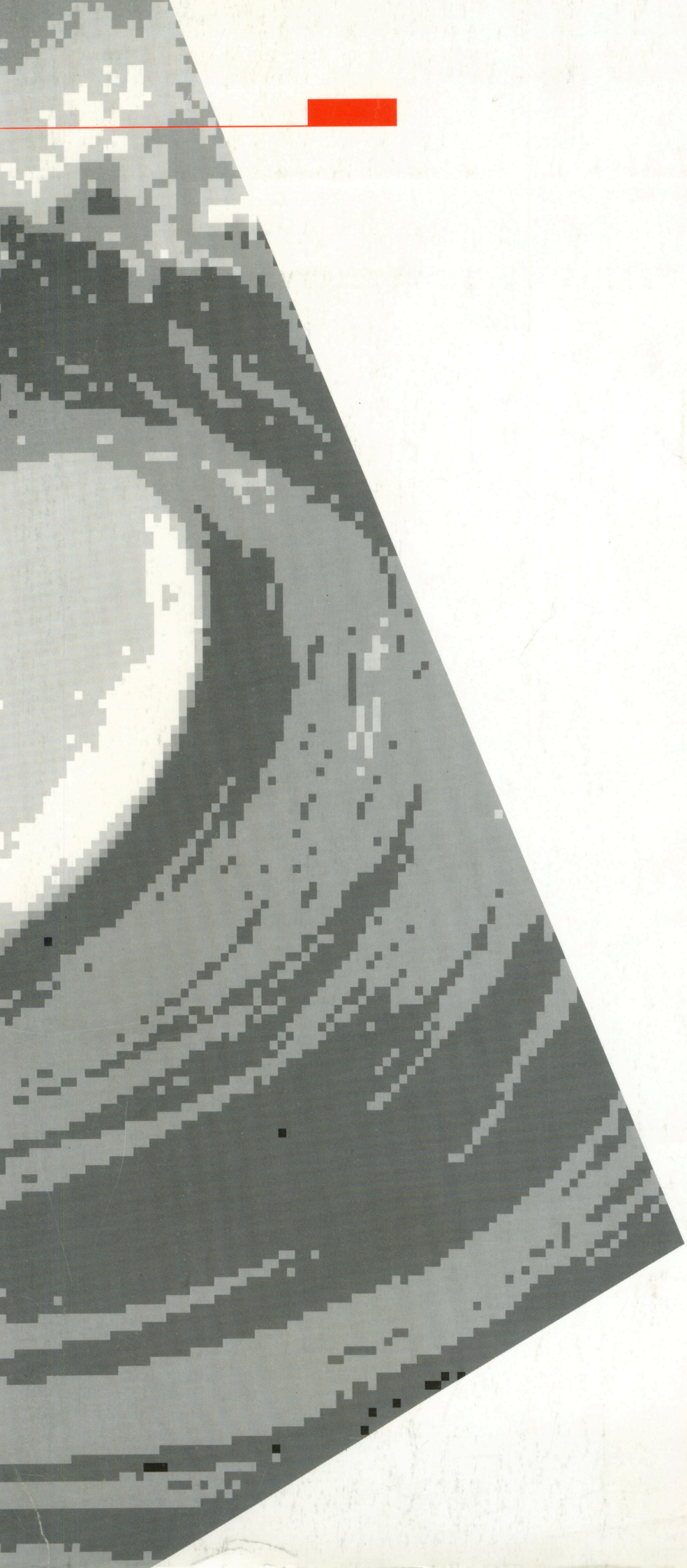

RE 331
RDS Decoder
Operator and Service Manual

Volume II

9. DIGITAL MOTHERBOARD

9.1 Circuit Description

The digital motherboard provides interconnections between the CPU board and the communication/sync board. An extra connector, J2 allows future expansion. The two-filtered Sub-D connectors, J4 and J5, provide a connection to the analog motherboard.

The digital motherboard does not contain any active circuits.

9.2 Schematic Diagram

The schematic diagram for the Digital Motherboard is located in the following. The diagram number is 985-325.

9.3 Component Locations

The following shows the component locations on the Digital Motherboard.

9.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 906-131.

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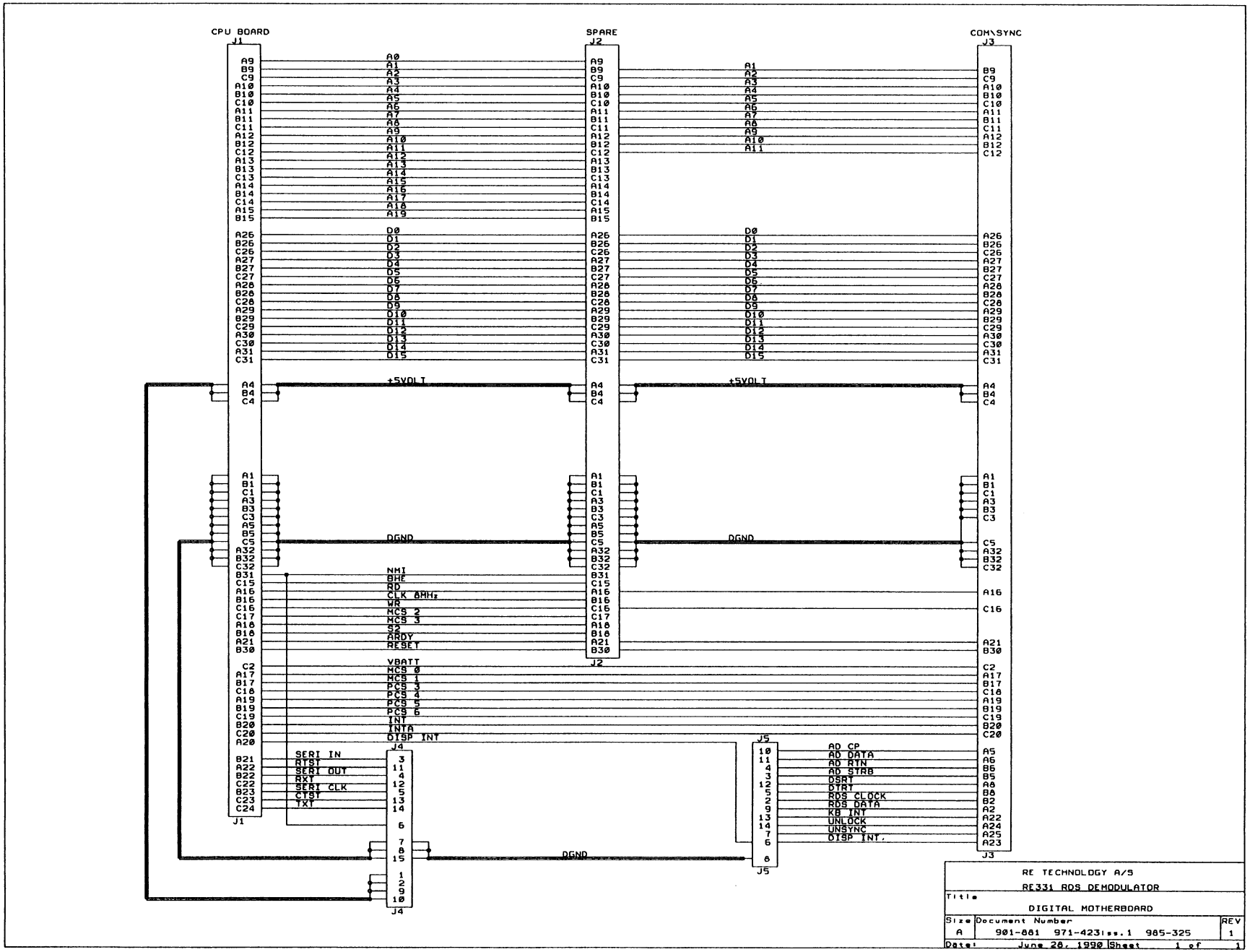
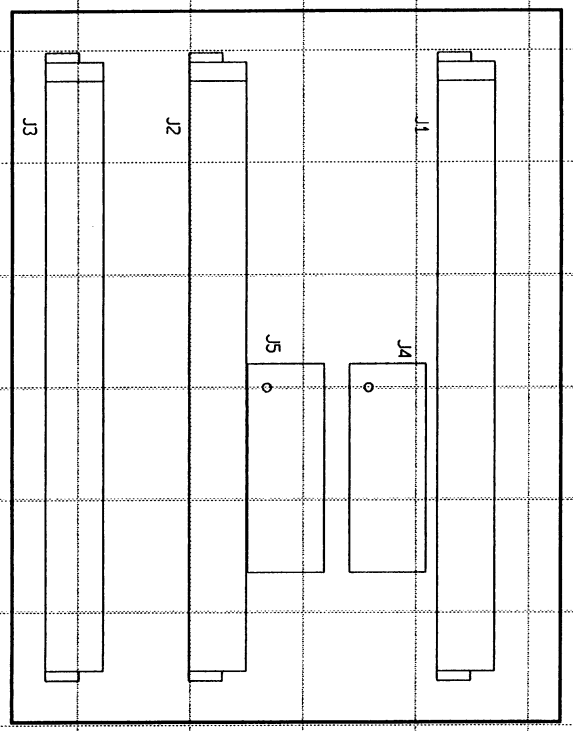

CPU BOARD
J1
SPARE
J2
COM\SYNC
J3
+5VOLT
DGND
NMI
BHE
RD
CLK 8MHz
WR
MCS 2
MCS 3
S2
ARDY
RESET
VBATT
MCS 0
MCS 1
PCS 3
PCS 4
PCS 5
PCS 6
INT
INTA
DISP INT
SERI IN
RTST
SERI OUT
RXT
SERI CLK
CTST
TXT
J4
J5
AD CP
AD DATA
AD RTN
AD STRB
DSRT
DTRT
RDS CLOCK
RDS DATA
KB INT
UNLOCK
UNSYNC
DISP INT.
RE TECHNOLOGY A/S
RE331 RDS DEMODULATOR
Title
DIGITAL MOTHERBOARD
Size
A
Document Number
901-881 971-423Iss.1 985-325
REV
1
Date: June 26, 1990
Sheet 1 of 1



RE 331 DIGITAL MOTHERBOARD ITO971-423iss. 1

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
J1	D9																								
J2	D11																								
J3	D12																								
J4	F9																								
J5	F10																								

COMPONENT SIDE

Digital Motherboard (906-131)

MISCELLANEOUS

Screw Pozidrive Pan Head M3,5X10	008-310
Screw pozidriv Countersunk M3X10	009-310
Hexagon Cyl.Screw M3X6 Rustprcof	010-306
Lock washer D3,2/5,5x0,45	046-405
Tubular Rivet 2.5X5	060-305
D-Sub access, screw lock for chassis	805-470
DIN 41612 96 pol female straight, C class II	805-925
D-Sub 15 pol male straight for PCB, UN4-40 and filte	806-017
Extruded Alu-Part in 2 Compartments MO86	932-964
Cover plate for 2 compartment RE204	933-076
PCB For RE331 Digital MotherBoard	971-423

10. CPU BOARD

10.1 Circuit Description

The main components of the CPU board are:

* The CPU itself with RAMs and EPROMs.
* 2 Mbit/s Serial Interface Circuit.
* IEEE 488 Interface Circuit.
* V24 Interface Circuit.
* Mode Switch Circuit.
* Battery Back-up Circuit.

10.1.1 CPU with RAMs and EPROMs

The CPU is a 16-bit 80C186, which interfaces to the RAMs (QD12 and QD13) and to the EPROMs (QD14 and QD15) via the address latches QD7, QD8 and QD9, which store the address during memory cycles. QD4 and QD5 buffer the 16 data bits. A PLD (QD19) handles address decoding for all devices except the EPROMs and the RAMs.

10.1.2 2 Mbit/s Serial Interface

The Main Computer communicates with boards outside the digital section via a specialized 3-wire 2 Mbit/s serial interface. The 2 MHz clock is derived from the 8 MHz output clock from the 80C186. To transmit or receive a 16-bit message, the Main Computer transmits 25 bits serially on SER OUT, clocked by SER CLK. Incoming data is received on the line SER IN. A PLD (QD25) controls the serial interface; the shift registers QD29, QD30 and QD31 receive or transmit data and addresses. Q3, Q4, Q5, and Q6 buffer the data and clock signals, while QD17C buffers received data.

The serial interface is located in the IO space of the 80C186 and uses PCS1 as chipselect. PCS1 is normally located to the IO addresses 080H to 0FFH.

Fig. 10.1 shows the general format for the communication via the serial interface.

A6 A5 ... A2 A1	W/R	1	D15 D14 ... D1 D0	0

Fig. 10.1 - Format of Serial Data

A6 - A1 constitute a 6-bit address originally stored in QD31. This address is received and decoded locally on the individual boards connected to the serial interface. A6 is transmitted first.

W/R identifies whether the operation is a write (W/R = 1) or a read (W/R = 0) operation. This bit originates from the CPU RD signal.

The following bit ("1") provides slack for delays in the transmitter chain during transmission of data to the Main Computer.

D15 - D0 are the 16 data bits from QD29 and QD30.

Finally, the last bit ("0") is used for synchronization. Note that this bit originates from the inverter QD17C connected to the SER IN line. The SER IN line must be high when the transmission start if the transmission shall work properly.

If the 80C186 wants to read information via the serial interface, it first transmits an address indicating who should send data to the computer. Then a W/R bit equal to 0 follows to indicate that this is a read operation. Finally comes the "1" bit, 16 dummy data bits and the synchronization bit. As soon as a PLD on one of the boards has found that the transmitted address equals its internal address, while the W/R bit indicates a read operation, it issues a latch pulse to load data into a local parallel-in-serial-out register, enables SER CLK to clock data out of the register, and activates SER IN, which normally is tri-stated. 16 bits of data are then sent back to the CPU from the addressed board.

During write operations, the local PLD recognizes its address as above, followed by a W/R bit equal to 1 to indicate a write operation. The PLD then counts 17 SER CLK pulses before issuing a latch pulse for an external serial-in-parallel-out register that has received the 16 data bits, clocked by SER CLK.

At regular intervals, the 80C186 computer transmits a synchronization word consisting of 24 "1" bits followed by the "0" synchronization bit. This ensures that all internal counters etc. in the PLDs are reset to a well-defined initial state even in case of errors on the SER CLK line.

10.1.3 IEEE 488 Interface

The IEEE 488 interface is built around three ICs (QD1, QD2 and QD3). QD1 and QD2 are special-purpose IEEE 488 buffers, while QD3 is the IEEE 488 interface chip that handles all data transfer via the IEEE 488 bus.

10.1.3 V24 Interface

The V24 interface is built around five ICs (QD33, QD34, QD32, QD11 and QD24A). QD34 and QD11 are special-purpose V24 buffers and level converters with internal generation of ± 10 V. QD33 is the V24 chip that handles all data transfer via the V24 interface. QD32 and QD24A can be used to control the DTR and DSR signals in the V24 interface, but at the present time this is not in use. Due to backward compatibility the DTR and DSR signal are controlled with circuit on the communication/sync board.

10.1.4 Mode Switch

The switch S1 is used to indicate different configurations of the RE 331. The switch is read via QD23, enabled by a chip select signal from the address decoding PLD QD19.

10.1.5 Battery Back-up

BT1, which is a 3.6 V Lithium battery, keeps the contents of the RAMs QD12 and QD13 intact during periods of power-down. The circuit QD10 ensures that the RAMs are deselected as soon as a power failure occurs. To keep CS1/ high, the battery also powers the address decoding circuit QD21.

10.2 Schematic Diagram

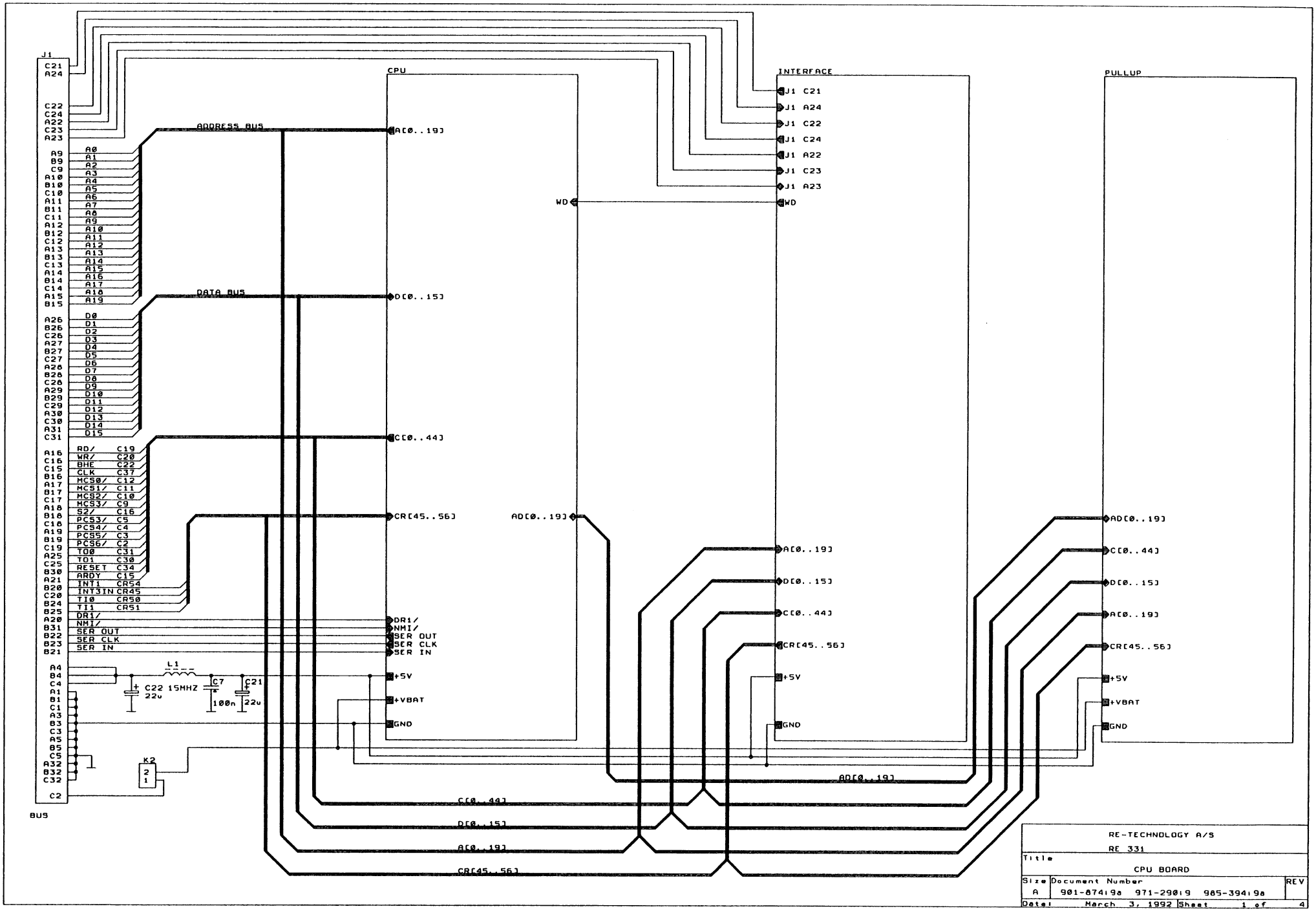
The schematic diagram for the CPU Board is located in the following. The diagram number is 985-394.

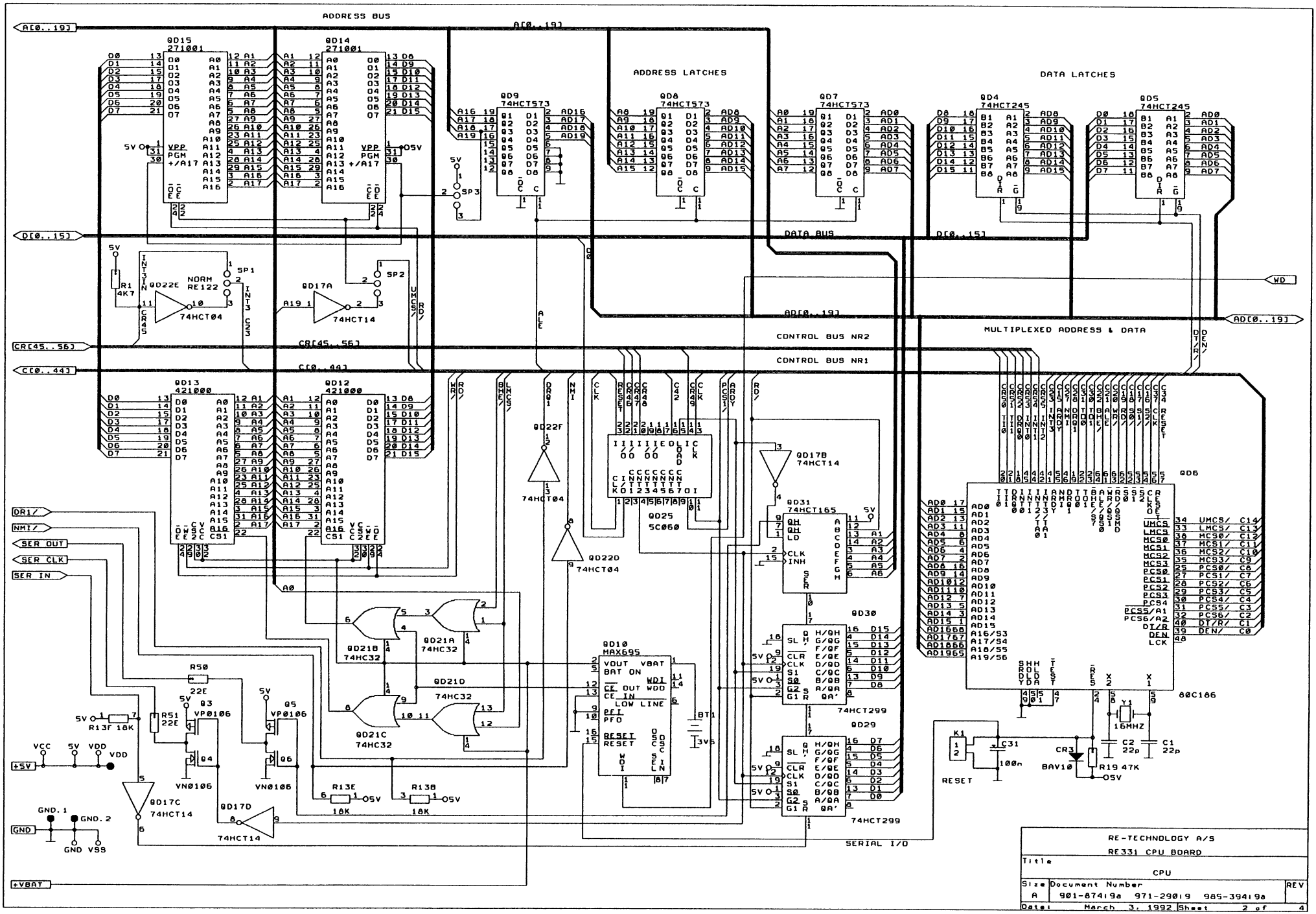
10.3 Component Locations

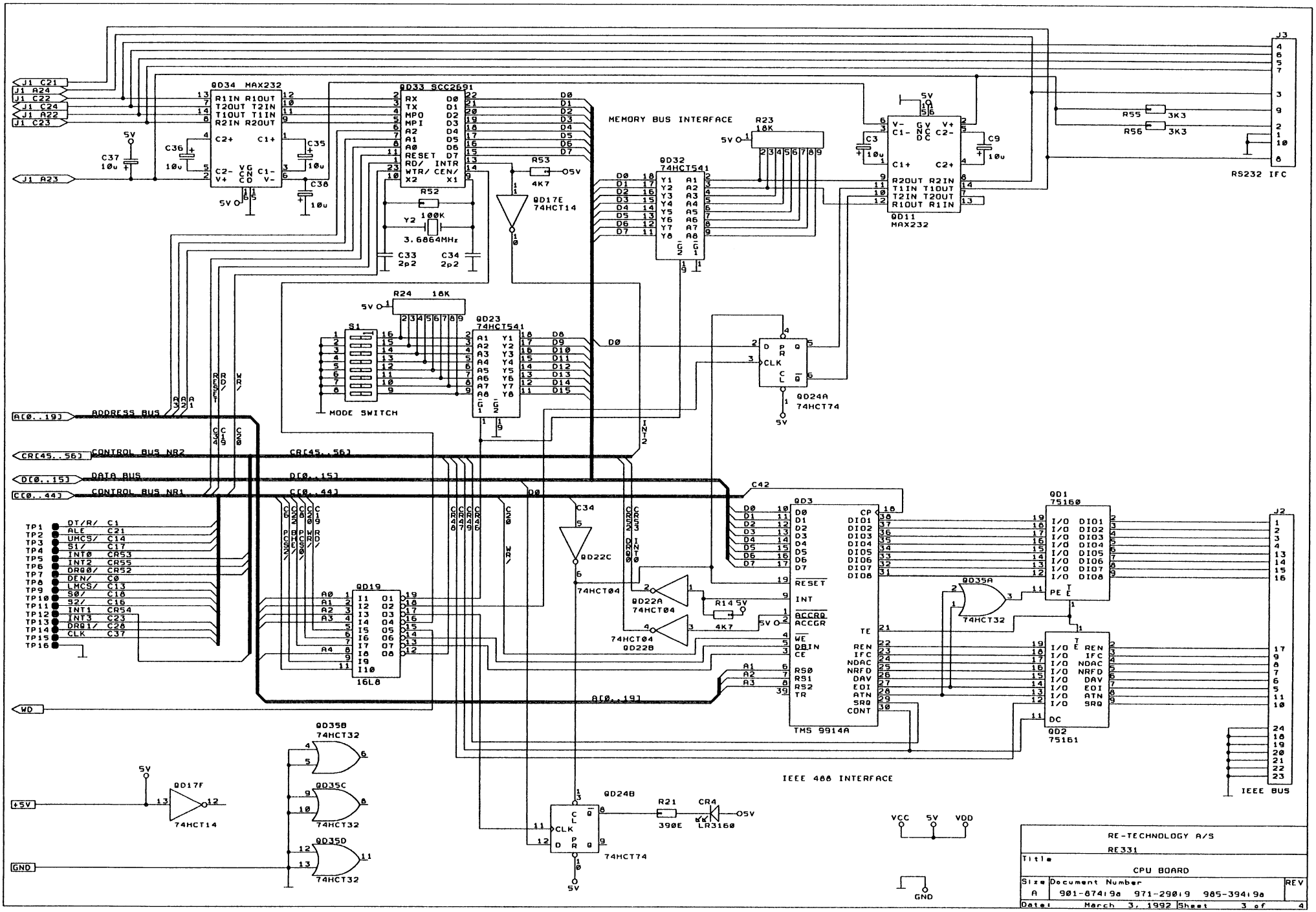
The following shows the component locations on the CPU Board.

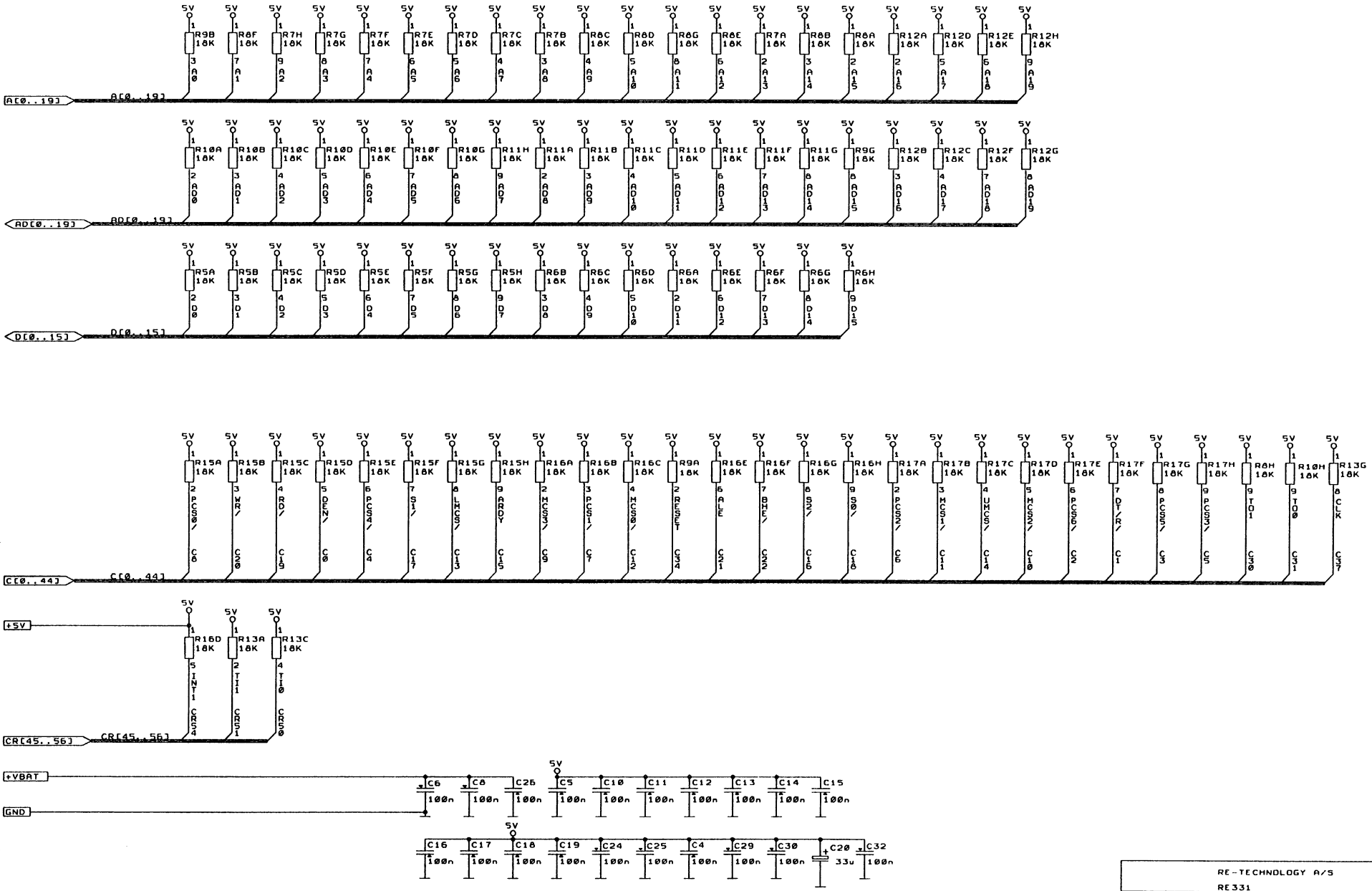
10.4 Parts List

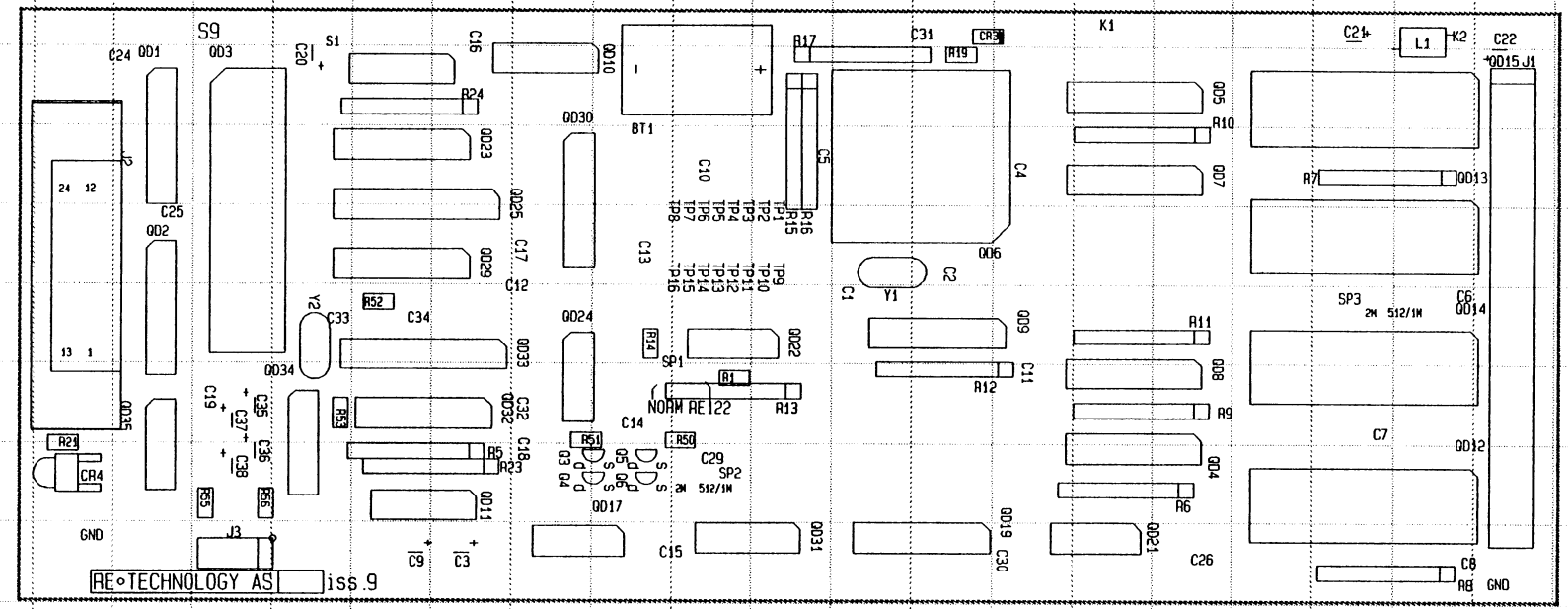
The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-874.


J1
C21
A24
C22
C24
A22
C23
A23
A9
B9
C9
A10
B10
C10
A11
B11
C11
A12
B12
C12
A13
B13
C13
A14
B14
C14
A15
B15
A26
B26
C26
A27
B27
C27
A28
B28
C28
A29
B29
C29
A30
C30
A31
C31
A16
C16
C15
B16
A17
B17
C17
A18
B18
C18
A19
B19
C19
A25
C25
B30
A21
B20
C20
B24
B25
A20
B31
B22
B23
B21
A4
B4
C4
A1
B1
C1
A3
B3
C3
A5
B5
C5
A32
B32
C32
C2
BUS
ADDRESS BUS
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
A16
A17
A18
A19
DATA BUS
D0
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
RD/ C19
WR/ C20
BHE C22
CLK C37
MCS0/ C12
MCS1/ C11
MCS2/ C10
MCS3/ C9
S2/ C16
PCS3/ C5
PCS4/ C4
PCS5/ C3
PCS6/ C2
TO0 C31
TO1 C30
RESET C34
ARDY C15
INT1 CR54
INT3IN CR45
TI0 CR50
TI1 CR51
DR1/
NMI/
SER OUT
SER CLK
SER IN
L1
C22 22u
15MHZ
C7 100n
C21 22u
K2
2
1
CPU
A[0..19]
D[0..15]
C[0..44]
CR[45..56]
DR1/
NMI/
SER OUT
SER CLK
SER IN
+5V
+VBAT
GND
AD[0..19]
INTERFACE
J1 C21
J1 A24
J1 C22
J1 C24
J1 A22
J1 C23
J1 A23
WD
WD
A[0..19]
D[0..15]
C[0..44]
CR[45..56]
+5V
GND
PULLUP
AD[0..19]
C[0..44]
D[0..15]
A[0..19]
CR[45..56]
+5V
+VBAT
GND
AD[0..19]
C[0..44]
D[0..15]
A[0..19]
CR[45..56]
RE-TECHNOLOGY A/S
RE 331
Title
CPU BOARD
Size
A
Document Number
901-8741-9a 971-2901-9 985-3941-9a
REV
Date: March 3, 1992
Sheet 1 of 4


ADDRESS BUS
A[0..19]
DATA BUS
D[0..15]
CONTROL BUS NR2
CR[45..56]
CONTROL BUS NR1
C[0..44]
MULTIPLEXED ADDRESS & DATA
AD[0..19]
ADDRESS LATCHES
DATA LATCHES
QD15 27100I
QD14 27100I
QD9 74HCT573
QD8 74HCT573
QD7 74HCT573
QD4 74HCT245
QD5 74HCT245
QD13 421000
QD12 421000
QD6 80C186
QD10 MAX695
QD30 74HCT299
QD29 74HCT299
QD31 74HCT165
QD25 5C060
QD22E 74HCT04
QD17A 74HCT14
QD22F 74HCT04
QD22D 74HCT04
QD17B 74HCT14
QD21B 74HC32
QD21A 74HC32
QD21D 74HC32
QD21C 74HC32
QD17C 74HCT14
QD17D 74HCT14
SP1
SP2
SP3
NORM
RE122
INIT/IN
INT3
CR45
UMCS/
OSV
5V
WD
DEN/
DT/R/
RESET
SERIAL I/O
DR1/
NMI/
SER OUT
SER CLK
SER IN
+VBAT
GND
+5V
VCC
VDD
R1 4K7
R50 22E
R51 22E
R13F 18K
R13E 18K
R13B 18K
R19 47K
Q3 VP0106
Q4 VN0106
Q5 VP0106
Q6 VN0106
BT1 3V6
Y1 16MHZ
C31 100n
C2 22p
C1 22p
CR3 BAV10
K1
GND. 1
GND. 2
GND VSS
RE-TECHNOLOGY A/S
RE331 CPU BOARD
Title
CPU
Size A
Document Number 901-87419a 971-29019 985-39419a
REV
Date: March 3, 1992
Sheet 2 of 4


MEMORY BUS INTERFACE
MODE SWITCH
IEEE 488 INTERFACE
RS232 IFC
IEEE BUS
ADDRESS BUS
CONTROL BUS NR2
DATA BUS
CONTROL BUS NR1
QD34 MAX232
QD33 SCC2691
QD32 74HCT541
QD23 74HCT541
QD11 MAX232
QD3 TMS 9914A
QD1 75160
QD2 75161
QD19 16L8
QD17E 74HCT14
QD17F 74HCT14
QD24A 74HCT74
QD24B 74HCT74
QD22A 74HCT04
QD22B 74HCT04
QD22C 74HCT04
QD35A 74HCT32
QD35B 74HCT32
QD35C 74HCT32
QD35D 74HCT32
R23 18K
R24 18K
R52 100K
R53 4K7
R14 4K7
R21 390E
CR4 LR3160
Y2 3.6864MHz
S1
RE-TECHNOLOGY A/S
RE331
Title
CPU BOARD
Size A
Document Number 901-6741-9a 971-2901-9 985-3941-9a
REV
Date: March 3, 1992 Sheet 3 of 4


A[0..19]
AD[0..19]
D[0..15]
C[0..44]
CR[45..56]
+5V
+VBAT
GND
RE-TECHNOLOGY A/S
RE331
CPU BOARD
Size A
Document Number 901-87419a 971-29019 985-39419a
REV
Date: March 3, 1992
Sheet 4 of 4



971-290iss.9

CPU BOARD

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
BT1	K6	Q3	J10																				
CR3	P4	Q4	J10																				
CR4	C10	Q5	K10																				
C1	N8	Q6	K10																				
C2	P7	R1	L9																				
C3	H11	R5	H10																				
C4	R6	R6	T10																				
C5	M6	R7	U6																				
C6	W8	R8	W11																				
C7	V9	R9	T9																				
C8	W11	R10	T6																				
C9	G11	R11	T8																				
C10	L6	R12	P9																				
C11	R8	R13	M9																				
C12	H8	R14	K8																				
C13	K7	R15	M7																				
C14	K9	R16	M7																				
C15	K11	R17	M4																				
C16	H4	R19	P5																				
C17	J7	R21	C10																				
C18	J9	R23	H10																				
C19	E9	R24	H5																				
C20	F4	R50	L10																				
C21	V4	R51	J10																				
C22	X4	R52	G8																				
C24	C5	R53	F9																				
C25	D7	R55	E10																				
C26	T11	R56	E10																				
C29	L10	SP1	K9																				
C30	R11	SP2	L10																				
C31	N4	SP3	V8																				
C32	J9	S1	F5																				
C33	F8	TP1	M6																				
C34	G8	TP2	M6																				
C35	E9	TP3	L6																				
C36	E9	TP4	L6																				
C37	E9	TP5	L6																				
C38	E10	TP6	L6																				
GND	C11	TP7	L6																				
GND	X11	TP8	K6																				
J1	X5	TP9	M7																				
J2	D6	TP10	M7																				
J3	E11	TP11	L7																				
K1	S4	TP12	L7																				
K2	W4	TP13	L7																				
L1	W4	TP14	L7																				
QD1	D5	TP15	L7																				
QD2	D7	TP16	K7																				
QD3	E5	Y1	N8																				
QD4	T10	Y2	F8																				
QD5	T5	9	G11																				
QD6	P7																						
QD7	T6																						
QD8	T8																						
QD9	R8																						
QD10	K4																						
QD11	H10																						
QD12	W10																						
QD13	W6																						
QD14	W8																						
QD15	X5																						
QD17	K10																						
QD19	R10																						
QD21	S11																						
QD22	M8																						
QD23	H6																						
QD24	J8																						
QD25	H6																						
QD29	H7																						
QD30	J5																						
QD31	M11																						
QD32	H9																						
QD33	J8																						
QD34	E9																						
QD35	D9																						

COMPONENT SIDE

CPU Board (901-874)

BATTERIES

BT 1	Battery Lithium 3V/0.9AH dxl 14.5x25, PCB Version	431-005

CAPACITORS

C 1	C Ceramic 22p0 2% 100V NP0	213-206
C 2	C Ceramic 22p0 2% 100V NP0	213-206
C 3	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Ceramic 100n 20% 50V	213-401
C 18	C Ceramic 100n 20% 50V	213-401
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 21	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 22	C Solid Aluminium 22u 20% 6v3 Short Type	265-109
C 24	C Ceramic 100n 20% 50V	213-401
C 25	C Ceramic 100n 20% 50V	213-401
C 26	C Ceramic 100n 20% 50V	213-401
C 29	C Ceramic 100n 20% 50V	213-401
C 30	C Ceramic 100n 20% 50V	213-401
C 31	C Ceramic 100n 20% 50V	213-401
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 2p2 +-p25 100V NP0	213-200
C 34	C Ceramic 2p2 +-p25 100V NP0	213-200
C 35	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 36	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 37	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 38	C Solid Aluminium 10u 20% 16V Short Type	265-108

DIODES

CR 3	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 4	LED Indicator 90° HP-HLMP5000	350-803

CONNECTORS

J 1	DIN 41612 96 pol male 90°, C class II	805-923
J 2	Connector Champ Angled 24 pins	805-943
J 3	Conn 2x4 Polet Plug	806-079

RELAYS & JUMPERS

K 1	2-pol amp connector	805-951

CHOKES

L 1	RF-choke six-hole core green	731-204

TRANSISTORS

Q 3	Transistor VP0106N3 Power Mos P-CH	360-244
Q 4	Transistor VN0106N3 Power Mos N-CH	360-245
Q 5	Transistor VP0106N3 Power Mos P-CH	360-244
Q 6	Transistor VN0106N3 Power Mos N-CH	360-245

INTEGRATED DIGITAL CIRCUITS

QD 1	IC SN75160A Octal IEEE-488 TR	364-576
QD 2	IC SN75161N Octal bus transceivers	364-455
QD 3	IC TMS9914ANL P-VER.Gen.Pur Interface bus	364-454
QD 4	IC 74HCT245 oct bus tx/rx	364-667
QD 5	IC 74HCT245 oct bus tx/rx	364-667
QD 6	IC 80C186-8 PLCC 16-Bit Microprocessor	365-114
QD 7	IC 74HCT573 Octal Latch	364-762
QD 8	IC 74HCT573 Octal Latch	364-762
QD 9	IC 74HCT573 Octal Latch	364-762
QD 10	IC MAX 695 Microprocessor supervisory Circuits	365-045
QD 11	IC MAX232 +5V Powered RS-232 Driver/Receiver	364-881
QD 12	IC 55257/51256 CMOS RAM 32KX8	364-759
QD 13	IC 55257/51256 CMOS RAM 32KX8	364-759
QD 14	RE331 Prog E-prom 901-874 QD14	368-393
QD 15	RE331 Prog E-prom 901-874 QD15	368-394
QD 17	IC 74HCT14 Hex inverter with Schmitt trigger	364-699
QD 19	RExxx Main Cpu 901-707 iss5 QD19 16L8	369-330
QD 21	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 22	IC 74HCT04 HEX inv	364-700
QD 23	IC 74HC541 Octal buffer/line driver	364-781
QD 24	IC 74HCT74 dual D ff	364-686
QD 25	RExxx Main Cpu QD25 For 971-290 Iss5 or Newer	369-361
QD 29	IC 74HCT299 8-bit Shift register	364-782
QD 30	IC 74HCT299 8-bit Shift register	364-782
QD 31	IC 74HCT165 8-bit PISO	364-695
QD 32	IC 74HC541 Octal buffer/line driver	364-781
QD 33	IC SCC2691 UART	364-882
QD 34	IC MAX232 +5V Powered RS-232 Driver/Receiver	364-881
QD 35	IC 74HCT32 quad OR gate	364-698

RESISTORS

R 1	R Metal film 18K0 5% 0.2W TC250	107-518
R 5	R Thick film Sil 8*18K	146-008
R 6	R Thick film Sil 8*18K	146-008
R 7	R Thick film Sil 8*18K	146-008
R 8	R Thick film Sil 8*18K	146-008
R 9	R Thick film Sil 8*18K	146-008
R 10	R Thick film Sil 8*18K	146-008
R 11	R Thick film Sil 8*18K	146-008
R 12	R Thick film Sil 8*18K	146-008
R 13	R Thick film Sil 8*18K	146-008
R 14	R Metal film 4K70 5% 0.2W TC250	107-447
R 15	R Thick film Sil 8*18K	146-008
R 16	R Thick film Sil 8*18K	146-008
R 17	R Thick film Sil 8*18K	146-008
R 19	R Metal film 47K0 5% 0.2W TC250	107-547
R 21	R Metal film 390E 5% 0.2W TC250	107-339
R 23	R Thick film Sil 8*18K	146-008
R 24	R Thick film Sil 8*18K	146-008
R 50	R Metal film 22E0 5% 0.2W TC250	107-222
R 51	R Metal film 22E0 5% 0.2W TC250	107-222
R 52	R Metal film 100K 5% 0.2W TC250	107-610
R 53	R Metal film 4K70 5% 0.2W TC250	107-447
R 55	R Metal film 3K30 5% 0.2W TC250	107-433
R 56	R Metal film 3K30 5% 0.2W TC250	107-433

SWITCHES

S 1	DIL Switch 8x1-Pol	547-003

CRYSTALS

Y 1	Quartz Crystal 16MHZ +-50ppm	910-202
Y 2	Quarts Crystal 3,6864MHz +-100ppm	910-206

MISCELLANEOUS

Screw pozidriv panhead M2.5x8	008-208
Hexagon Socket Head Cap Screw M2,5X6 Black	010-207
Lock washer D2,7/4,8x0,45	046-404
Tubular Rivet 2.5X10	060-310
Locknipple F. Multiplug Champ Short version 90	805-967
16 Pin Dil Socket	816-133
40 pin DIL Socket	816-179
20 Pin DIL Socket	816-184
Pin Grid Socket 68-pin	816-273
24 Pin DIL Socket w. 3 modul spacing	816-274
Isolating Plate F.Crystal	816-287
Isolating Plate F.Crystal	816-287
Dual In Line Socket 32 Pin 6 Modul Spacing	816-296
Solder Terminal 0.1 O2	823-303
L-piece for PCB	857-041
PCB For RExxx General Purpose Computer	971-290

	Rear Plate For CPU Sub Dwg 933-115	978-294
	Single Coater Foam Tape	992-125
GND1	Solder Terminal 0.1 O2	823-303
GND2	Solder Terminal 0.1 O2	823-303
QDS6	PLCC 68 pol socket	816-305
QDS34	16 Pin Dil Socket	816-133

11. COMMUNICATION/SYNC BOARD

11.1 Circuit Description

The main components of the communication/sync board are:

* Interrupt controller for the 80C186.
* Real-time clock.
* EEPROM for the 80C186.
* V24 interface circuits.
* TMS320 Digital Signal Processor with support circuits.

11.1.1 Interrupt Controller for the 80C186

The interrupt controller QD1 operates as a slave on the 80C186 with INT1 as interrupt request and INT3 as interrupt acknowledge. The interrupts controlled with interrupt 1 mentioned first are :

RDS data interrupt
Real Time Clock interrupt
DUART 1 interrupt
DUART 2 interrupt
Keyboard interrupt
Display interrupt
Unsync interrupt
Unlock interrupt

The interrupt controller are chip selected with PCS3.

11.1.2 Realtime Clock

The real-time clock QD2 provides means for correlation distortions in the RE 331 with the actual time of the event, even if the power has been switched off. The real-time clock is powered from the battery BT1 on the CPU board. The basic clock frequency of 32768 Hz can be measured on TP1. The frequency can be tuned with C10.

The real-time clock is chip selected with PSC6.

11.1.3 EEPROM for the 80C186

The EEPROM QD3 can hold 2 kBytes of set-up information for the RE 331. Note that you must have connected pin 1 and 2 on the jumper JP1, to be able to write data in the EEPROM. The EEPROM can be write protected by removing the jumper.

The EEPROM uses MMCS0 as chip select.

11.1.4 V24 Interface Circuits

The V24 interface circuits consists of two DUARTs QD32 and QD36, two circuits QD4 and QD5 for generation of ± 10 V, four V24 transmitter buffers QD33, QD34, QD35, QD37 and four V24 receiver buffers QD38, QD39, QD40, QD41.

The two DUARTs handle all the data transfer via the four V24 interfaces on the back of the RE 331.

Note that due to backward compatiability QD32 also handles the DTR and the DSR signals of the front terminal. The transmit buffer QD37 and the receive buffer QD41 are used for these signals.

The RDS data, RDS clock and Messstart bits are also converted to V24 levels with the buffers QD33, QD34 and QD 35.

11.1.5 TMS320 Signal Processor with Support Circuits

The digital signal processor TMS320 QD15 is used to calculate the RMS levels of the RDS and VRF signals from the samples received from the level measuring board and to make the block synchronization of the RDS signal on the data received from the demodulator board.

On power up, the program for the TMS320 is loaded in the program RAMs QD19 and QD20 from the main CPU. During download the addresses are controlled from the address buffers QD9 and QD10 and the data are sent through the buffers QD25 and QD26. When the TMS320 runs the program, the address buffers QD11 and QD12 are used.

The main CPU can send commands through the latch QD27 and can receive data from the TMS320 through the FIFOs QD28 and QD30. The write pulse to the FIFOs from the TMS320 are controlled with the circuits QD31, QD29 and QD8D. When the FIFOs are full an interrupt to the main CPU is generated.

The TMS320 program RAMs are chip selected from the main CPU with the MMCS1. The FIFOs and the control latch are chip selected with PCS5. The reset signal from the main CPU also resets the TMS circuits.

The TMS320 IO address decoding is done with the circuits QD7CDEF, QD14 and QD17.

The RDS data are received through the buffer inverters QD42AB with QD13. QD22B sets an interrupt to the TMS320. RDS data bits, corrected or uncorrected, and messstart bits are sent to the rear panel through QD24.

The samples from the level measurement board are received with the serial to parallel circuits QD16 and QD18. QD22A indicates to the TMS320 that a sample has arrived.

11.2 Schematic Diagram

The schematic diagram for the Communication/Sync Board is located in the following. The diagram number is 985-319.

11.3 Component Locations

The following shows the component locations on the Communication/Sync Board.

11.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-875.

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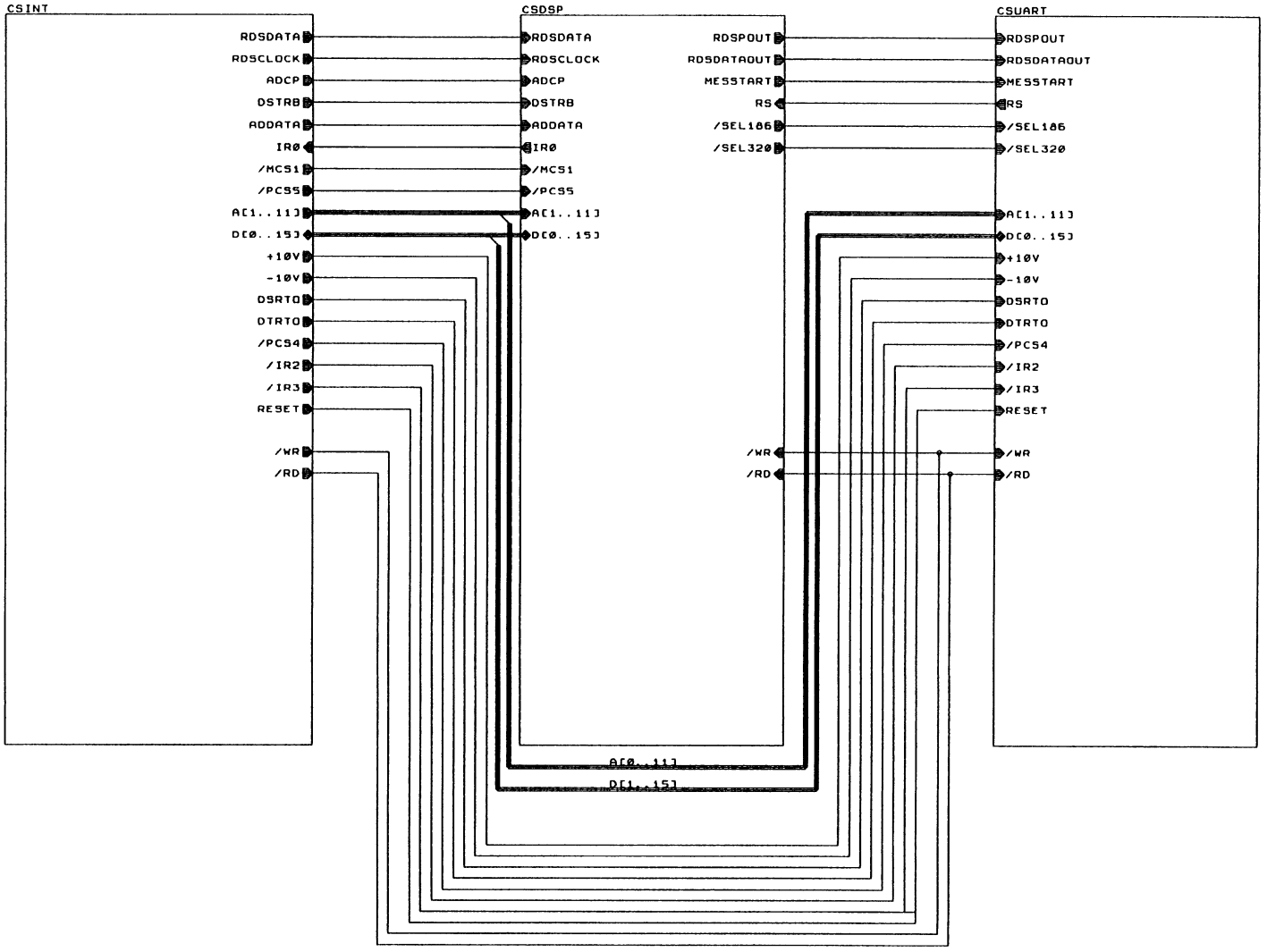
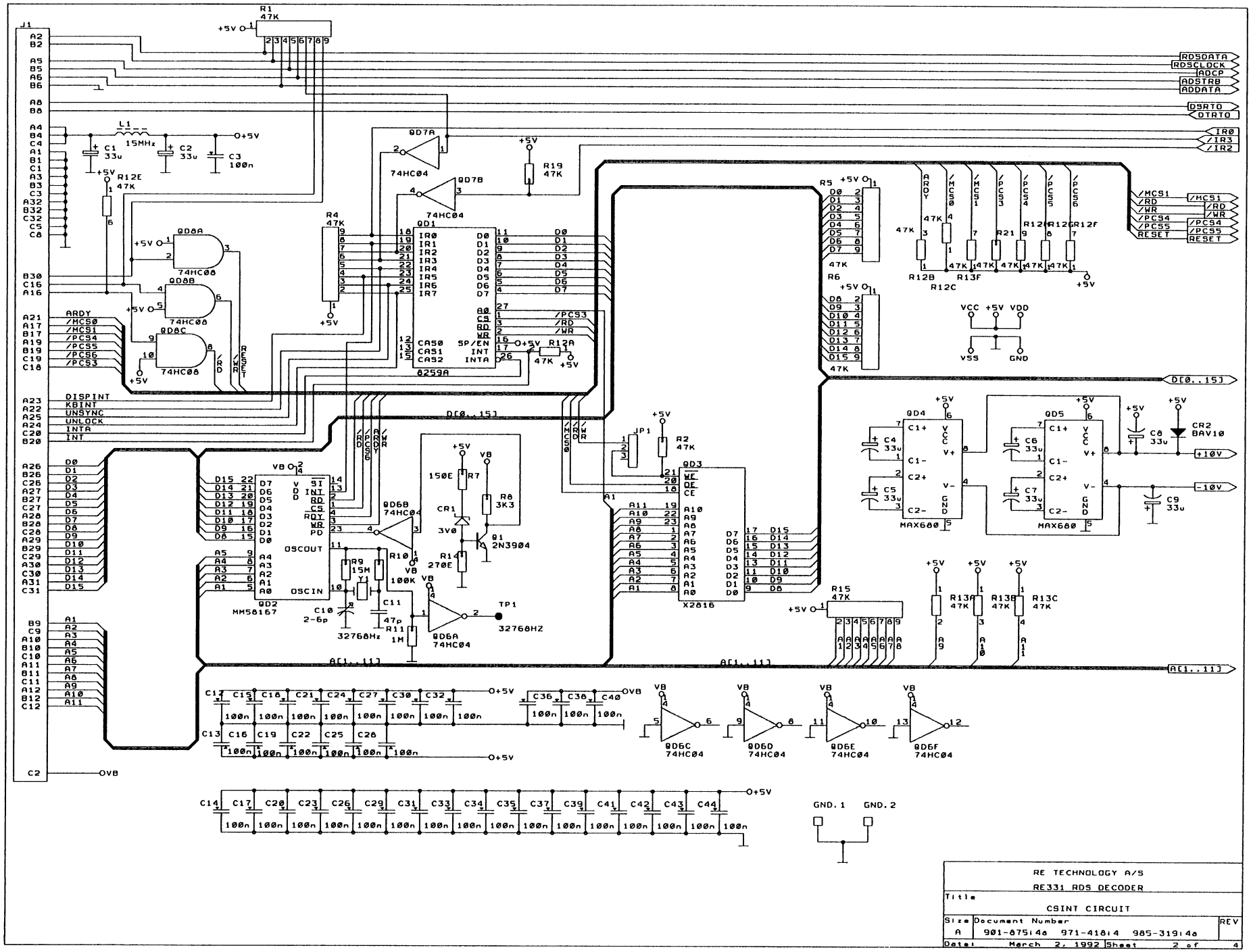
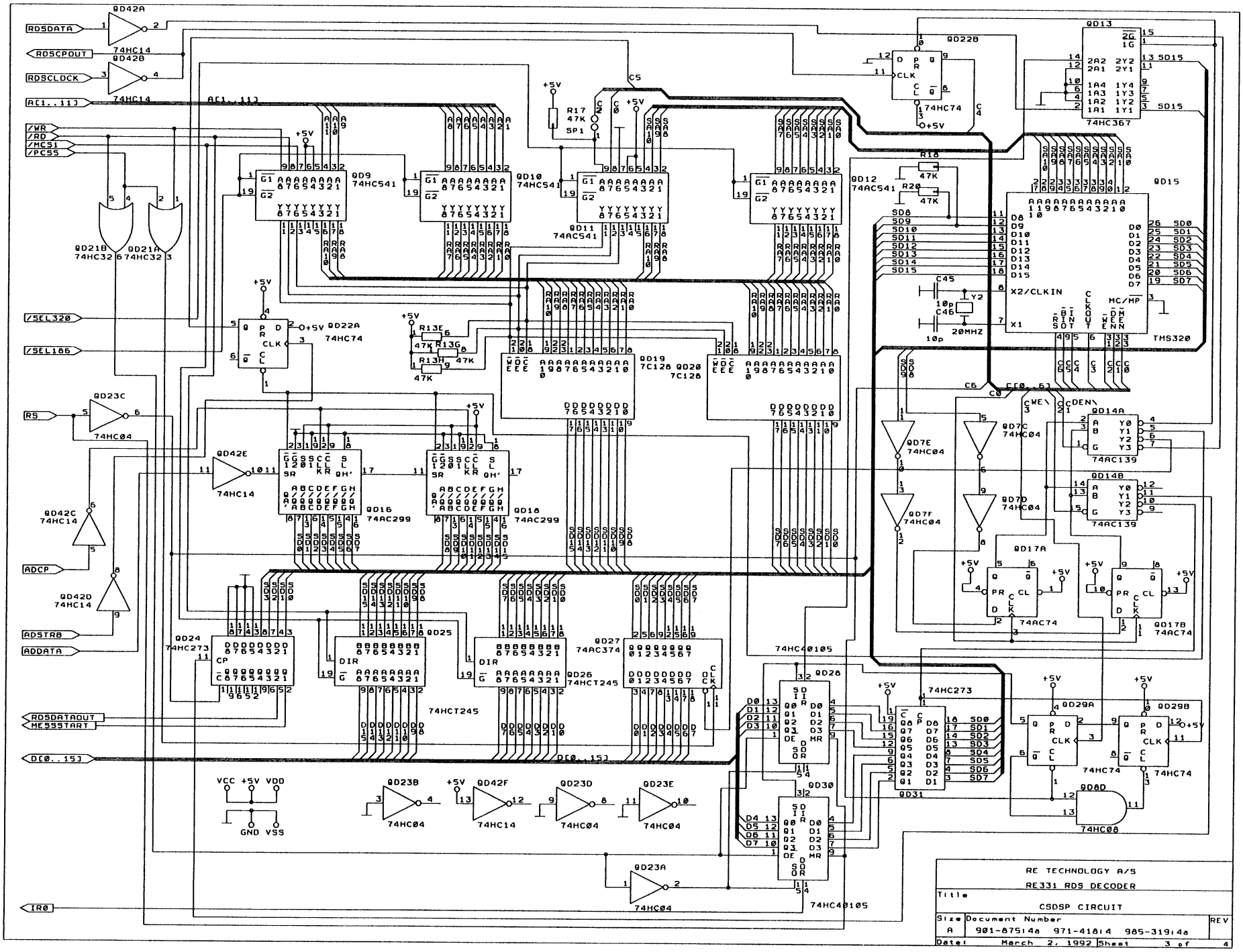
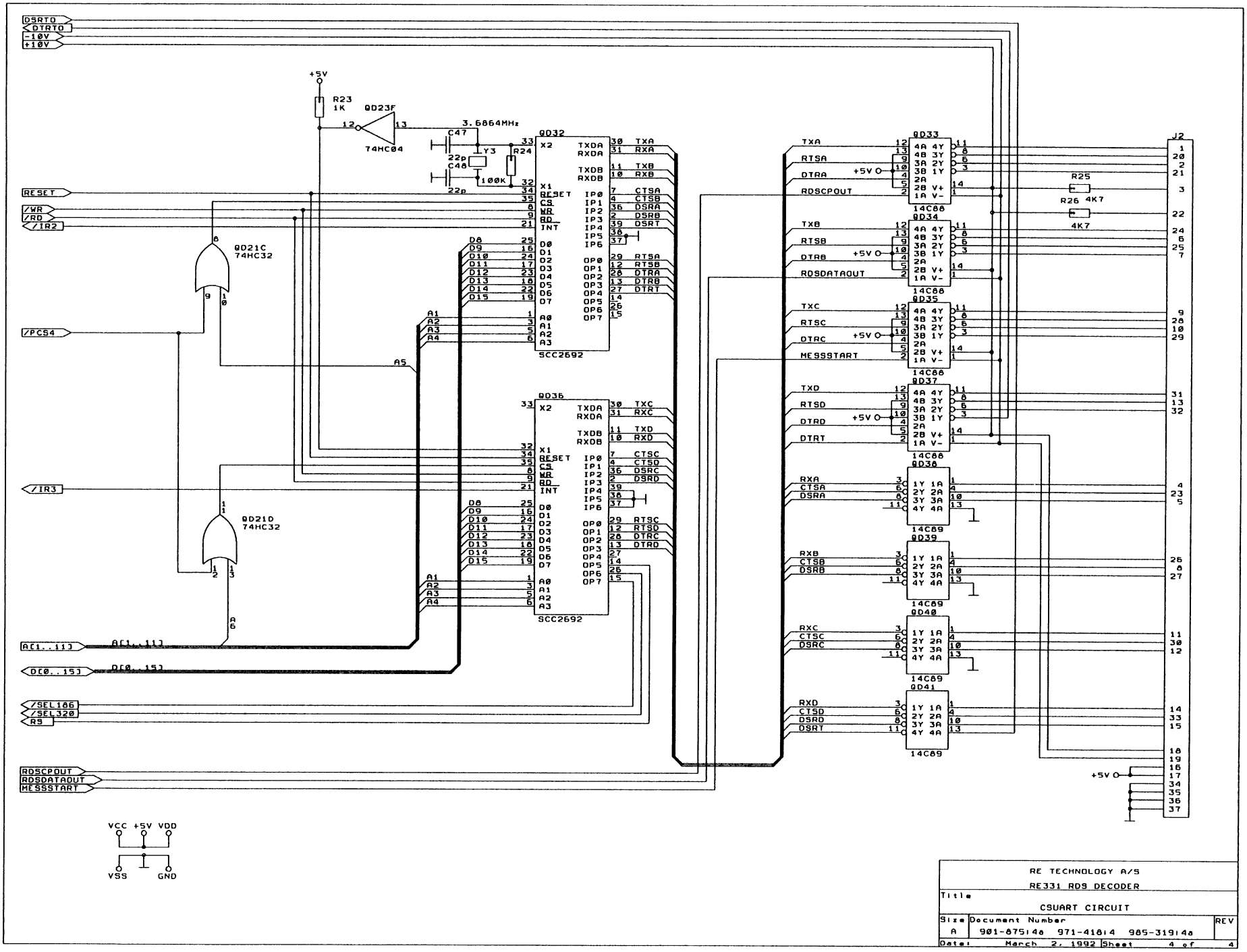


