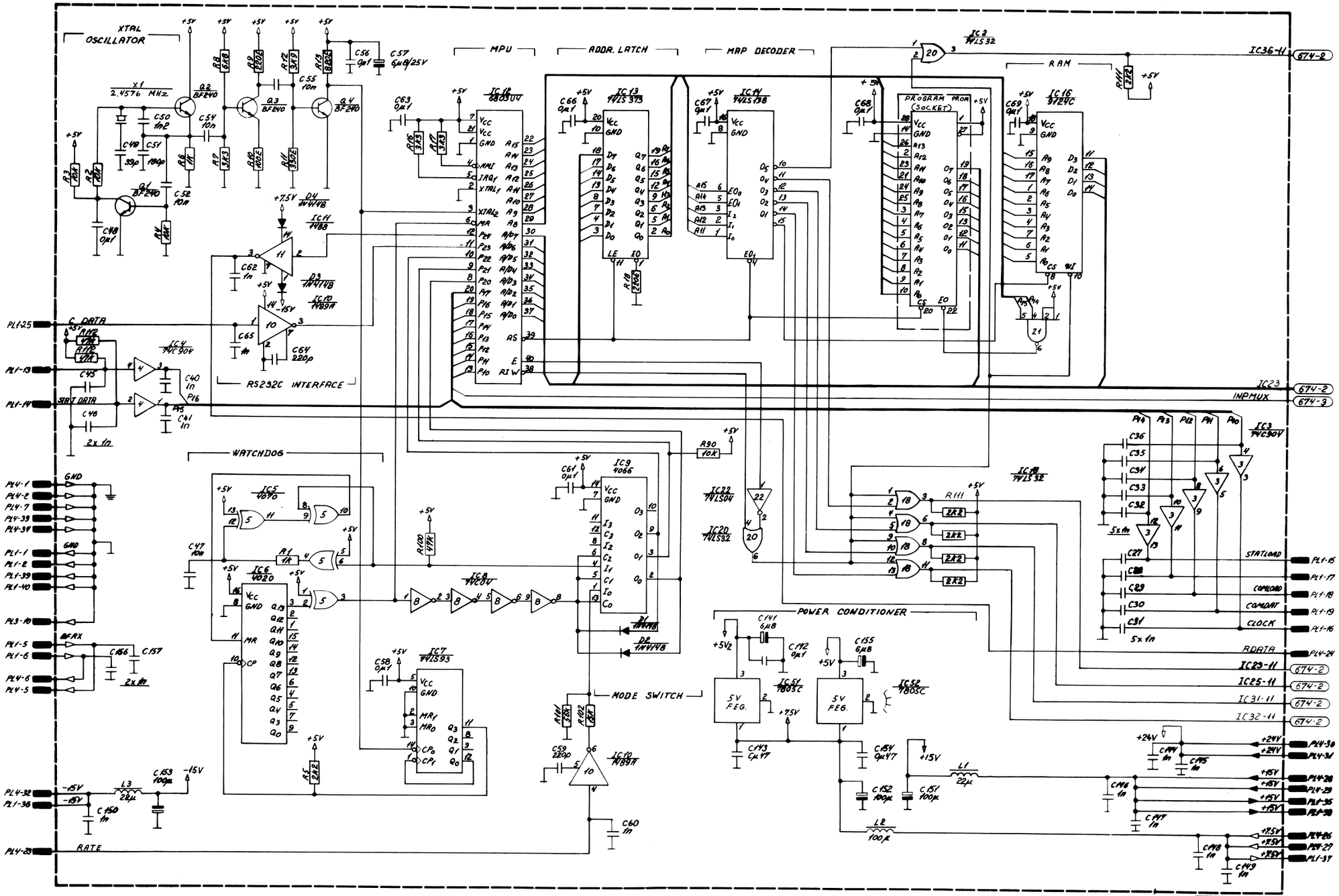


PCB 674 VERSION 1
RU CONTROL BOARD
VIEWED FROM COMPONENT SIDE



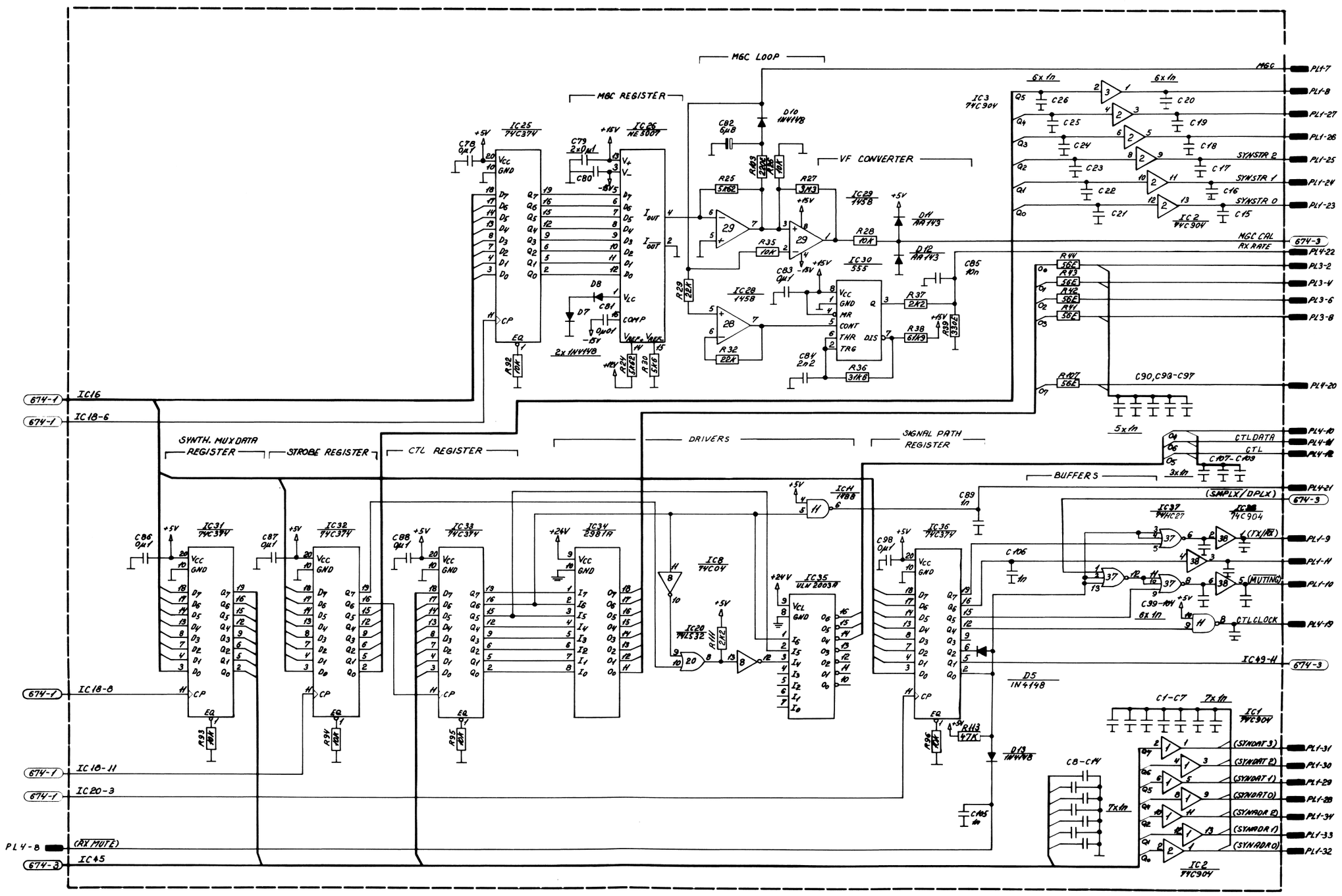
995 567 4X MAIN

MAIN DIAGRAM VERSION 1
674 RU CONTROL BOARD



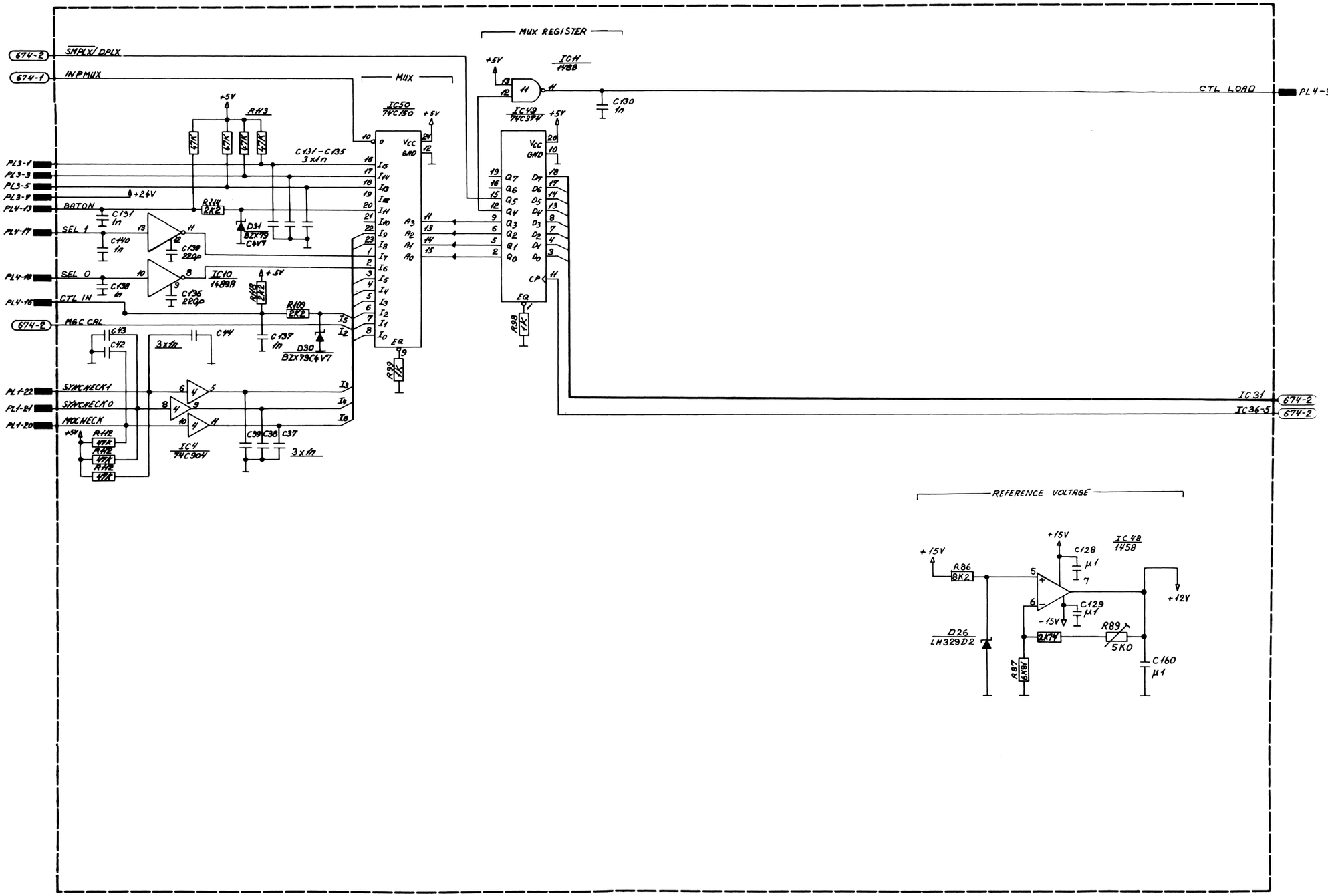
995 567 4X SUB1

PCB 674 RU CONTROL BOARD
VERSION 1 SUBDIAGRAM 1 OF 3



995 567 4X SUB2

PCB 674 RU CONTROL BOARD
VERSION 1 SUBDIAGRAM 2 OF 3



995 567 4X SUB3

PCB 674 RU CONTROL BOARD
VERSION 1 SUBDIAGRAM 3 OF 3

PARTS LIST FOR RU CONTROL BOARD 674 VERSION 1

Printed Circuit Board Complete					107 567 41
C1	1 nF	10%	100V	Cer.	602 310 02
C2	1 nF	10%	100V	Cer.	602 310 02
C3	1 nF	10%	100V	Cer.	602 310 02
C4	1 nF	10%	100V	Cer.	602 310 02
C5	1 nF	10%	100V	Cer.	602 310 02
C6	1 nF	10%	100V	Cer.	602 310 02
C7	1 nF	10%	100V	Cer.	602 310 02
C8	1 nF	10%	100V	Cer.	602 310 02
C9	1 nF	10%	100V	Cer.	602 310 02
C10	1 nF	10%	100V	Cer.	602 310 02
C11	1 nF	10%	100V	Cer.	602 310 02
C12	1 nF	10%	100V	Cer.	602 310 02
C13	1 nF	10%	100V	Cer.	602 310 02
C14	1 nF	10%	100V	Cer.	602 310 02
C15	1 nF	10%	100V	Cer.	602 310 02
C16	1 nF	10%	100V	Cer.	602 310 02
C17	1 nF	10%	100V	Cer.	602 310 02
C18	1 nF	10%	100V	Cer.	602 310 02
C19	1 nF	10%	100V	Cer.	602 310 02
C20	1 nF	10%	100V	Cer.	602 310 02
C21	1 nF	10%	100V	Cer.	602 310 02
C22	1 nF	10%	100V	Cer.	602 310 02
C23	1 nF	10%	100V	Cer.	602 310 02
C24	1 nF	10%	100V	Cer.	602 310 02
C25	1 nF	10%	100V	Cer.	602 310 02
C26	1 nF	10%	100V	Cer.	602 310 02
C27	1 nF	10%	100V	Cer.	602 310 02
C28	1 nF	10%	100V	Cer.	602 310 02
C29	1 nF	10%	100V	Cer.	602 310 02
C30	1 nF	10%	100V	Cer.	602 310 02
C31	1 nF	10%	100V	Cer.	602 310 02
C32	1 nF	10%	100V	Cer.	602 310 02
C33	1 nF	10%	100V	Cer.	602 310 02
C34	1 nF	10%	100V	Cer.	602 310 02
C35	1 nF	10%	100V	Cer.	602 310 02
C36	1 nF	10%	100V	Cer.	602 310 02
C37	1 nF	10%	100V	Cer.	602 310 02
C38	1 nF	10%	100V	Cer.	602 310 02
C39	1 nF	10%	100V	Cer.	602 310 02
C40	1 nF	10%	100V	Cer.	602 310 02
C41	1 nF	10%	100V	Cer.	602 310 02
C42	1 nF	10%	100V	Cer.	602 310 02
C43	1 nF	10%	100V	Cer.	602 310 02
C44	1 nF	10%	100V	Cer.	602 310 02
C45	1 nF	10%	100V	Cer.	602 310 02
C46	1 nF	10%	100V	Cer.	602 310 02
C47	10 nF	10%	63V	Polyes.	622 410 01
C48	0.1 uF	10%	63V	Polyes.	622 510 00
C49	39 pF	2%	63V	N150	602 139 01
C50	1.2 nF	10%	63V	Cer.	602 312 00
C51	180 pF	10%	63V	Cer.	602 218 00
C52	10 nF	10%	63V	Polyes.	622 410 01
C54	10 nF	10%	63V	Polyes.	622 410 01
C55	10 nF	10%	63V	Polyes.	622 410 01

