Technical Manual

Communication Receivers
DEBEG 2056/2057

Gerät Nr 1245

DEBEG SYSTEMS FOR COMMUNICATION
NAVIGATION · SECURITY

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C O N T E N T S

AMENDMENT RECORD SHEET

AMENDMENT No.	AMENDED BY	DATE	REMARKS

1. GENERAL DESCRIPTION

1.1. INTRODUCTION

The DEBEG 2056 and 2057 SSB-Receivers are tuned by its microprocessor control in steps of 10 Hz to any frequency in the range of 50 kHz to 29.999 MHz.

The receivers are for marine use and general purpose point-to-point systems and will receive AM, CW, USB, LSB and FSK (optional).

The receivers are double-superheterodyne with intermediate frequencies of 35.4 MHz (nominal) and 455 kHz. Front Panel controls have been clearly marked and kept to the minimum necessary for simple and efficient operation.

DEBEG 2057 is fitted with a R.F. Preselector Unit.

1.2. CONSTRUCTION

Each receiver is built using high quality epoxy-glass printed circuit boards, designed and built using high quality professional components and techniques. These boards are assembled into a robust steel chassis and inter-connected by a number of sixteen-way plug-in ribbon cables and co-axial signal cables.

The interconnection diagram number is 7411-3E. The individual board part list/circuit diagram number are as follows:

Receiver Board	A1-1050
Synthesizer Assy	A1-1051
Front Panel Board	A1-1199
C.P.U. Board	A1-1187
Power Supply Board	A1-1058
Oscillator Board	A2-1117
Frequency Std.Board	A2-1093
I/O Board	A1-1189
Rear Panel Board	A2-1090
Preselector Board	A1-7422-1
Line Output Board	A2-1150 (Optional)
Keypad Board	A1-1197

Circuit Diagrams are shown at the end of this handbook.

1.3. BRIEF TECHNICAL DESCRIPTION

This brief technical description should be read in conjunction with the receiver overall block diagram. Local oscillator and intermediate frequencies given are nominal and are subject to minor offsets as more fully explained in the detailed technical description.

DEBEG 2057 is fitted with a R.F. Preselector. This consists of a bank of tuned circuits each of which may be "Peaked" by a front panel control. To compensate for the loss inherent in these tuned circuits they are followed by a R.F. amplifier. A "wideband" facility is incorporated in which the tuned circuits are by-passed.

The signal from the Preselector then passes to the main receiver board. With DEBEG 2056 the signal is fed directly from the antenna to the Main Receiver Board.

The Main Receiver Board has at its input "protection and muting" circuits that switch the receiver into the self-protecting muted or desensitized condition when abnormally large signals are encountered. The signal then passes to the "Front End" L.P.F. which is an L.C. low pass filter cutting off above 30 MHz to provide image rejection, first I.F. rejection and spurious emission suppression.

The first mixer up converts the signal to the 35.4 MHz first intermediate frequency by mixing it with the synthesized first local oscillator frequency.

The first local oscillator frequency is always 35.4 MHz above the signal frequency and so covers the frequency range 35.4 MHz to 65.4 MHz. It is synthesized in 1 kHz steps and tuned by its microprocessor controlled by the keypad board. A single-loop digital synthesizer is employed that uses the latest L.S.I. metal oxide semiconductor technology. The output from the synthesizer is locked to a 1 MHz reference which may be either the internal 1 MHz Frequency Standard Board oscillator or an external 1 MHz reference.

The signal output from the mixer passes through the 35.4 MHz filter and is amplified before being fed to the second mixer which down converts it to the 455 kHz second intermediate frequency by mixing it with the second local oscillator frequency.

The second local oscillator frequency is synthesized in 100 Hz steps and is tuned by the 100 Hz setting controlled by the keypad board.

The output of this synthesizer is also locked to the 1 MHz reference.

A voltage controlled crystal oscillator is employed. This operates at 4992 kHz and the second local oscillator frequency is obtained by filtering and amplifying the seventh harmonic.

Overall selectivity is determined by the crystal filters in the 455 kHz I.F. The precise complement and function of 455 kHz filters varies with receiver type and options fitted. This is covered in detail in Chapter 4, Section 4.2.

After amplification at 455 kHz the signal is fed to four detectors. The A.G.C. detector controls the gain of both the 35.4 MHz and 455 kHz I.F. amplifiers. An envelope detector is used to demodulate A.M. signals and a product detector is used for CW and SSB signals.

With DEBEG 2056/2057 carrier reinsertion for SSB operation is generated by synthesizer circuitry that is controlled by the 10 Hz setting controlled by the keypad board.

For C.W. operation the synthesized carrier reinsertion incorporates a continuously - variable B.F.O. facility.

The fourth detector (not shown on the simplified block diagram) drives a bargraph signal strength meter located on the front panel.

MICROPROCESSOR CONTROL SUB-SYSTEM

The Microprocessor Control sub-system comprises of four Modules:-

C.P.U. Module	A1-1187
I/O Module	A1-1189
Front Panel Module	A1-1199
Keypad Module	A1-1197

The functions of the C.P.U. Module are to:-

Initiate the receiver
Re-call the settings which were present when the receiver was last switched off.

Respond to control codes generated by the keypad. Send control signals via the I/O Module to other parts of the receiver.

The I/O Module should be considered as a distribution centre for data produced by the C.P.U. Module.

The I/O Module comprises of a number of latches which hold control data for the frequency synthesizer, the front panel displays and the control lines for the various filters, oscillators and circuitry in the receiver.

The dynamic keypad circuit is INTERRUPT DRIVEN and generates 1 of 32 5 BIT BINARY CONTROL CODES.

TECHNICAL DATA

Frequency range:	50 kHz to 29.999 MHz		
Modes:	Telegraphy:	CW (A1A)	
		MCW (A2A)	
		USB (H2A)	
		LSB (H2A)	
		SITOR/RTTY (J2B/F1B)	(Optional)
	Telephony:	DSB (A3E)	
		USB (J3E)	
		LSB (J3E)	
Tuning:	In 10 Hz incremental steps by keypad, or with two speed electronic spinwheel.		
Frequency stability:	Better than $\pm$ 1 part in 10^7 per degree centigrade over the temperature range -15°C to +55°C.		
Frequency setting accuracy:	Within 3 Hz of any incoming signal.		
Selectivity:	Wide:	$\pm$ 2,7 kHz at - 6dB	
		$\pm$ 8,0 kHz at -60dB	
	Inter-mediate:	$\pm$ 1,0 kHz at - 6dB	
		$\pm$ 2,5 kHz at -60dB	
	Narrow:	$\pm$ 250 Hz at - 6dB	Optional
		$\pm$ 1 kHz at -60dB	
	USB:	+ 350 Hz to +2700Hz at - 6dB	
		- 500 Hz to +3800Hz at -60dB	
	LSB:	- 350 Hz to -2700Hz at - 6dB	
		+ 500 Hz to -3800Hz at -60dB	
Sensitivity:	200 kHz to 29.999 MHz USB and LSB 10 dB S/N with 1µV CW 10 dB S/N with 1µV in WIDE 0,5µV in NARROW AM (70 % mod) 10 dB S/N with 3µV in WIDE 1,5µV in NARROW Below 200 kHz the following signal levels are required for 10 dB S/N in the CW mode: 100 kHz 2µV 50 kHz 10µV		

Blocking:	With a wanted signal of 1mV, an unwanted signal more than 10 kHz removed must be greater than 1V to reduce the output by 3 dB.
Crossmodulation:	With a wanted signal of 1mV, an unwanted signal more than 10 kHz removed and with 30 % modulation, must be greater than 100mV to produce 1 % crossmodulation.
Intermodulation: (out of band)	Two equal unwanted signals, removed from the wanted signal by at least 30 kHz, will have a level of greater than 30mV to produce an output equivalent to a wanted signal of 30µV.
Intermodulation: (in band)	With two equal signals of 1mV, both of which lie within the SSB passband, no intermodulation product will exceed -30dB relative to either signal.
Noise factor:	10 dB
Spurious Response:	The spurious response rejection ratio for the intermediate frequency, image frequency, and all other spurious responses will not be less than 70 dB.
Spurious Radiation:	No discrete frequency in a spectrum of 10 kHz to 1 GHz will be radiated with a power in excess of 1 nanowatt (10^{-9}W)
Audio Outputs:	1W into internal loudspeaker. 1W into external loudspeaker of 8 ohms impedance. 10mW into 600 ohms headphones. Optional: 600 ohms balanced line output adjustable +10dB to -30dB.
Harmonic Distortion:	Harmonic distortion in any of the audio outputs will not exceed 5 % for any signal modulated up to 80 %.
Hum and Noise:	-40 dB relative to standard output levels of 1 mW in headphone output and 50 mW in loudspeaker output.

AGC Range:	A change in signal level of 100dB will not cause the output to change by more than 4dB.
AGC Time Constants:	Slow AGC (J3E mode): Attack time: Not greater than 10ms Recovery time: Not greater than 4s Fast AGC (A1A/F1B): Attack time: Not greater than 30ms Recovery time: Not greater than 0.5s using NARROW Filter.
BFO Range:	$\pm$ 2,7 kHz
Antenna Input Impedance:	50 ohms unbalanced (BNC Connector).
Antenna Input Protection:	The receiver will withstand inputs at the antenna of up to 30V r.m.s. for 15 minutes without damage. Protection against static voltages is provided by a leakage path from the antenna terminal to the chassis of less than 100 k ohms.
Power Supplies:	110-125V AC $\pm$ 10%. 47-60Hz AC Main 220-240V AC $\pm$ 10%. 47-60Hz 50VA max. 21-32V (nominal 24V) DC Battery 1.75A max. with floating earth, positive or negative earth. AC and DC supplies may be connected simultaneously to give automatic change-over in event of mains failure. DC Supplies protected against reversed polarity.
Environmental:	Operating Temperat.: -15°C to +55°C Storage Temperature: -40°C to +70°C Relative Humidity: up to 95 %.
Vibration:	The equipment will withstand vibration frequencies with peak to peak amplitudes as stated: 1 Hz to 12,5 Hz - amplitude 3,2 mm 12,5 Hz to 25 Hz - amplitude 0,76 mm 25 Hz to 50 Hz - amplitude 0,2 mm

Dimensions:	Applicable to a rack mounted unit. (For standard 19inch rack mounting) Width: 420 mm (16,5 ins) Height: 133 mm (5,25 ins) Depth: 395 mm (15,5 ins)
Weight:	Rack mounted unit: 12,25 kgs
Options:	Dual Diversity, FSK Demodulator, 600 ohms Line Output.
Compass Safety Distance:	Standard: 1,15 m (reduced 0,70 m) Steering: 0,70 m (reduced 0,45 m)

3. INSTALLATION

3.1. MOUNTING

The receiver is designed for rack, console or cabinet mounting. It has an all-up weight of 12,25 kg and is of sufficiently robust construction so that it may be cantilever mounted by the front panel from the uprights of its rack or cabinet.

3.2. ANTENNA AND EARTHING

The antenna connection is unbalanced and uses a 50 ohm B.N.C. connector. It is recommended that a 50 ohm co-axial lead-in be used for connection to the antenna.

A screw type earth terminal is provided on the rear panel. It is very important that this is used to bond the chassis to surrounding metalwork and equipment and to a good earth. This is for safety reasons, especially when the receiver is to operate from an A.C. mains supply.

3.3. POWER SUPPLIES

The receiver may be operated on A.C. supply with any of the following characteristics:

VOLTAGE: 105-125 V or 210-250 V
Frequency: 40 Hz - 60 Hz.

The 105-125 V ranges are selected by fitting links B-C and A-D or only link C-D, respectively on the Power Supply Board. It may alternatively be operated from a D.C. supply of between 15 Volts and 35 Volts. A supply of 24 V is recommended. This supply may be either positive earth, negative or floating.

The consumption on A.C. is 50 VA max. and on D.C. is 1.75 A max. The A.C. supply is connected via a 3 pin I.E.C. socket on the rear panel. The D.C. supply is connected to TS2 on the rear panel, with the more negative side to TS1-1 and the more positive side to TS1-2.

If required both A.C. and D.C. supplies may be connected simultaneously. In that event and with nominal voltages i.e. 230 V A.C. and 24 V D.C. the receiver will draw current only from the A.C. supply. In the event of an A.C. failure or reduction of voltage, current will be drawn from the D.C.

supply with instanteneous "no break" change over.

The two "supply" L.E.D.s on the front panel indicate from which source current is being drawn.

3.4. OTHER CONNECTIONS

An external 8 ohm loudspeaker may be connected to pins 3 and 4 of TS1 on the rear panel. Note that pin 3 is commoned to pin 1 (0V).

A headphone or telephone headset may be plugged into the "PHONES" socket on the Front Panel. A headphone of 600 ohms is recommended.

The output level to both the external loudspeaker and "PHONES" socket are controlled by the "A.F.GAIN" control on the front panel. Potentiometer RV6 on the Front Panel Board has the purpose of presetting the maximum power available at the "PHONES" socket. It leaves the factory set to mid position and this setting is ideal for a wide range of headphones impedances.

However, if extremely low impedance headphones are to be used a more comfortable listening level can be obtained by adjusting this preset potentiometer.

Connections 5 and 6 on TS1 at the rear panel are used to control the muting of the receiver.

If TS1 pin 5 is taken down to 0 V then the receiver will be muted. It is also permissible to pull TS1 pin 5 to a negative voltage for the same purpose. It is recommended that it is pulled not more than -50 Volts.

Similarly TS1 pin 6 may be pulled to any positive voltage between +3 V and +50 V to give the same effect. This arrangement allows maximum flexibility when engineering into a system with other equipment.

600 OHM LINE AMPLIFIER (OPTIONAL)

Connect 600 ohms telephone line to TSA terminals 1 and 2 adjacent to the 600 ohms transformer within the receiver. These terminals have not been extended to the normal rear panel connection strip for the following reasons:-

International Telephone Administrations desire that the telephone line shall terminate directly on the 600 ohm transformer and in a place where AC Main Supply or other voltages cannot be inadvertantly connected to the telephone line.

Scanning Auto Stop

Connections to external SITOR Type Equipment.

a) For Relay (Normal Open) Contacts, connect to TS2 Terminals 1 and 2
b) Pull negative, connect to TS2 Terminals 1 and 3
c) Pull positive, connect to TS2 Terminals 1 and 4

4. TECHNICAL DESCRIPTION

4.1. OPERATING FREQUENCIES

The first I.F. filter is described as having a nominal frequency of 35.4 MHz. More precisely it will accept signals in the band 35.393 MHz 35.400 MHz and reject those outside that band. It is a "Roofing" filter i.e. it determines the band width of the first I.F. but not of the whole receiver.

The two second I.F. filters are both centered on 455 kHz. The WIDE and NARROW filters accept signals within +- 2.7 kHz and +- 1.0 kHz respectively of 455 kHz.

For AM and CW reception the first local oscillator synthesizer is set to 35.397 MHz above the signal so that the signal spectrum is approximately centered in the 1st I.F. filter. The second local oscillator is set to 34.9420 MHz (hundred Hz setting at "0") giving precisely 455 kHz in the 100 Hz increments through to 34.9411 MHz to tune the signal in corresponding 100 Hz steps.

For USB reception the receiver is tuned 1.5 kHz high in frequency to place the upper sideband spectrum centrally in the 455 kHz NARROW filter response. This is achieved by offsetting the 1st L.O. synthesizer by +1 kHz and the 2nd L.O. synthesizer by -500 Hz. (The negative offset of 500 Hz is effectively reversed by sideband inversion at the first mixer). Carrier reinsertion is then at 456.5 kHz.

For LSB reception the receiver is tuned 1.5 kHz low in frequency by offsetting the 1st L.O. synthesizer by -2 kHz and the second L.O. synthesizer by -500 Hz. Carrier reinsertion is then at 453.5 kHz.

Selection of the synthesizer offsets is performed automatically within the receiver.

4.2. RECEIVER MODULE (Drawing No. A1-1050)

All connections to it are through two plug-in ribbon cables and three miniature plug-in co-axial connectors. It is secured into the chassis by nine steel screws. The input signal enters the receiver board via socket SK1.

Spark gap LA1 provides surge protection during electrical storms and R1 prevents the build-up of static charges. The receiver will operate normally with signals up to approximately ten volts r.m.s. (e.m.f. from 50 Ohms).

With signals above this level detector diode D5 drives IC1, TR1, TR2, RLA to disconnect the antenna from the Front end L.P.F. When this happens TR1 drives the "MUTE" L.E.D. on the front panel indicating that the receiver is muted. Shmitt Trigger IC1 prevents relay chatter. In this muted condition the receiver can withstand signals up to about 60 V r.m.s. (e.m.f. from 50 Ohms). With still higher signal levels fuse FS1 will rupture.

The receiver may also be muted on demand by control lines from the P.T.T. switch line of an associated transmitter fed into the "Densenitise" inputs at the rear of the receiver. Two lines are provided, one may be pulled down to any voltage between -3 V and +50 V to perform the same task. The "MUTE" L.E.D. is illuminated when this facility is activated.

The front end L.P.F. cuts off above 30 MHz. Its purpose is to reject incoming signals at image frequencies in the range 70.85 - 100.8 MHz and at the first intermediate frequency of 35.4 MHz. It also serves to suppress unwanted emission from the receiver. The trimmer capacitors C10, C13, C16, C19 and C22 are not to be disturbed. A spectrum analyser is necessary to realign them.

The first mixer is a hermetically sealed double balanced mixer employing hot carrier diodes and transmission line transformers. The first L.O. signal is amplified to high level by TR3 and TR4 to drive the mixer at the level necessary to produce its excellent signal handling performance.

The 35.4 MHz filter (FL1) is a high performance unit with excellent intermodulation performance and it operates as a roofing filter thereby defining the bandwidth of the first I.F. but is relatively wide compared with filters in the second I.F. the latter determine the overall receiver bandwidth.

The first 35.4 MHz I.F. amplifier is an automatically gain controlled, tuned, low noise amplifier. The second 35.4 MHz I.F. amplifier is a wideband fixed gain amplifier.

The second mixer is an F.E.T. type balanced to local oscillator input.