RE TECHNOLOGY A/S		
RE 331 RDS DECODER		
Title: COMM/SYNC BOARD		
Size: A	Document Number: 901-87514a 971-41814 985-31914a	REV
Date: March 2, 1992	Sheet 1 of 4	


RDSDATA
RDSCLOCK
ADCP
ADSTRB
ADDATA
DSRTO
DTRTO
IR0
/IR3
/IR2
/MCS1
/RD
/WR
/PCS4
/PCS5
RESET
D[0..15]
A[1..11]
DISPINT
KBINT
UNSYNC
UNLOCK
INTA
INT
ARDY
/MCS0
/PCS3
/PCS6
+5V
VB
OVB
VCC
VDD
VSS
GND
MAX680
MM58167
X2816
0259A
74HC04
74HC00
74HC08
32768HZ
RE TECHNOLOGY A/S
RE331 RDS DECODER
CSINT CIRCUIT
Size A
Document Number 901-875:4a 971-418:4 985-319:4a
REV
Date: March 2, 1992
Sheet 2 of 4


RDSDATA
RDSCPDOUT
RDSCLOCK
A[1..11]
/WR
/RD
/MCS1
/PCS5
/SEL320
/SEL186
RS
ADCP
ADSTRB
ADDATA
RDSDATAOUT
MESSSTART
D[0..15]
IR0
74HC14
74HC04
74HC32
74HC541
74AC541
74HC74
74HC367
74HC273
74AC374
74HCT245
74AC299
74AC74
74AC139
7C128
TMS320
20MHZ
47K
10p
VCC +5V VDD
GND VSS
RE TECHNOLOGY A/S
RE331 RDS DECODER
CSDSP CIRCUIT
Size A
Document Number 901-87514a 971-41814 985-31914a
REV
Date: March 2, 1992
Sheet 3 of 4



RE TECHNOLOGY A/S		
RE331 RDS DECODER		
Title: CSUART CIRCUIT		
Size: A	Document Number: 901-87514a 971-41814 985-31914a	REV
Date: March 2, 1992	Sheet 4 of 4	

RE◇TECHNOLOGY AS
iss.4
971-418iss.4
J1
J2
L1
L2
GND
TP1
JP1
SP1
Y1
Y2
Y3
Q1
S4
CR1
CR2

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	S6	QD20	T9																						
CR2	C12	QD21	J9																						
C1	W6	QD22	L5																						
C2	W5	QD23	E9																						
C3	W7	QD24	L7																						
C4	F12	QD25	M10																						
C5	F11	QD26	R10																						
C6	H12	QD27	T10																						
C7	H11	QD28	U11																						
C8	F10	QD29	P11																						
C9	F11	QD30	W11																						
C10	T5	QD31	S11																						
C11	V6	QD32	J7																						
C12	J7	QD33	E11																						
C13	J8	QD34	E10																						
C14	G11	QD35	E8																						
C15	W9	QD36	J6																						
C16	W11	QD37	E6																						
C17	T10	QD38	E11																						
C18	R10	QD39	E9																						
C19	M10	QD40	E7																						
C20	M9	QD41	E6																						
C21	R9	QD42	R7																						
C22	T9	Q1	T5																						
C23	S12	R1	R6																						
C24	L7	R2	T8																						
C25	T11	R4	W11																						
C26	R11	R5	P10																						
C27	M11	R6	M10																						
C28	L6	R7	S6																						
C29	P6	R8	T6																						
C30	U7	R9	U7																						
C31	X12	R10	U6																						
C32	M12	R11	W6																						
C33	K12	R12	T6																						
C34	R7	R13	P7																						
C35	P7	R14	S6																						
C36	W8	R15	T7																						
C37	P12	R17	K8																						
C38	T6	R18	G9																						
C39	U12	R19	S6																						
C40	W6	R20	G9																						
C41	N6	R21	W10																						
C42	S6	R23	F9																						
C43	G9	R24	G9																						
C44	K9	R25	C12																						
C45	H9	R26	C12																						
C46	J9	SP1	J8																						
C47	H8	TP1	W7																						
C48	G9	Y1	V6																						
GND	X12	Y2	H9																						
GND	T6	Y3	G8																						
JP1	U8	4	N5																						
J1	X6																								
J2	C6																								
L1	X6																								
QD1	W10																								
QD2	W7																								
QD3	W8																								
QD4	F12																								
QD5	G12																								
QD6	W5																								
QD7	S6																								
QD8	M6																								
QD9	P8																								
QD10	T8																								
QD11	M8																								
QD12	M9																								
QD13	K11																								
QD14	M11																								
QD15	J10																								
QD16	T7																								
QD17	P5																								
QD18	P7																								
QD19	R9																								

COMPONENT SIDE

Communication/Sync Board (901-875)

CAPACITORS

C 1	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 2	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 3	C Ceramic 100n 20% 50V	213-401
C 4	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 5	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 6	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 7	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 8	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 9	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 10	Capacitor Trimmer 2-6pF	286-209
C 11	C Ceramic 47p0 2% 100V NP0	213-209
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Ceramic 100n 20% 50V	213-401
C 18	C Ceramic 100n 20% 50V	213-401
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Ceramic 100n 20% 50V	213-401
C 21	C Ceramic 100n 20% 50V	213-401
C 22	C Ceramic 100n 20% 50V	213-401
C 23	C Ceramic 100n 20% 50V	213-401
C 24	C Ceramic 100n 20% 50V	213-401
C 25	C Ceramic 100n 20% 50V	213-401
C 26	C Ceramic 100n 20% 50V	213-401
C 27	C Ceramic 100n 20% 50V	213-401
C 28	C Ceramic 100n 20% 50V	213-401
C 29	C Ceramic 100n 20% 50V	213-401
C 30	C Ceramic 100n 20% 50V	213-401
C 31	C Ceramic 100n 20% 50V	213-401
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 100n 20% 50V	213-401
C 34	C Ceramic 100n 20% 50V	213-401
C 35	C Ceramic 100n 20% 50V	213-401
C 36	C Ceramic 100n 20% 50V	213-401
C 37	C Ceramic 100n 20% 50V	213-401
C 38	C Ceramic 100n 20% 50V	213-401
C 39	C Ceramic 100n 20% 50V	213-401
C 40	C Ceramic 100n 20% 50V	213-401
C 41	C Ceramic 100n 20% 50V	213-401
C 42	C Ceramic 100n 20% 50V	213-401
C 43	C Ceramic 100n 20% 50V	213-401
C 44	C Ceramic 100n 20% 50V	213-401
C 45	C Ceramic 10p0 2% 100V NP0	213-205
C 46	C Ceramic 10p0 2% 100V NP0	213-205
C 47	C Ceramic 22p0 2% 100V NP0	213-206
C 48	C Ceramic 22p0 2% 100V NP0	213-206

DIODES

CR 1	Diode zener BZX79-C3V6 0.4W	350-626
CR 2	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 96 pol male 90°, C class II	805-923
J 2	D-Sub 37 pol female 90° angled, with filter 1000pF	806-021

RELAYS & JUMPERS

JP 1	Wire Wrap Terminal	805-727
JP 1	3 Pin AMP mod II Terminal List, Straight	805-894

CHOKES

L 1	RF-choke six-hole core green	731-204

TRANSISTORS

Q 1	Transistor 2N3904 pnp	360-064

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 8259A Prog. Interrupt Cont.	364-587
QD 2	IC MM58167A Real Time Clock	364-786
QD 3	IC 2816A 2Kx8 EEprom	364-853
QD 4	IC MAX680CPA +5V To +/-10V Voltage Converter	364-790
QD 5	IC MAX680CPA +5V To +/-10V Voltage Converter	364-790
QD 6	IC 74HCT04 HEX inv	364-700
QD 7	IC 74HC04 HEX INV	364-757
QD 8	IC 74HC08 Quad 2-Input And Gate	364-808
QD 9	IC 74HC541 Octal buffer/line driver	364-781
QD 10	IC 74HC541 Octal buffer/line driver	364-781
QD 11	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 12	IC 74AC541 Octal Buffer/Line Driver	364-818
QD 13	IC 74HC367 buffer 3state	364-773
QD 14	IC 74AC139 Dual 1-OF-4 Decoder/Demultiplexer	364-805
QD 15	IC TMS320C10 Digital Signal Processor	364-783
QD 16	IC 74AC299 8-Input Universal Shift/Register	365-060
QD 17	IC 74AC74 dual D ff	364-795
QD 18	IC 74AC299 8-Input Universal Shift/Register	365-060
QD 19	IC Cmos Static Ram 2Kx8 30nsec.	364-868
QD 20	IC Cmos Static Ram 2Kx8 30nsec.	364-868
QD 21	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 22	IC 74HC74P dual d ff	364-755
QD 23	IC 74AC04 Hex Inverter	364-861
QD 24	IC 74HC273 Octal D-FF.	364-574
QD 25	IC 74HCT245 oct bus tx/rx	364-667
QD 26	IC 74HCT245 oct bus tx/rx	364-667
QD 27	IC 74AC374 OCT D-FF 3-State	364-754
QD 28	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 29	IC 74HC74P dual d ff	364-755

QD 30	IC 74HC40105 4-BitsX16 Words FiFo Register	364-802
QD 31	IC 74HC273 Octal D-FF.	364-574
QD 32	IC SCC2692 Duart Cmos	365-007
QD 33	IC DS14C88N Line Driver	364-789
QD 34	IC DS14C88N Line Driver	364-789
QD 35	IC DS14C88N Line Driver	364-789
QD 36	IC SCC2692 Duart Cmos	365-007
QD 37	IC DS14C88N Line Driver	364-789
QD 38	IC DS14C89AN Line Driver	364-788
QD 39	IC DS14C89AN Line Driver	364-788
QD 40	IC DS14C89AN Line Driver	364-788
QD 41	IC DS14C89AN Line Driver	364-788
QD 42	IC 74HC14 Hex inv. Schmitt Trig	364-800

RESISTORS

R 1	R Thick film Sil 8*47K	146-005
R 2	R Metal film 47K0 5% 0.2W TC250	107-547
R 4	R Thick film Sil 8*47K	146-005
R 5	R Thick film Sil 8*47K	146-005
R 6	R Thick film Sil 8*47K	146-005
R 7	R Metal film 150E 5% 0.2W TC250	107-315
R 8	R Metal film 3K30 5% 0.2W TC250	107-433
R 9	R Carbon Film 15M 10% 1/8W 140PPM	109-016
R 10	R Metal film 100K 5% 0.2W TC250	107-610
R 11	R Metal film 1M00 5% 0.2W TC250	107-710
R 12	R Thick film Sil 8*47K	146-005
R 13	R Thick film Sil 8*47K	146-005
R 14	R Metal film 270E 5% 0.2W TC250	107-327
R 15	R Thick film Sil 8*47K	146-005
R 17	R Metal film 47K0 5% 0.2W TC250	107-547
R 18	R Metal film 47K0 5% 0.2W TC250	107-547
R 19	R Metal film 47K0 5% 0.2W TC250	107-547
R 20	R Metal film 47K0 5% 0.2W TC250	107-547
R 21	R Metal film 47K0 5% 0.2W TC250	107-547
R 23	R Metal film 1K00 5% 0.2W TC250	107-410
R 24	R Metal film 100K 5% 0.2W TC250	107-610
R 25	R Metal film 4K70 5% 0.2W TC250	107-447
R 26	R Metal film 4K70 5% 0.2W TC250	107-447

TESTPOINTS

TP 1	Wire Wrap Terminal	805-727

CRYSTALS

Y 1	Quarts Crystal 32768Hz 100ppM	910-208
Y 2	Quarts Crystal 20MHz +-100ppm	910-207
Y 3	Quarts Crystal 3,6864MHz +-100ppm	910-206

MISCELLANEOUS

Screw pozidriv panhead M2.5x8	008-208
Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
Lock washer D2,7/4,8x0,45	046-404
Tubular River Ø3x0.2x6	060-210
14 Pin Dil Socket	816-131
8 Pin Dil Socket	816-132
24 Pin Dil Socket	816-134
40 pin DIL Socket	816-179
28 Pin DIL Socket	816-251
24 Pin DIL Socket w. 3 modul spacing	816-274
Isolating Plate F.Crystal	816-287
Solder Terminal 0.1 O2	823-303
L-piece for PCB	857-041
PCB For RE331 Comm/Sync	971-418
Rear Plate F.Comm/Sync Board	978-386

12. POWER SUPPLY

12.1 Circuit Description

The power supply board provides the +5 V for all digital circuitries. A power watch-dog circuit QD1 gives a NMI (Non Maskable Interrupt) to the CPU in case the power down. You can adjust the threshold for the power watch-dog with the potentiometer R2. In the 230 V setting, apply a 180 V AC to the RE 331 mains input and adjust R2 until you just have pulses on QD1 pin 5.

In addition, the power supply board holds rectifier and filtering circuitry for the ±15 V regulators, which are located on the analog motherboard. Refer to section 13 for a description of these power supplies.

NOTE

If you have the 100 V version use 85 V AC input for adjustment of R2.

12.2 Schematic Diagram

The schematic diagram for the Power Supply is located in the following. The diagram number is 985-323.

12.3 Component Locations

The following shows the component locations on the Power Supply.

12.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled power supply is 906-137. The parts list numbers for the fuses are as follows:

Fuse	1A T, 250 V	450-020
Fuse	2A T, 250 V	450-123

NOTE

If you want the 100 V the number is 906-239. When using the 100 V version the Line Transformer No. is 770-720 and the Rear Plate No. is 973-050.

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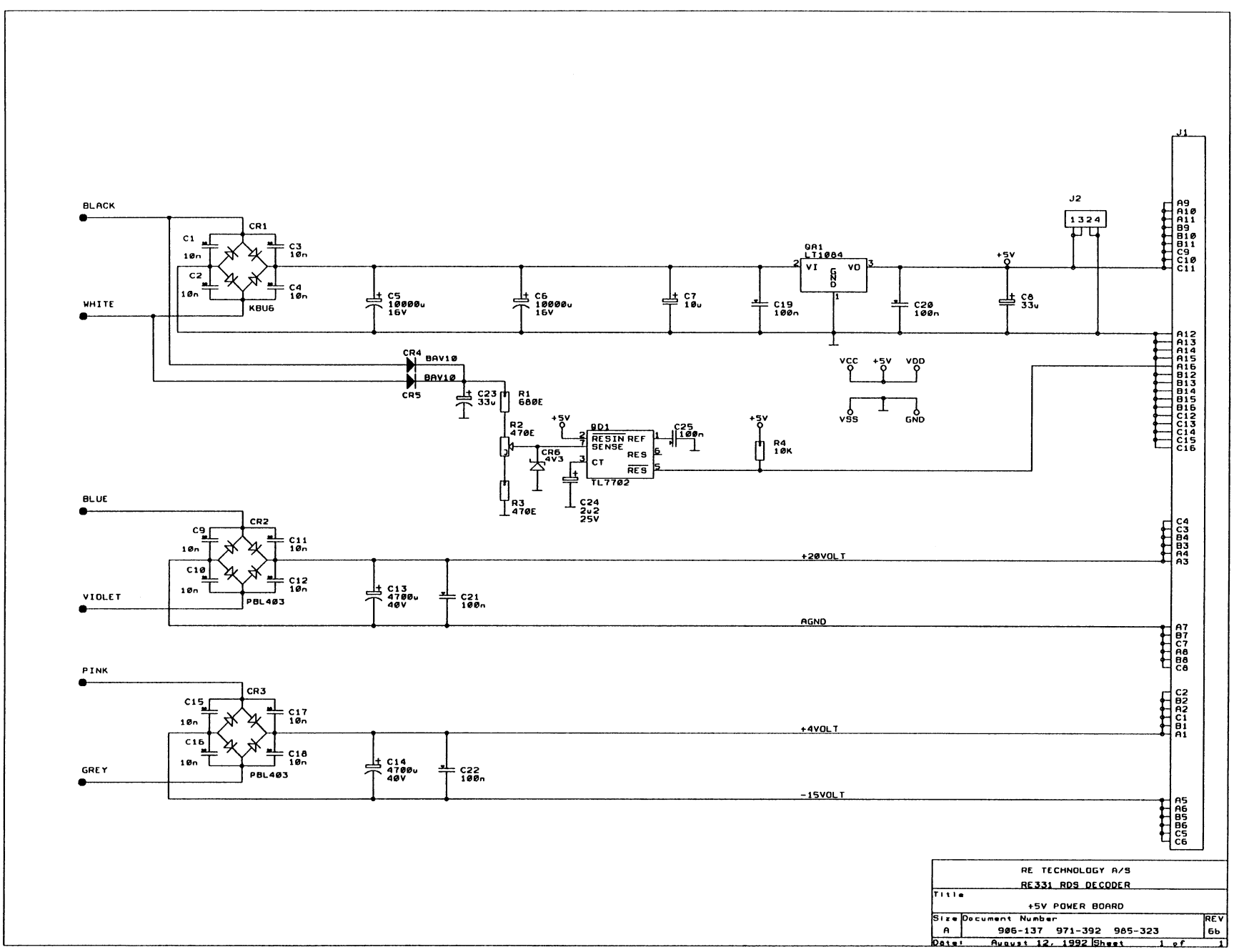
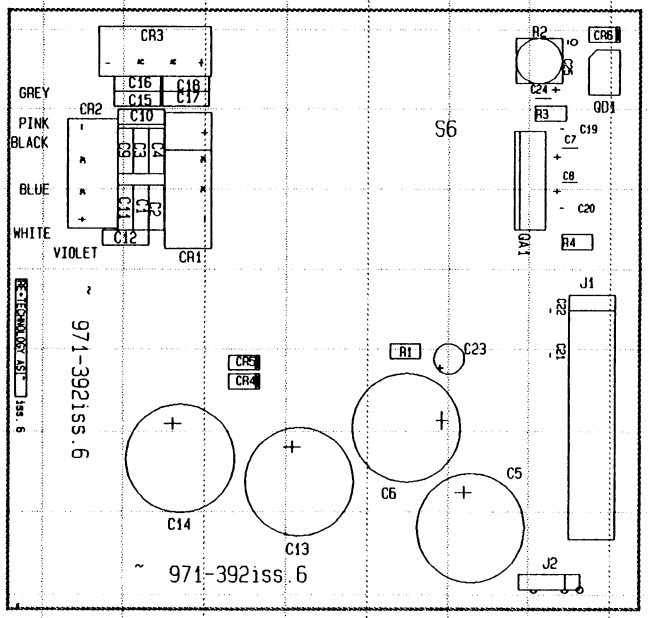


RE TECHNOLOGY A/S		
RE331 RDS DECODER		
Title: +5V POWER BOARD		
Size: A	Document Number: 986-137 971-392 985-323	REV: 6b
Date: August 12, 1992	Sheet 1 of 1	



901-844
RE204 +5V POWER SUPPLY

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
BLACK	H6																						
BLUE	H7																						
CR1	K7																						
CR2	J6																						
CR3	K5																						
CR4	L9																						
CR5	L9																						
CR6	S5																						
C1	K7																						
C2	K7																						
C3	K6																						
C4	K6																						
C5	P10																						
C6	N10																						
C7	R6																						
C8	R6																						
C9	K6																						
C10	K6																						
C11	K7																						
C12	K7																						
C13	M11																						
C14	K11																						
C15	K5																						
C16	K5																						
C17	K5																						
C18	K5																						
C19	R6																						
C20	R7																						
C21	R8																						
C22	R8																						
C23	P8																						
C24	R5																						
C25	R5																						
GREY	H5																						
J1	R8																						
J2	R11																						
PINK	H6																						
QA1	P7																						
QD1	R6																						
R1	N8																						
R2	R5																						
R3	R6																						
R4	R7																						
VIOLET	J7																						
WHITE	H7																						
6	H9																						

COMPONENT SIDE

Power Supply (906-137)

CAPACITORS

C 1	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 2	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 3	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 4	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 5	Electrolytic 10000/16, 2000h/105°, R:18*40, RM3	261-095
C 6	Electrolytic 10000/16, 2000h/105°, R:18*40, RM3	261-095
C 7	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 8	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 9	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 10	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 11	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 12	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 13	Electrolytic 4700/35, 2000h/105°, R:18*40, RM3	261-096
C 14	Electrolytic 4700/35, 2000h/105°, R:18*40, RM3	261-096
C 15	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 16	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 17	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 18	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Ceramic 100n 20% 50V	213-401
C 21	C Ceramic 100n 20% 50V	213-401
C 22	C Ceramic 100n 20% 50V	213-401
C 23	Electrolytic 33/16, 2000h/85°, Low Il, R:5*11, RM2	261-086
C 24	C Solid Aluminium 2u2 20% 25V Short Type	265-102
C 25	C Ceramic 100n 20% 50V	213-401

DIODES

CR 1	Bridges Rectifier Vin:140 Io:6A	340-212
CR 2	Bridgs Rectifer PBL403 140V 4A	340-215
CR 3	Bridgs Rectifer PBL403 140V 4A	340-215
CR 4	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 5	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 6	Diode zener BZX79-C4V3 0.4W	350-639

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 2	Wire Wrap Terminal	805-727

INTEGRATED ANALOG CIRCUITS

QA 1	IC LT1084CP 5V Regulator 5A	364-878

INTEGRATED DIGITAL CIRCUITS

QD 1	IC TL7702A Supply Voltage supervisors	364-820

RESISTORS

R 1	R Metal film 680E 5% 0.2W TC250	107-368
R 2	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 3	R Metal film 470E 5% 0.2W TC250	107-347
R 4	R Metal film 10K0 5% 0.2W TC250	107-510

MISCELLANEOUS

Screw pozidriv panhead M2.5x5	008-205
Screw pozidriv panhead M2.5x8	008-208
Screw pozidriv panhead M3x8	008-308
Screw Pozidrive Pan Head M3,5X10	008-310
Screw pozidriv panhead M3*12	008-312
Screw pozidriv panhead M4x6	008-406
Screw pozidriv countersunk M3x8	009-308
Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
Hexagon Cylinder Screw M5x50 Rustproof	010-550
Washer 3mm	042-315
Lock washer D2,7/4,8x0,45	046-404
Lock washer D3,2/5,5x0,45	046-405
Lock washer D4,3/7x0,5	046-407
Tubular Rivet 2.5X10	060-310
Soldering lug 4,3x12-3	061-341
Wier Electr.Yellow/Green 1mm	639-001
Sleewing shrink blk. 6,4	692-007
Line Transformer RE204	770-703
Power Line Filter With Powerswitch, Fuses, Voltage S	802-218
Conn Banana Receptable	803-241
Heat Sink For RE204	816-291
Mica Insulator Sot-93	816-297
Heat sink f. RE331	816-308
L-piece for PCB	857-041
Mounting Plate For Transformer RE530/531 ISSUE:7	933-009
PCB For RE204 +5 V Power Supply	971-392
Rear Plate F.Power Supply RE331	978-392

13. ANALOG MOTHERBOARD

13.1 Circuit Description

The analog motherboard carries the connections between the power supply board, the digital motherboard, the analog section and the front panel. Furthermore the analog motherboard holds the ±15 V power supply regulators for the analog circuitry.

To use low-voltage drop regulators, which are only available as positive regulators, the ±15 V supplies are configured as two positive voltage supplies in series. QA1 directly provides the +15 V supply from the +20 V and analog GND. The output of the regulator QA2 is connected to analog GND, thus establishing the -15 V supply as the return path.

The interface to the digital motherboard is provided by J10 and J11. J10 carries the +5 V power, the serial bus signals, NMI and part of the signals for the front terminal interface. J11 carries the samples from the level measurement board to the TMS320, the interrupt signals and the rest of the signals for the front terminal interface.

J9 connects the analog motherboard with the front panel and carries +5 V power, the serial bus, the keyboard interrupt signal and the signals for the front terminal.

J12 provides +5 V power to a fan which could be mounted at the trafo section.

J14 provides +5 V power to the display module.

J13 provides connection from the front panel signal input to the demodulator board.

The serial bus clock and data signals are buffered and shaped by means of the inverters in QD1.

13.2 Schematic Diagram

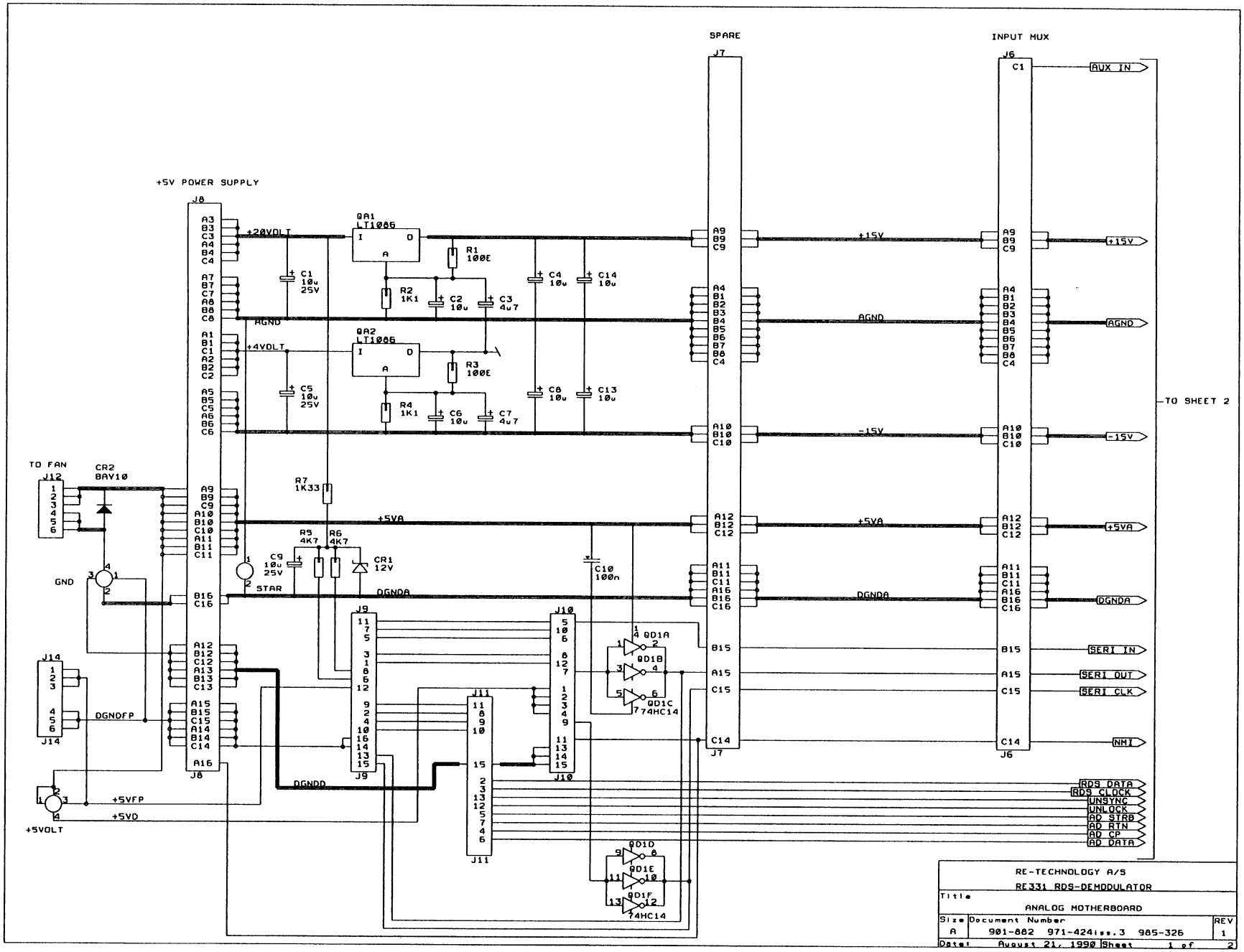
The schematic diagram for the Analog Motherboard is located in the following. The diagram number is 985-326.

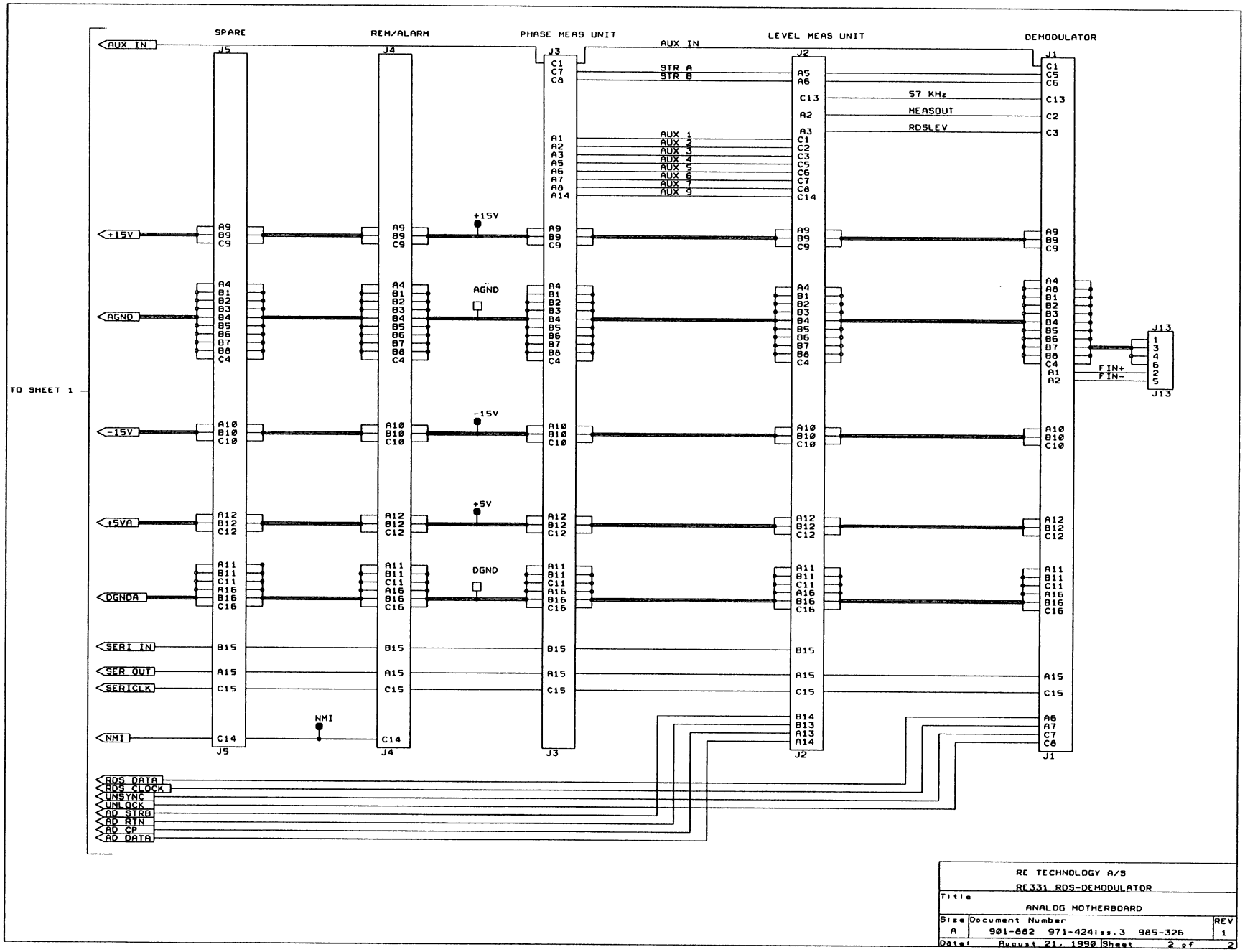
13.3 Component Locations

The following shows the component locations on the Analog Motherboard.

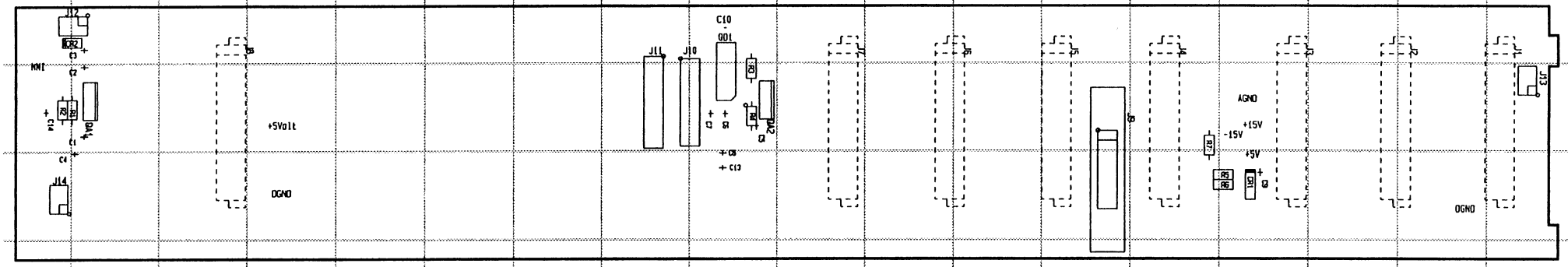
13.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-882.


SPARE
J7
INPUT MUX
J6
+5V POWER SUPPLY
J8
+20VOLT
+4VOLT
AGND
DGNDA
DGNDD
DGNDFP
+5VA
+5VD
+5VFP
+5VOLT
+15V
-15V
TO FAN
J12
CR2
BAV10
GND
STAR
R7
1K33
R5
4K7
R6
4K7
CR1
12V
C9
10u
25V
C10
100n
J14
J9
J10
J11
QD1A
QD1B
QD1C
QD1D
QD1E
QD1F
74HC14
AUX IN
+15V
AGND
-15V
+5VA
DGNDA
SERI IN
SERI OUT
SERI CLK
NMI
RDS DATA
RDS CLOCK
UNSYNC
UNLOCK
AD STRB
AD RTN
AD CP
AD DATA
TO SHEET 2
RE-TECHNOLOGY A/S
RE331 RDS-DEMODULATOR
Title
ANALOG MOTHERBOARD
Size
A
Document Number
901-882 971-424iss.3 985-326
REV
1
Date:
August 21, 1990
Sheet
1 of 2



RE TECHNOLOGY A/S		
RE331 RDS-DEMODULATOR		
Title: ANALOG MOTHERBOARD		
Size: A	Document Number: 901-882 971-424iss.3 985-326	REV: 1
Date: August 21, 1990	Sheet 2 of 2	



RE 331 ANALOG MOTHERBOARD D/0971-4241ss.3

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
+5V	G4																								
+5Volt	F15																								
+15V	F4																								
-15V	F4																								
AGND	F4																								
CR1	G4																								
CR2	E1B																								
C1	F1B																								
C2	F1B																								
C3	E1B																								
C4	G1B																								
C5	F10																								
C6	F10																								
C7	F10																								
C8	F10																								
C9	G4																								
C10	E10																								
C13	G10																								
C14	F1B																								
DGND	G2																								
DGND	G15																								
J1	E1																								
J2	E2																								
J3	E4																								
J4	E5																								
J5	E6																								
J6	E7																								
J7	E9																								
J8	E16																								
J9	F6																								
J10	E11																								
J11	E11																								
J12	E1B																								
J13	F1																								
J14	G1B																								
NMI	F1B																								
QA1	F17																								
QA2	F10																								
QD1	E10																								
R1	F1B																								
R2	F1B																								
R3	F10																								
R4	F10																								
R5	G4																								
R6	G4																								
R7	F5																								

COMPONENT SIDE

Analog Motherboard (901-882)

CAPACITORS

C 1	C Solid alu 10u 20% 25V	265-010
C 2	C Solid alu 10u 20% 25V	265-010
C 3	C Solid alu 4u7 20% 25V	265-000
C 4	C Solid alu 10u 20% 25V	265-010
C 5	C Solid alu 10u 20% 25V	265-010
C 6	C Solid alu 10u 20% 25V	265-010
C 7	C Solid alu 4u7 20% 25V	265-000
C 8	C Solid alu 10u 20% 25V	265-010
C 9	C Solid alu 10u 20% 25V	265-010
C 10	C Ceramic 100n 20% 50V	213-401
C 13	C Solid alu 10u 20% 25V	265-010
C 14	C Solid alu 10u 20% 25V	265-010

DIODES

CR 1	Diode zener BZX79-C12V 0.4W	350-605
CR 2	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 48 pol female straight, C/2 class II	805-959
J 2	DIN 41612 48 pol female straight, C/2 class II	805-959
J 3	DIN 41612 48 pol female straight, C/2 class II	805-959
J 4	DIN 41612 48 pol female straight, C/2 class II	805-959
J 6	DIN 41612 48 pol female straight, C/2 class II	805-959
J 8	DIN 41612 48 pol female straight, C/2 class II	805-959
J 9	Header Straight 16p Male For Pcb	805-056
J 10	Conn Miniature 16 pin Socket	806-050
J 13	Connector 2X3 pole DUBOX PCB male	805-985
J 14	Connector 2X3 pole DUBOX PCB male	805-985

INTEGRATED ANALOG CIRCUITS

QA 1	IC LT1086CT Regulator 1.5Amp	364-879
QA 2	IC LT1086CT Regulator 1.5Amp	364-879

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC14 Hex inv. Schmitt Trig	364-800

RESISTORS

R 1	R Metal Film 100E 1% 0.5W TC50	113-100
R 2	R Metal Film 1K10 1% 0.5W TC50	114-110
R 3	R Metal Film 100E 1% 0.5W TC50	113-100
R 4	R Metal Film 1K10 1% 0.5W TC50	114-110
R 5	R Metal film 4K70 5% 0.2W TC250	107-447
R 6	R Metal film 4K70 5% 0.2W TC250	107-447
R 7	R Metal Film 1K33 1% 0.5W TC50	114-133

MISCELLANEOUS

Screw pozidriv panhead M3x8	008-308
Screw Pozidrive Pan Head M3,5X10	008-310
Lock washer D3,2/5,5x0,45	046-405
tubular rivet 02.5x0.25x7	060-270
55mm Flat Cable For RE204 Analog Mother Board	617-926
42mm Flat Cable For RE331 Analog Mother Board	617-930
Wire Wrap Terminal	805-727
Term. strip 50pol mod 2	806-072
14 Pin Dil Socket	816-131
Mounting Acc. for TO-220	816-163
Rectangular Washer F. TO220	816-178
Insulation Bushing F. TO-220	816-214
Heat sink for RE204	816-290
Heat sink f. RE331	816-303
Solder Terminal 0.1 O2	823-303
PCB For RE331 Analog Mother Board	971-424

14. DEMODULATOR BOARD

14.1 Circuit Description

This section describes the various circuits that constitute the Demodulator Board. Refer to the extended block diagram, Fig. 14.1, and the schematic diagram in section 14.2.

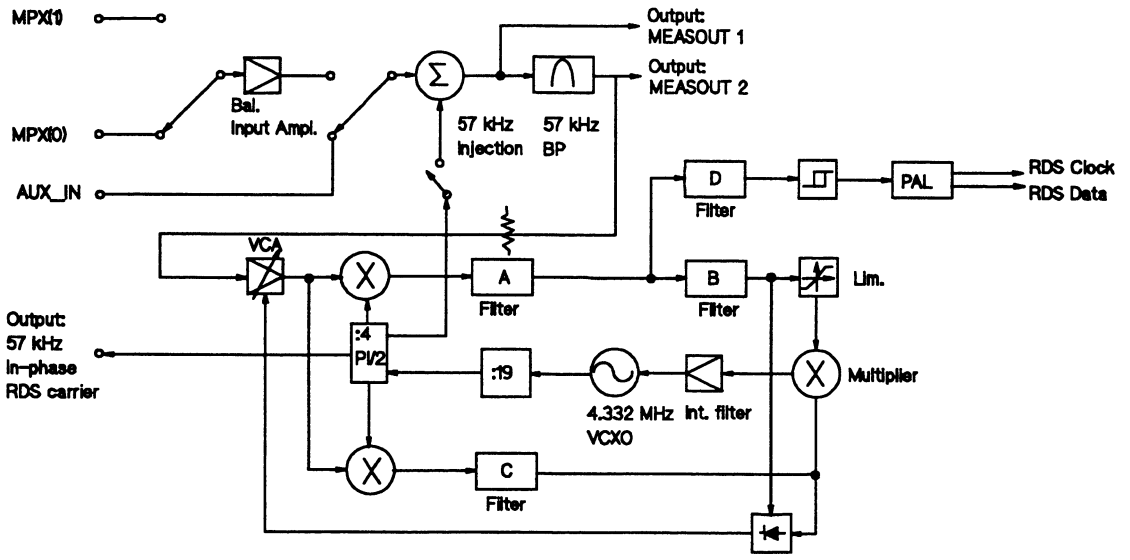


Fig. 14.1 - Block Diagram of Demodulator Board

14.1.1 Balanced Input Amplifier

The input amplifier, which suppresses common-mode noise on the input, is made sufficiently wide in order not to influence the measurements in the Measurement Option.

A relay switches between the Front and Rear inputs, while a FET switch makes the connection to the AUX_IN input. The control signal AUX controls the connection to AUX_IN: Regardless of the position of the Front/Rear relay, a connection to AUX_IN is made when AUX is high.

14.1.2 The 57 kHz Bandpass Filter

A 57 kHz Band-pass (BP) filter is incorporated to improve the noise immunity of both the RDS Demodulator and the Measurement Option. The BP filter sufficiently suppresses out-of-band noise while maintaining a flat frequency response in the frequency range of the RDS spectrum.

The filter is realised as a 4th. order State-variable filter with compensation for change of gain by shift in temperature.

The BP filter, however, is subject to some drift of the phase, which is why the software in RE 331 calibrates the filter. This calibration process is only done when the Measurement Option is installed.

During calibration, the phase shift of the filter is measured by a differential method consisting of two steps: First, the phase is measured between a 57 kHz carrier present in the MPX signal (and thus on the input of the BP filter) and another 57 kHz carrier present in the measurement system. Second, the phase between the same two carriers is measured, but this time the 57 kHz carrier in the MPX signal is taken after the BP filter. The phase shift in the BP filter is calculated as the difference between the two measurements. Refer to section 15.4 for details on this calibration.

The input circuitry of the Demodulator includes a switchable injection circuit which can inject a 57 kHz signal in order to calibrate the BP filter when no 57 kHz carrier is present in the VRF. The injection level and the switching time constants of the injection circuit have been chosen in order not to disturb the decoding of the RDS data.

14.1.3 Voltage Controlled Amplifier and AGC System

An AGC:AGC system has been included to increase the useful rangeof the Demodulator. A part of this system is the VCA, which controls the level of the signal delivered to the Costas Loop. The signal level in the I and Q branch of the Costas Loop controls the gain in the VCA: The higher the signal level in these two branches the lower the gain in the VCA.

The rectifier built around QA12 detects the level in the I and Q branch. An increased AC level in the I or Q branch results in an increased positive DC level on QD12-14. Inserting jumper JP1 forces the rectifier voltage to its maximum, and hence the VCA reaches its lowest gain (appr. 0 dB). This jumper is always out under normal use.

The filter characteristics in the I and Q branches and the chosen time constant in the rectifier ensure proper regulation during disturbances while maintaining level tracking capability.

14.1.4 The VCO and the Mixers

The Voltage Controlled Oscillator (VCO) is a tuneable crystal oscillator with a center frequency of 4.332 MHz. The frequency is changed by varying the working impedance seen from the crystal using the varactor CR30. The oscillator itself is a Colpitts oscillator which works in class C.

The Schmitt-trigger inverter QD5E shapes the oscillator signal, and the counter QD10 subsequently divides the frequency by 19. QD7 is a divide-by-4 quadrature divider which delivers two 57 kHz signals in quadrature, one to each of the mixers QD8 and QD11.

The recovered RDS carrier called 57KHZ is taken from the quadrature divider. This signal is used in the Measurement Option for measuring phases and RDS level.

Another signal, called 57_KHZ_INJ, is also taken from the quadrature divider. This signal is used for injection in the Bandpass filter whenever calibration of the filter calls for a 57 kHz carrier not present in the MPX signal. The phase of the injected signal is approximately in quadrature with the suppressed carrier of the RDS signal in order not to disturb decoding of the RDS data while switching the injection signal.

14.1.5 The filters and RDS decoding

In each of the two branches of the Costas Loop, the I branch starting with mixer QD8 and the Q branch starting with mixer QD11, filtration is being done. Refer to Fig. 14.1 and the schematic diagrams in section 14.2.

The filters in the two branches are identical, but the order of the individual filter sections is not the same. The reason for this is the different needs for filtration for the Costas Loop itself and the RDS data decoding branch, which is a part of the I branch; Both the Costas Loop and the RDS decoding process have been optimised for noise immunity, but this calls for different properties of the filtration.

In the I branch we find the filter block A consisting of a 1st order Low-pass filter in the level shifter QA20A, a Low-pass Notch Filter (QA20B), a frequency correction around QA30B and a phase correction in QA30A. After QA30A the signal is split into the RDS data decoding branch (starting with filter block D) and the rest of the I branch (filter block B).

Filter block B consists of a 4th order Lowpass filter (QA31), a High-pass Notch filter (QA28B) and finally a 2nd order Highpass filter (QA28A).

The Q branch (filter C in Fig. 14.1) consists of a 1st order Low-pass filter in the level shifter QA24A, a 4th order Low-pass filter (QA24B and QA32B), a Lowpass Notch filter (QA32A), a frequency correction around QA33B, a phase correction in QA33A, a High-pass Notch filter (QA29B), and finally a 2nd order High-pass filter (QA29A).

The ends of the I and Q branches are connected to the rectifier QA12 and to the mixer QD9. The diodes CR40 and CR41 limit the I signal to increase the dynamic range of the Demodulator.

The RDS data decoding branch, which starts at QA30A, consists of filter block D and a Schmitt-trigger signal shaper (QA27A). Filter block D consists of a 4th order Low-pass filter (partly QA34A) and a 2nd order High-pass filter. The signal shaper feeds the RDS biphase signal to the RDS Decode PAL which retrieves the RDS data and RDS clock.

The High-pass filters in each branch are equivalent to a Notch filter at 57 kHz in front of the Costas Loop. In this way a VRF signal, if present, is rejected.

14.2 Schematic Diagram

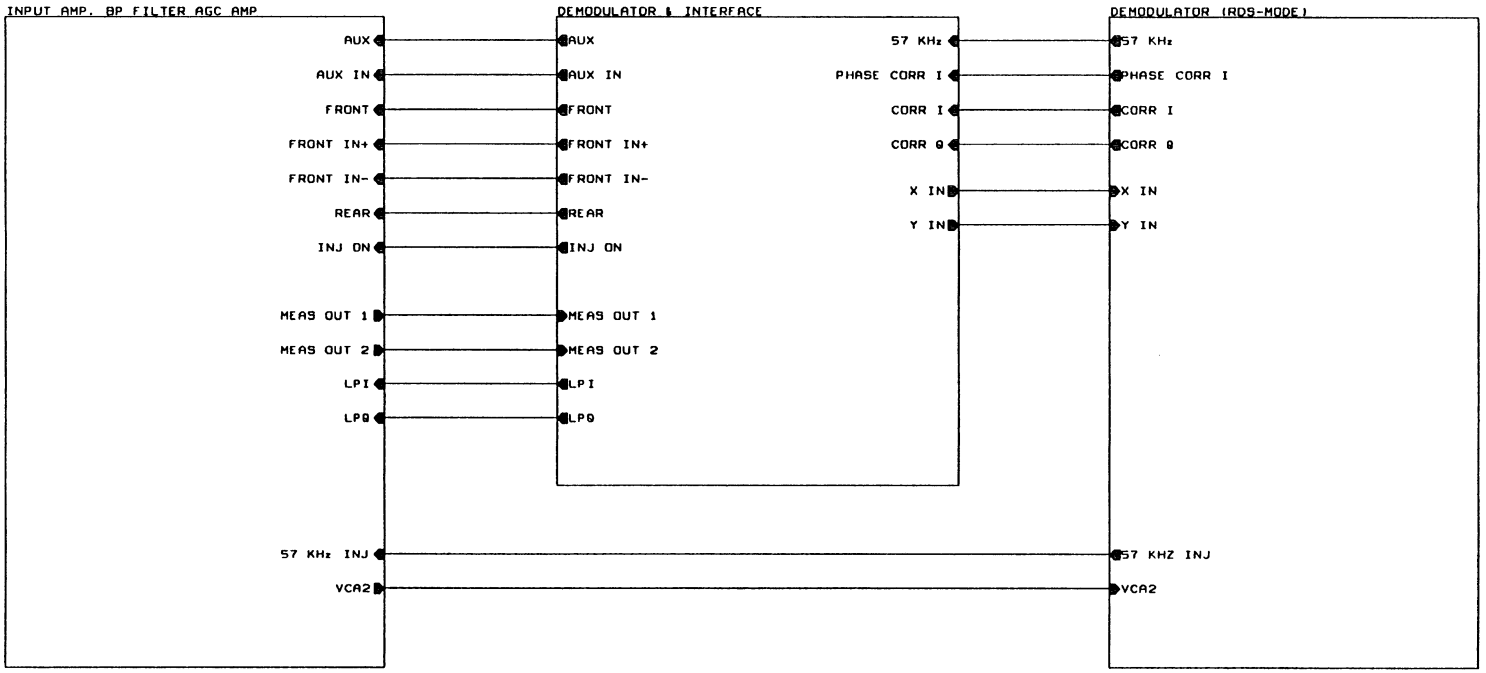
The schematic diagram for the Demodulator Board is located in the following. The diagram number is 985-321.

14.3 Component Locations

The following shows the component locations on the Demodulator Board.

14.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-877.