PARTS LIST FOR RU CONTROL BOARD 674 VERSION 1

C56	0.1 uF	10%	63V	Polyes.	622 510 00
C57	6.8 uF	20%	25V	Sol.al.	652 668 01
C58	0.1 uF	10%	63V	Polyes.	622 510 00
C59	220 pF	10%	100V	Cer.	603 222 00
C60	1 nF	10%	100V	Cer.	602 310 02
C61	0.1 uF	10%	63V	Polyes.	622 510 00
C62	1 nF	10%	100V	Cer.	602 310 02
C63	0.1 uF	10%	63V	Polyes.	622 510 00
C64	220 pF	10%	100V	Cer.	603 222 00
C65	1 nF	10%	100V	Cer.	602 310 02
C66	0.1 uF	10%	63V	Polyes.	622 510 00
C67	0.1 uF	10%	63V	Polyes.	622 510 00
C68	0.1 uF	10%	63V	Polyes.	622 510 00
C69	0.1 uF	10%	63V	Polyes.	622 510 00
C78	0.1 uF	10%	63V	Polyes.	622 510 00
C79	0.1 uF	10%	63V	Polyes.	622 510 00
C80	0.1 uF	10%	63V	Polyes.	622 510 00
C81	10 nF	10%	63V	Polyes.	622 410 01
C82	6.8 uF	20%	25V	Sol.al.	652 668 01
C83	0.1 uF	10%	63V	Polyes.	622 510 00
C84	2.2 nF	1%	125V	Polyst.	613 322 00
C85	10 nF	10%	63V	Polyes.	622 410 01
C86	0.1 uF	10%	63V	Polyes.	622 510 00
C87	0.1 uF	10%	63V	Polyes.	622 510 00
C88	0.1 uF	10%	63V	Polyes.	622 510 00
C89	1 nF	10%	100V	Cer.	602 310 02
C90	1 nF	10%	100V	Cer.	602 310 02
C94	1 nF	10%	100V	Cer.	602 310 02
C95	1 nF	10%	100V	Cer.	602 310 02
C96	1 nF	10%	100V	Cer.	602 310 02
C97	1 nF	10%	100V	Cer.	602 310 02
C98	0.1 uF	10%	63V	Polyes.	622 510 00
C99	1 nF	10%	100V	Cer.	602 310 02
C100	1 nF	10%	100V	Cer.	602 310 02
C101	1 nF	10%	100V	Cer.	602 310 02
C102	1 nF	10%	100V	Cer.	602 310 02
C103	1 nF	10%	100V	Cer.	602 310 02
C104	1 nF	10%	100V	Cer.	602 310 02
C105	1 nF	10%	100V	Cer.	602 310 02
C106	1 nF	10%	100V	Cer.	602 310 02
C107	1 nF	10%	100V	Cer.	602 310 02
C108	1 nF	10%	100V	Cer.	602 310 02
C109	1 nF	10%	100V	Cer.	602 310 02
C128	0.1 uF	10%	63V	Polyes.	622 510 00
C129	0.1 uF	10%	63V	Polyes.	622 510 00
C130	1 nF	10%	100V	Cer.	602 310 02
C131	1 nF	10%	100V	Cer.	602 310 02
C133	1 nF	10%	100V	Cer.	602 310 02
C134	1 nF	10%	100V	Cer.	602 310 02
C135	1 nF	10%	100V	Cer.	602 310 02
C136	220 pF	10%	100V	Cer.	603 222 00
C137	1 nF	10%	100V	Cer.	602 310 02
C138	1 nF	10%	100V	Cer.	602 310 02
C139	220 pF	10%	100V	Cer.	603 222 00
C140	1 nF	10%	100V	Cer.	602 310 02
C141	6.8 uF	20%	25V	Sol.al.	652 668 01

PARTS LIST FOR RU CONTROL BOARD 674 VERSION 1

C142	0.1 uF	10%	63V	Polyes.	622 510 00
C143	0.47 uF	10%	63V	Polyes.	622 547 01
C144	1 nF	10%	100V	Cer.	602 310 02
C145	1 nF	10%	100V	Cer.	602 310 02
C146	1 nF	10%	100V	Cer.	602 310 02
C147	1 nF	10%	100V	Cer.	602 310 02
C148	1 nF	10%	100V	Cer.	602 310 02
C149	1 nF	10%	100V	Cer.	602 310 02
C150	1 nF	10%	100V	Cer.	602 310 02
C151	100 uF	20%	25V	W.alum.	652 810 00
C152	100 uF	20%	25V	W.alum.	652 810 00
C153	100 uF	20%	25V	W.alum.	652 810 00
C154	0.47 uF	10%	63V	Polyes.	622 547 01
C155	6.8 uF	20%	25V	Sol.al.	652 668 01
C156	1 nF	10%	100V	Cer.	602 310 02
C157	1 nF	10%	100V	Cer.	602 310 02
C160	0.1 uF	10%	63V	Polyes.	622 510 00
D1	1N4148				830 414 80
D2	1N4148				830 414 80
D3	1N4148				830 414 80
D4	1N4148				830 414 80
D5	1N4148				830 414 80
D7	1N4148				830 414 80
D8	1N4148				830 414 80
D10	1N4148				830 414 80
D11	AA143				830 014 30
D12	AA143				830 014 30
D13	1N4148				830 414 80
D26	LM329DZ				830 032 90
D30	4V7	BZX79C4V7			832 794 70
D31	4V7	BZX79C4V7			832 794 70
IC10	1489P				850 148 90
IC11	1488P				850 148 80
IC12	6803U4				856 803 40
IC13	74LS373				857 437 30
IC14	74LS138				857 413 80
IC16	9124C				850 912 40
IC18	74LS32				850 743 20
IC1	74C904				857 490 40
IC20	74LS32				850 743 20
IC21	74LS20				850 740 21
IC22	74LS04				850 740 41
IC25	74C374				857 437 40
IC26	NE5007				850 500 70
IC28	MC1458N				850 145 80
IC29	MC1458N				850 145 80
IC2	74C904				857 490 40
IC30	NE555				850 055 50
IC31	74C374				857 437 40
IC32	74C374				857 437 40
IC33	74C374				857 437 40
IC34	UDN2981				850 298 10
IC35	ULN2003				850 200 30
IC36	74C374				857 437 40
IC37	74HC27				850 742 70
IC38	74C904				857 490 40

PARTS LIST FOR RU CONTROL BOARD 674 VERSION 1

IC3	74C904				857 490 40
IC48	MC1458N				850 145 80
IC49	74C374				857 437 40
IC4	74C904				857 490 40
IC50	74C150				857 415 00
IC51	MA7805				850 780 50
IC52	MA7805				850 780 50
IC5	4070BC				850 407 00
IC6	4020B				850 402 00
IC7	74LS93				850 749 32
IC8	74C04				850 740 42
IC9	4066BC				850 406 60
L1	22 uH	1582			740 122 00
L2	100 uH				740 210 06
L3	22 uH	1582			740 122 00
PL1	3M	40 pol			756 040 04
PL3	3M	10 pol			756 010 02
PL4	3M	34 pol			756 034 01
Q1	BF240				840 024 00
Q2	BF240				840 024 00
Q3	BF240				840 024 00
Q4	BF240				840 024 00
R1	1 k	5%	1/8W	MF	500 310 00
R2	10 k	5%	1/8W	MF	500 410 00
R3	10 k	5%	1/8W	MF	500 410 00
R4	10 k	5%	1/8W	MF	500 410 00
R5	2.2 k	5%	1/8W	MF	500 322 00
R6	1 k	5%	1/8W	MF	500 310 00
R7	3.3 k	5%	1/8W	MF	500 333 00
R8	6.8 k	5%	1/8W	MF	500 368 00
R9	220 E	5%	1/8W	MF	500 222 00
R10	100 E	5%	1/8W	MF	500 210 00
R11	330 E	5%	1/8W	MF	500 233 00
R12	3.9 k	5%	1/8W	MF	500 339 00
R13	820 E	5%	1/8W	MF	500 282 00
R16	3.3 k	5%	1/8W	MF	500 333 00
R17	3.3 k	5%	1/8W	MF	500 333 00
R18	220 E	5%	1/8W	MF	500 222 00
R24	5.62 k	1%	1/4W	MF	511 356 20
R25	5.62 k	1%	1/4W	MF	511 356 20
R26	10 k	5%	1/8W	MF	500 410 00
R27	3.3 M	5%	1/4W	Car.	501 633 00
R28	10 k	5%	1/8W	MF	500 410 00
R29	22 k	5%	1/8W	MF	500 422 00
R30	5.6 k	5%	1/8W	MF	500 356 00
R32	22 k	5%	1/8W	MF	500 422 00
R35	10 k	5%	1/8W	MF	500 410 00
R36	31.6 k	1%	1/4W	MF	511 431 60
R37	2.2 k	5%	1/8W	MF	500 322 00
R38	61.9 k	1%	1/4W	MF	511 461 90
R39	330 E	5%	1/8W	MF	500 233 00
R41	56 E	5%	1/2W	MF	512 156 00
R42	56 E	5%	1/2W	MF	512 156 00
R43	56 E	5%	1/2W	MF	512 156 00
R44	56 E	5%	1/2W	MF	512 156 00
R86	8.2 k	5%	1/8W	MF	500 382 00

PARTS LIST FOR RU CONTROL BOARD 674 VERSION 1

R87	6.81 k	1%	1/4W	MF	511 368 10
R88	2.74 k	1%	1/4W	MF	511 327 40
R89	5 k	Pot.			582 310 02
R90	10 k	5%	1/8W	MF	500 410 00
R92	10 k	5%	1/8W	MF	500 410 00
R93	10 k	5%	1/8W	MF	500 410 00
R94	10 k	5%	1/8W	MF	500 410 00
R95	10 k	5%	1/8W	MF	500 410 00
R96	10 k	5%	1/8W	MF	500 410 00
R98	1 k	5%	1/8W	MF	500 310 00
R99	1 k	5%	1/8W	MF	500 310 00
R100	47 k	5%	1/8W	MF	500 447 00
R101	56 k	5%	1/8W	MF	500 456 00
R102	15 k	5%	1/8W	MF	500 415 00
R103	220 E	5%	1/8W	MF	500 222 00
R107	56 E	5%	1/2W	MF	512 156 00
R109	2.2 k	5%	1/8W	MF	500 322 00
R111	2.2 k	Sil.			530 000 08
R112	47 k	Sil.			530 000 07
R113	47 k	Sil.			530 000 07
R114	2.2 k	5%	1/8W	MF	500 322 00
R118	2.2 k	5%	1/8W	MF	500 322 00
X1	2,4576M	CRYSTAL	2,4576MHz		812 000 02

TECHNICAL DESCRIPTION

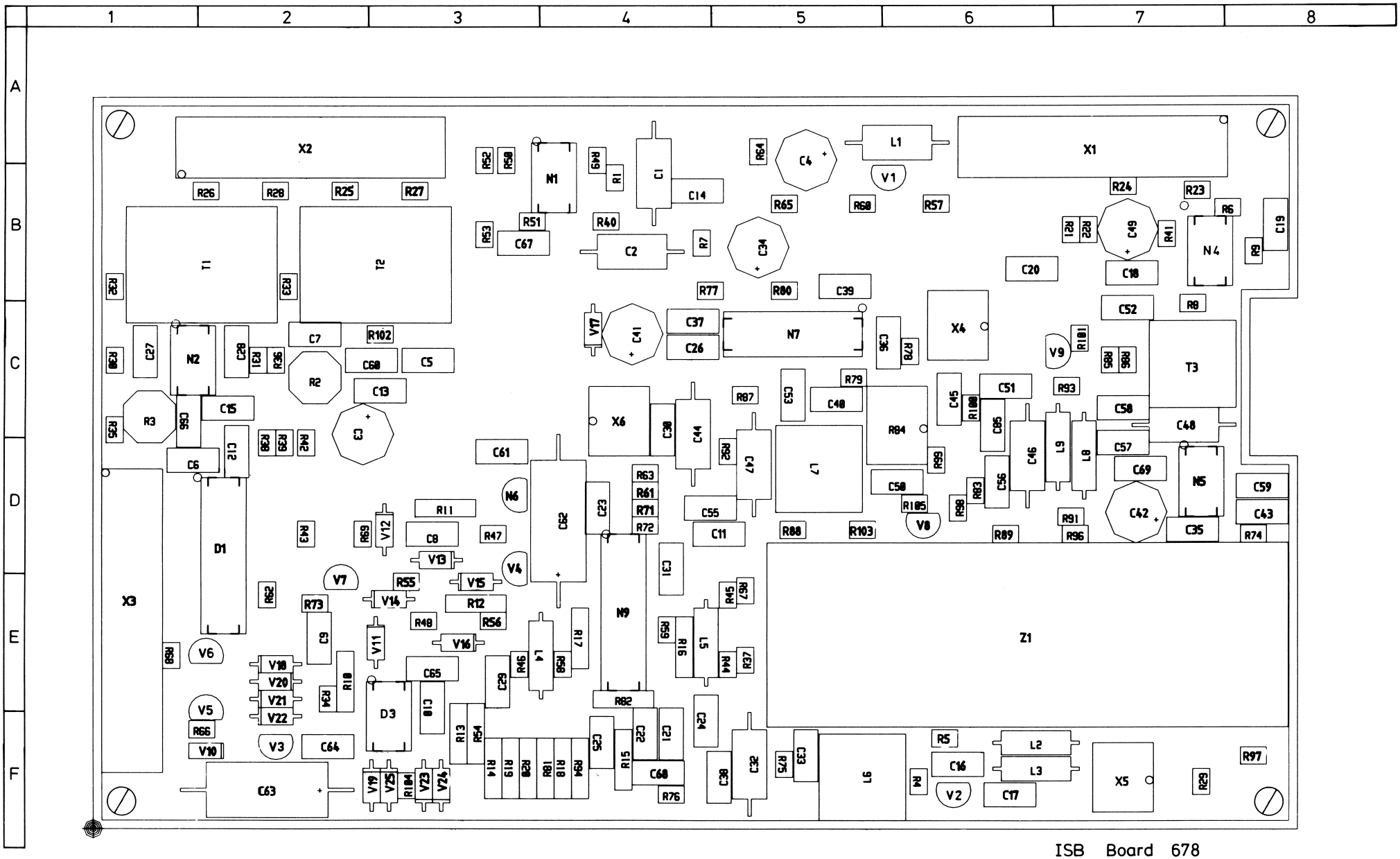
ISB Board 678

The 2. IF input signal is amplified in a grounded gate JFET amplifier before it is fed to the crystal filter which passes the sideband above 1.4 MHz, corresponding to the lower sideband of the antenna input signal. The filtered 1.4 MHz signal is amplified in the 1.4 MHz amplifier strip consisting of an integrated circuit and two bipolar transistors. The voltage gain of the amplifier strip is controlled by the AGC voltage applied to the integrated circuit.

From the IF strip the signal is fed to the Signal Detector. The integrated circuit of the Signal Detector contains a balanced mixer and a high gain limiting amplifier. The IF input is applied to one input port of the mixer while a 1.4 MHz signal generated by the 3. Local Oscillator on Synthesizer Board 611 is applied to the other port through the limiting amplifier. The difference frequency contains the wanted AF signal. The AF signal is filtered in an active Low Pass Filter and fed to the LSB Line Amplifier.

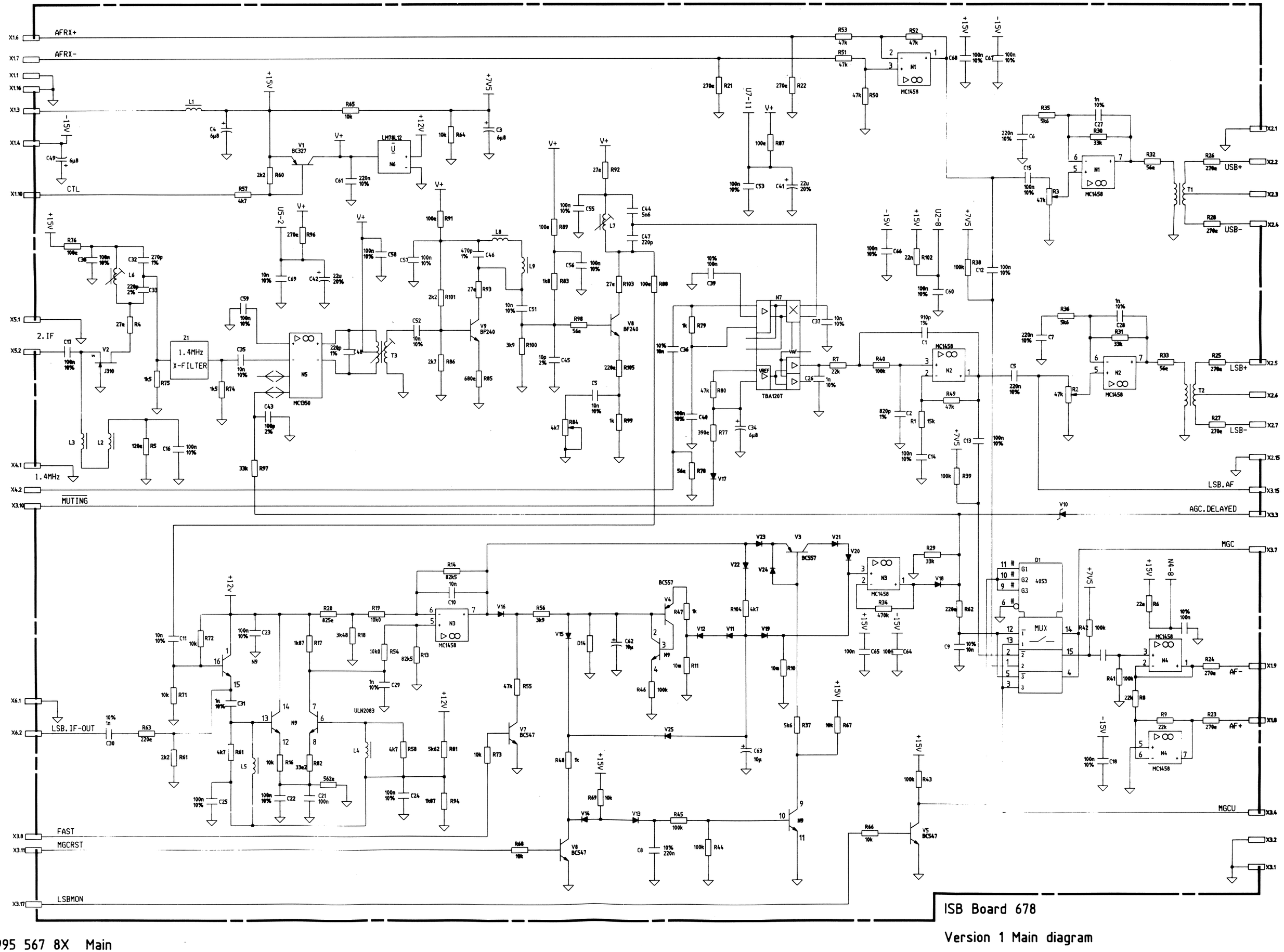
From the IF strip the signal is also fed to the AGC Detector consisting of two transistors in an integrated array. The signal which is now rectified to a dc voltage is applied to the AGC Timing Circuit. The AGC voltage from the AGC Timing Circuit controls the gain of the 1.4 MHz IF Amplifier and also, via a zener diode, the gain of the 45 MHz AGC Amplifier of the Receiver Signal Path, which is common to the USB and LSB channels. When the LSB channel is monitored the AGC voltage is also fed to the RU Control Board 674 via a switch controlled by the LSBMON signal. When manual gain control is selected the AGC circuit is disabled and the gain controlled via the MGC line by a DC voltage from the RU Control Board.