The 455 kHz filters are selected by switching diodes controlled by logic circuits on the Front Panel Module.

Filter FL2	(Bandwidth +/- 2.7 kHz)
Filter FL3	(Bandwidth +/- 1.2 kHz)
Filter FL4	(Bandwidth +/- 250 Hz) (optional)

The selection of filters with mode is as follows:

LSB		FL3
USB		FL3
AM	Wide	FL2
AM	Narrow	FL3
CW	Wide	FL3
CW	Narrow	FL4
FSK		FL3

The 455 kHz I.F. amplifier is a single high-gain integrated circuit. This provides a.g.c. operation and a facility (RV2) for setting the overall gain of the receiver. The output of the amplifier is tuned by L15/C71 and it drives four detectors.

The AGC detector function is performed by transistor TR12. If link LK2 is made the a.g.c. is completely disabled (a test facility). The a.g.c. voltage is amplified and inverted by TR11.

With a low level signal gradually increasing in amplitude the 455 kHz amplifier controls first and has a range of 35 dB. AGC Amp 2 is arranged so that, when the 455 kHz amplifier has run out of range, control transfers to the 35.4 MHz amplifier which has a range of at least 65 dB.

When the A.G.C. switch on the front panel is set to "OFF" a D.C. voltage is applied from the R.F. GAIN potentiometer via D24 on the receiver board to the A.G.C. CIRCUIT and the receiver gain being set over-high by the manual control and the a.g.c. will cut-in and prevent overloading and consequent loss of modulation.

The signal strength Detector TR9 drives a solid state bargraph display on the Front Panel. Display "set zero" is provided by RV1 on the Receiver Module.

The Envelope Detector is on the Receiver Module and consists of a simple diode detector biassed by a longtail current source to give a low distortion. The 455 kHz I.F. output is taken off the board and to the Oscillator Module to the Product Detector and reinsertion oscillators and then returns as audio. Solid State Switch IC4 selects the appropriate detector and is itself controlled by the logic on the Front Panel Module.

4.3. SYNTHESIZER MODULE (Drawing No. A1-1051)

The synthesizer module is sealed and encapsulated inside a steel screening box. The design of this synthesizer assembly is such that it is not possible to open it to gain access for effective repair without specialized equipment. If a synthesizer develops a fault it should be unbolted from the chassis and returned to DEBEG GmbH, Hamburg, for exchange replacement.

4.4. FRONT PANEL MODULE (Drawing No. A1-1199)

The Front Panel Module contains circuitry for:-

Displays indicating frequency data, mode setting, the drivers for these devices are on the I/O Module.

The Audio Amplifier (IC 8).
The Bargraph Driver (IC 5).
The Spin Wheel Tuning Circuit.
PORTS 2 AH and 2 BH on the I/O BUS.

Spin Wheel Tuning Circuit.

This circuit comprises of two opto-pairs (Infra Red L.E.D. and Photo Transistor) coupled by shaft encoder.

The output of the respective transistors are squared by gates from IC 7 and differentiated by the two Flip-Flops of IC 8.

The two outputs of the circuit join the Keypad Data Bus as D6 and D7 on the I/O Module.

Clockwise rotation of the Spin Wheel produces a series of pulses on D6, whilst anti-clockwise rotation produces a series of pulses on D7.

4.5. I/O MODULE (Drawing No. A1-1189)

The I/C Module is a distribution area for the C.P.U. I/O Bus (SK 13).

DATA is read from Port 31H (Keypad) at 5 VDD. or converted to CMOS level (at 10 VDD) and written to 1 of 9 WRITE ONLY PORTS. Of these Ports, ports 2A and 2B are actually located on the Front Panel Module. The PORT address decoding is performed by IC 18 and IC 19.

The following Modes/Filters:-

FSK
LSB
USB
CW1
CW2
AMW
AMN

are selected through PORT 26H (IC 17).

4.6. POWER SUPPLY MODULE (Drawing No. A1-1058)

Circuit diagram A1-1058 shows the circuit of the module itself as well as the routing of the supply to each of the modules which consume current.

The A.C. input enters the receiver via a 3 pin I.E.C. connector and a 1 Amp fuse on the rear panel. Live is switched by the SUPPLY switch on the Front Panel. Links are provided on the board for 100-120 V or 200-250 V operation. An encapsulated toroidal mains transformer is fitted directly to the board. Diodes D11 and D12 form a full wave rectifier.

The D.C. input enters the receiver via a terminal block on the rear panel board. This is a 3 Amp fuse on the rear panel and is switched by the SUPPLY switch. Diodes D1, D2, D3 and D9 give a very efficient reverse polarity protection.

It is permissible for the A.C. and D.C. inputs to be connected at the same time. In the event of failure of either supply there will then be no interpution in the operation of the receiver. The two detectors TR1 and TR3 drive L.E.D.s on the Display Board at the front panel to show which of the supplies is available at sufficient voltage to drive the receiver.

The output of the power supply module is stabilized 18 V D.C. and this is distributed to the other boards where it is reduced and stabilized to +12 V, +10 V or +5 V as required.

A1-1117

4.7. OSCILLATOR MODULE (Drawing No. A2-1117)?

The 455 kHz output from the receiver module is fed to the Product Detector on the Oscillator module. It is then mixed with any one of several frequencies.

(1) 456.5 kHz for USB reception
(2) 453.5 kHz for LSB reception
(3) A "special" frequency for F.S.K. reception. A typical frequency is 456.7 kHz giving 1.7 kHz offset for telex operation.

The frequencies listed above are generated in two stages. Firstly a frequency of 996.770 to 996.860 kHz is generated by a phase-locked-loop. This frequency is referred back to the 1 MHz standard and is variable in 10 Hz steps under the control of the 10 Hz decade switch on the Front Panel Module.

Secondly this frequency is then mixed with the output of any one of the several oscillators and the frequencies listed above are selected by a tuned circuit.

All of the oscillators except for the B.F.O are crystal controlled. The B.F.O is a tunable oscillator controlled by the B.F.O potentiometer on the Front Panel Module.

4.8. FREQUENCY STANDARD MODULE (Drawing No. A2-1093)

The Frequency Standard Module is built onto a small single-sided Printed Circuit Board.

Crystal XL1 is resonated by TR1 in a "Clapp" type oscillator circuit and is trimmed to precisely 1 MHz by capacitor C1.

Its output is buffered by transistor TR2 which drives the signal in four separate directions:

(1) To the A.G.C. detector diode D3 and D.C. amplifier TR3. The function of resistors R8, R9 and diodes D1, D2 is to provide D.C. bias to D3 and TR3 which is fully temperature compensating. The output from the collector of TR3 is fed back to the oscillator to precisely control its level of oscillation.

(2) To output buffer amplifier TR4 which drives SK1. This output is supplied to the phase-locked loop on the oscillator board. (Not used on certain models)

(3) To output buffer amplifier TR5 which drives SK3. This is, in turn, connected to the Synthesizer Module.

(4) To SK2. This is, in turn, connected through to the "1 MHz FREQUENCY STANDARD" socket on the Rear Panel. This socket serves several purposes.

1. Allows a Digital Frequency Meter to be connected to check the accuracy of the 1 MHz Crystal.

2. A 1 MHz output may be taken from this socket to slave another equipment.

3. A 1 MHz input may be accepted into this socket to allow the use of a high stability source or to allow master/slaving of equipments.

Note: that when the "1 MHz FREQUENCY STANDARD" socket is used as an input port then the internal oscillator must be disabled by completing link LK1.

4.9. KEYPAD MODULE (Drawing No. A1-1197)

Thirty two single pole non-latching switches are arranged on a matrix of 8 rows by 4 columns.

Three gates from IC1 with timing components R6 and C3, form a simple clock generator of nominal frequency of 1 kHz and having a swing of approx. 5 V p-p (TP1).

This clock drives a decimal counter (IC 1) which strobes each of the 8 row sequentially. These rows are encoded to 3 BITS (D0-D2) by IC 2.

The columns are encoded to 2 BITS (D3 and D4) by IC 3. When a key is depressed, D5 goes high, INTERRUPT goes low and the counter is disabled. Key-debounce is performed in software.

4.10. REAR PANEL MODULE (Drawing No. A2-1090)

It provides a convenient way of interconnecting rear panel services (D.C. supply, extension speaker and desensitising lines) with the power supply board and the front panel board.

4.11. PRESELECTOR MODULE (Drawing No. A1-7422-1)

Connection to it are through three plug-in ribbon cables and two co-axial sockets. It is secured into the chassis by eight steel screws. The signal, on entering the module passes a fuse and a spark gap. It is then routed by a system of relays to the R.F. circuit appropriate to the frequency that is to be received. There are nine selective R.F. filters as follows:-

RANGE 1	50-100 kHz A fixed-tuned filter covering the range without the need for peaking.
RANGE 2	100 kHz - 200 kHz
RANGE 3	200 kHz - 400 kHz
RANGE 4	400 kHz - 1 MHz
RANGE 5	1 MHz - 2 MHz
RANGE 6	2 MHz - 4 MHz
RANGE 7	4 MHz - 10 MHz
RANGE 8	10 MHz - 20 MHz
RANGE 9	20 MHz - 30 MHz

Each of the ranges 2 to 9 inclusive are covered by a tuneable filter. The tuning is effected by motor-driven air-space variable capacitors. The tuning is peaked by the "R.F. PEAK" control on the front panel which controls the motor.

Selection of the correct R.F. range is fully automatic. The relays that switch the filters are controlled via logic circuits on the Preselector Board by frequency settings.

A "Wideband" facility is provided. This is effected by a gain equalizing attenuator which is switched into circuit in lieu of the R.F. filters. A linear R.F. amplifier compensates for the loss in the R.F. filters.

4.12. 600 OHM LINE OUTPUT MODULE (Drawing No. A2-1050)

Provides an isolated and balanced 600 ohm line to be driven by the receiver. It has its own independent output to adjust the level to line.

4.13. C.P.U. MODULE (Drawing No. A1-1187)

This module is based on a Z 80 A Processor operating on a 614.4 kHz clock.

14 of the available address lines are used to access a 2716 (single rail) EPROM which contains the operating system, and a MV 5516 low power STATIC RAM which contains 200 channel memory and the C.P.U. STACK and WORKSPACE.

Only "INT" of the three interrupt pins is utilised.

Clock Circuit.

A crystal oscillator generates a nominal frequency of 1.2288 MHz.

This is divided by IC 1, buffered by IC 2 and TR1 to provide the C.P.U. clock frequency of 614.4 kHz.

Memory Map.

A12 and A13 are decoded to select 1 of 4 4K memory areas:-

0000H-OFFH EPROM (0800H-OFFFH only used in remote control versions.

1000H-IFFFH RAM (1800H-1FFFH unused.)

2000H-2FFFH ARQ status. Location 2000H is polled if an "INTERRUPT" is detected during a "SCAN" cycle.

3000H-3FFFH. Unassigned.

I/O Map.

A4 and A5 are decoded to select 1 of 4 I/O Areas:-

PORTS OOH-OFH. Reserved.

PORTS 10H-1FH. Reserved.
PORTS 20H-2FH. I/O Module WRITE-ONLY.
PORTS 30H-3FH. I/O Module READ-ONLY.

INTERRUPT.

An "INTERRUPT" is generated when a key is pressed on the keypad and also when SK2-11 is pulled high or SK2-10 is pulled low.

NMI and BUSRQ are not utilised.

Non Volatile RAM.

The 5 V supply to the RAM (IC 6) is isolated from the main 5 V supply by D5 and D4.

When the receiver is switched off a Lithium Battery maintains steady voltage of approx. 2.7 V to prevent loss of data from RAM.

TR2 disables access to RAM when the main receiver 18 V power rail falls below approx. 15 V, providing protection against corruption of RAM contents during power switch "ON" switch "OFF" sequences.

Write Protect.

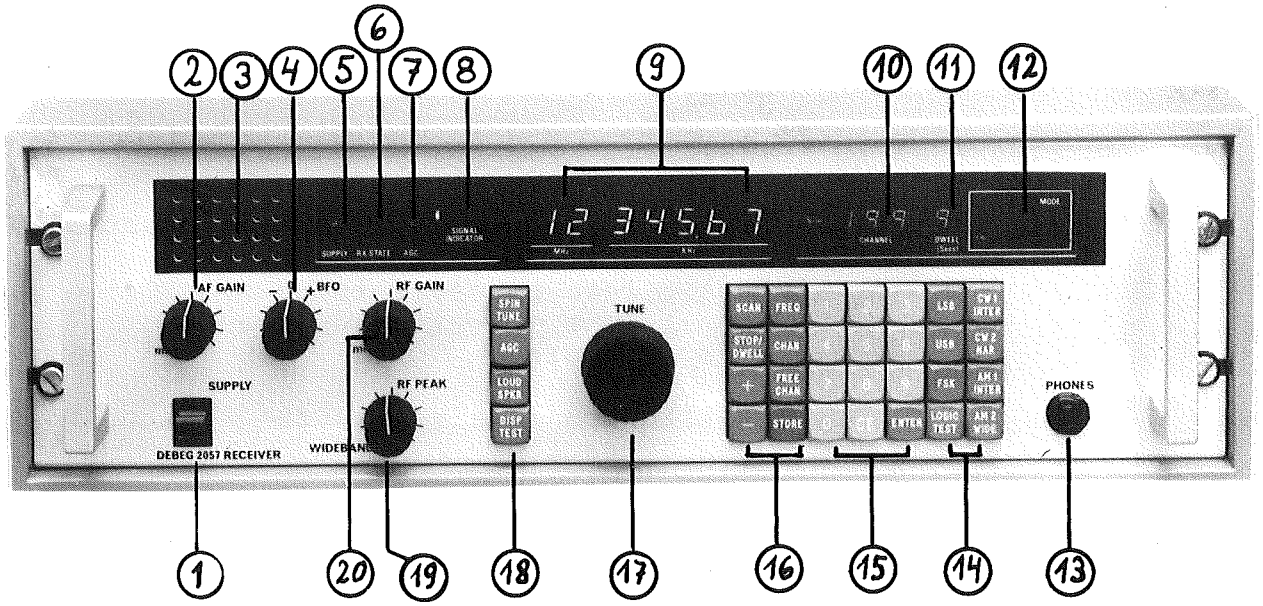
Channel settings are stored in RAM between 1000H and 16FFH.

This area is protected from WRITE operation if the 2 DIL switches of SW1 are in the "OFF" position.

Normal "STORE" function is restored with either switch in the "ON" position.

5. OPERATING INSTRUCTIONS

5.1 Controls



	Control	Function
①	Supply	Power ON/OFF Switch. In ON-Position SUPPLY LED AC or DC lits.
②	AF Gain	Controls output level to internal speaker, external speaker and phones.
③	Loudspeaker	Built-in loudspeaker. Controlled by AF-Gain potentiometer.
④	BFO	Beat frequency oscillator for CW-operation.
⑤	SUPPLY LED AC/DC	Indicates from which source current is being drawn.
⑥	RX STATE LED LOCK FAIL	Lits when 1. Local Oscillator Synthesizer fails to lock for any reason.
	REMOTE	Lits when receiver is remote controlled. (Optional)
	MUTED	Lits when receiver is muted.

	Control	Function
(7)	AGC LED ON/OFF	Lits when AGC is switched on or off by means of AGC pushbutton.
(8)	SIGNAL INDICATOR	Bargraph display indicates signal strength of received RF-Signal.
(9)	FREQUENCY DISPLAY	Indicates selected frequency.
(10)	CHANNEL	Indicates the selected stored channel.
	TUNE	Is lit when receiver is in normal tune operation by means of spin wheel.
	SCAN	Is lit when receiver is in scan operation.
	STORE	Is lit when receiver is in store operation.
(11)	DWELL (secs)	Indicates dwell time in scan operation.
(12)	MODE DISPLAY	Indicates selected mode.
(13)	PHONES	Socket for headphones connection. Volume is controlled by AF-Gain.
(14)		Non-latching switches for Mode-Selection
(15)		Non-latching numeric switches.
(16)		Non-latching switches for microprocessor purposes.
(17)	TUNE	Electronic two speed tuning giving fast and slow tuning rates. Enabled only when receiver is in normal tune operation, by pressing SPIN TUNE switch. LED Tune is then lit.
(18)		Non-latching switches for SPIN TUNE AGC, LOUDSPEAKER and DISPLAY TEST.

	CONTROL	FUNCTION
(19)	WIDEBAND-RF PEAK (only with DEBEG 2057)	In Wideband position Preselector disabled. When switched to RF PEAK Preselector is enabled with fine tune facility to set for maximum RF-Signal.
	ANT.ATTEN. dB (only with DEBEG 2056)	Antenna attenuator. Adjustable up to approx. 20 dB.
(20)	RF-GAIN	Potentiometer manually adjusts gain to AGC circuit. Enabled only when AGC is switched off and AGC LED "Off" is lit.

4.2 MICROPROCESSOR OPERATION

The following sequences must be used in operating microprocessor controlled receivers DEBEG 2056 and DEBEG 2057.

1. TO TUNE TO ANY FREQUENCY

   (a) Press "FREQ".

   (b) Press appropriate numeric buttons ensuring the correct number of "O"s down to 10 Hz.

   Example - 218200
   Example - 2218200

   (c) Press "ENTER".

2. TO TUNE TO ANY CHANNEL STORED IN MEMORY

   (a) Press "CHAN".

   (b) Press appropriate numeric buttons for desired channel which will be from:-

   000
   to
   199

   (c) Press "ENTER".

   Note that channel number will be displayed.

3. In both paragraphs 1 and 2 above modes and filters may be directly selected by the keypad.

4. TO SCAN A NUMBER OF CHANNELS ALREADY STORED IN MEMORY

For any group of channels:-

(a) Press "SCAN". Then first channel number.

(b) Press "SCAN". Then last channel number.

(c) Press "ENTER".

Scan will commence and will continue until:-

(d) "STOP/DWELL" is pressed.

or

(e) "CE" is pressed.

5. STOP

"SCAN" may be stopped at any point using the "STOP" key. The (+) and (-) keys may then be used to step through the selected group of channels.

To restart scan press "SCAN" once.

6. TO CHANGE DWELL TIME

(a) Press "STOP/DWELL".