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RE331		
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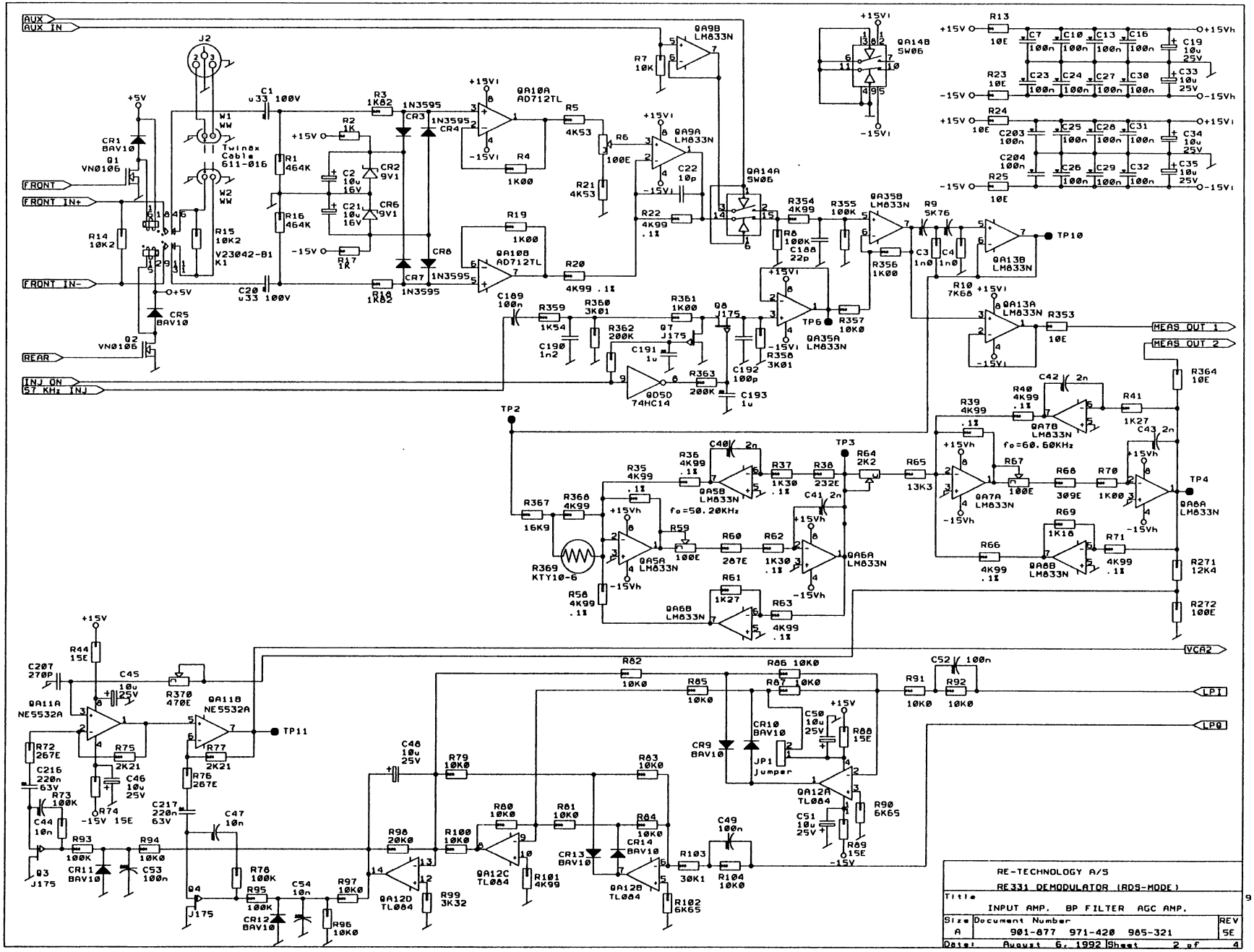
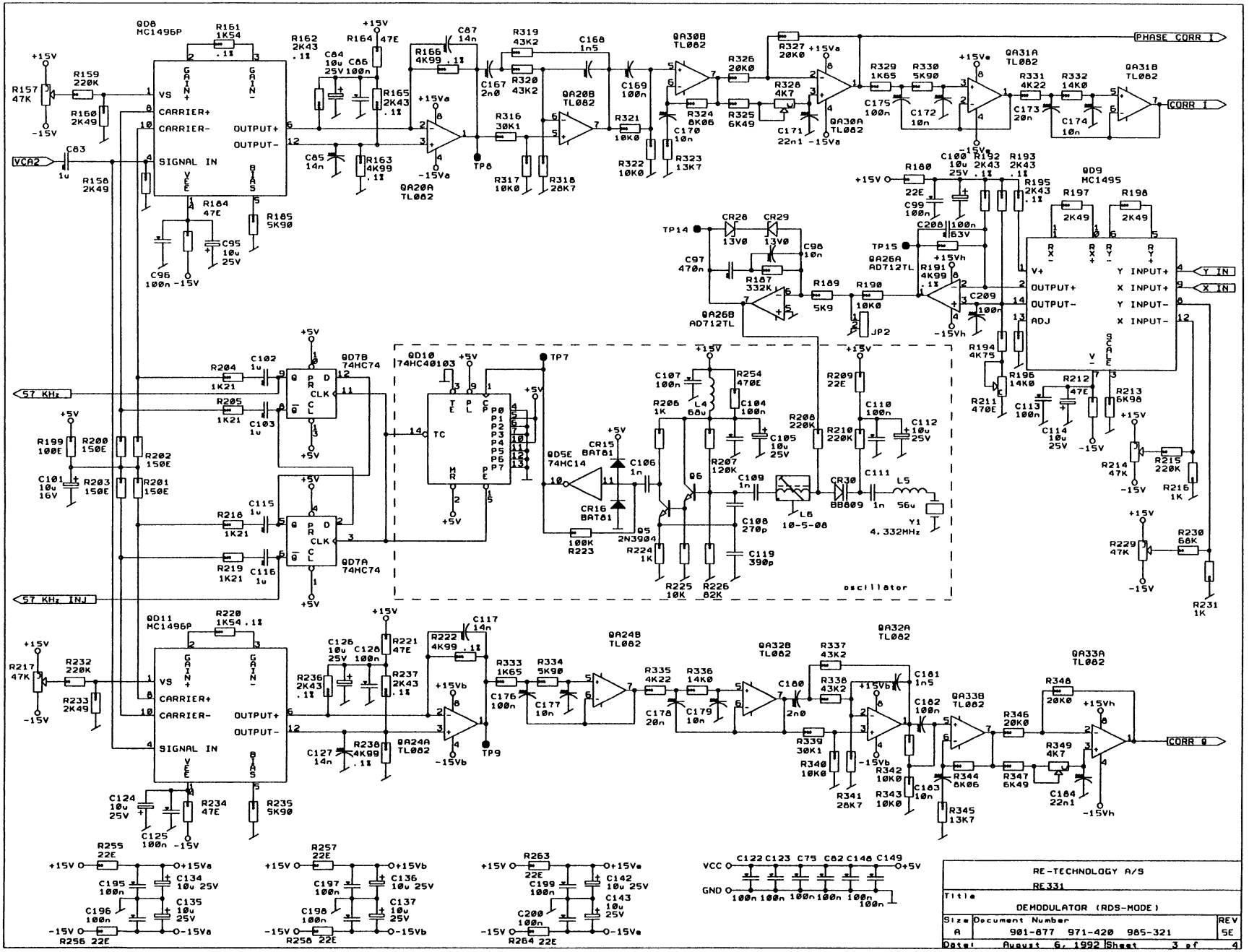
Date: August 6, 1992	Sheet 1 of 4	


AUX
AUX IN
FRONT
FRONT IN+
FRONT IN-
REAR
INJ ON
57 KHz INJ
Twinax Cable 611-016
V23042-B1
K1
MEAS OUT 1
MEAS OUT 2
VCA2
LP1
LP0
TP2
TP3
TP4
TP10
TP11
fo=50.20KHz
fo=60.60KHz
RE-TECHNOLOGY A/S
RE331 DEMODULATOR (RDS-MODE)
INPUT AMP. BP FILTER AGC AMP.
Size A
Document Number 901-877 971-420 985-321
REV 5E
Date: August 6, 1992
Sheet 2 of 4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QD9 MC1495
QD10 74HC40103
QD7B 74HC74
QD7A 74HC74
QD5E 74HC14
QD11 MC1496P
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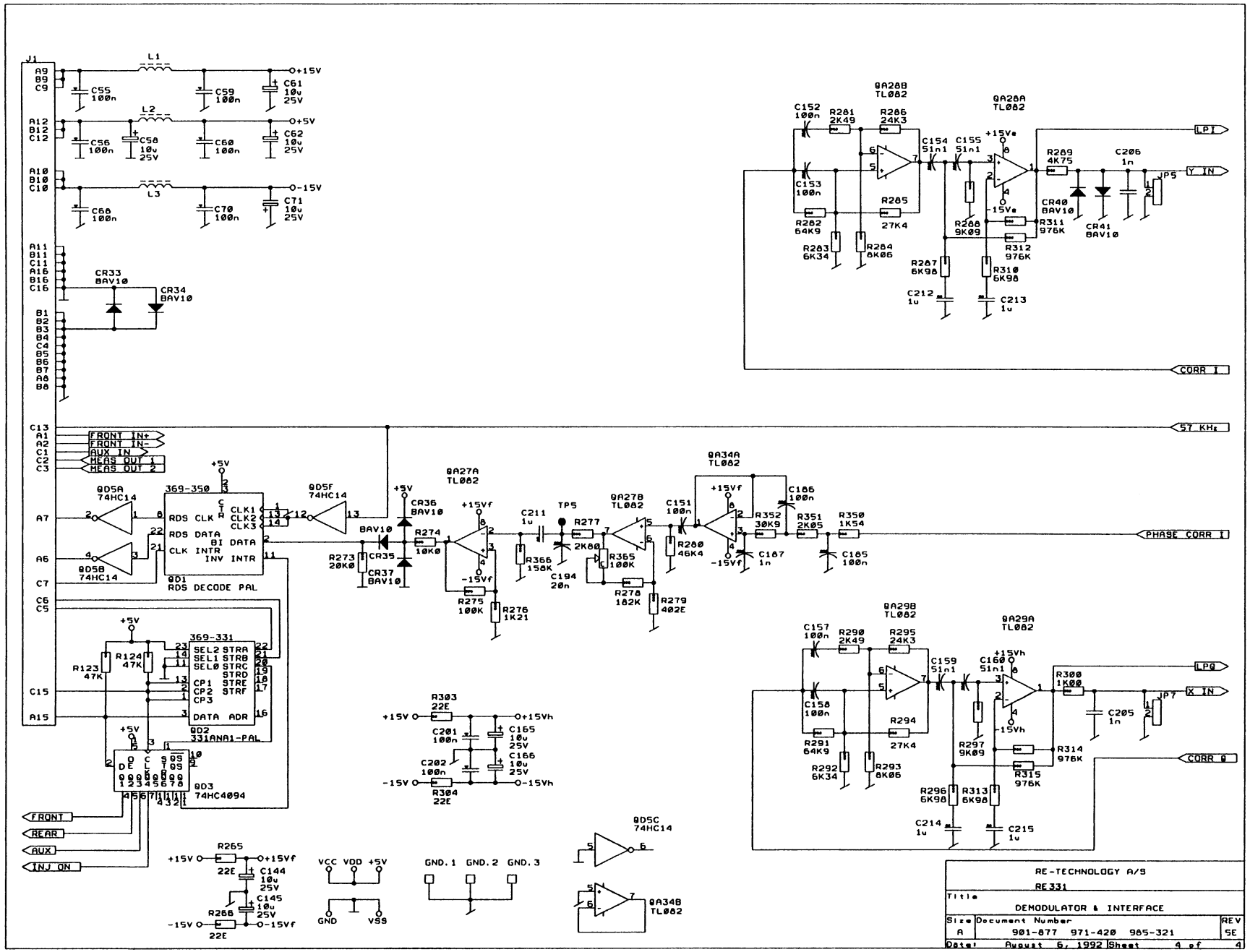
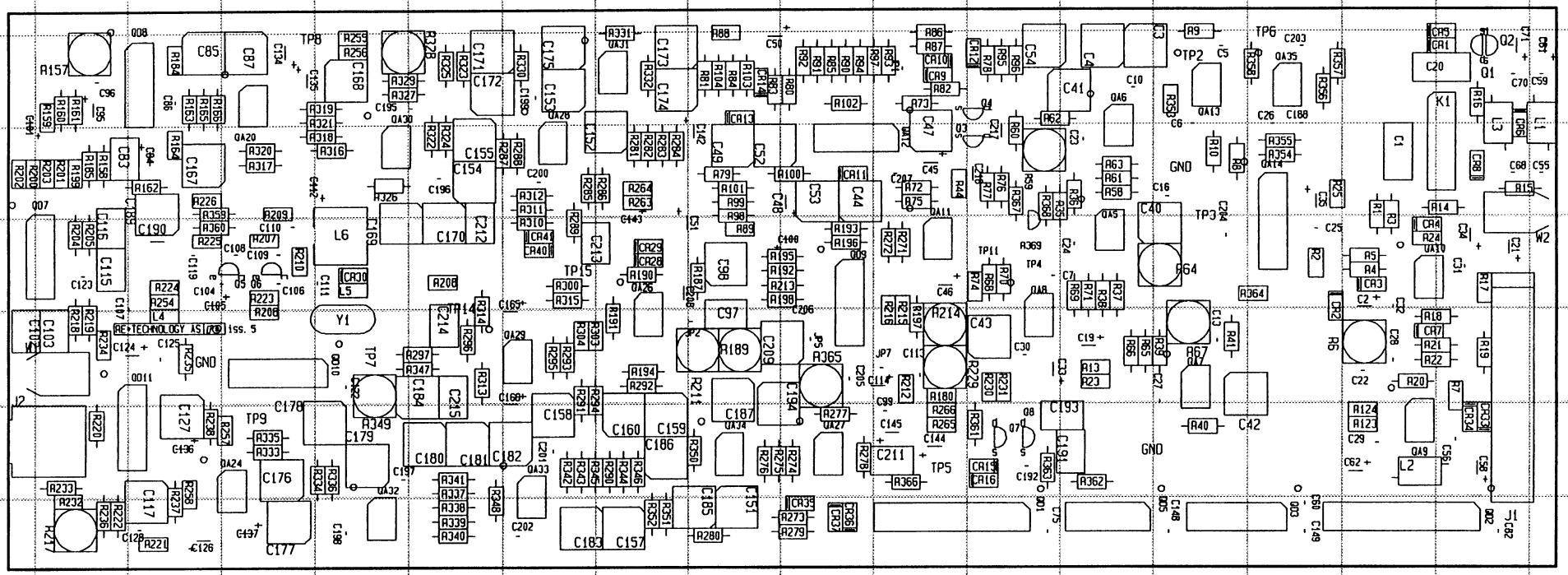
QA20B TL082
QA30A TL082
QA30B TL082
QA31A TL082
QA31B TL082
QA24A TL082
QA24B TL082
QA32A TL082
QA32B TL082
QA33A TL082
QA33B TL082
QA26A AD712TL
QA26B AD712TL
PHASE CORR I
CORR I
CORR Q
Y IN
X IN
VCA2
57 KHz
57 KHz INJ
oscillator
RE-TECHNOLOGY A/S
RE331
DEMODULATOR (RDS-MODE)
Size A
Document Number 901-077 971-420 985-321
REV 5E
Date: August 6, 1992
Sheet 3 of 4


J1
L1
L2
L3
+15V
+5V
-15V
C55 100n
C59 100n
C61 10u 25V
C56 100n
C58 10u 25V
C60 100n
C62 10u 25V
C66 100n
C70 100n
C71 10u 25V
CR33 BAV10
CR34 BAV10
FRONT IN+
FRONT IN-
AUX IN
MEAS OUT 1
MEAS OUT 2
57 KHz
369-350
RDS CLK
RDS DATA
CLK INTR
BI DATA
INV INTR
RDS DECODE PAL
74HC14
BAV10
CR35 BAV10
CR36 BAV10
CR37 BAV10
R273 20K0
R274 10K0
R275 100K
R276 1K21
R277 2K80
R278 182K
R279 402E
R280 46K4
R285 27K4
R288 9K09
R289 4K75
R291 64K9
R292 6K34
R293 6K05
R294 27K4
R296 6K98
R297 9K09
R300 1K00
R303 22E
R304 22E
R310 6K98
R311 976K
R312 976K
R313 6K98
R314 976K
R315 976K
C151 100n
C152 100n
C153 100n
C154 51n1
C155 51n1
C157 100n
C158 100n
C159 51n1
C160 51n1
C165 100n
C166 100n
C167 1n
C194 20n
C201 100n
C202 100n
C205 1n
C206 1n
C211 1u
C212 1u
C213 1u
C214 1u
C215 1u
TP5
OA27A TL082
OA27B TL082
OA28A TL082
OA28B TL082
OA29A TL082
OA29B TL082
OA34A TL082
OA34B TL082
LPI
Y IN
CORR I
PHASE CORR I
LPQ
X IN
CORR Q
JP5
JP7
369-331
SEL2 SEL1 SEL0 CP1 CP2 CP3 DATA
STRA STRB STRC STRD STRE STRF ADR
331ANA1-PAL
74HC4094
FRONT
REAR
AUX
INJ ON
VCC VDD +5V
GND VSS
GND.1 GND.2 GND.3
RE-TECHNOLOGY A/S
RE331
Title
DEMODULATOR & INTERFACE
Size A
Document Number 901-877 971-420 985-321
REV SE
Date: August 6, 1992
Sheet 4 of 4



RE 331 DEMODULATOR RE971-420iss. 5

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	D3	C68	E2	C180	H13	QD1	J7	R85	D9	R230	G7	R337	H13										
CR2	F4	C70	D2	C181	H13	QD2	J2	R86	C8	R231	G7	R338	J13										
CR3	F3	C71	D2	C182	H12	QD3	J4	R87	D8	R232	H17	R339	J13										
CR4	F3	C75	J6	C183	J11	QD5	J5	R88	D10	R233	H17	R340	J13										
CR5	D3	C82	J2	C184	G13	QD7	E18	R89	F10	R234	G17	R341	H13										
CR6	D2	C83	E16	C185	J10	QD8	D16	R90	D9	R235	G16	R342	H12										
CR7	G3	C84	E16	C186	H11	QD9	F9	R91	D9	R236	J17	R343	H12										
CR8	E2	C85	D16	C187	H10	QD10	G14	R92	D9	R237	H16	R344	H11										
CR9	D8	C86	D16	C188	D4	QD11	G16	R93	D8	R238	H16	R345	H11										
CR10	D8	C87	D15	C189	F16	Q1	D2	R94	D9	R254	F16	R346	H11										
CR11	E9	C95	D17	C190	F16	Q2	D2	R95	D7	R255	C14	R347	G13										
CR12	D7	C96	D17	C191	H6	Q3	E8	R96	D7	R256	D14	R348	J13										
CR13	D10	C97	G10	C192	H7	Q4	D7	R97	D9	R257	H15	R349	H14										
CR14	D10	C98	F10	C193	H7	Q5	F15	R98	E10	R258	H16	R350	H10										
CR15	H7	C99	H8	C194	G9	Q6	F15	R99	E10	R263	E11	R351	J11										
CR16	H7	C100	F10	C195	D14	Q7	H7	R100	E9	R264	E11	R352	J11										
CR28	F11	C101	E18	C196	E13	Q8	H7	R101	E10	R265	H8	R353	D5										
CR29	F11	C102	G18	C197	H14	R1	E3	R102	D9	R266	H8	R354	E4										
CR30	F14	C103	G17	C198	J14	R2	F4	R103	D10	R271	F8	R355	E4										
CR33	H2	C104	F16	C199	D12	R3	E3	R104	D10	R272	F8	R356	D4										
CR34	H2	C105	F15	C200	E12	R4	F3	R123	H3	R273	J9	R357	D4										
CR35	J9	C106	F15	C201	H12	R5	F3	R124	H3	R274	H9	R358	D4										
CR36	J9	C107	G17	C202	J12	R6	G4	R157	D17	R275	H10	R359	E15										
CR37	J9	C108	F15	C203	D4	R7	G2	R158	E17	R276	H10	R360	F16										
CR40	F12	C109	F15	C204	F5	R8	E5	R159	D17	R277	H9	R361	H7										
CR41	F12	C110	F15	C205	G9	R9	D5	R160	D17	R278	H9	R362	H6										
C1	E3	C111	F14	C206	F9	R10	E5	R161	D17	R279	J9	R363	H7										
C2	F3	C112	E14	C207	E8	R13	G6	R162	E16	R280	J10	R364	F4										
C3	C5	C113	G8	C208	F10	R14	E3	R163	D16	R281	E11	R365	G9										
C4	D6	C114	G8	C209	G10	R15	E2	R164	E16	R282	E11	R366	H8										
C5	D5	C115	F17	C211	H8	R16	D2	R165	D16	R283	E11	R367	E7										
C6	E5	C116	F17	C212	E13	R17	F2	R166	D16	R284	E11	R368	E7										
C7	F6	C117	J16	C213	F12	R18	G3	R180	G8	R285	E12	R369	F7										
C10	D6	C119	F16	C214	G13	R19	G2	R184	D16	R286	E11	TP2	D5										
C13	G5	C122	G14	C215	G13	R20	G3	R185	E17	R287	E13	TP3	F5										
C16	E5	C123	F17	C216	E7	R21	G3	R187	F10	R288	E12	TP4	F7										
C19	G6	C124	G16	C217	D7	R22	G2	R189	G10	R289	E12	TP5	H8										
C20	D3	C125	G16	GND	H5	R23	G6	R190	F11	R290	H11	TP6	C4										
C21	F2	C126	J16	GND	E5	R24	F3	R191	F11	R291	H12	TP7	G14										
C22	G3	C127	H16	GND	G16	R25	E4	R192	F10	R292	G11	TP8	D15										
C23	E6	C128	J16	JP1	D8	R35	F6	R193	F9	R293	G12	TP9	H15										
C24	F6	C134	D15	JP2	G11	R36	E6	R194	G11	R294	H11	TP11	F7										
C25	F4	C135	D15	JP5	G9	R37	F6	R195	F10	R295	G12	TP14	G13										
C26	D4	C136	H16	JP7	G8	R38	F6	R196	F9	R296	G13	TP15	F12										
C27	G5	C137	J15	J1	J2	R39	G5	R197	F8	R297	G13	W1	G18										
C28	G3	C142	D10	J2	G18	R40	H5	R198	F10	R300	F12	W2	F1										
C29	H3	C143	E11	K1	D2	R41	G5	R199	E17	R303	G12	Y1	G14										
C30	G7	C144	H8	L1	E1	R44	E8	R200	E17	R304	G12	5	G15										
C31	F2	C145	H8	L2	H3	R58	E6	R201	E17	R310	F12												
C32	G3	C148	J5	L3	E2	R59	E7	R202	E18	R311	E12												
C33	G6	C149	J4	L4	G16	R60	E7	R203	E17	R312	E12												
C34	F2	C151	H10	L5	F14	R61	E6	R204	F17	R313	G13												
C35	E4	C152	E12	L6	F14	R62	D7	R205	F17	R314	G13												
C40	E6	C153	D12	QA5	F6	R63	E6	R206	F15	R315	F12												
C41	D6	C154	E13	QA6	D6	R64	F5	R207	F15	R316	E14												
C42	H5	C155	E13	QA7	G5	R65	G6	R208	F13	R317	E15												
C43	G7	C157	J11	QA8	F7	R66	G6	R209	E15	R318	E14												
C44	E9	C158	H12	QA9	H3	R67	G5	R210	F15	R319	D15												
C45	E8	C159	H11	QA10	F3	R68	F7	R211	H10	R320	E15												
C46	F8	C160	H11	QA11	E8	R69	F6	R212	G8	R321	D14												
C47	D8	C165	F12	QA12	E8	R70	F7	R213	F9	R322	E13												
C48	E9	C166	G12	QA13	D5	R71	F6	R214	F8	R323	D13												
C49	E10	C167	E16	QA14	E4	R72	E8	R215	G8	R324	E13												
C50	D9	C168	D14	QA20	E15	R73	D8	R216	G8	R325	D13												
C51	E10	C169	F14	QA24	H16	R74	F7	R217	J17	R326	E14												
C52	E10	C170	F13	QA26	F11	R75	E8	R218	G17	R327	D13												
C53	E9	C171	D13	QA27	H9	R76	E7	R219	G17	R328	D13												
C54	D7	C172	D13	QA28	D12	R77	E7	R220	H17	R329	D14												
C55	E1	C173	D11	QA29	G12	R78	D7	R221	J16	R330	D12												
C56	H2	C174	D11	QA30	D14	R79	E10	R222	J17	R331	D11												
C58	H2	C175	D12	QA31	D11	R80	D9	R223	F15	R332	D11												
C59	D1	C176	H15	QA32	H14	R81	D10	R224	F16	R333	H15												
C60	J4	C177	J15	QA33	H12	R82	D8	R225	F16	R334	H15												
C61	D1	C178	G15	QA34	H10	R83	D10	R226	E16	R335	H15												
C62	H3	C179	H14	QA35	D4	R84	D10	R229	G7	R336	H14												

COMPONENT SIDE

Demodulator Board (901-877)

CAPACITORS

C 1	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 2	C solid AL 10u 20% 16V	265-008
C 3	C Polyst 1n00 1% 63V	243-304
C 4	C Polyst 1n00 1% 63V	243-304
C 7	C Ceramic 100n 20% 50V	213-401
C 10	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 19	C Solid alu 10u 20% 25V	265-010
C 20	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 21	C solid AL 10u 20% 16V	265-008
C 22	C Ceramic 10p0 2% 100V NP0	213-205
C 23	C Ceramic 100n 20% 50V	213-401
C 24	C Ceramic 100n 20% 50V	213-401
C 25	C Ceramic 100n 20% 50V	213-401
C 26	C Ceramic 100n 20% 50V	213-401
C 27	C Ceramic 100n 20% 50V	213-401
C 28	C Ceramic 100n 20% 50V	213-401
C 29	C Ceramic 100n 20% 50V	213-401
C 30	C Ceramic 100n 20% 50V	213-401
C 31	C Ceramic 100n 20% 50V	213-401
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Solid alu 10u 20% 25V	265-010
C 34	C Solid alu 10u 20% 25V	265-010
C 35	C Solid alu 10u 20% 25V	265-010
C 40	C Polyst 2n00 1% 63V	243-305
C 41	C Polyst 2n00 1% 63V	243-305
C 42	C Polyst 2n00 1% 63V	243-305
C 43	C Polyst 2n00 1% 63V	243-305
C 44	C Polyst 10n0 1% 63V	243-302
C 45	C Solid alu 10u 20% 25V	265-010
C 46	C Solid alu 10u 20% 25V	265-010
C 47	C Polyst 10n0 1% 63V	243-302
C 48	C Solid alu 10u 20% 25V	265-010
C 49	C Polypropylen 100n 1% 63V 150PPM	242-302
C 50	C Solid alu 10u 20% 25V	265-010
C 51	C Solid alu 10u 20% 25V	265-010
C 52	C Polypropylen 100n 1% 63V 150PPM	242-302
C 53	C Polypropylen 100n 1% 63V 150PPM	242-302
C 54	C Polyst 10n0 1% 63V	243-302
C 55	C Ceramic 100n 20% 50V	213-401
C 56	C Ceramic 100n 20% 50V	213-401
C 58	C Solid alu 10u 20% 25V	265-010
C 59	C Ceramic 100n 20% 50V	213-401
C 60	C Ceramic 100n 20% 50V	213-401
C 61	C Solid alu 10u 20% 25V	265-010
C 62	C Solid alu 10u 20% 25V	265-010
C 68	C Ceramic 100n 20% 50V	213-401
C 70	C Ceramic 100n 20% 50V	213-401
C 71	C Solid alu 10u 20% 25V	265-010

C 75	C Ceramic 100n 20% 50V	213-401
C 82	C Ceramic 100n 20% 50V	213-401
C 83	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 84	C Solid alu 10u 20% 25V	265-010
C 85	C Polystyrene 14n 1% 63V	243-322
C 86	C Ceramic 100n 20% 50V	213-401
C 87	C Polystyrene 14n 1% 63V	243-322
C 95	C Solid alu 10u 20% 25V	265-010
C 96	C Ceramic 100n 20% 50V	213-401
C 97	MKT, 0.47/63/10, R:4.5*9*7.2, RM2	241-073
C 98	C Polyst 10n0 1% 63V	243-302
C 99	C Ceramic 100n 20% 50V	213-401
C 100	C Solid alu 10u 20% 25V	265-010
C 101	C solid AL 10u 20% 16V	265-008
C 102	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 103	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 104	C Ceramic 100n 20% 50V	213-401
C 105	C Solid alu 10u 20% 25V	265-010
C 106	C Ceramic 1n 5% NP0 63V	213-616
C 107	C Ceramic 100n 20% 50V	213-401
C 108	C Ceramic 270p 2% 100V N750	213-213
C 109	C Ceramic 1n 5% NP0 63V	213-616
C 110	C Ceramic 100n 20% 50V	213-401
C 111	C Ceramic 1n 5% NP0 63V	213-616
C 112	C Solid alu 10u 20% 25V	265-010
C 113	C Ceramic 100n 20% 50V	213-401
C 114	C Solid alu 10u 20% 25V	265-010
C 115	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 116	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 117	C Polystyrene 14n 1% 63V	243-322
C 119	C Ceramic 390p 10% 100V	213-021
C 122	C Ceramic 100n 20% 50V	213-401
C 123	C Ceramic 100n 20% 50V	213-401
C 124	C Solid alu 10u 20% 25V	265-010
C 125	C Ceramic 100n 20% 50V	213-401
C 126	C Solid alu 10u 20% 25V	265-010
C 127	C Polystyrene 14n 1% 63V	243-322
C 128	C Ceramic 100n 20% 50V	213-401
C 134	C Solid alu 10u 20% 25V	265-010
C 135	C Solid alu 10u 20% 25V	265-010
C 136	C Solid alu 10u 20% 25V	265-010
C 137	C Solid alu 10u 20% 25V	265-010
C 142	C Solid alu 10u 20% 25V	265-010
C 143	C Solid alu 10u 20% 25V	265-010
C 144	C Solid alu 10u 20% 25V	265-010
C 145	C Solid alu 10u 20% 25V	265-010
C 148	C Ceramic 100n 20% 50V	213-401
C 149	C Ceramic 100n 20% 50V	213-401
C 151	C Polypropylen 100n 1% 63V 150PPM	242-302
C 152	C Polypropylen 100n 1% 63V 150PPM	242-302
C 153	C Polypropylen 100n 1% 63V 150PPM	242-302
C 154	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 155	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 157	C Polypropylen 100n 1% 63V 150PPM	242-302

C 158	C Polypropylen 100n 1% 63V 150PPM	242-302
C 159	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 160	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 165	C Solid alu 10u 20% 25V	265-010
C 166	C Solid alu 10u 20% 25V	265-010
C 167	C Polyst 2n00 1% 63V	243-305
C 168	C Polystyrene 1n5 1% 63V	243-312
C 169	C Polypropylen 100n 1% 63V 150PPM	242-302
C 170	C Polyst 10n0 1% 63V	243-302
C 171	C Polystyrene 22n1 1% 63V	243-315
C 172	C Polyst 10n0 1% 63V	243-302
C 173	C Polystyrene 20n 1% 63V	243-316
C 174	C Polyst 10n0 1% 63V	243-302
C 175	C Polypropylen 100n 1% 63V 150PPM	242-302
C 176	C Polypropylen 100n 1% 63V 150PPM	242-302
C 177	C Polyst 10n0 1% 63V	243-302
C 178	C Polystyrene 20n 1% 63V	243-316
C 179	C Polyst 10n0 1% 63V	243-302
C 180	C Polyst 2n00 1% 63V	243-305
C 181	C Polystyrene 1n5 1% 63V	243-312
C 182	C Polypropylen 100n 1% 63V 150PPM	242-302
C 183	C Polyst 10n0 1% 63V	243-302
C 184	C Polystyrene 22n1 1% 63V	243-315
C 185	C Polypropylen 100n 1% 63V 150PPM	242-302
C 186	C Polypropylen 100n 1% 63V 150PPM	242-302
C 187	C Polyst 1n00 1% 63V	243-304
C 188	C Ceramic 22p0 2% 100V NP0	213-206
C 189	C Polypropylen 100n 1% 63V 150PPM	242-302
C 190	C Ceramic 1n2 1% 50V	213-620
C 191	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 192	C Ceramic 100p 2% 100V NP0	213-211
C 193	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 194	C Polystyrene 20n 1% 63V	243-316
C 195	C Ceramic 100n 20% 50V	213-401
C 196	C Ceramic 100n 20% 50V	213-401
C 197	C Ceramic 100n 20% 50V	213-401
C 198	C Ceramic 100n 20% 50V	213-401
C 199	C Ceramic 100n 20% 50V	213-401
C 200	C Ceramic 100n 20% 50V	213-401
C 201	C Ceramic 100n 20% 50V	213-401
C 202	C Ceramic 100n 20% 50V	213-401
C 203	C Ceramic 100n 20% 50V	213-401
C 204	C Ceramic 100n 20% 50V	213-401
C 205	C Ceramic 1n 5% NP0 63V	213-616
C 206	C Ceramic 1n 5% NP0 63V	213-616
C 207	C Ceramic 270p 1% 50V NP0	213-636
C 208	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 209	C Polypropylen 100n 1% 63V 150PPM	242-302
C 211	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 212	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 213	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 214	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 215	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 216	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071

C 217	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071

DIODES

CR 1	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 2	Diode zener BZX79-C9V1 0.4W	350-606
CR 3	Diode 1N3595 SI 100V 100mA	350-415
CR 4	Diode 1N3595 SI 100V 100mA	350-415
CR 5	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 6	Diode zener BZX79-C9V1 0.4W	350-606
CR 7	Diode 1N3595 SI 100V 100mA	350-415
CR 8	Diode 1N3595 SI 100V 100mA	350-415
CR 9	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 10	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 11	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 12	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 13	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 14	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 15	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 16	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 28	Diode zener BZX79-C13V 0.4W	350-634
CR 29	Diode zener BZX79-C13V 0.4W	350-634
CR 30	Diode cap BB809 Vr-28V Ir-10nA	350-063
CR 33	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 34	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 35	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 36	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 37	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 40	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 41	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958

RELAYS & JUMPERS

JP 2	2-pol amp connector	805-951
JP 5	2-pol amp connector	805-951
JP 7	2-pol amp connector	805-951
K 1	Miniature Relay D2 V23042-B1201-B101	570-088

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204
L 4	Choke HF Mini 68u 10% 95mA	703-073
L 5	Choke Mini 47u 5% 100mA	703-072
L 6	Coil Var 12-30	702-900

TRANSISTORS

Q 1	Transistor VN0106N3 Power Mos N-CH	360-245
Q 2	Transistor VN0106N3 Power Mos N-CH	360-245
Q 3	Transistor J175-18 p jfet	360-252
Q 4	Transistor J175-18 p jfet	360-252
Q 5	Transistor 2N3904 pnp	360-064
Q 6	Transistor 2N3904 pnp	360-064
Q 7	Transistor J175-18 p jfet	360-252
Q 8	Transistor J175-18 p jfet	360-252

INTEGRATED ANALOG CIRCUITS

QA 5	IC LM833N Dual Low Noise OPamp	365-037
QA 6	IC LM833N Dual Low Noise OPamp	365-037
QA 7	IC LM833N Dual Low Noise OPamp	365-037
QA 8	IC LM833N Dual Low Noise OPamp	365-037
QA 9	IC LM833N Dual Low Noise OPamp	365-037
QA 10	IC AD712K Dual OP.AMP.	364-791
QA 11	IC NE5532A Dual OP-Amp low noise	364-640
QA 12	IC TL084 quad op amp	364-276
QA 13	IC LM833N Dual Low Noise OPamp	365-037
QA 14	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 20	IC TL082 dual op amp	364-619
QA 24	IC TL082 dual op amp	364-619
QA 26	IC AD712K Dual OP.AMP.	364-791
QA 27	IC TL082 dual op amp	364-619
QA 28	IC TL082 dual op amp	364-619
QA 29	IC TL082 dual op amp	364-619
QA 30	IC TL082 dual op amp	364-619
QA 31	IC TL082 dual op amp	364-619
QA 32	IC TL082 dual op amp	364-619
QA 33	IC TL082 dual op amp	364-619
QA 34	IC TL082 dual op amp	364-619
QA 35	IC LM833N Dual Low Noise OPamp	365-037

INTEGRATED DIGITAL CIRCUITS

QD 1	RE331 Bisync 901-877 QD1	369-350
QD 2	RExxx Seriel Bus Receiver For 6 Adr. 364-876	369-331
QD 3	IC 74HC4094 8 stage shift REG.	364-811
QD 5	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 7	IC 74HC74P dual d ff	364-755
QD 8	IC MC1496P Balanced Modulator Demodulator	365-008
QD 9	IC MC1495L Multiplier	364-459
QD 10	IC 74HC40103 8 Bit Counter	364-797
QD 11	IC MC1496P Balanced Modulator Demodulator	365-008

RESISTORS

R 1	R Metal Film 464K 1% 0.5W TC50	116-464
R 2	R Metal film 1K00 5% 0.2W TC250	107-410
R 3	R Metal Film 1K82 1% 0.5W TC50	114-182
R 4	R Metal Film 1K00 1% 0.5W TC50	114-100
R 5	R Metal Film 4K53 1% 0.5W TC50	114-453
R 6	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 7	R Metal film 10K0 5% 0.2W TC250	107-510
R 8	R Metal Film 100K 1% 0.5W TC50	116-100
R 9	R Metal Film 5K76 1% 0.5W TC50	114-576
R 10	R Metal Film 7K68 0,1% 0,125W TC25	141-263
R 13	R Metal film 10E0 5% 0.2W TC250	107-210
R 14	R Metal Film 10K2 1% 0.5W TC50	115-102
R 15	R Metal Film 10K2 1% 0.5W TC50	115-102
R 16	R Metal Film 464K 1% 0.5W TC50	116-464
R 17	R Metal film 1K00 5% 0.2W TC250	107-410
R 18	R Metal Film 1K82 1% 0.5W TC50	114-182
R 19	R Metal Film 1K00 1% 0.5W TC50	114-100
R 20	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 21	R Metal Film 4K53 1% 0.5W TC50	114-453
R 22	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 23	R Metal film 10E0 5% 0.2W TC250	107-210
R 24	R Metal film 10E0 5% 0.2W TC250	107-210
R 25	R Metal film 10E0 5% 0.2W TC250	107-210
R 35	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 36	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 37	R Metal Film 1K3 0.5% 0.4W TC50	140-883
R 38	R Metal Film 232E 1% 0.5W TC50	113-232
R 39	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 40	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 41	R Metal Film 1K27 1% 0.5W TC50	114-127
R 44	R Metal film 15E0 5% 0.2W TC250	107-215
R 58	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 59	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 60	R Metal Film 287E 1% 0.5W TC50	113-287
R 61	R Metal Film 1K27 1% 0.5W TC50	114-127
R 62	R Metal Film 1K3 0.5% 0.4W TC50	140-883
R 63	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 64	R var 2K2 20% 0.5W	182-313
R 65	R Metal Film 13K3 1% 0.5W TC50	115-133
R 66	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 67	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 68	R Metal Film 309E 0.5% 0.4W TC50	140-783
R 69	R Metal Film 1K18 1% 0.5W TC50	114-118
R 70	R Metal Film 1K00 1% 0.5W TC50	114-100
R 71	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 72	R Metal Film 267E 1% 0.5W TC50	113-267
R 73	R Metal Film 100K 1% 0.5W TC50	116-100
R 74	R Metal film 15E0 5% 0.2W TC250	107-215
R 75	R Metal Film 2K21 1% 0.5W TC50	114-221
R 76	R Metal Film 267E 1% 0.5W TC50	113-267
R 77	R Metal Film 2K21 1% 0.5W TC50	114-221
R 78	R Metal Film 100K 1% 0.5W TC50	116-100

R 79	R Metal Film 10K0 1% 0.5W TC50	115-100
R 80	R Metal Film 10K0 1% 0.5W TC50	115-100
R 81	R Metal Film 10K0 1% 0.5W TC50	115-100
R 82	R Metal Film 10K0 1% 0.5W TC50	115-100
R 83	R Metal Film 10K0 1% 0.5W TC50	115-100
R 84	R Metal Film 10K0 1% 0.5W TC50	115-100
R 85	R Metal Film 10K0 1% 0.5W TC50	115-100
R 86	R Metal Film 10K0 1% 0.5W TC50	115-100
R 87	R Metal Film 10K0 1% 0.5W TC50	115-100
R 88	R Metal film 15E0 5% 0.2W TC250	107-215
R 89	R Metal film 15E0 5% 0.2W TC250	107-215
R 90	R Metal Film 6K65 1% 0.5W TC50	114-665
R 91	R Metal Film 10K0 1% 0.5W TC50	115-100
R 92	R Metal Film 10K0 1% 0.5W TC50	115-100
R 93	R Metal Film 100K 1% 0.5W TC50	116-100
R 94	R Metal Film 10K0 1% 0.5W TC50	115-100
R 95	R Metal Film 100K 1% 0.5W TC50	116-100
R 96	R Metal Film 10K0 1% 0.5W TC50	115-100
R 97	R Metal Film 10K0 1% 0.5W TC50	115-100
R 98	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 99	R Metal Film 3K32 1% 0.5W TC50	114-332
R 100	R Metal Film 10K0 1% 0.5W TC50	115-100
R 101	R Metal Film 4K99 1% 0.5W TC50	114-499
R 102	R Metal Film 6K65 1% 0.5W TC50	114-665
R 103	R Metal Film 30K1 1% 0.5W TC50	115-301
R 104	R Metal Film 10K0 1% 0.5W TC50	115-100
R 123	R Metal film 47K0 5% 0.2W TC250	107-547
R 124	R Metal film 47K0 5% 0.2W TC250	107-547
R 157	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 158	R Metal Film 2K49 1% 0.5W TC50	114-249
R 159	R Metal film 220K 5% 0.2W TC250	107-622
R 160	R Metal Film 2K49 1% 0.5W TC50	114-249
R 161	R Metal Film 1K54 0.1% 0,125W TC25	141-254
R 162	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 163	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 164	R Metal film 47E0 5% 0.2W TC250	107-247
R 165	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 166	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 180	R Metal film 22E0 5% 0.2W TC250	107-222
R 184	R Metal film 47E0 5% 0.2W TC250	107-247
R 185	R Metal Film 5K90 1% 0.5W TC50	114-590
R 187	R Metal Film 332K 1% 0.5W TC50	116-332
R 189	R Metal Film 5K90 1% 0.5W TC50	114-590
R 190	R Metal Film 10K0 1% 0.5W TC50	115-100
R 191	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 192	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 193	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 194	R Metal Film 4K75 1% 0.5W TC50	114-475
R 195	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 196	R Metal Film 14K0 1% 0.5W TC50	115-140
R 197	R Metal Film 2K49 1% 0.5W TC50	114-249
R 198	R Metal Film 2K49 1% 0.5W TC50	114-249
R 199	R Metal film 100E 5% 0.2W TC250	107-310
R 200	R Metal film 150E 5% 0.2W TC250	107-315

R 201	R Metal film 150E 5% 0.2W TC250	107-315
R 202	R Metal film 150E 5% 0.2W TC250	107-315
R 203	R Metal film 150E 5% 0.2W TC250	107-315
R 204	R Metal Film 1K21 1% 0.5W TC50	114-121
R 205	R Metal Film 1K21 1% 0.5W TC50	114-121
R 206	R Metal film 1K00 5% 0.2W TC250	107-410
R 207	R Metal film 120K 5% 0.2W TC250	107-612
R 208	R Metal film 220K 5% 0.2W TC250	107-622
R 209	R Metal film 22E0 5% 0.2W TC250	107-222
R 210	R Metal film 220K 5% 0.2W TC250	107-622
R 211	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 212	R Metal film 47E0 5% 0.2W TC250	107-247
R 213	R Metal Film 6K98 1% 0.5W TC50	114-698
R 214	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 215	R Metal film 220K 5% 0.2W TC250	107-622
R 216	R Metal film 1K00 5% 0.2W TC250	107-410
R 217	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 218	R Metal Film 1K21 1% 0.5W TC50	114-121
R 219	R Metal Film 1K21 1% 0.5W TC50	114-121
R 220	R Metal Film 1K54 0.1% 0,125W TC25	141-254
R 221	R Metal film 47E0 5% 0.2W TC250	107-247
R 222	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 223	R Metal film 100K 5% 0.2W TC250	107-610
R 224	R Metal film 1K00 5% 0.2W TC250	107-410
R 225	R Metal film 10K0 5% 0.2W TC250	107-510
R 226	R Metal film 82K0 5% 0.2W TC250	107-582
R 229	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 230	R Metal film 68K0 5% 0.2W TC250	107-568
R 231	R Metal film 1K00 5% 0.2W TC250	107-410
R 232	R Metal film 220K 5% 0.2W TC250	107-622
R 233	R Metal Film 2K49 1% 0.5W TC50	114-249
R 234	R Metal film 47E0 5% 0.2W TC250	107-247
R 235	R Metal Film 5K90 1% 0.5W TC50	114-590
R 236	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 237	R Metal Film 2K43 0,1% 0,125W TC25	141-257
R 238	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 254	R Metal film 470E 5% 0.2W TC250	107-347
R 255	R Metal film 22E0 5% 0.2W TC250	107-222
R 256	R Metal film 22E0 5% 0.2W TC250	107-222
R 257	R Metal film 22E0 5% 0.2W TC250	107-222
R 258	R Metal film 22E0 5% 0.2W TC250	107-222
R 263	R Metal film 22E0 5% 0.2W TC250	107-222
R 264	R Metal film 22E0 5% 0.2W TC250	107-222
R 265	R Metal film 22E0 5% 0.2W TC250	107-222
R 266	R Metal film 22E0 5% 0.2W TC250	107-222
R 271	R Metal Film 12K4 1% 0.5W TC50	115-124
R 272	R Metal Film 100E 1% 0.5W TC50	113-100
R 273	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 274	R Metal Film 10K0 1% 0.5W TC50	115-100
R 275	R Metal Film 100K 1% 0.5W TC50	116-100
R 276	R Metal Film 1K21 1% 0.5W TC50	114-121
R 277	R Metal Film 2K80 1% 0.5W TC50	114-280
R 278	R Metal Film 182K 1% 0.5W TC50	116-182
R 279	R Metal Film 402E 1% 0.5W TC50	113-402

R 280	R Metal Film 46K4 1% 0.5W TC50	115-464
R 281	R Metal Film 2K49 1% 0.5W TC50	114-249
R 282	R Metal Film 64K9 1% 0.5W TC50	115-649
R 283	R Metal Film 6K34 1% 0.5W TC50	114-634
R 284	R Metal Film 8K06 1% 0.5W TC50	114-806
R 285	R Metal Film 27K4 1% 0.5W TC50	115-274
R 286	R Metal Film 24K3 1% 0.5W TC50	115-243
R 287	R Metal Film 6K98 1% 0.5W TC50	114-698
R 288	R Metal Film 9K09 1% 0.5W TC50	114-909
R 289	R Metal Film 4K75 1% 0.5W TC50	114-475
R 290	R Metal Film 2K49 1% 0.5W TC50	114-249
R 291	R Metal Film 64K9 1% 0.5W TC50	115-649
R 292	R Metal Film 6K34 1% 0.5W TC50	114-634
R 293	R Metal Film 8K06 1% 0.5W TC50	114-806
R 294	R Metal Film 27K4 1% 0.5W TC50	115-274
R 295	R Metal Film 24K3 1% 0.5W TC50	115-243
R 296	R Metal Film 6K98 1% 0.5W TC50	114-698
R 297	R Metal Film 9K09 1% 0.5W TC50	114-909
R 300	R Metal Film 1K00 1% 0.5W TC50	114-100
R 303	R Metal film 22E0 5% 0.2W TC250	107-222
R 304	R Metal film 22E0 5% 0.2W TC250	107-222
R 310	R Metal Film 6K98 1% 0.5W TC50	114-698
R 311	R Metal Film 976K 1% 0.5W TC50	116-976
R 312	R Metal Film 976K 1% 0.5W TC50	116-976
R 313	R Metal Film 6K98 1% 0.5W TC50	114-698
R 314	R Metal Film 976K 1% 0.5W TC50	116-976
R 315	R Metal Film 976K 1% 0.5W TC50	116-976
R 316	R Metal Film 30K1 1% 0.5W TC50	115-301
R 317	R Metal Film 10K0 1% 0.5W TC50	115-100
R 318	R Metal Film 28K7 1% 0.5W TC50	115-287
R 319	R Metal film 43K2 1% 0.4W TC50	115-432
R 320	R Metal film 43K2 1% 0.4W TC50	115-432
R 321	R Metal Film 10K0 1% 0.5W TC50	115-100
R 322	R Metal Film 10K0 1% 0.5W TC50	115-100
R 323	R Metal Film 13K7 1% 0.5W TC50	115-137
R 324	R Metal Film 8K06 1% 0.5W TC50	114-806
R 325	R Metal Film 6K49 1% 0.5W TC50	114-649
R 326	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 327	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 328	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 329	R Metal Film 1K65 1% 0.5W TC50	114-165
R 330	R Metal Film 5K90 1% 0.5W TC50	114-590
R 331	R Metal Film 4K22 1% 0.5W TC50	114-422
R 332	R Metal Film 14K0 1% 0.5W TC50	115-140
R 333	R Metal Film 1K65 1% 0.5W TC50	114-165
R 334	R Metal Film 5K90 1% 0.5W TC50	114-590
R 335	R Metal Film 4K22 1% 0.5W TC50	114-422
R 336	R Metal Film 14K0 1% 0.5W TC50	115-140
R 337	R Metal film 43K2 1% 0.4W TC50	115-432
R 338	R Metal film 43K2 1% 0.4W TC50	115-432
R 339	R Metal Film 30K1 1% 0.5W TC50	115-301
R 340	R Metal Film 10K0 1% 0.5W TC50	115-100
R 341	R Metal Film 28K7 1% 0.5W TC50	115-287
R 342	R Metal Film 10K0 1% 0.5W TC50	115-100

R 343	R Metal Film 10K0 1% 0.5W TC50	115-100
R 344	R Metal Film 8K06 1% 0.5W TC50	114-806
R 345	R Metal Film 13K7 1% 0.5W TC50	115-137
R 346	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 347	R Metal Film 6K49 1% 0.5W TC50	114-649
R 348	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 349	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 350	R Metal Film 1K54 1% 0.5W TC50	114-154
R 351	R Metal Film 2K05 0.5% 0.4W TC50	140-971
R 352	R Metal Film 30K9 0.5% 0.4W TC50	141-147
R 353	R Metal film 10E0 5% 0.2W TC250	107-210
R 354	R Metal Film 4K99 1% 0.5W TC50	114-499
R 355	R Metal Film 100K 1% 0.5W TC50	116-100
R 356	R Metal Film 1K00 1% 0.5W TC50	114-100
R 357	R Metal Film 10K0 1% 0.5W TC50	115-100
R 358	R Metal Film 3K01 1% 0.5W TC50	114-301
R 359	C Ceramic 1n2 1% 50V	213-620
R 360	R Metal Film 3K01 1% 0.5W TC50	114-301
R 361	R Metal Film 1K00 1% 0.5W TC50	114-100
R 362	R Metal Film 200K 1% 0.5W TC50	116-200
R 363	R Metal Film 200K 1% 0.5W TC50	116-200
R 364	R Metal film 10E0 5% 0.2W TC250	107-210
R 365	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 366	R Metal Film 158K 1% 0.5W TC50	116-158
R 367	R Metal Film 16K9 1% 0.5W TC50	115-169
R 368	R Metal Film 4K99 1% 0.5W TC50	114-499
R 369	Sensistor 2K AT 25C PTC KTY 10-7	160-055
R 370	R Cermet Trimpot 470E 20% 0.5W TC70	182-302

TESTPOINTS

TP 1	Wire Wrap Terminal	805-727
TP 2	Wire Wrap Terminal	805-727
TP 3	Wire Wrap Terminal	805-727
TP 4	Wire Wrap Terminal	805-727
TP 5	Wire Wrap Terminal	805-727
TP 6	Wire Wrap Terminal	805-727
TP 8	Wire Wrap Terminal	805-727
TP 9	Wire Wrap Terminal	805-727
TP 10	Wire Wrap Terminal	805-727
TP 11	Wire Wrap Terminal	805-727
TP 14	Wire Wrap Terminal	805-727
TP 15	Wire Wrap Terminal	805-727

CRYSTALS

Y 1	Quarts Crystal 4,332MHz +-30ppM	910-224

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
	Lock washer D3,2/5,5x0,45	046-405
	Tubular Rivet 2.5X10	060-310
	Lemo Isolation/code Washer	066-407
	Twinax Cable for RE331 Demodulator	617-953
	Lemo Triaxial Male For Chassis	806-076
	Isolating Plate F.Crystal	816-287
	Solder Terminal 0.1 O2	823-303
	L-piece for PCB	857-041
	PCB For Re331 Demodulator	971-420
	Rearplate f.demudolator	978-356
QDS1	24 Pin DIL Socket w. 3 modul spacing	816-274
QDS2	24 Pin DIL Socket w. 3 modul spacing	816-274

15. LEVEL MEASURING BOARD

15.1 Circuit Description

This section describes the various circuits that constitute the Level Measuring Board. Refer to the extended block diagram, Fig. 15.1, and the schematic diagram in section 15.4.

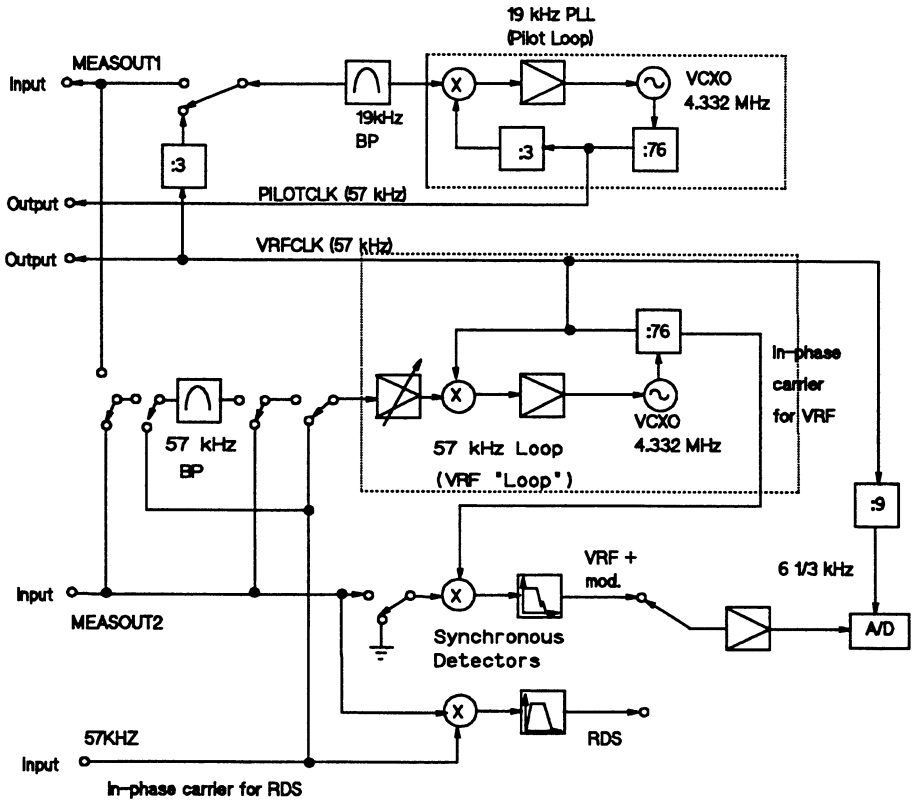


Fig. 15.1 - Block Diagram of Level Measuring Board

15.1.1 Pilot Loop

The Pilot Loop is connected either directly to MEASOUT1, or to a divide-by-3 divider in QD3, by switching QA3A. When connected to MEASOUT1, the Pilot Loop locks on to the Pilot in the MPX signal. The connection to QD3 is only made during calibration of the Pilot Loop.

To increase the out-of-band noise rejection, the signal path to the PLL includes a 19 kHz Band-pass filter. The filter mainly consists of a 4th order State-variable Band-pass filter (QA5, QA6, QA7 and QA2). A buffer (QA4B) has been included

in order not to load the switch QA3A.

Besides having a static phase error, the Band-pass filter and the PLL itself are subject to some thermal drift. A system to calibrate the Pilot Loop is therefore included on the Level Measuring Board. The settings on the board during this calibration are explained in section 16.4.

The Voltage Controlled Oscillator (VCO) in the PLL is a tuneable crystal oscillator with a center frequency of 4.332 MHz. The frequency is changed by varying the working impedance seen from the crystal using the varactor CR3. The oscillator itself is a Colpitts oscillator which works in class C.

The Schmitt-trigger inverter QD13C shapes the oscillator signal, and the PAL QD3 subsequently divides the frequency by 76, which gives a 57 kHz signal with 50 % Duty Cycle called PILOTCLK. At the same time QD3 divides the frequency of PILOTCLK with 3, and feeds the resulting 19 kHz signal to the mixer QD5, which acts as a phase comparator in the PLL. This 2-step frequency division gives a 57 kHz clock with information about the phase of the Pilot.

The loop amplifier QA1A amplifies the phase difference signal from the phase comparator, and the resulting signal controls the VCO.

15.1.2 VRF Loop

The VRF Loop can be connected in different ways through the switches QA17 and QA22 to facilitate both calibration and locking to the VRF signal. Section 15.4 describes the use of the VRF Loop during calibration of other circuit parts.

When the control signal 57KHZ_DIR_VRF to QA22 is low and the control signal SEL_VRF_BP to QA22 is high, the VRF Loop is connected through a 57 kHz Band-pass filter to either the recovered RDS carrier, to MEASOUT1 or to MEASOUT2 by switching QA17: When control signal MEASOUTSEL is high MEASOUT2 is selected, otherwise MEASOUT1 is selected. However, the control signal 57KHZ_VRF_BP overrides MEASOUTSEL when 57KHZ_VRF_BP goes high: The recovered carrier from the Demodulator is then injected regardless of the state of MEASOUTSEL.

The control signal SEL_VRF_BP decides whether the PLL is connected through the 57 kHz Band-pass filter or to MEASOUT2 directly. However, the control signal 57KHZ_DIR_VRF overrides the control signal SEL_VRF_BP by injecting the recovered carrier from the Demodulator when 57KHZ_DIR_VRF goes high.

In the signal path between the QA17 and QA22 switch network and the PLL itself, an amplifier with switchable gain is inserted. When the control signal VRF_AMP_ON goes high, the gain in the amplifier is increased. The amplifier has active feedback to minimise the phase shift when changing the gain.

The 57 kHz Band-pass filter is included in signal path to the PLL to increase out-of-band noise rejection and to add gain during lock to weak 57 kHz carriers. The filter consists mainly of a 4th order State-variable Band-pass filter (QA16, QA23, QA24 and QA21).

Besides having a static phase error, both the Band-pass filter and the PLL itself are subject to some thermal drift. Therefore the Level Measuring Board includes a system to calibrate the VRF Loop. Section 15.4 describes the settings on the board during this calibration.

The Voltage Controlled Oscillator (VCO) in the PLL is a tuneable crystal oscillator with a center frequency of 4.332 MHz. A change of the working impedance seen from the crystal using the varactor CR8, changes the frequency. The oscillator itself is a Colpitts oscillator which works in class C.

The Schmitt-trigger inverter QD13E shapes the oscillator signal, and the counter QD12 subsequently divides the frequency. QD10 is a divide-by-4 quadrature divider which delivers two 57 kHz sets of signals in quadrature, one to the mixer QD11 and one to the VRF detector. When the VRF Loop is in lock, the set of 57 kHz signals delivered to the mixer QD11 will be in quadrature with the carrier of the VRF signal, while the set of 57 kHz signals delivered to the VRF detectors will be in in-phase with the carrier of the VRF signal.

The 57 kHz Band-pass filter in the VRF Loop is bypassed when measuring VRF Level in order not to give false readings. If the Bandpass filter is inserted in the signal path to the PLL, the carrier fed to the Synchronous Detector would not be in in-phase with the VRF signal on MEASOUT2.

The clock VRF_CLK, which is related to the VRF carrier, is taken from the quadrature divider. The Phase Measuring Board uses this signal for measuring the phase between VRF and Pilot or between VRF and RDS. When the VRF Loop is used during a part of the phase calibrations of the Measuring Option, this signal is used too. Section 15.4 describes the use of the VRF Loop during calibration.

The mixer QD11 acts as a phase comparator in the PLL. The loop amplifier QA18A amplifies the resulting phase difference signal on TP14 from the phase comparator, and the resulting signal controls the VCO.

15.1.3 The Level Detection System

This section describes the principles of the RDS and VRF Detectors. The settings of the Level Measuring Board during the level measurements are shown in section 15.5.

Each of the two Synchronous Detectors receives its own oscillator signal; The RDS detector (mixer QD8) gets an in-phase RDS clock from the Demodulator, while the VRF detector (mixer QD7) gets an in-phase VRF clock from the VRF Loop on the Level Measuring Board. The down-converted signals from the Synchronous Detectors

are filtered separately with filters optimised for the spectrum of the RDS and VRF signals respectively.

The signal MEASOUT2 from the Demodulator sources both detectors. The demodulating clocks therefore have to be in-phase with the RDS and VRF signals present at MEASOUT2. This is always the case with the recovered RDS carrier, as the Costas Loop is connected to MEASOUT2 on the Demodulator, but the VRF Loop will have to have its 57 kHz Band-pass filter shunted.

The RDS detecting branch, which starts with mixer QD8 and level shifter QA11B, consists of a 5th order Switched Capacitor Butterworth Low-pass filter (QA25) in conjunction with active filter circuitry. The PAL QD3 generates a 228 kHz clock called FILTER_CLK for the switched capacitor filter by dividing the oscillator signal in the Pilot Loop by 19.

The rest of the filtration in the RDS detecting branch consists of a 3rd order Low-pass filter (QA11B and QA11A) and two Low-pass Notch filters (QA14). You can adjust the gain in amplifier QA13B using R142. An AC coupling between the RDS branch and the A/D Converter suppresses the contribution of the DC contents to the RMS measurement.

To get the same RMS level regardless of the RDS modulation, the frequency characteristics of the filter in the RDS detecting branch is flat throughout the entire RDS spectrum. A trimming of the flatness of the frequency response enhances the accuracy. It should be noted that noise within the RDS spectrum with a level comparable to that of the RDS signal can corrupt the measurement of the RDS level.

The VRF detecting branch, which starts with mixer QD7 and level shifter QA8B, consists of a 4th order Low-pass filter (QA8B and QA10A) and a Low-pass Notch filter (QA10B). R95 in amplifier QA13A adjusts the gain of the branch.

The A/D Converter QA9 is connected through the buffer QA8A to either the RDS or the VRF branch depending on the control signal SLAVESEL. When SLAVESEL is high, the RDS branch is connected to the A/D Converter.

The divider QD9 divides the 57 kHz clock VRFCLK by 9, and sets the sampling rate of the A/D conversion to 6 1/3 kHz. This sampling rate gives ample distance to cut-off in the filters to ensure sufficient suppression of out-of-band components, while accommodating the detection of the VRF modulation. This detection is done in the RE 331 software.

The output of the A/D Converter QA9 is a serial data signal with strobe and clock. An internal clock of conversion within the A/D Converter defines the timing of the burst of data.

The input to the VRF branch can be shut down in order to make it possible to measure the static and thermally depending DC error in the VRF branch: When the control signal VRF_SLAVE_CAL goes high, the switch QA15B cuts the connection between MEASOUT2 and the mixer QD7.

15.2 Calibration

The calibration procedures are based on the use of the signals in the MPX signal as independent signal sources. The software sets up the Level Measuring Board, the Phase Measuring Board, and the Demodulator so various phase measurements can be made during the calibrations. While the calibration measurements are made, the Pilot, the RDS signal and the VRF signal, if present, act as signal sources. However, depending on the actual levels of the signals, the software decides on different actions when calibrating.

It is important to emphasise that the software in the RE 331 contains all actions of calibrations. These actions include measurement and subsequent weighted averaging of the calibration results, besides the actual sequencing and timing of the settings. These actions constitute an integrated part of the measurement routines in the software, and they are not covered in this section.

The explanations that follow in this section focus on the principles of calibration and on the settings in the Measurement Option.

15.2.1 Calibration of the BP Filter on the Demodulator

The measurement of phase shift of the filter is calculated as the difference between two measurements, which are described in the following:

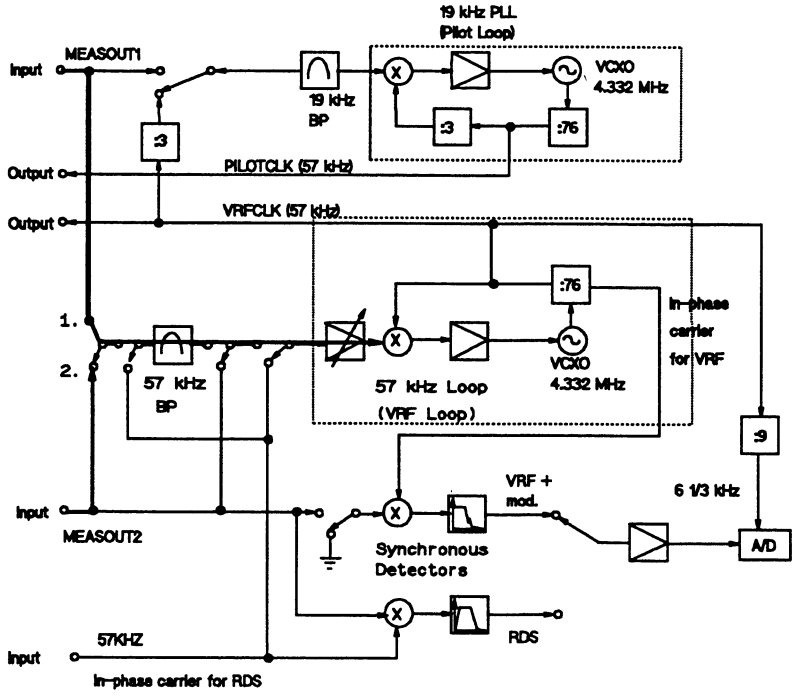


Fig. 15.2 - Calibration of Band-pass Filter

The first step is to measure the phase between a 57 kHz carrier present on the input of the BP filter and another 57 kHz carrier present in the measurement system. The first carrier is either the carrier of a VRF signal or an injected signal on the Demodulator, the second is the recovered RDS carrier.

When no 57 kHz carrier in the MPX signal is present, the switchable injection circuit on the Demodulator injects a 57 kHz signal in the Band-pass filter. The software in RE 331 determines using a VRF level measurement whether to inject the signal or not.

The phase between the same two carriers is measured, but this time the 57 kHz carrier in the MPX signal is taken after the BP filter. The phase shift in the BP filter is calculated as a difference between the two measurements.

In both steps, the software measures the phase between the recovered RDS carrier (from the Demodulator) and the VRF clock (from the VRF Loop).

The only change of settings on the Level Measuring Board between the two steps of the calibration is the change of the control signal MEASOUTSEL.

It is important that the phase between the 57 kHz clock from the VRF Loop and the carrier on the Band-pass filter is unchanged when going from the first to the second step in the differential measurement. For this reason the 57 kHz Band-pass filter in the VRF Loop is kept bypassed or active in both measurements.

The software in RE 331 decides the state of control signal VRF_AMP_ON based on a measurement of the VRF signal level.

15.2.2 Calibration of the VRF Loop

During the calibration the control signal 57KHZ_DIR_VRF is high. This forces the VRF Loop to lock on to the recovered RDS carrier from the Demodulator.

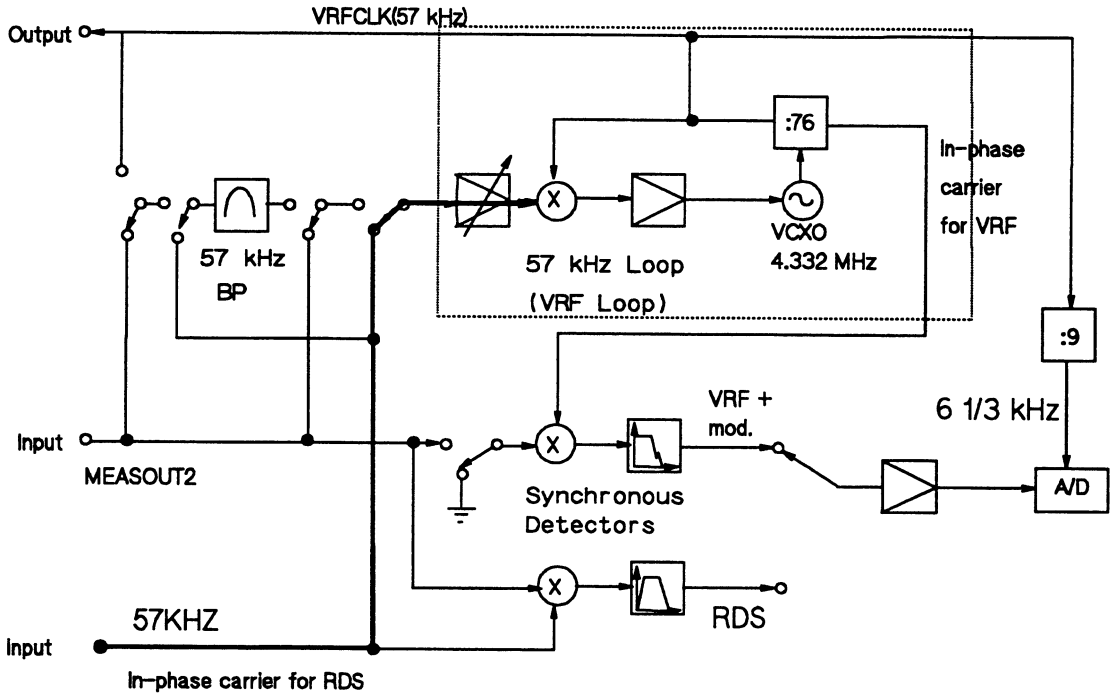


Fig. 15.3 - Calibration of VRF Loop

The measurement of phase error in the VRF Loop is calculated as the difference between the clock VRFCLK from the VRF Loop and the carrier 57KHZ from the Demodulator.

15.2.3 Calibration of the Pilot Loop

The measurement of phase error in the Pilot Loop is calculated as the difference between the clock PILOTCLK from the Pilot Loop and the clock VRFCLK from the VRF Loop.