The AF output signal from The Receiver Signal Path is routed via the balanced-to-unbalanced AF Amplifier to the USB Line Amplifier. The AF signal to be monitored by the Control Unit is selected by a switch controlled by LSBMON. The LSB channel is switched off when the CTL signal is high.



ISB Board 678
Version 1
Viewed from component side

995 567 8X COMP



ISB Board 678

Version 1 Main diagram

995 567 8X Main

PARTS LIST FOR ISB BOARD 678 VERSION 1

Printed Circuit Board Complete					107 567 81
C1	910pF	1%	500V	Polyst.	615 291 00
C10	10nF	10%	50V	Polyes.	622 410 01
C11	10nF	10%	50V	Polyes.	622 410 01
C12	100nF	10%	50V	Polyes.	622 510 00
C13	100nF	10%	50V	Polyes.	622 510 00
C14	100nF	10%	50V	Polyes.	622 510 00
C15	100nF	10%	50V	Polyes.	622 510 00
C16	100nF	10%	50V	Polyes.	622 510 00
C17	100nF	10%	50V	Polyes.	622 510 00
C18	100nF	10%	50V	Polyes.	622 510 00
C19	100nF	10%	50V	Polyes.	622 510 00
C2	820pF	1%	500V	Polyst.	615 282 00
C20	100nF	10%	50V	Polyes.	622 510 00
C21	100nF	10%	50V	Polyes.	622 510 00
C22	100nF	10%	50V	Polyes.	622 510 00
C23	100nF	10%	50V	Polyes.	622 510 00
C24	100nF	10%	50V	Polyes.	622 510 00
C25	100nF	10%	50V	Polyes.	622 510 00
C26	1nF	10%	50V	Cer.	602 310 02
C27	1nF	10%	50V	Cer.	602 310 02
C28	1nF	10%	50V	Cer.	602 310 02
C29	1nF	10%	50V	Cer.	602 310 02
C3	6.8uF		20V	Sol.al.	652 668 01
C30	1nF	10%	50V	Cer.	602 310 02
C31	1nF	10%	50V	Cer.	602 310 02
C32	270pF	1%	500V	Polyst.	615 270 00
C33	120pF	2%	50V	Cer.	602 212 00
C34	6.8uF		20V	Sol.al.	652 668 01
C35	10nF	10%	50V	Polyes.	622 410 01
C36	10nF	10%	50V	Polyes.	622 410 01
C37	10nF	10%	50V	Polyes.	622 410 01
C38	100nF	10%	50V	Polyes.	622 510 00
C39	100nF	10%	50V	Polyes.	622 510 00
C4	6.8uF		20V	Sol.al.	652 668 01
C40	100nF	10%	50V	Polyes.	622 510 00
C41	22uF	20%	15V	Tan.	615 722 01
C42	22uF	20%	15V	Tan.	615 722 01
C43	100pF	2%	50V	Cer.	602 210 00
C44	5.6nF	1%	50V	Polyst.	612 356 00
C45	10pF	2%	50V	Cer.	602 110 00
C46	470pF	1%	500V	Polyst.	615 247 00
C47	220pF	1%	500V	Polyst.	615 222 00
C48	220pF	1%	500V	Polyst.	615 222 00
C49	6.8uF		20V	Sol.al.	652 668 01
C5	220nF	10%	50V	Polyes.	622 522 01
C50	10nF	10%	50V	Polyes.	622 410 01
C51	10nF	10%	50V	Polyes.	622 410 01
C52	10nF	10%	50V	Polyes.	622 410 01
C53	100nF	10%	50V	Polyes.	622 510 00
C55	100nF	10%	50V	Polyes.	622 510 00
C56	100nF	10%	50V	Polyes.	622 510 00
C57	100nF	10%	50V	Polyes.	622 510 00
C58	100nF	10%	50V	Polyes.	622 510 00
C59	100nF	10%	50V	Polyes.	622 510 00

PARTS LIST FOR ISB BOARD 678 VERSION 1

C6	220nF	10%	50V	Polyes.	622 522 01
C60	100nF	10%	50V	Polyes.	622 510 00
C61	220nF	10%	50V	Polyes.	622 522 01
C62	10uF		50V	Sol.al.	652 710 02
C63	10uF		50V	Sol.al.	652 710 02
C64	100nF	10%	50V	Polyes.	622 510 00
C65	100nF	10%	50V	Polyes.	622 510 00
C66	100nF	10%	50V	Polyes.	622 510 00
C67	100nF	10%	50V	Polyes.	622 510 00
C68	100nF	10%	50V	Polyes.	622 510 00
C69	10nF	10%	50V	Polyes.	622 410 01
C7	220nF	10%	50V	Polyes.	622 522 01
C8	220nF	10%	50V	Polyes.	622 522 01
C9	10nF	10%	50V	Polyes.	622 410 01
D1	4053				850 505 30
L1	100uH	10%			740 210 00
L2	22uH	10%			740 122 02
L3	22uH	10%			740 122 02
L4	220uH	10%			740 222 02
L5	220uH	10%			740 222 02
L6	150uH				103 578 41
L7	75uH				103 578 51
L8	4.7uH	10%			740 047 02
L9	22uH	10%			740 122 02
N1	MC1458D				850 145 80
N2	MC1458D				850 145 80
N3	MC1458D				850 145 80
N4	MC1458D				850 145 80
N5	MC1350				850 135 00
N6	LM78L12				850 781 21
N7	TBA120T				850 012 01
N9	ULN2083				850 208 30
R1	15kohm	5%	1/8W	MF	500 415 00
R10	10Mohm	5%	1/4W	MF	501 710 00
R100	3.9kohm	5%	1/8W	MF	500 339 00
R101	2.2kohm	5%	1/8W	MF	500 322 00
R102	22ohm	5%	1/8W	MF	500 122 00
R103	27ohm	5%	1/8W	MF	500 127 00
R104	4.7kohm	5%	1/8W	MF	500 347 00
R105	220ohm	5%	1/8W	MF	500 222 00
R11	10Mohm	5%	1/4W	MF	501 710 00
R12	1.5Mohm	5%	1/4W	MF	501 615 00
R13	82.5kohm	1%	1/4W	MF	511 482 50
R14	82.5kohm	1%	1/4W	MF	511 482 50
R15	562ohm	1%	1/4W	MF	511 256 20
R16	10ohm	1%	1/4W	MF	511 110 00
R17	1.87kohm	1%	1/4W	MF	511 318 70
R18	3.48kohm	1%	1/4W	MF	511 334 80
R19	10.0kohm	1%	1/4W	MF	511 410 00
R2	47kohm			Pot.	583 447 01
R20	825ohm	1%	1/4W	MF	511 282 50
R21	270ohm	5%	1/8W	MF	500 227 00

PARTS LIST FOR ISB BOARD 678 VERSION 1

R22	270ohm 5%	1/8W	MF	500 227 00
R23	270ohm 5%	1/8W	MF	500 227 00
R24	270ohm 5%	1/8W	MF	500 227 00
R25	270ohm 5%	1/8W	MF	500 227 00
R26	270ohm 5%	1/8W	MF	500 227 00
R27	270ohm 5%	1/8W	MF	500 227 00
R28	270ohm 5%	1/8W	MF	500 227 00
R29	33kohm 5%	1/8W	MF	500 433 00
R3	47kohm		Pot.	583 447 01
R30	33kohm 5%	1/8W	MF	500 433 00
R31	33kohm 5%	1/8W	MF	500 433 00
R32	56ohm 5%	1/8W	MF	500 156 00
R33	56ohm 5%	1/8W	MF	500 156 00
R34	470kohm 5%	1/8W	MF	500 547 00
R35	5.6kohm 5%	1/8W	MF	500 356 00
R36	5.6kohm 5%	1/8W	MF	500 356 00
R37	5.6kohm 5%	1/8W	MF	500 356 00
R38	100kohm 5%	1/8W	MF	500 510 00
R39	100kohm 5%	1/8W	MF	500 510 00
R4	27ohm 5%	1/8W	MF	500 127 00
R40	100kohm 5%	1/8W	MF	500 510 00
R41	100kohm 5%	1/8W	MF	500 510 00
R42	100kohm 5%	1/8W	MF	500 510 00
R43	100kohm 5%	1/8W	MF	500 510 00
R44	100kohm 5%	1/8W	MF	500 510 00
R45	100kohm 5%	1/8W	MF	500 510 00
R46	100kohm 5%	1/8W	MF	500 510 00
R47	1kohm 5%	1/8W	MF	500 310 00
R48	1kohm 5%	1/8W	MF	500 310 00
R49	47kohm 5%	1/8W	MF	500 447 00
R5	120ohm 5%	1/8W	MF	500 212 00
R50	47kohm 5%	1/8W	MF	500 447 00
R51	47kohm 5%	1/8W	MF	500 447 00
R52	47kohm 5%	1/8W	MF	500 447 00
R53	47kohm 5%	1/8W	MF	500 447 00
R54	10.0kohm 1%	1/4W	MF	511 410 00
R55	47kohm 5%	1/8W	MF	500 447 00
R56	3.9kohm 5%	1/8W	MF	500 339 00
R57	4.7kohm 5%	1/8W	MF	500 347 00
R58	4.7kohm 5%	1/8W	MF	500 347 00
R59	4.7kohm 5%	1/8W	MF	500 347 00
R6	22ohm 5%	1/8W	MF	500 122 00
R60	2.2kohm 5%	1/8W	MF	500 322 00
R61	2.2kohm 5%	1/8W	MF	500 322 00
R62	220ohm 5%	1/8W	MF	500 222 00
R63	220ohm 5%	1/8W	MF	500 222 00
R64	10kohm 5%	1/8W	MF	500 410 00
R65	10kohm 5%	1/8W	MF	500 410 00
R66	10kohm 5%	1/8W	MF	500 410 00
R67	10kohm 5%	1/8W	MF	500 410 00
R68	10kohm 5%	1/8W	MF	500 410 00
R69	10kohm 5%	1/8W	MF	500 410 00
R7	22kohm 5%	1/8W	MF	500 422 00
R71	10kohm 5%	1/8W	MF	500 410 00
R72	10kohm 5%	1/8W	MF	500 410 00
R73	10kohm 5%	1/8W	MF	500 410 00

PARTS LIST FOR ISB BOARD 678 VERSION 1

R74	1.5kohm 5%	1/8W	MF	500 315 00
R75	1.5kohm 5%	1/8W	MF	500 315 00
R76	100ohm 5%	1/8W	MF	500 210 00
R77	390ohm 5%	1/8W	MF	500 239 00
R78	56ohm 5%	1/8W	MF	500 156 00
R79	1kohm 5%	1/8W	MF	500 310 00
R8	22kohm 5%	1/8W	MF	500 422 00
R80	4.7kohm 5%	1/8W	MF	500 347 00
R81	5.62kohm 1%	1/4W	MF	511 356 20
R82	33.2ohm 1%	1/4W	MF	511 133 20
R83	1.8kohm 5%	1/8W	MF	500 318 00
R84	4.7kohm		Pot.	582 347 00
R85	680ohm 5%	1/8W	MF	500 268 00
R86	2.7kohm 5%	1/8W	MF	500 327 00
R87	100ohm 5%	1/8W	MF	500 210 00
R88	100ohm 5%	1/8W	MF	500 210 00
R89	100ohm 5%	1/8W	MF	500 210 00
R9	22kohm 5%	1/8W	MF	500 422 00
R91	100ohm 5%	1/8W	MF	500 210 00
R92	27ohm 5%	1/8W	MF	500 127 00
R93	27ohm 5%	1/8W	MF	500 127 00
R94	1.87kohm 1%	1/4W	MF	511 318 70
R96	270ohm 5%	1/8W	MF	500 227 00
R97	33kohm 5%	1/8W	MF	500 433 00
R98	56ohm 5%	1/8W	MF	500 156 00
R99	1kohm 5%	1/8W	MF	500 310 00
T1	600ohm			802 000 00
T2	600ohm			802 000 00
T3	70uH 1.4MHz			103 577 81
V1	BC327			840 032 70
V10	BZX79B5V6			832 795 60
V11	1N4148			830 414 80
V12	1N4148			830 414 80
V13	1N4148			830 414 80
V14	1N4148			830 414 80
V15	1N4148			830 414 80
V16	1N4148			830 414 80
V17	1N4148			830 414 80
V18	1N4148			830 414 80
V19	1N4148			830 414 80
V2	J310			840 031 03
V20	1N4148			830 414 80
V21	1N4148			830 414 80
V22	1N4148			830 414 80
V23	1N4148			830 414 80
V24	1N4148			830 414 80
V25	1N4148			830 414 80
V3	BC557			840 055 70
V4	BC557			840 055 70
V5	BC547			840 054 70
V6	BC547			840 054 70
V7	BC547			840 054 70
V8	BF240			840 024 00
V9	BF240			840 024 00

PARTS LIST FOR ISB BOARD 678 VERSION 1

X1	16-pole	756 016 00
X2	16-pole	756 016 00
X3	20-pole	756 020 03
X4	2-pole	756 001 45
X5	2-pole	756 001 45
X6	2-pole	756 001 45
Z1	1.4MHz Crystal filter	385 244 12

TECNICAL DESCRIPTION

FSK Board 679

The FSK Board contains a microprocessor part and a FSK demodulator part.

The microprocessor part controls the frequency synthesizer and the programmable filters. Futhermore it controls the FSK data line, sets up the baudrate for communication according to the DIP switch setting, and selects the input signal to be LSB or USB.

The input to the FSK demodulator part is digitized in a comparator. Signals above -30 dBm can be handled. Controlled by the synthesizer the outputs of the two flip flops will be the mark and space frequencies selected. These outputs are mixed with the input signal in an Exclusive-OR gate.

The mixer output from the mark channel respectively the space channel are low pass filtered in second order Butterworth filters. The bandwidths of these filters are controlled by the microprocessor to match the baudrate selected. The filters are designed to operate with baudrates ranging from 50 to 750 baud in 50 baud steps. Next the filter outputs are fed to precision full wave rectifiers.

Before the outputs of the mark and space channels are added in a differential amplifier each channel has its DC level lowered according to the output of a peak detector. This allows the demodulator to function even when one of the tones has faded out. The discharge time of the peak detektor is approximately 1 S.

The output of the differential amplifier will have one polarity for space and the opposite for mark. This signal is led to another second order Butterworth filter. The bandwidth of this filter is also controlled according to the baudrate.

The output from the filter is fed into a first order low pass filter. The corner frequency of this filter is 3.8 kHz. The reason for this filter is the connection of the diversity input/output line to this point. That is the predetection outputs of two demodulators can be added together here.