(b) Press a number between 1 and 9 (for number of seconds).

(c) Press "ENTER".

NB. When "SCAN" has been stopped the dwell time may be changed simply by pressing an appropriate numeric key.

7. In all cases at paragraph 4 above channel numbers will be displayed and changed during scan, and dwell time in seocnds will be continuously displayed.

8. TO PROGRAMME INFORMATION INTO THE MEMORY

(a) Select desired frequency and Mode

(b) Press "STORE"

(c) Select desired channel number - the "FREE CHAN" key may be used if required to call up the next free channel.

(d) Press "ENTER".

NB: The "STORE INDICATOR" will illuminate after (b) and extinguish after (d).

9. FINE TUNE

Any displayed frequency may be "Fine Tuned" using the Spin Wheel Control.

(a) Press "TUNE".

(b) Rotate the control to the desired setting.

(c) Press "TUNE" again to hold the displayed frequency.

If the spin wheel is spun fast the displayed frequency will increase or decrease in 1 kHz rather than in 10 Hz steps.

10. +/-

"+" and "-" may be used to step through the stored channels. Normally these keys will give the operator access to all 200 channels. However, when a "SCAN" has been stopped but not cancelled the keys will only access the channels within the scanned subset. Pressing "CE" restores normal operation.

11. TO "FREE" A CHANNEL

Channels may be "erased" and therefore made accessible to the "FREE CHAN" operation as follows:-

(a) Select channel to be erased.

(b) Press "FREQ".

(c) Press "STORE".

(d) Press "ENTER".

12. LOGIC TEST

Details of the Logic Test sequence are included in the technical handbook, however the following operational notes may also be helpful.

(a) "LOGIC TEST" may be stopped at any point using the "STOP" key, or cancelled using C/E.

(b) To continue the sequence press "LOGIC TEST" again.

(c) To abort simply press C/E.
Whenever C/E is pressed, the receiver reverts to the settings which were obtained prior to "LOGIC TEST".

6. MAINTENANCE

6.1. TEST POINTS - TYPICAL MEASUREMENTS

The receiver has been supplied with a very generous number of test points throughout the Printed Circuit Boards. This allows most faults that can occur to be conveniently and rapidly traced using only two items of test equipment.

(1) A R.F. signal generator, which is to be connected to the antenna socket and
(2) An oscilloscope of at least 30 kHz bandwidth and with a high impedance probe with which to connect it to the various test points.

RECEIVER MODULE

Set the R.F. signal generator to 3 MHz at a level of 400 mV r.m.s. connect the oscilloscope probe to the antenna input socket on the rear panel. When the ANT.ATTEN. control on the front panel is fully C/W the voltage should be approx. 500 mV peak to peak.

The following levels should be seen at the following test points:

TP1	500 mV P.P sine wave at 3 MHz. D.C level 0 V
TP2	No R.F., D.C. level approx. 4.7 V
TP3	No R.F., D.C. level approx. 4.7 V
TP4	No R.F., D.C. level approx. 4.7 V
TP5	No R.F., D.C. level 0 V
TP6	500 mV P.P sine wave at 3 MHz D.C. level approx. 8.5 V
TP7	No R.F., D.C. level 0 V
TP8	No R.F., D.C. level 8.5-9.0 V
TP9	No R.F., D.C. level 8.0-8.5 V
TP10	500 mV P.P sine wave at 3 MHz. D.C level 0 V

TP11 This is the input to the board from the 1st L.O. in the synthesizer unit. The frequency varies from 35.4 MHz to 65.4 MHz depending on front panel decade switch setting. A precise measure of level may be difficult due to lack of oscilloscope bandwidth. To minimise this problem set the frequency display to 00.000.0. The frequency should be 35.4 MHz and the level around 700 mV peak to peak (sine wave).

TP12 Set the frequency display to 03.000.0. The level will vary from approx. 150 mV P.P to approx. 300 mV P.P depending on precise R.F. Generator setting of frequency. The wave form will be complex, since it includes all components produced by mixer M1.

TP13 This is after the 35.4 MHz filter FL1. The R.F. generator should be tuned around 3 MHz and the response of the filter will be seen. When peaked to maximum the 35.4 MHz sine wave should have an amplitude of between 150 mV peak to peak.

TP14 If the a.g.c. is operated the signal at TP14 will be small (approx. 100 mV peak to peak). However, if the a.g.c. is tuned off, link TP2 is temporarily made and the R.F. gain control is tuned fully C/W then a sine wave at 35.4 MHz of 2.5-3.0 V peak to peak will be seen.

D.C. level 10 V. A high capacity probe will detune L7.

TP15 No A.C. component D.C level approx. 4.7 V.
TP16 No A.C. component D.C level approx. 10 V.
TP17 500-600 mV peak to peak at 35.4 MHz. Some modulation at 455 kHz due to reflection back from 2nd mixer. D.C level 10 V.

TP18 This is the input to the board from the 2nd L.O in the synthesizer unit. The frequency is 34.94 MHz. The R.F. level is approximately 1.7 V peak to peak (sine wave). The D.C. level is approx. 0.85 V (i.e. swing is from 0 V to 1,7 V).

TP19 The level at this point can vary considerably depending on the filter bandwidth selected at the front panel switch and is also dependent upon precise R.F. generator frequency. Approx. range 50 mV P.P to 350 mV P.P frequency 455 kHz Sine wave with other components visible.

TP20-TP25 INCLUSIVE

This set of test points allows the correct operation of the crystal filters and the diode switching circuits to be checked. In the LSB, USB, CW Narrow and AM Narrow modes TP 23 should be at +9.5 V to +10 V D.C (no A.C. or R.F. components). This turns on diodes D20 and D22 so that the R.F. seen at TP19 may be seen at TP22, TP25 and through to ACCESS PIN 2 via the "NARROW" filter. In the CW Wide and AM Wide modes TR21 should be at +9.5 V to +10 V D.C. The signal then reaches ACCESS PIN 2 via D19, TP20 the wide filter TP24 and D21.

Note: This is the a.g.c control line to the 455 kHz I.F. amplifier. No A.C. or R.F. component. D.C. levels: With no signal at antenna. 0 V increase with signal level to max. of approx. +1.8 V.

TP27 — 455 kHz I.F. output at approx. 2 V P.P sine wave. D.C. level +9.5 to +10 V.

TP28 — Audio signal present in USB, LSB and CW modes. Approx. 400 mV P.P some "Fuzz" on wave form. D.C. level 200 mV approx.

TP29 — Audio signal present in AM modes only when R.F generator is modulated. Approx. 400 mV P.P some "Fuzz" on wave form D.C. level 200 mV approx.

TP30 — Audio signal wave forms as at TP28 or TP29 depending on mode selected, but with "Fuzz" removed. D.C. level 20 mV approx.

SYNTHESIZER MODULE

This unit is fully encapsulated and sealed and is not maintainable by the user. Full details of how to obtain a replacement are given in the components list.

The following tests may be performed to ascertain whether the synthesizer units performing correctly within the receiver. There are in effect two synthesizers within the synthesizer module. These function independently, have separate frequency control inputs and have separate outputs but do share a common 1 MHz reference input and D.C supply system.

1st L.O. Synthesizer:

Whatever the frequency setting displayed on the front panel (call the setting = f RECEIVED) the output frequency from the 1st L.O synthesizer can be monitored at TP11 on the Receiver Board and is always given by

f L.O. = f RECEIVED + f offset

The factor f offset changes from mode to mode as follows:

USB.	f offset = 35398 kHz
LSB.	f offset = 35395 kHz
AM CW	f offset = 35397 kHz

The "LOCK FAIL" L.E.D on the front panel will illuminate if the 1st L.O. synthesizer fails to lock for any reason.

Before removing the synthesizer unit from the chassis because of suspected failure of the 1st L.O Synthesizer please check the following points.

(1) That the synthesizer module is being supplied with correct supply voltages, i.e. is there 0 V and +18 V present at pins 1 and 16 respectively of SK1 on the Front Panel Board.

(2) That the synthesizer unit is being supplied with the 1 MHz frequency standard. The correct drive out of frequency standard unit is a 1 MHz square wave swinging between 0 V and approx. +8 V.

(3) That the logic control lines that determine the 1st L.O synthesizer frequency are operating correctly. These are simple D.C lines using "active positive" logic that programme the synthesizer in BCD logic decade by decade.

(4) That pins 1, 2, and 3 on SK2 on the I/O Module go high (i.e to greater than +7 V) for LSB, USB, AM, CW modes respectively but that each is otherwise at 0 V.

These are the lines that control the frequency offsets.

If the above conditions are satisfied and the 1st L.O synthesizer is still not functioning correctly then it may be assumed to be faulty.

2nd L.O. Synthesizer:

The output of the 2nd L.O Synthesizer may be monitored at TP18 on the receiver module and should always be within the range 34940.6 kHz. The exact frequency depends on the setting of the 100 Hz decade and also on the mode selected. If a fault in the 2nd L.O synthesizer is suspected then before removing the synthesizer module from the chassis please check the following points:

(1) and (2) Check supply and frequency standards as for the 1st L.O. synthesizer.

(3) That the D.C. logic control lines that determine the 2nd L.O synthesizer frequency are operating correctly. These are accessible at pins 9-13 inclusive of SK1 on the I/O Module.

These operate with "active positive" logic and should follow the table shown in the section "Maintenance - Logic Test".

If the above conditions are satisfied and the 2nd L.O synthesizer is still not functioning correctly then it may be assumed to be faulty.

FRONT PANEL MODULE

The front panel module consists primarily of digital integrated circuits (C.M.O.S) and inter-connections to and from the other boards. Points that need monitoring on this board are all readily accessible at integrated circuits "Legs" no test point pins are necessary on this board. A basic knowledge of C.M.O.S integrated circuits together with a multimeter or oscilloscope and the information given on circuit A1-1199 are all that are necessary to find any fault on the logic circuits.

Integrated circuit IC8 (LM380N) is an orthodox audio amplifier and needs no special explanation.

POWER SUPPLY MODULE

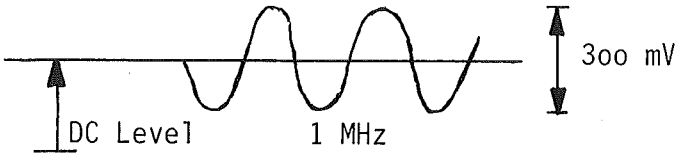
The on load D.C. volts measured at TS1-2 (or at the 3 Amp on board fuse) relative to the 0 V at TS1-3 should be 17.0 - 18.5 V D.C. When the supply input is D.C. this will be a ripple free D.C. output from the board. On an A.C. input however there will be a super-imposed ripple at 100 Hz of up to 25 mV peak to peak.

FREQUENCY STANDARD MODULE

Fault finding on this module requires only an oscilloscope and a digital frequency meter.

TP1 This is on the emitter of oscillator transistor TR1.

Typical waveform



The D.C. level will vary depending on the activity of the crystal. 3V is typical. 2 V to 5 V is not unusual.

TP2 This is the A.G.C. Control line to the oscillator. The D.C. level will again vary depending on crystal activity. 3.5 V is typical.

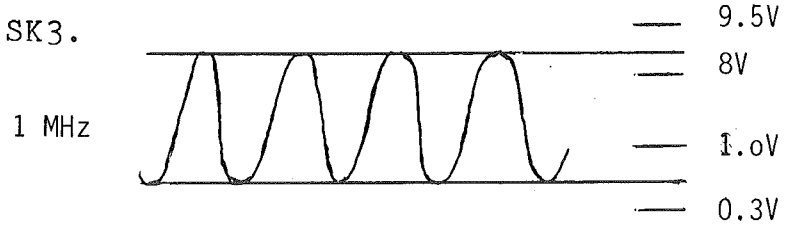
2.5 V to 6 V is not unusual.

A small amount (say 100mV p.p) of 1 MHz on this line is normal.

SK2 Typical Waveform.

A swing of between 0.75Vpp and 1Vpp is not unusual.

SK1, SK3.



When observing the waveform it is essential that the sockets are not loaded by excessive capacitance, i.e. a high impedance (X10) probe should be used.

FRONT PANEL MODULE

If any of the L.E.D displays D1 - D5 ceases to function then check:

(1) That the board is being correctly supplied with +5 V.

(2) That the relevant cathode is being pulled down towards 0 V (to about +2.5 V) to activate it.

If the "signal indicator" ceases to work check:

(1) That its input control on pin 5 of IC5 (LM3914) lies in it normal operating range of 0 V - 0.5 V.

(2) That RV1 which sets full scale deflection has not been tampered with.

REAR PANEL MODULE

No test or maintenance required.

PRESELECTOR MODULE (only DEBEG 2057)

The circuits on this board can be conveniently broken into three distinct areas. (1) R.F filters (2) Bandswitching logic circuits (3) Tuning motor control servo. These are shown in the circuit diagram.

RF-CIRCUITS

The relays are all longlife high reliability types. If however one needs replacing this can only be done with the module out of the receiver.

The air-spaced variable capacitors are precision items. If one of these is damaged and has to be replaced then the module must be put through it re-alignment procedure which requires the use of a special test jig and a spectrum analyser. It is recommended that in such cases the module be returned to DEBEG GmbH, Hamburg, for any repair. Any of the tuning coils may be successfully replaced without special facilities.

The R.F. Amplifier has a gain of approximately 7 dB at all frequencies between 50 kHz and 30 MHz.

BANDSWITCHING

This straight forward E-PROM logic circuitry can be examined and faults found with a voltmeter.

TUNING MOTOR CONTROL SERVO

This comprises a classical D.C. feedback servo loop. It is suggested that if a fault develops the loop be broken by disconnecting the shaft coupler that drives the air-spaced capacitors. Set R750 to its mid-position.

By adjusting the front panel tuning control a differential input to N 702 can be made and the motor amplifier circuit operation then easily examined.

The motor itself is a sealed unit and should be replaced if faulty.

OSCILLATOR MODULE

The frequency of the V.C.X.O (at the center of the circuit diagram) is controlled by its phase-locked loop in 10 Hz steps as follows:

Setting of 10 Hz decade switch (on the front panel)	Frequency of V.C.X.O
0	996865 Hz
1	996855 Hz
2	996845 Hz
3	996835 Hz
4	996825 Hz
5	996815 Hz
6	996805 Hz
7	996795 Hz
8	996785 Hz
9	996775 Hz

Also refer to LOGIC TEST

These frequencies may be observed using a digital frequency meter with it high impedance probe connected to TP2. If the frequencies are seen to be slighty shifted from those above, but to be correctly spaced then is an indication that the frequency standard requires adjustment. If the frequencies are erratic over a whole or part of the range then this indicates that the phase locked loop is failing and its operation should be examined as follows.

The signal at the collector of TR1/pin 3 of IC3 should be at the same frequency as that TP2 but amplified to C.M.O.S compatible levels. This should be digitally mixed by IC3 with the 1 MHZ signal at pin 5 to produce a frequency of approximately 32 kHz at pin 1.

The 1 MHz signal is also fed to pin 1 of IC2. The division ratio of IC2 is from 310 to 319 so that a frequency of approximately 3.2 kHz should appear at pin 23.

The two approximately 3.2 kHz signals are divided by two IC4 to produce two approximately 1.6 kHz signals. These two signals are compared by the two digital phase comparator IC5 (A). When the loop is in lock these two signals are identical in frequency and the output of IC5 (A) at pin 10 is a steady waveform and the output off the loop filter at TP1 is a steady D.C level.

This steady D.C. level is amplified by IC6 which is non-inverting and "Tunes" the varicap diodes D1, D2.

If the two frequencies at the input to IC5 (A) are not identical then the output at pin 10 will fluctuate at a few hertz. The output of the loop filter will be a D.C level that swings up and down and the varicaps will cause the V.C.X.O to "hunt".

The 543.34 kHz 540.34 kHz and "Telex" crystal oscillators are straight forward clapp oscillators with no special features. Similarily the B.F.O circuitry on sheet 2 of A1-1117 can be easily fault traced.

Note that only one oscillator feeds a signal via its switching diode D3, D4, D5 or D6 to TP3 etc. at any one time. The level at this point from any of the oscillators should be approximately 0.7 V peak to peak.

600 OHM LINE OUTPUT MODULE

This is a straight-forward audio amplifier. If there is an input at pin 2 of IC1 but no output at pin 8 then check that pin 6 is at 0 V. If pin 6 is pulled high then the output of the amplifier is automatically muted.

6.2. REALIGNMENT

The number of items requiring adjustment and re-alignment within the receiver have, by design been kept to the very minimum furthermore the realignment of these items requires the very minimum of test equipments.

RECEIVER MODULE

Capacitors C10, C13, C16, C19 and C22.

These do not usually require any adjustment. They are set up in the factory for optimum frequency response of the FRONT END L.P.F. This filter is to be flat with zero insertion loss from frequency to 30 MHz. It then rolls off to at least 50 dB at 35.4 MHz and maintains this attenuation to 101 MHz. If the capacitors are inadvertently disturbed then optimum performance can only be assured if they are realigned using a spectrum analyser to obtain the parameters described above.

However if such an analyser is not available a satisfactory performance and one within the manu-factures claimed specification can normally be obtained simply by setting them to the mid position of their range.

Capacitor C33 tunes the first stage of the 35.4 MHz amplifier to 35.4 MHz and L15 similary tunes the second I.F to 455 kHz. To realign C33 and/or L15 one simply tunes the receiver to a low level (i.e 3 microvolt) signal at any frequency and peak them for maximum output whilst monitoring the level at TP27 using the oscilloscope.

With the receiver tuned to 3 MHz and at a level of 2.5 microvolts e.m.f RV2 is adjusted so that the receiver is just entering its a.g.c range (this may be seen by monitoring TP27 using the oscilloscope).

RV1 is adjusted so that with no input signal the "signal indicator" bargraph at the front panel has only its extreme lefthand bar illuminated.

SYNTHESIZER MODULE

No adjustments or realignment.

FRONT PANEL MODULE

The function of VR1 is to balance the brilliance of the bargraph display against that of the other L.E.D.s.

VR5 is used to vary the audio power available from the headphones socket and its adjustment is covered under "Installation".