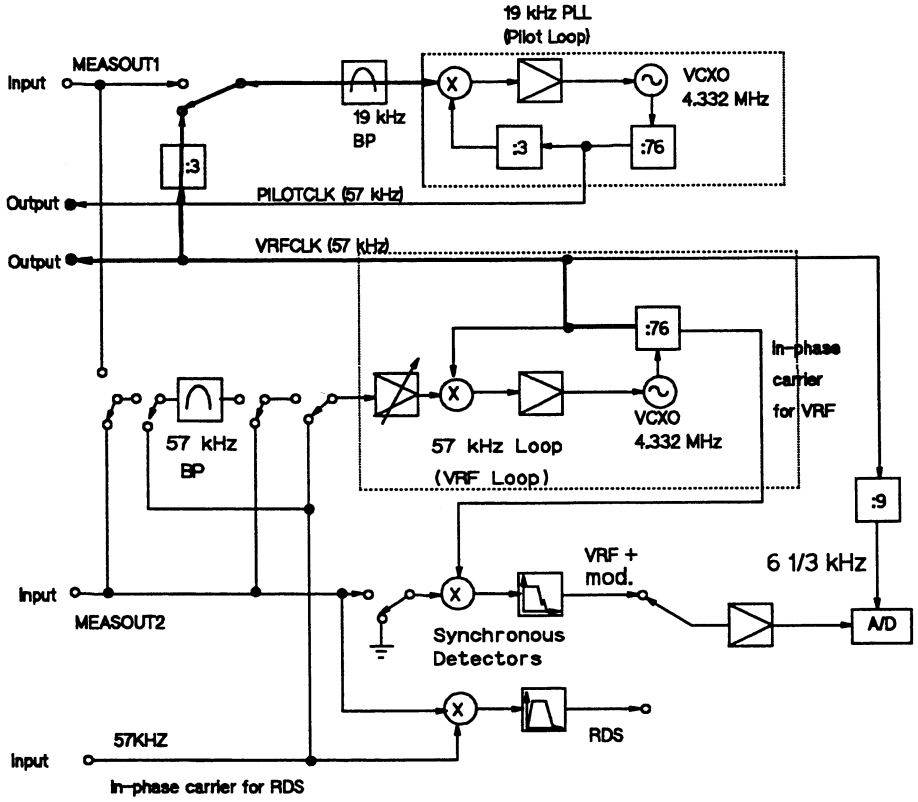


Fig. 15.4 - Calibration of Pilot Loop

When VRF is present in the MPX signal, the VRF Loop is locked to the VRF signal, but when VRF is missing, the control signal 57KHZ_DIR_VRF is set high which makes the VRF Loop lock to the recovered carrier from the Demodulator.

The software in RE 331 decides the state of control signal VRF_AMP_ON based on a measurement of the VRF signal level. However, the control signal VRF_AMP_ON is kept low when the VRF signal is missing and the VRF Loop is locked to the recovered RDS carrier.

15.2.4 Calibration of the DC Offset in the VRF Detector

When the control signal VRF_SLAVE_CAL goes high, the switch QA15B cuts the connection between MEASOUT2 and the mixer QD7.

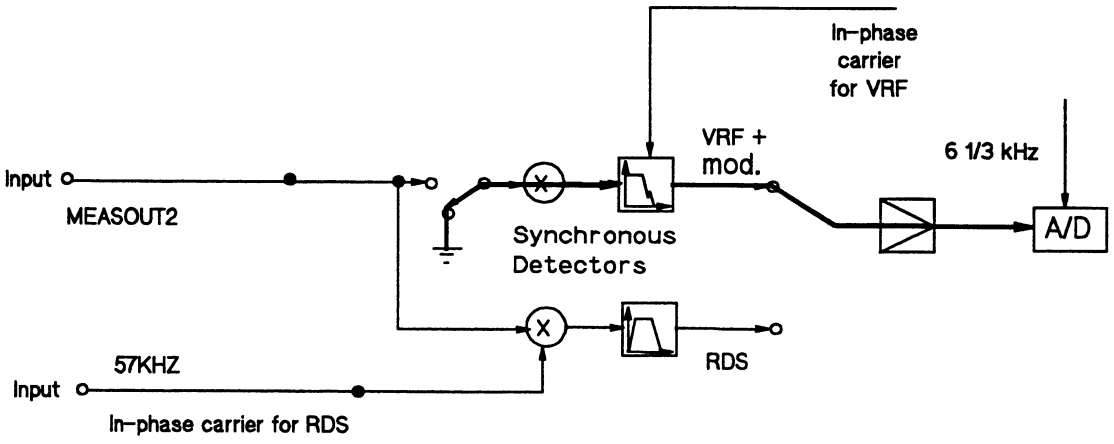


Fig. 15.5 - Calibration of VRF Detector

A VRF level measurement determines the DC Offset as seen on the output of the A/D Converter QA9. In this way the RE 331 software can correct for the DC errors in the total VRF measuring branch including the mixer QD7, the filters, the buffer QA8A and the A/D Converter itself.

15.3 Settings During Measurements

The measurements are divided into two main categories: Phase and Level measurements. The signals of interest for the phase measurements are the Pilot, the RDS signal and the VRF signal (if present), which gives 3 combinations of phase measurements: RDS to Pilot, RDS to VRF and finally Pilot to VRF.

The signals of interest for the Level measurements are the RDS and the VRF signal.

Five different measurements in total are made. Each of these are described in the following.

15.3.1 RDS to Pilot Phase

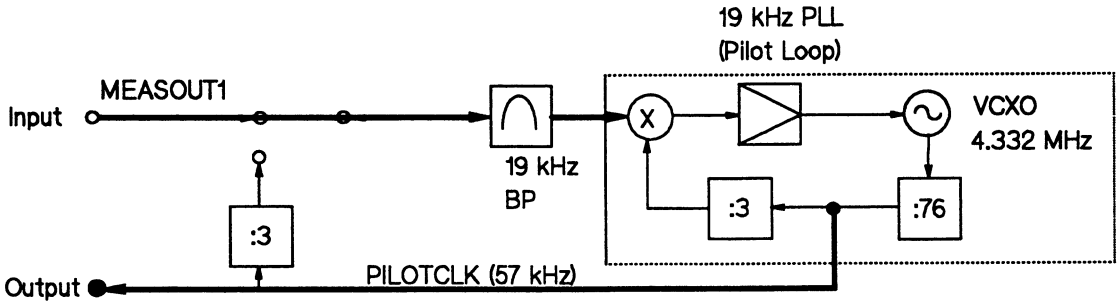


Fig. 15.6 - Measurement of RDS to Pilot Phase

The control signal PILOT_INP_SEL is low during this measurement. This forces the Pilot Loop to lock on to the Pilot. The software in RE 331 corrects for phase errors in the Pilot Loop.

15.3.2 RDS to VRF Phase

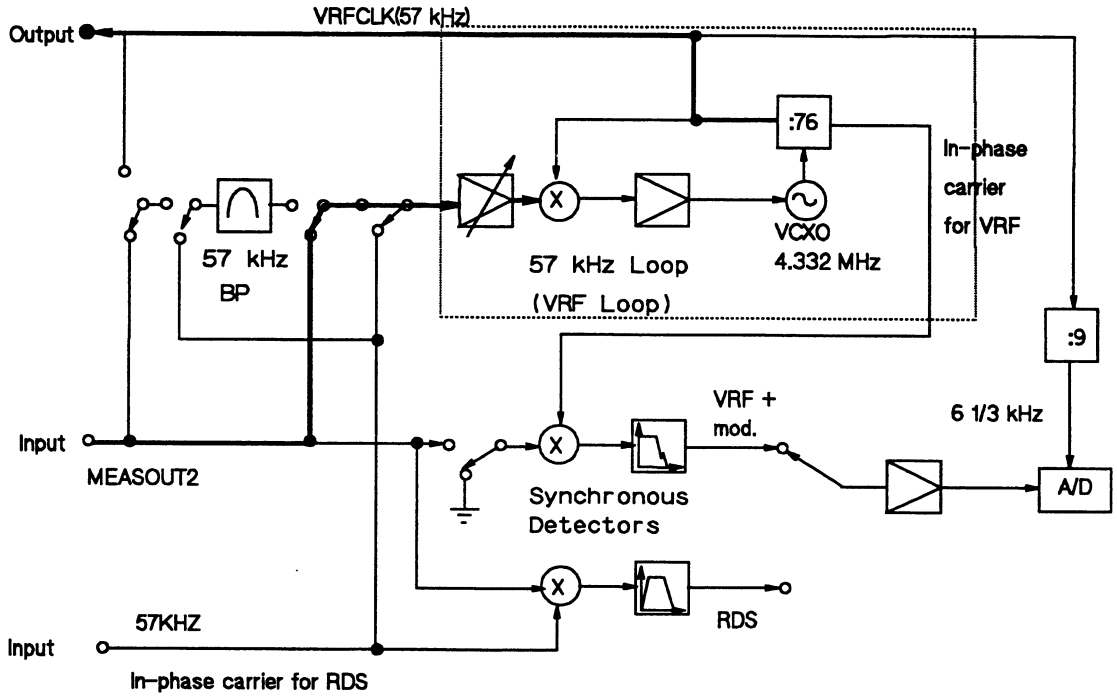


Fig. 15.7 - Measurement of RDS to VRF Phase

The control signals 57KHZ_VRF_BP, SEL_VRF_BP and 57KHZ_DIR_VRF are all low during this measurement. The software in RE 331 decides the state of control signal VRF_AMP_ON based on a measurement of the VRF signal level.

The software in RE 331 corrects for phase errors in the VRF Loop.

15.3.3 VRF to Pilot Phase

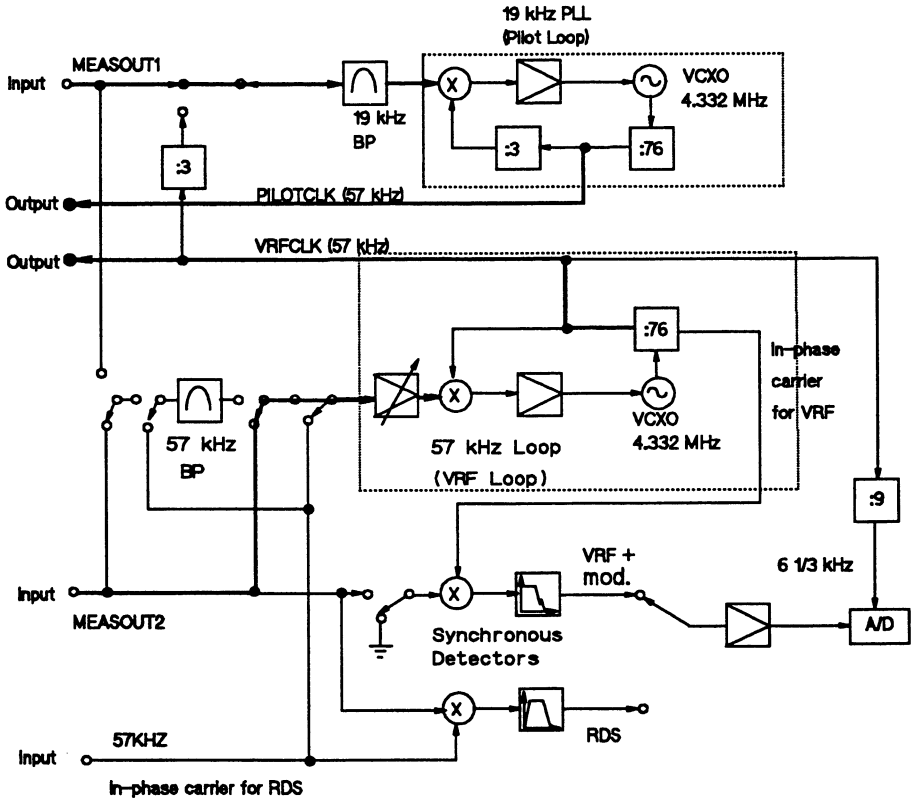


Fig. 15.8 - Measurement of VRF to Pilot Phase

The control signals MEASOUTSEL, 57KHZ_VRF_BP, SEL_VRF_BP, 57KHZ_DIR_VRF and PILOT_INP_SEL are all low during this measurement. The software in RE 331 decides the state of control signal VRF_AMP_ON based on a measurement of the VRF signal level.

The software in RE 331 corrects for phase errors in the VRF Loop and the Pilot Loop.

15.3.4 RDS Level

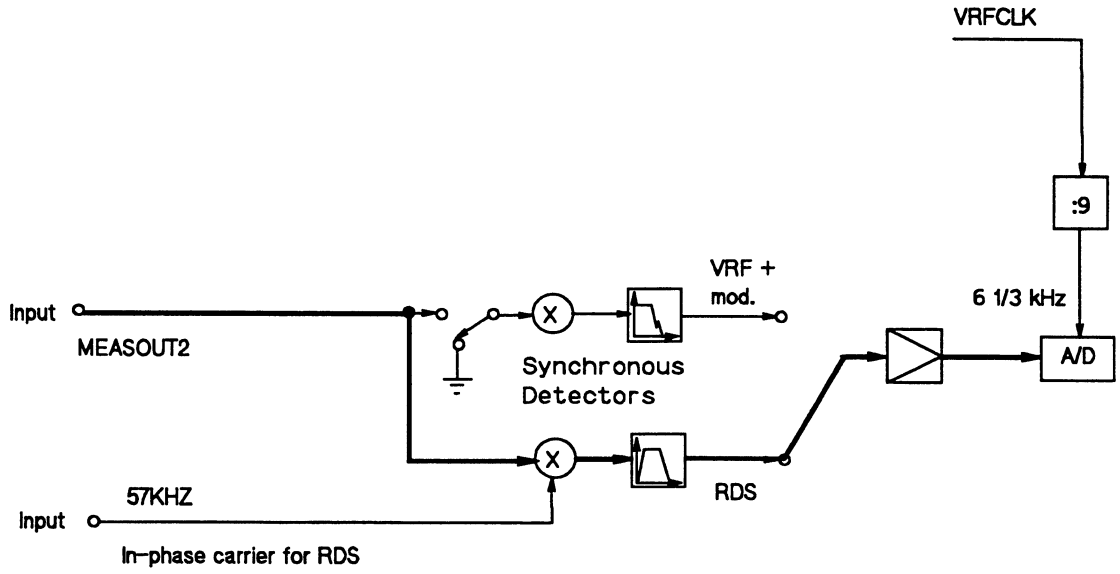


Fig. 15.9 - Measurement of RDS Level

The control signal SLAVESEL is high when measuring the RDS Level.

15.3.5 VRF Measurements

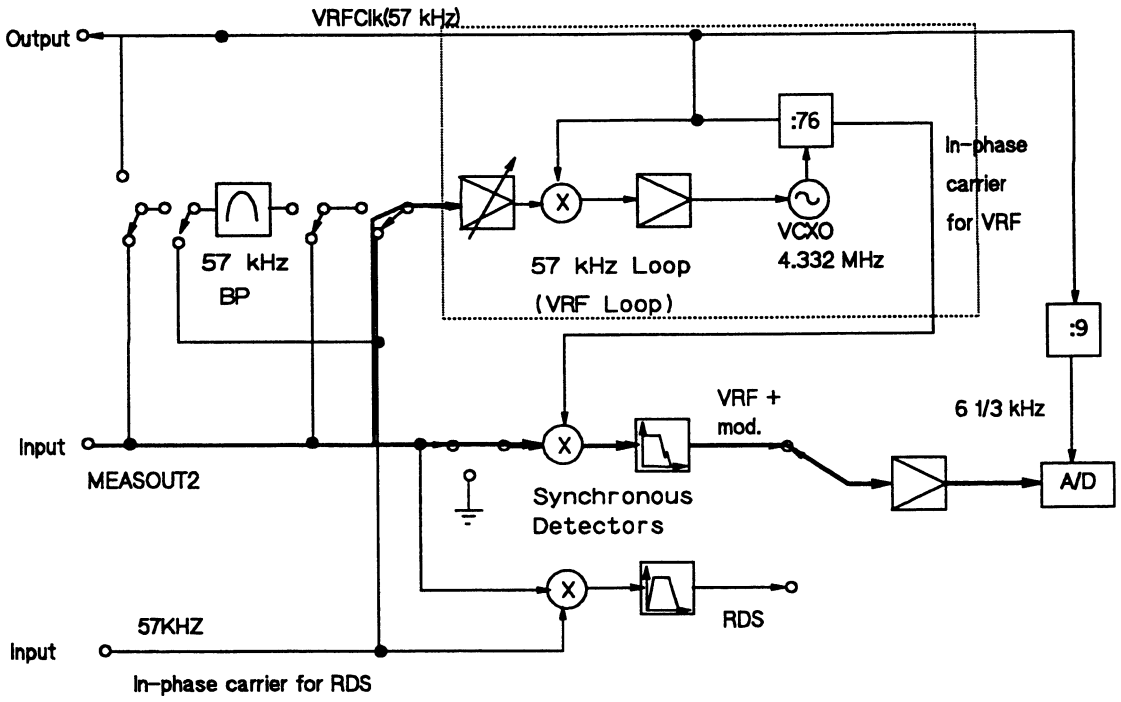


Fig. 15.10 - Measurement of VRF Level

The control signal SLAVESEL is high when measuring the RDS Level. The software in RE 331 corrects for DC errors in the VRF Loop.

15.4 Schematic Diagram

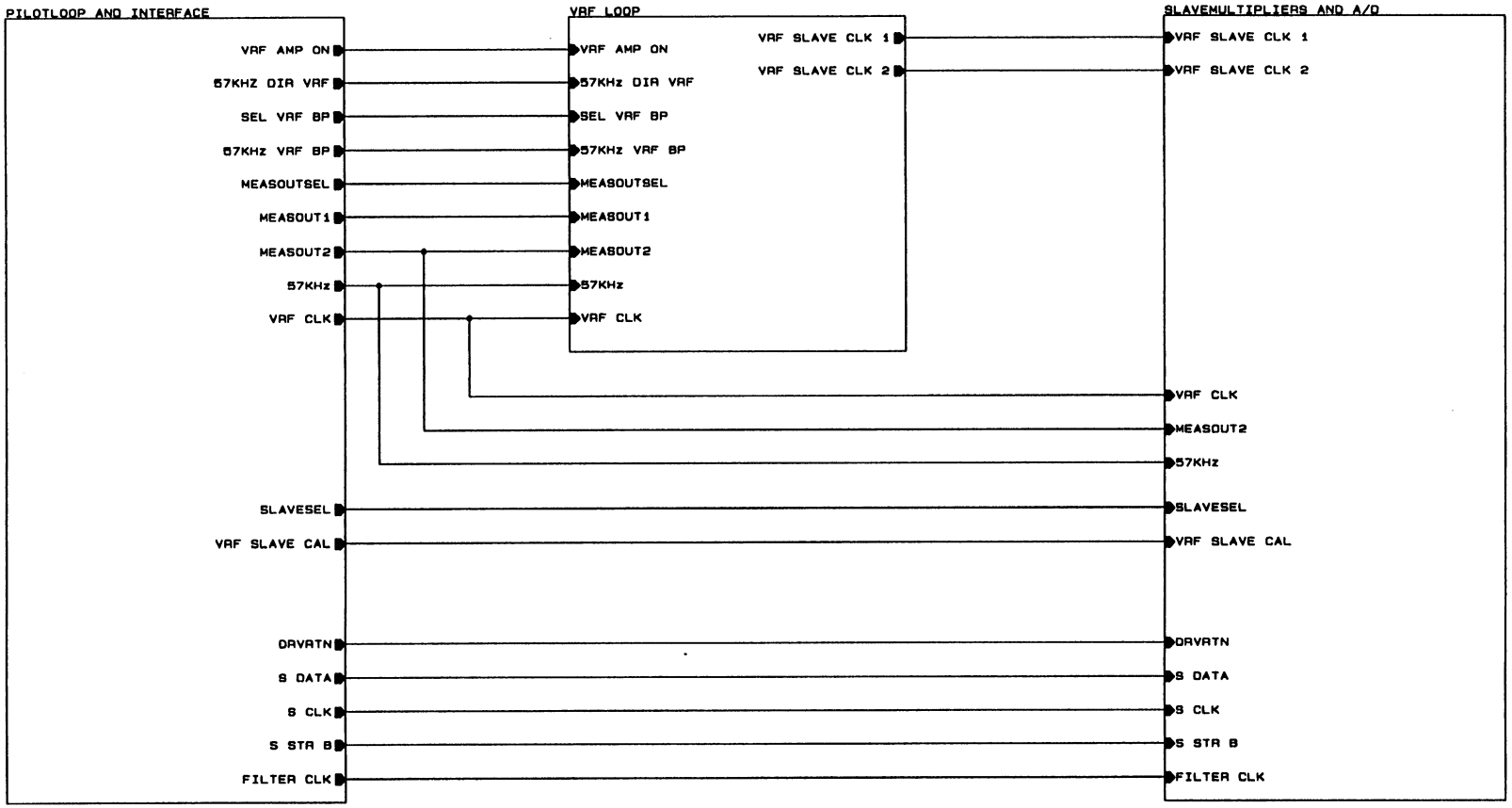
The schematic diagram for the Level Measuring Board is located in the following. The diagram number is 985-324.

15.5 Component Locations

The following shows the component locations on the Level Measuring Board.

15.6 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-880.



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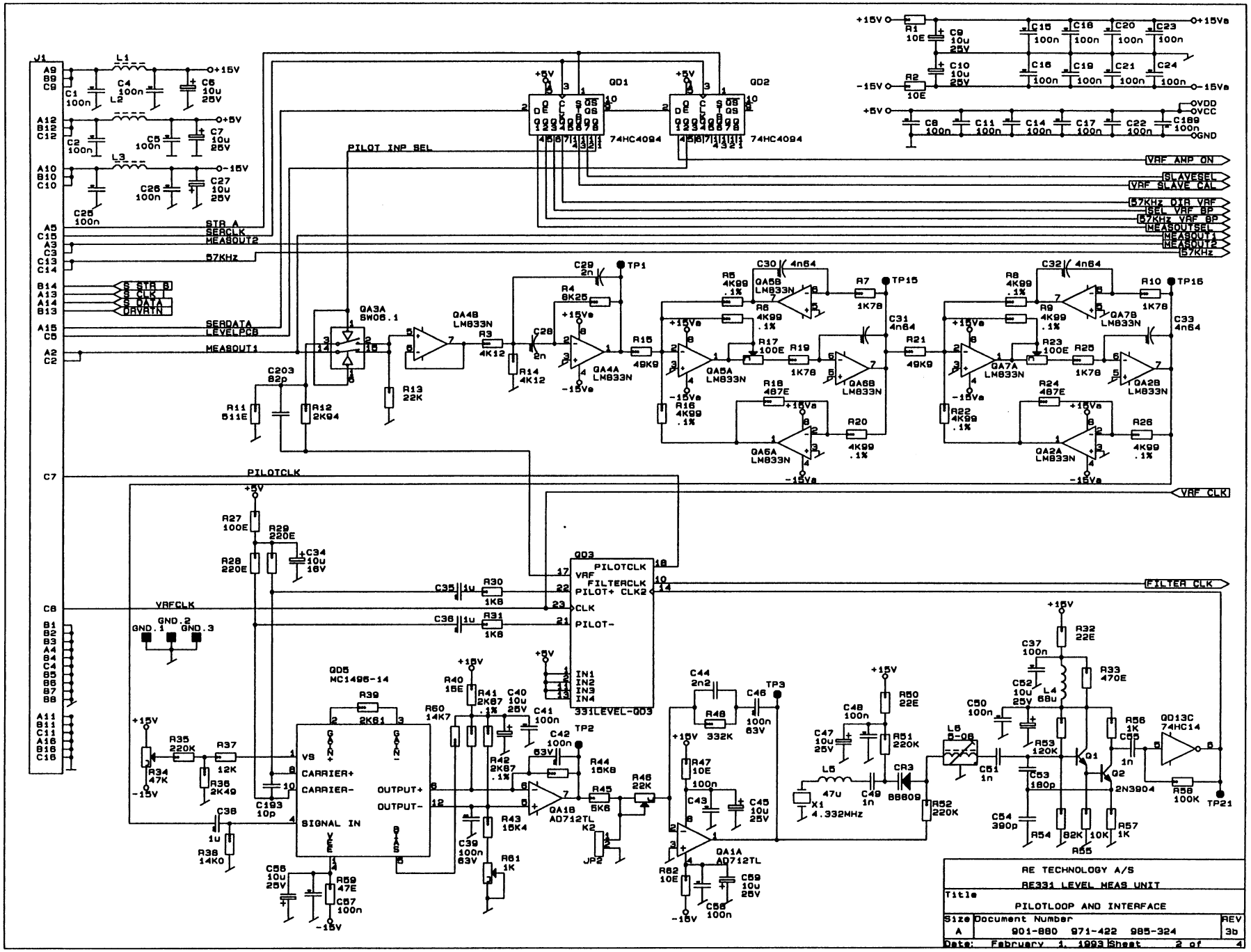
RE331 MEAS UNIT		
Title: ROOT SHEET		
Size: A	Document Number: 901-880 971-422 985-324	REV: 3b
Date: February 1, 1993	Sheet 1 of 4	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RE331 LEVEL MEAS UNIT
Title
PILOTLOOP AND INTERFACE
Size A
Document Number 901-880 971-422 985-324
REV 3b
Date: February 1, 1993 Sheet 2 of 4
PILOT INP SEL
VRF AMP ON
SLAVESEL
VRF SLAVE CAL
57KHz DTA VRF
SEL VRF BP
57KHz VRF BP
MEASOUTSEL
MEASOUT1
MEASOUT2
57KHz
STR A
SERCLK
MEASOUT2
57KHz
SERDATA
LEVELPCB
MEASOUT1
PILOTCLK
VRFCLK
VRF CLK
FILTER CLK
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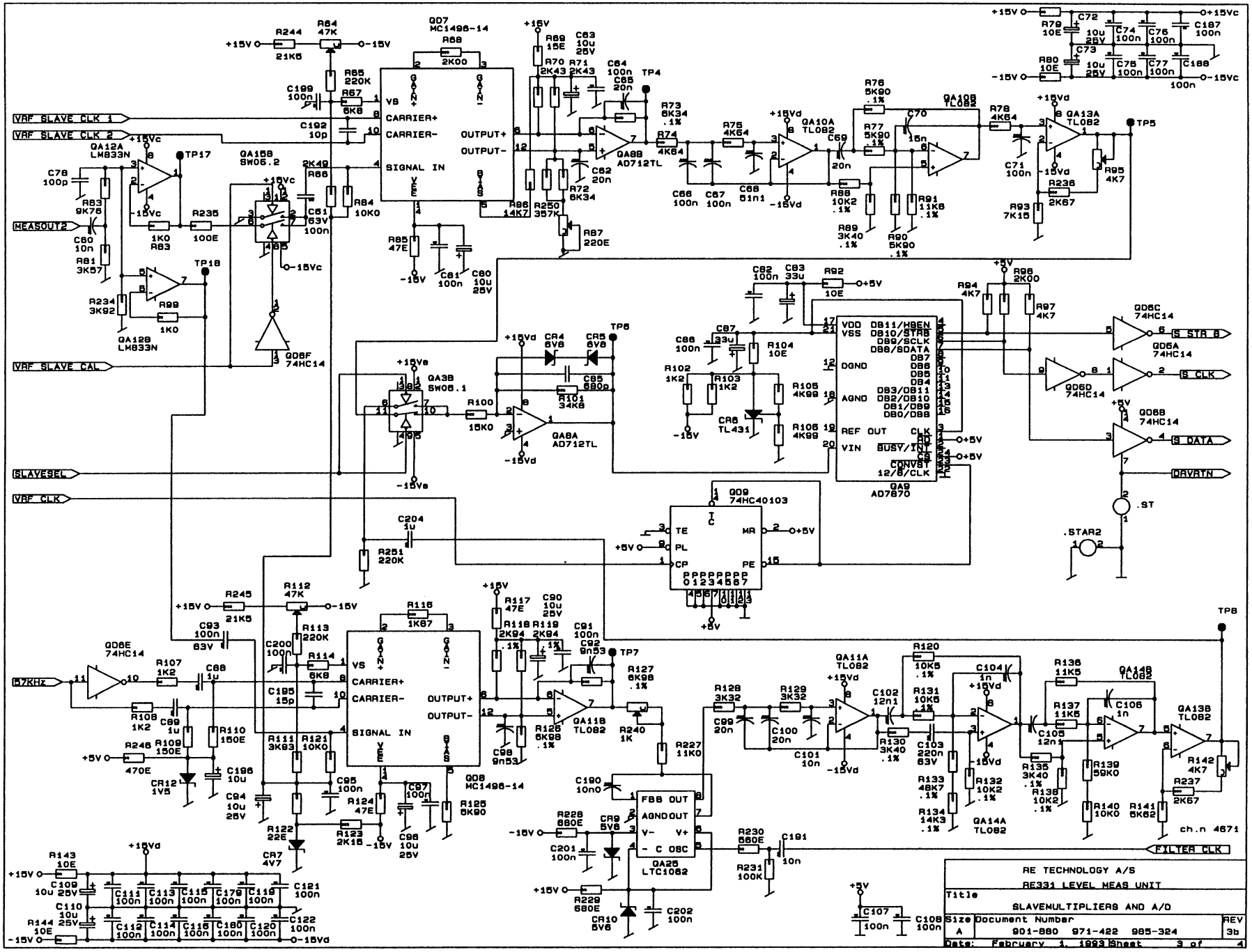
331LEVEL-QD3
MC1496-14
AD712TL
LM833N
SW06.1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VAF SLAVE CLK 2
MEASOUT2
VAF SLAVE CAL
SLAVESEL
VAF CLK
57KHz
FILTER CLK
QD7 MC1496-14
QD8 MC1496-14
QA9 AD7870
QD9 74HC40103
QA8A AD712TL
QA8B AD712TL
QA10A TL082
QA10B TL082
QA11A TL082
QA11B TL082
QA12A LM833N
QA12B LM833N
QA13A TL082
QA13B TL082
QA14A TL082
QA14B TL082
QA3A SW06.1
QA3B SW06.1
QA15A SW06.2
QA15B SW06.2
QA16 LTC1062
QD5A 74HC14
QD5B 74HC14
QD5C 74HC14
QD5D 74HC14
QD5E 74HC14
QD5F 74HC14
S STR B
S CLK
S DATA
DRVATN
.ST
.STAR2
TP4
TP5
TP6
TP7
TP8
TP17
TP18
+15V
-15V
+15Vd
-15Vd
+15Vc
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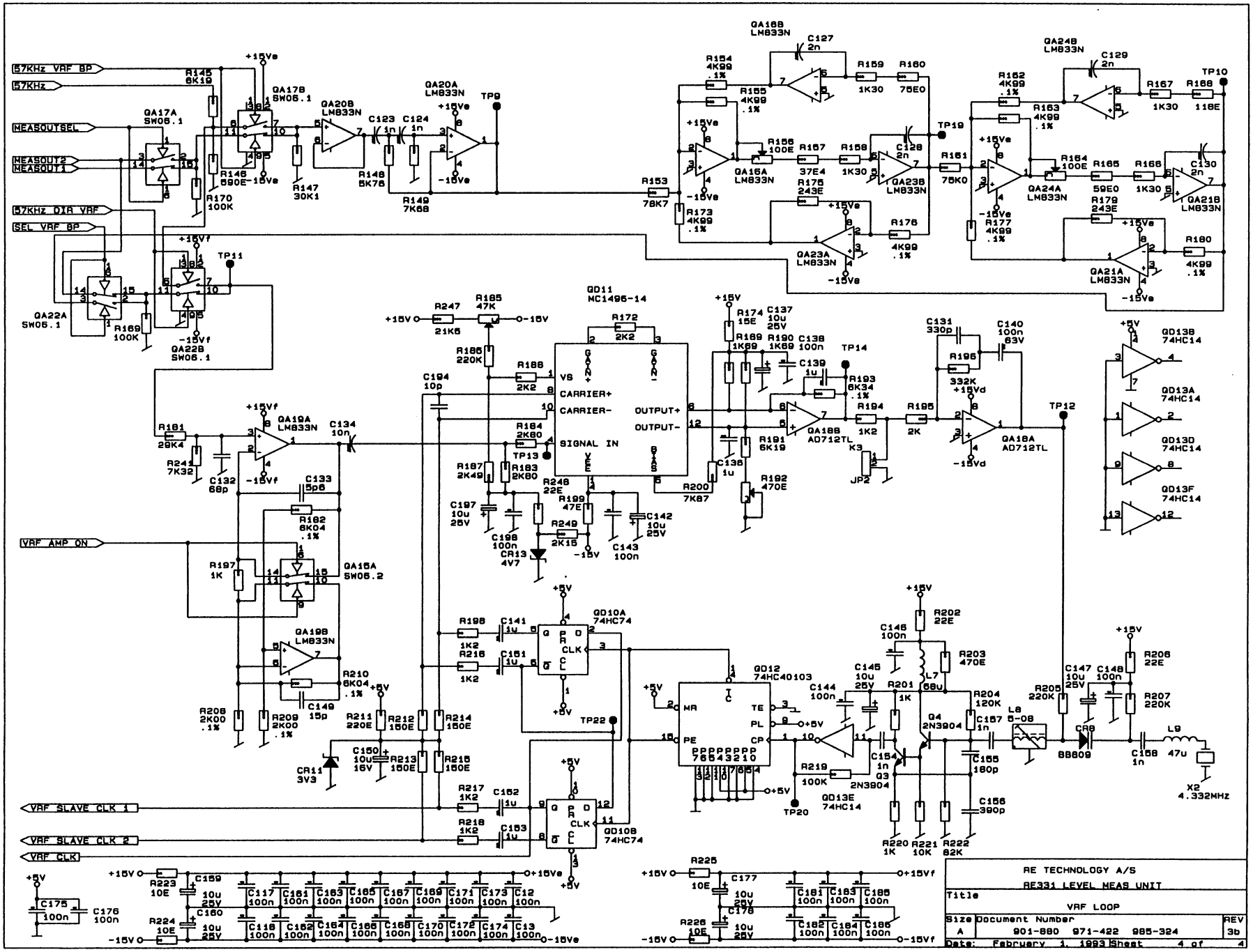
+5V
-15Ve
RE TECHNOLOGY A/S
RE331 LEVEL MEAS UNIT
SLAVEMULTIPLIERS AND A/D
Size A
Document Number 901-880 971-422 985-324
REV 3b
Date: February 1, 1993 Sheet 3 of 4
ch.n 4671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57KHz
MEASOUTSEL
MEASOUT2
MEASOUT1
57KHz DIA VAF
SEL VAF BP
VAF AMP ON
VAF SLAVE CLK 1
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VAF CLK
QA17A SW06.1
QA17B SW06.1
QA18A AD712TL
QA18B AD712TL
QA15A SW06.2
QA19A LM833N
QA19B LM833N
QA20A LM833N
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QA21A LM833N
QA21B LM833N
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QA22B SW06.1
QA23A LM833N
QA23B LM833N
QA24A LM833N
QA24B LM833N
QD11 MC1496-14
QD10A 74HC74
QD10B 74HC74
QD12 74HC40103
QD13A 74HC14
QD13B 74HC14
QD13D 74HC14
QD13E 74HC14
QD13F 74HC14
CARRIER+
CARRIER-
SIGNAL IN
OUTPUT+
OUTPUT-
TP9
TP10
TP11
TP12
TP13
TP14
TP19
TP20
TP22
X2 4.332MHz
RE TECHNOLOGY A/S
RE331 LEVEL MEAS UNIT
VAF LOOP
Size A
Document Number 901-880 971-422 985-324
REV 3b
Date: February 1, 1993 Sheet 4 of 4

RE 331 LEVEL MEASURING UNIT Ø0971-4221SS.3

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
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CR4	G10	C67	G13	C147	D13	QA3	G4	R37	E17	R116	H14	R196	F10										
CR5	H9	C68	F12	C148	D12	QA4	H5	R38	F17	R117	F15	R197	F7										
CR6	J9	C69	G12	C149	G7	QA5	F3	R39	F17	R118	F14	R198	E9										
CR7	H13	C70	J10	C150	G10	QA6	F3	R40	G17	R119	E14	R199	E9										
CR8	D11	C71	J12	C151	D9	QA7	D2	R41	G17	R120	G13	R200	E8										
CR9	F16	C72	G10	C152	D10	QA8	H9	R42	G17	R121	G15	R201	D12										
CR10	F15	C73	F7	C153	E11	QA9	H7	R43	H16	R122	E12	R202	D13										
CR11	D9	C74	G7	C154	D12	QA10	H11	R44	G16	R123	F13	R203	E12										
CR12	H15	C75	F7	C155	D12	QA11	F13	R45	H17	R124	H14	R204	E13										
CR13	F9	C76	G9	C156	D12	QA12	F9	R46	J17	R125	H14	R205	E10										
C1	G2	C77	F8	C157	D12	QA13	H11	R47	G16	R126	H14	R206	D12										
C2	H2	C78	F9	C158	D11	QA14	H13	R48	H17	R127	G14	R207	D12										
C4	G3	C80	F10	C159	F4	QA15	F8	R50	D16	R128	F14	R208	G7										
C5	H2	C81	F11	C160	F5	QA16	D6	R51	D15	R129	F13	R209	G7										
C6	G3	C82	G6	C161	D8	QA17	G5	R52	D14	R130	F14	R210	G7										
C7	J3	C83	G7	C162	D6	QA18	E10	R53	E17	R131	G13	R211	F13										
C8	C10	C85	G9	C163	D6	QA19	F7	R54	D16	R132	H13	R212	D9										
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C12	G5	C89	H8	C167	D5	QA23	E6	R58	E16	R136	J13	R216	D9										
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C14	D9	C91	E14	C169	D4	QA25	F15	R60	G17	R138	H14	R218	G11										
C15	F3	C92	F13	C170	E3	QD1	J4	R61	H16	R139	H13	R219	E12										
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C17	J4	C94	E12	C172	E5	QD3	J15	R63	G6	R141	H12	R221	D12										
C18	F3	C95	F12	C173	F5	QD5	G17	R64	E13	R142	J12	R222	D12										
C19	G2	C96	H14	C174	F5	QD6	J6	R65	F12	R143	H9	R223	F5										
C20	D2	C97	G14	C175	E15	QD7	F11	R66	F12	R144	J10	R224	F5										
C21	E3	C98	F14	C176	G15	QD8	G14	R67	F12	R145	G5	R225	F6										
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C25	H2	C102	G14	C180	F10	QD12	D11	R71	H9	R149	D7	R229	F15										
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C28	H5	C105	J13	C183	G6	Q2	D16	R74	H9	R155	E6	R234	G6										
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C32	D1	C109	J11	C187	G8	R2	E2	R78	J12	R159	D6	R240	G16										
C33	D3	C110	H10	C188	G9	R3	G4	R79	G9	R160	D6	R241	E7										
C34	E15	C111	F13	C189	D14	R4	H5	R80	F6	R161	E5	R244	E13										
C35	F16	C112	H10	C190	G16	R5	G2	R81	G5	R162	E5	R245	E12										
C36	F16	C113	H10	C191	G16	R6	G3	R83	F9	R163	E5	R246	H15										
C37	D17	C114	H11	C192	G11	R7	F3	R84	E9	R164	E3	R247	E8										
C38	G17	C115	H11	C193	F16	R8	E2	R85	F11	R165	E4	R248	F9										
C39	H16	C116	H12	C194	E8	R9	E2	R86	G11	R166	D4	R249	F9										
C40	G17	C117	G3	C195	F13	R10	D2	R87	G10	R167	D4	R250	H10										
C41	G17	C118	G4	C196	H16	R11	G4	R88	G11	R168	D4	R251	H4										
C42	G17	C119	H9	C197	F10	R12	H4	R89	H11	R169	G5	TP1	F4										
C43	H17	C120	H14	C198	F9	R13	G3	R90	J11	R170	F4	TP2	H17										
C44	H17	C121	H13	C199	G12	R14	G5	R91	H11	R172	E9	TP3	E15										
C45	H17	C122	H14	C200	H14	R15	G2	R92	H7	R173	E6	TP4	H10										
C46	H17	C123	D6	C201	G15	R16	G3	R93	H12	R174	F11	TP5	J13										
C47	D16	C124	D7	C202	G15	R17	F1	R94	H7	R175	E6	TP6	G9										
C48	D15	C127	D6	C203	H4	R18	G4	R95	H13	R176	E6	TP7	E14										
C49	D15	C128	D5	C204	H4	R19	E3	R96	H8	R177	E4	TP8	H4										
C50	E16	C129	D4	GND	J3	R20	F3	R97	J6	R179	E4	TP9	D8										
C51	D15	C130	D3	GND	E7	R21	E2	R99	G9	R180	E4	TP10	D4										
C52	E16	C131	G10	GND	J16	R22	E2	R100	G9	R181	G6	TP11	G6										
C53	D16	C132	G6	J1	J2	R23	E2	R101	G9	R182	F7	TP12	F10										
C54	D16	C133	F7	K2	J17	R24	E3	R102	H9	R183	F9	TP13	E7										
C55	D16	C134	F7	K3	F11	R25	D3	R103	J9	R184	E7	TP14	F11										
C56	E16	C136	F10	L1	G2	R26	E3	R104	H8	R185	E9	TP15	E2										
C57	E16	C137	E10	L2	H2	R27	E15	R105	H8	R186	F8	TP16	D3										
C58	H16	C138	E10	L3	H2	R28	F16	R106	J9	R187	F9	TP17	F8										
C59	H16	C139	E10	L4	E17	R29	F16	R107	H6	R188	E9	TP18	F10										
C60	F6	C140	F11	L5	D15	R30	G16	R108	H6	R189	E10	TP19	D5										
C61	F9	C141	D8	L6	D14	R31	F16	R109	J14	R190	F10	TP20	D13										
C62	H10	C142	E10	L7	E13	R32	D17	R110	J14	R191	E10	TP21	E15										
C63	J10	C143	E9	L8	D11	R33	E16	R111	F12	R192	F9	TP22	D8										
C64	H9	C144	E12	L9	D11	R34	E17	R112	E12	R193	E9	X1	E15										
C65	H10	C145	E12	QA1	H17	R35	E17	R113	E12	R194	F11	X2	E12										

COMPONENT SIDE

Level Measuring Board (901-880)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Solid alu 10u 20% 25V	265-010
C 7	C Solid alu 10u 20% 25V	265-010
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Solid alu 10u 20% 25V	265-010
C 10	C Solid alu 10u 20% 25V	265-010
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Ceramic 100n 20% 50V	213-401
C 18	C Ceramic 100n 20% 50V	213-401
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Ceramic 100n 20% 50V	213-401
C 21	C Ceramic 100n 20% 50V	213-401
C 22	C Ceramic 100n 20% 50V	213-401
C 23	C Ceramic 100n 20% 50V	213-401
C 24	C Ceramic 100n 20% 50V	213-401
C 25	C Ceramic 100n 20% 50V	213-401
C 26	C Ceramic 100n 20% 50V	213-401
C 27	C Solid alu 10u 20% 25V	265-010
C 28	C Polyst 2n00 1% 63V	243-305
C 29	C Polyst 2n00 1% 63V	243-305
C 30	C Polyst 4n64 1% 63V	243-301
C 31	C Polyst 4n64 1% 63V	243-301
C 32	C Polyst 4n64 1% 63V	243-301
C 33	C Polyst 4n64 1% 63V	243-301
C 34	C solid AL 10u 20% 16V	265-008
C 35	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 36	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 37	C Ceramic 100n 20% 50V	213-401
C 38	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 39	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 40	C Solid alu 10u 20% 25V	265-010
C 41	C Ceramic 100n 20% 50V	213-401
C 42	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 43	C Ceramic 100n 20% 50V	213-401
C 44	C Ceramic 2n20 -20+80% 63V	213-012
C 45	C Solid alu 10u 20% 25V	265-010
C 46	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 47	C Solid alu 10u 20% 25V	265-010
C 48	C Ceramic 100n 20% 50V	213-401
C 49	C Ceramic 1n 5% NP0 63V	213-616
C 50	C Ceramic 100n 20% 50V	213-401
C 51	C Ceramic 1n 5% NP0 63V	213-616

C 52	C Solid alu 10u 20% 25V	265-010
C 53	C Ceramic 180p 2% 100V N750	213-228
C 54	C Ceramic 390p 10% 100V	213-021
C 55	C Ceramic 1n 5% NP0 63V	213-616
C 56	C Solid alu 10u 20% 25V	265-010
C 57	C Ceramic 100n 20% 50V	213-401
C 58	C Ceramic 100n 20% 50V	213-401
C 59	C Solid alu 10u 20% 25V	265-010
C 60	C Polyst 10n0 1% 63V	243-302
C 61	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 62	C Polystyrene 20n 1% 63V	243-316
C 63	C Solid alu 10u 20% 25V	265-010
C 64	C Ceramic 100n 20% 50V	213-401
C 65	C Polystyrene 20n 1% 63V	243-316
C 66	C Polypropylen 100n 1% 63V 150PPM	242-302
C 67	C Polypropylen 100n 1% 63V 150PPM	242-302
C 68	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 69	C Polystyrene 20n 1% 63V	243-316
C 70	C Polyst 15n0 1% 63V	243-341
C 71	C Polypropylen 100n 1% 63V 150PPM	242-302
C 72	C Solid alu 10u 20% 25V	265-010
C 73	C Solid alu 10u 20% 25V	265-010
C 74	C Ceramic 100n 20% 50V	213-401
C 75	C Ceramic 100n 20% 50V	213-401
C 76	C Ceramic 100n 20% 50V	213-401
C 77	C Ceramic 100n 20% 50V	213-401
C 78	C Ceramic 100p 2% 100V NP0	213-211
C 80	C Solid alu 10u 20% 25V	265-010
C 81	C Ceramic 100n 20% 50V	213-401
C 82	C Ceramic 100n 20% 50V	213-401
C 83	C solid AL 33u 20% 10V	265-005
C 85	C Ceramic 680p 10% 100V	213-234
C 86	C Ceramic 100n 20% 50V	213-401
C 87	C solid AL 33u 20% 10V	265-005
C 88	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 89	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 90	C Solid alu 10u 20% 25V	265-010
C 91	C Ceramic 100n 20% 50V	213-401
C 92	C Polystyrene 9n53 1% 63V	243-331
C 93	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 94	C Solid alu 10u 20% 25V	265-010
C 95	C Ceramic 100n 20% 50V	213-401
C 96	C Solid alu 10u 20% 25V	265-010
C 97	C Ceramic 100n 20% 50V	213-401
C 98	C Polystyrene 9n53 1% 63V	243-331
C 99	C Polystyrene 20n 1% 63V	243-316
C 100	C Polystyrene 20n 1% 63V	243-316
C 101	C Polyst 10n0 1% 63V	243-302
C 102	C Polystyrene 12n1 1% 63V	243-307
C 103	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071
C 104	C Polyst 1n00 1% 63V	243-304
C 105	C Polystyrene 12n1 1% 63V	243-307
C 106	C Polyst 1n00 1% 63V	243-304
C 107	C Ceramic 100n 20% 50V	213-401

C 108	C Ceramic 100n 20% 50V	213-401
C 109	C Solid alu 10u 20% 25V	265-010
C 110	C Solid alu 10u 20% 25V	265-010
C 111	C Ceramic 100n 20% 50V	213-401
C 112	C Ceramic 100n 20% 50V	213-401
C 113	C Ceramic 100n 20% 50V	213-401
C 114	C Ceramic 100n 20% 50V	213-401
C 115	C Ceramic 100n 20% 50V	213-401
C 116	C Ceramic 100n 20% 50V	213-401
C 117	C Ceramic 100n 20% 50V	213-401
C 118	C Ceramic 100n 20% 50V	213-401
C 119	C Ceramic 100n 20% 50V	213-401
C 120	C Ceramic 100n 20% 50V	213-401
C 121	C Ceramic 100n 20% 50V	213-401
C 122	C Ceramic 100n 20% 50V	213-401
C 123	C Polyst 1n00 1% 63V	243-304
C 124	C Polyst 1n00 1% 63V	243-304
C 127	C Polyst 2n00 1% 63V	243-305
C 128	C Polyst 2n00 1% 63V	243-305
C 129	C Polyst 2n00 1% 63V	243-305
C 130	C Polyst 2n00 1% 63V	243-305
C 131	C Ceramic 330p 2% 100V N750	213-214
C 132	C Ceramic 68p0 2% 100V NP0	213-215
C 133	C Ceramic 5p60 p25 100V NPO	213-226
C 134	C Polyst 10n0 1% 63V	243-302
C 136	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 137	C Solid alu 10u 20% 25V	265-010
C 138	C Ceramic 100n 20% 50V	213-401
C 139	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 140	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 141	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 142	C Solid alu 10u 20% 25V	265-010
C 143	C Ceramic 100n 20% 50V	213-401
C 144	C Ceramic 100n 20% 50V	213-401
C 145	C Solid alu 10u 20% 25V	265-010
C 146	C Ceramic 100n 20% 50V	213-401
C 147	C Solid alu 10u 20% 25V	265-010
C 148	C Ceramic 100n 20% 50V	213-401
C 149	C Ceramic 15p0 2% 100V NP0	213-216
C 150	C solid AL 10u 20% 16V	265-008
C 151	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 152	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 153	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 154	C Ceramic 1n 5% NP0 63V	213-616
C 155	C Ceramic 180p 2% 100V N750	213-228
C 156	C Ceramic 390p 10% 100V	213-021
C 157	C Ceramic 1n 5% NP0 63V	213-616
C 158	C Ceramic 1n 5% NP0 63V	213-616
C 159	C Solid alu 10u 20% 25V	265-010
C 160	C Solid alu 10u 20% 25V	265-010
C 161	C Ceramic 100n 20% 50V	213-401
C 162	C Ceramic 100n 20% 50V	213-401
C 163	C Ceramic 100n 20% 50V	213-401
C 164	C Ceramic 100n 20% 50V	213-401

C 165	C Ceramic 100n 20% 50V	213-401
C 166	C Ceramic 100n 20% 50V	213-401
C 167	C Ceramic 100n 20% 50V	213-401
C 168	C Ceramic 100n 20% 50V	213-401
C 169	C Ceramic 100n 20% 50V	213-401
C 170	C Ceramic 100n 20% 50V	213-401
C 171	C Ceramic 100n 20% 50V	213-401
C 172	C Ceramic 100n 20% 50V	213-401
C 173	C Ceramic 100n 20% 50V	213-401
C 174	C Ceramic 100n 20% 50V	213-401
C 175	C Ceramic 100n 20% 50V	213-401
C 176	C Ceramic 100n 20% 50V	213-401
C 177	C Solid alu 10u 20% 25V	265-010
C 178	C Solid alu 10u 20% 25V	265-010
C 179	C Ceramic 100n 20% 50V	213-401
C 180	C Ceramic 100n 20% 50V	213-401
C 181	C Ceramic 100n 20% 50V	213-401
C 182	C Ceramic 100n 20% 50V	213-401
C 183	C Ceramic 100n 20% 50V	213-401
C 184	C Ceramic 100n 20% 50V	213-401
C 185	C Ceramic 100n 20% 50V	213-401
C 186	C Ceramic 100n 20% 50V	213-401
C 187	C Ceramic 100n 20% 50V	213-401
C 188	C Ceramic 100n 20% 50V	213-401
C 189	C Ceramic 100n 20% 50V	213-401
C 190	C Polyst 10n0 1% 63V	243-302
C 191	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069
C 192	C Ceramic 10p0 2% 100V NP0	213-205
C 193	C Ceramic 10p0 2% 100V NP0	213-205
C 194	C Ceramic 10p0 2% 100V NP0	213-205
C 195	C Ceramic 15p0 2% 100V NP0	213-216
C 196	C solid AL 10u 20% 16V	265-008
C 197	C Solid alu 10u 20% 25V	265-010
C 198	C Ceramic 100n 20% 50V	213-401
C 199	C Ceramic 100n 20% 50V	213-401
C 200	C Ceramic 100n 20% 50V	213-401
C 201	C Ceramic 100n 20% 50V	213-401
C 202	C Ceramic 100n 20% 50V	213-401
C 203	C Ceramic 150p 2% 100V N750	213-212
C 204	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064

DIODES

CR 3	Diode cap BB809 Vr-28V Ir-10nA	350-063
CR 4	Diode zener BZX79-C6V8 0.4W	350-627
CR 5	Diode zener BZX79-C6V8 0.4W	350-627
CR 6	IC TL431 ADJ. Precision Shunt Regulators	364-849
CR 7	Diode zener BZX79-C4V7 0.4W	350-642
CR 8	Diode cap BB809 Vr-28V Ir-10nA	350-063
CR 9	Diode zener BZX79-C5V6 0.4W	350-629
CR 10	Diode zener BZX79-C5V6 0.4W	350-629
CR 11	Diode zener BZX79-C3V3 0.4W	350-625
CR 12	Diode BZV46-C1V5 Low Voltage Stabistor	350-676
CR 13	Diode zener BZX79-C4V7 0.4W	350-642

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958

RELAYS & JUMPERS

K 2	2-pol amp connector	805-951
K 3	2-pol amp connector	805-951

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204
L 4	Choke HF Mini 68u 10% 95mA	703-073
L 5	Choke HF Mini 47U 5% 450mA 1.1 Ohm	703-008
L 6	Coil Var 12-30	702-900
L 7	Choke HF Mini 68u 10% 95mA	703-073
L 8	Coil Var 12-30	702-900
L 9	Choke HF Mini 47U 5% 450mA 1.1 Ohm	703-008

TRANSISTORS

Q 1	Transistor 2N3904 pnp	360-064
Q 2	Transistor 2N3904 pnp	360-064
Q 3	Transistor 2N3904 pnp	360-064
Q 4	Transistor 2N3904 pnp	360-064

INTEGRATED ANALOG CIRCUITS

QA 1	IC AD712K Dual OP.AMP.	364-791
QA 2	IC LM833N Dual Low Noise OPamp	365-037
QA 3	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 4	IC LM833N Dual Low Noise OPamp	365-037
QA 5	IC LM833N Dual Low Noise OPamp	365-037
QA 6	IC LM833N Dual Low Noise OPamp	365-037
QA 7	IC LM833N Dual Low Noise OPamp	365-037
QA 8	IC AD712K Dual OP.AMP.	364-791
QA 9	IC AD7870JN 12-Bit A/D Connerter	365-051
QA 10	IC TL082 dual op amp	364-619
QA 11	IC TL082 dual op amp	364-619
QA 12	IC LM833N Dual Low Noise OPamp	365-037
QA 13	IC TL082 dual op amp	364-619
QA 14	IC TL082 dual op amp	364-619
QA 15	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 16	IC LM833N Dual Low Noise OPamp	365-037
QA 17	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 18	IC AD712K Dual OP.AMP.	364-791
QA 19	IC LM833N Dual Low Noise OPamp	365-037
QA 20	IC LM833N Dual Low Noise OPamp	365-037
QA 21	IC LM833N Dual Low Noise OPamp	365-037
QA 22	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 23	IC LM833N Dual Low Noise OPamp	365-037
QA 24	IC LM833N Dual Low Noise OPamp	365-037

QA 25	IC LTC1062CN8 5TH Order Low Pass Filter	365-058

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC4094 8 stage shift REG.	364-811
QD 2	IC 74HC4094 8 stage shift REG.	364-811
QD 3	IC EPG10PC-35 Pal 35nS	365-062
QD 5	IC MC1496P Balanced Modulator Demodulator	365-008
QD 6	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 7	IC MC1496P Balanced Modulator Demodulator	365-008
QD 8	IC MC1496P Balanced Modulator Demodulator	365-008
QD 9	IC 74HC40103 8 Bit Counter	364-797
QD 10	IC 74HC74P dual d ff	364-755
QD 11	IC MC1496P Balanced Modulator Demodulator	365-008
QD 12	IC 74HC40103 8 Bit Counter	364-797
QD 13	IC 74HC14 Hex inv. Schmitt Trig	364-800

RESISTORS

R 1	R Metal film 10E0 5% 0.2W TC250	107-210
R 2	R Metal film 10E0 5% 0.2W TC250	107-210
R 3	R Metal Film 4K12 1% 0.5W TC50	114-412
R 4	R Metal Film 8K25 1% 0.5W TC50	114-825
R 5	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 6	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 7	R Metal Film 1K78 1% 0.5W TC50	114-178
R 8	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 9	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 10	R Metal Film 1K78 1% 0.5W TC50	114-178
R 11	R Metal Film 511E 1% 0.5W TC50	113-511
R 12	R Metal Film 2K94 1% 0.5W TC50	114-294
R 13	R Metal film 22K0 5% 0.2W TC250	107-522
R 14	R Metal Film 4K12 1% 0.5W TC50	114-412
R 15	R Metal Film 49K9 1% 0.5W TC50	115-499
R 16	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 17	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 18	R Metal film 487E 1% 0.4W TC50	113-487
R 19	R Metal Film 1K78 1% 0.5W TC50	114-178
R 20	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 21	R Metal Film 49K9 1% 0.5W TC50	115-499
R 22	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 23	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 24	R Metal film 487E 1% 0.4W TC50	113-487
R 25	R Metal Film 1K78 1% 0.5W TC50	114-178
R 26	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 27	R Metal film 100E 5% 0.2W TC250	107-310
R 28	R Metal film 220E 5% 0.2W TC250	107-322
R 29	R Metal film 220E 5% 0.2W TC250	107-322
R 30	R Metal film 1K80 5% 0.2W TC250	107-418
R 31	R Metal film 1K80 5% 0.2W TC250	107-418
R 32	R Metal film 22E0 5% 0.2W TC250	107-222
R 33	R Metal film 470E 5% 0.2W TC250	107-347
R 34	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 35	R Metal film 220K 5% 0.2W TC250	107-622

R 36	R Metal Film 2K49 1% 0.5W TC50	114-249
R 37	R Metal film 12K0 5% 0.2W TC250	107-512
R 38	R Metal Film 14K0 1% 0.5W TC50	115-140
R 39	R Metal Film 2K61 1% 0.5W TC50	114-261
R 40	R Metal film 15E0 5% 0.2W TC250	107-215
R 41	R Metal Film 2K87 0.1% 0.2W TC50	140-978
R 42	R Metal Film 2K87 0.1% 0.2W TC50	140-978
R 43	R Metal Film 15K4 1% 0.5W TC50	115-154
R 44	R Metal Film 15K8 1% 0.5W TC50	115-158
R 45	R Metal film 5K60 5% 0.2W TC250	107-456
R 46	R Cermet Trimpot 22K 20% 0.3W TC70	182-303
R 47	R Metal film 10E0 5% 0.2W TC250	107-210
R 48	R Metal Film 332K 1% 0.5W TC50	116-332
R 50	R Metal film 22E0 5% 0.2W TC250	107-222
R 51	R Metal film 220K 5% 0.2W TC250	107-622
R 52	R Metal film 220K 5% 0.2W TC250	107-622
R 53	R Metal film 120K 5% 0.2W TC250	107-612
R 54	R Metal film 82K0 5% 0.2W TC250	107-582
R 55	R Metal film 10K0 5% 0.2W TC250	107-510
R 56	R Metal film 1K00 5% 0.2W TC250	107-410
R 57	R Metal film 1K00 5% 0.2W TC250	107-410
R 58	R Metal film 100K 5% 0.2W TC250	107-610
R 59	R Metal film 47E0 5% 0.2W TC250	107-247
R 60	R Metal Film 14K7 1% 0.5W TC50	115-147
R 61	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 62	R Metal film 10E0 5% 0.2W TC250	107-210
R 63	R Metal Film 9K76 1% 0.5W TC50	114-976
R 64	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 65	R Metal film 220K 5% 0.2W TC250	107-622
R 66	R Metal Film 2K49 1% 0.5W TC50	114-249
R 67	R Metal film 6K80 5% 0.2W TC250	107-468
R 68	R Metal Film 2K00 1% 0.5W TC50	114-200
R 69	R Metal film 15E0 5% 0.2W TC250	107-215
R 70	R Metal Film 2K43 1% 0.5W TC50	114-243
R 71	R Metal Film 2K43 1% 0.5W TC50	114-243
R 72	R Metal Film 6K34 0.1% TC15 0.25W	141-262
R 73	R Metal Film 6K34 0.1% TC15 0.25W	141-262
R 74	R Metal Film 4K64 1% 0.5W TC50	114-464
R 75	R Metal Film 4K64 1% 0.5W TC50	114-464
R 76	R Metal film 5K90 0.1% 0.25w TC25	141-350
R 77	R Metal film 5K90 0.1% 0.25w TC25	141-350
R 78	R Metal Film 4K64 1% 0.5W TC50	114-464
R 79	R Metal film 10E0 5% 0.2W TC250	107-210
R 80	R Metal film 10E0 5% 0.2W TC250	107-210
R 81	R Metal Film 3K57 1% 0.5W TC50	114-357
R 83	R Metal film 1K00 5% 0.2W TC250	107-410
R 84	R Metal Film 10K0 1% 0.5W TC50	115-100
R 85	R Metal film 47E0 5% 0.2W TC250	107-247
R 86	R Metal Film 14K7 1% 0.5W TC50	115-147
R 87	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 88	R Metal film 10K7 0.1% 0.25w TC25	141-354
R 89	R Metal Film 3K40 0.1% 0.2W 0.1W TK23	140-979
R 90	R Metal film 5K90 0.1% 0.25w TC25	141-350
R 91	R Metal Film 11K8 1% 0.5W TC50	115-118