From the first order filter the signal is fed into a comparator where the detection takes place. An Exclusive-OR gate is used to implement the FSK data invert and the FSK data out enable functions. Lastly the demodulated FSK data are fed into a line driver that implements the V28 interface.

995 567 9X COMP

FSK Board 679
Version 2
Viewed from component side

FSK BOARD 679

VERSION 2 SUB DIAGRAM 1 OF 2

995 567 9X SUB 1

FSK Board 679

Version 2 Sub diagram 2 of 2

995 567 9X Sub 2

PARTS LIST FOR FSK BOARD 679 VERSION 2

Printed Circuit Board Complete					107 567 91
C1	33pF	5%	400V	Cer.	605 133 00
C10	220nF	10%	50V	Polyes.	622 522 01
C11	220nF	10%	50V	Polyes.	622 522 01
C12	1nF	10%	50V	Cer.	602 310 02
C13	1nF	10%	50V	Cer.	602 310 02
C14	1nF	10%	50V	Cer.	602 310 02
C15	1nF	10%	50V	Cer.	602 310 02
C16	1nF	10%	50V	Cer.	602 310 02
C17	1nF	10%	50V	Cer.	602 310 02
C18	1nF	10%	50V	Cer.	602 310 02
C19	1nF	10%	50V	Cer.	602 310 02
C2	33pF	5%	400V	Cer.	605 133 00
C20	1nF	10%	50V	Cer.	602 310 02
C22	10nF	10%	50V	Polyes.	622 410 01
C23	22nF	10%	50V	Polyes.	622 422 00
C24	47nF	10%	400V	Polyes.	622 447 01
C25	6.8uF		20V	Sol.al.	652 668 01
C26	6.8uF		20V	Sol.al.	652 668 01
C27	6.8uF		20V	Sol.al.	652 668 01
C28	6.8uF		20V	Sol.al.	652 668 01
C29	6.8uF		20V	Sol.al.	652 668 01
C3	22uF	20%	20V	Tan.	652 722 00
C30	6.8uF		20V	Sol.al.	652 668 01
C31	6.8uF		20V	Sol.al.	652 668 01
C32	27nF	1%	50V	Polyst.	612 427 00
C33	27nF	1%	50V	Polyst.	612 427 00
C34	27nF	1%	50V	Polyst.	612 427 00
C35	27nF	1%	50V	Polyst.	612 427 00
C36	27nF	1%	50V	Polyst.	612 427 00
C37	27nF	1%	50V	Polyst.	612 427 00
C38	27nF	1%	50V	Polyst.	612 427 00
C39	27nF	1%	50V	Polyst.	612 427 00
C40	27nF	1%	50V	Polyst.	612 427 00
C41	27nF	1%	50V	Polyst.	612 427 00
C42	27nF	1%	50V	Polyst.	612 427 00
C43	27nF	1%	50V	Polyst.	612 427 00
C44	100nF	10%	50V	Polyes.	622 510 00
C45	100nF	10%	50V	Polyes.	622 510 00
C47	100nF	10%	50V	Polyes.	622 510 00
C48	100nF	10%	50V	Polyes.	622 510 00
C5	220nF	10%	50V	Polyes.	622 522 01
C50	100nF	10%	50V	Polyes.	622 510 00
C51	100nF	10%	50V	Polyes.	622 510 00
C52	100nF	10%	50V	Polyes.	622 510 00
C54	100nF	10%	50V	Polyes.	622 510 00
C55	100nF	10%	50V	Polyes.	622 510 00
C56	100nF	10%	50V	Polyes.	622 510 00
C57	100nF	10%	50V	Polyes.	622 510 00
C58	100nF	10%	50V	Polyes.	622 510 00
C59	100nF	10%	50V	Polyes.	622 510 00
C6	220nF	10%	50V	Polyes.	622 522 01
C60	100nF	10%	50V	Polyes.	622 510 00
C62	100nF	10%	50V	Polyes.	622 510 00
C65	100nF	10%	50V	Polyes.	622 510 00

PARTS LIST FOR FSK BOARD 679 VERSION 2

C66	100nF	10%	50V	Polyes.	622 510 00
C68	100nF	10%	50V	Polyes.	622 510 00
C69	100nF	10%	50V	Polyes.	622 510 00
C7	220nF	10%	50V	Polyes.	622 522 01
C70	100nF	10%	50V	Polyes.	622 510 00
C71	100nF	10%	50V	Polyes.	622 510 00
C72	1nF	10%	50V	Cer.	602 310 02
C74	100nF	10%	50V	Polyes.	622 510 00
C75	100nF	10%	50V	Polyes.	622 510 00
C76	100nF	10%	50V	Polyes.	622 510 00
C77	100nF	10%	50V	Polyes.	622 510 00
C78	100nF	10%	50V	Polyes.	622 510 00
C79	100nF	10%	50V	Polyes.	622 510 00
C8	220nF	10%	50V	Polyes.	622 522 01
C80	100nF	10%	50V	Polyes.	622 510 00
C82	100nF	10%	50V	Polyes.	622 510 00
C83	100nF	10%	50V	Polyes.	622 510 00
C84	100nF	10%	50V	Polyes.	622 510 00
C85	100nF	10%	50V	Polyes.	622 510 00
C86	100nF	10%	50V	Polyes.	622 510 00
C87	1nF	10%	50V	Cer.	602 310 02
C88	1nF	10%	50V	Cer.	602 310 02
C89	1nF	10%	50V	Cer.	602 310 02
C9	220nF	10%	50V	Polyes.	622 522 01
C90	1nF	10%	50V	Cer.	602 310 02
C91	1nF	10%	50V	Cer.	602 310 02
C92	1nF	10%	50V	Cer.	602 310 02
C93	1nF	10%	50V	Cer.	602 310 02
C94	1nF	10%	50V	Cer.	602 310 02
C95	1nF	10%	50V	Cer.	602 310 02
C96	1nF	10%	50V	Cer.	602 310 02

D1	74HC132	857 413 22
D10	6303	850 630 30
D11	4053	850 505 30
D15	MC14052	851 405 20
D16	HC4066	850 406 60
D17	HC4066	850 406 60
D18	HC4066	850 406 60
D19	HC4066	850 406 60
D2	27C256	852 725 60
D20	HC4066	850 406 60
D21	HC4066	850 406 60
D22	HC4066	850 406 60
D23	HC4066	850 406 60
D24	74HC86	850 748 60
D25	74HC86	850 748 60
D28	74HC74	850 747 42
D29	74HC74	850 747 42
D3	MC145406	851 454 06
D30	74HC74	850 747 42
D4	6321P	850 632 10
D5	145157	851 451 57
D6	74HC138	857 413 81
D7	6340	850 634 00
D8	5517	850 551 70

PARTS LIST FOR FSK BOARD 679 VERSION 2

D9	74HC573				857 457 30
L1	100uH	10%			740 210 00
L2	100uH	10%			740 210 00
L3	100uH	10%			740 210 00
N1	LF353				850 035 30
N2	LF353				850 035 30
N3	LF353				850 035 30
N4	LF353				850 035 30
N5	LF353				850 035 30
N6	LF353				850 035 30
N7	LF353				850 035 30
N8	LF353				850 035 30
N9	LM7805				850 780 50
N10	LM78L12				850 781 21
N11	LM79L12				850 791 21
N12	LM2903				850 290 30
N13	LM2903				850 290 30
R1	30.1kohm	1%	1/4W	MF	511 430 10
R10	100kohm	5%	1/8W	MF	500 510 00
R100	48.7kohm	1%	1/4W	MF	511 448 70
R101	48.7kohm	1%	1/4W	MF	511 448 70
R102	48.7kohm	1%	1/4W	MF	511 448 70
R103	48.7kohm	1%	1/4W	MF	511 448 70
R104	48.7kohm	1%	1/4W	MF	511 448 70
R11	100kohm	5%	1/8W	MF	500 510 00
R12	5.6kohm	5%	1/8W	MF	500 356 00
R13	5.6kohm	5%	1/8W	MF	500 356 00
R14	5.6kohm	5%	1/8W	MF	500 356 00
R15	100ohm	5%	1/8W	MF	500 210 00
R16	1Mohm	5%	1/8W	MF	500 610 00
R17	47kohm	5%	1/8W	MF	500 447 00
R18	47kohm	5%	1/8W	MF	500 447 00
R19	47kohm	5%	1/8W	MF	500 447 00
R2	30.1kohm	1%	1/4W	MF	511 430 10
R20	47kohm	5%	1/8W	MF	500 447 00
R21	10kohm	5%	1/8W	MF	500 410 00
R22	10kohm	5%	1/8W	MF	500 410 00
R23	22kohm	5%	1/8W	MF	500 422 00
R24	22kohm	5%	1/8W	MF	500 422 00
R25	47kohm	5%	1/8W	MF	500 447 00
R26	47kohm	5%	1/8W	MF	500 447 00
R27	150kohm	5%	1/8W	MF	500 515 00
R28	150kohm	5%	1/8W	MF	500 515 00
R29	59.0kohm	1%	1/4W	MF	511 459 00
R3	51.1kohm	1%	1/4W	MF	511 451 10
R30	20.5kohm	1%	1/4W	MF	511 420 50
R31	20.5kohm	1%	1/4W	MF	511 420 50
R32	20.5kohm	1%	1/4W	MF	511 420 50
R33	20.5kohm	1%	1/4W	MF	511 420 50
R34	20.5kohm	1%	1/4W	MF	511 420 50
R35	20.5kohm	1%	1/4W	MF	511 420 50
R36	20.5kohm	1%	1/4W	MF	511 420 50
R37	20.5kohm	1%	1/4W	MF	511 420 50

PARTS LIST FOR FSK BOARD 679 VERSION 2

R38	20.5kohm	1%	1/4W	MF	511 420 50
R39	20.5kohm	1%	1/4W	MF	511 420 50
R4	51.1kohm	1%	1/4W	MF	511 451 10
R40	20.5kohm	1%	1/4W	MF	511 420 50
R41	20.5kohm	1%	1/4W	MF	511 420 50
R42	20.5kohm	1%	1/4W	MF	511 420 50
R43	20.5kohm	1%	1/4W	MF	511 420 50
R44	20.5kohm	1%	1/4W	MF	511 420 50
R45	20.5kohm	1%	1/4W	MF	511 420 50
R46	20.5kohm	1%	1/4W	MF	511 420 50
R47	20.5kohm	1%	1/4W	MF	511 420 50
R48	20.5kohm	1%	1/4W	MF	511 420 50
R49	20.5kohm	1%	1/4W	MF	511 420 50
R5	59.0kohm	1%	1/4W	MF	511 459 00
R50	95.3kohm	1%	1/4W	MF	511 495 30
R51	95.3kohm	1%	1/4W	MF	511 495 30
R52	95.3kohm	1%	1/4W	MF	511 495 30
R53	95.3kohm	1%	1/4W	MF	511 495 30
R54	95.3kohm	1%	1/4W	MF	511 495 30
R55	95.3kohm	1%	1/4W	MF	511 495 30
R56	95.3kohm	1%	1/4W	MF	511 495 30
R57	95.3kohm	1%	1/4W	MF	511 495 30
R58	196kohm	1%	1/4W	MF	511 519 60
R59	196kohm	1%	1/4W	MF	511 519 60
R6	100kohm	1%	1/4W	MF	511 510 00
R60	196kohm	1%	1/4W	MF	511 519 60
R61	196kohm	1%	1/4W	MF	511 519 60
R62	196kohm	1%	1/4W	MF	511 519 60
R63	196kohm	1%	1/4W	MF	511 519 60
R64	196kohm	1%	1/4W	MF	511 519 60
R65	196kohm	1%	1/4W	MF	511 519 60
R66	4.7kohm	5%	1/8W	MF	500 347 00
R67	4.7kohm	5%	1/8W	MF	500 347 00
R68	4.7kohm	5%	1/8W	MF	500 347 00
R69	4.7kohm	5%	1/8W	MF	500 347 00
R7	100kohm	1%	1/4W	MF	511 510 00
R70	560kohm	5%	1/8W	MF	500 556 00
R71	1kohm	1%	1/4W	MF	511 310 00
R72	1kohm	1%	1/4W	MF	511 310 00
R73	1kohm	5%	1/8W	MF	500 310 00
R74	10kohm	5%	1/8W	MF	500 410 00
R75	10kohm	5%	1/8W	MF	500 410 00
R76	10kohm	5%	1/8W	MF	500 410 00
R77	10kohm	5%	1/8W	MF	500 410 00
R78	10kohm	5%	1/8W	MF	500 410 00
R79	10kohm	5%	1/8W	MF	500 410 00
R8	12kohm	5%	1/8W	MF	500 412 00
R80	10kohm	5%	1/8W	MF	500 410 00
R81	10kohm	5%	1/8W	MF	500 410 00
R82	10kohm	5%	1/8W	MF	500 410 00
R83	10kohm	5%	1/8W	MF	500 410 00
R84	10kohm	5%	1/8W	MF	500 410 00
R85	24.9kohm	1%	1/4W	MF	511 424 90
R86	24.9kohm	1%	1/4W	MF	511 424 90
R87	24.9kohm	1%	1/4W	MF	511 424 90
R88	24.9kohm	1%	1/4W	MF	511 424 90

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R89	24.9kohm	1%	1/4W	MF	511 424 90
R9	100kohm	5%	1/8W	MF	500 510 00
R90	24.9kohm	1%	1/4W	MF	511 424 90
R91	24.9kohm	1%	1/4W	MF	511 424 90
R92	24.9kohm	1%	1/4W	MF	511 424 90
R93	48.7kohm	1%	1/4W	MF	511 448 70
R94	48.7kohm	1%	1/4W	MF	511 448 70
R95	48.7kohm	1%	1/4W	MF	511 448 70
R96	48.7kohm	1%	1/4W	MF	511 448 70
R97	48.7kohm	1%	1/4W	MF	511 448 70
R98	48.7kohm	1%	1/4W	MF	511 448 70
R99	48.7kohm	1%	1/4W	MF	511 448 70
S1	DIP-switch				762 000 26
V1	1N4001				831 400 10
V10	1N4148				830 414 80
V11	1N4148				830 414 80
V12	1N4148				830 414 80
V13	1N4148				830 414 80
V2	1N4148				830 414 80
V3	1N4148				830 414 80
V4	1N4148				830 414 80
V5	1N4148				830 414 80
V6	1N4148				830 414 80
V7	1N4148				830 414 80
V8	1N4148				830 414 80
V9	1N4148				830 414 80
X1	P16PPV3M	16-pole connector			756 016 00
X2	P16PPV3M	16-pole connector			756 016 00
Z1	YR8M	8MHz X-tal			812 000 04

9. AMENDMENTS

Appendix 1

Full Remote Control

This section describes the facilities for full remote control operation of the R 8000 receiver. To enable full remote control the Control Unit of the receiver must be equipped with the Notch Filter and Remote Control Board 680 and the Control and Audio Board 681.

INTRODUCTION

The Full Remote Control option provides for remote control of all operating functions of the R 8000 receiver (except Supply ON/OFF).

An RS 485 serial interface allows up to 32 receivers to be connected to a control line consisting of a twisted pair which may be up to 1000 m in length. Another balanced line carries the AF monitoring signal.

Each receiver may be individually addressed. Up to 99 receivers may be addressed. A controlled receiver (slave) transfers its operating status to the controller and will also display its status locally. Volume, speaker, and dimmer functions may be operated locally while the receiver is acting as a slave.

Any receiver Control Unit may be used as a master, controlling any of the receivers in the group. Only one master is allowed at a time. When acting as a master the Control Unit displays the status and monitors the AF output of the slave and is operated as if it was operated locally. The receiver part of the master continues to operate on its current setting.

OPERATION

Description of REMOTE key.

o REMOTE	For switching between local/remote operation. Local operation is disabled when the indicator is ON or flashing.

Description of REMOTE Indicator.

Indicator OFF: Local operation.

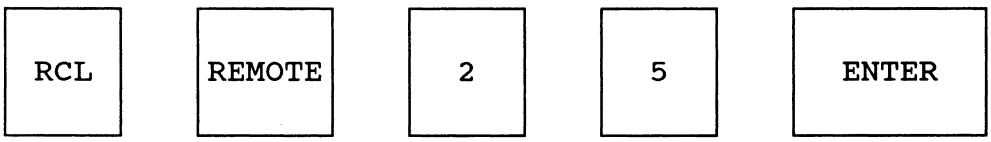
Slow Flashing: Local operation disabled,
ready to be remote controlled as a slave.

Flashing: The receiver is remote controlled (slave).

Indicator ON: The receiver is controlling a remote
receiver (is master).