POWER SUPPLY MODULE

No adjustments or realignment. (Setting of A.C. supply voltage adjusting links is covered in "Installation")

FREQUENCY STANDARD MODULE

The accuracy of the 1 MHz Standard may be checked by connecting the counter to the "1 MHZ FREQ. STD" socket at the rear panel. If necessary the frequency may be adjusted to 1.000000 MHz by trimming C1 on the Frequency Standard Board.

DISPLAY MODULE

Having firstly determined that with no input signal to the receiver only the extreme left hand bar on the bargraph is illuminated (adjusting RV1 on the Receiver Board if necessary) the receiver is then tuned to a 1 mV signal at 3 MHz and VR1 on the Front Panel Board is adjusted so that all bars except the extreme right hand one are illuminated.

PRESELECTOR MODULE

It is recommended that no attempt is made to realign the Preselector Board unless a spectrum analyser is available.

The tracking output of the spectrum analyser should be connected to the antenna socket and the output to the analyser should be plugged into X 702 on the Preselector Board.

The cores of the coils L 701 and L 702, L 707 and L 708, T 702 and T 703, L 709 may then be adjusted to ensure that the correct frequency ranges are covered.

OSCILLATOR MODULE

Trimmer potentiometer RV2 may be adjusted to centralise the B.F.O. range. To perform this operation connect a coaxial lead between the FREQ.STD. and ANTENNA sockets on the rear of the receiver, tune the receiver to 1 MHz, set the mode to C.W. Then to perform adjustment of the frequencies of the USB and Telex crystal oscillators connect a digital frequency meter by means of a high impedance probe to TP3. The frequency of the oscillators may be adjusted by C42, C44 or C46 respectively.

To tune L4 or L8 requires both a D.F.M and an oscilloscope connected to TP4 via high impedance probes. To tune L4 switch the receiver to USB and trim L4 for maximum output at 456.5 kHz.

The D.F.M and oscilloscope must be used in conjunction to ensure that it is the 456.5 kHz component that has been maximized as there are several other frequencies present at TP4.

To tune L8 set the mode switch to CW and the B.F.O control to its central position. Trim L8 for maximum output at 455 kHz.

600 OHM LINE OUTPUT MODULE

No realignment necessary.

C.P.U. MODULE

The most critical functions of the C.P.U. Module are the clock circuit, the reset circuit and the 5 V supply, faults in any of which may cause malfunction.

CLOCK CIRCUIT

Absolute Frequency is not critical but C3 may be used to trim the output of the CRYSTAL OSCILLATOR to within +-20 Hz of 1.2288 MHz. The oscillator circuit, however, should have a fast start-up (less than 10ms) so as to ensure correct C.P.U. initialization.

The C.P.U. clock, nominal frequency 614.4 kHz may be inspected at TP3, and the wave form should show a very fast rise - time and should swing within a few millivolts of the supply rails. A poor clock wave form may cause internal latch-up of the C.P.U.

LOGIC TESTS

The system operating software incorporates a routine - "LOGIC TEST", which facilitates fault finding in the I/O Module and circuits directly controlled by the I/O Module. This facility may be called up simply by pressing the "LOGIC TEST" key.

The sequence of operations is as follows:-

(1) Display Test: All displays on the Front Panel should illuminate for approximately 3 seconds, loudspeaker switched off.

(2) Channel and Dwell Time: (Ports 2AH & 2BH). Each display in turn should increment from 0 through to 9 and back to 0 again. This test highlights any faults in the decoding IC's (IC's 1 - 4, Front Panel) and in the port select lines.

(3) First V.F.O. Synthesizer: Control Lines; Frequency Display Decoders: For these tests and also the subsequent 2nd synthesizer tests a D.F.M. is required with "EXT 1 MHz Standard" facility.

The "EXT" socket on the D.F.M. should be connected to the "1 MHz FREQUENCY STANDARD" socket on the rear panel of the receiver using a BNC - BNC lead.

The D.F.M. is then synchronized to the 1 MHz Standard on the receiver and the frequencies stated should be accurate to +-1 count.

Connect the D.F.M. to TP11 on the receiver module.

The displays and synthesizer frequencies should be as follows:-

	DISPLAY	V.F.O. FREQUENCY	STEPS
(a)	0 - 30 MHz	35.397 - 65.397	10 MHz
(b)	0 - 9 MHz	35.397 - 44.397	1 MHz
(c)	0 - 900 kHz	35.397 - 36.297	100 kHz
(d)	0 - 90 kHz	35.397 - 35.487	10 kHz
(e)	0 - 9 kHz	35.397 - 35.406	1 kHz

These tests highlight faults in the D.C. latches (IC's 11 - 13) and the B.C.D. Decoder (IC's 1 - 5) on the I/O Module.

(4) Second Synthesizer Control Lines.
Synthesized Oscillator:

Frequency Display Decoders.

Transfer the probe to TP18 on the receiver module.

The frequency displayed on the Front Panel Displays should be 200 kHz, Mode C.W.1. loudspeaker switched on.

(a) The Hz x 10 display should increment from 0 to 9. At the same time a tone should be heard from the loudspeaker which changes frequency in 10 Hz steps.

(b) The Hz x 100 display should increment from 0 to 9. The V.F.O. frequency should decrement from 34942.0 kHz through to 34941.1 kHz in 100 Hz steps.

(c) Modes should change to U.S.B. step (a) above is repeated.

(d) Step (b) above is repeated but this time the V.F.O. frequency should decrement from 34941.5 kHz through to 34940.6 kHz in 100 Hz steps.

(5) MODES: Transfer the probe to TP11 on the Receiver Module. Each receiver mode is selected in turn for approximately 3 seconds.

The "MODE" displays should change accordingly and there should be some audio indication of the correct operation of CRYSTALS on the Synthesized Oscillator Module, and of Filters on the Receiver Module.

The first V.F.O. frequencies should be as follows:

F.S.K.	35597.00 kHz
U.S.B.	35598.00 kHz
L.S.B.	35595.00 kHz
C.W.1.	35597.00 kHz
C.W.2.	35597.00 kHz
A.M.1.	35597.00 kHz
A.M.2.	35597.00 kHz

NOTES

The tests described above give a good indication of whether the receiver logic systems are functioning correctly or not.

The following notes may help to pinpoint faults on the I/O Module.

	SYMPTON	PROBABLE CAUSE
(a)	Frequency displayed is incorrect though V.F.O. frequencies are correct.	1 or more B.C.D. Decoders (IC's 1-7) faulty.
(b)	As (a) but V.F.O. frequencies incorrect.	1 or more data latches (IC's 1-4) faulty.
(c)	The same data appears on more than one port at once.	Faulty address decoders (IC's 18 + 19) or faulty C.P.U. I/O timing.
(d)	Sequence of port selection is correct but data displayed is regularly wrong.	TTL - CMOS interface IC's (20 + 21) faulty.

PARTS LIST

A C H T U N G !

Bei Materialbestellungen bitten wir um folgende Angaben:

1. Ausgabedatum der Stückliste
2. Gerätetyp
3. Position lt. Stückliste
4. Materialnummer lt. Stückliste
5. Benennung lt. Stückliste

A T T E N T I O N !

If you want to order some spares, please let us know following details:

1. Edition of the Parts List
2. Type of Set
3. Position (according to the Parts List)
4. Partnumber " " " " "
5. Description " " " " "

AUSGABE:
EDITION: 01/85

DEBEG 2056 ESB-EMPFAENGER USB/LSB

POSITION	MAT-NR/PART-NO	BENENNUNG / DESCRIPTION
	061 3894	DEBEG 2056 ESB-EMPFAENGER USB/LSB DEBEG 2056 SSB-RECEIVER USB/LSB
	061 5048	GRUNDCHASSIS 2056 BASE CHASSIS 2056
	C61 5064	FRONTPLATTENEINHEIT 2056 FRONTPANEL 2056
	C61 4955	KABELBAUMSATZ FUER 2051 CABLE HARNESS FOR 2051
	C61 5048	GRUNDCHASSIS 2056 BASE CHASSIS 2056
LP8	061 3932	LP 8 EMPFAENGER (VIGILANT) PCB 8 RECEIVER (VIGILANT)
LP9	C61 3940	LP 9 FREQUENZAUFBER. (VIGILANT) PCB 9 SYNTHESIZER (VIGILANT)
LP	C61 4114	LP STROMVERSORGUNGS-MODUL A1-1058 PCB POWER SUPPLY MODULE A1-1058
LP	C61 4025	LP ANSCHL.MODUL RUECKWAND A2-1090 PCB REAR PANEL MODULE A2-1090
LP10	061 3991	LP 10 FREQU.STANDARD (VIGILANT) PCB10 FREQU.STANDARD (VIGILANT)
LP17B	031 2657	LP 17B EINGANGSSCHUTZ PCB17B INPUT PROTECTION
LP	C61 4084	LP MIKROPROZESSOR A1-1187 PCB C.P.U.MODULE A1-1187
LP11	C61 3975	LP 11 OSZILLATOR 2050/3130 PCB11 OSCILLATOR 2050/3130
LP	C61 4092	LP EIN/AUSG.SCHNITTSTELLE A1-1189 PCB I.O.MODULE A1-1189
LP	C61 4076	LP FRONTPLATTEN-MODUL A1-1199 PCB FRONT PANEL MODULE A1-1199
	350 8609	POTI 1KO LIN 2W MCI POT. 1KO LIN 2W MCI
	070 1858	LAUTSPRECHER 8 OHM LOUDSPEAKER 8 OHM
	390 3842	G-SICHER.EINS. 5X20 M 1,0A FUSE,CARTRIDGE 5X20 M 1,0A
	390 3885	G-SICHER.EINS. 5X20 M 3,15A FUSE,CARTRIDGE 5X20 M 3,15A
	310 1797	KALTGERAETESTECKDOSE FN322-1/01 APPLIANCE RECEPTACLE DC FN322-1
	C61 2111	NETZANSCHLUSSKABEL 2,5M KOMPLETT POWER SUPPLY CABLE 2,5M COMPLETE
	321 4397	HF-BU.EINB.STECK.ISO. BNC R141574 RF BUILT-IN SOCKET BNC R141574
	421 2142	ANREIHKLEMME ADK1PA TERMINAL FOR CONNECTION
	C61 5218	KABELBAUM FUER 2056 CABLE HARNESS FOR 2056

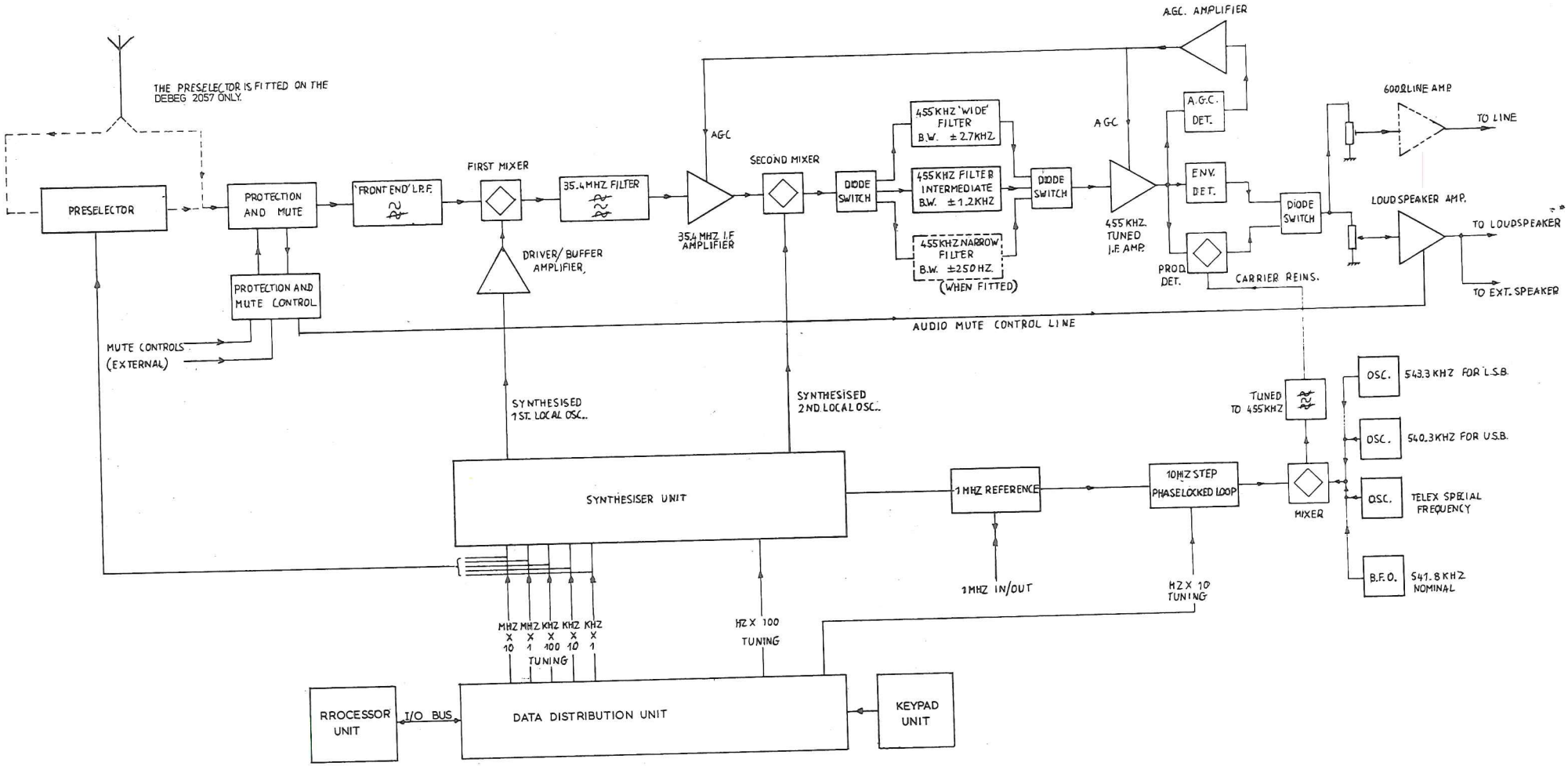
DEEEG 2056 ESB-EMPFAENGER USB/LSB

POSITION	MAT-NR/PART-NO	BENENNUNG / DESCRIPTION	
	C61 5064	FRONTPLATTENEINHEIT 2056 FRONTPANEL 2056	
	321 4400	EINBAUBUCHSE S4/BNB/SW PANEL JACK S4/BNB/BLK	6,3MM 6,3MM
LP	C61 4106	LP EINGABETASTATUR A1-1197 PCB KEYBOARD MODULE A1-1197	
	301 3367	WIPPSCHALTER 1802.0102 TOGGLE SWITCH 1802.0102	2POL 2WAY
	C61 3908	DEBEG 2057 ESB-EMPFAENGER USB/LSB DEBEG 2057 SSB-RECEIVER USB/LSB	
	C61 5056	GRUNDCHASSIS 2057 BASE CHASSIS 2057	
	C61 5072	FRONTPLATTENEINHEIT 2057 FRONTPANEL UNIT 2057	
	C61 4947	KABELBAUMSATZ FUER 2054 CABLE HARNESS FOR 2054	

DEBEG 2057 ESB-EMPFAENGER USB/LSB

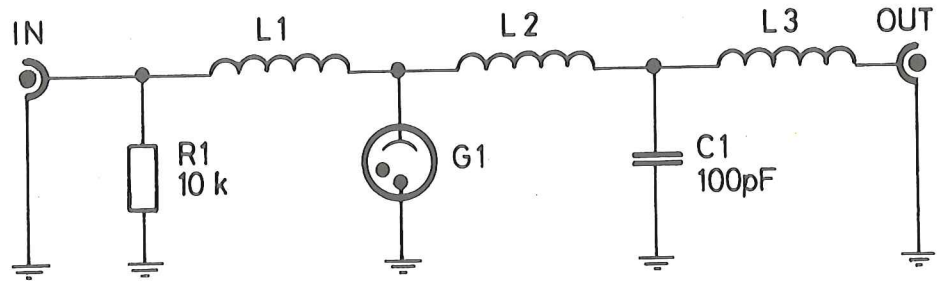
POSITION	MAT-NR/PART-NO	BENENNUNG / DESCRIPTION
	C61 5056	GRUNDCHASSIS 2057 BASE CHASSIS 2057
LP8	061 3932	LP 8 EMPFAENGER (VIGILANT) PCB 8 RECEIVER (VIGILANT)
LP9	061 3940	LP 9 FREQUENZAUFBER. (VIGILANT) PCB 9 SYNTHESIZER (VIGILANT)
LP	C61 4114	LP STROMVERSORGUNGS-MODUL A1-1058 PCB POWER SUPPLY MODULE A1-1058
LP	C61 4025	LP ANSCHL.MODUL RUECKWAND A2-1090 PCB REAR PANEL MODULE A2-1090
LP7	C31 2142	LP 7 VORKREISABSTIMMUNG PCB 7 PRESELECTOR BOARD
LP10	061 3991	LP 10 FREQU.STANDARD (VIGILANT) PCB10 FREQU.STANDARD (VIGILANT)
LP17B	C31 2657	LP 17B EINGANGSSCHUTZ PCB17B INPUT PROTECTION
LP	C61 4084	LP MIKROPROZESSOR A1-1187 PCB C.P.U.MODULE A1-1187
LP11	C61 3975	LP 11 OSZILLATOR 2050/3130 PCB11 OSCILLATOR 2050/3130
LP	061 4092	LP EIN/AUSG.SCHNITTSTELLE A1-1189 PCB I.O.MODULE A1-1189
LP	C61 4076	LP FRONTPLATTEN-MODUL A1-1199 PCB FRONT PANEL MODULE A1-1199
	350 8595	POTI M.SCHALT 1KO LIN P20 POT. W.SWITCH 1KO LIN P20
	070 1858	LAUTSPRECHER 8 OHM LOUDSPEAKER 8 OHM
	390 3842	G-SICHER.EINS. 5X20 M 1,0A FUSE,CARTRIDGE 5X20 M 1,0A
	390 3885	G-SICHER.EINS. 5X20 M 3,15A FUSE,CARTRIDGE 5X20 M 3,15A
	310 1797	KALTGERAETESTECKDOSE FN322-1/01 APPLIANCE RECEPTACLE DC FN322-1
	C61 2111	NETZANSCHLUSSKABEL 2,5M KOMPLETT POWER SUPPLY CABLE 2,5M COMPLETE
	321 4397	HF-BU.EINB.STECK.ISO. BNC R141574 RF BUILT-IN SOCKET BNC R141574
	421 2142	ANREIHKLEMME ADK1PA TERMINAL FOR CONNECTION
	C61 5226	KABELBAUM FUER 2057 CABLE HARNESS FOR 2057
	C61 5072	FRONTPLATTENEINHEIT 2057 FRONTPANEL UNIT 2057
	321 4400	EINBAUBUCHSE S4/BNB/SW 6,3MM PANEL JACK S4/BNB/BLK 6,3MM
LP	C61 4100	LP EINGABETASTATUR A1-1197 PCB KEYBOARD MODULE A1-1197
	301 3367	WIPPSCHALTER 1802.0102 2POL TOGGLE SWITCH 1802.0102 2WAY