R 92	R Metal film 10E0 5% 0.2W TC250	107-210
R 93	R Metal Film 7K15 1% 0.5W TC50	114-715
R 94	R Metal film 4K70 5% 0.2W TC250	107-447
R 95	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 96	R Metal Film 2K00 1% 0.5W TC50	114-200
R 97	R Metal film 4K70 5% 0.2W TC250	107-447
R 99	R Metal film 1K00 5% 0.2W TC250	107-410
R 100	R Metal Film 15K0 1% 0.5W TC50	115-150
R 101	R Metal Film 34K8 1% 0.5W TC50	115-348
R 102	R Metal film 1K20 5% 0.2W TC250	107-412
R 103	R Metal film 1K20 5% 0.2W TC250	107-412
R 104	R Metal film 10E0 5% 0.2W TC250	107-210
R 105	R Metal Film 4K99 1% 0.5W TC50	114-499
R 106	R Metal Film 4K99 1% 0.5W TC50	114-499
R 107	R Metal film 1K20 5% 0.2W TC250	107-412
R 108	R Metal film 1K20 5% 0.2W TC250	107-412
R 109	R Metal film 150E 5% 0.2W TC250	107-315
R 110	R Metal film 150E 5% 0.2W TC250	107-315
R 111	R Metal Film 3K83 1% 0.5W TC50	114-383
R 112	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 113	R Metal film 220K 5% 0.2W TC250	107-622
R 114	R Metal film 6K80 5% 0.2W TC250	107-468
R 116	R Metal Film 1K87 1% 0.5W TC50	114-187
R 117	R Metal film 47E0 5% 0.2W TC250	107-247
R 118	R Metal film 2K94 0.1% 0.25w TC25	141-258
R 119	R Metal film 2K94 0.1% 0.25w TC25	141-258
R 120	R Metal film 10K5 0.1% 0.25w TC25	141-332
R 121	R Metal Film 10K0 1% 0.5W TC50	115-100
R 122	R Metal film 22E0 5% 0.2W TC250	107-222
R 123	R Metal Film 2K15 1% 0.5W TC50	114-215
R 124	R Metal film 47E0 5% 0.2W TC250	107-247
R 125	R Metal Film 5K90 1% 0.5W TC50	114-590
R 126	R Metal film 6K98 0.1% 0.25w TC25	141-348
R 127	R Metal film 6K98 0.1% 0.25w TC25	141-348
R 128	R Metal Film 3K32 1% 0.5W TC50	114-332
R 129	R Metal Film 3K32 1% 0.5W TC50	114-332
R 130	R Metal Film 3K40 0.1% 0.2W 0.1W TK23	140-979
R 131	R Metal film 10K5 0.1% 0.25w TC25	141-332
R 132	R Metal film 10K7 0.1% 0.25w TC25	141-354
R 133	R Metal film 48K7 0.1% 0.25w TC25	141-353
R 134	R Metal film 14K3 0.1% 0.25w TC25	141-329
R 135	R Metal Film 3K40 0.1% 0.2W 0.1W TK23	140-979
R 136	R Metal Film 11K5 1% 0.5W TC50	115-115
R 137	R Metal Film 11K5 1% 0.5W TC50	115-115
R 138	R Metal film 10K7 0.1% 0.25w TC25	141-354
R 139	R Metal film 59K0 1% 0.4W TC50	115-590
R 140	R Metal Film 10K0 1% 0.5W TC50	115-100
R 141	R Metal Film 5K62 1% 0.5W TC50	114-562
R 142	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 143	R Metal film 10E0 5% 0.2W TC250	107-210
R 144	R Metal film 10E0 5% 0.2W TC250	107-210
R 145	R Metal Film 6K19 1% 0.5W TC50	114-619
R 146	R Metal Film 590E 1% 0.5W TC50	113-590
R 147	R Metal Film 30K1 1% 0.5W TC50	115-301

R 148	R Metal Film 5K76 1% 0.5W TC50	114-576
R 149	R Metal Film 7K68 0,1% 0,125W TC25	141-263
R 153	R Metal Film 78K7 1% 0.5W TC50	115-787
R 154	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 155	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 156	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 157	R Metal Film 37E4 1% 0.5W TC50	112-374
R 158	R Metal Film 1K30 1% 0.5W TC50	114-130
R 159	R Metal Film 1K30 1% 0.5W TC50	114-130
R 160	R Metal Film 75E0 1% 0.5W TC50	112-750
R 161	R Metal Film 75K0 1% 0.5W TC50	115-750
R 162	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 163	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 164	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 165	R Metal Film 59E0 1% 0.5W TC50	112-590
R 166	R Metal Film 1K30 1% 0.5W TC50	114-130
R 167	R Metal Film 1K30 1% 0.5W TC50	114-130
R 168	R Metal Film 118E 1% 0.5W TC50	113-118
R 169	R Metal film 100K 5% 0.2W TC250	107-610
R 170	R Metal Film 100K 1% 0.5W TC50	116-100
R 172	R Metal film 2K20 5% 0.2W TC250	107-422
R 173	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 174	R Metal film 15E0 5% 0.2W TC250	107-215
R 175	R Metal Film 243E 1% 0.5W TC50	113-243
R 176	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 177	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 179	R Metal Film 243E 1% 0.5W TC50	113-243
R 180	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 181	R Metal Film 29K4 1% 0.5W TC50	115-294
R 182	R Metal Film 6K04 0.1% 0.5W TC25	141-158
R 183	R Metal Film 2K80 1% 0.5W TC50	114-280
R 184	R Metal Film 2K80 1% 0.5W TC50	114-280
R 185	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 186	R Metal film 220K 5% 0.2W TC250	107-622
R 187	R Metal Film 2K49 1% 0.5W TC50	114-249
R 188	R Metal film 2K20 5% 0.2W TC250	107-422
R 189	R Metal Film 1K69 1% 0.5W TC50	114-169
R 190	R Metal Film 1K69 1% 0.5W TC50	114-169
R 191	R Metal Film 6K19 1% 0.5W TC50	114-619
R 192	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 193	R Metal Film 6K34 0.1% TC15 0.25W	141-262
R 194	R Metal film 1K20 5% 0.2W TC250	107-412
R 195	R Metal Film 2K00 1% 0.5W TC50	114-200
R 196	R Metal Film 332K 1% 0.5W TC50	116-332
R 197	R Metal film 1K00 5% 0.2W TC250	107-410
R 198	R Metal film 1K20 5% 0.2W TC250	107-412
R 199	R Metal film 47E0 5% 0.2W TC250	107-247
R 200	R Metal Film 7K87 1% 0.5W TC50	114-787
R 201	R Metal film 1K00 5% 0.2W TC250	107-410
R 202	R Metal film 22E0 5% 0.2W TC250	107-222
R 203	R Metal film 470E 5% 0.2W TC250	107-347
R 204	R Metal film 120K 5% 0.2W TC250	107-612
R 205	R Metal film 220K 5% 0.2W TC250	107-622
R 206	R Metal film 22E0 5% 0.2W TC250	107-222

R 207	R Metal film 220K 5% 0.2W TC250	107-622
R 208	R Metal Film 2K0 0,1% 0,125W TC25	141-255
R 209	R Metal Film 2K0 0,1% 0,125W TC25	141-255
R 210	R Metal Film 6K04 0.1% 0.5W TC25	141-158
R 211	R Metal film 220E 5% 0.2W TC250	107-322
R 212	R Metal film 150E 5% 0.2W TC250	107-315
R 213	R Metal film 150E 5% 0.2W TC250	107-315
R 214	R Metal film 150E 5% 0.2W TC250	107-315
R 215	R Metal film 150E 5% 0.2W TC250	107-315
R 216	R Metal film 1K20 5% 0.2W TC250	107-412
R 217	R Metal film 1K20 5% 0.2W TC250	107-412
R 218	R Metal film 1K20 5% 0.2W TC250	107-412
R 219	R Metal film 100K 5% 0.2W TC250	107-610
R 220	R Metal film 1K00 5% 0.2W TC250	107-410
R 221	R Metal film 10K0 5% 0.2W TC250	107-510
R 222	R Metal film 82K0 5% 0.2W TC250	107-582
R 223	R Metal film 10E0 5% 0.2W TC250	107-210
R 224	R Metal film 10E0 5% 0.2W TC250	107-210
R 225	R Metal film 10E0 5% 0.2W TC250	107-210
R 226	R Metal film 10E0 5% 0.2W TC250	107-210
R 227	R Metal Film 11K0 1% 0.5W TC50	115-110
R 228	R Metal film 680E 5% 0.2W TC250	107-368
R 229	R Metal film 680E 5% 0.2W TC250	107-368
R 230	R Metal film 560E 5% 0.2W TC250	107-356
R 231	R Metal film 100K 5% 0.2W TC250	107-610
R 234	R Metal Film 3K92 1% 0.5W TC50	114-392
R 235	R Metal film 100E 5% 0.2W TC250	107-310
R 236	R Metal Film 2K67 1% 0.5W TC50	114-267
R 237	R Metal Film 2K67 1% 0.5W TC50	114-267
R 240	R Cermet Trimpot 470E 20% 0.5W TC70	182-302
R 240	R Cermet Trimpot 1K 10% 0.5W TC70	182-310
R 241	R Metal Film 7K32 1% 0.5W TC50	114-732
R 244	R Metal Film 21K5 1% 0.5W TC50	115-215
R 245	R Metal Film 21K5 1% 0.5W TC50	115-215
R 246	R Metal film 470E 5% 0.2W TC250	107-347
R 247	R Metal Film 21K5 1% 0.5W TC50	115-215
R 248	R Metal film 22E0 5% 0.2W TC250	107-222
R 249	R Metal Film 2K15 1% 0.5W TC50	114-215
R 250	R Metal Film 357K 1% 0.5W TC50	116-357
R 251	R Metal film 220K 5% 0.2W TC250	107-622

TESTPOINTS

TP 1	Wire Wrap Terminal	805-727
TP 2	Wire Wrap Terminal	805-727
TP 3	Wire Wrap Terminal	805-727
TP 4	Wire Wrap Terminal	805-727
TP 5	Wire Wrap Terminal	805-727
TP 6	Wire Wrap Terminal	805-727
TP 7	Wire Wrap Terminal	805-727
TP 8	Wire Wrap Terminal	805-727
TP 9	Wire Wrap Terminal	805-727
TP 10	Wire Wrap Terminal	805-727
TP 11	Wire Wrap Terminal	805-727

TP 12	Wire Wrap Terminal	805-727
TP 13	Wire Wrap Terminal	805-727
TP 14	Wire Wrap Terminal	805-727
TP 15	Wire Wrap Terminal	805-727
TP 16	Wire Wrap Terminal	805-727
TP 17	Wire Wrap Terminal	805-727
TP 18	Wire Wrap Terminal	805-727
TP 19	Wire Wrap Terminal	805-727
TP 20	Wire Wrap Terminal	805-727
TP 21	Wire Wrap Terminal	805-727
TP 22	Wire Wrap Terminal	805-727

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
	Solder Terminal 0.1 O2	823-303
	L-piece for PCB	857-041
	PCB For RE331 Measuring Unit	971-422
	Rearplate For RE331 Sub Dwg 933-150	978-388
JS 1	Tubular Rivet 2.5X10	060-310
QAS9	24 Pin DIL Socket w. 3 modul spacing	816-274
QDS3	24 Pin DIL Socket w. 3 modul spacing	816-274
X 1	Quarts Crystal 4,332MHz +-30ppM	910-224
X 2	Quarts Crystal 4,332MHz +-30ppM	910-224
XS 1	Isolating Plate F.Crystal	816-287
XS 2	Isolating Plate F.Crystal	816-287

16. PHASE MEASURING BOARD

16.1 Circuit Description

This section describes the various circuits that constitute the Phase Measuring Board. Refer to the extended block diagram, Fig. 16.1, and the schematic diagram in section 16.2.

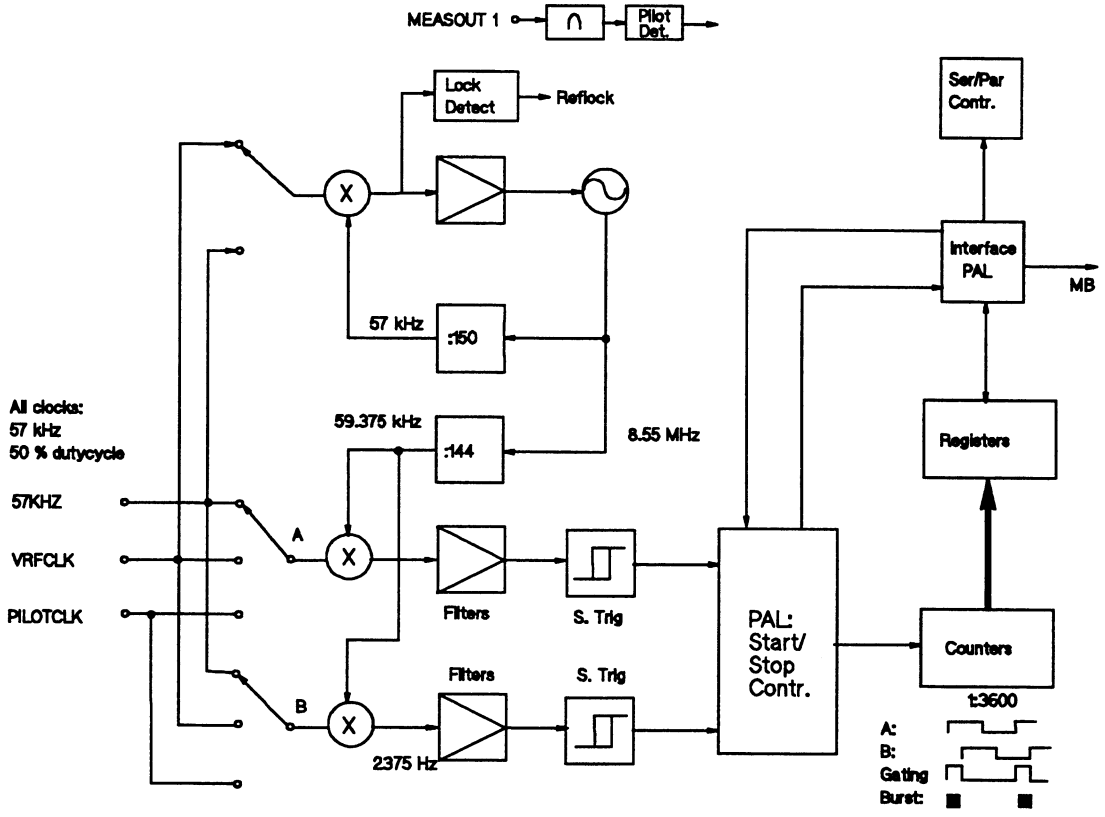


Fig. 16.1 - Block Diagram of Phase Measuring Board

The Phase Measuring Board uses the recovered 57 kHz RDS clock from the Demodulator, the derived 57 kHz clock from the Pilot Loop and the 57 kHz VRF clock from the VRF Loop.

The Phase Measuring Board uses these 3 signals during both measurement and calibration; The actual meaning of the phase measurement depends on the settings on the Level Measuring Board.

16.1.1 The Reference Loop

The Reference Loop generates an 8.55 MHz clock which can be locked to either the VRFCLK or the recovered RDS clock. The 8.55 MHz clock (called CLK on the Phase Measuring Board) is used in both the down-conversion of the two 57 kHz signals present on point A and B, and in the phase measuring counter in QD11.

The Voltage Controlled Oscillator (VCO) in the Reference Loop is a tuneable crystal oscillator with a center frequency of 8.55 MHz. The frequency is changed by varying the working impedance seen from the crystal using the varactor CR6. The oscillator itself is a Colpitts oscillator which works in class C.

A Band-pass filter on the output of the VCO gives a Duty Cycle around 50 % of the 8.55 MHz clock CLK.

The Schmitt-trigger inverter QD4F shapes the oscillator signal, and the counter QD6 subsequently divides the frequency by 75. The D-type Flip-Flop QD5A divides the frequency by 2, and feeds the resulting 57 kHz signal with 50 % Duty Cycle to the EXOR mixer QD3A, which acts as a phase comparator in the PLL.

The loop amplifier QA3 amplifies the phase difference signal from the phase comparator, and the resulting signal controls the VCO.

The unlock detector built around QA1 and QA2 detects the AC level on the output of the differential amplifier QA3A. When the Reference Loop is in lock, the signal REFLOCK gets high, and the LED CR3 lights up. The signal REFLOCK is routed to the PAL QD11, which OR's the fault condition of REFLOCK with possible other fault conditions. The resulting signal called ERR, which indicates error in the phase measurement, is routed to the register QD16.

16.1.2 The Start and Stop Branches

The Start and Stop Branches handle the signal conditioning of the 57 kHz clocks, and controls the gating of the phase measuring counters in PAL QD11.

The two branches, which are identical, consist of an input switch, a mixer, a filter with limiters and a signal shaper.

The switch network consisting of QD1A, QD1B, QD1C, QD1D, QD7A, QD7B, QD9A and QD9B selects the two 57 kHz clocks to which the Start and Stop Branches are to be connected.

The counter QD8 divides the frequency of the signal from the VCO in the Reference Loop with 72, and the D-type Flip-Flop QD5B subsequently divides the frequency by 2. The resulting 59375 Hz clock is routed to the EXOR mixers QD3B and QD3C. The phase information of the 57 kHz clocks is unchanged in the mixing process: The resulting 2375 Hz signals have the same phase relation as the 57 kHz clocks.

The resolution of the phase measurement in the gated oscillator technique is equivalent to the ratio between the frequency of the clock and the start/stop signals. The Phase Measuring Board has a 8.55 MHz clock and 2375 Hz gating signals. This gives a ratio of 1:3600, and a resolution of 0.1°.

The Low-pass filters QA5A and QA5B clean up the signals from the EXOR mixers, and the non-linear amplifiers QA6A, QA6B, QA8A and QA8B adapt the signals to the signal shapers QA4 and QA7.

16.1.3 The Gating Circuitry and Interface

The PAL QD11 controls the phase measuring counting process, but it is triggered by the signals from the Start and Stop Branch: The signal A_INPUT from the Start Branch initiates the counting, while the signal B_INPUT from the Stop Branch ends the counting.

The signal managing in QD11 includes generating a burst of clock pulses, resetting the counters, detecting overflow in the counters, and generating an error indication. The counters QD12, QD13 and QD14 count the pulses in the burst of clock pulses. The error indication is based on the lock status of the Reference Loop, a possible overflow in the counters and finally erroneous gating in QD11.

The PAL QD11 controls the gating of the clock CLK in such a way, that situations which would lead to erroneous results, are detected: For example, disappearance of one of the 57 kHz signals or the 57 kHz signals coinciding.

Besides the 12-bit counter word, the registers QD15 and QD16 read the status of the error indication and the Pilot Detector.

The Interface PAL QD17 not only reads a serial word from the registers QD15 and QD16, but it also loads a serial word to the serial to parallel converter QD18, which controls the input switch in the Start and Stop Branches. The connection from QD18-4 to QD16-7 allows the software to detect the presence of the Phase Measuring Board. To avoid confrontation between counting and reading of phase measurements the PALs QD11 and QD17 control the reading process in collaboration.

16.1.4 The Pilot Detector

The Pilot Detector detects the presence of a 19 kHz Pilot in the MPX signal. The detector is connected to MEASOUT1 from the Demodulator.

To increase the out-of-band noise rejection, a 19 kHz Band-pass filter is included in signal path to the PLL. The filter consists mainly of a 4th order Q-enhanced SAB Band-pass filter (QA9A, QA10B, QA10A and QA12B). A buffer (QA12A) has been

included in order not to load the input.

The detector QA11 is a phase locked tone-decoder. When the level reaches a certain level adjusted by R111, the indicator signal PILOTDET goes high, and the LED CR20 lights up.

The software in RE 331 reads the status of PILOTDET through QD16 and QD17.

16.2 Schematic Diagram

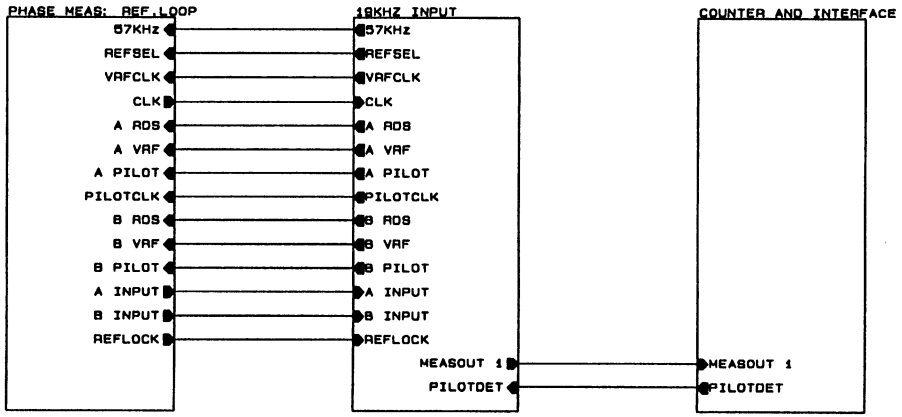
The schematic diagram for the Phase Measuring Board is located in the following. The diagram number is 985-362.

16.3 Component Locations

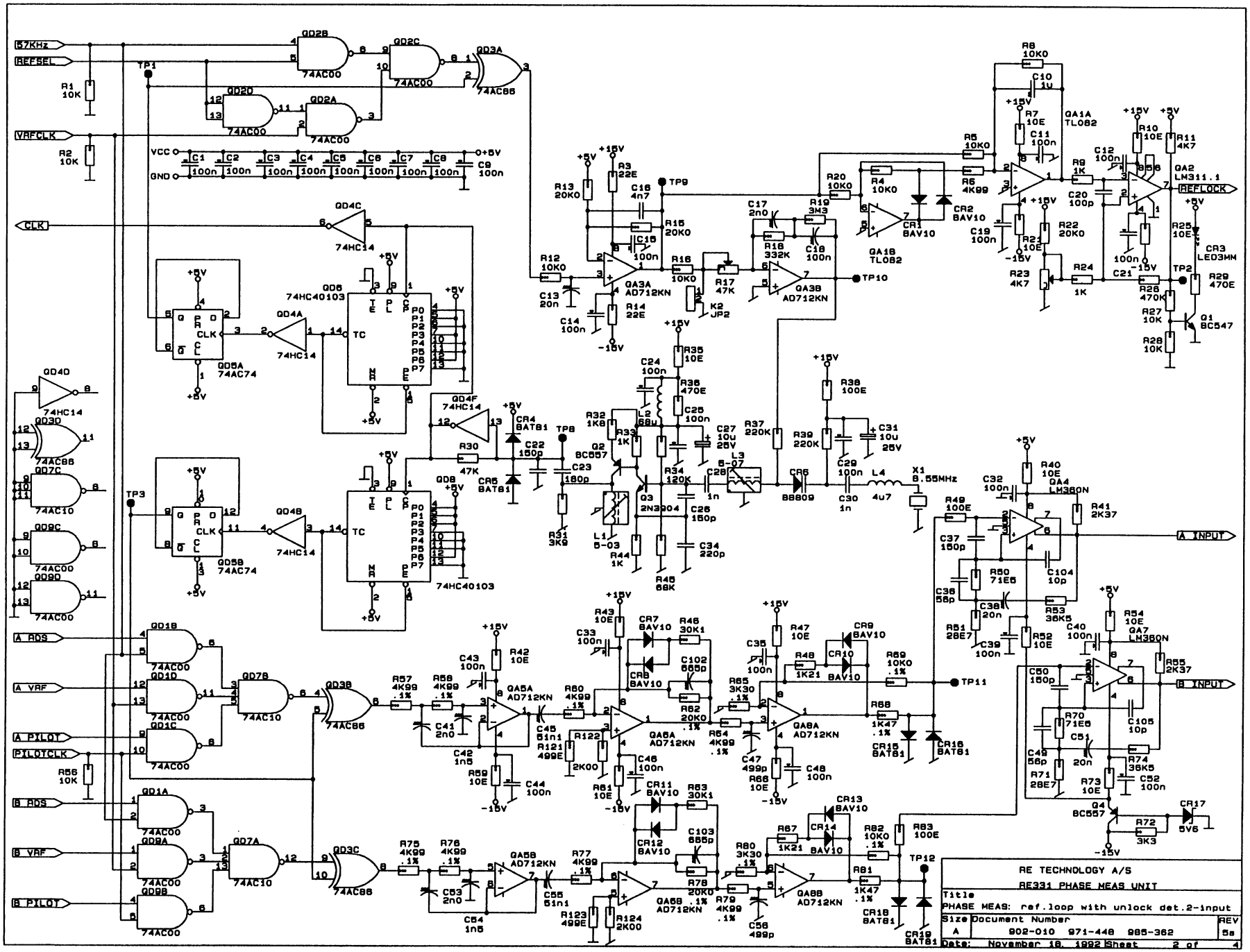
The following shows the component locations on the Phase Measuring Board.

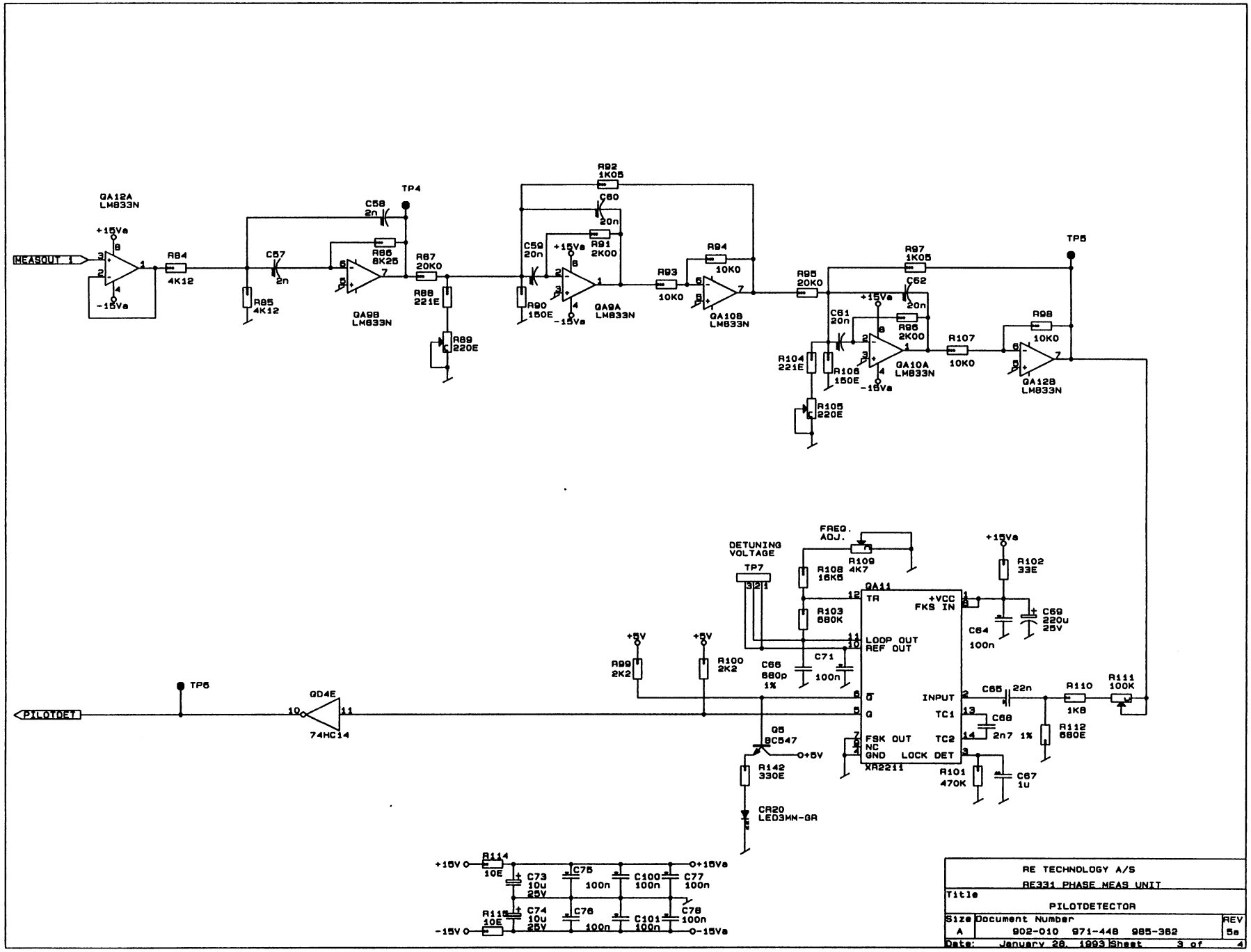
16.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 902-010.

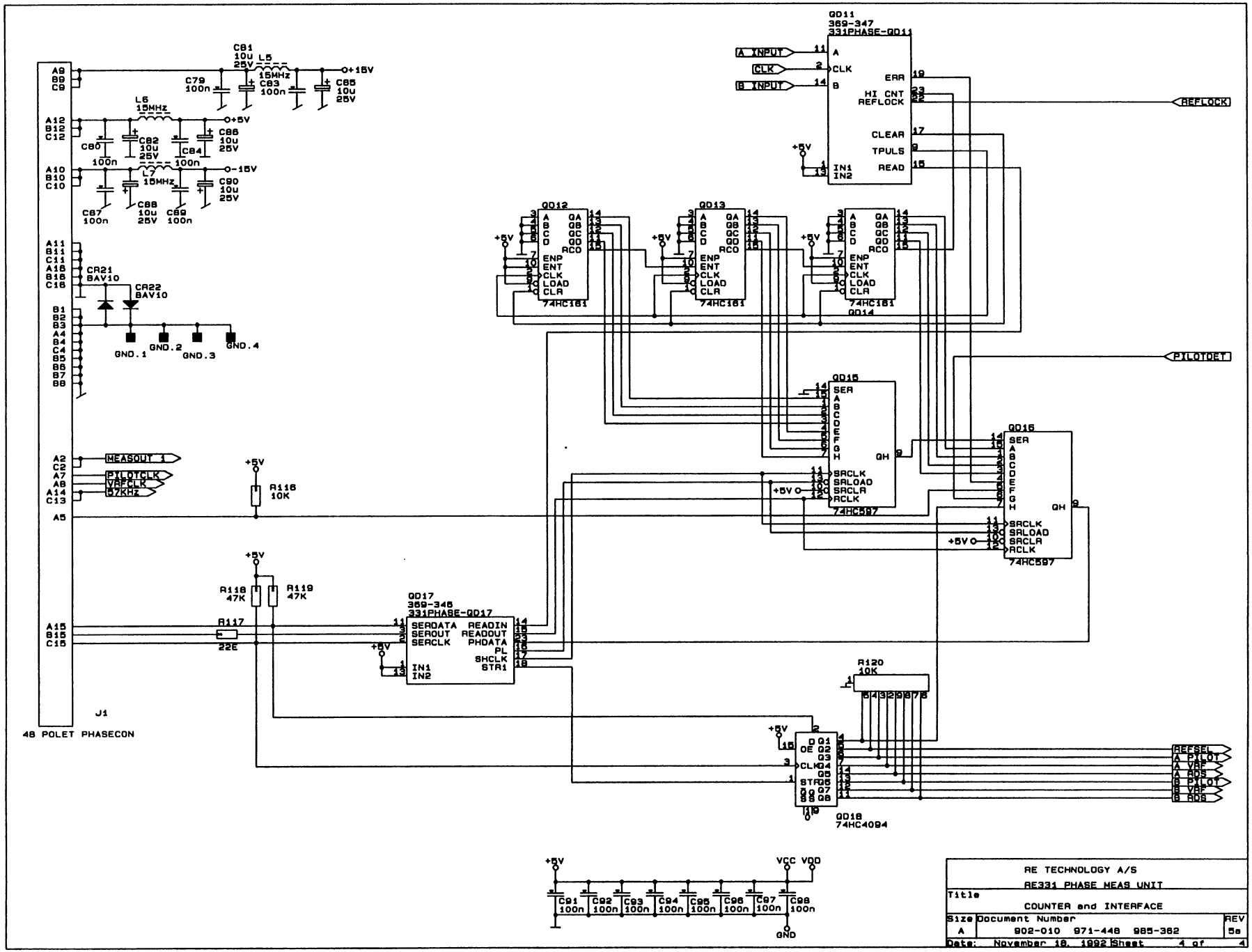


RE TECHNOLOGY A/S		
RE331 PHASE MEAS UNIT		
Title: PHASE MEAS BOARD		
Size: A	Document Number: 902-010 971-448 985-362	REV: 5a
Date: November 18, 1992	Sheet 1 of 4	

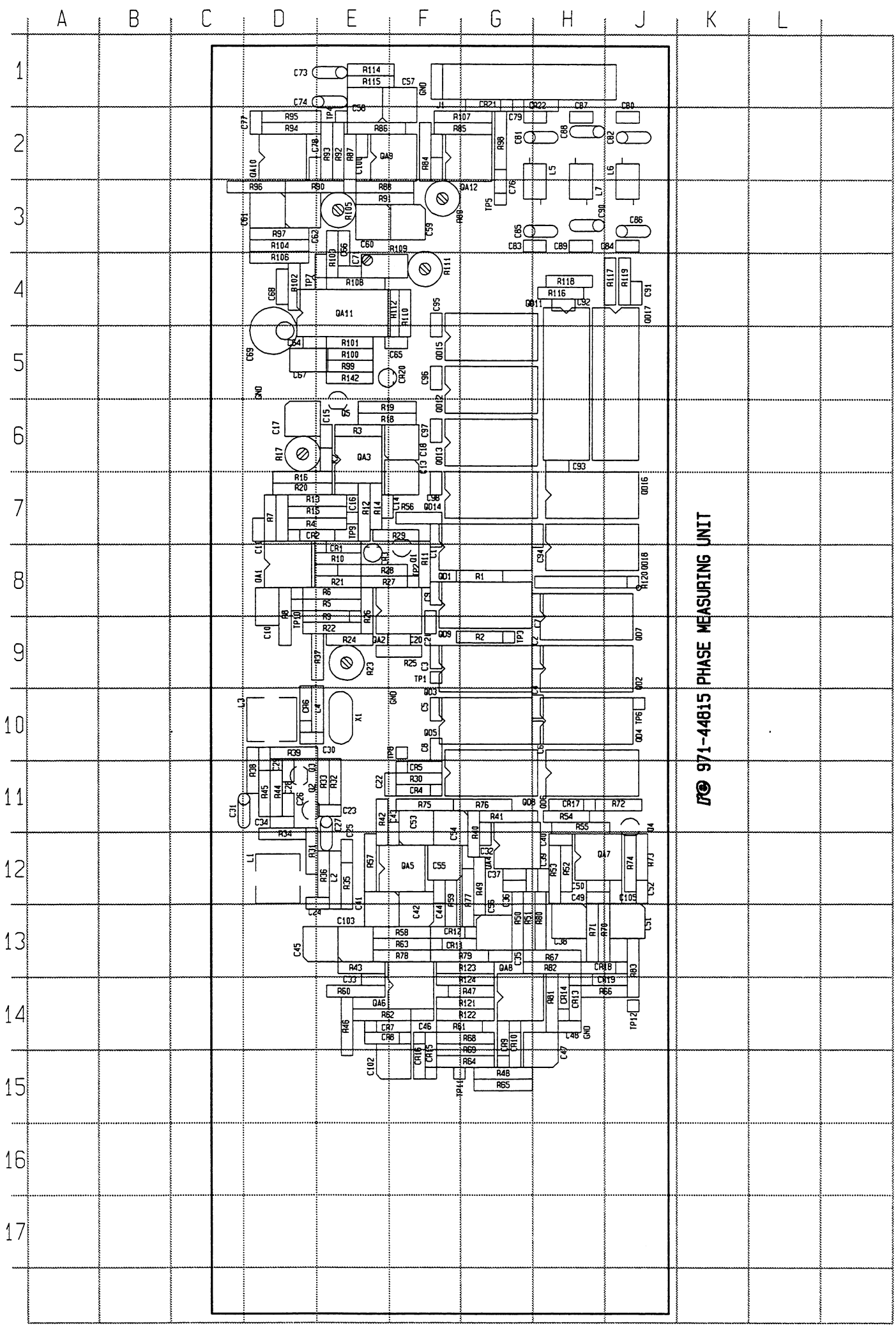

57KHz
REFSEL
VRFCLK
CLK
A ADS
A VRF
A PILOT
PILOTCLK
B ADS
B VRF
B PILOT
74AC00
74AC86
74AC10
74HC14
74HC40103
74AC74
A INPUT
B INPUT
REFLOCK
RE TECHNOLOGY A/S
RE331 PHASE MEAS UNIT
PHASE MEAS: ref.loop with unlock det.2-input
902-010 971-448 985-362
November 18, 1992 Sheet 2 of 4



RE TECHNOLOGY A/S		
RE331 PHASE MEAS UNIT		
Title: PILOTDETECTOR		
Size: A	Document Number: 902-010 971-448 985-362	REV: 5a
Date: January 28, 1993	Sheet 3 of 4	



RE TECHNOLOGY A/S	
RE331 PHASE MEAS UNIT	
Title: COUNTER and INTERFACE	
Size: A	Document Number: 902-010 971-448 985-362 REV: 5a
Date: November 18, 1992	Sheet 4 of 4


971-44815 PHASE MEASURING UNIT

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	E8	C56	G12	QD8	H11	R61	F14	TP12	J14														
CR2	D7	C57	F1	QD9	F9	R62	F14	X1	E10														
CR3	E8	C58	E2	QD11	H4	R63	F13																
CR4	F11	C59	F3	QD12	F5	R64	G15																
CR5	F11	C60	E3	QD13	F6	R65	G15																
CR6	D10	C61	D3	QD14	F7	R66	H14																
CR7	E14	C62	D3	QD15	F5	R67	H13																
CR8	F14	C64	D5	QD16	J7	R68	G14																
CR9	G15	C65	F5	QD17	J4	R69	G14																
CR10	G14	C66	E3	QD18	J8	R70	H13																
CR11	F13	C67	D5	Q1	F8	R71	H13																
CR12	G13	C68	D4	Q2	D11	R72	J11																
CR13	H14	C69	D5	Q3	D11	R73	J12																
CR14	H14	C71	E3	Q4	J11	R74	J12																
CR15	F15	C73	D1	Q5	E6	R75	F11																
CR16	F14	C74	D1	R1	G8	R76	G11																
CR17	H11	C76	G3	R2	G9	R77	G12																
CR18	J13	C77	D2	R3	E6	R78	F13																
CR19	H14	C78	D2	R4	D7	R79	F13																
CR20	F5	C79	G2	R5	E8	R80	H13																
CR21	G1	C80	J2	R6	E8	R81	H14																
CR22	G2	C81	G2	R7	D7	R82	H13																
C1	F8	C82	J2	R8	D8	R83	J13																
C2	G9	C83	G3	R9	E9	R84	F2																
C3	F9	C84	H3	R10	E8	R85	F2																
C4	G9	C85	G3	R11	F8	R86	E2																
C5	F10	C86	J3	R12	E7	R87	E2																
C6	H10	C87	H2	R13	D7	R88	E3																
C7	H9	C88	H2	R14	E7	R89	G3																
C8	F10	C89	H3	R15	E7	R90	E3																
C9	F8	C90	H3	R16	D7	R91	F3																
C10	D9	C91	J4	R17	D6	R92	E2																
C11	D8	C92	H4	R18	E6	R93	E2																
C13	F7	C93	H6	R19	F6	R94	D2																
C14	F7	C94	H8	R20	D7	R95	D2																
C15	E6	C95	F4	R21	E8	R96	D3																
C16	E7	C96	F5	R22	E9	R97	D3																
C17	D6	C97	F6	R23	E9	R98	G2																
C18	F6	C98	F7	R24	E9	R99	E5																
C20	F9	C100	E2	R25	F9	R100	E5																
C21	F9	C102	E15	R26	E9	R101	E5																
C22	E11	C103	E13	R27	E8	R102	D4																
C23	E11	C105	J12	R28	F8	R103	E4																
C24	E13	GND. 1	F1	R29	F7	R104	D3																
C25	E12	GND. 2	D5	R30	F11	R105	E3																
C26	D11	GND. 3	F10	R31	D12	R106	D4																
C27	E11	GND. 4	H14	R32	E11	R107	F2																
C28	D11	J1	F2	R33	E11	R108	E4																
C29	D10	K2	E6	R34	D11	R109	F3																
C30	E10	L1	D12	R35	E12	R110	F4																
C31	C11	L2	E12	R36	E12	R111	F4																
C32	G12	L3	C10	R37	D9	R112	F4																
C33	E14	L4	E10	R38	D11	R114	E1																
C34	D11	L5	H2	R39	D10	R115	E1																
C35	G13	L6	J2	R40	G11	R116	H4																
C36	G13	L7	H3	R41	G11	R117	J4																
C37	G12	QA1	D8	R42	E11	R118	H4																
C38	H13	QA2	E9	R43	E13	R119	J4																
C39	H12	QA3	E6	R44	D11	R120	J8																
C40	H12	QA4	G12	R45	D11	R121	F14																
C41	E13	QA5	F12	R46	E14	R122	F14																
C42	F13	QA6	E14	R47	G14	R123	F13																
C43	F11	QA7	J12	R48	G15	R124	F14																
C44	F13	QA8	G13	R49	G12	R142	E5																
C45	D13	QA9	F2	R50	G13	TP1	F9																
C46	F14	QA10	D2	R51	G13	TP2	F8																
C47	H14	QA11	E4	R52	H12	TP3	G9																
C48	H14	QA12	G3	R53	H12	TP4	E2																
C49	H12	QD1	F8	R54	H11	TP5	G3																
C50	H12	QD2	J9	R55	H11	TP6	J10																
C51	J13	QD3	F10	R56	F7	TP7	D4																
C52	J12	QD4	J10	R57	E12	TP8	F10																
C53	F11	QD5	F10	R58	F13	TP9	E7																
C54	F12	QD6	H11	R59	F12	TP10	D9																
C55	F12	QD7	J9	R60	E14	TP11	G15																

COMPONENT SIDE

Phase Measuring Board (902-010)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 100n 20% 50V	213-401
C 10	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Polystyrene 20n 1% 63V	243-316
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 4700p 63V 5%	213-614
C 17	C Polyst 2n00 1% 63V	243-305
C 18	C Polypropylen 100n 1% 63V 150PPM	242-302
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Ceramic 100p 2% 100V NP0	213-211
C 21	C Ceramic 100n 20% 50V	213-401
C 22	C Ceramic 150p 2% 100V N750	213-212
C 23	C Ceramic 180p 2% 100V N750	213-228
C 24	C Ceramic 100n 20% 50V	213-401
C 25	C Ceramic 100n 20% 50V	213-401
C 26	C Ceramic 150p 2% 100V N750	213-212
C 27	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 28	C Ceramic 1n 5% NP0 63V	213-616
C 29	C Ceramic 100n 20% 50V	213-401
C 30	C Ceramic 1n 5% NP0 63V	213-616
C 31	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 100n 20% 50V	213-401
C 34	C Ceramic 220p 2% 100V N750	213-218
C 35	C Ceramic 100n 20% 50V	213-401
C 36	C Ceramic 56p0 2% 100V NP0	213-210
C 37	C Ceramic 150p 2% 100V N750	213-212
C 38	C Polystyrene 20n 1% 63V	243-316
C 39	C Ceramic 100n 20% 50V	213-401
C 40	C Ceramic 100n 20% 50V	213-401
C 41	C Polyst 2n00 1% 63V	243-305
C 42	C Polystyrene 1n5 1% 63V	243-312
C 43	C Ceramic 100n 20% 50V	213-401
C 44	C Ceramic 100n 20% 50V	213-401
C 45	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 46	C Ceramic 100n 20% 50V	213-401
C 47	C Polyst 2n00 1% 63V	243-305
C 48	C Ceramic 100n 20% 50V	213-401
C 49	C Ceramic 56p0 2% 100V NP0	213-210
C 50	C Ceramic 150p 2% 100V N750	213-212

C 51	C Polystyrene 20n 1% 63V	243-316
C 52	C Ceramic 100n 20% 50V	213-401
C 53	C Polyst 2n00 1% 63V	243-305
C 54	C Polystyrene 1n5 1% 63V	243-312
C 55	C Polypropylen 51n1 1% 63V 150PPM	242-301
C 56	C Polyst 2n00 1% 63V	243-305
C 57	C Polyst 2n00 1% 63V	243-305
C 58	C Polyst 2n00 1% 63V	243-305
C 59	C Polystyrene 20n 1% 63V	243-316
C 60	C Polystyrene 20n 1% 63V	243-316
C 61	C Polystyrene 20n 1% 63V	243-316
C 62	C Polystyrene 20n 1% 63V	243-316
C 64	C Ceramic 100n 20% 50V	213-401
C 65	C Ceramic 22n0 -20+80% 63V	213-011
C 66	Multilayer, 680pF 1% NPO 50V, 7.62*5.1*3.2, RM2	213-611
C 67	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 68	C Ceramic 2n7 1% 50V NPO	213-628
C 69	Electrolytic 220/35, 2000h/105°, R:10*12,5, RM2	261-092
C 71	C Ceramic 100n 20% 50V	213-401
C 73	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 74	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 75	C Ceramic 100n 20% 50V	213-401
C 76	C Ceramic 100n 20% 50V	213-401
C 77	C Ceramic 100n 20% 50V	213-401
C 78	C Ceramic 100n 20% 50V	213-401
C 79	C Ceramic 100n 20% 50V	213-401
C 80	C Ceramic 100n 20% 50V	213-401
C 81	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 82	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 83	C Ceramic 100n 20% 50V	213-401
C 84	C Ceramic 100n 20% 50V	213-401
C 85	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 86	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 87	C Ceramic 100n 20% 50V	213-401
C 88	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 89	C Ceramic 100n 20% 50V	213-401
C 90	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 91	C Ceramic 100n 20% 50V	213-401
C 92	C Ceramic 100n 20% 50V	213-401
C 93	C Ceramic 100n 20% 50V	213-401
C 94	C Ceramic 100n 20% 50V	213-401
C 95	C Ceramic 100n 20% 50V	213-401
C 96	C Ceramic 100n 20% 50V	213-401
C 97	C Ceramic 100n 20% 50V	213-401
C 98	C Ceramic 100n 20% 50V	213-401
C 100	C Ceramic 100n 20% 50V	213-401
C 101	C Ceramic 100n 20% 50V	213-401
C 102	C Polystyrene 665p 1% 63V	243-325
C 103	C Polystyrene 665p 1% 63V	243-325
C 104	C Ceramic 10p0 2% 100V NP0	213-205
C 105	C Ceramic 10p0 2% 100V NP0	213-205

DIODES

CR 1	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 2	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 3	LED 3mm red	350-043
CR 4	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 5	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 6	Diode cap BB809 Vr-28V Ir-10nA	350-063
CR 7	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 8	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 9	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 10	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 11	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 12	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 13	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 14	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 15	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 16	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 17	Diode zener BZX79-C5V6 0.4W	350-629
CR 18	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 19	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 20	LED 3mm red	350-043
CR 21	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 22	Diode BAV10 Si Vr-60V If-600mA	350-022

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958

RELAYS & JUMPERS

K 2	2-pol amp connector	805-951

CHOKES

L 1	HF Coil 3u25 Adjustable	740-226
L 2	Choke HF Mini 68u 10% 95mA	703-073
L 3	Coil Slot-Ten 7,7-18,4uH	740-236
L 4	Choke HF Mini 4U7 10% 430mA	703-038
L 5	RF-choke six-hole core green	731-204
L 6	RF-choke six-hole core green	731-204
L 7	RF-choke six-hole core green	731-204

TRANSISTORS

Q 1	Transistor BC547B npn	360-159
Q 2	Transistor BC557B pnp	360-160
Q 3	Transistor 2N3904 pnp	360-064
Q 4	Transistor BC557B pnp	360-160
Q 5	Transistor BC547B npn	360-159

INTEGRATED ANALOG CIRCUITS

QA 1	IC TL082 dual op amp	364-619
QA 2	IC LM311N comparator	364-024
QA 3	IC AD712K Dual OP.AMP.	364-791
QA 4	IC LM360 comparator	364-148
QA 5	IC AD712K Dual OP.AMP.	364-791
QA 6	IC AD712K Dual OP.AMP.	364-791
QA 7	IC LM360 comparator	364-148
QA 8	IC AD712K Dual OP.AMP.	364-791
QA 9	IC LM833N Dual Low Noise OPamp	365-037
QA 10	IC LM833N Dual Low Noise OPamp	365-037
QA 11	IC XR2211 FSK Demodulator	364-777
QA 12	IC LM833N Dual Low Noise OPamp	365-037

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74AC00 quad NAND gate	364-819
QD 2	IC 74AC00 quad NAND gate	364-819
QD 3	IC 74AC86 Exclusive-OR Gate	365-048
QD 4	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 5	IC 74AC74 dual D ff	364-795
QD 6	IC 74HC40103 8 Bit Counter	364-797
QD 7	IC 74AC10 Nand Gate	365-047
QD 8	IC 74HC40103 8 Bit Counter	364-797
QD 9	IC 74AC00 quad NAND gate	364-819
QD 11	RE331 Phase Meas Pal 920-010 QD11	369-347
QD 12	IC 74HC161 Presettable Counters	364-806
QD 13	IC 74HC161 Presettable Counters	364-806
QD 14	IC 74HC161 Presettable Counters	364-806
QD 15	IC 74HC597 8-Bit Shift Register W. Input FF	365-038
QD 16	IC 74HC597 8-Bit Shift Register W. Input FF	365-038
QD 17	RE331 Phase Comm Pal 902-010 QD17	369-346
QD 18	IC 74HC4094 8 stage shift REG.	364-811

RESISTORS

R 1	R Metal film 10K0 5% 0.2W TC250	107-510
R 2	R Metal film 10K0 5% 0.2W TC250	107-510
R 3	R Metal film 22E0 5% 0.2W TC250	107-222
R 4	R Metal Film 10K0 1% 0.5W TC50	115-100
R 5	R Metal Film 10K0 1% 0.5W TC50	115-100
R 6	R Metal Film 4K99 1% 0.5W TC50	114-499
R 7	R Metal film 10E0 5% 0.2W TC250	107-210
R 8	R Metal Film 10K0 1% 0.5W TC50	115-100
R 9	R Metal film 1K00 5% 0.2W TC250	107-410
R 10	R Metal film 10E0 5% 0.2W TC250	107-210
R 11	R Metal film 4K70 5% 0.2W TC250	107-447
R 12	R Metal Film 10K0 1% 0.5W TC50	115-100
R 13	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 14	R Metal film 22E0 5% 0.2W TC250	107-222
R 15	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 16	R Metal Film 10K0 1% 0.5W TC50	115-100
R 17	R Cermet Trimpot 47K 20% 0.5W TC70	182-314

R 18	R Metal Film 332K 1% 0.5W TC50	116-332
R 19	R Metal Film 3M3 5% 0.4W	106-733
R 20	R Metal Film 10K0 1% 0.5W TC50	115-100
R 21	R Metal film 10E0 5% 0.2W TC250	107-210
R 22	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 23	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 24	R Metal film 1K00 5% 0.2W TC250	107-410
R 25	R Metal film 10E0 5% 0.2W TC250	107-210
R 26	R Metal film 470K 5% 0.2W TC250	107-647
R 27	R Metal film 10K0 5% 0.2W TC250	107-510
R 28	R Metal film 10K0 5% 0.2W TC250	107-510
R 29	R Metal film 470E 5% 0.2W TC250	107-347
R 30	R Metal film 47K0 5% 0.2W TC250	107-547
R 31	R Metal film 3K90 5% 0.2W TC250	107-439
R 32	R Metal film 1K80 5% 0.2W TC250	107-418
R 33	R Metal film 1K00 5% 0.2W TC250	107-410
R 34	R Metal film 120K 5% 0.2W TC250	107-612
R 35	R Metal film 10E0 5% 0.2W TC250	107-210
R 36	R Metal film 470E 5% 0.2W TC250	107-347
R 37	R Metal film 220K 5% 0.2W TC250	107-622
R 38	R Metal film 100E 5% 0.2W TC250	107-310
R 39	R Metal film 220K 5% 0.2W TC250	107-622
R 40	R Metal film 10E0 5% 0.2W TC250	107-210
R 41	R Metal Film 2K37 1% 0.5W TC50	114-237
R 42	R Metal film 10E0 5% 0.2W TC250	107-210
R 43	R Metal film 10E0 5% 0.2W TC250	107-210
R 44	R Metal film 1K00 5% 0.2W TC250	107-410
R 45	R Metal film 68K0 5% 0.2W TC250	107-568
R 46	R Metal Film 30K1 1% 0.5W TC50	115-301
R 47	R Metal film 10E0 5% 0.2W TC250	107-210
R 48	R Metal Film 1K21 1% 0.5W TC50	114-121
R 49	R Metal Film 100E 1% 0.5W TC50	113-100
R 50	R Metal Film 71E5 1% 0.5W TC50	112-715
R 51	R Metal Film 28E7 1% 0.5W TC50	112-287
R 52	R Metal film 10E0 5% 0.2W TC250	107-210
R 53	R Metal Film 36K5 1% 0.5W TC50	115-365
R 54	R Metal film 10E0 5% 0.2W TC250	107-210
R 55	R Metal Film 2K37 1% 0.5W TC50	114-237
R 56	R Metal film 10K0 5% 0.2W TC250	107-510
R 57	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 58	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 59	R Metal film 10E0 5% 0.2W TC250	107-210
R 60	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 61	R Metal film 10E0 5% 0.2W TC250	107-210
R 62	R Metal Film 20K0 0.1% 0.25W TC25	141-294
R 63	R Metal Film 30K1 1% 0.5W TC50	115-301
R 64	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 65	R Metal Film 3K30 0.1% 0.1W TC25	141-203
R 66	R Metal film 10E0 5% 0.2W TC250	107-210
R 67	R Metal Film 1K21 1% 0.5W TC50	114-121
R 68	R Metal Film 1K47 0,1% 0,125W TC25	141-253
R 69	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 70	R Metal Film 71E5 1% 0.5W TC50	112-715
R 71	R Metal Film 28E7 1% 0.5W TC50	112-287

R 72	R Metal film 3K30 5% 0.2W TC250	107-433
R 73	R Metal film 10E0 5% 0.2W TC250	107-210
R 74	R Metal Film 36K5 1% 0.5W TC50	115-365
R 75	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 76	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 77	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 78	R Metal Film 20K0 0.1% 0.25W TC25	141-294
R 79	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 80	R Metal Film 3K30 0.1% 0.1W TC25	141-203
R 81	R Metal Film 1K47 0,1% 0,125W TC25	141-253
R 82	R Metal Film 10K 0.1% 0.1W TC25	141-010
R 83	R Metal Film 100E 1% 0.5W TC50	113-100
R 84	R Metal Film 4K12 1% 0.5W TC50	114-412
R 85	R Metal Film 4K12 1% 0.5W TC50	114-412
R 86	R Metal Film 8K25 1% 0.5W TC50	114-825
R 87	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 88	R Metal Film 221E 1% 0.5W TC50	113-221
R 89	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 90	R Metal Film 150E 1% 0.5W TC50	113-150
R 91	R Metal Film 2K00 1% 0.5W TC50	114-200
R 92	R Metal Film 1K05 1% 0.5W TC50	114-105
R 93	R Metal Film 10K0 1% 0.5W TC50	115-100
R 94	R Metal Film 10K0 1% 0.5W TC50	115-100
R 95	R Metal film 20K0 0.5% 0.25w TC25	140-473
R 96	R Metal Film 2K00 1% 0.5W TC50	114-200
R 97	R Metal Film 1K05 1% 0.5W TC50	114-105
R 98	R Metal Film 10K0 1% 0.5W TC50	115-100
R 99	R Metal film 2K20 5% 0.2W TC250	107-422
R 100	R Metal film 2K20 5% 0.2W TC250	107-422
R 101	R Metal film 470K 5% 0.2W TC250	107-647
R 102	R Metal film 33E0 5% 0.2W TC250	107-233
R 103	R Metal film 680K 5% 0.2W TC250	107-668
R 104	R Metal Film 221E 1% 0.5W TC50	113-221
R 105	R Cermet Trimpot 200E 20% 0.5W TC70	182-315
R 106	R Metal Film 150E 1% 0.5W TC50	113-150
R 107	R Metal Film 10K0 1% 0.5W TC50	115-100
R 108	R Metal Film 16K5 1% 0.4W TC50	115-165
R 109	R var 5K00 20% 0.5W	182-418
R 110	R Metal film 1K80 5% 0.2W TC250	107-418
R 111	R Cermet Trimpot 100K 20% 0.5W TC70	182-311
R 112	R Metal film 680E 5% 0.2W TC250	107-368
R 114	R Metal film 10E0 5% 0.2W TC250	107-210
R 115	R Metal film 10E0 5% 0.2W TC250	107-210
R 116	R Metal film 10K0 5% 0.2W TC250	107-510
R 117	R Metal film 22E0 5% 0.2W TC250	107-222
R 118	R Metal film 47K0 5% 0.2W TC250	107-547
R 119	R Metal film 47K0 5% 0.2W TC250	107-547
R 120	R Thick film Sil 8*10K	146-003
R 121	R Metal Film 499E 1% 0.5W TC50	113-499
R 122	R Metal Film 2K00 1% 0.5W TC50	114-200
R 123	R Metal Film 499E 1% 0.5W TC50	113-499
R 124	R Metal Film 2K00 1% 0.5W TC50	114-200
R 142	R Metal film 330E 5% 0.2W TC250	107-333

TESTPOINTS

TP 1	Term. strip 50pol mod 2	806-072
TP 2	Term. strip 50pol mod 2	806-072
TP 3	Term. strip 50pol mod 2	806-072
TP 4	Term. strip 50pol mod 2	806-072
TP 5	Term. strip 50pol mod 2	806-072
TP 6	Term. strip 50pol mod 2	806-072
TP 7	3 Pin AMP mod II Terminal List, Straight	805-894
TP 8	Term. strip 50pol mod 2	806-072
TP 9	Term. strip 50pol mod 2	806-072
TP 10	Term. strip 50pol mod 2	806-072
TP 11	Term. strip 50pol mod 2	806-072
TP 12	Term. strip 50pol mod 2	806-072

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
	Tubular Rivet 2.5X10	060-310
	L-piece for PCB	857-041
	PCB For RE331 Phase Meas Unit	971-448
	Coverplate For RE331 Sub Dwg 933-111	978-387
GND1	Solder Terminal 0.1 O2	823-303
GND2	Solder Terminal 0.1 O2	823-303
GND3	Solder Terminal 0.1 O2	823-303
GND4	Solder Terminal 0.1 O2	823-303
QDS11	24 Pin DIL Socket w. 3 modul spacing	816-274
QDS17	24 Pin DIL Socket w. 3 modul spacing	816-274
X 1	Isolating Plate F.Crystal	816-287
X 1	Quarts Crystal 8.550MhZ 20ppm	910-227

17. REMOTE AND ALARM BOARD

17.1 Circuit Description

The remote and alarm board provides three functions in the RE 331:

* Reads the remote inputs.
* Sets the output relays.
* Implements a program run away watchdog.

The CPU communicates with the remote and alarm board via the serial bus. The receiver on the serial bus is QD3. The addresses used are:

write on address 0C0H for setting the alarm relay K30.
write on address 0C2H for setting the relays K1 to K15.
write on address 0C4H for setting the relays K16 to K29 and K31.
read on address 0C0H for reseting the watchdog.
read on address 0C2H for reading the lower half of the remote input.
read on address 0C4H for reading the upper half of the remote input.

The remote input status are read with QD2, QD4 and QD17.

The relays K1 to K15 are set with QD5, QD6, QD7, QD8, QD9 and QD10.

The relays K16 to K29 and K31 are set with QD11, QD12, QD13, QD14, QD15 and QD16. The relay K31 can be mounted as either a normal relay or an electronic relay.

The alarm relay K30 is set directly from the serial interface PAL QD3.

The program run away watchdog QD1 is a free running counter. If the counter is not reset by the CPU it generates an NMI (Non Maskable Interrupt) to the CPU.

Note that with the remote loopback test it is possible to test all remote inputs and all alarm outputs.

17.2 Schematic Diagram

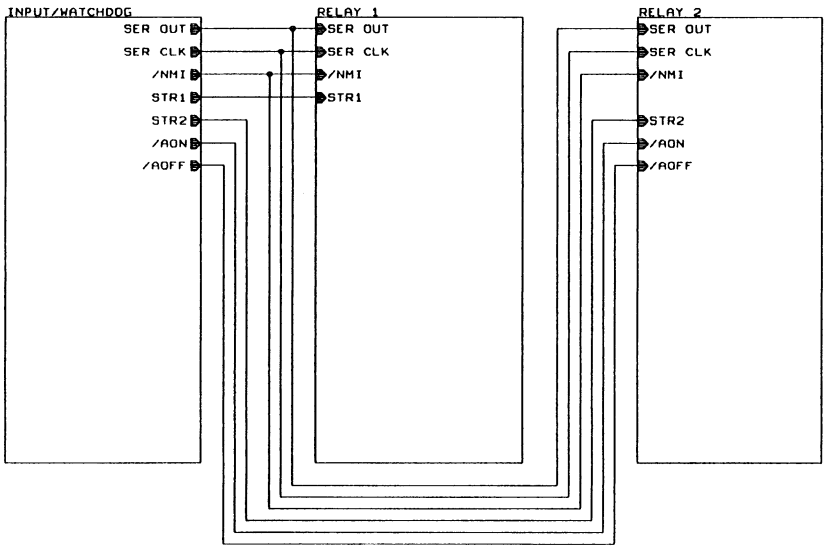
The schematic diagram for the Remote and Alarm Board is located in the following. The diagram number is 985-322.