SELECTING A REMOTE CONTROL ADDRESS (e.g. No. 25)

The receiver must be in local mode, i.e. REMOTE Indicator OFF



1 Press "RCL"
Left-hand display field is cleared

2 Press "REMOTE"
The current address is shown in the PROG display

3 To change the address, press the desired number (1-99)

4 Press "ENTER"
The display is restored to its initial state.
The number entered is now the current address which will be used when remote control is initiated by pressing the REMOTE Key.

Note: Entering the number 0 and subsequently pressing the REMOTE Key will disable local control and enable the receiver to be remote controlled.

If the address cannot be changed, the receiver is configured to a fixed address.

INITIATING REMOTE CONTROL

Press "REMOTE"
The REMOTE indicator turns ON to indicate that the receiver is now acting as a master, controlling the receiver with the selected address. At the same time the front panel status will change to show the settings of the slave, and the AF signal of the slave receiver will sound in the loudspeaker or the headphone.

The slave receiver may now be operated from the front panel of the master just as if it was operated locally.

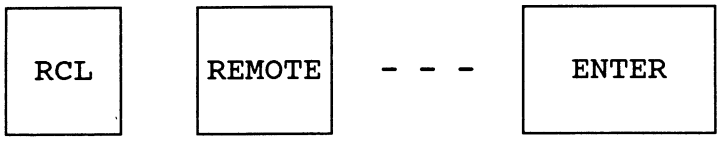
Volume, speaker and dimmer functions are local functions which are not transferred to the slave.

The receiver part of the master continues to operate on its current setting with AF output at the line output(s).

Note: If the remote control line is busy or disconnected, a low-note beep sounds and the receiver returns to local operation.

A slow flashing REMOTE Indicator means that remote control address 0 was selected to disable local operation and enable the receiver to be remote controlled as a slave.

VIEWING THE ADDRESS OF THE SLAVE RECEIVER (on master)



1 Press "RCL"
Left-hand display field is cleared

2 Press "REMOTE"
Read the address of the slave in the PROG display

3 Press "ENTER"
The display is restored to its initial state

TERMINATING REMOTE CONTROL (on master)

Press "REMOTE"
The REMOTE Indicator turns OFF. The front panel returns to local status display and operation.

LOCAL OPERATION OF A SLAVE RECEIVER

Volume, Speaker and Dimmer functions can be operated locally even when the receiver is remote controlled.

Operation of all other functions is inhibited when the receiver is in remote control mode, which is indicated by a flashing REMOTE Indicator.

Operation of the REMOTE key is dependent on the priority of the master, (see below).

PRIORITY

Each receiver in the group is given a priority which determines to what extent it can force another receiver to be remote controlled. Following priority levels are possible:

0 The receiver can operate as a slave only.

1 The receiver can be master for receivers on which remote control is enabled (REMOTE Indicator slow flashing). Remote control can be interrupted on the slave with the REMOTE key.

2 The receiver can be master for receivers on which remote control enabled (REMOTE Indicator slow flashing). Remote control cannot be interrupted on the slave with the REMOTE key.

3 The receiver can be master for any receiver, irrespective of REMOTE/LOCAL selection on the slave.

4 The receiver can be master for any receiver, irrespective of REMOTE/LOCAL selection on the slave. The slave remains in REMOTE after remote control (REMOTE Indicator slow flashing).

5 The receiver can be master for any receiver, irrespective of REMOTE/LOCAL selection on the slave. The slave remains in REMOTE and selection of LOCAL is inhibited after remote control. (REMOTE Indicator slow flashing).

The priority level of the receiver may be viewed or changed in the configuration mode, see section [3.6], Configuration.

INSTALLATION

THE RS-485 INTERFACE STANDARD

The serial data interface standard RS-485 defined by EIA is a multipoint interface, intended to allow up to 32 driver-receiver pairs on a common data bus. It uses differential data transmission to cancel the effects of ground shifts and noise signals. Data rates of up to 100 kbps are possible on a twisted pair line of up to 1000 meters length using a terminating resistor of 120 ohms at each end.

The RS-485 terminals on the receiver are named REMCTL+ and REMCTL- and are located at pin 4 and pin 5 of the "AUX 1" socket. The RS-485 interface permits a number of receivers to be interconnected directly.

THE RS-232 INTERFACE

The receiver is also equipped with a serial interface circuit which conforms electrically to the EIA standard RS-232-C. The terminals are pin 2 and pin 3 of the"AUX 1" socket. Pin 2, TXREM, is the input terminal and pin 3, RXREM is the output terminal. The RS-232 interface permits a computer or a telephone line modem to be connected directly to the receiver.

RS-232/RS-485 CONVERSION

The receiver contains a circuit which coverts the RS-485 interface signals to the internally used RS-232 interface signals. Fig.1 shows a simplified diagram of this circuit.

By moving a pair of jumpers on PCB 680 it is possible to reverse the direction of the conversion process, as illustrated in fig. 2. With the jumpers in this position the conversion is performed between the external RS-232 interface terminals of the receiver and the RS-485 interface terminals. The receiver itself is controlled via the RS-232 interface.

This facility makes it possible to control a number of receivers via an RS-232 interface.

The PCB 680 is located in the Control Unit of the receiver. To gain access to the jumpers, loosen the six screws at the rear side of the Control Unit and lift off the back panel. The jumpers are now accessible at the soldering side of PCB 680. Both jumpers must be shifted one position so that no space are left between them. The position nearest the edge of the printed circuit board is the REVERSE position.

AUDIO MONITORING

A built-in audio switching system permits the receivers to be connected to a common balanced AF monitoring line which may consist of a twisted pair of lines. A receiver operating as a slave will connect its audio output to the common line and a receiver operating as a master will have its audio amplifier input connected to the line, as illustrated in fig. 3. All other receivers will be disconnected from the line.

The audio monitoring terminals are named REMAF+ and REMAF- and are located at pin 9 and pin 22 of the "AUX 1" socket. The impedance level of the balanced output of a slave receiver is 600 ohms and the peak output level between -6 dBm and 0 dBm if the output is loaded with 600 ohms.

INTERCONNECTION OF A GROUP OF RECEIVERS

Fig. 4 shows the connections necessary for interconnection of a group of receivers. All connections are made to the "AUX 1" socket which is located at the rear of the receiver. The two twisted pair lines for control data signals and AF monitoring signals respectively may be contained in the same cable and the GND interconnection be the screen of this cable. The maximum length is 1000 m.

CONNECTING A HOST COMPUTER

Fig. 5 shows how a group of receivers may be connected to a host computer with an RS-232 interface.

One of the receivers is selected to perform the RS-232/ RS-485 conversion. The jumper on PCB 680 of this receiver must be moved to the REVERSE position, as described above. The control data output of the computer is connected to TXREM of this receiver and RXREM to the revertive data input.

The computer can operate as a master for any of the receivers in the group. Additionally any receiver, except receiver A, may act as a master for any other receiver. Receiver A can only be controlled from the computer.

REMOTE CONTROL VIA TELEPHONE LINE MODEMS

Fig. 6 shows how telephone line modems may be inserted to make remote control over longer distances possible.

The modems are connected to the RS-232 interface of the receivers A and B. In the case illustrated receiver B performs the RS-232/RS-485 conversion i.e. the jumper on PCB 680 of this receiver must be moved to the REVERSE position as described above.

Receiver A can operate as a master for any of the receivers. Additionally any receiver, except receiver B, may act as a master for any other receiver, except receiver B.

The audio monitoring line may be extended to receiver A by using special simultaneous voice and data modems or by using

a separate line for that purpose.

The data rate of the receivers may be selected in the range 300 to 9600 bauds to suit the modems used.

DISABLING OF SUPPLY ON/OFF SWITCH

In remote control applications it may be desirable to disable the SUPPLY ON/OFF switch on the front panel of the Control Unit.

To disable the SUPPLY ON/OFF switch remove the bottom cover o the Receiver Unit and the cover of the Power Supply Assembly and move the jumper X11 on PCB 671 to the position nearest th middle of the printed circuit board.

CONFIGURATION

The receivers in a remote control installation must be configured on certain functions to be able to work together. The relevant configuration parameters are listed below.

To select the configuration mode press "PROG" "9" "9" "ENTER". The number 99 is shown in the PROG display and the FREQUENCY display is cleared. Enter the Password by pressing "9" "9" "9" "ENTER". For each of the three key-strokes of the password a "]" sign is displayed and at ENTER the PROG LED starts flashing at a faster rate.

Note: 999 is the default password. In case another password has been selected, this must be entered instead.

Now the desired configuration function number is entered. The number will be displayed in the PROG display and when ENTER is pressed the current value of the configurable parameter is shown in the FREQUENCY display.

The value may be changed by means of the numeric keys and entered by means of the ENTER key. Another configuration function number may then be selected. The configuration mode is terminated by pressing the PROG key.

Configuration functions:

No.	Function	Parameter	Value
92	Remote control address selection (master)	Front Panel Fixed	0 1-99
	(Normally set to 0 for front panel selection of the slave receiver address. A fixed address may be used if only one slave is controlled.)		
	or		
	Address of Master (slave only)	All masters can control the receiver Only the master with	0

		the specified number can control the receiver.	1-99

(When remote control priority is set to Slave Only, i.e. configuration function 95 = 0, a particular master may be allocated to the receiver.)

93	Remote Control Serial Interface *)	Baud rate (Bits/sec)	300 600 1200 2400 4800 9600

(Normally set to 9600 bits/sec for fastest response. The lower baud rates are for adaptation to telephone line modems.)

94	Remote Control Serial Interface Word Selection*)	7 bits even parity 2 stop bits	0
		7 bits odd parity 2 stop bits	1
		7 bits even parity 1 stop bit	2
		7 bits odd parity 1 stop bit	3
		8 bits 2 stop bits	4
		8 bits 1 stop bit	5
		8 bits even parity 1 stop bit	6
		8 bits odd parity 1 stop bit	7

(Normally set to 3. The other values are for adaptation to various host computers.)

95	Remote Control Priority	Slave only	0
		Respects REM/LOCAL selection on slave	1
		Respects REM/LOCAL selection on slave but not interruption	2

		Overrides REM/LOCAL selection on slave. Slave returns to LOCAL after remote control	3
		Overrides REM/LOCAL selection on slave. Slave remains in REM after remote control	4
		Overrides REM/LOCAL selection on slave. Selection of LOCAL on slave not possible after remote control	5

(This function determines the 'rank' of the receiver when it acts as a master.)

96	Remote Control Type *)	Disabled	0
		Autotelex	1
		Autotelex with TX commands retransmitted	2
		Autotelex with TX commands retransmitted and embedded acknowledge	3
		Remote frequency selection	4
		Full remote control	5

(Must be set to 5.)

97	Own Remote Control Address	No.	1-99

(This is the address to which the receiver responds as a slave. Each receiver in a group must have its own individual address.)

98	Own Remote Control Listen Only Address	No.	0-99

(Normally set to 0. When set to 1-99 the receiver responds to that address as a slave, except that no revertive information and no monitoring audio is sent to the master. The function permits simultaneous operation of diversity receivers.)

*) The Supply must be switched OFF/ON to accomplish a change.

Remarks to the selection of password:
VOLUME, DIMMER and SPEAKR key functions are not transferred from master to slave in remote control applications. This means that it is possible to make the configuration of the receiver a local function by selecting a password which contains one or more of the above keys in the sequence.

AUXILIARY SOCKET 1 (AUX 1)

25-pole type D connector.

Pin	Designation	I/O	Signal Level	Description
1	GND			
2	TXREM	In	RS-232-C	Remote Control Data
3	RXREM	Out	RS-232-C	Remote Control Data
4	REMCTL+	I/O	RS-485	Remote Control Data
5	REMCTL-	I/O	RS-485	Remote Control Data
6	SPEAKER+	Out	0 to 5 W	8 ohm load pin 6-19
7	AF OUT	Out	0 to 10 m	500 ohm load. Controlled by VOL.
8	CENTER (LINE)			Line out center tap
9	REMAF+	I/O	-6 - 0 dBm	Remote Control AF
10	GND			
11	not used			
12	not used			
13	not used			
14	SIDETONE IN	In	0dBm/600 ohm	For 5 mW in built-in speaker. Independent of VOLUME.
15	GND			
16	GND			
17	GND			
18	SCAN S/S	In	0/12 V	Scan Hold Signal
19	SPEAKER-	Out	See pin 6	
20	LINE+	Out	0 to 10 dBm	Balanced 600 ohm audio output. Internally adjustable
21	LINE-	Out	0 to 10 dBm	
22	REMAF-	I/O	-6 - 0 dBm	Remote Control AF
23	not used			
24	not used			
25	not used			

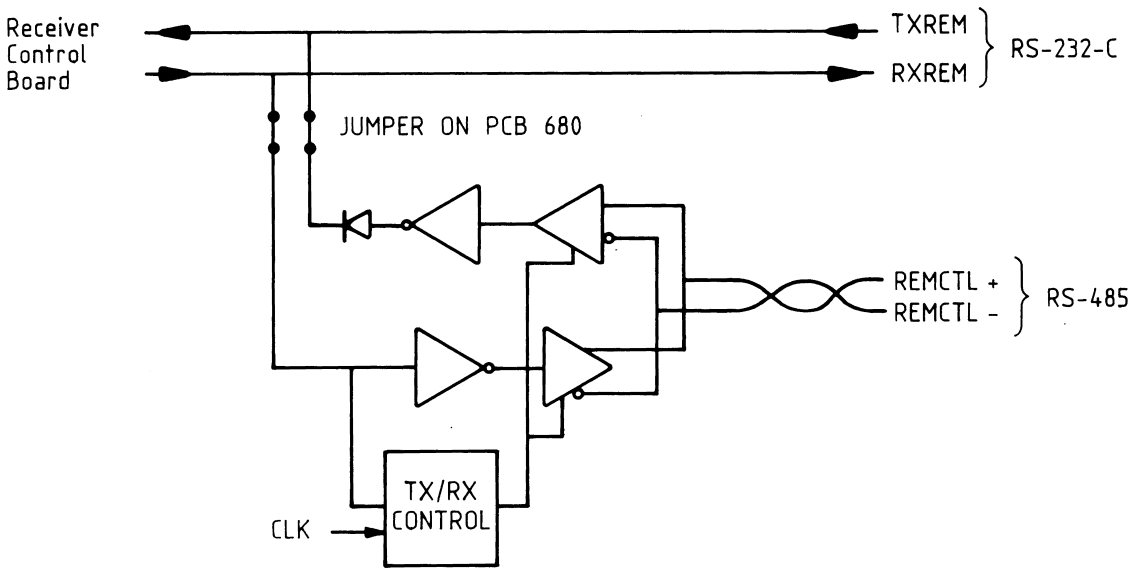


fig. 1 RS-232 / RS-485 CONVERSION
NORMAL :
The receiver is controlled via the RS-232 interface (single receiver)
or via the RS-485 interface (mutiple receivers)

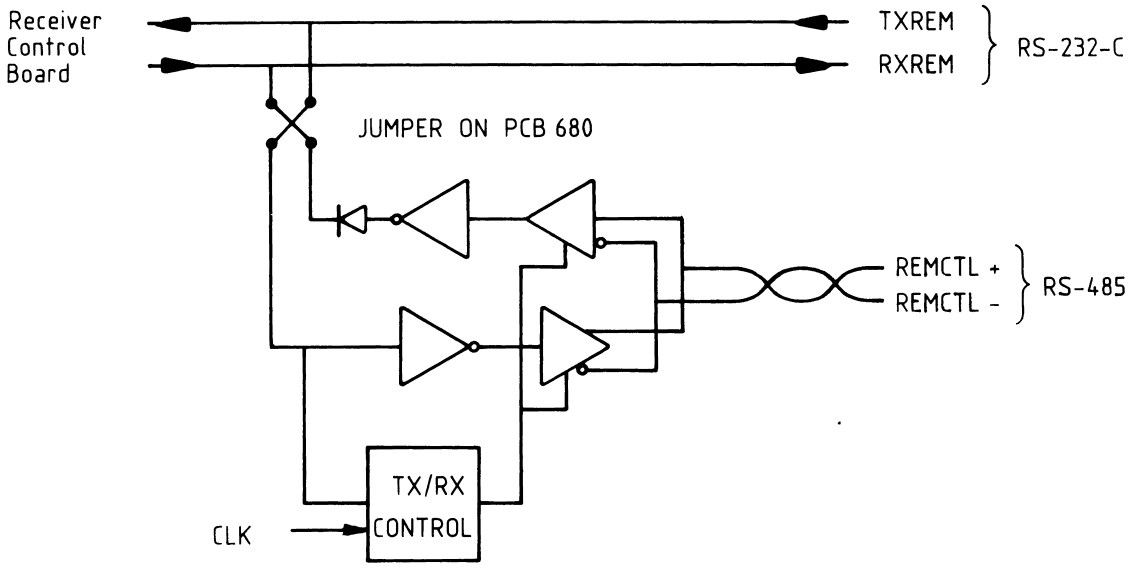


fig. 2 RS-232 / RS-485 CONVERSION
REVERSE :
The receiver converts signals on the RS-232 interface to RS-485.
The receiver itself is controlled via the RS-232 interface only.