A P P E N D I X



					Datum	Name	SSB RECEIVER DEBEG 2050 SERIES
				Gezeichnet	29.3.84	Dorphwe	
				Geprüft		Klu	BLOCK DIAGRAM SSB RECEIVER DEBEG 2056 AND DEBEG 2057
				Bearbeitet			Maßstab —
				Norm			
				DEBEG			Zchngs.-Nr. 7411-2E
Ausgabe	Änder.-Nr.	Datum	Name	Ursprung			Ersetzt für: / Ersetzt durch:

Blatt — Blätter



	Datum	Name
Gezeichnet	5.2.85	Kue
Geprüft		
Bearbeitet		
Norm		

DEBEG

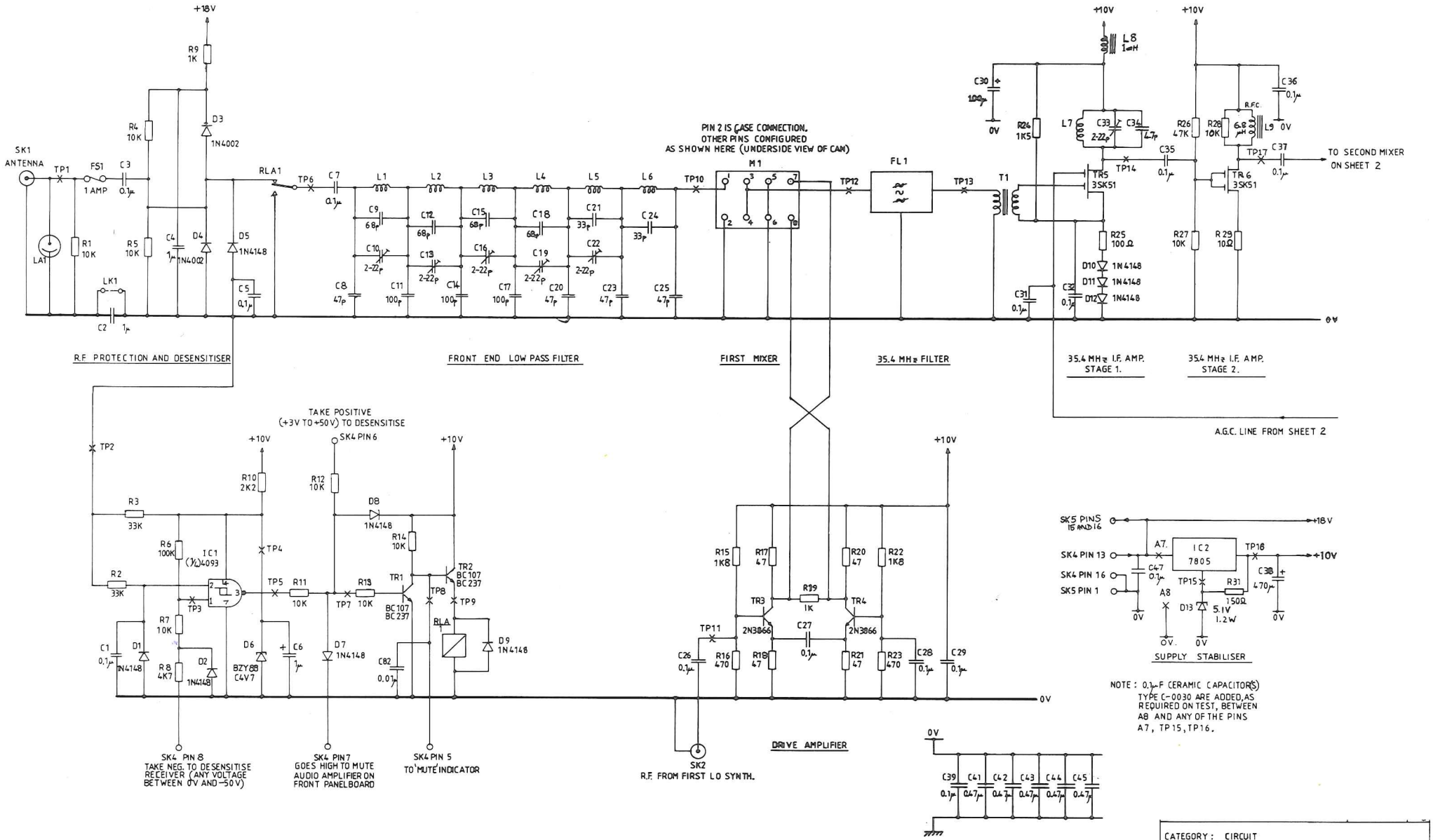
Eingangsschutz

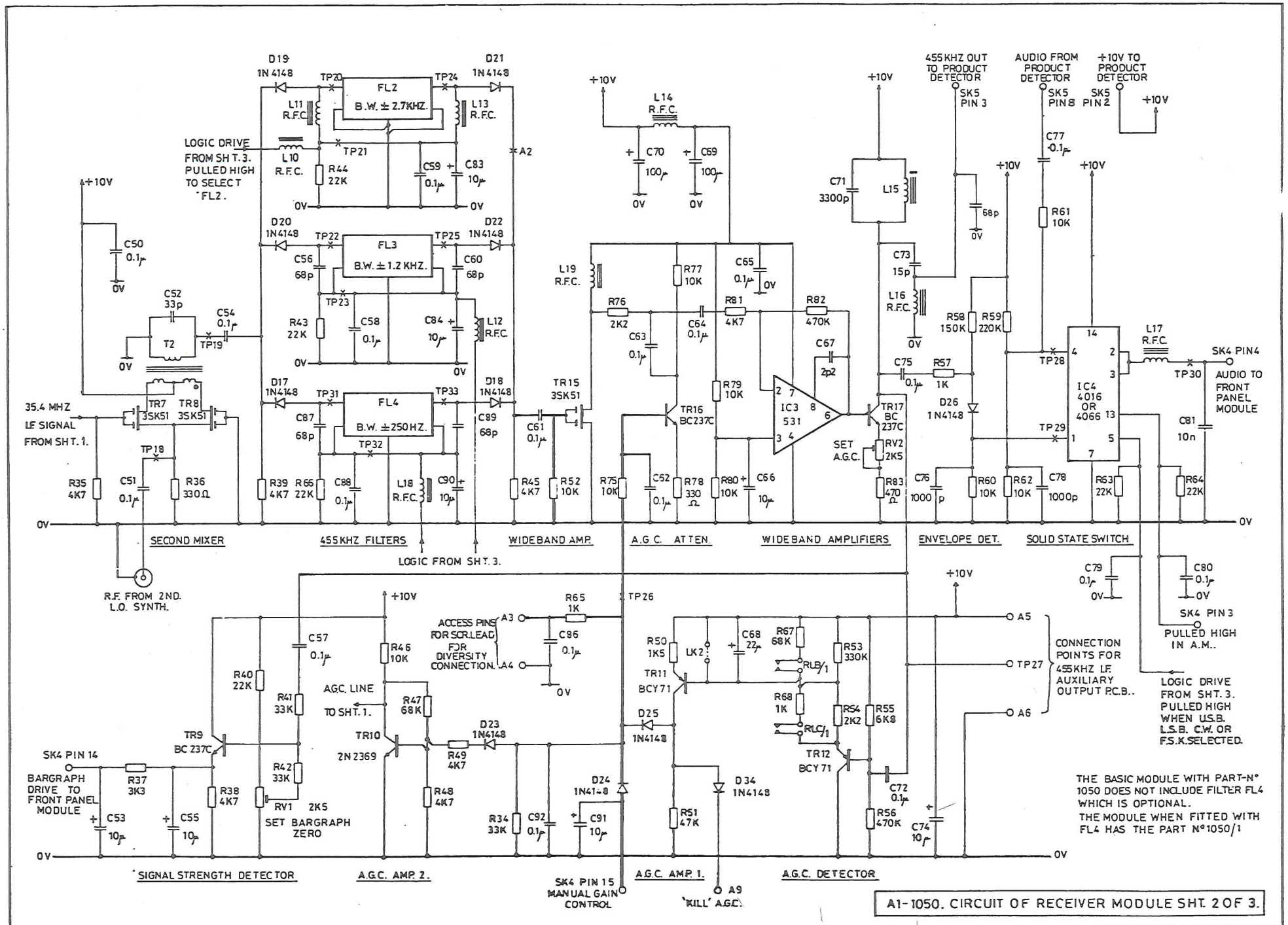
Maßstab

Zchngs.-Nr.

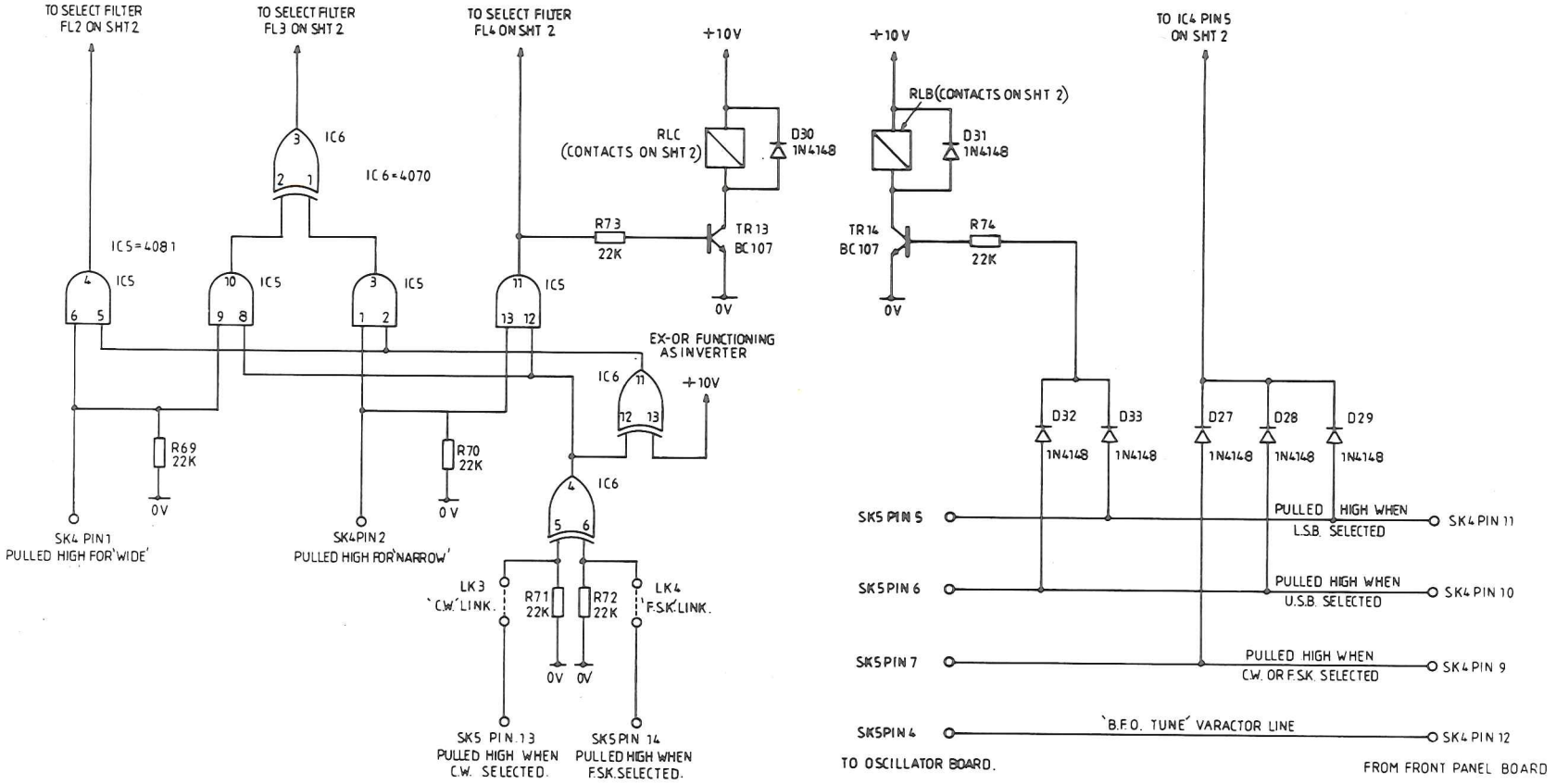
Blatt

Ausgabe	Änder-Nr.	Datum	Name	Ursprung	Ersatz für:	Ersetzt durch:	Blätter


SK1 ANTENNA
TP1
FS1 1 AMP
C3 0.1µ
+18V
R9 1K
R4 10K
D3 1N4002
RLA1
TP6
C7 0.1µ
L1
L2
L3
L4
L5
L6
TP10
M1
PIN 2 IS CASE CONNECTION. OTHER PINS CONFIGURED AS SHOWN HERE (UNDERSIDE VIEW OF CAN)
TP12
FL1
TP13
T1
+10V
L8 1mH
C30 100p
0V
R24 1K5
L7
C33 2-22p
C34 4.7p
TP14
C35 0.1µ
TR5 3SK51
R25 100Ω
D10 1N4148
D11 1N4148
D12 1N4148
C31 0.1µ
C32 0.1µ
R26 47K
R28 10K
R.F.C. 6.8µH
L9
C36 0.1µ
TP17
C37 0.1µ
TR6 3SK51
R27 10K
R29 10Ω
TO SECOND MIXER ON SHEET 2
LA1
R1 10K
R5 10K
C4 1µ
D4 1N4002
D5 1N4148
C5 0.1µ
LK1
C2 1µ
C8 47p
C9 68p
C10 2-22p
C11 100p
C12 68p
C13 2-22p
C14 100p
C15 68p
C16 2-22p
C17 100p
C18 68p
C19 2-22p
C20 47p
C21 33p
C22 2-22p
C23 47p
C24 33p
C25 47p
0V
R.F. PROTECTION AND DESENSITISER
FRONT END LOW PASS FILTER
FIRST MIXER
35.4 MHz FILTER
35.4 MHz I.F. AMP. STAGE 1.
35.4 MHz I.F. AMP. STAGE 2.
A.G.C. LINE FROM SHEET 2
TAKE POSITIVE (+3V TO +50V) TO DESENSITISE
TP2
R3 33K
R2 33K
R6 100K
IC1 (½)4093
TP3
TP4
TP5
R11 10K
R13 10K
TP7
TP8
TP9
R7 10K
R8 4K7
C1 0.1µ
D1 1N4148
D2 1N4148
D6 BZY88 C4V7
C6 1µ
D7 1N4148
C82 0.01µ
R10 2K2
R12 10K
SK4 PIN 6
D8 1N4148
R14 10K
TR1 BC107 BC237
TR2 BC107 BC237
RLA
D9 1N4148
SK4 PIN 8 TAKE NEG. TO DESENSITISE RECEIVER (ANY VOLTAGE BETWEEN 0V AND −50V)
SK4 PIN 7 GOES HIGH TO MUTE AUDIO AMPLIFIER ON FRONT PANELBOARD
SK4 PIN 5 TO 'MUTE' INDICATOR
R15 1K8
R17 47
R20 47
R22 1K8
R19 1K
TR3 2N3866
TR4 2N3866
C27 0.1µ
TP11
C26 0.1µ
R16 470
R18 47
R21 47
R23 470
C28 0.1µ
C29 0.1µ
SK2 R.F. FROM FIRST LO SYNTH.
DRIVE AMPLIFIER
C39 0.1µ
C41 0.47µ
C42 0.47µ
C43 0.47µ
C44 0.47µ
C45 0.47µ
SK5 PINS 15 AND 16
SK4 PIN 13
SK4 PIN 16
SK5 PIN 1
A7
IC2 7805
TP16
C47 0.1µ
TP15
R31 150Ω
C38 470µ
A8
D13 5.1V 1.2W
SUPPLY STABILISER
NOTE : 0.1µF CERAMIC CAPACITOR(S) TYPE C-0030 ARE ADDED, AS REQUIRED ON TEST, BETWEEN A8 AND ANY OF THE PINS A7, TP15, TP16.
CATEGORY : CIRCUIT
FOR : RECEIVER BOARD (DUAL I.F.)



A1-1050. CIRCUIT OF RECEIVER MODULE SHT. 2 OF 3.