17.3 Component Locations

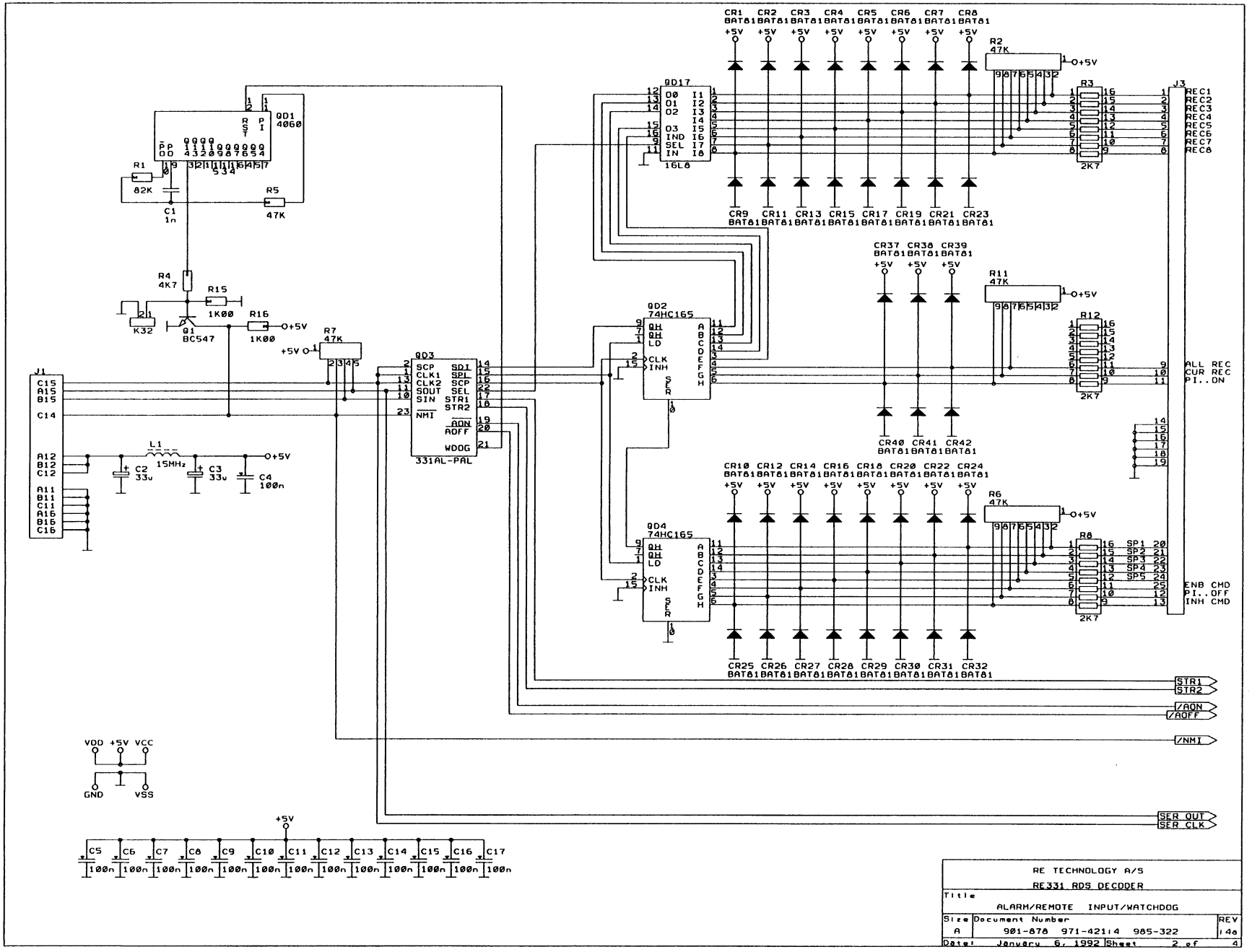
The following shows the component locations on the Remote and Alarm Board.

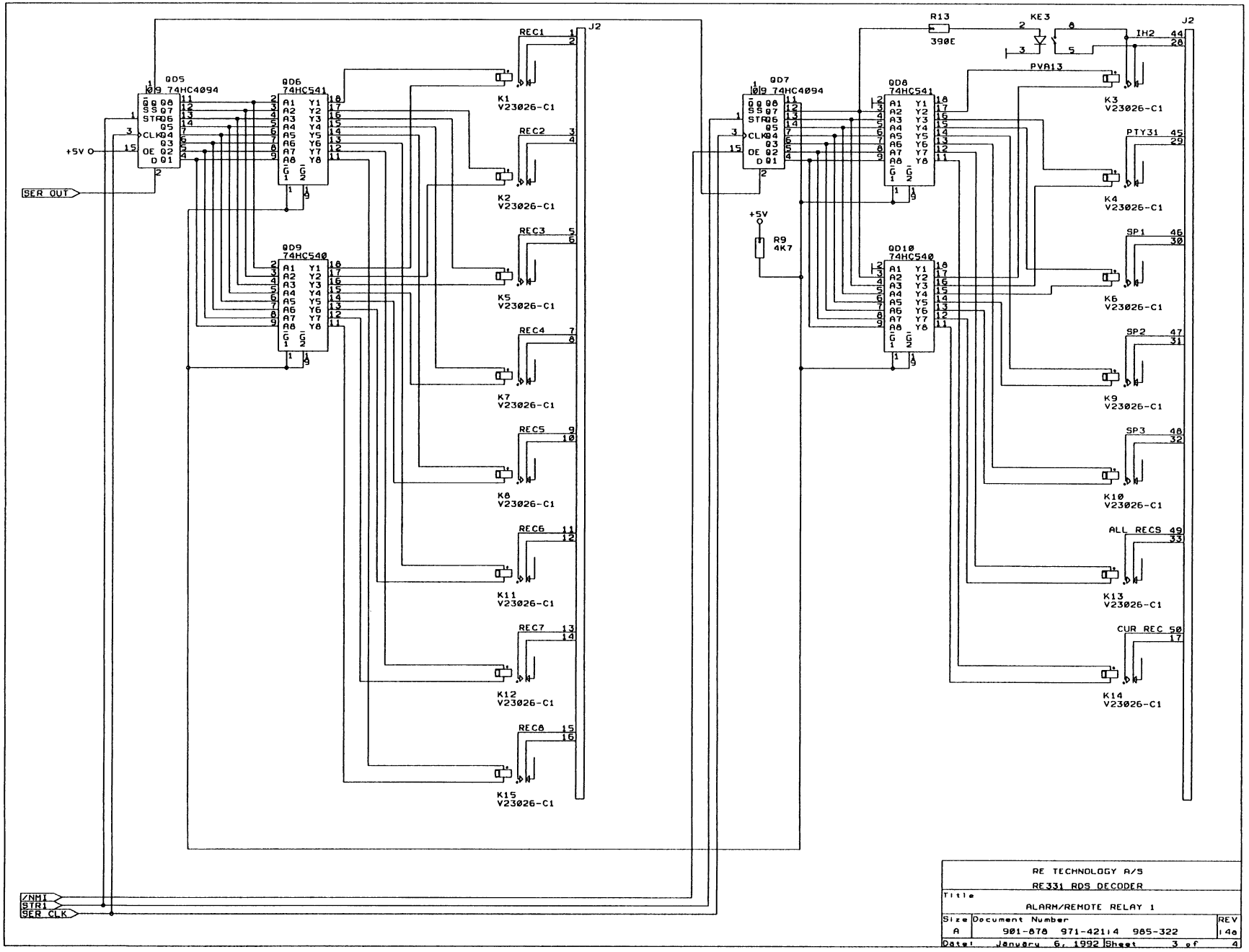
17.4 Parts List

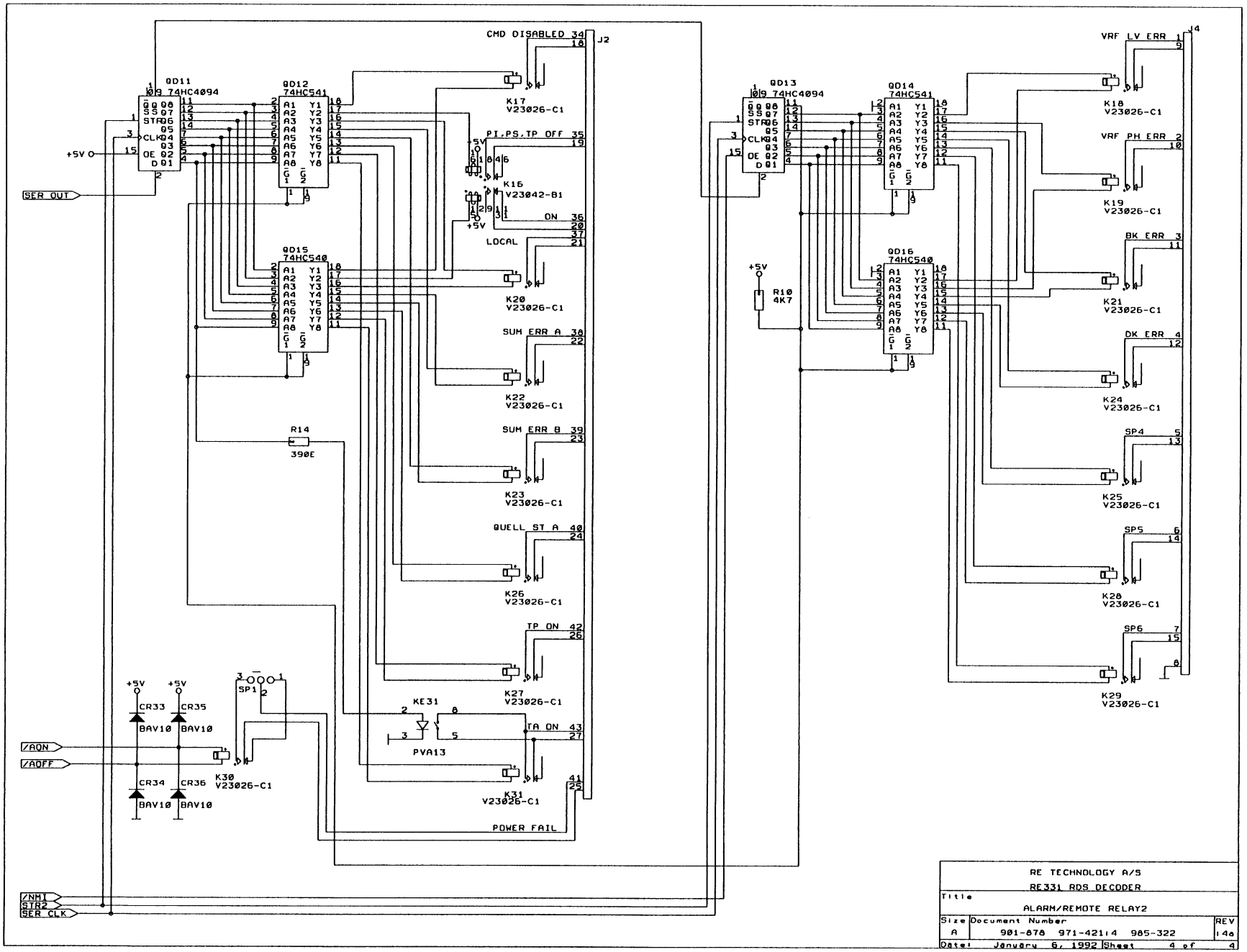
The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-878.



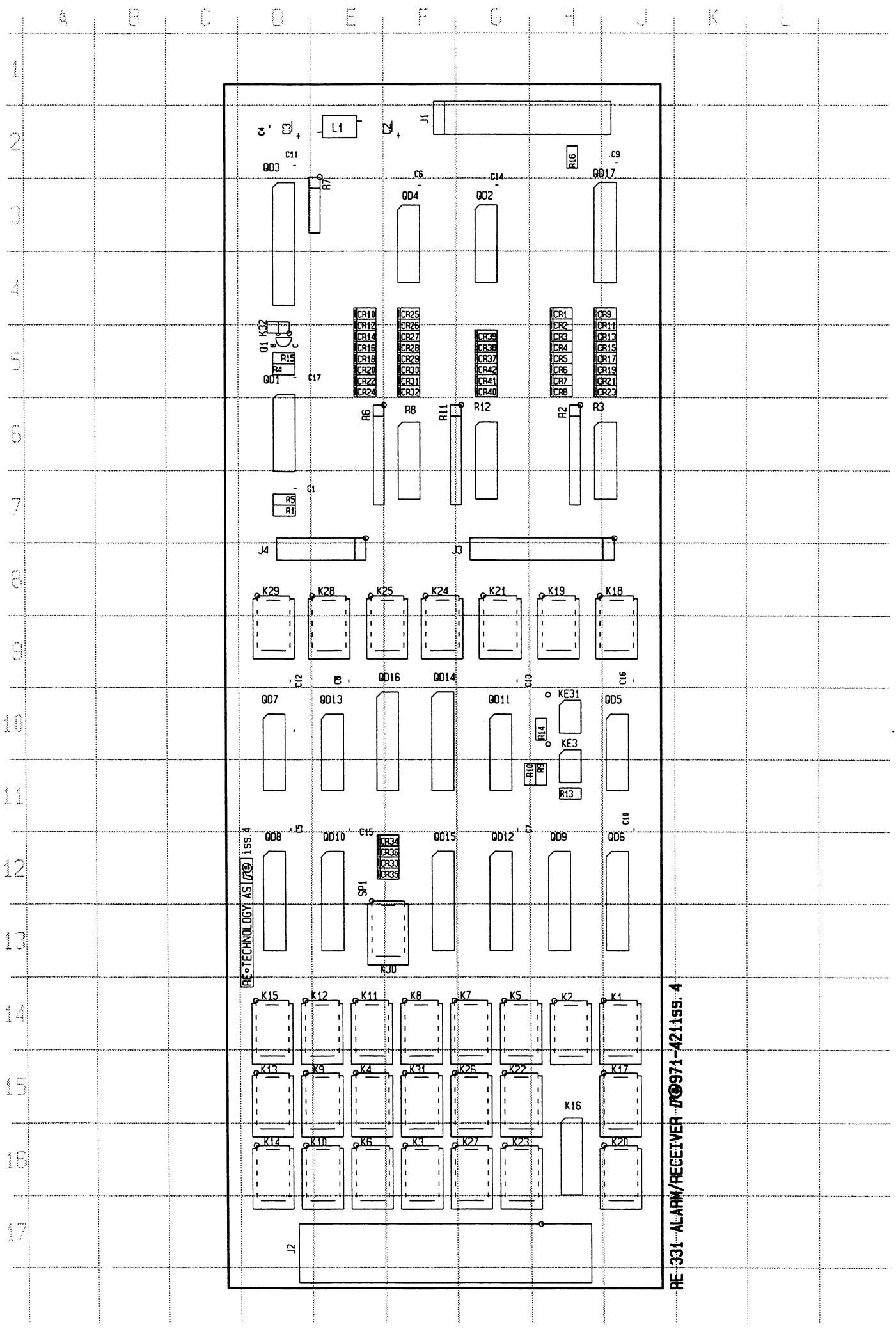
RE TECHNOLOGY A/S		
RE331 RDS DECODER		
Title: ALARM/REMOTE BOARD		
Size: A	Document Number: 901-878 971-4211-4 985-322	REV: 1.4a
Date: January 6, 1992	Sheet: 1 of 4	


QD1
4060
534
R1
82K
C1
1n
R5
47K
R4
4K7
R15
1K00
R16
1K00
+5V
K32
Q1
BC547
R7
47K
J1
C15
A15
B15
C14
A12
B12
C12
A11
B11
C11
A16
B16
C16
L1
15MHz
C2
33u
C3
33u
C4
100n
QD3
SCP
CLK1
CLK2
SDOUT
SIN
NMI
SDI
SPL
SCP
SEL
STR1
STR2
AON
AOFF
WDOG
331AL-PAL
QD17
O0
O1
O2
O3
IND
SEL
IN
I1
I2
I3
I4
I5
I6
I7
I8
16L8
CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8
BAT81
CR9 CR11 CR13 CR15 CR17 CR19 CR21 CR23
R2
47K
R3
2K7
J3
REC1
REC2
REC3
REC4
REC5
REC6
REC7
REC8
QD2
74HC165
QH
QH
LD
CLK
INH
SER
A
B
C
D
E
F
G
H
CR37 CR38 CR39
CR40 CR41 CR42
R11
47K
R12
2K7
ALL REC
CUR REC
PI..ON
CR10 CR12 CR14 CR16 CR18 CR20 CR22 CR24
CR25 CR26 CR27 CR28 CR29 CR30 CR31 CR32
QD4
74HC165
R6
47K
R8
2K7
SP1
SP2
SP3
SP4
SP5
ENB CMD
PI..OFF
INH CMD
STR1
STR2
/AON
/AOFF
/NMI
SER OUT
SER CLK
VDD +5V VCC
GND VSS
+5V
C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17
100n
RE TECHNOLOGY A/S
RE331 RDS DECODER
Title
ALARM/REMOTE INPUT/WATCHDOG
Size
A
Document Number
901-878 971-421:4 985-322
REV
1.4a
Date: January 6, 1992
Sheet 2 of 4


QD5
74HC4094
QD6
74HC541
QD7
74HC4094
QD8
74HC541
QD9
74HC540
QD10
74HC540
+5V
SER OUT
R13
390E
KE3
R9
4K7
J2
REC1
REC2
REC3
REC4
REC5
REC6
REC7
REC8
K1
V23026-C1
K2
V23026-C1
K5
V23026-C1
K7
V23026-C1
K8
V23026-C1
K11
V23026-C1
K12
V23026-C1
K15
V23026-C1
IH2
PVA13
PTY31
SP1
SP2
SP3
ALL RECS
CUR REC
K3
V23026-C1
K4
V23026-C1
K6
V23026-C1
K9
V23026-C1
K10
V23026-C1
K13
V23026-C1
K14
V23026-C1
/NMI
STR
SER CLK
RE TECHNOLOGY A/S
RE331 RDS DECODER
Title
ALARM/REMOTE RELAY 1
Size
A
Document Number
901-878 971-421:4 985-322
REV
1.4a
Date: January 6, 1992
Sheet 3 of 4



RE TECHNOLOGY A/S		
RE331 RDS DECODER		
Title: ALARM/REMOTE RELAY2		
Size: A	Document Number: 901-878 971-4214 985-322	REV: 14a
Date: January 6, 1992	Sheet: 4 of 4	


RE•TECHNOLOGY AS
RE 331 ALARM/RECEIVER 971-421iss. 4

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	H4	K11	E14																				
CR2	H5	K12	D14																				
CR3	H5	K13	D15																				
CR4	H5	K14	D16																				
CR5	H5	K15	D14																				
CR6	H5	K16	H15																				
CR7	H5	K17	J15																				
CR8	H5	K18	J8																				
CR9	H4	K19	H8																				
CR10	E4	K20	J16																				
CR11	H5	K21	G8																				
CR12	E5	K22	G15																				
CR13	H5	K23	G16																				
CR14	E5	K24	F8																				
CR15	H5	K25	E8																				
CR16	E5	K26	G15																				
CR17	H5	K27	G16																				
CR18	E5	K28	E8																				
CR19	H5	K29	D8																				
CR20	E5	K30	E13																				
CR21	H5	K31	F15																				
CR22	E5	K32	D4																				
CR23	H5	L1	E2																				
CR24	E5	QD1	D5																				
CR25	F4	QD2	G3																				
CR26	F5	QD3	D2																				
CR27	F5	QD4	F3																				
CR28	F5	QD5	J10																				
CR29	F5	QD6	J12																				
CR30	F5	QD7	D10																				
CR31	F5	QD8	D12																				
CR32	F5	QD9	H12																				
CR33	E12	QD10	E12																				
CR34	E12	QD11	G10																				
CR35	E12	QD12	G12																				
CR36	E12	QD13	E10																				
CR37	G5	QD14	F9																				
CR38	G5	QD15	F12																				
CR39	G5	QD16	E9																				
CR40	G5	QD17	H2																				
CR41	G5	Q1	D5																				
CR42	G5	R1	D7																				
C1	D7	R2	H6																				
C2	F2	R3	H6																				
C3	D2	R4	D5																				
C4	D2	R5	D7																				
C5	D12	R6	E6																				
C6	F2	R7	E3																				
C7	H12	R8	F6																				
C8	E9	R9	H11																				
C9	J2	R10	G11																				
C10	J11	R11	F6																				
C11	D2	R12	G6																				
C12	D9	R13	H11																				
C13	H9	R14	H10																				
C14	G2	R15	D5																				
C15	E12	R16	H2																				
C16	J9	SP1	E12																				
C17	E5	4	D12																				
J1	F2																						
J2	D17																						
J3	G8																						
J4	D8																						
KE3	H10																						
KE31	H10																						
K1	J14																						
K2	H14																						
K3	F16																						
K4	E15																						
K5	G14																						
K6	E16																						
K7	G14																						
K8	F14																						
K9	E15																						
K10	D16																						

COMPONENT SIDE

Remote and Alarm Board (901-878)

CAPACITORS

C 1	C Ceramic 1n 5% NP0 63V	213-616
C 2	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 3	C Solid Aluminium 33u 20% 10V Short Type	265-105
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 100n 20% 50V	213-401
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Ceramic 100n 20% 50V	213-401

DIODES

CR 1	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 2	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 3	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 4	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 5	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 6	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 7	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 8	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 9	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 10	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 11	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 12	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 13	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 14	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 15	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 16	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 17	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 18	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 19	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 20	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 21	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 22	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 23	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 24	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 25	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 26	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 27	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 28	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 29	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 30	Diode Bat81 schottky Vr-40V If-30mA	350-066

CR 31	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 32	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 33	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 34	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 35	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 36	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 37	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 38	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 39	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 40	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 41	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 42	Diode Bat81 schottky Vr-40V If-30mA	350-066

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 2	D-Sub 50 pol female 90° angled	806-058
J 3	DIN 41651 header f. pcb 26 pol	805-961
J 4	Header Straight 16p Male For Pcb	805-056

RELAYS & JUMPERS

K 1	Relay Miniature V23026-C1051-B201	570-091
K 2	Relay Miniature V23026-C1051-B201	570-091
K 4	Relay Miniature V23026-C1051-B201	570-091
K 5	Relay Miniature V23026-C1051-B201	570-091
K 6	Relay Miniature V23026-C1051-B201	570-091
K 7	Relay Miniature V23026-C1051-B201	570-091
K 8	Relay Miniature V23026-C1051-B201	570-091
K 9	Relay Miniature V23026-C1051-B201	570-091
K 10	Relay Miniature V23026-C1051-B201	570-091
K 11	Relay Miniature V23026-C1051-B201	570-091
K 12	Relay Miniature V23026-C1051-B201	570-091
K 13	Relay Miniature V23026-C1051-B201	570-091
K 14	Relay Miniature V23026-C1051-B201	570-091
K 15	Relay Miniature V23026-C1051-B201	570-091
K 16	Miniature Relay D2 V23042-B1201-B101	570-088
K 17	Relay Miniature V23026-C1051-B201	570-091
K 18	Relay Miniature V23026-C1051-B201	570-091
K 19	Relay Miniature V23026-C1051-B201	570-091
K 20	Relay Miniature V23026-C1051-B201	570-091
K 21	Relay Miniature V23026-C1051-B201	570-091
K 22	Relay Miniature V23026-C1051-B201	570-091
K 23	Relay Miniature V23026-C1051-B201	570-091
K 24	Relay Miniature V23026-C1051-B201	570-091
K 25	Relay Miniature V23026-C1051-B201	570-091
K 26	Relay Miniature V23026-C1051-B201	570-091
K 27	Relay Miniature V23026-C1051-B201	570-091
K 28	Relay Miniature V23026-C1051-B201	570-091
K 29	Relay Miniature V23026-C1051-B201	570-091
K 30	Relay Miniature V23026-C1051-B201	570-091
K 32	2-pol amp connector	805-951

CHOKES

L 1	RF-choke six-hole core green	731-204

TRANSISTORS

Q 1	Transistor BC547B npn	360-159

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC4060 BIN Counter With Oscillator	364-817
QD 2	IC 74HC165 Shift Register	365-013
QD 3	RE331 Alarmboard Pal Ver 2.0 5C060	369-390
QD 4	IC 74HC165 Shift Register	365-013
QD 5	IC 74HC4094 8 stage shift REG.	364-811
QD 6	IC 74HC541 Octal buffer/line driver	364-781
QD 7	IC 74HC4094 8 stage shift REG.	364-811
QD 8	IC 74HC541 Octal buffer/line driver	364-781
QD 9	IC 74HC540 Octal Buffer/line driver inverting	364-839
QD 10	IC 74HC540 Octal Buffer/line driver inverting	364-839
QD 11	IC 74HC4094 8 stage shift REG.	364-811
QD 12	IC 74HC541 Octal buffer/line driver	364-781
QD 13	IC 74HC4094 8 stage shift REG.	364-811
QD 14	IC 74HC541 Octal buffer/line driver	364-781
QD 15	IC 74HC540 Octal Buffer/line driver inverting	364-839
QD 16	IC 74HC540 Octal Buffer/line driver inverting	364-839
QD 17	RE331 Alarmboard Pal Ver 2.0 16L8	369-391

RESISTORS

R 1	R Metal film 82K0 5% 0.2W TC250	107-582
R 2	R Thick film Sil 8*47K	146-005
R 3	R Thick film Dil 8*2K7 2% 0.25W TC250	146-028
R 4	R Metal film 4K70 5% 0.2W TC250	107-447
R 5	R Metal film 47K0 5% 0.2W TC250	107-547
R 6	R Thick film Sil 8*47K	146-005
R 7	R Thick Film Sil 4*47K 5% 0.1W	146-018
R 8	R Thick film Dil 8*2K7 2% 0.25W TC250	146-028
R 9	R Metal film 4K70 5% 0.2W TC250	107-447
R 10	R Metal film 4K70 5% 0.2W TC250	107-447
R 11	R Thick film Sil 8*47K	146-005
R 12	R Thick film Dil 8*2K7 2% 0.25W TC250	146-028
R 13	R Metal film 390E 5% 0.2W TC250	107-339
R 14	R Metal film 390E 5% 0.2W TC250	107-339
R 15	R Metal film 1K00 5% 0.2W TC250	107-410
R 16	R Metal film 1K00 5% 0.2W TC250	107-410

MISCELLANEOUS

Screw pozidriv panhead M2.5x8	008-208
Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
Lock washer D2,7/4,8x0,45	046-404
Tubular rivet D2,5x6	060-260
Tubular Rivet 2.5X10	060-310

	Flat Cabel For RE331 Alarm Board	617-941
	Flat Cabel For RE331 Alarm Board	617-942
	D-Sub access, screw lock for chassis	805-470
	16 Pin Dil Socket	816-133
	20 Pin DIL Socket	816-184
	24 Pin DIL Socket w. 3 modul spacing	816-274
	L-piece for PCB	857-041
	PCB For RE331 Remote/alarm	971-421
	Rear Plate F.Alarm/Remote Sub Dwg 933-116	978-295
KE 3	PCA1354 Photo Vol-taic Relay	570-093
KE 31	PCA1354 Photo Vol-taic Relay	570-093

18. KEYBOARD

18.1 Circuit Description

The keyboard implements three sub-circuits of the RE 331:

* The keys with key scanning circuits.
* The LEDS in the keys.
* The interface to the display.

When a key is pressed or the cursor wheel turned, the output of QD9 is set high. The output is debounced with QD4C and QD4D and generates via QD1 an interrupt to the main CPU.

The keys S1 to S37 and the cursor wheel are then scanned from the main CPU via the serial bus. The PAL QD1 decodes the serial bus transmission. A read on the addresses 0A0H to 0A60H each provide information on two of the rows of keys. The information from the cursor wheel comes from QD8 and is always read. All information is loaded into the parallel to serial register QD7 and send back to the CPU during the serial bus transmission. A read on address 0A80H provides information on the undisturbed key matrix. From all this information the CPU can calculate which key is pressed.

The LEDS in the keys are controlled via the serial bus. The PAL controlling the latch pulses for the 3 latches QD5, QD6 and QD10 is situated on the front panel board. The two LEDs in S30 and S31 can be put in blink mode controlled from the front panel board.

The interface to the display is also controlled from the serial bus. A parallel/serial shift register QD3 enables the CPU to send and receive data from the display. The PAL controlling the display is situated on the front panel board. QD11D can be used to invert the interrupt from the display.

K1 can be used to force the display into a test mode. If you short pin 1 and pin 2 on K1 on power up, then the display enters a test mode where it slowly shows the possible characters.

18.2 Schematic Diagramn

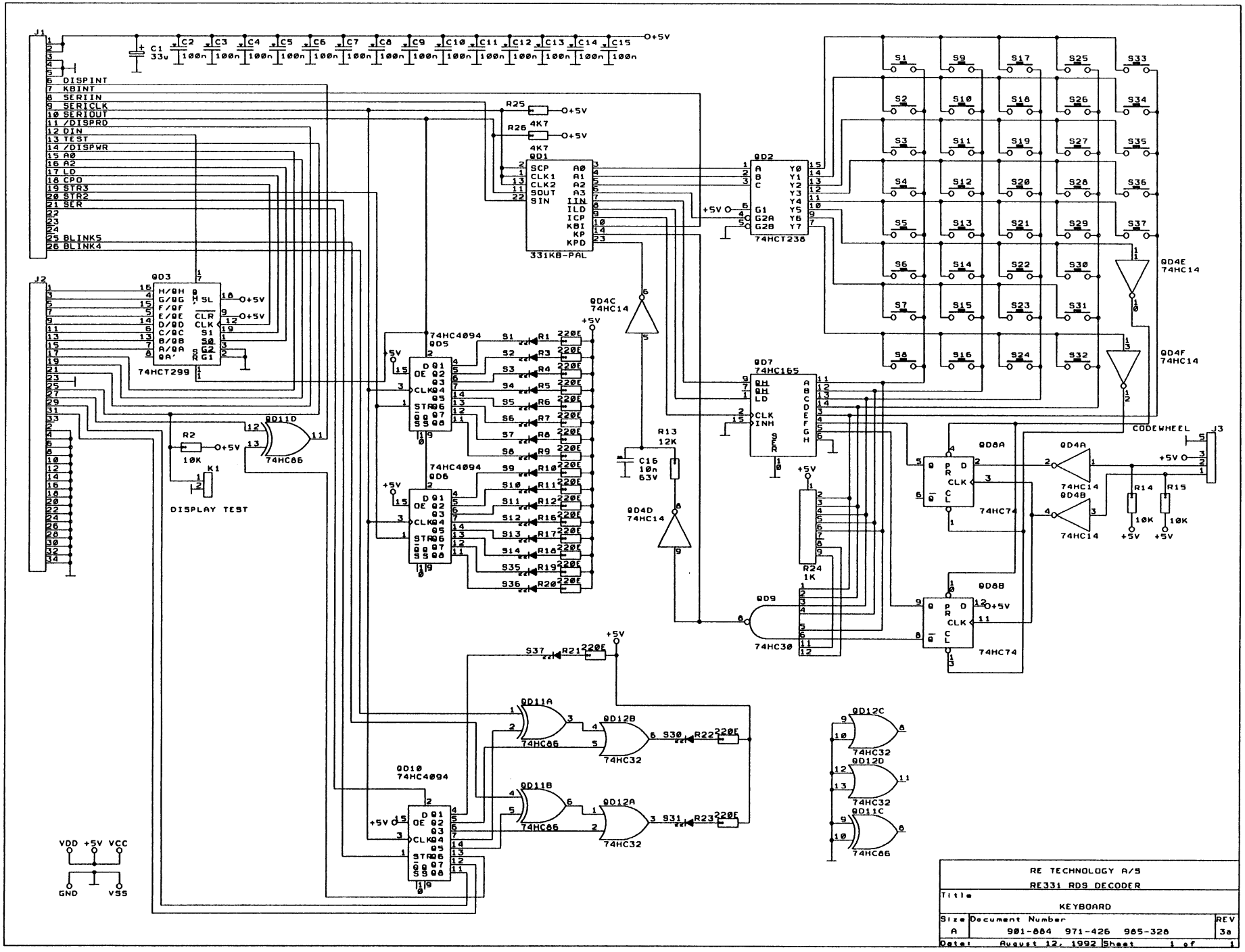
The schematic diagram for the Keyboard is located in the following. The diagram number is 985-328.

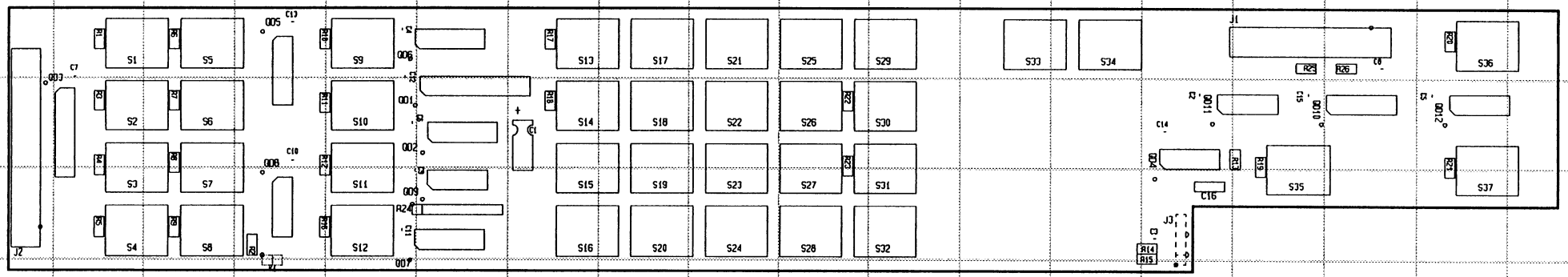
18.3 Component Locations

The following shows the component locations on the Keyboard.

18.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 902-239.


J1
C1 33u
C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 100n
+5V
DISPINT
KBINT
SERIIN
SERICLK
SERIOUT
/DISPRD
DIN
TEST
/DISPWR
A0
A2
LD
CPO
STR3
STR2
SER
BLINK5
BLINK4
R25 4K7
R26 4K7
QD1
331K8-PAL
SCP
CLK1
CLK2
SDOUT
SDIN
A0
A1
A2
A3
IIN
ILD
ICP
KBI
KP
KPD
QD2
74HCT238
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
G1
G2A
G2B
S1 S2 S3 S4 S5 S6 S7 S8
S9 S10 S11 S12 S13 S14 S15 S16
S17 S18 S19 S20 S21 S22 S23 S24
S25 S26 S27 S28 S29 S30 S31 S32
S33 S34 S35 S36 S37
QD4E 74HC14
QD4F 74HC14
J2
QD3
74HCT299
QD4C 74HC14
QD4D 74HC14
QD5 74HC4094
QD6 74HC4094
R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 220E
R13 12K
C16 10n 63V
QD7 74HC165
QD8A QD8B 74HC74
QD4A QD4B 74HC14
R14 10K
R15 10K
CODEWHEEL
J3
R2 10K
K1
DISPLAY TEST
QD11D 74HC86
R24 1K
QD9 74HC30
R21 220E
R22 220E
R23 220E
QD11A QD11B QD11C QD11D 74HC86
QD12A QD12B QD12C QD12D 74HC32
QD10 74HC4094
VDD +5V VCC
GND VSS
RE TECHNOLOGY A/S
RE331 RDS DECODER
Title
KEYBOARD
Size A
Document Number 901-884 971-426 985-328
REV 3a
Date: August 12, 1992
Sheet 1 of 1



DWG 971-426iss.3 KEY BOARD

COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC	COMP.	LOC
C1	F12	S18	F11																						
C2	F5	S19	G11																						
C3	G5	S20	G11																						
C4	E14	S21	E10																						
C5	F2	S22	F10																						
C6	F13	S23	G10																						
C7	E17	S24	G10																						
C8	E3	S25	E9																						
C9	F13	S26	F9																						
C10	F15	S27	G9																						
C11	G14	S28	G9																						
C12	E14	S29	E8																						
C13	E15	S30	F8																						
C14	F5	S31	G8																						
C15	F4	S32	G8																						
C16	G5	S33	E7																						
J1	E4	S34	E6																						
J2	G18	S35	G4																						
J3	G5	S36	E2																						
K1	H15	S37	G2																						
QD1	F14																								
QD2	F14																								
QD3	F18																								
QD4	F5																								
QD5	E15																								
QD6	E14																								
QD7	H14																								
QD8	F15																								
QD9	G13																								
QD10	F4																								
QD11	F5																								
QD12	F2																								
R1	E17																								
R2	G15																								
R3	F17																								
R4	F17																								
R5	G17																								
R6	E16																								
R7	F16																								
R8	F16																								
R9	G16																								
R10	E15																								
R11	F15																								
R12	F15																								
R13	F4																								
R14	G5																								
R15	G5																								
R16	G15																								
R17	E12																								
R18	F12																								
R19	F4																								
R20	E2																								
R21	F2																								
R22	F9																								
R23	F9																								
R24	G14																								
R25	E4																								
R26	E3																								
S1	E17																								
S2	F17																								
S3	G17																								
S4	G17																								
S5	E16																								
S6	F16																								
S7	G16																								
S8	G16																								
S9	E14																								
S10	F14																								
S11	G14																								
S12	G14																								
S13	E12																								
S14	F12																								
S15	G12																								
S16	G12																								
S17	E11																								

COMPONENT SIDE

Keyboard (902-239)

CAPACITORS

C 1	Electrolytic 22/10, 2000h/85°, A:5*12.5, RM6	260-061
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C Ceramic 100n 20% 50V	213-401
C 9	C Ceramic 100n 20% 50V	213-401
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Ceramic 100n 20% 50V	213-401
C 12	C Ceramic 100n 20% 50V	213-401
C 13	C Ceramic 100n 20% 50V	213-401
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	MKT, 0.01/250/10, R:2.5*6.5*7.2, RM2	241-069

CONNECTORS

J 1	Flat Cabel For RE331 Keyboard	617-946
J 2	Flat Cabel For RE331 Keyboard	617-945
J 3	5 Pin Connector Male mod II W. Lock	805-895

RELAYS & JUMPERS

K 1	2-pol amp connector	805-951

INTEGRATED DIGITAL CIRCUITS

QD 1	RE331 Keyboard Pal 5C060	369-344
QD 2	IC 74HCT238 3 to 8 decode NAND	364-694
QD 3	IC 74HCT299 8-bit Shift register	364-782
QD 4	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 5	IC 74HC4094 8 stage shift REG.	364-811
QD 6	IC 74HC4094 8 stage shift REG.	364-811
QD 7	IC 74HC165 Shift Register	365-013
QD 8	IC 74HC74P dual d ff	364-755
QD 9	IC 74HC30 8-Input Nand Gate	365-015
QD 10	IC 74HC4094 8 stage shift REG.	364-811
QD 11	IC 74HC86 Quad 2-Input EX OR Gate	364-804
QD 12	IC 74HC32 Quad 2-Input OR Gate	364-756

RESISTORS

R 1	R Metal film 220E 5% 0.2W TC250	107-322
R 2	R Metal film 10K0 5% 0.2W TC250	107-510
R 3	R Metal film 220E 5% 0.2W TC250	107-322
R 4	R Metal film 220E 5% 0.2W TC250	107-322
R 5	R Metal film 220E 5% 0.2W TC250	107-322
R 6	R Metal film 220E 5% 0.2W TC250	107-322

R 7	R Metal film 220E 5% 0.2W TC250	107-322
R 8	R Metal film 220E 5% 0.2W TC250	107-322
R 9	R Metal film 220E 5% 0.2W TC250	107-322
R 10	R Metal film 220E 5% 0.2W TC250	107-322
R 11	R Metal film 220E 5% 0.2W TC250	107-322
R 12	R Metal film 220E 5% 0.2W TC250	107-322
R 13	R Metal film 12K0 5% 0.2W TC250	107-512
R 14	R Metal film 10K0 5% 0.2W TC250	107-510
R 15	R Metal film 10K0 5% 0.2W TC250	107-510
R 16	R Metal film 220E 5% 0.2W TC250	107-322
R 17	R Metal film 220E 5% 0.2W TC250	107-322
R 18	R Metal film 220E 5% 0.2W TC250	107-322
R 19	R Metal film 220E 5% 0.2W TC250	107-322
R 20	R Metal film 220E 5% 0.2W TC250	107-322
R 21	R Metal film 220E 5% 0.2W TC250	107-322
R 22	R Metal film 220E 5% 0.2W TC250	107-322
R 23	R Metal film 220E 5% 0.2W TC250	107-322
R 24	R Thick film Sil 8*1K	146-010
R 25	R Metal film 4K70 5% 0.2W TC250	107-447
R 26	R Metal film 4K70 5% 0.2W TC250	107-447

SWITCHES

S 1	Keyboard Switch W Green Led 16x19mm	551-167
S 2	Keyboard Switch W Green Led 16x19mm	551-167
S 3	Keyboard Switch W Green Led 16x19mm	551-167
S 4	Keyboard Switch W Green Led 16x19mm	551-167
S 5	Keyboard Switch W Green Led 16x19mm	551-167
S 6	Keyboard Switch W Green Led 16x19mm	551-167
S 7	Keyboard Switch W Green Led 16x19mm	551-167
S 8	Keyboard Switch W Green Led 16x19mm	551-167
S 9	Keyboard Switch W Green Led 16x19mm	551-167
S 10	Keyboard Switch W Green Led 16x19mm	551-167
S 11	Keyboard Switch W Green Led 16x19mm	551-167
S 12	Keyboard Switch W Green Led 16x19mm	551-167
S 13	Keyboard Switch W Green Led 16x19mm	551-167
S 14	Keyboard Switch W Green Led 16x19mm	551-167
S 15	Tast 16x19 without LED	551-166
S 16	Tast 16x19 without LED	551-166
S 17	Tast 16x19 without LED	551-166
S 18	Tast 16x19 without LED	551-166
S 19	Tast 16x19 without LED	551-166
S 20	Tast 16x19 without LED	551-166
S 21	Tast 16x19 without LED	551-166
S 22	Tast 16x19 without LED	551-166
S 23	Tast 16x19 without LED	551-166
S 24	Tast 16x19 without LED	551-166
S 25	Tast 16x19 without LED	551-166
S 26	Tast 16x19 without LED	551-166
S 27	Tast 16x19 without LED	551-166
S 28	Tast 16x19 without LED	551-166
S 29	Tast 16x19 without LED	551-166
S 30	Keyboard Switch W Green Led 16x19mm	551-167
S 31	Keyboard Switch W Green Led 16x19mm	551-167

S 32	Tast 16x19 without LED	551-166
S 33	Tast 16x19 without LED	551-166
S 34	Tast 16x19 without LED	551-166
S 35	Keyboard Switch W Green Led 16x19mm	551-167
S 36	Tast 16x19 with Red LED	551-165
S 37	Keyboard Switch W Green Led 16x19mm	551-167

MISCELLANEOUS

MO86 Keytop CE	520-228
MO86 Keytop ENTER	520-231
MO86 Keytop RDS MENU	520-233
MO86 Keytop AUX.MENU	520-235
MO86 Keytop 0	520-236
MO86 Keytop 1	520-237
MO86 Keytop 2	520-238
MO86 Keytop 3	520-239
MO86 Keytop 4	520-240
MO86 Keytop 5	520-241
MO86 Keytop 6	520-242
MO86 Keytop 7	520-243
MO86 Keytop 8	520-244
MO86 Keytop 9	520-245
MO86 Keytop .	520-246
MO86 Keytop -	520-247
MO86 Keytop >	520-248
MO86 Keytop <	520-249
MO86 Keytop LOCAL	520-250
Buttons 'STORE' RE 331	520-279
Buttons 'FRONT' RE 331	520-280
Buttons 'CANCEL' RE 331	520-281
Buttons 'ACCEPT' RE 331	520-282
Buttons 'MXP (0)' RE 331	520-283
Buttons ' DISP 2' RE 331	520-284
Buttons ' DISP 1' RE 331	520-285
Buttons ' TEST MENU' RE 331	520-286
Buttons ' V.24 MENU' RE 331	520-290
Buttons ' ON MENU' RE 331	520-295
Keytop ' ERROR MENU' RE 331	520-296
Keytop ' MEAS MENU' RE 331	520-297
Keytop 'SELECT MENU' RE 331	520-298
Keytop 'LIMITS MENU' RE 331	520-299
Keytop 'ADJUST MENU' RE 331	520-300
Keytop ' SETUP MENU' RE 331	520-301
Keytop ' REF MENU' RE 331	520-302
Keytop ' X ' RE 331	520-303
24 Pin DIL Socket w. 3 modul spacing	816-274
PCB For RE331 Keyboard	971-426

19. FRONT PANEL BOARD

19.1 Circuit Description

The 16 LEDs on the front panel board are controlled from the main CPU via the serial bus.

Depending on the data written to the serial to parallel register QD17 some of the LEDs can be put into blink mode. The blinking of some LEDs in the keys of the RE 331 is also controlled here. The blink rate is determined by the slow oscillator QD2A, R9 and C11.

The PAL QD14 interfaces to the serial bus. The PAL also provides a control signal for communication between the CPU and display. The addresses used are :

write on address 0D0H commands for display (D15 to D8).
write on address 0D2H data for display (D15 to D8).
write on address 0D8H data for LEDs on front panel board.
write on address 0DAH data for blink control and LEDs in keys.
write on address 0DCH data for LEDs in keys.
read on address 0D0H read from display

19.2 Schematic Diagramn

The schematic diagram for the Front Panel Board is located in the following. The diagram number is 985-327.

19.3 Component Locations

The following shows the component locations on the Front Panel Board.

19.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-883.

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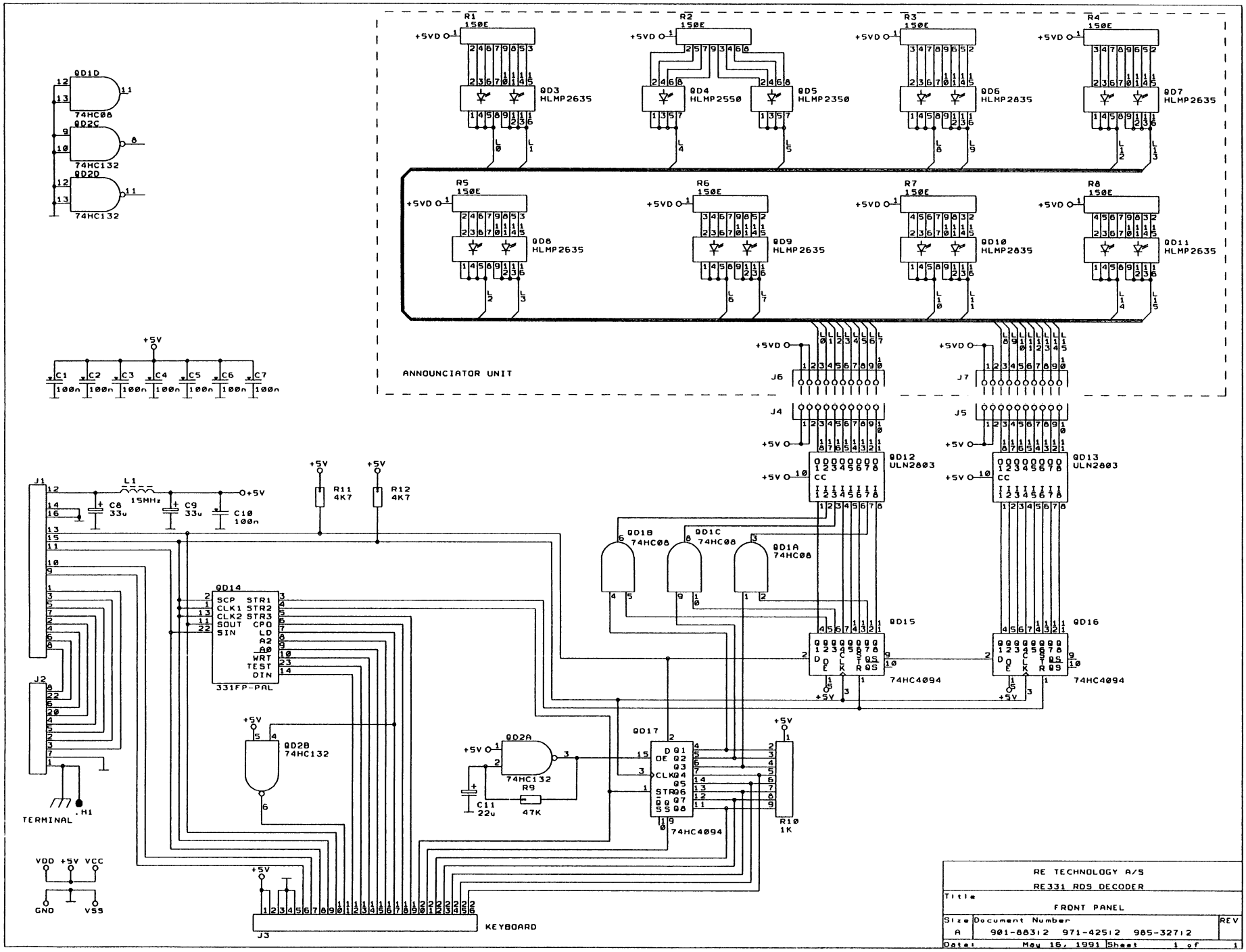
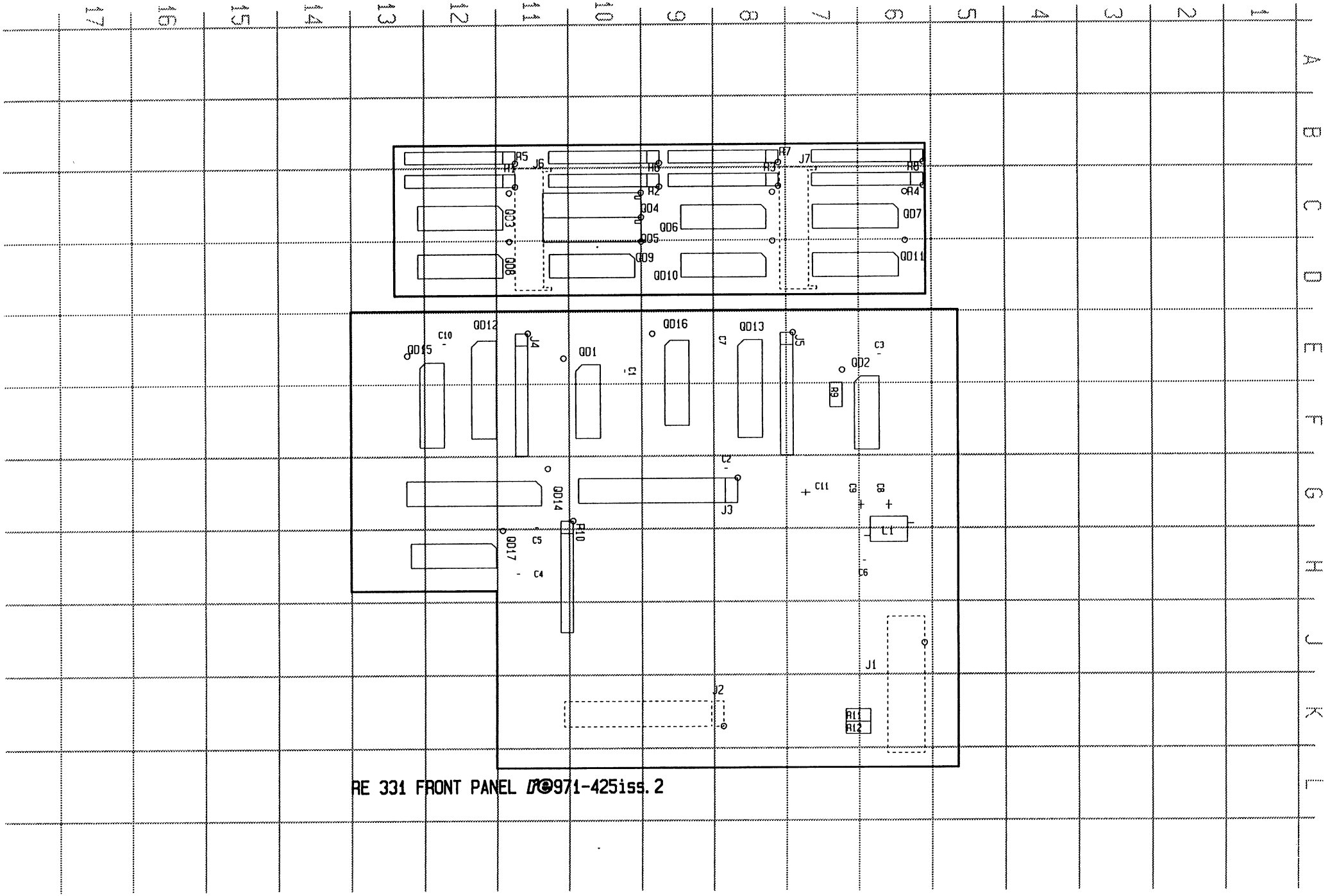


RE TECHNOLOGY A/S		
RE331 RDS DECODER		
Title: FRONT PANEL		
Size: A	Document Number: 901-80312 971-42512 985-32712	REV
Date: May 16, 1991	Sheet 1 of 1	



RE 331 FRONT PANEL M@971-425iss.2

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
C1	E10																						
C2	G8																						
C3	E6																						
C4	H11																						
C5	H11																						
C6	H7																						
C7	E8																						
C8	G6																						
C9	G7																						
C10	E12																						
C11	G7																						
J1	J6																						
J2	K9																						
J3	G8																						
J4	E11																						
J5	E7																						
J6	B11																						
J7	B7																						
L1	G6																						
QD1	E10																						
QD2	E7																						
QD3	C11																						
QD4	C9																						
QD5	C9																						
QD6	C9																						
QD7	C6																						
QD8	D11																						
QD9	D10																						
QD10	D9																						
QD11	D6																						
QD12	E12																						
QD13	E8																						
QD14	G11																						
QD15	E13																						
QD16	E9																						
QD17	H11																						
R1	B11																						
R2	C9																						
R3	B8																						
R4	C6																						
R5	B11																						
R6	B9																						
R7	B7																						
R8	B6																						
R9	F7																						
R10	G10																						
R11	K7																						
R12	K7																						

COMPONENT SIDE

Front Panel Board (901-883)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Ceramic 100n 20% 50V	213-401
C 8	C solid AL 33u 20% 10V	265-005
C 9	C solid AL 33u 20% 10V	265-005
C 10	C Ceramic 100n 20% 50V	213-401
C 11	C Solid alu 22u 20% 6.3V	265-009

CONNECTORS

J 1	Flat Cabel For RE331 Front Panel	617-943
J 2	DIN 41651 26-POL PCB Mounted	805-918
J 3	DIN 41651 header f. pcb 26 pol	805-961
J 4	Wire Wrap Terminal	805-727
J 5	Wire Wrap Terminal	805-727
J 6	Con Straight Header 10p Top Entry	806-051
J 7	Con Straight Header 10p Top Entry	806-051

CHOKES

L 1	RF-choke six-hole core green	731-204

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC08 Quad 2-Input And Gate	364-808
QD 2	IC 74HC132 Quad 2-InP Nand Schmitt Tigger	364-825
QD 3	LED HLMP-2635, light bar 2 segments 3.81*19.05, hi-r	350-806
QD 4	LED HLMP-2550, light bar 1 segment 19.05*3.81, green	350-812
QD 5	LED HLMP-2350, light bar 1 segment 19.05*3.81, hi-re	350-811
QD 6	LED HLMP-2835, light bar 2 segments 3.81*19.05, gree	350-808
QD 7	LED HLMP-2635, light bar 2 segments 3.81*19.05, hi-r	350-806
QD 8	LED HLMP-2635, light bar 2 segments 3.81*19.05, hi-r	350-806
QD 9	LED HLMP-2635, light bar 2 segments 3.81*19.05, hi-r	350-806
QD 10	LED HLMP-2835, light bar 2 segments 3.81*19.05, gree	350-808
QD 11	LED HLMP-2635, light bar 2 segments 3.81*19.05, hi-r	350-806
QD 12	Transistor ULN2803 Darlington Arrys	360-279
QD 13	Transistor ULN2803 Darlington Arrys	360-279
QD 14	RE331 Frontpanel Pal 5C060	369-345
QD 15	IC 74HC4094 8 stage shift REG.	364-811
QD 16	IC 74HC4094 8 stage shift REG.	364-811
QD 17	IC 74HC4094 8 stage shift REG.	364-811

RESISTORS

R 1	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 2	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 3	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 4	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 5	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 6	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 7	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 8	R Thick Film Sil 8*270E 5% 0.18W	146-023
R 9	R Metal film 27K0 5% 0.2W TC250	107-527
R 10	R Thick film Sil 8*1K	146-010
R 11	R Metal film 4K70 5% 0.2W TC250	107-447
R 12	R Metal film 4K70 5% 0.2W TC250	107-447

MISCELLANEOUS

Nipple thrd M2,5/3,5-1,25	065-420
24 Pin DIL Socket w. 3 modul spacing	816-274
PCB For RE331 Frontpanel Board	971-425

20. REAR PANEL BOARD

20.1 Circuit Description

The rear panel board connects the communication/sync board connected to J7, with the four V24 connectors J1, J2, J3 and J4 on the rear panel of the RE 331.

The RDS clock and RDS data from the communication/sync board are converted to TTL levels with QD1 and sent to the connectors J5 and J6.

20.2 Schematic Diagramn

The schematic diagram for the Rear Panel Board is located in the following. The diagram number is 985-320.

20.3 Component Locations

The following shows the component locations on the Rear Panel Board.

20.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 901-876.

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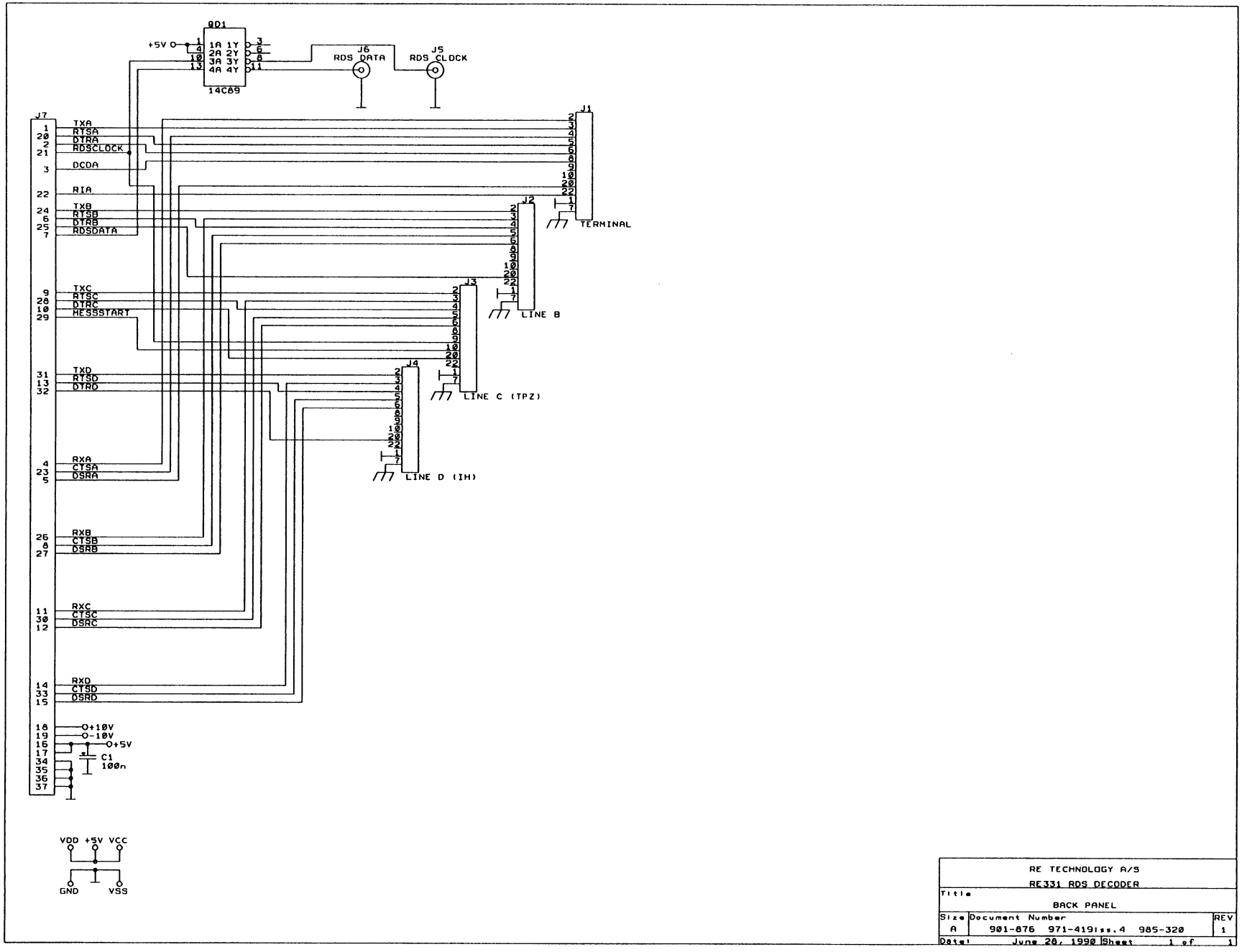
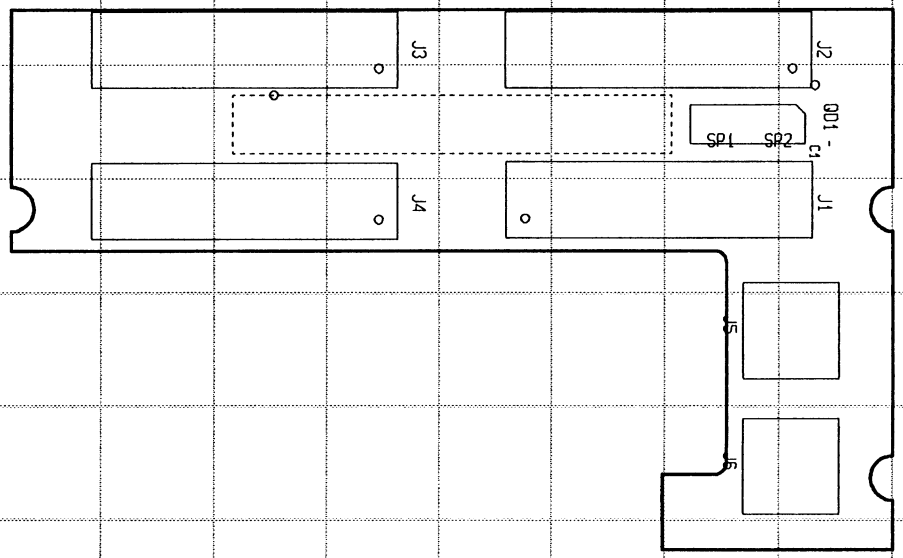


RE TECHNOLOGY A/S	
RE331 RDS DECODER	
Title: BACK PANEL	
Size: A	Document Number: 901-876 971-419iss.4 985-320 REV: 1
Date: June 20, 1990	Sheet 1 of 1



RE 331 BACKPANEL PCB971-419iss. 4

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
C1	E6																						
J1	F6																						
J2	D6																						
J3	D10																						
J4	F10																						
J5	G7																						
J6	H7																						
QD1	E6																						
SP1	E7																						
SP2	E6																						

COMPONENT SIDE

Rear Panel Board (901-876)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401

CONNECTORS

J 1	D-Sub 25 pol female straight for PCB, with UN4-40	805-983
J 2	D-Sub 25 pol male straight for PCB, with UN4-40	805-055
J 3	D-Sub 25 pol male straight for PCB, with UN4-40	805-055
J 4	D-Sub 25 pol male straight for PCB, with UN4-40	805-055
J 5	BNC female straight jack for PCB 50E	805-057
J 6	BNC female straight jack for PCB 50E	805-057
J 7	Flat Cabel For RE331 Back Panel	617-944

INTEGRATED DIGITAL CIRCUITS

QD 1	IC DS14C89AN Line Driver	364-788

MISCELLANEOUS

	Threaded Nipple GT M3/8-1.25	065-436
	PCB For RE331 Backpanel	971-419

21. MPX SCANNER

21.1 Circuit Description

The MPX scanner can be considered as an active switching unit feeding one out of 4 or 8 MPX signals to an RE 331 RDS decoder. This enables the decoder to monitor up to 8 MPX signals thereby making it possible for smaller broadcasters to invest in professional RDS monitoring equipment.