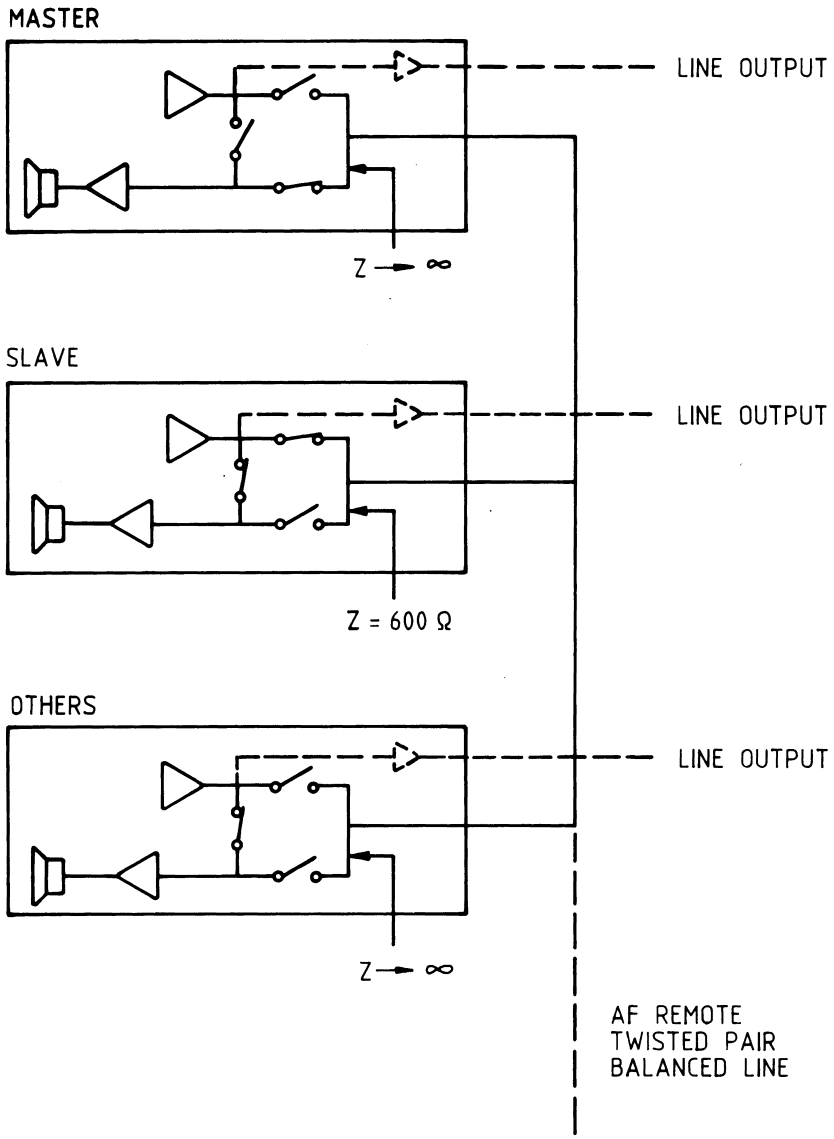


fig. 3 Remote Control AF monitoring. Principle.

995 583 71

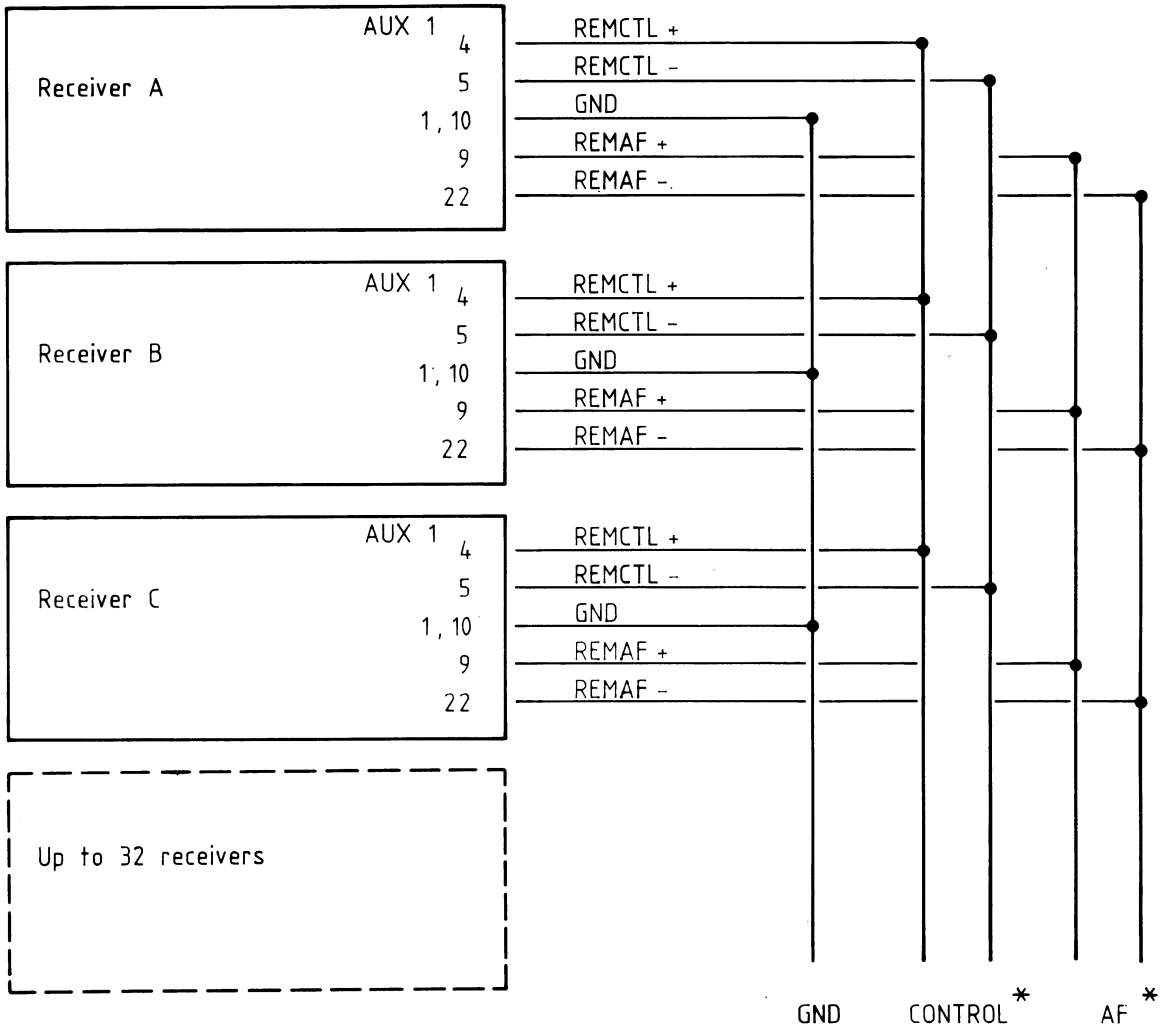


fig. 4

Interconnection of a group of receivers.

* Twisted pair

995 583 81

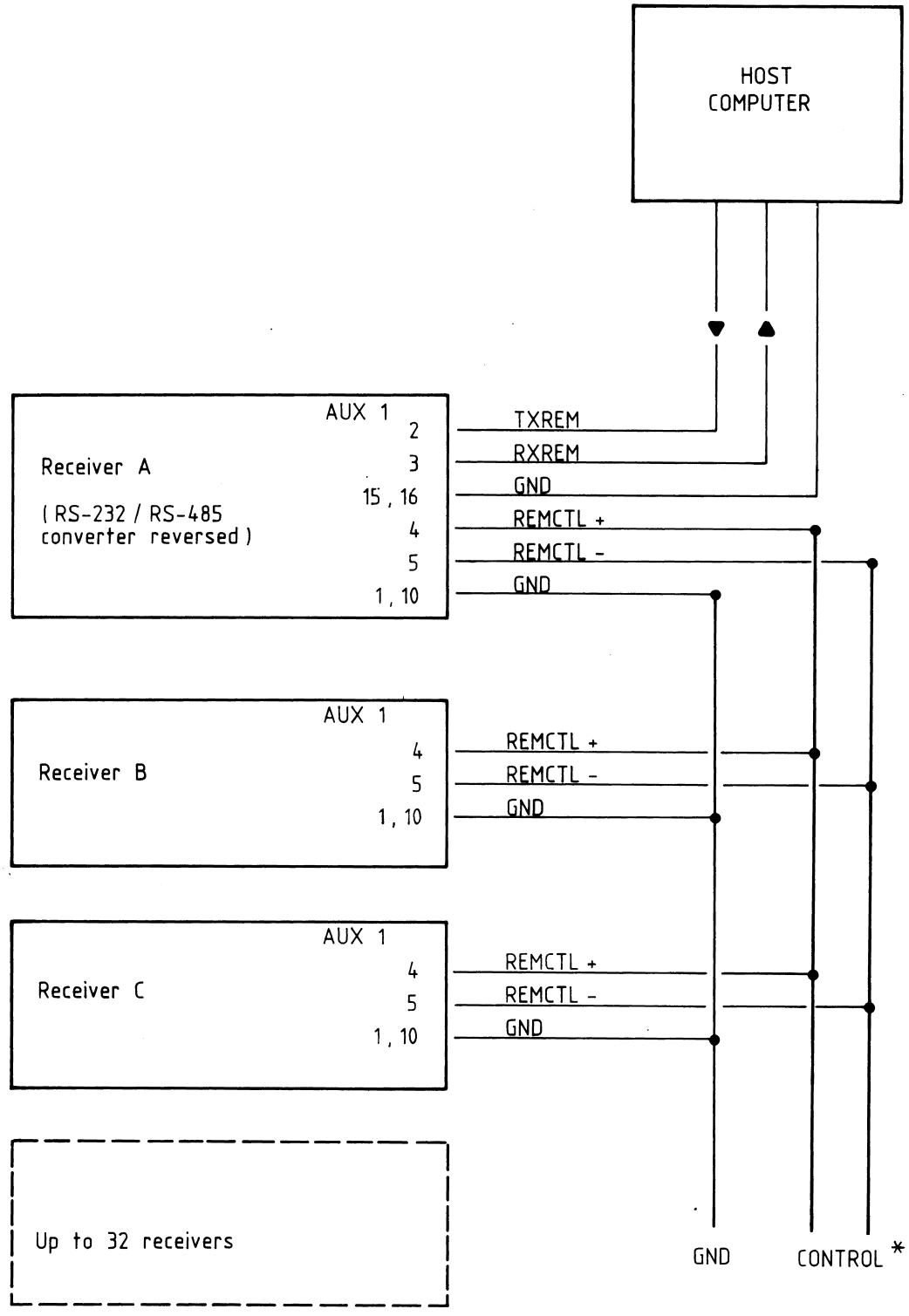


fig . 5

Connecting a host computer .

* Twisted pair

995 583 91

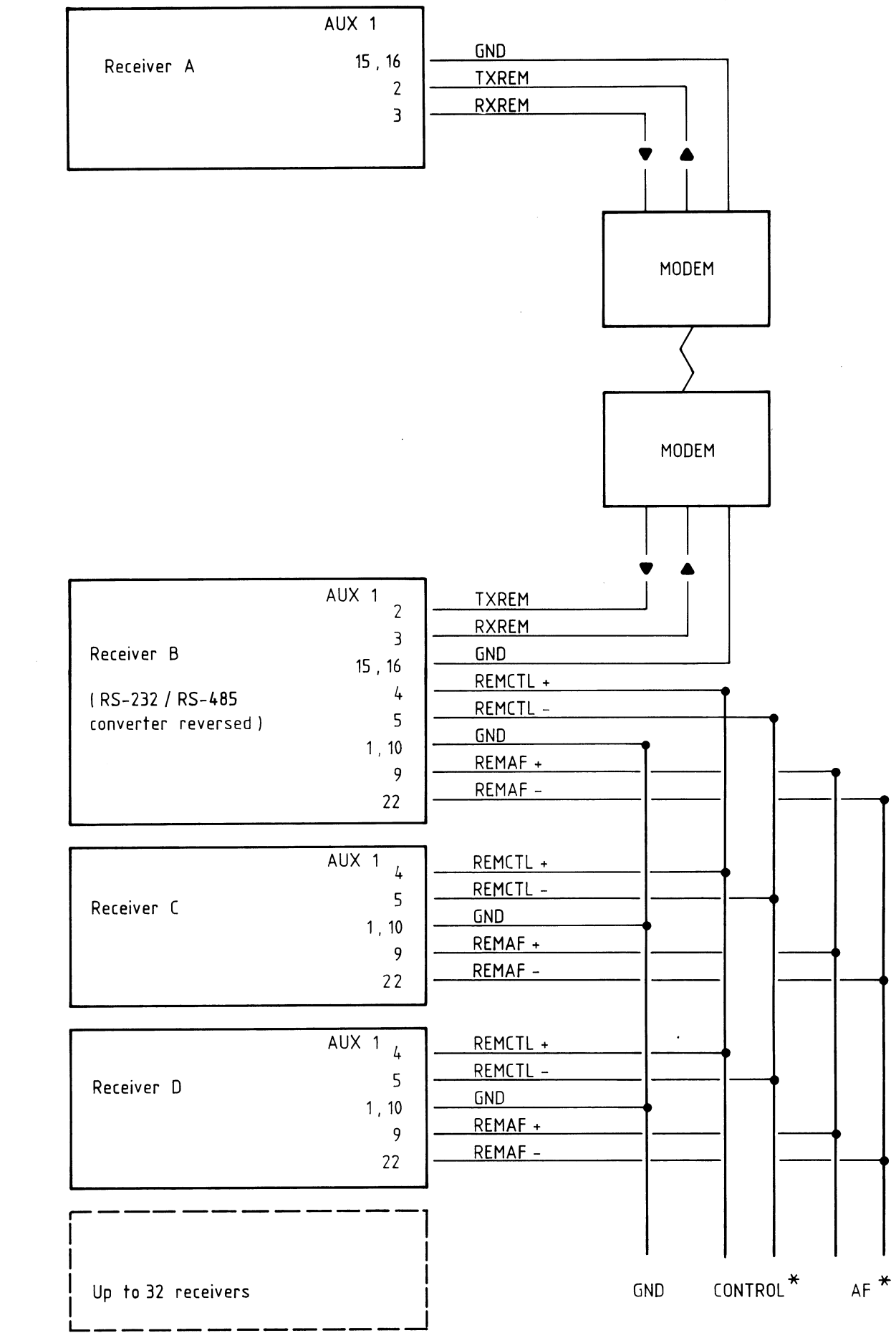


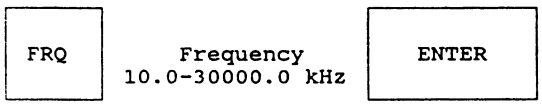
fig . 6

Remote control via telephone line modems.

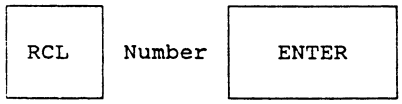
* Twisted pair

OPERATING SEQUENCES, SUMMARY

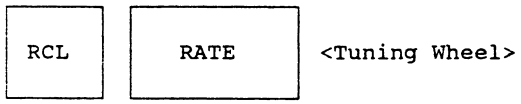
Direct Frequency Entry:



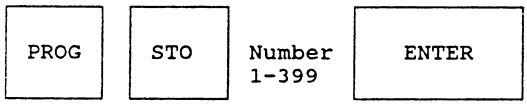
Recall Channel:



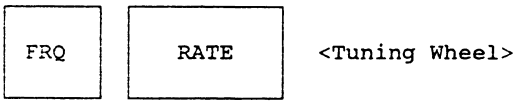
Manual Channel Scan:



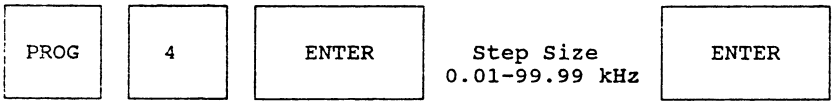
Store Set-up:



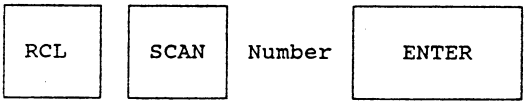
User-programmable Rate:



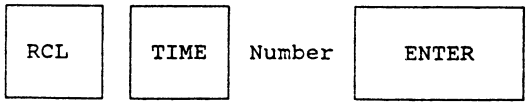
Setting User-programmable Rate:



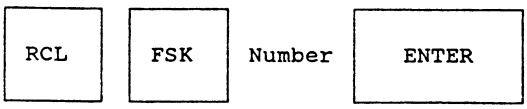
View/change Scan Program Number:



View/change Time Program Number:



View/change FSK Set-up Number (R8003):



SCAN PROGRAMS

PROG	SCAN	Number 1-40	ENTER	Value see below	ENTER	do. do.