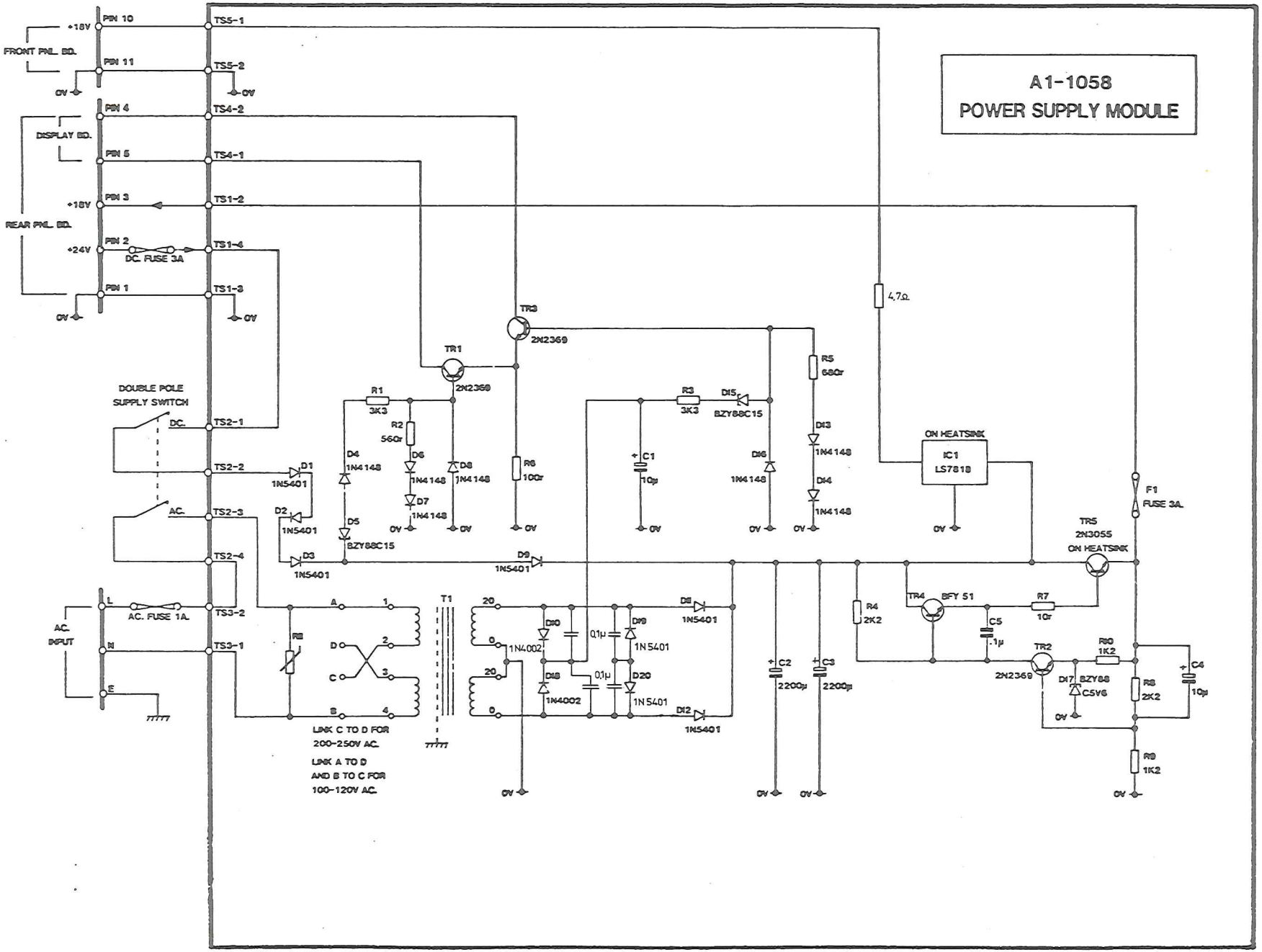
POSITION OF MODE SWITCH	LINKS	FILTER SELECTED	PASSBAND	ATTACK T.C.	RECOVERY T.C.
L.S.B.	—	FL3	-350 TO -2700HZ.	8m SEC.	2 SEC.
U.S.B.	—	FL3	+350 TO +2700HZ.	8m SEC.	2 SEC.
A.M. WIDE.	—	FL2	±2.7 KHZ.	8m SEC.	400m SEC.
A.M. NARROW.	—	FL3	±1 KHZ.	8m SEC.	400m SEC.
C.W. WIDE.	LK3 OPEN	FL2	±2.7 KHZ.	8m SEC.	400m SEC.
C.W. NARROW.	LK3 OPEN	FL3	±1 KHZ.	8m SEC.	400m SEC.
C.W. WIDE.	LK3 CLOSED	FL3	±1 KHZ.	8m SEC.	400m SEC.
C.W NARROW	LK3 CLOSED	FL4	±250HZ.	50m SEC.	400m SEC.
F.S.K.	LK4 OPEN	FL3	±1 KHZ.	8m SEC.	400m SEC.
F.S.K.	LK4 CLOSED	FL4	±250HZ.	50m SEC.	400m SEC.

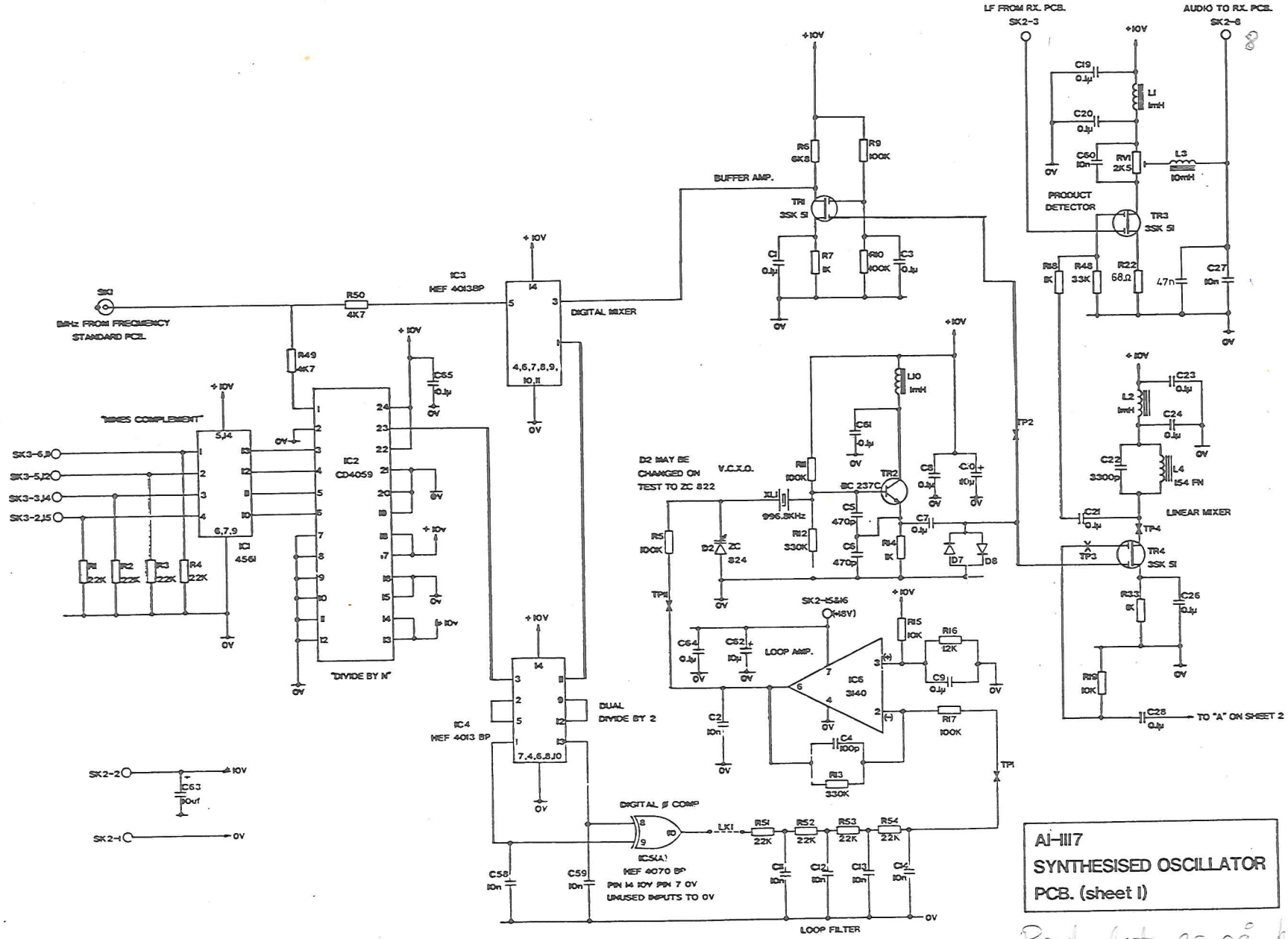
NOTE : ON RECEIVERS WITH FL4 OMITTED, LINKS LK3 AND LK4 MUST ALSO BE OMITTED i.e. OPEN.

DRAWN	DATE	CHECKED
N Taylor	18.10.82.	

TITLE RECEIVER BOARD

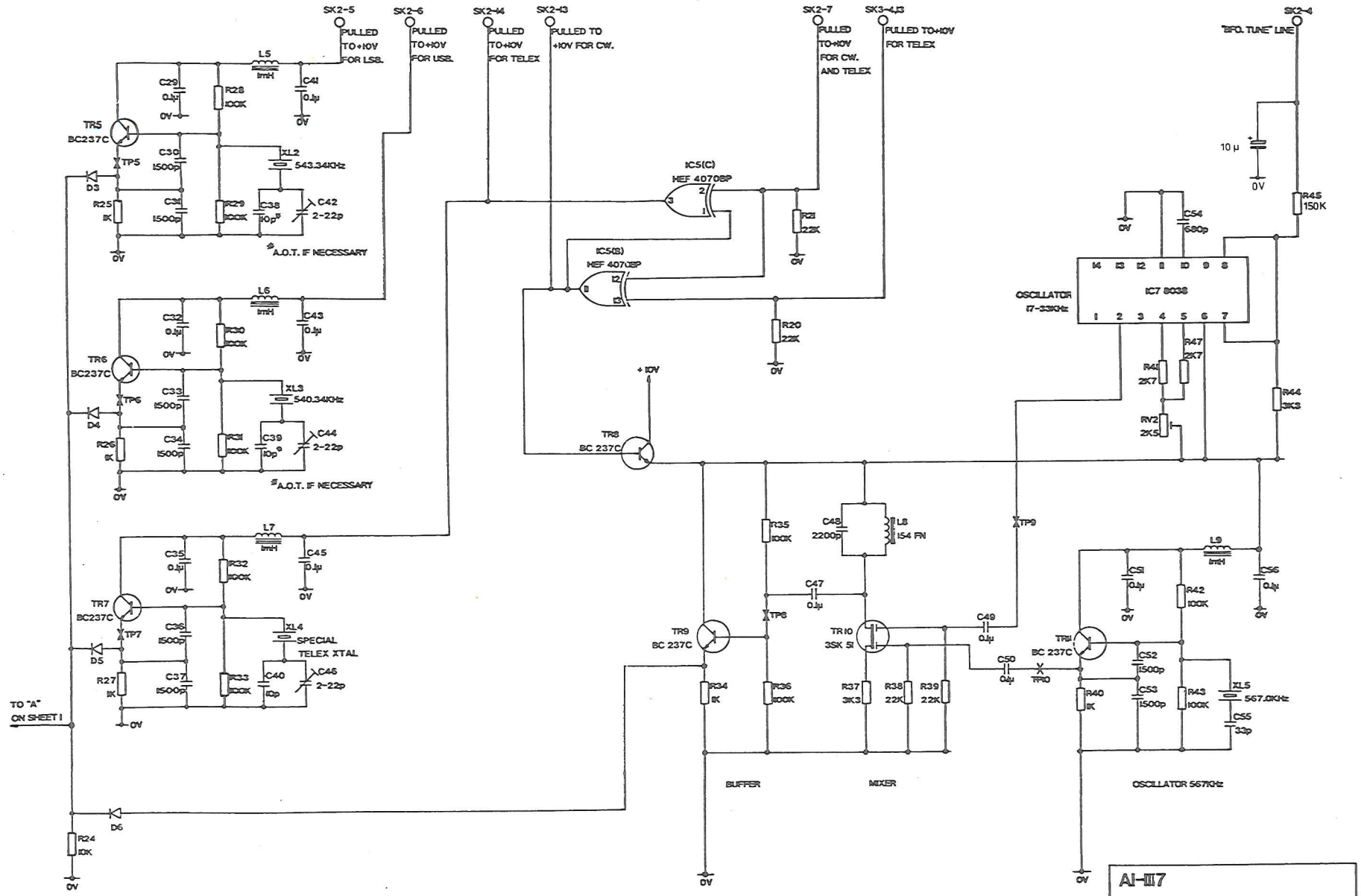
DRG. No. A1-1050 SHT.


A1-1058
POWER SUPPLY MODULE
FRONT PNL. BD.
DISPLAY BD.
REAR PNL. BD.
+18V
+24V
0V
PIN 10
PIN 11
PIN 4
PIN 5
PIN 3
PIN 2
PIN 1
TS5-1
TS5-2
TS4-2
TS4-1
TS1-2
TS1-4
TS1-3
DC. FUSE 3A
DOUBLE POLE
SUPPLY SWITCH
DC.
AC.
TS2-1
TS2-2
TS2-3
TS2-4
AC.
INPUT
L
N
E
AC. FUSE 1A.
TS3-2
TS3-1
D1
1N5401
D2
1N5401
D3
1N5401
TR1
2N2369
TR3
2N2369
R1
3K3
R2
560r
D4
1N4148
D5
BZY88C15
D6
1N4148
D7
1N4148
D8
1N4148
R6
100r
R3
3K3
D15
BZY88C15
C1
10µ
D16
1N4148
R5
680r
D13
1N4148
D14
1N4148
4.7Ω
ON HEATSINK
IC1
LS7818
F1
FUSE 3A.
TR5
2N3055
ON HEATSINK
D9
1N5401
R8
T1
A
B
C
D
1
2
3
4
LINK C TO D FOR
200-250V AC.
LINK A TO D
AND B TO C FOR
100-120V AC.
20
0
D10
1N4002
D18
1N4002
0.1µ
D19
1N5401
D20
1N5401
D11
1N5401
D12
1N5401
C2
2200µ
C3
2200µ
R4
2K2
TR4
BFY 51
R7
10r
C5
.1µ
TR2
2N2369
R10
1K2
D17
BZY88
C5V6
R8
2K2
C4
10µ
R9
1K2



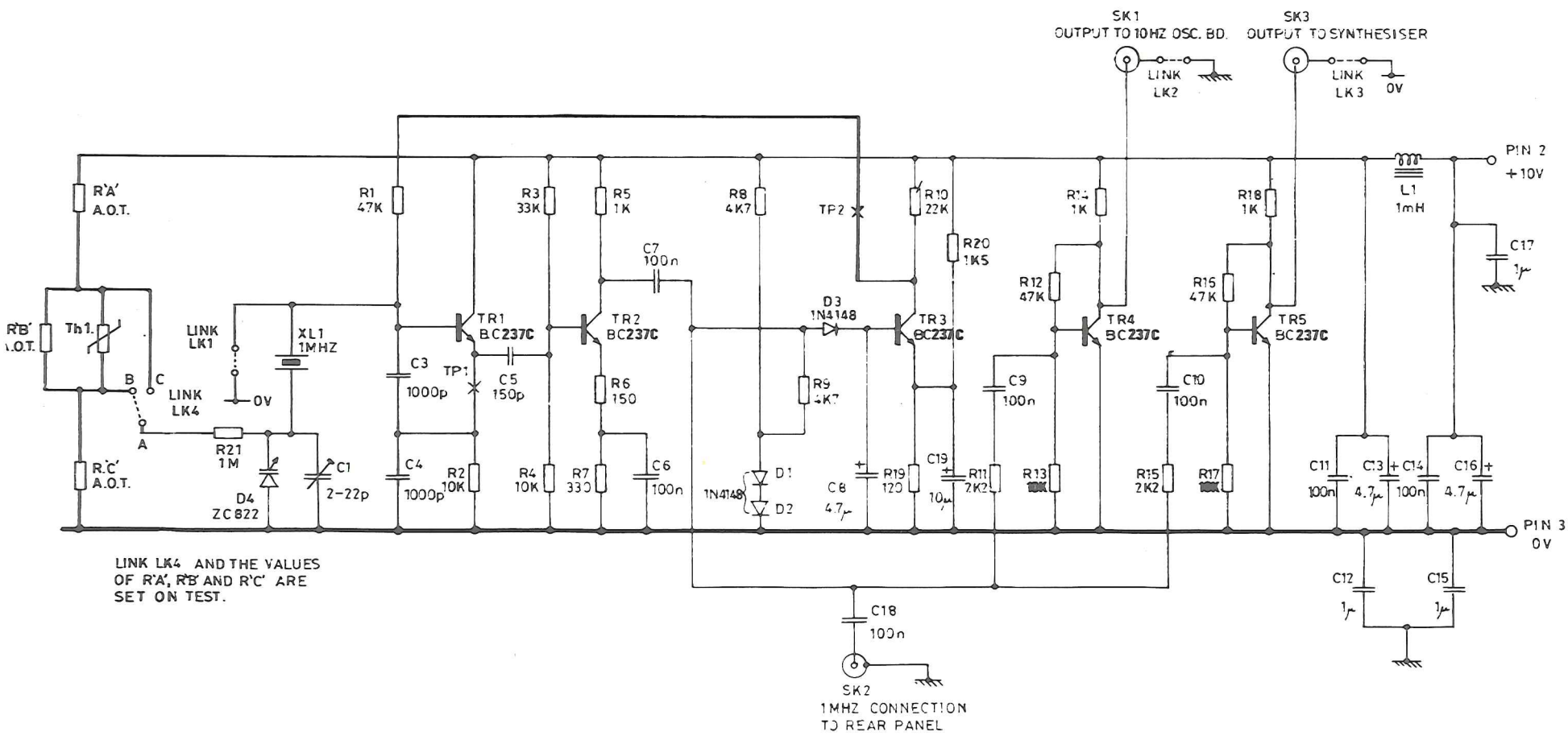
AI-III7
SYNTHESISED OSCILLATOR
PCB. (sheet I)

Prod. bet. er på kort A2-1116 (helt anden kredsløsning!)