The scanning sequence and duration is entirely under control from the main computer in the RE 331.

Fig. 21.1 shows the overall block diagram of an 8-channel MPX scanner.

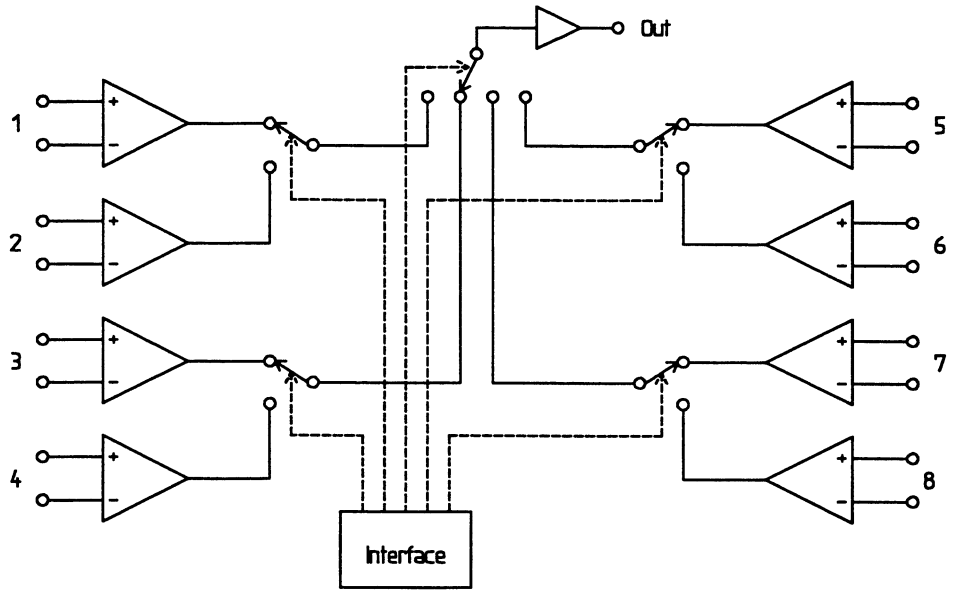


Fig. 21.1 - Block Diagram of MPX Scanner

Each of the 8 input amplifiers consists of a balanced to unbalanced buffer amplifier with a bandwidth wide enough to allow measurements on an MPX signal without influencing the phase response.

Switching between the channels happens in two stages in order to achieve a layout that minimizes crosstalk between channels. The buffer amplifiers are grouped in four groups of two amplifiers with a FET switch at each group (QA3, QA10, QA7 and QA14) selecting between the two channels. Four signals run from the FET switches

to a 4 to 1 demultiplexer that only allows one signal to reach the output stage (controlled by the OR-gate QD1).

The gain in the MPX scanner is 0 dB from input to output.

The MPX scanner has a 37-pole Sub-D connector on the rear panel which allows up to 8 MPX inputs to be connected. An optional MPX Adapter Box (902-169) is available, converting the 37-pole Sub-D connector into a 8-Lemo Triaxial male connector.

21.2 Schematic Diagram

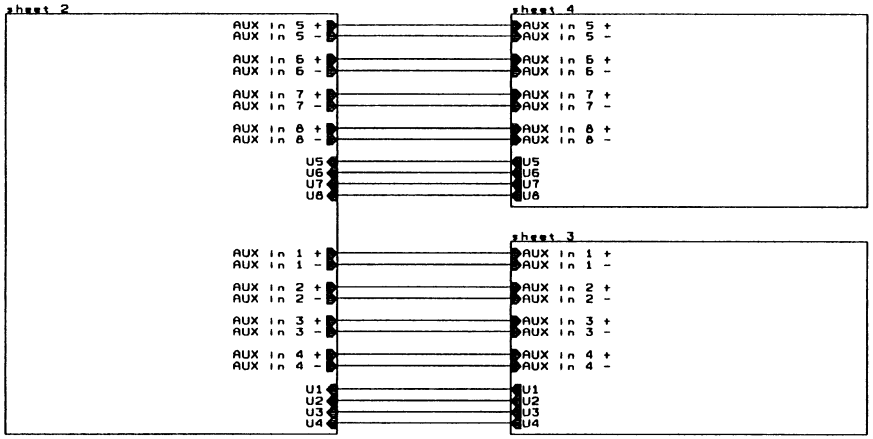
The schematic diagram for the MPX scanner is located in the following. The diagram number is 985-369.

21.3 Component Locations

The following shows the component locations on the MPX scanner.

21.4 Parts List

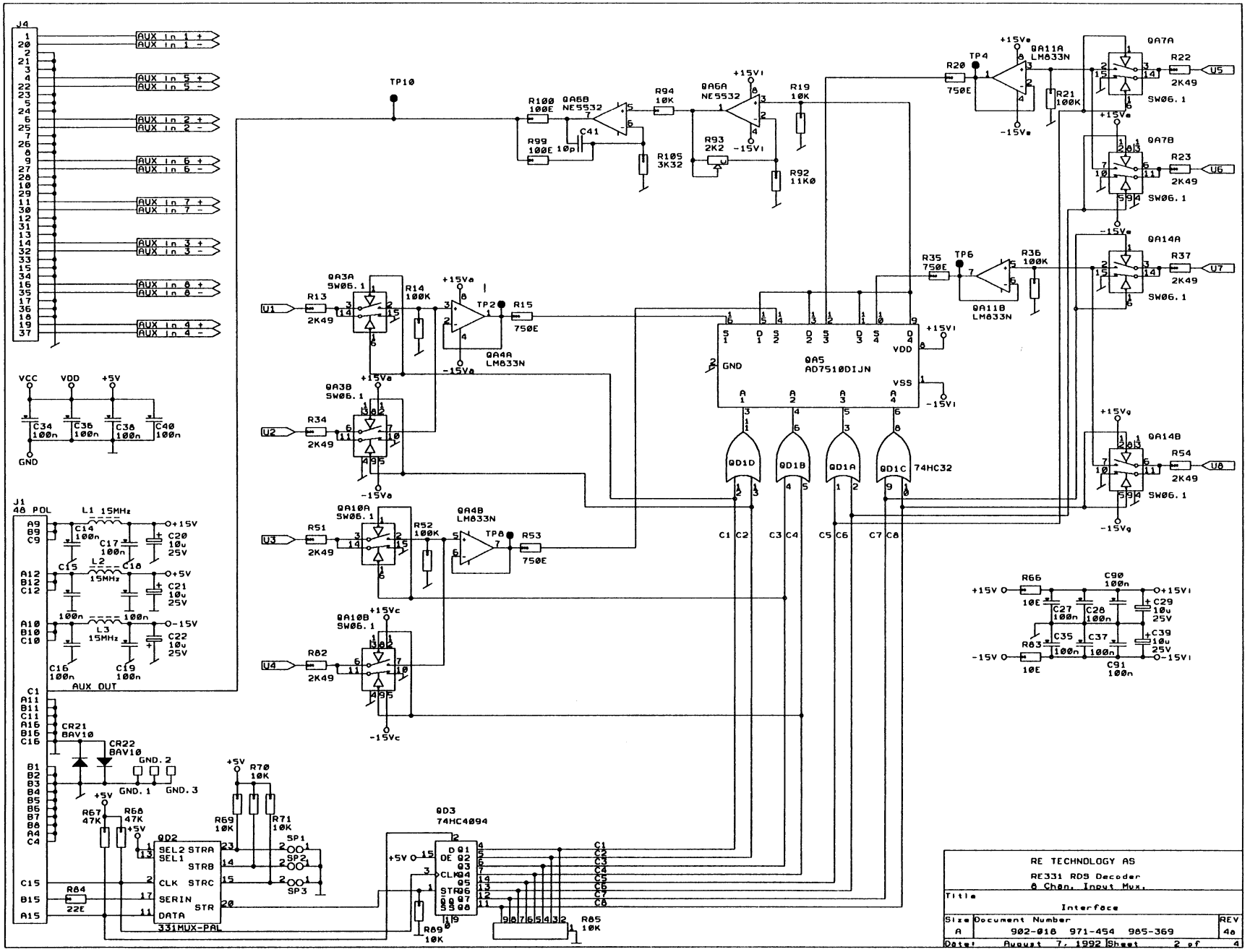
The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 902-018.

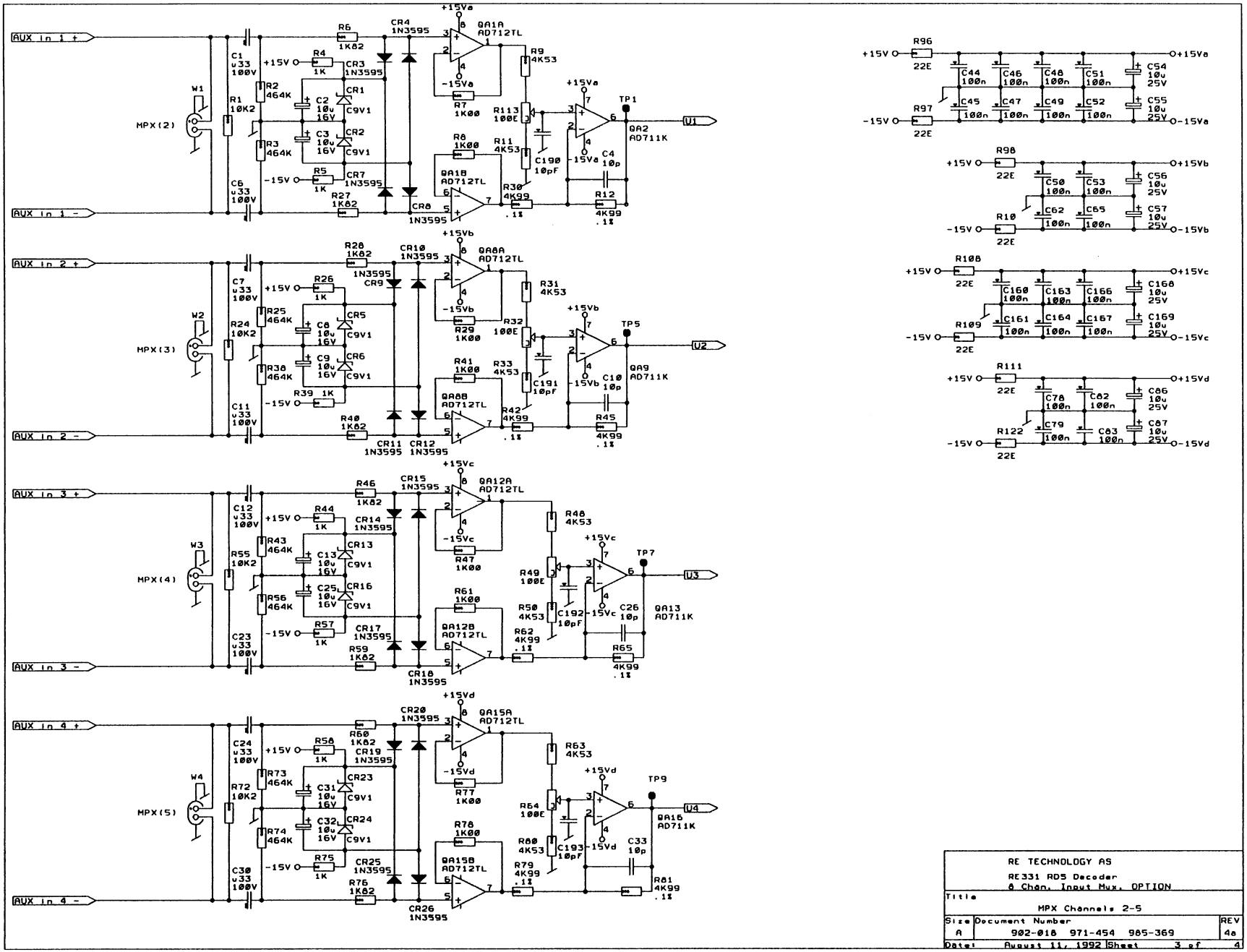


RE TECHNOLOGY AS

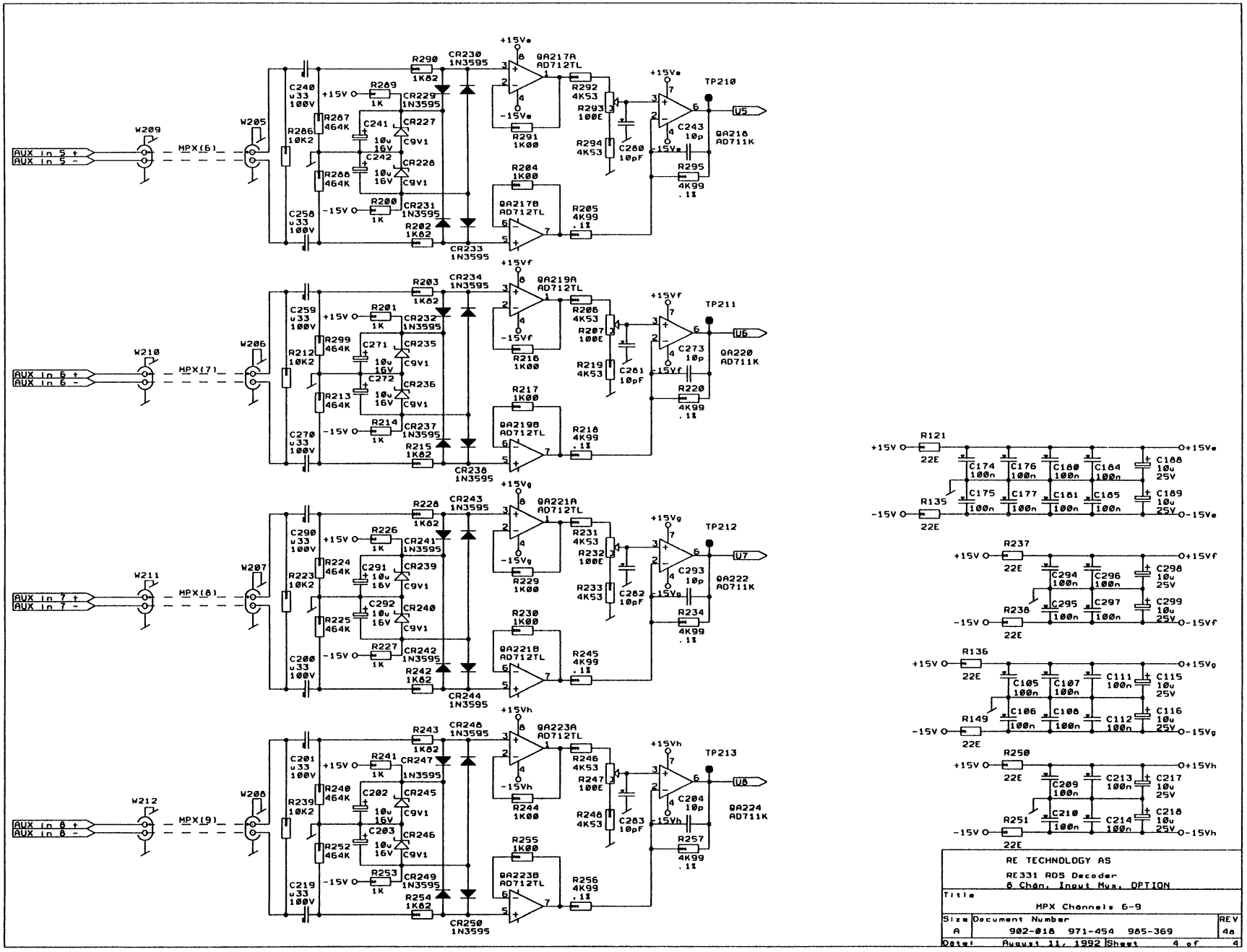
RE331 RDS Decoder
8 Chan. Input Mux. OPTION

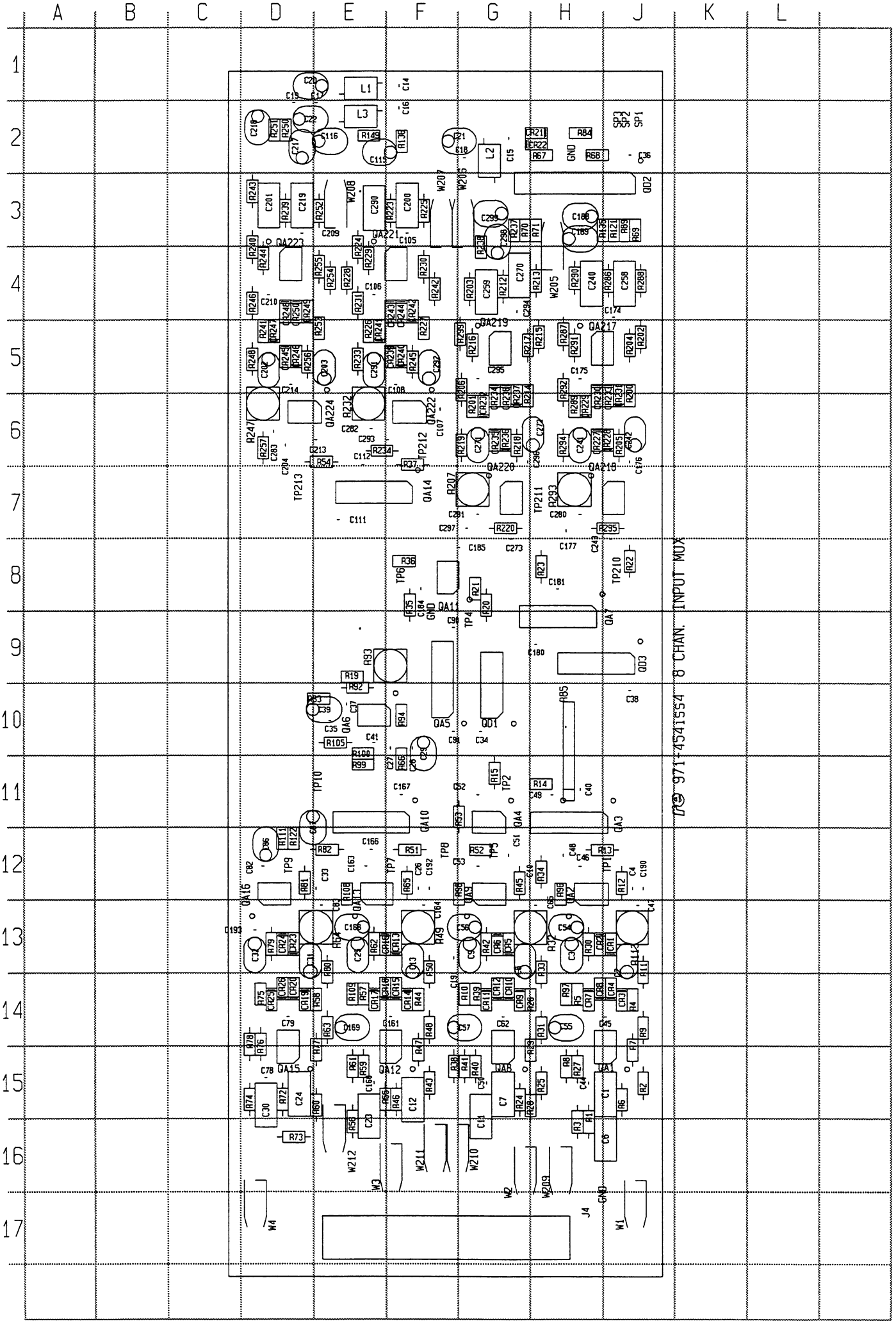
Title: Root Sheet		
Size: A	Document Number: 902-018 971-454 985-369	REV: 4a
Date: August 7, 1992	Sheet 1 of 4	


J4
AUX In 1 +
AUX In 1 -
AUX In 5 +
AUX In 5 -
AUX In 2 +
AUX In 2 -
AUX In 6 +
AUX In 6 -
AUX In 7 +
AUX In 7 -
AUX In 3 +
AUX In 3 -
AUX In 8 +
AUX In 8 -
AUX In 4 +
AUX In 4 -
TP10
R100 100E
QA6B NE5532
C41
R99 100E 10p
R94 10K
QA6A NE5532
R105 3K32
R93 2K2
R19 10K
R92 11KØ
+15Vl
-15Vl
TP4
R20 750E
QA11A LM833N
R21 100K
QA7A
QA7B
QA14A
QA14B
R22 2K49
R23 2K49
R37 2K49
R54 2K49
U5
U6
U7
U8
SW06.1
R35 750E
TP6
R36 100K
QA11B LM833N
QA3A SW06.1
R13 2K49
R14 100K
TP2
R15 750E
QA4A LM833N
U1
QA3B SW06.1
R34 2K49
U2
QA10A SW06.1
R51 2K49
R52 100K
QA4B LM833N
TP8
R53 750E
U3
QA10B SW06.1
R82 2K49
U4
QA5 AD7510DIJN
QD1D
QD1B
QD1A
QD1C 74HC32
C1 C2 C3 C4 C5 C6 C7 C8
VCC VDD +5V
C34 100n C35 100n C38 100n C40 100n
GND
J1 48 POL
L1 15MHz
L2 15MHz
L3 15MHz
C14 100n C17 100n C20 10u 25V
C15 C18 100n
C21 10u 25V
C16 100n C19 100n C22 10u 25V
+15V
+5V
-15V
AUX OUT
CR21 BAV10
CR22 BAV10
GND.1 GND.2 GND.3
R67 47K
R68 47K
R64 22E
QD2
SEL2 SEL1 STRA STRB CLK STRC SERIN STR DATA
331MUX-PAL
R70 10K
R69 10K
R71 10K
SP1 SP2 SP3
QD3 74HC4094
D Q1 OE Q2 Q3 CLK Q4 Q5 STR Q6 Q7 Q8
R89 10K
R85 10K
R66 10E
C90 100n
C27 100n C28 100n C29 10u 25V
R63 10E
C35 100n C37 100n C39 10u 25V
C91 100n
RE TECHNOLOGY AS
RE331 RDS Decoder
8 Chan. Input Mux.
Title
Interface
Size A
Document Number 902-018 971-454 985-369
REV 4a
Date: August 7, 1992 Sheet 2 of 4



RE TECHNOLOGY AS		
RE331 RDS Decoder 8 Chan. Input Mux. OPTION		
Title: MPX Channels 2-5		
Size: A	Document Number: 902-018 971-454 985-369	REV: 4a
Date: August 11, 1992	Sheet: 3 of 4	


W209
W205
MPX(6)
AUX In 5 +
AUX In 5 -
C240 u33 100V
R289 1K
R287 464K
R286 10K2
R288 464K
C258 u33 100V
R290 1K62
CR230 1N3595
CR229 1N3595
CR227 C9V1
CR228 C9V1
CR231 1N3595
R200 1K
R202 1K62
CR233 1N3595
C241 10u 16V
C242 10u 16V
+15V
-15V
+15Ve
QA217A AD712TL
QA217B AD712TL
-15Ve
R291 1K00
R292 4K53
R293 100E
R294 4K53
C260 10pF
R204 1K00
R205 4K99 .1%
C243 10p
R295 4K99 .1%
TP210
U5
QA218 AD711K
W210
W206
MPX(7)
AUX In 6 +
AUX In 6 -
C259 u33 100V
R201 1K
R299 464K
R212 10K2
R213 464K
C270 u33 100V
R203 1K62
CR234 1N3595
CR232 1N3595
CR235 C9V1
CR236 C9V1
CR237 1N3595
R214 1K
R215 1K62
CR238 1N3595
C271 10u 16V
C272 10u 16V
+15Vf
QA219A AD712TL
QA219B AD712TL
-15Vf
R216 1K00
R206 4K53
R207 100E
R219 4K53
C261 10pF
R217 1K00
R218 4K99 .1%
C273 10p
R220 4K99 .1%
TP211
U6
QA220 AD711K
W211
W207
MPX(8)
AUX In 7 +
AUX In 7 -
C290 u33 100V
R226 1K
R224 464K
R223 10K2
R225 464K
C200 u33 100V
R228 1K62
CR243 1N3595
CR241 1N3595
CR239 C9V1
CR240 C9V1
CR242 1N3595
R227 1K
R242 1K62
CR244 1N3595
C291 10u 16V
C292 10u 16V
+15Vg
QA221A AD712TL
QA221B AD712TL
-15Vg
R229 1K00
R231 4K53
R232 100E
R233 4K53
C262 10pF
R230 1K00
R245 4K99 .1%
C293 10p
R234 4K99 .1%
TP212
U7
QA222 AD711K
W212
W208
MPX(9)
AUX In 8 +
AUX In 8 -
C201 u33 100V
R241 1K
R240 464K
R239 10K2
R252 464K
C219 u33 100V
R243 1K62
CR246 1N3595
CR247 1N3595
CR245 C9V1
CR246 C9V1
CR249 1N3595
R253 1K
R254 1K62
CR250 1N3595
C202 10u 16V
C203 10u 16V
+15Vh
QA223A AD712TL
QA223B AD712TL
-15Vh
R244 1K00
R246 4K53
R247 100E
R248 4K53
C263 10pF
R255 1K00
R256 4K99 .1%
C294 10p
R257 4K99 .1%
TP213
U8
QA224 AD711K
R121
R135
22E
C174 100n
C175 100n
C176 100n
C177 100n
C180 100n
C181 100n
C184 100n
C185 100n
C188 10u 25V
C189 10u 25V
+15Ve
-15Ve
R237
R238
C294 100n
C295 100n
C296 100n
C297 100n
C298 10u 25V
C299 10u 25V
+15Vf
-15Vf
R136
R149
C105 100n
C106 100n
C107 100n
C108 100n
C111 100n
C112 100n
C115 10u 25V
C116 10u 25V
+15Vg
-15Vg
R250
R251
C209 100n
C210 100n
C213 100n
C214 100n
C217 10u 25V
C218 10u 25V
+15Vh
-15Vh
RE TECHNOLOGY AS
RE331 RDS Decoder
8 Chan. Input Mux. OPTION
Title
MPX Channels 6-9
Size A
Document Number 902-018 971-454 985-369
REV 4a
Date: August 11, 1992
Sheet 4 of 4


8 CHAN. INPUT MUX
971-4541554

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
.2	E3	C25	E13	C204	D6	R10	G14	R93	E9	R295	H7												
.3	E9	C26	F12	C209	E3	R11	J13	R94	F10	R299	F5												
CR1	J13	C27	F11	C210	D4	R12	J12	R96	H12	SP1	J2												
CR2	H13	C28	F11	C213	D6	R13	J12	R97	H14	SP2	J2												
CR3	J14	C29	F10	C214	D5	R14	H11	R98	F12	SP3	J2												
CR4	J14	C30	D15	C217	D2	R15	G11	R99	E11	TP1	J12												
CR5	G13	C31	D13	C218	D2	R19	E9	R100	E11	TP2	G11												
CR6	G13	C32	D13	C219	D3	R20	G9	R105	E10	TP4	G9												
CR7	H14	C33	E12	C240	H4	R21	G8	R108	E12	TP5	G12												
CR8	H14	C34	G10	C241	H6	R22	J8	R109	E14	TP6	F8												
CR9	G14	C35	E10	C242	J6	R23	H8	R111	D12	TP7	F12												
CR10	G14	C36	J2	C243	H8	R24	G15	R113	J13	TP8	F12												
CR11	G14	C37	E10	C258	J4	R25	H15	R121	J3	TP9	D12												
CR12	G14	C38	J10	C259	G4	R26	H14	R122	D12	TP10	E11												
CR13	F13	C39	E10	C270	G4	R27	H15	R135	H3	TP210	J8												
CR14	F14	C40	H11	C271	G6	R28	H15	R136	F2	TP211	H7												
CR15	F14	C41	E10	C272	H6	R29	G14	R149	E2	TP212	F6												
CR16	E13	C44	H15	C273	G8	R30	H13	R200	J5	TP213	D7												
CR17	E14	C45	H14	C280	H7	R31	H14	R201	G6	W1	J17												
CR18	F14	C46	H12	C281	G7	R32	H13	R202	J5	W2	G17												
CR19	D14	C47	J12	C282	E6	R33	H13	R203	G4	W3	E16												
CR20	D14	C48	H12	C283	D6	R34	H12	R204	J5	W4	D17												
CR21	H2	C49	H11	C290	E3	R35	F9	R205	J6	W205	H4												
CR22	G2	C50	G15	C291	E5	R36	F8	R206	G5	W206	G2												
CR23	D13	C51	G12	C292	F5	R37	F7	R207	F7	W207	F2												
CR24	D13	C52	G11	C293	E6	R38	F15	R212	G4	W208	E3												
CR25	D14	C53	G12	C294	G4	R39	G14	R213	H4	W209	H17												
CR26	D14	C54	H13	C295	G5	R40	G15	R214	G5	W210	G16												
CR227	H6	C55	H14	C296	H7	R41	G15	R215	H5	W211	F16												
CR228	J6	C56	G13	C297	F7	R42	G13	R216	G5	W212	E16												
CR229	H6	C57	G14	C298	G3	R43	F15	R217	H5														
CR230	H5	C62	G14	C299	G3	R44	F14	R218	G6														
CR231	J6	C65	H12	GND. 1	H2	R45	G12	R219	G6														
CR232	G6	C78	D15	GND. 2	F9	R46	F15	R220	G7														
CR233	J5	C79	D14	GND. 3	J17	R47	F14	R223	F3														
CR234	G5	C82	D12	J4	H17	R48	F14	R224	E3														
CR235	G6	C83	E12	L1	E1	R49	F13	R225	F3														
CR236	G6	C86	D12	L2	G2	R50	F13	R226	E5														
CR237	G6	C87	D11	L3	E2	R51	F12	R227	F4														
CR238	G5	C90	G9	QA1	J15	R52	G12	R228	E4														
CR239	F5	C91	F10	QA2	H13	R53	G11	R229	E4														
CR240	F5	C105	F3	QA3	J11	R54	E6	R230	F4														
CR241	E5	C106	E4	QA4	G11	R55	E15	R231	E4														
CR242	F5	C107	F6	QA5	F10	R56	E16	R232	E6														
CR243	F4	C108	F5	QA6	E10	R57	E14	R233	E5														
CR244	F4	C111	E7	QA7	J8	R58	E14	R234	E6														
CR245	D5	C112	E6	QA8	G15	R59	E15	R237	G3														
CR246	D5	C115	E2	QA9	G13	R60	E15	R238	G3														
CR247	D5	C116	E2	QA10	F11	R61	E15	R239	D3														
CR248	D4	C160	E15	QA11	G8	R62	E13	R240	D3														
CR249	D5	C161	E14	QA12	F15	R63	E14	R241	D5														
CR250	D4	C163	E12	QA13	E13	R64	E13	R242	F4														
C1	J15	C164	F13	QA14	F7	R65	F12	R243	D3														
C2	J14	C166	E12	QA15	D15	R66	F11	R244	D4														
C3	H13	C167	F11	QA16	D13	R67	H2	R245	F5														
C4	J12	C168	E13	QA217	H5	R68	H2	R246	D4														
C6	J16	C169	E14	QA218	H7	R69	J3	R247	D6														
C7	G15	C174	J4	QA219	G5	R70	G3	R248	D5														
C8	G14	C175	H5	QA220	G7	R71	H3	R250	D2														
C9	G13	C176	J7	QA221	E3	R72	D15	R251	D2														
C10	H12	C177	H8	QA222	F6	R73	D16	R252	E3														
C11	G16	C180	H9	QA223	D4	R74	D15	R253	E4														
C12	F15	C181	H8	QA224	E6	R75	D14	R254	E4														
C13	F13	C184	F9	QD1	G10	R76	D15	R255	E4														
C14	F1	C185	G8	QD2	J3	R77	D14	R256	D5														
C15	G2	C188	H3	QD3	J9	R78	D14	R257	D6														
C16	F2	C189	H3	R1	H15	R79	D13	R286	J4														
C17	E1	C190	J12	R2	J15	R80	E13	R287	H5														
C18	F2	C191	F13	R3	H16	R81	D12	R288	J4														
C19	D1	C192	F12	R4	J14	R82	E12	R289	H6														
C20	E1	C193	D13	R5	H14	R83	D10	R290	H4														
C21	F2	C200	F3	R6	J15	R84	H2	R291	H5														
C22	D2	C201	D3	R7	J14	R85	H10	R292	H5														
C23	E16	C202	D5	R8	H15	R89	J3	R293	H7														
C24	D15	C203	E5	R9	J14	R92	E10	R294	H6														

COMPONENT SIDE

MPX Scanner (902-018)

CAPACITORS

C 1	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 2	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 3	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 4	C Ceramic 10p0 2% 100V NP0	213-205
C 6	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 7	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 8	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 9	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 10	C Ceramic 10p0 2% 100V NP0	213-205
C 11	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 12	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 13	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 14	C Ceramic 100n 20% 50V	213-401
C 15	C Ceramic 100n 20% 50V	213-401
C 16	C Ceramic 100n 20% 50V	213-401
C 17	C Ceramic 100n 20% 50V	213-401
C 18	C Ceramic 100n 20% 50V	213-401
C 19	C Ceramic 100n 20% 50V	213-401
C 20	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 21	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 22	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 23	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 24	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 25	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 26	C Ceramic 10p0 2% 100V NP0	213-205
C 27	C Ceramic 100n 20% 50V	213-401
C 28	C Ceramic 100n 20% 50V	213-401
C 29	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 30	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 31	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 32	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 33	C Ceramic 10p0 2% 100V NP0	213-205
C 34	C Ceramic 100n 20% 50V	213-401
C 35	C Ceramic 100n 20% 50V	213-401
C 36	C Ceramic 100n 20% 50V	213-401
C 37	C Ceramic 100n 20% 50V	213-401
C 38	C Ceramic 100n 20% 50V	213-401
C 39	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 40	C Ceramic 100n 20% 50V	213-401
C 41	C Ceramic 10p0 2% 100V NP0	213-205
C 44	C Ceramic 100n 20% 50V	213-401
C 45	C Ceramic 100n 20% 50V	213-401
C 46	C Ceramic 100n 20% 50V	213-401
C 47	C Ceramic 100n 20% 50V	213-401
C 48	C Ceramic 100n 20% 50V	213-401
C 49	C Ceramic 100n 20% 50V	213-401
C 50	C Ceramic 100n 20% 50V	213-401
C 51	C Ceramic 100n 20% 50V	213-401
C 52	C Ceramic 100n 20% 50V	213-401
C 53	C Ceramic 100n 20% 50V	213-401

C 54	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 55	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 56	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 57	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 62	C Ceramic 100n 20% 50V	213-401
C 65	C Ceramic 100n 20% 50V	213-401
C 78	C Ceramic 100n 20% 50V	213-401
C 79	C Ceramic 100n 20% 50V	213-401
C 82	C Ceramic 100n 20% 50V	213-401
C 83	C Ceramic 100n 20% 50V	213-401
C 86	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 87	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 90	C Ceramic 100n 20% 50V	213-401
C 91	C Ceramic 100n 20% 50V	213-401
C 105	C Ceramic 100n 20% 50V	213-401
C 106	C Ceramic 100n 20% 50V	213-401
C 107	C Ceramic 100n 20% 50V	213-401
C 108	C Ceramic 100n 20% 50V	213-401
C 111	C Ceramic 100n 20% 50V	213-401
C 112	C Ceramic 100n 20% 50V	213-401
C 115	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 116	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 160	C Ceramic 100n 20% 50V	213-401
C 161	C Ceramic 100n 20% 50V	213-401
C 163	C Ceramic 100n 20% 50V	213-401
C 164	C Ceramic 100n 20% 50V	213-401
C 166	C Ceramic 100n 20% 50V	213-401
C 167	C Ceramic 100n 20% 50V	213-401
C 168	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 169	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 174	C Ceramic 100n 20% 50V	213-401
C 175	C Ceramic 100n 20% 50V	213-401
C 176	C Ceramic 100n 20% 50V	213-401
C 177	C Ceramic 100n 20% 50V	213-401
C 180	C Ceramic 100n 20% 50V	213-401
C 181	C Ceramic 100n 20% 50V	213-401
C 184	C Ceramic 100n 20% 50V	213-401
C 185	C Ceramic 100n 20% 50V	213-401
C 188	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 189	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 190	C Ceramic 10p0 2% 100V NP0	213-205
C 191	C Ceramic 10p0 2% 100V NP0	213-205
C 192	C Ceramic 10p0 2% 100V NP0	213-205
C 193	C Ceramic 10p0 2% 100V NP0	213-205
C 200	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 201	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 202	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 203	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 204	C Ceramic 10p0 2% 100V NP0	213-205
C 209	C Ceramic 100n 20% 50V	213-401
C 210	C Ceramic 100n 20% 50V	213-401
C 213	C Ceramic 100n 20% 50V	213-401
C 214	C Ceramic 100n 20% 50V	213-401
C 217	C Solid Aluminium 10u 20% 25V Short Type	265-110

C 218	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 219	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 240	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 241	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 242	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 243	C Ceramic 10p0 2% 100V NP0	213-205
C 258	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 259	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 270	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 271	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 272	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 273	C Ceramic 10p0 2% 100V NP0	213-205
C 280	C Ceramic 10p0 2% 100V NP0	213-205
C 281	C Ceramic 10p0 2% 100V NP0	213-205
C 282	C Ceramic 10p0 2% 100V NP0	213-205
C 283	C Ceramic 10p0 2% 100V NP0	213-205
C 290	MKT, 0.33/100/10, R:5*10.5*10,RM3	241-085
C 291	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 292	C Solid Aluminium 10u 20% 16V Short Type	265-108
C 293	C Ceramic 10p0 2% 100V NP0	213-205
C 294	C Ceramic 100n 20% 50V	213-401
C 295	C Ceramic 100n 20% 50V	213-401
C 296	C Ceramic 100n 20% 50V	213-401
C 297	C Ceramic 100n 20% 50V	213-401
C 298	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 299	C Solid Aluminium 10u 20% 25V Short Type	265-110

DIODES

CR 1	Diode zener BZX79-C9V1 0.4W	350-606
CR 2	Diode zener BZX79-C9V1 0.4W	350-606
CR 3	Diode 1N3595 SI 100V 100mA	350-415
CR 4	Diode 1N3595 SI 100V 100mA	350-415
CR 5	Diode zener BZX79-C9V1 0.4W	350-606
CR 6	Diode zener BZX79-C9V1 0.4W	350-606
CR 7	Diode 1N3595 SI 100V 100mA	350-415
CR 8	Diode 1N3595 SI 100V 100mA	350-415
CR 9	Diode 1N3595 SI 100V 100mA	350-415
CR 10	Diode 1N3595 SI 100V 100mA	350-415
CR 11	Diode 1N3595 SI 100V 100mA	350-415
CR 12	Diode 1N3595 SI 100V 100mA	350-415
CR 13	Diode zener BZX79-C9V1 0.4W	350-606
CR 14	Diode 1N3595 SI 100V 100mA	350-415
CR 15	Diode 1N3595 SI 100V 100mA	350-415
CR 16	Diode zener BZX79-C9V1 0.4W	350-606
CR 17	Diode 1N3595 SI 100V 100mA	350-415
CR 18	Diode 1N3595 SI 100V 100mA	350-415
CR 19	Diode 1N3595 SI 100V 100mA	350-415
CR 20	Diode 1N3595 SI 100V 100mA	350-415
CR 21	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 22	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 23	Diode zener BZX79-C9V1 0.4W	350-606
CR 24	Diode zener BZX79-C9V1 0.4W	350-606
CR 25	Diode 1N3595 SI 100V 100mA	350-415

CR 26	Diode 1N3595 SI 100V 100mA	350-415
CR 227	Diode zener BZX79-C9V1 0.4W	350-606
CR 228	Diode zener BZX79-C9V1 0.4W	350-606
CR 229	Diode 1N3595 SI 100V 100mA	350-415
CR 230	Diode 1N3595 SI 100V 100mA	350-415
CR 231	Diode 1N3595 SI 100V 100mA	350-415
CR 232	Diode 1N3595 SI 100V 100mA	350-415
CR 233	Diode 1N3595 SI 100V 100mA	350-415
CR 234	Diode 1N3595 SI 100V 100mA	350-415
CR 235	Diode zener BZX79-C9V1 0.4W	350-606
CR 236	Diode zener BZX79-C9V1 0.4W	350-606
CR 237	Diode 1N3595 SI 100V 100mA	350-415
CR 238	Diode 1N3595 SI 100V 100mA	350-415
CR 239	Diode zener BZX79-C9V1 0.4W	350-606
CR 240	Diode zener BZX79-C9V1 0.4W	350-606
CR 241	Diode 1N3595 SI 100V 100mA	350-415
CR 242	Diode 1N3595 SI 100V 100mA	350-415
CR 243	Diode 1N3595 SI 100V 100mA	350-415
CR 244	Diode 1N3595 SI 100V 100mA	350-415
CR 245	Diode zener BZX79-C9V1 0.4W	350-606
CR 246	Diode zener BZX79-C9V1 0.4W	350-606
CR 247	Diode 1N3595 SI 100V 100mA	350-415
CR 248	Diode 1N3595 SI 100V 100mA	350-415
CR 249	Diode 1N3595 SI 100V 100mA	350-415
CR 250	Diode 1N3595 SI 100V 100mA	350-415

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 4	D-Sub 37 pol female 90° angled, with UN4-40	806-096

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204

INTEGRATED ANALOG CIRCUITS

QA 1	IC AD712K Dual OP.AMP.	364-791
QA 2	IC AD711K OP.AMP	364-792
QA 3	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 4	IC LM833N Dual Low Noise OPamp	365-037
QA 5	IC AD7510 Analog Switches	364-896
QA 6	IC NE5532A Dual OP-Amp low noise	364-640
QA 7	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 8	IC AD712K Dual OP.AMP.	364-791
QA 9	IC AD711K OP.AMP	364-792
QA 10	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 11	IC LM833N Dual Low Noise OPamp	365-037
QA 12	IC AD712K Dual OP.AMP.	364-791
QA 13	IC AD711K OP.AMP	364-792
QA 14	IC SW06 Quad Spst Jfet Analog Switch	364-872
QA 15	IC AD712K Dual OP.AMP.	364-791

QA 16	IC AD711K OP.AMP	364-792
QA 217	IC AD712K Dual OP.AMP.	364-791
QA 218	IC AD711K OP.AMP	364-792
QA 219	IC AD712K Dual OP.AMP.	364-791
QA 220	IC AD711K OP.AMP	364-792
QA 221	IC AD712K Dual OP.AMP.	364-791
QA 222	IC AD711K OP.AMP	364-792
QA 223	IC AD712K Dual OP.AMP.	364-791
QA 224	IC AD711K OP.AMP	364-792

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC32 Quad 2-Input OR Gate	364-756
QD 2	RE331 Prog MPX-Pal	369-372
QD 3	IC 74HC4094 8 stage shift REG.	364-811

RESISTORS

R 1	R Metal Film 10K2 1% 0.5W TC50	115-102
R 2	R Metal Film 464K 1% 0.5W TC50	116-464
R 3	R Metal Film 464K 1% 0.5W TC50	116-464
R 4	R Metal film 1K00 5% 0.2W TC250	107-410
R 5	R Metal film 1K00 5% 0.2W TC250	107-410
R 6	R Metal Film 1K82 1% 0.5W TC50	114-182
R 7	R Metal Film 1K00 1% 0.5W TC50	114-100
R 8	R Metal Film 1K00 1% 0.5W TC50	114-100
R 9	R Metal Film 4K53 1% 0.5W TC50	114-453
R 10	R Metal film 22E0 5% 0.2W TC250	107-222
R 11	R Metal Film 4K53 1% 0.5W TC50	114-453
R 12	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 13	R Metal Film 2K49 1% 0.5W TC50	114-249
R 14	R Metal film 100K 5% 0.2W TC250	107-610
R 15	R Metal Film 750E 1% 0.5W TC50	113-750
R 19	R Metal film 10K0 5% 0.2W TC250	107-510
R 20	R Metal Film 750E 1% 0.5W TC50	113-750
R 21	R Metal film 100K 5% 0.2W TC250	107-610
R 22	R Metal Film 2K49 1% 0.5W TC50	114-249
R 23	R Metal Film 2K49 1% 0.5W TC50	114-249
R 24	R Metal Film 10K2 1% 0.5W TC50	115-102
R 25	R Metal Film 464K 1% 0.5W TC50	116-464
R 26	R Metal film 1K00 5% 0.2W TC250	107-410
R 27	R Metal Film 1K82 1% 0.5W TC50	114-182
R 28	R Metal Film 1K82 1% 0.5W TC50	114-182
R 29	R Metal Film 1K00 1% 0.5W TC50	114-100
R 30	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 31	R Metal Film 4K53 1% 0.5W TC50	114-453
R 32	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 33	R Metal Film 4K53 1% 0.5W TC50	114-453
R 34	R Metal Film 2K49 1% 0.5W TC50	114-249
R 35	R Metal Film 750E 1% 0.5W TC50	113-750
R 36	R Metal film 100K 5% 0.2W TC250	107-610
R 37	R Metal Film 2K49 1% 0.5W TC50	114-249
R 38	R Metal Film 464K 1% 0.5W TC50	116-464
R 39	R Metal film 1K00 5% 0.2W TC250	107-410

R 40	R Metal Film 1K82 1% 0.5W TC50	114-182
R 41	R Metal Film 1K00 1% 0.5W TC50	114-100
R 42	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 43	R Metal Film 464K 1% 0.5W TC50	116-464
R 44	R Metal film 1K00 5% 0.2W TC250	107-410
R 45	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 46	R Metal Film 1K82 1% 0.5W TC50	114-182
R 47	R Metal Film 1K00 1% 0.5W TC50	114-100
R 48	R Metal Film 4K53 1% 0.5W TC50	114-453
R 49	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 50	R Metal Film 4K53 1% 0.5W TC50	114-453
R 51	R Metal Film 2K49 1% 0.5W TC50	114-249
R 52	R Metal film 100K 5% 0.2W TC250	107-610
R 53	R Metal Film 750E 1% 0.5W TC50	113-750
R 54	R Metal Film 2K49 1% 0.5W TC50	114-249
R 55	R Metal Film 10K2 1% 0.5W TC50	115-102
R 56	R Metal Film 464K 1% 0.5W TC50	116-464
R 57	R Metal film 1K00 5% 0.2W TC250	107-410
R 58	R Metal film 1K00 5% 0.2W TC250	107-410
R 59	R Metal Film 1K82 1% 0.5W TC50	114-182
R 60	R Metal Film 1K82 1% 0.5W TC50	114-182
R 61	R Metal Film 1K00 1% 0.5W TC50	114-100
R 62	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 63	R Metal Film 4K53 1% 0.5W TC50	114-453
R 64	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 65	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 66	R Metal film 10E0 5% 0.2W TC250	107-210
R 67	R Metal film 47K0 5% 0.2W TC250	107-547
R 68	R Metal film 47K0 5% 0.2W TC250	107-547
R 69	R Metal film 10K0 5% 0.2W TC250	107-510
R 70	R Metal film 10K0 5% 0.2W TC250	107-510
R 71	R Metal film 10K0 5% 0.2W TC250	107-510
R 72	R Metal Film 10K2 1% 0.5W TC50	115-102
R 73	R Metal Film 464K 1% 0.5W TC50	116-464
R 74	R Metal Film 464K 1% 0.5W TC50	116-464
R 75	R Metal film 1K00 5% 0.2W TC250	107-410
R 76	R Metal Film 1K82 1% 0.5W TC50	114-182
R 77	R Metal Film 1K00 1% 0.5W TC50	114-100
R 78	R Metal Film 1K00 1% 0.5W TC50	114-100
R 79	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 80	R Metal Film 4K53 1% 0.5W TC50	114-453
R 81	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 82	R Metal Film 2K49 1% 0.5W TC50	114-249
R 83	R Metal film 10E0 5% 0.2W TC250	107-210
R 84	R Metal film 22E0 5% 0.2W TC250	107-222
R 85	R Thick film Sil 8*10K	146-003
R 89	R Metal film 10K0 5% 0.2W TC250	107-510
R 92	R Metal Film 11K0 1% 0.5W TC50	115-110
R 93	R var 2K2 20% 0.5W	182-313
R 94	R Metal film 10K0 5% 0.2W TC250	107-510
R 96	R Metal film 22E0 5% 0.2W TC250	107-222
R 97	R Metal film 22E0 5% 0.2W TC250	107-222
R 98	R Metal film 22E0 5% 0.2W TC250	107-222
R 99	R Metal film 100E 5% 0.2W TC250	107-310

R 100	R Metal film 100E 5% 0.2W TC250	107-310
R 105	R Metal Film 3K32 1% 0.5W TC50	114-332
R 108	R Metal film 22E0 5% 0.2W TC250	107-222
R 109	R Metal film 22E0 5% 0.2W TC250	107-222
R 111	R Metal film 22E0 5% 0.2W TC250	107-222
R 113	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 121	R Metal film 22E0 5% 0.2W TC250	107-222
R 122	R Metal film 22E0 5% 0.2W TC250	107-222
R 135	R Metal film 22E0 5% 0.2W TC250	107-222
R 136	R Metal film 22E0 5% 0.2W TC250	107-222
R 149	R Metal film 22E0 5% 0.2W TC250	107-222
R 200	R Metal film 1K00 5% 0.2W TC250	107-410
R 201	R Metal film 1K00 5% 0.2W TC250	107-410
R 202	R Metal Film 1K82 1% 0.5W TC50	114-182
R 203	R Metal Film 1K82 1% 0.5W TC50	114-182
R 204	R Metal Film 1K00 1% 0.5W TC50	114-100
R 205	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 206	R Metal Film 4K53 1% 0.5W TC50	114-453
R 207	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 212	R Metal Film 10K2 1% 0.5W TC50	115-102
R 213	R Metal Film 464K 1% 0.5W TC50	116-464
R 214	R Metal film 1K00 5% 0.2W TC250	107-410
R 215	R Metal Film 1K82 1% 0.5W TC50	114-182
R 216	R Metal Film 1K00 1% 0.5W TC50	114-100
R 217	R Metal Film 1K00 1% 0.5W TC50	114-100
R 218	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 219	R Metal Film 4K53 1% 0.5W TC50	114-453
R 220	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 223	R Metal Film 10K2 1% 0.5W TC50	115-102
R 224	R Metal Film 464K 1% 0.5W TC50	116-464
R 225	R Metal Film 464K 1% 0.5W TC50	116-464
R 226	R Metal film 1K00 5% 0.2W TC250	107-410
R 227	R Metal film 1K00 5% 0.2W TC250	107-410
R 228	R Metal Film 1K82 1% 0.5W TC50	114-182
R 229	R Metal Film 1K00 1% 0.5W TC50	114-100
R 230	R Metal Film 1K00 1% 0.5W TC50	114-100
R 231	R Metal Film 4K53 1% 0.5W TC50	114-453
R 232	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 233	R Metal Film 4K53 1% 0.5W TC50	114-453
R 234	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 237	R Metal film 22E0 5% 0.2W TC250	107-222
R 238	R Metal film 22E0 5% 0.2W TC250	107-222
R 239	R Metal Film 10K2 1% 0.5W TC50	115-102
R 240	R Metal Film 464K 1% 0.5W TC50	116-464
R 241	R Metal film 1K00 5% 0.2W TC250	107-410
R 242	R Metal Film 1K82 1% 0.5W TC50	114-182
R 243	R Metal Film 1K82 1% 0.5W TC50	114-182
R 244	R Metal Film 1K00 1% 0.5W TC50	114-100
R 245	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 246	R Metal Film 4K53 1% 0.5W TC50	114-453
R 247	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 248	R Metal Film 4K53 1% 0.5W TC50	114-453
R 250	R Metal film 22E0 5% 0.2W TC250	107-222
R 251	R Metal film 22E0 5% 0.2W TC250	107-222

R 252	R Metal Film 464K 1% 0.5W TC50	116-464
R 253	R Metal film 1K00 5% 0.2W TC250	107-410
R 254	R Metal Film 1K82 1% 0.5W TC50	114-182
R 255	R Metal Film 1K00 1% 0.5W TC50	114-100
R 256	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 257	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 286	R Metal Film 10K2 1% 0.5W TC50	115-102
R 287	R Metal Film 464K 1% 0.5W TC50	116-464
R 288	R Metal Film 464K 1% 0.5W TC50	116-464
R 289	R Metal film 1K00 5% 0.2W TC250	107-410
R 290	R Metal Film 1K82 1% 0.5W TC50	114-182
R 291	R Metal Film 1K00 1% 0.5W TC50	114-100
R 292	R Metal Film 4K53 1% 0.5W TC50	114-453
R 293	R Cermet Trimpot 100E 20% 0.5W TC70	182-317
R 294	R Metal Film 4K53 1% 0.5W TC50	114-453
R 295	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 299	R Metal Film 464K 1% 0.5W TC50	116-464

CABLES

W 209	235mm Twinax Cable for RE331 Input MUX.	617-954
W 210	235mm Twinax Cable for RE331 Input MUX.	617-954
W 211	235mm Twinax Cable for RE331 Input MUX.	617-954
W 212	235mm Twinax Cable for RE331 Input MUX.	617-954

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
	Nut hexagon M2,5	031-250
	Lock washer D2,7/4,8x0,45	046-404
	Tubular Rivet 2.5X10	060-310
	Term. strip 50pol mod 2	806-072
	L-piece for PCB	857-041
	PCB RE331 Input Mux.	971-454
	Rear plate f.scanner	978-357
GND.1	Solder Terminal 0.1 O2	823-303
GND.2	Solder Terminal 0.1 O2	823-303
GND.3	Solder Terminal 0.1 O2	823-303
QDS2	24 Pin DIL Socket w. 3 modul spacing	816-274

22. RF SCANNER

22.1 Circuit Description

This section describes the various circuits that make up an RF scanner. Refer to the extended block diagram, Fig. 22.1, and the schematic diagrams in section 22.2.

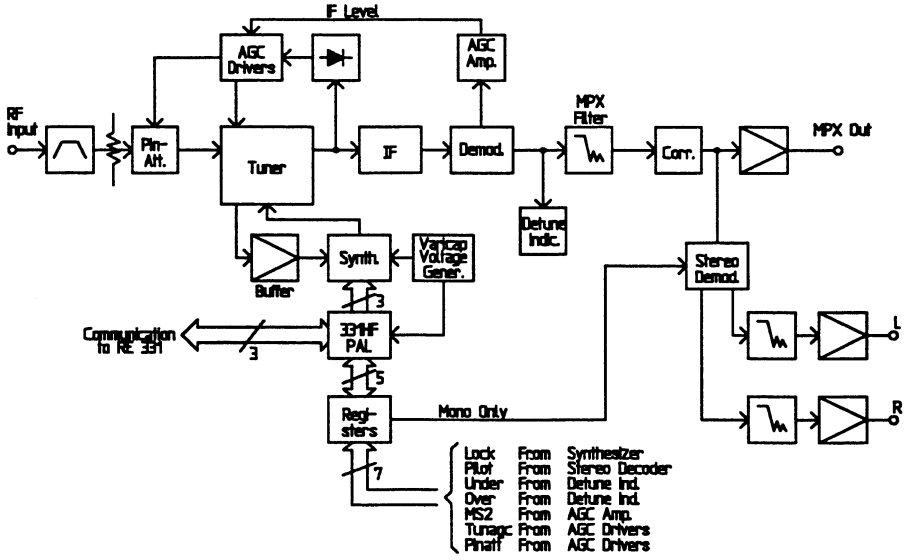


Fig. 22.1 - Block Diagram of the RF Scanner

22.1.1 Tuner

This module is designed with a dual gate MOSFET in the front end and one in the mixer. The gain in the RF front end is set by varying the DC voltage on gate 2 of the front end MOSFET.

A coupled circuit is placed between the RF stage and the mixer which, like the resonant circuit in the front end, uses double varactor diodes. The varactor diodes in the local oscillator are controlled by the same voltage as the varactor diodes in the tuned circuits.

The IF signal is taken from the mixer FET via a coupled resonant circuit tuned to approximately 10.7 MHz.

The local oscillator frequency is above the receiving frequency.

22.1.2 IF Amplifier

This amplifier, which determines the selectivity of the receiver, consists of cascaded, symmetrically limiting amplifiers in folded cascode configuration. The input and output impedances are well defined for correct interface to the ceramic filters.

Stage one combines high overload capability with low-noise figures. Resonant decoupling of the emitter is used to optimize the intermodulation specifications.

The entire amplifier chain is terminated by an LC resonant circuit partly to reduce the noise bandwidth of the chain and to mute any possible spurious frequencies and partly to secure matching to the demodulator.

The use of current sources in each individual amplifier stage ensures stable operating conditions and increases the noise immunity.

The total gain in the entire chain is approximately +10 dB, but to compensate for the losses in the ceramic filters each individual amplifier stage has a higher gain.

The ceramic filters are of the type SFE10.7MX-A from Murata. They are optimized for constant group delay response.

The characteristics of the IF chain influence the output level of the demodulated signal and as a consequence corrections to the level are done later in the chain.

22.1.3 Demodulator

The demodulator is designed as a quadrature demodulator including double detector resonators for lowest possible distortion.

The resonators are temperature compensated using capacitors with well defined temperature coefficients.

Gain variations as a result of variations in the supply voltage are reduced by regulating the supply voltage locally.

A balanced to unbalanced level shifter/buffer is used on the output of the demodulator TDA1576 to use the balance in TDA1576. A DC signal is used to indicate the level of detuning. The level shifter/buffer also ensures that the MPX filter is driven with a low source impedance.

The resonators are adjusted by measuring 2nd harmonic distortion (see section 12, Adjustment and Maintenance).

The level of detuning can be measured on TP26 as a DC voltage. The sensitivity on TP26 is approximately 11.5 mV/kHz. If the local oscillator frequency is above the receiver frequency then the voltage on TP26 is positive.

Q in the demodulator circuits is relatively low in order to ensure low distortion and small gain variations as a function of the temperature.

The detector bandwidth is sufficiently wide to ensure that the limiting factor on the frequency response of the demodulated signal is the IF characteristics.

22.1.4 MPX Filter

The purpose of this filter is to reduce the high-frequency contents in the demodulated signal.

The interference from neighboring channels is reduced but the filter primarily attenuates frequencies around 3rd and 5th harmonics of the RDS signal, that is at 171 kHz and 285 kHz respectively. Thereby we obtain an improved noise immunity for the measurements in RE 331.

The filter is a pseudo-elliptic filter with linear phase and amplitude characteristics in the 0 to 60 kHz range.

The cut-off frequency downwards is set appropriately low (approximately 1.3 Hz @ -3 dB) to obtain a satisfactory channel separation and not to influence the RDS measurements.

22.1.5 Equalization Circuit and Output Stage

Level and phase errors, especially introduced by the IF-amplifier, are corrected in the equalization circuit which consists of a non-inverting amplifier with adjustable high frequency gain and an all-pass network.

The level adjustment is done before the final stage which is designed to operate into a load down to 600 Ω.

22.1.6 Detuning Indicator

The circuit responds to major DC offsets from the demodulator, (see Fig. 22.2).

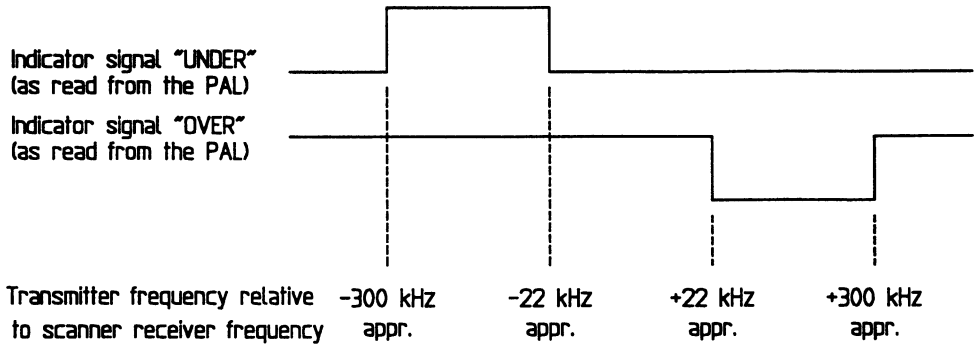


Fig. 22.2 - Detuning Signals to the Main Computer

An integrating comparator followed by a Schmitt trigger ensures a "glitch-free" shift between logic high and low.

22.1.7 Stereo Decoder

A time multiplexed decoder circuit is used. The decoding is switched off either at low RF levels (see M/S shift in section 12, Adjustment and Maintenance) or from the digital interface by a command from the operator.

The presence of a pilot signal is indicated simultaneously on the LED CR21 and on the indicator signal "PILOT". However, this is only the case if the decoding has not been switched off.

The PLL filter has been designed to minimize intermodulation caused by the presence of an RDS signal.

The output filter, besides 50μs de-emphasis, incorporates a 19 kHz notch filter and an LP-filter with a notch frequency around 38 kHz.

Channel separation is optimized by adding L and R signals at low levels to the other channel either in phase or out of phase.

22.1.8 AGC Amplifier

The AGC control is primarily a function of the IF level measured in the demodulator. An AGC amplifier is used to interface the level indication to the rest of the AGC-system, and to control the switching between mono and stereo in the stereo decoder.

The attack level for the AGC is adjusted using R153.

The AGC amplifier's output signal "IF LEVEL" on TP10 controls the M/S switching using an integrating comparator.

22.1.9 Broadband Rectifier

To increase the AGC amplifier's control range, to avoid overload of the IF chain (including the output of the tuner) due to the presence of strong signals outside the IF amplifier's passband, and to increase the total dynamic range of the RF scanner, a rectifier has been added which detects the level before the selective IF amplifier.

This rectified signal is weighted and added to the signal "IF LEVEL" (from the AGC amplifier) in the AGC driver circuit to form the final AGC control signal.