	Parameter (CHANNEL display)	Value (FREQUENCY display)
1	Dwell Time	1-250 (x 0.1 s)
2	Hold Time	0-99 (s), 100=infinite
3	Hold Source	0 = None 1 = Squelch 2 = Signal Threshold 3 = Squelch or Signal Threshold 4 = External Signal
4	Hold Mode	1 = Hold Time Only 2 = Signal Time + Hold Time
5	Scan Type	0 = Consecutive Channel Scan 1-9999 Frequency Step (x10 Hz) 10000 Sequential Channel Scan
6	Start Channel	1-399 0=delete
7	Stop Channel/ Next Channel	1-399 0=delete/end of sequence
8	Linking	1-40 0=None

TIME PROGRAMS

PROG	TIME	Number 1-40	ENTER	Value see below	ENTER	do. do.

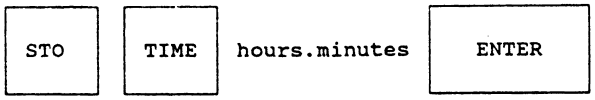
	Parameter (CHANNEL display)	Value (FREQUENCY display)
1	Time, 1-hour cycles 24-hour cycles End of program/delete	8800-8859 XX:minutes 0-2359 hours:minutes 99
2	Action	1 = Recall Channel 2 = Store current set-up 3 = Recall stored set-up 4 = Recall Scan Program 5 = Start Scan Program 6 = Recall Time Program
3	Channel/Program No.	0-399

FSK DEMODULATOR (R8003)

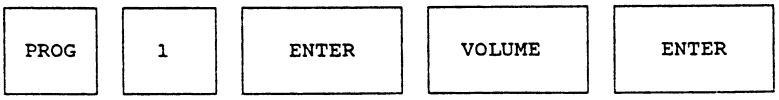
PROG	FSK	Value see below	ENTER	do. do..

	Parameter (CHANNEL display)	Value (FREQUENCY display)
1	Mark Frequency	1000-3000 (Hz)
2	Space Frequency	1000-3000 (Hz)
3	Data Rate	50, 100, 150, ..750 (Baud)

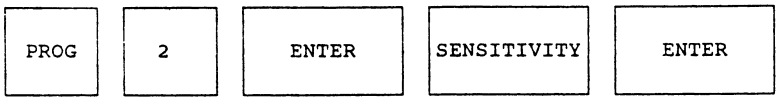
Set Time:



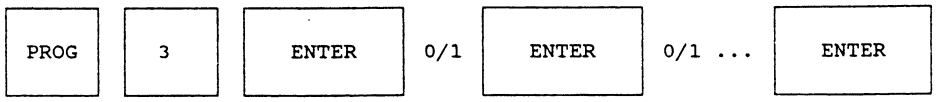
Set Beep Level:



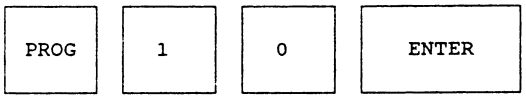
Set Signal Threshold Level:



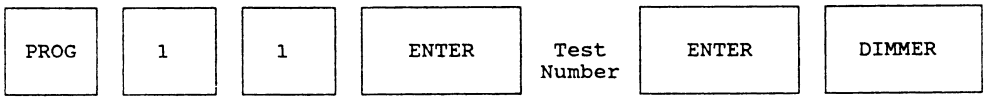
Set CTL OUT 1-7:



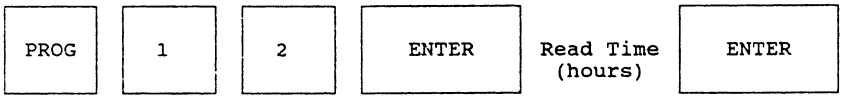
Start Automatic Self-test:



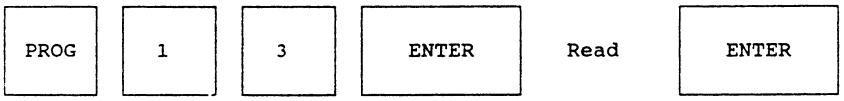
Manual Self-test:



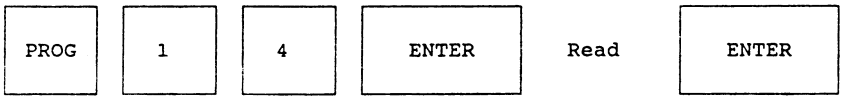
Read Accumulated On-time:



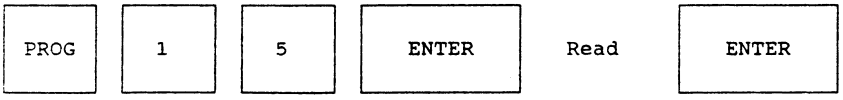
Read CU Configuration PROM Version and Date:



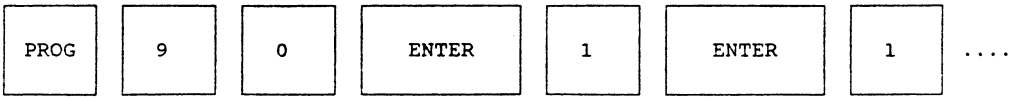
Read CU Program PROM Version and Date:



Read RU Program PROM Version and Date:



Delete Memory (R8001):



EXAMPLES

Time Programs
Configuration Functions
Scan Programs

Examples of Time Programs.

Example 1:
This example shows key-by-key how to program the R8000 to twice a day (at 9.00 and 13.00) to select a certain station:

1. Tune the receiver to the desired frequency, select mode etc.

2. Save the set-up by storing it on a channel number (eg. 20) by pressing
   PROG - STO - 2 - 0 - ENTER .

3. Key-in the Time Program:

o PROG	The PROG Indicator flashes.
o TIME	The SCAN Indicator turns ON.
1	We name the Time Program number 1. "1" is shown in the PROG display.
ENTER	The figure 1 is shown in the CHANNEL display to indicate that parameter 1 (Time) may be keyed-in:
9 0 0	"900" is shown in the FREQUENCY display.
ENTER	The figure 2 is shown in the CHANNEL display to indicate that parameter 2 (Action) may be keyed-in:
1	"1" (Recall Channel) is shown in the FREQUENCY display.
ENTER	The figure 3 is shown in the CHANNEL display to indicate that parameter 3 (Channel Number) may be keyed-in:
2 0	"20" (Ch 20) is shown in the FREQUENCY display.

ENTER	The figure 1 is shown in the CHANNEL display to indicate that parameter 1 (Time) may be keyed-in:
1 3 3 0	"1330" is shown in the FREQUENCY display.
ENTER	The figure 2 is shown in the CHANNEL display to indicate that parameter 2 (Action) may be keyed-in:
1	"1" (Recall Channel) is shown in the FREQUENCY display.
ENTER	The figure 3 is shown in the CHANNEL display to indicate that parameter 3 (Channel Number) may be keyed-in:
2 0	"20" (Ch 20) is shown in the FREQUENCY display.
ENTER	The figure 1 is shown in the CHANNEL display to indicate that parameter 1 (Time) may be keyed-in:
9 9	"99" (End of Program) is shown in the FREQUENCY display.
ENTER	Provided Time Program no.1 does not contain previously programmed times the programming is now finalized and the receiver returned to its normal state. Previously programmed times are deleted by keying 9 - 9 - ENTER until all are deleted.

4. Activate the time control by keying-in
RCL - TIME - 1 - ENTER .

Time Program no.1 which we have just prepared is now active, i.e. every time the hour of the built-in clock equals the programmed times, the set-up that was stored on channel 20 will be recalled, irrespective of the operation of the receiver in the mean time.

The time control may be de-activated without deleting the program by pressing
RCL - TIME - 0 - ENTER .

To check if a Time Program is active, press
RCL - TIME
read the number in the PROG display and press ENTER .

More Time Programs may be prepared (No.1 to 40) and activated when desired.

The program in paragraph 3 is an example of a simple Time Program. The data that was keyed-in is contained in a file in the user-programmable memory, as illustrated below.

TIME PROGRAM NO.1

1	(Time)	900	(9.00 o'clock)
2	(Action)	1	(Recall Channel)
3	(No.)	20	(CH 20)
1	(Time)	1330	(13.30 o'clock)
2	(Action)	1	(Recall Channel)
3	(No.)	20	(CH 20)
1	(Time)	99	(End of program)

The file may be read by pressing
PROG - TIME - 1 - ENTER - ENTER ... ENTER .
The parameter numbers will then be shown in the CHANNEL display and the corresponding values in the FREQUENCY display. Each ENTER will call the next parameter in the file.

Editing is possible by keying-in new data for a parameter before pressing ENTER. More time/actions may be added. The order may be arbitrary. If an incident must be repeated once every hour then it is sufficient to enter 88 + the desired minutes at parameter 1.

A time indication and the action belonging to it may be deleted by pressing
9 - 9 - ENTER
whereupon the next time indication in the stack moves up.

Please note, that the receiver may be operated normally even if a Time Program is active. The effect of the Time Program is, that the programmed activity takes place at the programmed time.

In addition to recalling channels it is possible to recall Scan Programs or start Scan Programs. It is also possible to store the current set-up of the receiver for later recall. A Time Program may even call another Time Program. Some additional examples may be appropriate.

Example 2:
This program will on the hours and half-hours switch to channel number 100. Three minutes later it returns to the previously used setting.

1	(Time)	8800	(XX:00)
2	(Action)	2	(Store current set-up)
1	(Time)	8800	(XX:00)
2	(Action)	1	(Recall Channel)
3	(No.)	100	(CH 100)
1	(Time)	8803	(XX:03)
2	(Action)	3	(Recall stored set-up)
1	(Time)	8830	(XX:30)
2	(Action)	2	(Store current set-up)
1	(Time)	8830	(XX:30)
2	(Action)	1	(Recall Channel)
3	(No.)	100	(CH 100)
1	(Time)	8833	(XX:33)
2	(Action)	3	(Recall stored set-up)
1	(Time)	99	(End of program)

Example 3:
This program will set the receiver to channel number 10 from 8:00 to 8:15 and to channel number 11 from 12:00 to 12:30.
The rest of the time the receiver is muted, which is done by recalling channel number 0.

1	(Time)	800	(8:00)
2	(Action)	1	(Recall Channel)
3	(No.)	10	(CH 10)
1	(Time)	815	(8:15)
2	(Action)	1	(Recall Channel)
3	(No.)	0	(CH 0 = muted)
1	(Time)	1200	(12:00)
2	(Action)	1	(Recall Channel)
3	(No.)	11	(CH 11)
1	(Time)	1230	(12:30)
2	(Action)	1	(Recall Channel)
3	(No.)	0	(CH 0 = muted)
1	(Time)	99	(End of program)

Example 4:
This program will on the hours start a tape recorder and watch channel number 37. Five minutes past, channel 20 is selected and the tape recorder is stopped.

The tape recorder is controlled from the terminal "CTL OUT 1" of the "AUX2" socket. The output is operated as described in section 3.4. '0' or '1' is selected so as to cause the tape recorder to run. This setting is stored together with the remaining set-up on channel 37. Then the opposite setting of CTL OUT 1 is selected (tape recorder stopped). This setting is stored on channel no.20 together with the remaining set-up on that channel.

1	(Time)	8800	(XX:00)
2	(Action)	1	(Recall Channel)
3	(No.)	37	(CH 37)
1	(Time)	8805	(XX:05)
2	(Action)	1	(Recall Channel)
3	(No.)	20	(CH 20)
1	(Time)	99	(End of program)

Example 5:
This program will switch between two Scan Programs. Scan Program no.1 is called at 4 a.m. (4:00) and Scan Program no.2 is called at 8 p.m. (20:00).

The effect of this program is that whenever the operator presses the SCAN key, Scan program no.1 will run in the period from 4:00 to 20:00 and Scan Program 2 will run in the period from 20:00 to 4:00.

1	(Time)	400	(4:00)
2	(Action)	4	(Recall Scan Program)
3	(No.)	1	(Scan Program 1)
1	(Time)	2000	(20:00)
2	(Action)	4	(Recall Scan Program)
3	(No.)	2	(Scan Program 2)
1	(Time)	99	(End of program)

Example 6:
This is an example on how Time Programs may be combined.

These two programs together will select channel 20 every hour in the period from 8:00 to 16:00.

TIME PROGRAM NO.1:

1	(Time)	8800	(XX:00)
2	(Action)	1	(Recall Channel)
3	(No.)	20	(CH 20)
1	(Time)	1600	(16:00)
2	(Action)	6	(Recall Time Program)
3	(No.)	2	(Time Program 2)
1	(Time)	99	(End of program)

TIME PROGRAM NO.2:

1	(Time)	759	(7:59)
2	(Action)	6	(Recall Time Program)
3	(No.)	1	(Time Program 1)
1	(Time)	99	(End of program)

Examples of Configuration Functions.

Example 1:
This example shows how to disable the function of a key. The full keying sequence is illustrated, including the selection of Configuration Mode. Say you want to disable the LSB key, you proceed as follows.

1. Select Configuration Mode by keying:

o PROG	The PROG Indicator flashes.
9 9	"99" is shown in the PROG display.
ENTER	The FREQUENCY display is cleared. Ready for entry of the password.
9 9 9	"]]]" is shown in the FREQUENCY display. (999 is the default password. In case another password has been selected, this must be entered instead).
ENTER	The FREQUENCY display is cleared. The CHANNEL display shows a configuration function number. The PROG indicator starts flashing at a faster rate to indicate that configuration mode has now been selected.

2. Find the number of the LSB key in the list of Configuration Functions in section 3.6. Enter the number (2):

2	"2" is shown in the CHANNEL display.
ENTER	The figure 1 is shown flashing in the FREQUENCY display indicating that the LSB key is enabled.

3. Disable the LSB key by keying:

0	"0" is flashing in the FREQUENCY display.
ENTER	The FREQUENCY display is cleared.

4. Terminate the Configuration Mode by pressing:

o PROG	The PROG Indicator turns off and the receiver returns to its normal state.

The LSB key is now disabled which you can convince yourself of by pressing the key. To re-enable the key you follow the same procedure except that the value '1' must be entered instead of '0'.

If more functions are to be changed it is not necessary to leave Configuration Mode between each function. When a value is entered by pressing the ENTER key and the FREQUENCY display is cleared, a new function number may be selected by pressing the desired number followed by ENTER. The new function number will then be shown in the CHANNEL display.

Example 2:
Not only single keys, but also key sequences may be disabled. As an example of this say you want to prevent Scan Programs from being changed.

This is done by selecting Configuration Function 55. Disabling this function by entering a '0' causes the sequence PROG - SCAN to have no effect in the receiver.

If more Scan Programs have been prepared, the operator can still choose between these programs by means of the 'RCL-SCAN' function. In case it is desired to limit the possibilities to only one Scan Program, the 'RCL-SCAN' function may be disabled as well, using configuration function number 50.

It may also be relevant to disable the 'RCL-SCAN' function in case a Time Program is asked to recall certain Scan Programs at selected times, but manual selection is undesired.

Example 3:
This example shows how to change the configuration of the receiver to allow only BW WIDE in AM mode.

You start by selecting Configuration Function number 63. When this function is selected the FREQUENCY display shows a row of 0's and 1's, one for each parameter, e.g.

0 1 1 1 1 1 1
-

with the right-most figure flashing to indicate that this figure may be changed. Pressing ENTER will move the flashing to the next figure in the row.