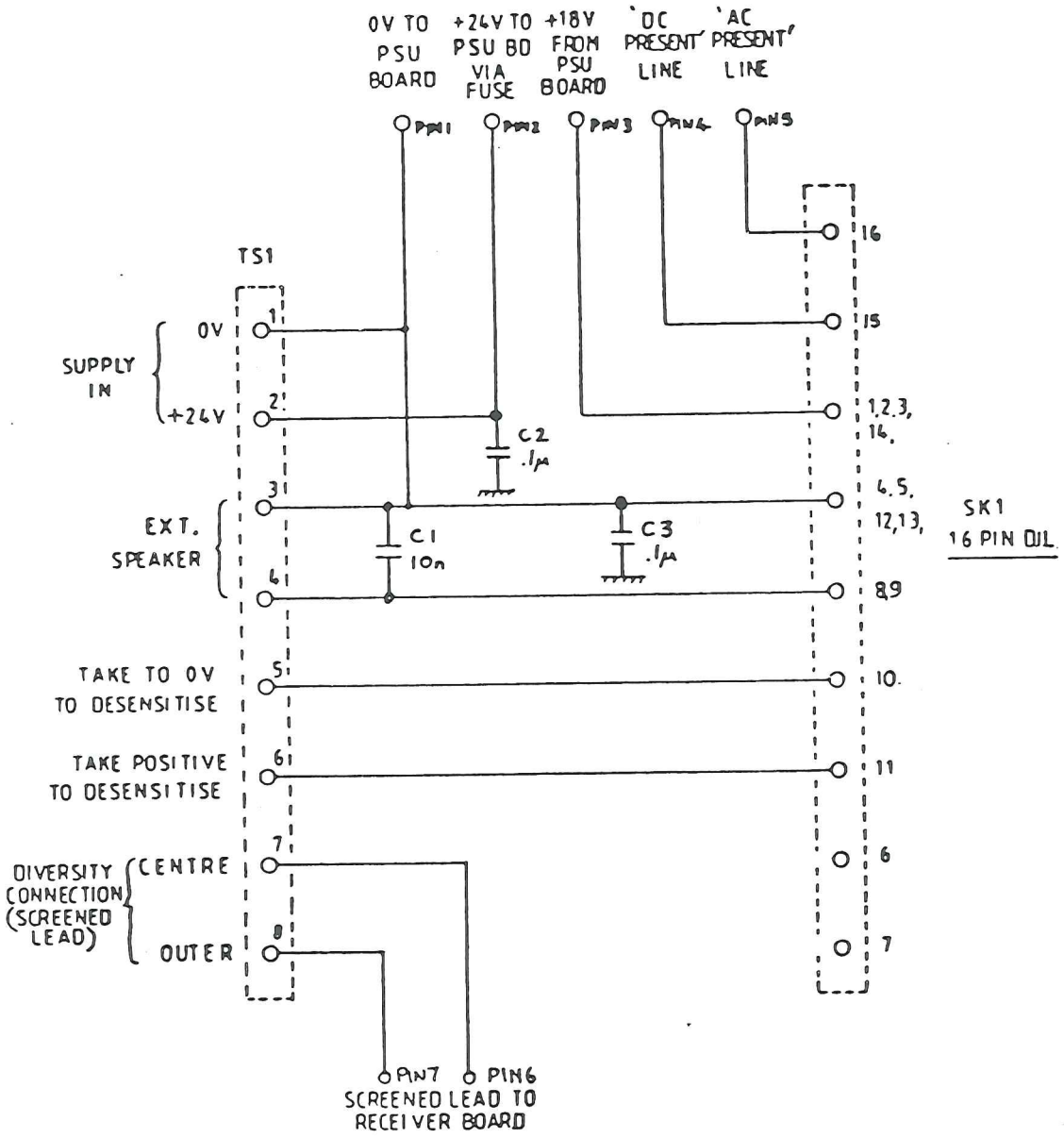
ALL DIODES IN 4148 OR IN 4149 UNLESS OTHERWISE STATED

AI-III7
SYNTHESISED OSCILLATOR
PCB.(sheet 2)



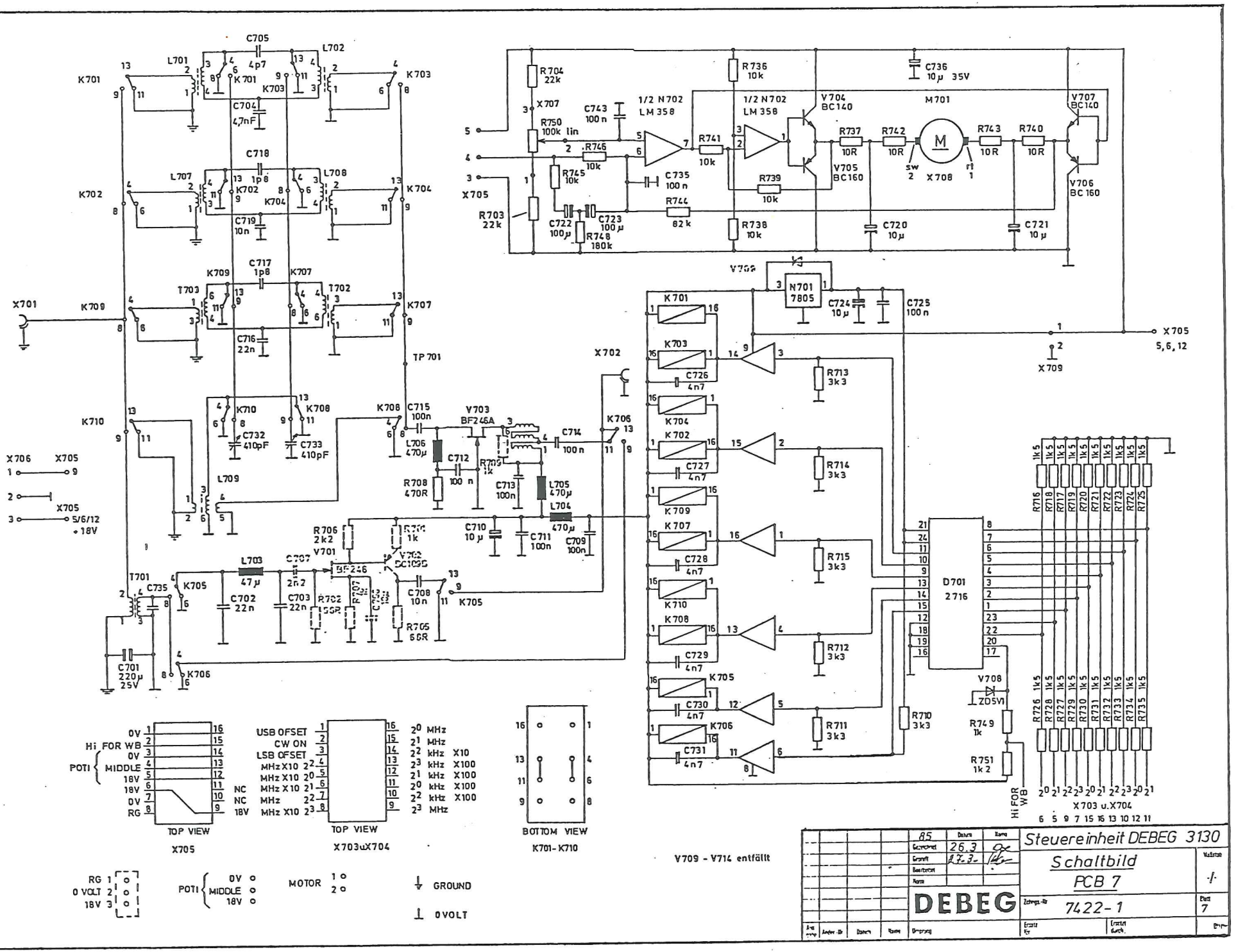
LINK LK4 AND THE VALUES OF R'A', R'B' AND R'C' ARE SET ON TEST.

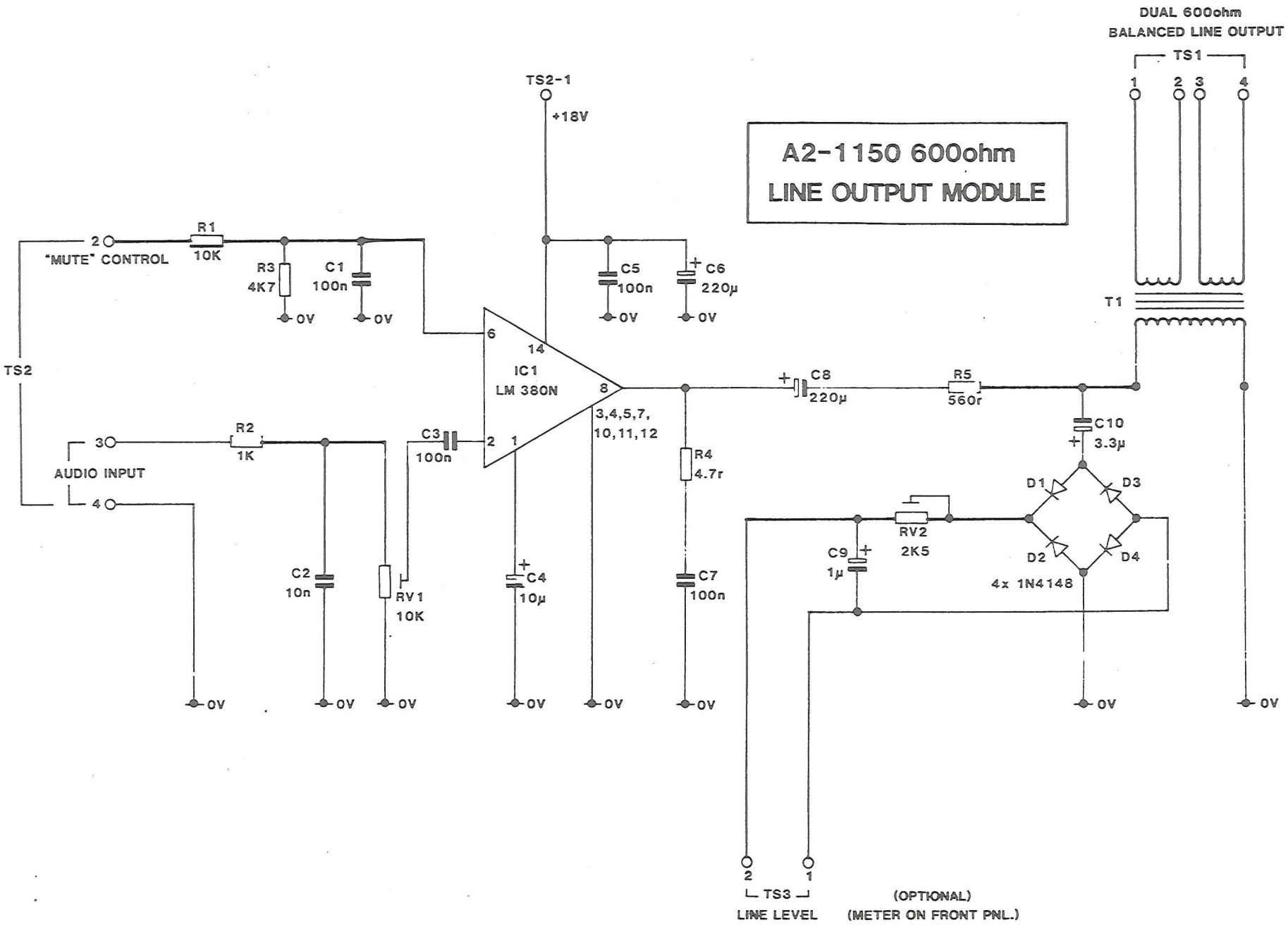
A1-1093 FREQUENCY STANDARD MODULE (MK3).