We want to change the parameters 5, 6, and 7 which must be set to '0' to disable BW INTER, BW NARR, and BW VNARR (see the list of configuration functions in section 3.6). This is done by accepting the first four values by pressing ENTER. The display still shows six 1's but now the fifth is flashing:

0 1 1 1 1 1 1
-

This figure is changed to a zero by pressing 0 - ENTER:

0 1 0 1 1 1 1
-

The next value is changed in the same way and the display shows:

0 0 0 1 1 1 1
-

The last value is accepted by pressing ENTER by which the FREQUENCY display is cleared.

Before leaving the Configuration Mode it may be a good idea to check Configuration Function number 73, which determines the default settings in AM mode to see if the default values conform to the legal values just entered. The FREQUENCY display in this case may show

0 0 0 1 0 0 1
-

which indicates that AGC FAST and BW WIDE are default values, i.e. will be selected whenever AM mode is selected by pressing the AM key. This is as desired and the function may be aborted by pressing PROG. Configuration Mode may be left by pressing PROG once more.

When this change in the configuration has been made, it is no longer possible to change the bandwidth in AM mode by means of the BW keys. If, however, a set-up is stored in advance with another bandwidth, this bandwidth is still valid when the set-up is recalled.

Example 4:
When a receiver set-up is stored on a channel number, not only the frequency, but also the remaining setting is saved. When a set-up is recalled it may not be desirable to recall the complete setting. Configuration Function number 83 makes it possible to select which stored parameters shall be recalled.

This example shows how to change the configuration so RF AMP and ANT ATT settings are recalled.

We select Configuration Function 83 which causes the CHANNEL display to show the figure 1, and the FREQUENCY display to show a row of 0's and 1's which may look like this:

0 0 0 0 1 1 1
-

Using the ENTER key we step to parameter 5 (RF AMP) and change the figure to '1' by keying 1 - ENTER . Parameter 6 (ANT ATT) is also changed to '1' and the FREQUENCY display now shows:

0 1 1 0 1 1 1
-

At the next ENTER the figure in the CHANNEL display changes to '2' and at the same time the next parameter values shows up in the FREQUENCY display. We do not want to change any of these so the function is terminated by pressing ENTER the sufficient number of times.

Example 5:
In this example we shall configure the receiver to operate in channel mode only, with no display of operating frequency.

The frequency display is disabled by setting Configuration Function number 45 to '0'.

To protect stored set-ups the "Store" function is disabled by setting Configuration Function number 53 to '0'.

Finally, Direct Frequency Selection is disabled by setting Configuration Function number 68 to '0'.

Example 6:
This example describes how to change the Audio Subcarrier frequency in TELEX mode to 1500 Hz.

In the TELEX mode a received FSK signal with center frequency equal to the receiver frequency is converted to an AFSK signal the center frequency of which must match the AFSK demodulator used.

Using Configuration Function number 91, this frequency may be selected between 1500 and 2500 Hz in steps of 100 Hz. When the function is selected, the current audio subcarrier frequency is shown in the FREQUENCY display. The new value is entered by keying:

1 - 5 - 0 - 0 - ENTER.

An illegal value will cause the display to flash when entered. A new value may be keyed-in after pressing ENTER or PROG.

Example 7:
Is is sometimes desirable to be able to protect some stored set-ups against unintended overwriting, which may happen by accidental storage on an already used channel number.

Channels may be protected by using Configuration Function number 69. The procedure is to enable the function, store the set-ups, and then disable the function again.

All the channels which have been stored while the function was enabled are now protected against overwriting. If storage is attempted, the channel number will flash. Storage on an unprotected channel number however is still possible.

Example 8:
The audio squelch circuit of the receiver may be utilized to start an associated tape recorder when speech signals are being received. This may be achieved by setting the configuration function number 86 to "1". The output from the squelch circuit is then routed to the terminal "CTL OUT 7" of the "AUX2" socket at the rear of the receiver. The output is an open collector output which is low when no speech signal is present.

Example 9:
The last example describes how to change the password.

This is done by means of Configuration Function number 99. When this function is selected the figure 1 is shown in the CHANNEL display. The old password must now be entered:

9 - 9 - 9 - ENTER .

The figure 2 is shown in the CHANNEL display and the new password must be entered.

The password concists of a sequence of three key-strokes. Any key may be used in the sequence. As an example we may select the keys RCL, STO and FRQ:

RCL - STO - FRQ - ENTER .

For each key in the password a "]" sign is shown in the FREQUENCY display. At ENTER the figure in the CHANNEL display is changed to 3. The new password must now be entered once more:

RCL - STO - FRQ - ENTER .

The new password is now valid and must be used next time that Configuration Mode is selected.

It is of course important to register or remember the password, as there are no ways in which the password can be read out.

Examples of Scan Programs.

Example 1:
This example shows in detail how to key-in a scan program which scans the channel numbers from 100 to 110 with 2 seconds of dwell time on each channel, and holds the scanning for 10 seconds in case a speech signal is recognized.

1. Key-in the Scan Program:

o PROG	The PROG Indicator flashes.
o SCAN	The SCAN Indicator turns ON.
1	We name the Scan Program number 1. "1" is shown in the PROG display.
ENTER	The figure 1 is shown in the CHANNEL display to indicate that parameter 1 (Dwell Time) may be keyed-in:
2 0	2 seconds is selected. "20" (20x0.1 s = 2 s) is shown in the FREQUENCY display.
ENTER	The figure 2 is shown in the CHANNEL display to indicate that parameter 2 (Hold Time) may be keyed-in:
1 0	10 seconds is selected. "10" (10 s) is shown in the FREQUENCY display.
ENTER	The figure 3 is shown in the CHANNEL display to indicate that parameter 3 (Hold Source) may be keyed-in:
1	Squelch is selected. "1" is shown in the FREQUENCY display.
ENTER	The figure 4 is shown in the CHANNEL display to indicate that parameter 4 (Hold Mode) may be keyed-in:

1	Hold Time Only is selected. "1" is shown in the FREQUENCY display.
ENTER	The figure 5 is shown in the CHANNEL display to indicate that parameter 5 (Scan Type) may be keyed-in:
0	Consecutive Channel Scan is selected. "0" is shown in the FREQUENCY display.
ENTER	The figure 6 is shown in the CHANNEL display to indicate that parameter 6 (Start Channel) may be keyed-in:
1 0 0	Channel no.100 is selected. "100" is shown in the FREQUENCY display.
ENTER	The figure 7 is shown in the CHANNEL display to indicate that parameter 7 (Stop Channel) may be keyed-in:
1 1 0	Channel no.110 is selected. "110" is shown in the FREQUENCY display.
ENTER	The figure 8 is shown in the CHANNEL display to indicate that parameter 8 (Linking) may be keyed-in:
0	No linking is selected. "0" is shown in the FREQUENCY display.
ENTER	The programming is finalized and the receiver returned to its normal state.

2. Select Scan Program number 1 by keying
   RCL - SCAN - 1 - ENTER

3. Store the channels to be scanned on channel numbers 100 to 110.

4. Start scanning by pressing:

o SCAN	The SCAN Indicator flashes and scanning starts.

The scanning starts on channel 100. After 2 seconds the receiver switches to channel 101, after further 2 seconds to channel 102, etc. If a speech signal is detected by the squelch circuit, scanning is held for 10 seconds. Stored information on frequency, mode, bandwidth, etc. is recalled in the same way as when recalling a stored set-up manually. If, on a channel number, no set-up has been stored, this number is omitted in the scanning sequence. If none of the channel numbers are programmed, the Scan Program Number flashes.

Scanning may be interrupted at any time by pressing the SCAN key, whereupon the receiver returns to its normal state. When pressing the SCAN key again, scanning continues immediately from the next channel number.

During scanning, only VOLUME and DIMMER controls are active.

The data that was keyed-in under paragraph 1 is contained in a stack in the user-programmable memory as illustrated below:

SCAN PROGRAM NO.1

1	(Dwell Time)	20 (2 seconds)
2	(Hold Time)	10 (10 seconds)
3	(Hold Source)	1 (Squelch)
4	(Hold Mode)	1 (Hold Time Only)
5	(Scan Type)	0 (Consecutive Channel Scan)
6	(Start Channel)	100 (Ch 100)
7	(Stop Channel)	110 (Ch 110)
8	(Linking)	0 (none)

The stack may be read by keying
PROG - SCAN - 1 - ENTER - ENTER ... ENTER

The parameter numbers will then be shown in the CHANNEL display and the corresponding values in the FREQUENCY display. Each ENTER will call the next parameter in the stack.

It is possible to edit in a program by keying-in new data for a parameter before pressing ENTER. E.g. to change the dwell time to 0.5 seconds, just key-in '5' while the figure 1 is shown in the CHANNEL display. The value "20" in the FREQUENCY display is then changed to "5". If a wrong figure is keyed-in it may be corrected by pressing 0 - 0 - new figure.

If there are no more changes to be made, programming may be terminated by pressing SCAN, whereupon the receiver immediately returns to the normal state, or ENTER - ENTER ... ENTER by which we step through the remainder of the stack.

Programming mode may be aborted at any time by pressing the PROG key. The receiver will then return to its normal state without carrying out any program changes.

Example 2:
This Scan Program will scan the channels from 100 to 110 and stop if a speech signal is recognized. Scanning will continue if the speech signal vanishes for more than 10 seconds.

Compared with the previous example the Hold Mode has been changed into 'Signal Time + Hold Time'. This causes the scanning to be held as long as a signal is present and until the specified Hold Time has elapsed after the signal disappears. If the signal reappears in the Hold period the timing restarts.

1	(Dwell Time)	5	(0.5 seconds)
2	(Hold Time)	10	(10 seconds)
3	(Hold Source)	1	(Squelch)
4	(Hold Mode)	2	(Signal Time + Hold Time)
5	(Scan Type)	0	(Consecutive Channel Scan)
6	(Start Channel)	100	(Ch 100)
7	(Stop Channel)	110	(Ch 110)
8	(Linking)	0	(none)

Example 3:
This example shows how to program the receiver to scan the frequency range between 9500 kHz and 9775 kHz in 5 kHz steps in the AM mode, and to stop the scanning for 5 seconds on frequencies where the signal level exceeds 60 on the Signal Strength meter.

We name this Scan Program number 3: PROG - SCAN - 3 - ENTER.

SCAN PROGRAM NO. 3

1	(Dwell Time)	1	(0.1 seconds)
2	(Hold Time)	5	(5 seconds)
3	(Hold source)	2	(Signal Threshold)
4	(Hold Mode)	1	(Hold Time Only)
5	(Scan Type)	500	(Frequency Step, 5kHz)
6	(Start Channel)	30	(Ch 30)
7	(Stop Channel)	31	(Ch 31)
8	(Linking)	0	(none)

The start and stop channels have been arbitrarily selected to 30 and 31 respectively. Before running the program the desired settings must be stored on these channels as follows.

The receiver is set to the desired start frequency (9500 kHz) and mode (AM). The Signal Threshold Level is set by keying
PROG - 2 - ENTER
and with the SENSITIVITY keys move the flashing bar in the Signal Strength meter to 60 and then press ENTER .

This set-up is now stored on channel 30 by keying
PROG - STO - 3 - 0 - ENTER .

The stop frequency is stored on channel 31 by selecting the desired frequency (9775 kHz) and key
PROG - STO - 3 - 1 - ENTER .

During Frequency Scan the setting of the receiver is determined by the Start Channel. The Stop Channel determines the frequency only.

To activate this Scan Program remember to key-in
RCL - SCAN - 3 - ENTER
after which Scan Program number 3 will run when the SCAN key is pressed.

Example 4:
In this example the receiver is programmed to scan the frequency ranges 9500 kHz to 9775 kHz and 11700 kHz to 12050 kHz in steps of 5 kHz and hold scan for 5 seconds on frequencies where the signal strength exceeds 60 respectively 70 in the two frequency ranges.

This is done by linking two Scan Programs together, i.e. they are programmed to mutually call each other.

We use the program from the previous example, but modify it to call Scan Program no. 4:

SCAN PROGRAM NO. 3

1	(Dwell Time)	1	(0.1 seconds)
2	(Hold Time)	5	(5 seconds)
3	(Hold Source)	2	(Signal Threshold)
4	(Hold Mode)	1	(Hold Time Only)
5	(Scan type)	500	(Frequency Step, 5kHz)
6	(Start Channel)	30	(Ch 30)
7	(Stop Channel)	31	(Ch 31)
8	(Linking)	4	(Scan Program no. 4)
		-	

Scan Program no. 4 in turn is made to call Scan Program 3:

SCAN PROGRAM NO. 4

1	(Dwell Time)	1	(0.1 seconds)
2	(Hold Time)	5	(5 seconds)
3	(Hold Source)	2	(Signal Threshold)
4	(Hold Mode)	1	(Hold Time Only)
5	(Scan type)	500	(Frequency Step, 5kHz)
6	(Start Channel)	32	(Ch 32)
7	(Stop Channel)	33	(Ch 33)
8	(Linking)	3	(Scan Program no. 3)

The start set-up on 11700 kHz inclusive the threshold value of 70 must be stored on channel 32, and the stop frequency 12050 kHz must be stored on channel 33.

Example 5:
This Scan Program will scan the channels 30, 32, 100, 101, 102, 103, 104, 105. Dwell Time is 5 seconds, scanning stops on speech signals but continues if the speech vanishes for more than 5 seconds.

SCAN PROGRAM NO. 5

1	(Dwell Time)	50	(5 seconds)
2	(Hold Time)	5	(5 seconds)
3	(Hold Source)	1	(Squelch)
4	(Hold Mode)	2	(Signal Time + Hold Time)
5	(Scan Type)	10000	(Sequential Channel Scan)
6	(Start Channel)	30	(Ch 30)
7	(Next Channel)	32	(Ch 32)
7	(Next Channel)	100	(Ch 100)
7	(Next Channel)	101	(Ch 101)
7	(Next Channel)	102	(Ch 102)
7	(Next Channel)	103	(Ch 103)
7	(Next Channel)	104	(Ch 104)
7	(Next Channel)	105	(Ch 105)
7	(Next Channel)	0	(end of sequence)
8	(Linking)	0	(none)

The program is keyed-in in the same way as the previous examples, but as the scan type Sequential Channel Scan (10000) is selected as parameter 5, an arbitrary long list of channel numbers may be entered under parameter 7 (Next Channel). To end this sequence a "0" must be entered after which parameter 8 comes up.

Channel numbers may be added or deleted from the list. E.g. to add channel number 33 after channel 32, just step through the stack by pressing ENTER until the FREQUENCY display shows 32 and then enter the desired number: 3 - 3 - ENTER. On ENTER the next number appears in the FREQUENCY display, here number 100.

To delete a channel number from the list you step through the stack until that channel number appears in the FREQUENCY display and then you enter a zero: 0 - ENTER . On ENTER the next number appears in the FREQUENCY display.

When running a Sequential Channel Scan Program, a channel number may be temporarily skipped from the list by pressing the STO key while the receiver dwells or is held on that channel. The receiver will then immediately switch to the next channel and in the next lap skip the channel in question. To include skipped channels in the scan sequence again, recall the Scan Program by keying:

RCL - SCAN - 5 - ENTER.

Example 6:
This example shows how scanning may be synchronized by an external control signal.

The control signal is connected between terminal AUX1-18 (SCAN S/S) and AUX1-17 (GND). Dwell Time is set to maximum, Hold Time to zero, and Hold Mode to 2. This causes scanning to be held while the control signal is low (input short circuited) and to step to the next channel on each low-to-high transition. The synchronization pulses must be shorter than the Dwell Time.

1	(Dwell Time)	250	(25 seconds)
2	(Hold Time)	0	(0 seconds)
3	(Hold Source)	4	(External Signal)
4	(Hold Mode)	2	(Signal Time + Hold Time)
5	(Scan Type)	0	(Consecutive Channel Scan)
6	(Start Channel)	100	(Ch 100)
7	(Stop Channel)	110	(Ch 110)
8	(Linking)	0	(none)

The control signal may be inverted so channel shift takes place on high-to-low transitions by changing configuration parameter 85, see section 3.6, Configuration.

Example 7:
This Scan Program will scan the channels from 1 to 6 and stop on an external signal. The dwell time on each channel is 0.2 seconds and scanning is held when the signal on SCAN S/S (AUX1-18) is low and continues immediately when the signal goes high.

1	(Dwell Time)	3	(0.2 seconds)
2	(Hold Time)	0	(0 seconds)
3	(Hold Source)	4	(External Signal)
4	(Hold Mode)	2	(Signal Time + Hold Time)
5	(Scan Type)	0	(Consecutive Channel Scan)
6	(Start Channel)	1	(Ch 1)
7	(Stop Channel)	6	(Ch 6)
8	(Linking)	0	(none)

10. SKANTI SERVICE AGENTS

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