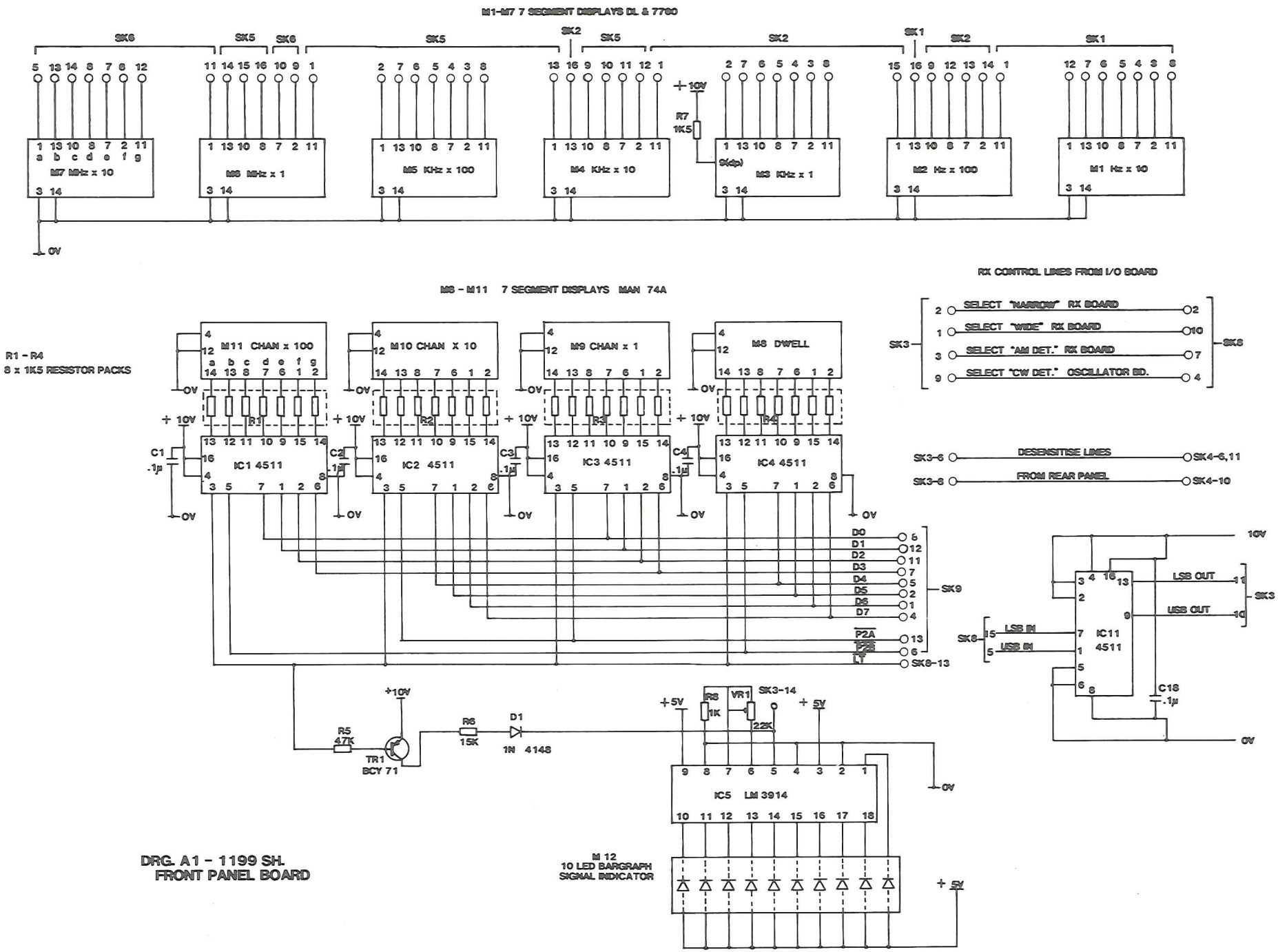


A2-1090

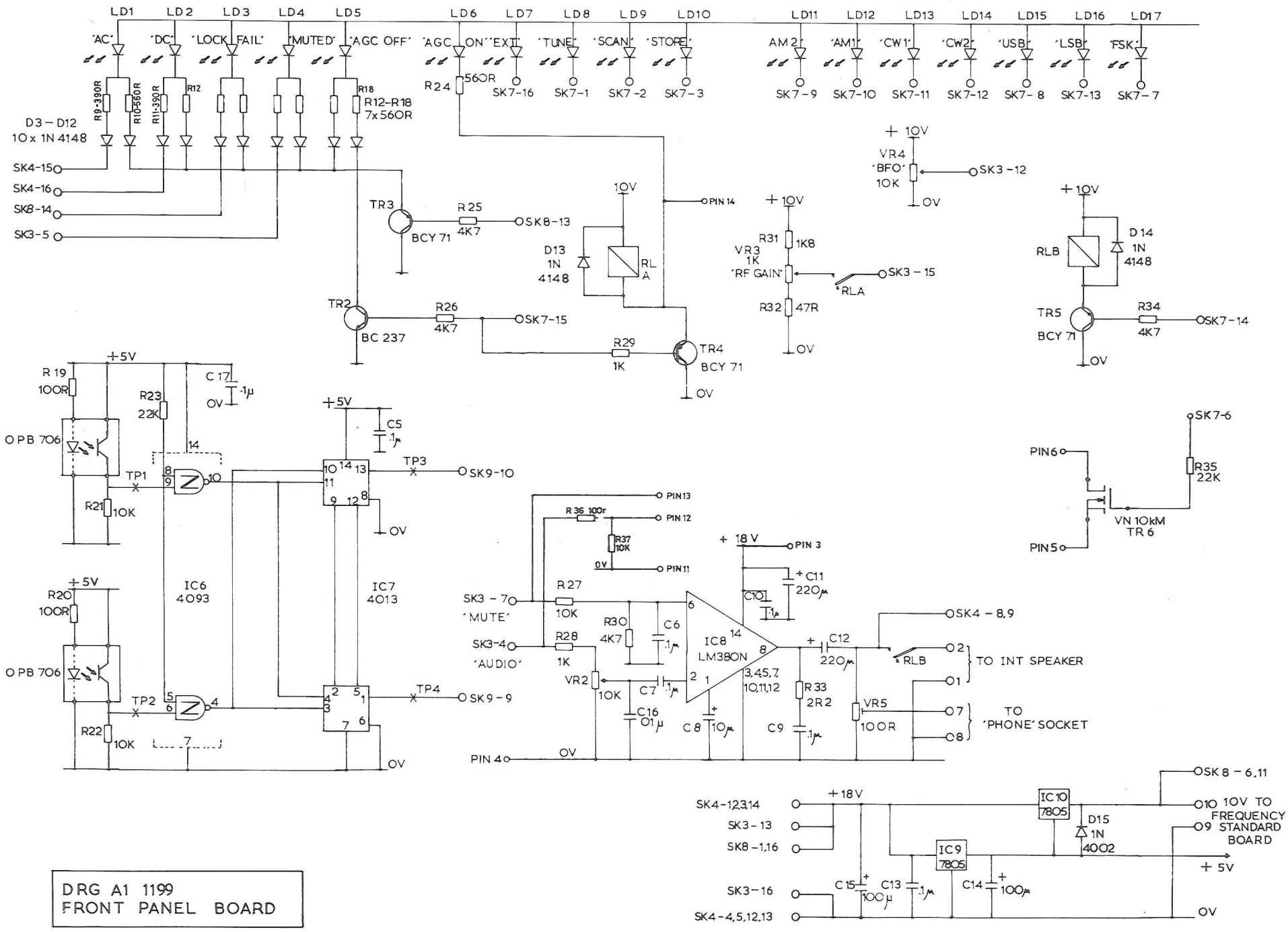
REAR PANEL MODULE


C705 4p7
L701
L702
K701
K703
C704 4,7nF
C718 1p8
L707
L708
K702
K704
C719 10n
C717 1p8
K709
K707
T703
T702
X701
C716 22n
TP 701
X702
K710
K708
C715 100n
V703 BF246A
C732 410pF
C733 410pF
K706
C714 100n
L706 470µ
C712 100 n
R708 470R
R709 1k
C713 100n
L705 470µ
L704 470µ
L709
X706 X705
X705 5/6/12 +18V
R706 2k2
R707 1k
V701 BF246
V702 BC109C
C710 10 µ
C711 100n
C709 100n
T701
K705
L703 47µ
C707 2n2
C735
C702 22n
C703 22n
R702 56R
R703 56R
C708 10n
R705 56R
C701 220µ 25V
K706
R704 22k
X707
R736 10k
C736 10µ 35V
1/2 N702 LM 358
1/2 N702 LM 358
V704 BC140
M701
V707 BC140
C743 100 n
R750 100k lin
R746 10k
R741 10k
R737 10R
R742 10R
R743 10R
R740 10R
R745 10k
C735 100 n
R739 10k
V705 BC160
sw 2 X708 rl 1
V706 BC 160
X705
R703 22k
C722 100µ
C723 100 µ
R744 82 k
R738 10k
C720 10 µ
C721 10 µ
R748 180k
V708
N701 7805
C724 10 µ
C725 100 n
X705 5,6,12
X709
K701
K703
C726 4n7
K704
K702
C727 4n7
K709
K707
C728 4n7
K710
K708
C729 4n7
K705
C730 4n7
K706
C731 4n7
R713 3k3
R714 3k3
R715 3k3
R712 3k3
R710 3k3
R711 3k3
D701 2716
V708 ZD5V1
R749 1k
R751 1k2
Hi FOR WB
R716 1k5
R718 1k5
R717 1k5
R719 1k5
R720 1k5
R721 1k5
R722 1k5
R723 1k5
R724 1k5
R725 1k5
R726 1k5
R728 1k5
R727 1k5
R729 1k5
R730 1k5
R731 1k5
R732 1k5
R733 1k5
R734 1k5
R735 1k5
X703 u.X704
6 5 9 7 15 16 13 10 12 11
0V
Hi FOR WB
POTI
MIDDLE
18V
0V
RG
NC
NC
18V
TOP VIEW
X705
USB OFSET
CW ON
LSB OFSET
MHz X10
MHz X10
MHz X10
MHz
MHz X10
TOP VIEW
X703uX704
BOTTOM VIEW
K701-K710
V709 - V714 entfällt
RG 1
0 VOLT 2
18V 3
POTI
0V
MIDDLE
18V
MOTOR
GROUND
0VOLT
DEBEG
Steuereinheit DEBEG 3130
Schaltbild
PCB 7
7422-1
Blatt 7

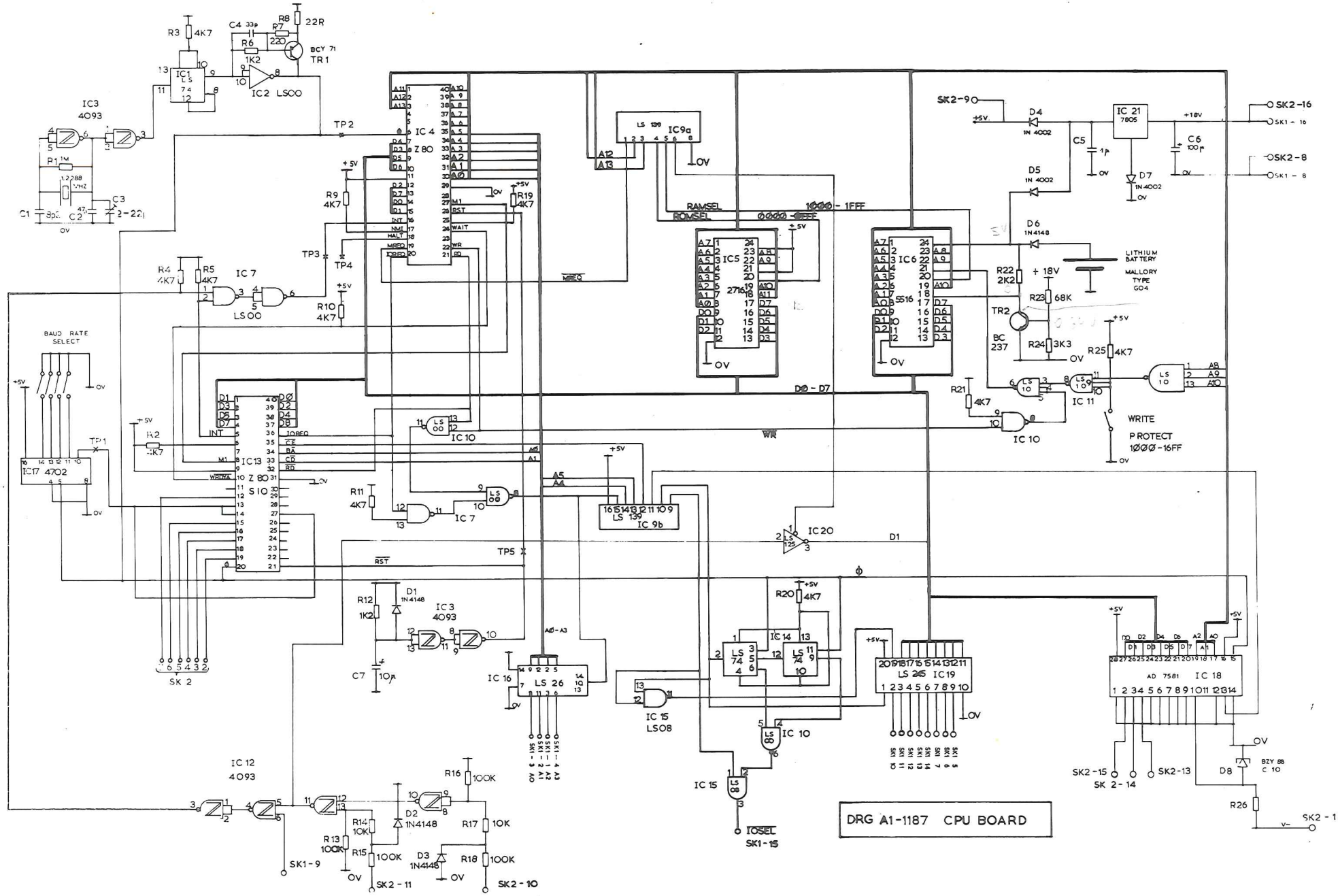

A2-1150 600ohm
LINE OUTPUT MODULE
DUAL 600ohm
BALANCED LINE OUTPUT
TS1
1 2 3 4
T1
TS2-1
+18V
TS2
2
"MUTE" CONTROL
R1
10K
R3
4K7
C1
100n
0V
C5
100n
C6
220µ
6
14
IC1
LM 380N
8
3,4,5,7,
10,11,12
C8
220µ
R5
560r
C10
3.3µ
3
AUDIO INPUT
4
R2
1K
C3
100n
2
1
R4
4.7r
D1
D3
D2
D4
4x 1N4148
RV2
2K5
C9
1µ
C2
10n
RV1
10K
C4
10µ
C7
100n
2
1
TS3
LINE LEVEL
(OPTIONAL)
(METER ON FRONT PNL.)

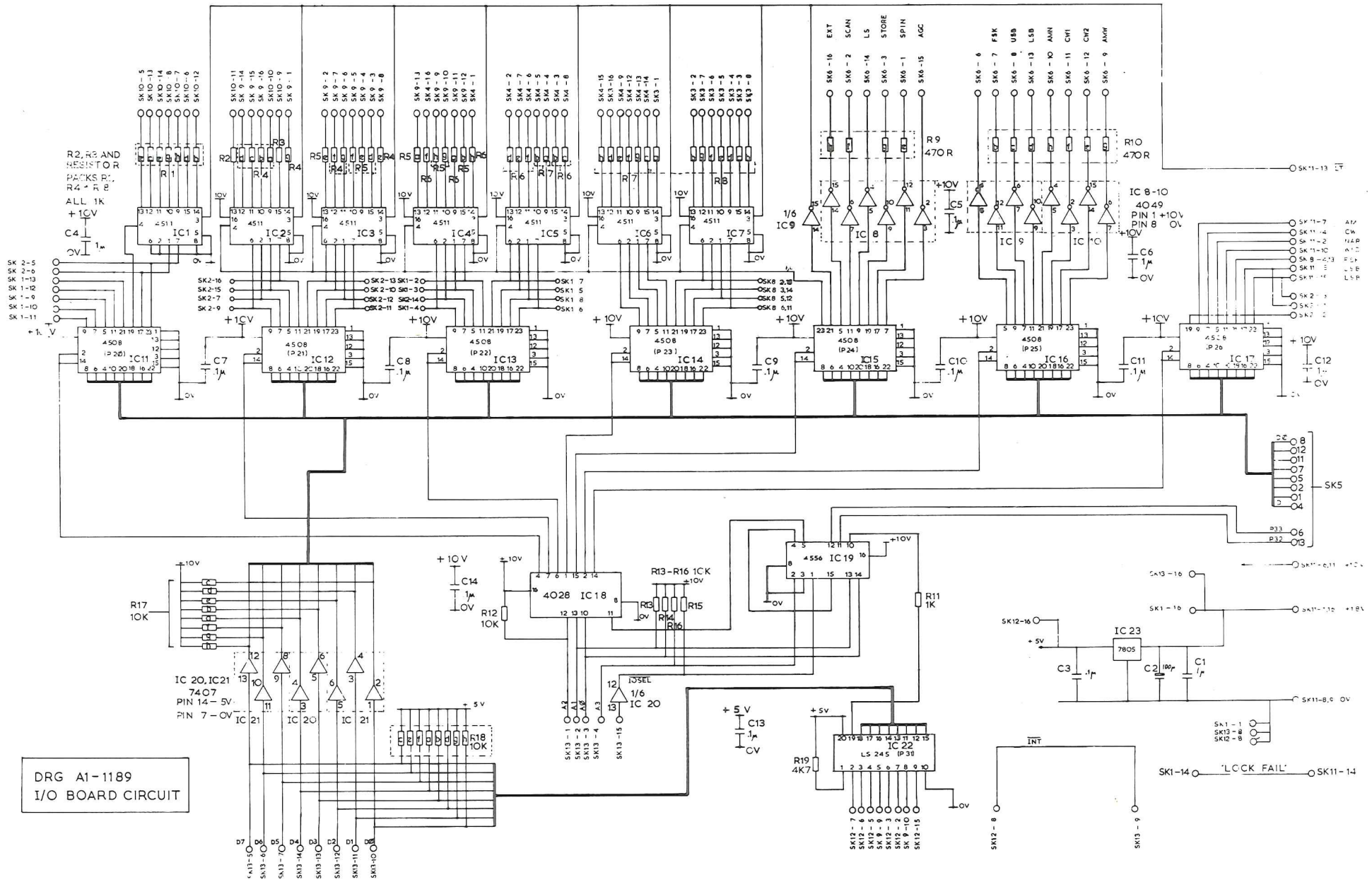


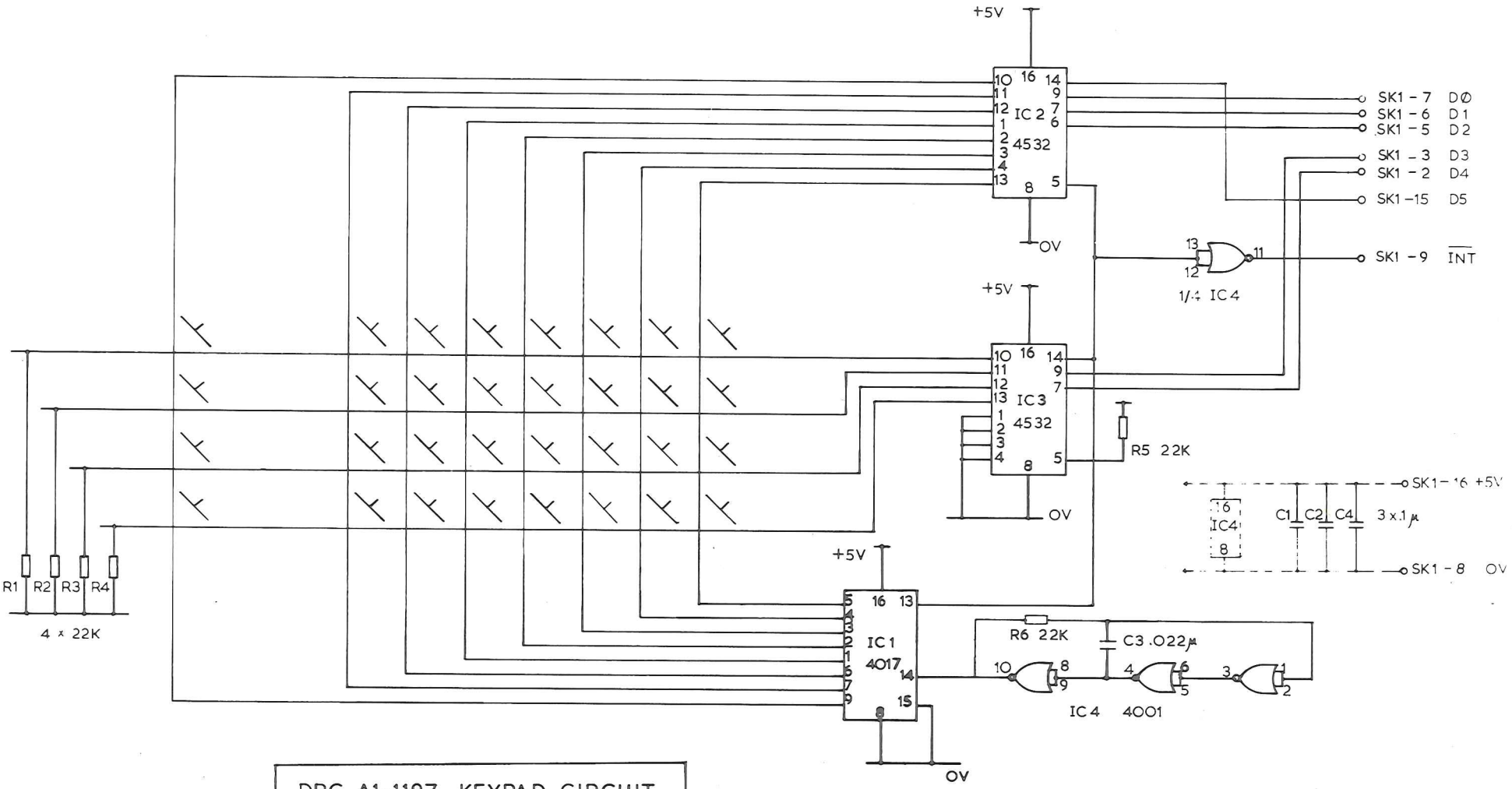
DRG. A1 - 1199 SH.
FRONT PANEL BOARD



DRG A1 1199
FRONT PANEL BOARD


DRG A1-1187 CPU BOARD
BAUD RATE SELECT
WRITE PROTECT 1000-16FF
LITHIUM BATTERY MALLORY TYPE 604
SK2-16
SK1-16
SK2-8
SK1-8
SK2-15
SK 2-14
SK2-13
SK2-1
SK1-9
SK2-11
SK2-10
IOSEL SK1-15
RAMSEL
ROMSEL
0000-0FFF
1000-1FFF
D0-D7
WR
RST
IORQ
TP1
TP2
TP3
TP4
TP5
IC1 LS 74
IC2 LS00
IC3 4093
IC4 Z80
IC5 2716
IC6 5516
IC7 LS00
IC9a LS 139
IC9b LS 139
IC10 LS 00
IC11 LS 10
IC12 4093
IC13 Z80 SIO
IC14 LS 74
IC15 LS08
IC16 LS 26
IC17 4702
IC18 AD 7581
IC19 LS 245
IC20 LS 125
IC21 7805
TR1 BCY 71
TR2 BC 237
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4002
D5 1N4002
D6 1N4148
D7 1N4002
D8 BZY 88 C 10
SK 2


DRG A1-1189
I/O BOARD CIRCUIT
R2, R3 AND R4 RESISTOR PACKS R2, R4 + R8 ALL 1K
IC 20, IC21 7407 PIN 14 – 5V PIN 7 – 0V
R9 470R
R10 470R
IC 8-10 4049 PIN 1 +10V PIN 8 0V
R11 1K
R12 10K
R13–R16 1CK
R17 10K
R18 10K
R19 4K7
C1 1µ
C2 100p
C3 .1µ
C4 1µ
C5 1µ
C6 1µ
C7 .1µ
C8 .1µ
C9 .1µ
C10 .1µ
C11 .1µ
C12 1µ
C13 .1µ
C14 1µ
IC 23 7805
IC 22 LS 245 (P31)
4556 IC 19
4028 IC 18
4508 (P20) IC11
4508 (P21) IC12
4508 (P22) IC13
4508 (P23) IC14
4508 (P24) IC15
4508 (P25) IC16
4508 (P26) IC17
4511 IC1
4511 IC2
4511 IC3
4511 IC4
4511 IC5
4511 IC6
4511 IC7
1/6 IC9
1/6 IC 20
EXT
SCAN
LS
STORE
SPIN
AGC
FSK
USB
LSB
AMN
CW1
CW2
AMW
'LOCK FAIL'
INT
SK5
IOSEL
+10V
+5V
0V



DRG A1-1197 KEYPAD CIRCUIT