The rectifier has been designed with a FET buffer in order to reduce the influence on the IF signal.

22.1.10 AGC Drivers

The AGC control signal is fed to the tuner's AGC control input and regulates the current to the PIN diode attenuator.

When the AGC control starts to decrease the gain in the tuner, a signal called "TUNAGC" is activated, this happens at approximately 40 dBμV. Likewise when the AGC control initiates attenuation in the PIN diode attenuator another signal "PINATT" is activated, this happens at approximately 58 dBμV.

The control currents to the two PIN-diodes are non-linear in order to distribute the attenuation between both diodes and to control the sensitivity of the attenuator.

At high RF levels the broadband rectifier is dominant and the level of the IF signal which is fed to the demodulator is almost constant.

22.1.11 PIN Attenuator and Filter

The PIN diodes used are especially suited for low frequencies, (that is down to 1 MHz) due to long carrier lifetime, and as a consequence of this intermodulation can be kept at a minimum.

The attenuator is designed as a shunt-series configuration with the ability of high attenuation (approximately 50 dB).

It is possible to insert an extra resistive attenuator to be used in applications with high levels, that is when connecting the receiver to a coupler on a transmitter antenna.

An extra band-pass filter has been included in order to reduce the interference from signals outside the FM band. In addition, the filter improves the matching to the receiver during attenuation in the PIN diode attenuator.

22.1.12 Varicap Voltage Generator

This circuit generates a voltage of approximately +31.5 V using a voltage doubler which is fed from a power oscillator.

The oscillator frequency is set at approximately 80 kHz to ensure that any remaining switch noise lies outside the frequency range of the MPX-signal.

The oscillator is a controlled, modified Wienbridge oscillator; the voltage variation across the regulator FET is less than usual.

The LC filtering of the voltage is followed by a 25 V regulator with good RF-suppression.

More or less aperiodical regulation is used in both the oscillator and the regulator.

22.1.13 Synthesizer

The varactor voltage is controlled by the synthesizer circuit SAA1057 from Philips. A built-in crystal oscillator is used as reference.

The circuit is fed from the local oscillator in the tuner module via a buffer amplifier to achieve satisfactory isolation and level.

An adjustment which sets the minimum voltage to the tuner has been incorporated as the output voltage from the synthesizer might reach zero during start.

22.1.14 Interface Circuit

The key part of the interface circuit is the PAL QD2.

The signals "CLB", "I2CDATA", and "DLEN" are fed to the synthesizer in accordance with the I^2C format for SAA1057.

Together with QD3 and QD5 the PAL converts the external serial 2 Mbit/s bus signal to the slower I^2C format.

Data is clocked into QD3 and QD5 and is then slowly clocked out again with the slow "SLOWCLK" which is taken from the varactor voltage generator. The control of data in QD3 and QD5 is handled by the PAL.

Data collection is done in QD5 while QD3 distributes the control signal "MONO ONLY". The presence of an RF scanner in an RE 331 is detected using the connection called "PCB" between QD3 and QD5, which makes it possible to write to one of the 8 databits which can be read from the scanner.

22.2 Schematic Diagramn

The schematic diagram for the RF scanner is located in the following. The diagram number is 985-411.

22.3 Component Locations

The following shows the component locations on the RF scanner.

22.4 Parts List

The following shows a copy of the parts list from the production documentation. The code number of the assembled PCB is 902-061.

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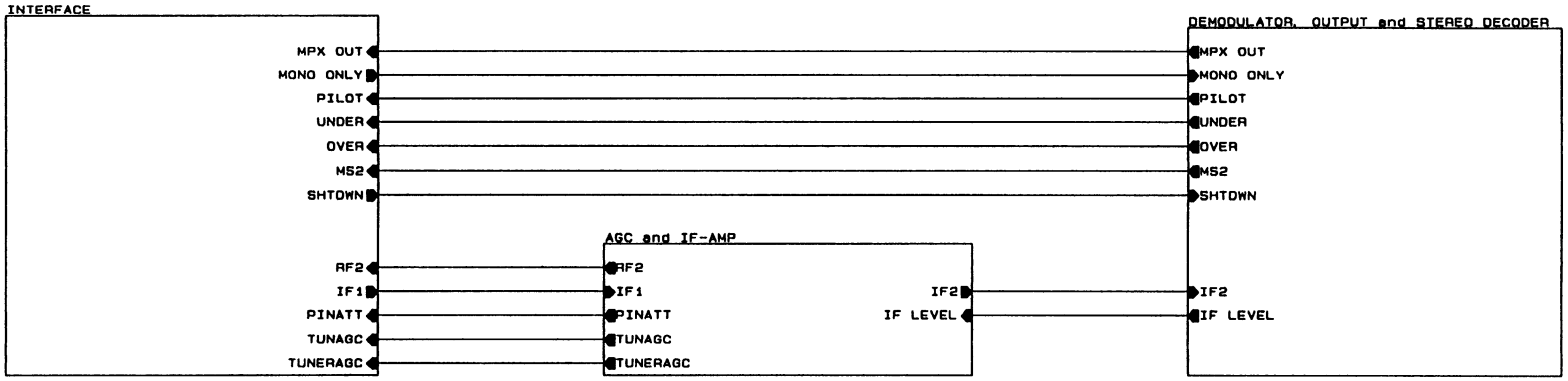
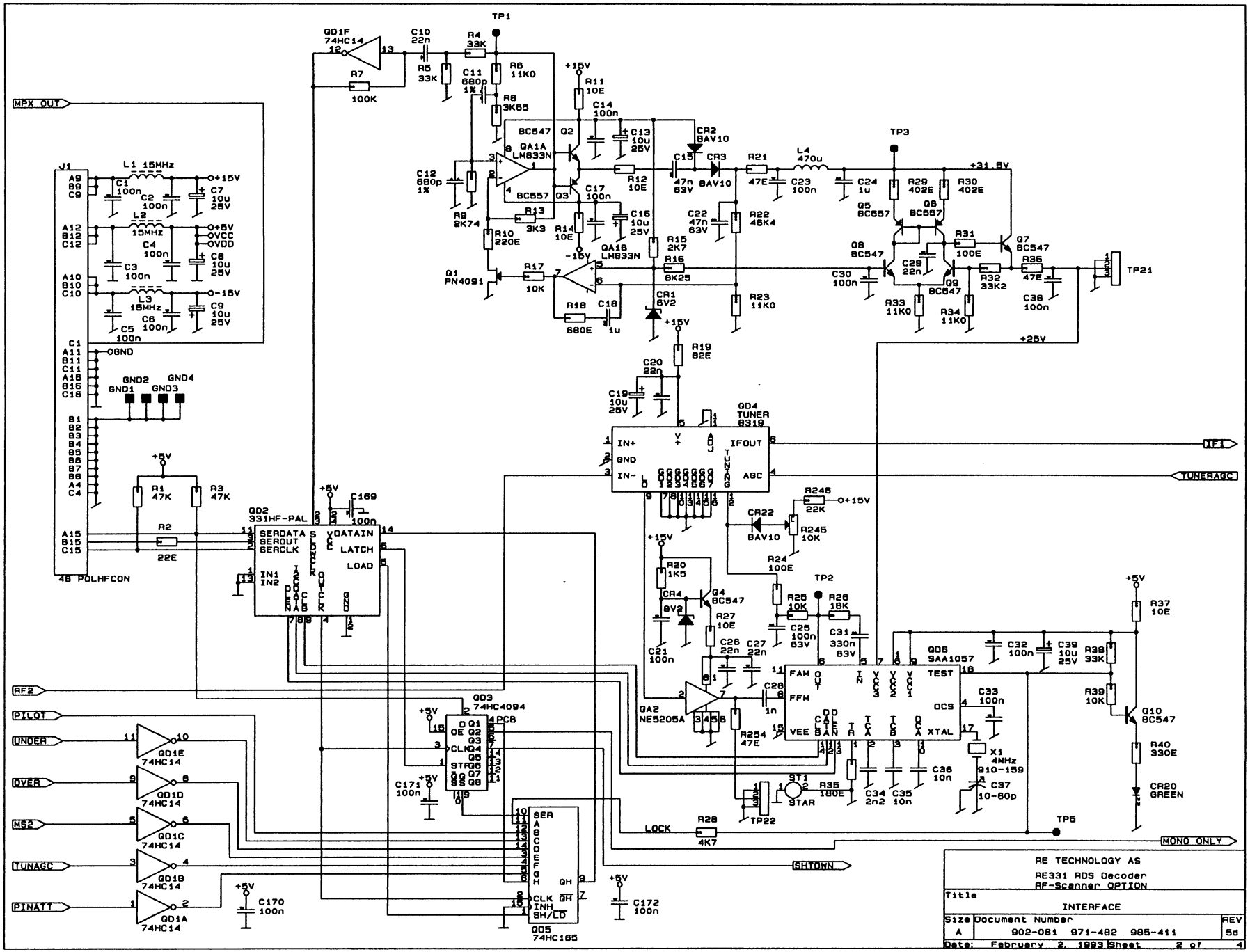
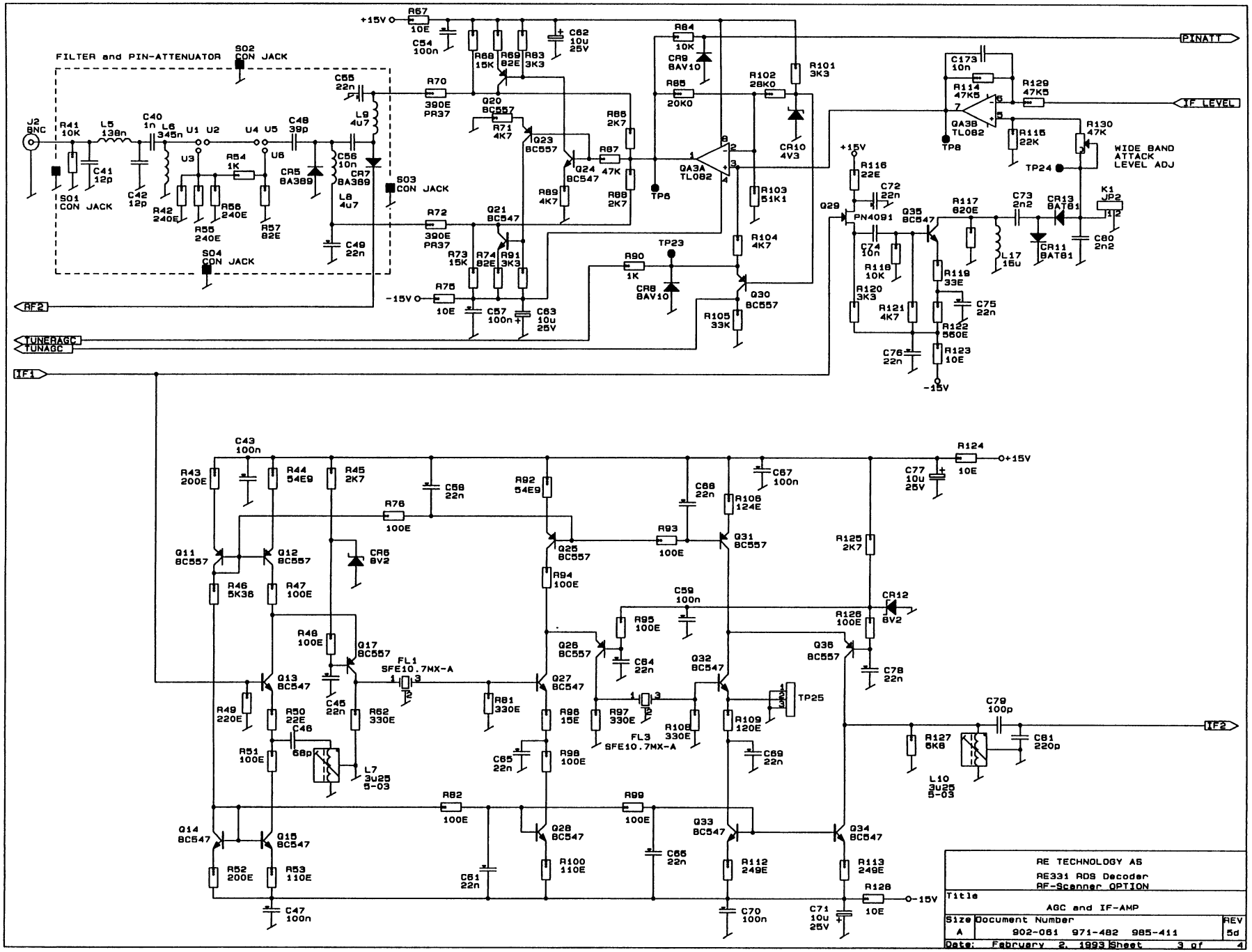
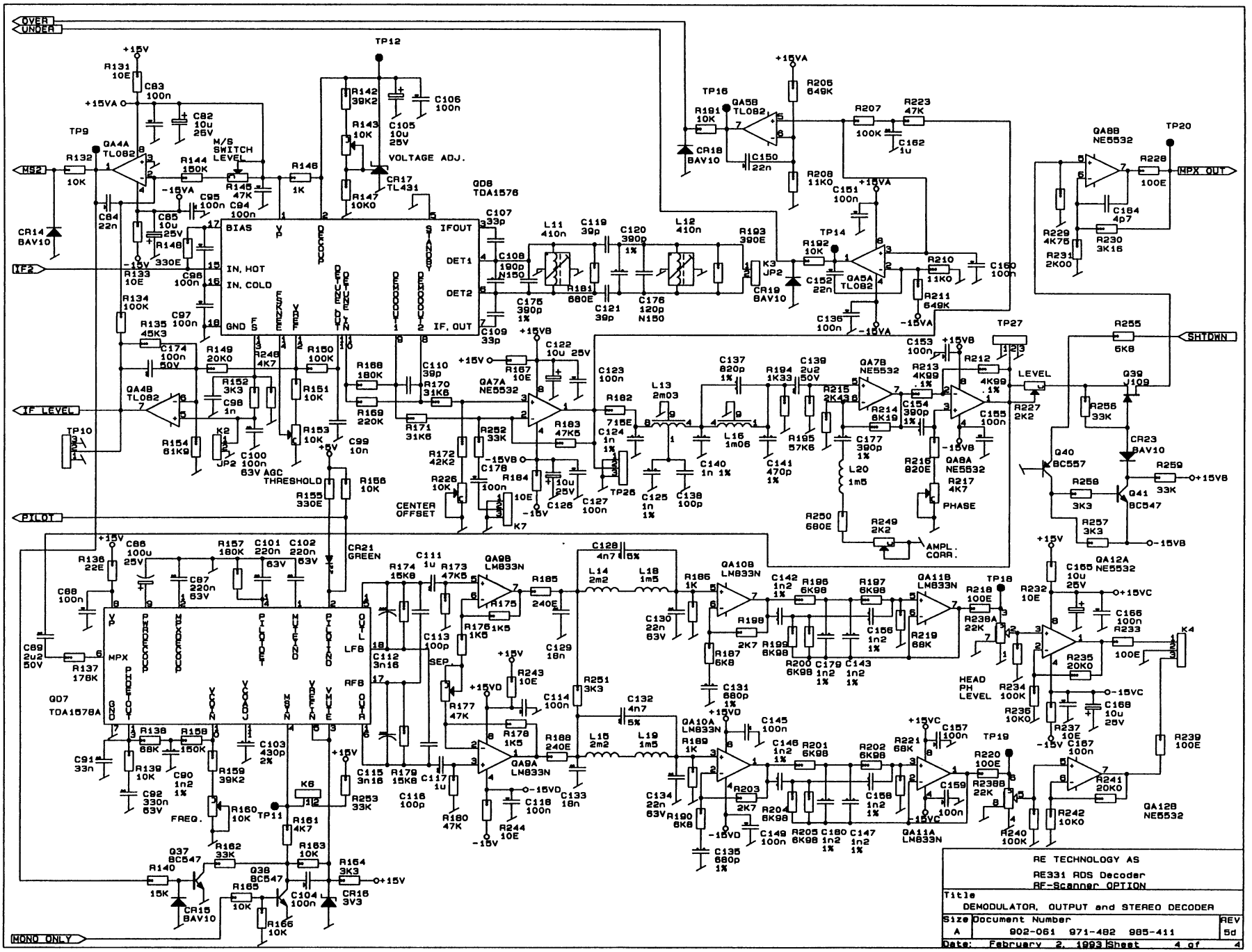
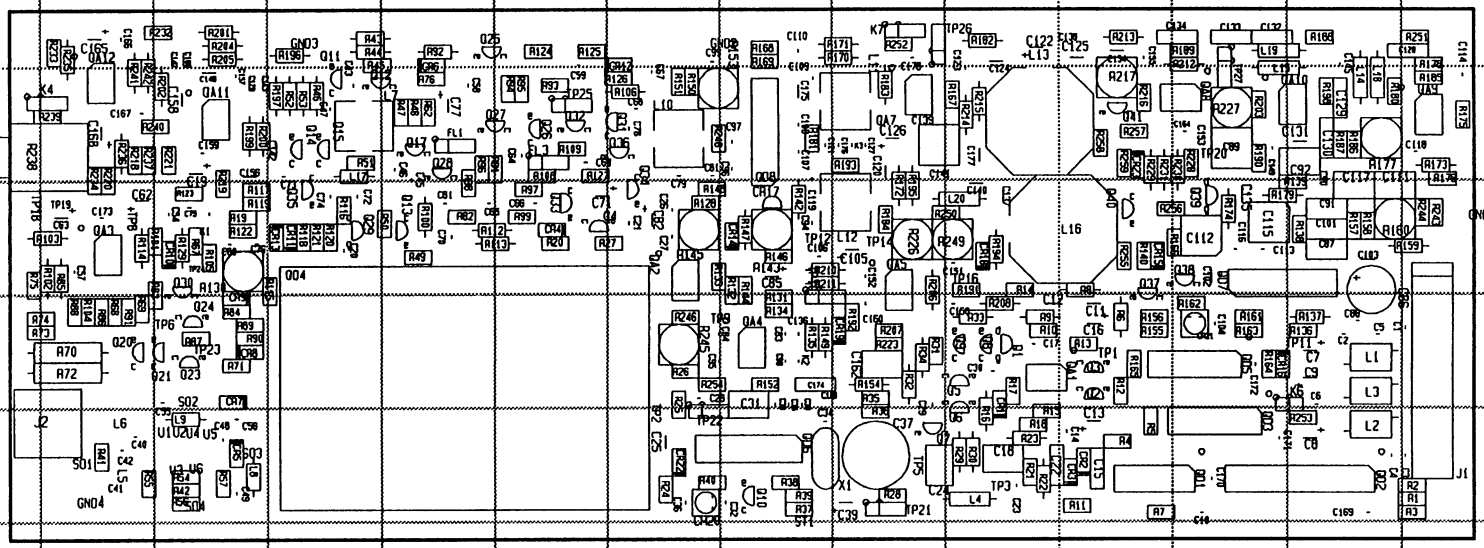


RE TECHNOLOGY AS RE331 RDS Decoder RF-Scanner OPTION		
Title: Root Sheet		
Size: A	Document Number: 902-081 971-482 985-411	REV: 5d
Date: February 2, 1993	Sheet 1 of 4	


MPX OUT
TP1
TP2
TP3
TP5
TP21
QD1F 74HC14
C10 22n
R4 33K
R5 33K
R6 11K0
R7 100K
C11 680p 1%
R8 3K65
R9 2K74
C12 680p 1%
R10 220E
R11 10E
C14 100n
C13 10u 25V
QA1A LM833N
BC547 Q2
BC557 Q3
QA1B LM833N
R12 10E
R13 3K3
R14 10E
C16 10u 25V
C17 100n
R15 2K7
R16 8K25
R17 10K
Q1 PN4091
R18 680E
C18 1u
CR1 6V2
CR2 BAV10
CR3 BAV10
C15 47n 63V
R21 47E
L4 470u
C24 1u
C23 100n
C22 47n 63V
R22 46K4
R23 11K0
R29 402E
R30 402E
+31.5V
Q5 BC557
Q6 BC557
Q8 BC547
Q7 BC547
Q9 BC547
R31 100E
R32 33K2
R36 47E
C38 100n
C29 22n
C30 100n
R33 11K0
R34 11K0
+25V
J1
L1 15MHz
L2 15MHz
L3 15MHz
C1 100n
C2 100n
C3 100n
C4 100n
C5 100n
C6 100n
C7 10u 25V
C8 10u 25V
C9 10u 25V
+15V
+5V
VCC
VDD
-15V
GND
GND1
GND2
GND3
GND4
48 POLHFCON
R1 47K
R2 22E
R3 47K
QD2 331HF-PAL
SERDATA
SEROUT
SERCLK
DATAIN
LATCH
LOAD
IN1
IN2
C169 100n
R19 82E
C20 22n
C19 10u 25V
QD4 TUNER 8319
IN+
GND
IN-
IFOUT
AGC
IF1
TUNERAGC
R246 22K
CR22 BAV10
R245 10K
R24 100E
R20 1K5
CR4 8V2
Q4 BC547
R27 10E
C21 100n
C26 22n
C27 22n
R25 10K
R26 18K
C31 330n 63V
C25 100n 63V
QD6 SAA1057
FAM OUT
FFM
IN
VCC3
VCC2
VCC1
TEST
OCS
CODE BAN
TCA
TCB
DCA
XTAL
VEE
C32 100n
C39 10u 25V
C33 100n
R38 33K
R39 10K
Q10 BC547
R37 10E
R40 330E
CR20 GREEN
X1 4MHz 910-159
C37 10-60p
C36 10n
C34 2n2
C35 10n
ST1 STAR
R35 180E
TP22
QA2 NE5205A
C28 1n
R254 47E
RF2
PILOT
UNDER
OVER
MS2
TUNAGC
PINATT
QD1E 74HC14
QD1D 74HC14
QD1C 74HC14
QD1B 74HC14
QD1A 74HC14
QD3 74HC4094
OE
STR
QS
QS'
PCB
C171 100n
C170 100n
C172 100n
QD5 74HC165
SER
QH
QH'
CLK INH
SH/LD
LOCK
R28 4K7
SHTDWN
MONO ONLY
RE TECHNOLOGY AS
RE331 RDS Decoder
RF-Scanner OPTION
Title
INTERFACE
Size A
Document Number 902-061 971-482 985-411
REV 5d
Date: February 2, 1993 Sheet 2 of 4


FILTER and PIN-ATTENUATOR
S02 CON JACK
S01 CON JACK
S03 CON JACK
S04 CON JACK
J2 BNC
RF2
IF1
TUNERAGC
TUNAGC
+15V
-15V
PINATT
IF LEVEL
WIDE BAND ATTACK LEVEL ADJ
IF2
TP8
TP23
TP24
TP25
TP6
FL1 SFE10.7MX-A
FL3 SFE10.7MX-A
L7 3u25 5-03
L10 3u25 5-03
QA3A TL082
QA3B TL082
PN4091
BC547
BC557
8V2
8AV10
8A389
8AT81
4V3
RE TECHNOLOGY AS
RE331 RDS Decoder
RF-Scanner OPTION
Title
AGC and IF-AMP
Size A
Document Number 902-061 971-482 985-411
REV 5d
Date: February 2, 1993 Sheet 3 of 4


OVER
UNDER
TP12
+15V
R131 10E
C83 100n
+15VA
C82 10u 25V
TP9
QA4A TL082
R132 10K
MS2
M/S SWITCH LEVEL
R144 150K
R145 47K
R146 1K
-15VA
C95 100n
C94 100n
C84 22n
C85 10u 25V
R148 330E
CR14 BAV10
IF2
-15V
R133 10E
C96 100n
R134 100K
C97 100n
R135 45K3
C174 100n 50V
R149 20K0
R248 4K7
R150 100K
R152 3K3
C98 1n
R151 10K
IF LEVEL
TP10
R154 61K9
K2
JP2
C100 100n 63V AGC
R153 10K
THRESHOLD
C99 10n
R155 330E
R156 10K
PILOT
R142 39K2
C105 10u 25V
R143 10K
VOLTAGE ADJ.
CR17 TL431
R147 10K0
C106 100n
QD8 TDA1576
BIAS
IN, HOT
IN, COLD
GND
IFOUT
DET1
DET2
IF, OUT
C107 33p
C108 190p N150
C175 390p 1%
C109 33p
L11 410n
C119 39p
C120 390p 1%
R181 680E
C121 39p
C176 120p N150
L12 410n
R193 390E
K3
JP2
CR19 BAV10
+15VA
TP16
QA5B TL082
R191 10K
CR18 BAV10
R205 649K
R207 100K
R223 47K
C162 1u
C150 22n
R208 11K0
C151 100n
TP14
R192 10K
C152 22n
QA5A TL082
R210 11K0
C160 100n
R211 649K
C136 100n
-15VA
+15V
R167 10E
C122 10u 25V
+15VB
C123 100n
R182 715E
C124 1n 1%
L13 2m03
C137 820p 1%
R194 1K33
C139 2u2 50V
QA7A NE5532
R183 47K5
R168 180K
R169 220K
C110 39p
R170 31K6
R171 31K6
R172 42K2
R252 33K
R226 10K
C178 100n
R184 10E
-15V
C126 10u 25V
K7
CENTER OFFSET
TP26
C127 100n
C125 1n 1%
C138 100p
C140 1n 1%
L16 1m06
R195 57K6
C141 470p 1%
L20 1m5
R250 680E
R249 2K2
AMPL. CORR.
QA7B NE5532
R213 4K99 .1%
R214 8K19
R215 2K43
C154 390p 1%
C177 390p 1%
R216 820E
QA8A NE5532
R217 4K7
PHASE
TP27
R212 4K99 .1%
LEVEL
R227 2K2
C155 100n
-15VB
R255 6K8
SHTDWN
Q39 J109
R256 33K
CR23 BAV10
R259 33K
+15VB
Q40 BC557
R258 3K3
Q41 BC547
R257 3K3
-15VB
QA8B NE5532
TP20
R228 100E
MPX OUT
C164 4p7
R229 4K75
R230 3K16
R231 2K00
C153 100n
C122 10u 25V
C128 4n7 5%
L14 2m2
L18 1m5
R185 240E
C129 18n
R186 1K
C130 22n 63V
QA10B LM833N
C142 1n2 1%
R196 6K98
R197 6K98
C156 1n2 1%
R198 2K7
R187 6K8
C131 680p 1%
R199 6K98
R200 6K98
C179 1n2 1%
C143 1n2 1%
QA11B LM833N
R218 100E
R238A 22K
R219 68K
TP18
R232 10E
C165 10u 25V
+15VC
C166 100n
R233 100E
K4
R235 20K0
HEAD PH LEVEL
R234 100K
R236 10K0
C168 10u 25V
-15VC
R237 10E
C167 100n
R239 100E
QA12A NE5532
R241 20K0
R242 10K0
R240 100K
QA12B NE5532
C157 100n
TP19
R220 100E
R238B 22K
R221 68K
QA11A LM833N
C159 100n
C158 1n2 1%
R202 6K98
R201 6K98
C146 1n2 1%
C145 100n
QA10A LM833N
R189 1K
C132 4n7 5%
L15 2m2
L19 1m5
R188 240E
C133 18n
C134 22n 63V
R190 6K8
C135 680p 1%
R203 2K7
R204 6K98
R205 6K98
C180 1n2 1%
C147 1n2 1%
C149 100n
-15VD
+15VD
C114 100n
R251 3K3
C131 680p 1%
R243 10E
R244 10E
C118 100n
-15V
R177 47K
R178 1K5
QA9A LM833N
C115 3n16
R179 15K8
C116 100p
C117 1u
R180 47K
R253 33K
C111 1u
R174 15K8
R173 47K5
QA9B LM833N
R175 1K5
R176 1K5
C113 100p
C112 3n16
SEP
RF8
OUTL
OUTR
LF8
PILOTF
PILOTIND
MUTEIND
MUTEOUT
PHSDCOUT
MXDCOUT
PHSDCOUT
VP
GND
MPX
QD7 TDA1578A
C88 100n
C89 2u2 50V
R137 178K
C91 33n
R138 68K
R158 150K
C92 330n 63V
R139 10K
C90 1n2 1%
C103 430p 2%
R159 39K2
FREQ.
R160 10K
TP11
K6
R161 4K7
R162 33K
R163 10K
R164 3K3
+15V
Q37 BC547
Q38 BC547
R140 15K
CR15 BAV10
R165 10K
C104 100n
CR16 3V3
R166 10K
MONO ONLY
C86 100u 25V
C87 220n 63V
R157 180K
C101 220n 63V
C102 220n 63V
CR21 GREEN
R136 22E
R253 33K
RE TECHNOLOGY AS
RE331 RDS Decoder
RF-Scanner OPTION
Title
DEMODULATOR, OUTPUT and STEREO DECODER
Size A
Document Number 902-061 971-482 985-411
REV 5d
Date: February 2, 1993 Sheet 4 of 4



971-48215 RF-SCANNER

COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC	COMP	LOC
CR1	H7	C58	E12	C135	F5	L20	F7	R19	F14	R106	E10	R185	E3	TP1	G6								
CR2	H6	C59	E11	C136	G9	QA1	G6	R20	F11	R108	E11	R186	E4	TP2	H10								
CR3	H6	C61	F12	C137	F7	QA2	F10	R21	H7	R109	E11	R187	E4	TP3	H7								
CR4	F11	C62	F15	C138	D6	QA3	F15	R22	H7	R112	F11	R188	D4	TP5	H8								
CR5	H14	C63	F15	C139	E8	QA4	G9	R23	H7	R113	F11	R189	D5	TP6	G14								
CR6	E12	C64	E11	C140	F7	QA5	F8	R24	H10	R114	F15	R190	E5	TP8	F15								
CR7	G14	C65	F11	C141	E7	QA7	E8	R25	H10	R115	F14	R191	F7	TP9	G9								
CR8	G14	C66	F11	C142	E13	QA8	E5	R26	G10	R116	F13	R192	G8	TP10	F9								
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CR11	F13	C69	E10	C146	E14	QA11	E14	R29	H7	R119	F13	R195	E8	TP14	F8								
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CR22	H10	C80	F14	C158	E14	Q2	G6	R40	H10	R130	F14	R206	F8	TP27	D5								
CR23	E6	C81	E10	C159	E14	Q3	G6	R41	H15	R131	G9	R207	G8	U1	H14								
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C3	H4	C84	G9	C164	E5	Q6	H7	R44	D13	R134	G9	R211	F8	U4	H14								
C4	H4	C85	F9	C165	D15	Q7	H8	R45	E13	R135	G9	R212	E5	U5	H14								
C5	G4	C86	F4	C166	D15	Q8	G7	R46	E13	R136	G4	R213	D6	U6	H14								
C6	G4	C87	F4	C167	E15	Q9	G7	R47	E12	R137	G4	R214	E7	X1	H8								
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C9	G4	C90	F4	C170	H5	Q12	E13	R50	F12	R140	F6	R217	E6										
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C19	E14	C101	F4	C180	D14	Q26	E11	R68	G15	R151	E10	R230	E5										
C20	F13	C102	F5	FL1	E12	Q27	E12	R69	G15	R152	G9	R231	E6										
C21	F10	C103	F4	FL3	E11	Q28	E12	R70	G15	R153	D9	R232	D14										
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C25	H10	C107	E9	GND4	H15	Q32	E11	R74	G15	R157	F4	R236	E15										
C26	F10	C108	E9	J1	H3	Q33	F11	R75	F16	R158	F4	R237	E15										
C27	F10	C109	E9	J2	H16	Q34	F10	R76	E12	R159	F4	R238	E16										
C28	G10	C110	D9	K1	F14	Q35	F13	R81	E12	R160	F3	R239	E15										
C29	H8	C111	F4	K2	G9	Q36	E10	R82	F12	R161	G5	R240	E15										
C30	G7	C112	F5	K3	E8	Q37	F6	R83	F15	R162	G5	R241	E15										
C31	H9	C113	F4	K4	E15	Q38	F5	R84	G14	R163	G5	R242	E15										
C32	H9	C114	D3	K6	G4	Q39	F5	R85	F15	R164	G5	R243	F3										
C33	H9	C115	F5	K7	D8	Q40	F6	R86	G15	R165	G6	R244	F3										
C34	H9	C116	F5	L1	G4	Q41	E6	R87	G14	R166	F5	R245	G10										
C35	G9	C117	F4	L2	H4	R1	H3	R88	G15	R167	E7	R246	G10										
C36	H10	C118	E3	L3	G4	R2	H3	R89	G14	R168	D9	R248	E10										
C37	H8	C119	F9	L4	H7	R3	H3	R90	G14	R169	D9	R249	F8										
C38	H9	C120	E8	L5	H15	R4	H6	R91	G15	R170	D9	R250	F8										
C39	H8	C121	E9	L6	H15	R5	H6	R92	D12	R171	D9	R251	D3										
C40	H15	C122	D7	L7	E12	R6	G6	R93	E11	R172	E8	R252	D8										
C41	H15	C123	E7	L8	H14	R7	H6	R94	E11	R173	E3	R253	H4										
C42	H15	C124	D7	L9	H14	R8	F6	R95	E11	R174	F5	R254	G10										
C43	E13	C125	D6	L10	E10	R9	G7	R96	E12	R175	E3	R255	F6										
C45	E12	C126	E8	L11	E8	R10	G7	R97	F11	R176	E3	R256	F6										
C46	E12	C127	E8	L12	F8	R11	H6	R98	F12	R177	E4	R257	E6										
C47	E13	C128	D3	L13	D7	R12	G6	R99	F11	R178	D3	R258	E6										
C48	H14	C129	E4	L14	E4	R13	G6	R100	F12	R179	F5	R259	E6										
C49	H14	C130	E4	L15	D4	R14	F7	R101	F15	R180	E4	SO1	H15										
C54	F14	C131	E4	L16	F6	R15	G7	R102	F15	R181	E9	SO2	G14										
C55	G14	C132	D5	L17	E13	R16	H7	R103	F15	R182	D7	SO3	H14										
C56	H14	C133	D5	L18	E4	R17	G7	R104	G15	R183	E8	SO4	H14										
C57	F15	C134	D5	L19	D5	R18	H7	R105	F14	R184	F8	ST1	J9										

COMPONENT SIDE

RF Scanner (902-061)

CAPACITORS

C 1	C Ceramic 100n 20% 50V	213-401
C 2	C Ceramic 100n 20% 50V	213-401
C 3	C Ceramic 100n 20% 50V	213-401
C 4	C Ceramic 100n 20% 50V	213-401
C 5	C Ceramic 100n 20% 50V	213-401
C 6	C Ceramic 100n 20% 50V	213-401
C 7	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 8	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 9	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 10	C Ceramic 22n0 -20+80% 63V	213-011
C 11	Multilayer, 680pF 1% NPO 50V, 7.62*5.1*3.2, RM2	213-611
C 12	Multilayer, 680pF 1% NPO 50V, 7.62*5.1*3.2, RM2	213-611
C 13	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 14	C Ceramic 100n 20% 50V	213-401
C 15	MKT, 0.047/63/10, R:2.5*6.5*7.2, RM2	241-083
C 16	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 17	C Ceramic 100n 20% 50V	213-401
C 18	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 19	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 20	C Ceramic 22n0 -20+80% 63V	213-011
C 21	C Ceramic 100n 20% 50V	213-401
C 22	MKT, 0.047/63/10, R:2.5*6.5*7.2, RM2	241-083
C 23	C Ceramic 100n 20% 50V	213-401
C 24	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 25	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 26	C Ceramic 22n0 -20+80% 63V	213-011
C 27	C Ceramic 22n0 -20+80% 63V	213-011
C 28	C Ceramic 1n00 -20+80% 63V	213-013
C 29	C Ceramic 22n0 -20+80% 63V	213-011
C 30	C Ceramic 100n 20% 50V	213-401
C 31	MKT, 0.33/63/10, R:3.5*8*7.2, RM2	241-072
C 32	C Ceramic 100n 20% 50V	213-401
C 33	C Ceramic 100n 20% 50V	213-401
C 34	C Ceramic 2n20 -20+80% 63V	213-012
C 35	C Ceramic 10n0 -20+80% 63V	213-020
C 36	C Ceramic 10n0 -20+80% 63V	213-020
C 37	C Var. 10-60p hor	286-007
C 38	C Ceramic 100n 20% 50V	213-401
C 39	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 40	C Ceramic 1n00 -20+80% 63V	213-013
C 41	C Ceramic 12p0 p25 100V NPO	213-227
C 42	C Ceramic 12p0 p25 100V NPO	213-227
C 43	C Ceramic 100n 20% 50V	213-401
C 45	C Ceramic 22n0 -20+80% 63V	213-011
C 46	C Ceramic 68p0 2% 100V NP0	213-215
C 47	C Ceramic 100n 20% 50V	213-401
C 48	C Ceramic 39p0 2% 100V NP0	213-232
C 49	C Ceramic 22n0 -20+80% 63V	213-011
C 54	C Ceramic 100n 20% 50V	213-401
C 55	C Ceramic 22n0 -20+80% 63V	213-011

C 56	C Ceramic 10n0 -20+80% 63V	213-020
C 57	C Ceramic 100n 20% 50V	213-401
C 58	C Ceramic 22n0 -20+80% 63V	213-011
C 59	C Ceramic 100n 20% 50V	213-401
C 61	C Ceramic 22n0 -20+80% 63V	213-011
C 62	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 63	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 64	C Ceramic 22n0 -20+80% 63V	213-011
C 65	C Ceramic 22n0 -20+80% 63V	213-011
C 66	C Ceramic 22n0 -20+80% 63V	213-011
C 67	C Ceramic 100n 20% 50V	213-401
C 68	C Ceramic 22n0 -20+80% 63V	213-011
C 69	C Ceramic 22n0 -20+80% 63V	213-011
C 70	C Ceramic 100n 20% 50V	213-401
C 71	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 72	C Ceramic 22n0 -20+80% 63V	213-011
C 73	C Ceramic 2n20 -20+80% 63V	213-012
C 74	C Ceramic 10n0 -20+80% 63V	213-020
C 75	C Ceramic 22n0 -20+80% 63V	213-011
C 76	C Ceramic 22n0 -20+80% 63V	213-011
C 77	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 78	C Ceramic 22n0 -20+80% 63V	213-011
C 79	C Ceramic 100p 2% 100V NP0	213-211
C 80	C Ceramic 2n20 -20+80% 63V	213-012
C 81	C Ceramic 220p 2% 100V N750	213-218
C 82	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 83	C Ceramic 100n 20% 50V	213-401
C 84	C Ceramic 22n0 -20+80% 63V	213-011
C 85	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 86	Electrolytic 100/25, 2000h/85°, R:6.3*11, RM2	261-073
C 87	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071
C 88	C Ceramic 100n 20% 50V	213-401
C 89	MKT, 2.2/50/20, R:7.2*13*7.2, RM2	241-103
C 90	C Ceramic 1n2 1% 50V	213-620
C 91	MKT, 0.033/63/10, R:3.5*8*7.2, RM2	241-059
C 92	MKT, 0.33/63/10, R:3.5*8*7.2, RM2	241-072
C 94	C Ceramic 100n 20% 50V	213-401
C 95	C Ceramic 100n 20% 50V	213-401
C 96	C Ceramic 100n 20% 50V	213-401
C 97	C Ceramic 100n 20% 50V	213-401
C 98	C Ceramic 1n00 -20+80% 63V	213-013
C 99	C Ceramic 10n0 -20+80% 63V	213-020
C 100	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 101	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071
C 102	MKT, 0.22/63/10, R:3.5*8*7.2, RM2	241-071
C 103	C Ceramic 430p 2% 50V	213-623
C 104	C Ceramic 100n 20% 50V	213-401
C 105	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 106	C Ceramic 100n 20% 50V	213-401
C 107	C Ceramic 33p0 2% 100V NP0	213-208
C 108	C Ceramic 120p 2% N150	213-415
C 109	C Ceramic 33p0 2% 100V NP0	213-208
C 110	C Ceramic 39p0 2% 100V NP0	213-232
C 111	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064

C 112	C Polystyrene 3n16 1% 63V	243-329
C 113	C Ceramic 100p 2% 100V NP0	213-211
C 114	C Ceramic 100n 20% 50V	213-401
C 115	C Polystyrene 3n16 1% 63V	243-329
C 116	C Ceramic 100p 2% 100V NP0	213-211
C 117	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 118	C Ceramic 100n 20% 50V	213-401
C 119	C Ceramic 39p0 2% 100V NP0	213-232
C 120	C Ceramic 390p 1% 50V	213-634
C 121	C Ceramic 39p0 2% 100V NP0	213-232
C 122	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 123	C Ceramic 100n 20% 50V	213-401
C 124	C Ceramic 1n0 1% 50V	213-621
C 125	C Ceramic 1n0 1% 50V	213-621
C 126	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 127	C Ceramic 100n 20% 50V	213-401
C 128	KT, 4700pF 5%,	241-084
C 129	MKT, 0.018/63/10, R:2.5*6.5*7.2, RM2	241-104
C 130	MKT, 0.022/63/10, R:2.5*6.5*7.2, RM2	241-078
C 131	Multilayer, 680pF 1% NPO 50V, 7.62*5.1*3.2, RM2	213-611
C 132	KT, 4700pF 5%,	241-084
C 133	MKT, 0.018/63/10, R:2.5*6.5*7.2, RM2	241-104
C 134	MKT, 0.022/63/10, R:2.5*6.5*7.2, RM2	241-078
C 135	Multilayer, 680pF 1% NPO 50V, 7.62*5.1*3.2, RM2	213-611
C 136	C Ceramic 100n 20% 50V	213-401
C 137	C Ceramic 820p 1% 50V	213-625
C 138	C Ceramic 100p 2% 100V NP0	213-211
C 139	MKT, 2.2/50/20, R:7.2*13*7.2, RM2	241-103
C 140	C Ceramic 1n0 1% 50V	213-621
C 141	C Ceramic 470p 1% 50V	213-624
C 142	C Ceramic 1n2 1% 50V	213-620
C 143	C Ceramic 1n2 1% 50V	213-620
C 145	C Ceramic 100n 20% 50V	213-401
C 146	C Ceramic 1n2 1% 50V	213-620
C 147	C Ceramic 1n2 1% 50V	213-620
C 149	C Ceramic 100n 20% 50V	213-401
C 150	C Ceramic 22n0 -20+80% 63V	213-011
C 151	C Ceramic 100n 20% 50V	213-401
C 152	C Ceramic 22n0 -20+80% 63V	213-011
C 153	C Ceramic 100n 20% 50V	213-401
C 154	C Ceramic 390p 1% 50V	213-634
C 155	C Ceramic 100n 20% 50V	213-401
C 156	C Ceramic 1n2 1% 50V	213-620
C 157	C Ceramic 100n 20% 50V	213-401
C 158	C Ceramic 1n2 1% 50V	213-620
C 159	C Ceramic 100n 20% 50V	213-401
C 160	C Ceramic 100n 20% 50V	213-401
C 162	MKT, 1/63/10, R:6*11.5*7.2, RM2	241-064
C 164	C Ceramic 4p70 p25 100V p100	213-203
C 165	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 166	C Ceramic 100n 20% 50V	213-401
C 167	C Ceramic 100n 20% 50V	213-401
C 168	C Solid Aluminium 10u 20% 25V Short Type	265-110
C 169	C Ceramic 100n 20% 50V	213-401

C 170	C Ceramic 100n 20% 50V	213-401
C 171	C Ceramic 100n 20% 50V	213-401
C 172	C Ceramic 100n 20% 50V	213-401
C 173	C Ceramic 10n0 -20+80% 63V	213-020
C 174	MKT, 0.1/63/10, R:2.5*6.5*7.2, RM2	241-070
C 175	C Ceramic 390p 1% 50V	213-634
C 176	C Ceramic 120p 2% N150	213-415
C 177	C Ceramic 390p 1% 50V	213-634
C 178	C Ceramic 100n 20% 50V	213-401
C 179	C Ceramic 1n2 1% 50V	213-620
C 180	C Ceramic 1n2 1% 50V	213-620

DIODES

CR 1	Diode zener BZX79-C6V2 0.4W	350-604
CR 2	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 3	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 4	Diode zener BZX79-C8V2 0.4W	350-607
CR 5	Diode BA389 pin Vr-30 If-20mA	350-038
CR 6	Diode zener BZX79-C8V2 0.4W	350-607
CR 7	Diode BA389 pin Vr-30 If-20mA	350-038
CR 8	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 9	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 10	Diode zener BZX79-C4V3 0.4W	350-639
CR 11	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 12	Diode zener BZX79-C8V2 0.4W	350-607
CR 13	Diode Bat81 schottky Vr-40V If-30mA	350-066
CR 14	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 15	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 16	Diode zener BZX79-C3V3 0.4W	350-625
CR 17	IC TL431 ADJ. Precision Shunt Regulators	364-849
CR 18	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 19	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 20	LED 3mm green	350-060
CR 21	LED 3mm green	350-060
CR 22	Diode BAV10 Si Vr-60V If-600mA	350-022
CR 23	Diode BAV10 Si Vr-60V If-600mA	350-022

FILTERS

FL 1	C Ceramic Filter 10.7MHz	216-009
FL 3	C Ceramic Filter 10.7MHz	216-009

CONNECTORS

J 1	DIN 41612 64 pol male 90°, C/2 class II	805-958
J 2	Angle Bnc Jack For Printed Circuin Board 50E	800-524

RELAYS & JUMPERS

K 1	2-pol amp connector	805-951
K 2	2-pol amp connector	805-951
K 3	2-pol amp connector	805-951
K 4	3 Pin AMP mod II Terminal List, Straight	805-894
K 6	2-pol amp connector	805-951
K 7	3 Pin AMP mod II Terminal List, Straight	805-894

CHOKES

L 1	RF-choke six-hole core green	731-204
L 2	RF-choke six-hole core green	731-204
L 3	RF-choke six-hole core green	731-204
L 4	Choke HF Mini 470uH 10% 124MA	703-014
L 5	Coil Hf-132-09 138nH 5%	703-085
L 6	Coil Hf-132-15 345nH 5%	703-086
L 7	HF Coil 3u25 Adjustable	740-226
L 8	Choke HF Mini 4U7 10% 430mA	703-038
L 9	Choke HF Mini 4U7 10% 430mA	703-038
L 10	HF Coil 3u25 Adjustable	740-226
L 11	HF Coil 410nH Adjustable	740-222
L 12	HF Coil 410nH Adjustable	740-222
L 13	Coil 2m03 For RE331 RF-Scanner L13	740-257
L 14	Choke HF Mini 2m2 5%	703-089
L 15	Choke HF Mini 2m2 5%	703-089
L 16	*Potcore Coil	740-015
L 17	Choke HF Mini 15u 5% 185mA	703-071
L 18	Choke HF Mini 1m5 5%	703-088
L 19	Choke HF Mini 1m5 5%	703-088

TRANSISTORS

Q 1	Transistor JFet-N J111, TO92	360-116
Q 2	Transistor BC547B npn	360-159
Q 3	Transistor BC557B pnp	360-160
Q 4	Transistor BC547B npn	360-159
Q 5	Transistor BC557B pnp	360-160
Q 6	Transistor BC557B pnp	360-160
Q 7	Transistor BC547B npn	360-159
Q 8	Transistor BC547B npn	360-159
Q 9	Transistor BC547B npn	360-159
Q 10	Transistor BC547B npn	360-159
Q 11	Transistor BC557B pnp	360-160
Q 12	Transistor BC557B pnp	360-160
Q 13	Transistor BC547B npn	360-159
Q 14	Transistor BC547B npn	360-159
Q 15	Transistor BC547B npn	360-159
Q 17	Transistor BC557B pnp	360-160
Q 20	Transistor BC557B pnp	360-160
Q 21	Transistor BC547B npn	360-159
Q 23	Transistor BC557B pnp	360-160
Q 24	Transistor BC547B npn	360-159
Q 25	Transistor BC557B pnp	360-160

Q 26	Transistor BC557B pnp	360-160
Q 27	Transistor BC547B npn	360-159
Q 28	Transistor BC547B npn	360-159
Q 29	Transistor JFet-N J111, TO92	360-116
Q 30	Transistor BC557B pnp	360-160
Q 31	Transistor BC557B pnp	360-160
Q 32	Transistor BC547B npn	360-159
Q 33	Transistor BC547B npn	360-159
Q 34	Transistor BC547B npn	360-159
Q 35	Transistor BC547B npn	360-159
Q 36	Transistor BC557B pnp	360-160
Q 37	Transistor BC547B npn	360-159
Q 38	Transistor BC547B npn	360-159
Q 39	Transistor J109-18 n Fet	360-188
Q 40	Transistor BC557B pnp	360-160
Q 41	Transistor BC547B npn	360-159

INTEGRATED ANALOG CIRCUITS

QA 1	IC LM833N Dual Low Noise OPamp	365-037
QA 2	IC NE5205A wideband HF amp, 600MHz, dip8	364-953
QA 3	IC TL082 dual op amp	364-619
QA 4	IC TL082 dual op amp	364-619
QA 5	IC TL082 dual op amp	364-619
QA 7	IC NE5532A Dual OP-Amp low noise	364-640
QA 8	IC NE5532A Dual OP-Amp low noise	364-640
QA 9	IC LM833N Dual Low Noise OPamp	365-037
QA 10	IC LM833N Dual Low Noise OPamp	365-037
QA 11	IC LM833N Dual Low Noise OPamp	365-037
QA 12	IC NE5532A Dual OP-Amp low noise	364-640

INTEGRATED DIGITAL CIRCUITS

QD 1	IC 74HC14 Hex inv. Schmitt Trig	364-800
QD 2	RE331 HF-Scanner Pal 902-061 QD2	369-358
QD 3	IC 74HC4094 8 stage shift REG.	364-811
QD 4	Tuner Frontend 8319	910-235
QD 5	IC 74HC165 Shift Register	365-013
QD 6	IC SAA1057 Radio Tuning PLL Frequency Syntheizer	365-076
QD 7	IC TDA1578A Time Multiplex PLL Stereo Decoder	365-074
QD 8	IC TDA1576 FM/IF Amplifier	364-554

RESISTORS

R 1	R Metal film 47K0 5% 0.2W TC250	107-547
R 2	R Metal film 22E0 5% 0.2W TC250	107-222
R 3	R Metal film 47K0 5% 0.2W TC250	107-547
R 4	R Metal film 33K0 5% 0.2W TC250	107-533
R 5	R Metal film 33K0 5% 0.2W TC250	107-533
R 6	R Metal Film 11K0 1% 0.5W TC50	115-110
R 7	R Metal film 100K 5% 0.2W TC250	107-610
R 8	R Metal Film 3K65 1% 0.5W TC50	114-365
R 9	R Metal Film 2K74 1% 0.5W TC50	114-274
R 10	R Metal film 220E 5% 0.2W TC250	107-322

R 11	R Metal film 10E0 5% 0.2W TC250	107-210
R 12	R Metal film 10E0 5% 0.2W TC250	107-210
R 13	R Metal film 3K30 5% 0.2W TC250	107-433
R 14	R Metal film 10E0 5% 0.2W TC250	107-210
R 15	R Metal film 2K70 5% 0.2W TC250	107-427
R 16	R Metal Film 8K25 1% 0.5W TC50	114-825
R 17	R Metal film 10K0 5% 0.2W TC250	107-510
R 18	R Metal film 680E 5% 0.2W TC250	107-368
R 19	R Metal film 82E0 5% 0.2W TC250	107-282
R 20	R Metal film 1K50 5% 0.2W TC250	107-415
R 21	R Metal film 47E0 5% 0.2W TC250	107-247
R 22	R Metal Film 46K4 1% 0.5W TC50	115-464
R 23	R Metal Film 11K0 1% 0.5W TC50	115-110
R 24	R Metal film 100E 5% 0.2W TC250	107-310
R 25	R Metal film 10K0 5% 0.2W TC250	107-510
R 26	R Metal film 18K0 5% 0.2W TC250	107-518
R 27	R Metal film 10E0 5% 0.2W TC250	107-210
R 28	R Metal film 4K70 5% 0.2W TC250	107-447
R 29	R Metal Film 402E 1% 0.5W TC50	113-402
R 30	R Metal Film 402E 1% 0.5W TC50	113-402
R 31	R Metal film 100E 5% 0.2W TC250	107-310
R 32	R Metal Film 33K2 1% 0.5W TC50	115-332
R 33	R Metal Film 11K0 1% 0.5W TC50	115-110
R 34	R Metal Film 11K0 1% 0.5W TC50	115-110
R 35	R Metal film 180E 5% 0.2W TC250	107-318
R 36	R Metal film 47E0 5% 0.2W TC250	107-247
R 37	R Metal film 10E0 5% 0.2W TC250	107-210
R 38	R Metal film 33K0 5% 0.2W TC250	107-533
R 39	R Metal film 10K0 5% 0.2W TC250	107-510
R 40	R Metal film 330E 5% 0.2W TC250	107-333
R 41	R Metal film 10K0 5% 0.2W TC250	107-510
R 42	R Metal film 240E 5% 0.2W TC250	107-324
R 43	R Metal Film 200E 1% 0.5W TC50	113-200
R 44	R Metal film 54E9 1% 0.4W TC50	112-549
R 45	R Metal film 2K70 5% 0.2W TC250	107-427
R 46	R Metal Film 5K36 1% 0.5W TC50	114-536
R 47	R Metal film 100E 5% 0.2W TC250	107-310
R 48	R Metal film 100E 5% 0.2W TC250	107-310
R 49	R Metal film 220E 5% 0.2W TC250	107-322
R 50	R Metal film 22E0 5% 0.2W TC250	107-222
R 51	R Metal film 100E 5% 0.2W TC250	107-310
R 52	R Metal Film 200E 1% 0.5W TC50	113-200
R 53	R Metal Film 110E 1% 0.5W TC50	113-110
R 54	R Metal film 1K00 5% 0.2W TC250	107-410
R 55	R Metal film 240E 5% 0.2W TC250	107-324
R 56	R Metal film 240E 5% 0.2W TC250	107-324
R 57	R Metal film 82E0 5% 0.2W TC250	107-282
R 62	R Metal film 330E 5% 0.2W TC250	107-333
R 67	R Metal film 10E0 5% 0.2W TC250	107-210
R 68	R Metal film 15K0 5% 0.2W TC250	107-515
R 69	R Metal film 82E0 5% 0.2W TC250	107-282
R 70	R ww 390E 5% 1.6w	130-517
R 71	R Metal film 4K70 5% 0.2W TC250	107-447
R 72	R ww 390E 5% 1.6w	130-517

R 73	R Metal film 15K0 5% 0.2W TC250	107-515
R 74	R Metal film 82E0 5% 0.2W TC250	107-282
R 75	R Metal film 10E0 5% 0.2W TC250	107-210
R 76	R Metal film 100E 5% 0.2W TC250	107-310
R 81	R Metal film 330E 5% 0.2W TC250	107-333
R 82	R Metal film 100E 5% 0.2W TC250	107-310
R 83	R Metal film 3K30 5% 0.2W TC250	107-433
R 84	R Metal film 10K0 5% 0.2W TC250	107-510
R 85	R Metal Film 20K0 1% 0.5W TC50	115-200
R 86	R Metal film 2K70 5% 0.2W TC250	107-427
R 87	R Metal film 47K0 5% 0.2W TC250	107-547
R 88	R Metal film 2K70 5% 0.2W TC250	107-427
R 89	R Metal film 4K70 5% 0.2W TC250	107-447
R 90	R Metal film 1K00 5% 0.2W TC250	107-410
R 91	R Metal film 3K30 5% 0.2W TC250	107-433
R 92	R Metal film 54E9 1% 0.4W TC50	112-549
R 93	R Metal film 100E 5% 0.2W TC250	107-310
R 94	R Metal film 100E 5% 0.2W TC250	107-310
R 95	R Metal film 100E 5% 0.2W TC250	107-310
R 96	R Metal film 15E0 5% 0.2W TC250	107-215
R 97	R Metal film 330E 5% 0.2W TC250	107-333
R 98	R Metal film 100E 5% 0.2W TC250	107-310
R 99	R Metal film 100E 5% 0.2W TC250	107-310
R 100	R Metal Film 110E 1% 0.5W TC50	113-110
R 101	R Metal film 3K30 5% 0.2W TC250	107-433
R 102	R Metal Film 28K0 1% 0.5W TC50	115-280
R 103	R Metal Film 51K1 1% 0.5W TC50	115-511
R 104	R Metal film 4K70 5% 0.2W TC250	107-447
R 105	R Metal film 33K0 5% 0.2W TC250	107-533
R 106	R Metal film 124E 1% 0.4W TC50	113-124
R 108	R Metal film 330E 5% 0.2W TC250	107-333
R 109	R Metal film 120E 5% 0.2W TC250	107-312
R 112	R Metal Film 249E 1% 0.5W TC50	113-249
R 113	R Metal Film 249E 1% 0.5W TC50	113-249
R 114	R Metal Film 47K5 1% 0.5W TC50	115-475
R 115	R Metal film 22K0 5% 0.2W TC250	107-522
R 116	R Metal film 22E0 5% 0.2W TC250	107-222
R 117	R Metal film 820E 5% 0.2W TC250	107-382
R 118	R Metal film 10K0 5% 0.2W TC250	107-510
R 119	R Metal film 33E0 5% 0.2W TC250	107-233
R 120	R Metal film 3K30 5% 0.2W TC250	107-433
R 121	R Metal film 4K70 5% 0.2W TC250	107-447
R 122	R Metal film 560E 5% 0.2W TC250	107-356
R 123	R Metal film 10E0 5% 0.2W TC250	107-210
R 124	R Metal film 10E0 5% 0.2W TC250	107-210
R 125	R Metal film 2K70 5% 0.2W TC250	107-427
R 126	R Metal film 100E 5% 0.2W TC250	107-310
R 127	R Metal film 6K80 5% 0.2W TC250	107-468
R 128	R Metal film 10E0 5% 0.2W TC250	107-210
R 129	R Metal Film 47K5 1% 0.5W TC50	115-475
R 130	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 131	R Metal film 10E0 5% 0.2W TC250	107-210
R 132	R Metal film 10K0 5% 0.2W TC250	107-510
R 133	R Metal film 10E0 5% 0.2W TC250	107-210

R 134	R Metal film 100K 5% 0.2W TC250	107-610
R 135	R Metal film 45K3 1% 0.4W TC50	115-453
R 136	R Metal film 22E0 5% 0.2W TC250	107-222
R 137	R Metal Film 178K 1% 0.5W TC50	116-178
R 138	R Metal film 68K0 5% 0.2W TC250	107-568
R 139	R Metal film 10K0 5% 0.2W TC250	107-510
R 140	R Metal film 15K0 5% 0.2W TC250	107-515
R 142	R Metal Film 39K2 1% 0.5W TC50	115-392
R 143	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 144	R Metal film 150K 5% 0.2W TC250	107-615
R 145	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 146	R Metal film 1K00 5% 0.2W TC250	107-410
R 147	R Metal Film 10K0 1% 0.5W TC50	115-100
R 148	R Metal film 330E 5% 0.2W TC250	107-333
R 149	R Metal Film 20K0 1% 0.5W TC50	115-200
R 150	R Metal film 100K 5% 0.2W TC250	107-610
R 151	R Metal film 10K0 5% 0.2W TC250	107-510
R 152	R Metal film 3K30 5% 0.2W TC250	107-433
R 153	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 154	R Metal Film 61K9 1% 0.5W TC50	115-619
R 155	R Metal film 330E 5% 0.2W TC250	107-333
R 156	R Metal film 10K0 5% 0.2W TC250	107-510
R 157	R Metal film 180K 5% 0.2W TC250	107-618
R 158	R Metal film 150K 5% 0.2W TC250	107-615
R 159	R Metal Film 39K2 1% 0.5W TC50	115-392
R 160	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 161	R Metal film 4K70 5% 0.2W TC250	107-447
R 162	R Metal film 33K0 5% 0.2W TC250	107-533
R 163	R Metal film 10K0 5% 0.2W TC250	107-510
R 164	R Metal film 3K30 5% 0.2W TC250	107-433
R 165	R Metal film 10K0 5% 0.2W TC250	107-510
R 166	R Metal film 10K0 5% 0.2W TC250	107-510
R 167	R Metal film 10E0 5% 0.2W TC250	107-210
R 168	R Metal film 180K 5% 0.2W TC250	107-618
R 169	R Metal film 220K 5% 0.2W TC250	107-622
R 170	R Metal Film 31K6 1% 0.5W TC50	115-316
R 171	R Metal Film 31K6 1% 0.5W TC50	115-316
R 172	R Metal Film 42K2 1% 0.5W TC50	115-422
R 173	R Metal Film 47K5 1% 0.5W TC50	115-475
R 174	R Metal Film 15K8 1% 0.5W TC50	115-158
R 175	R Metal film 1K50 5% 0.2W TC250	107-415
R 176	R Metal film 1K50 5% 0.2W TC250	107-415
R 177	R Cermet Trimpot 47K 20% 0.5W TC70	182-314
R 178	R Metal film 1K50 5% 0.2W TC250	107-415
R 179	R Metal Film 15K8 1% 0.5W TC50	115-158
R 180	R Metal film 47K0 5% 0.2W TC250	107-547
R 181	R Metal film 680E 5% 0.2W TC250	107-368
R 182	R Metal Film 715E 1% 0.5W TC50	113-715
R 183	R Metal Film 47K5 1% 0.5W TC50	115-475
R 184	R Metal film 10E0 5% 0.2W TC250	107-210
R 185	R Metal film 240E 5% 0.2W TC250	107-324
R 186	R Metal film 1K00 5% 0.2W TC250	107-410
R 187	R Metal film 6K80 5% 0.2W TC250	107-468
R 188	R Metal film 240E 5% 0.2W TC250	107-324

R 189	R Metal film 1K00 5% 0.2W TC250	107-410
R 190	R Metal film 6K80 5% 0.2W TC250	107-468
R 191	R Metal film 10K0 5% 0.2W TC250	107-510
R 192	R Metal film 10K0 5% 0.2W TC250	107-510
R 193	R Metal film 390E 5% 0.2W TC250	107-339
R 194	R Metal Film 1K33 1% 0.5W TC50	114-133
R 195	R Metal Film 57K6 1% 0.5W TC50	115-576
R 196	R Metal Film 6K98 1% 0.5W TC50	114-698
R 197	R Metal Film 6K98 1% 0.5W TC50	114-698
R 198	R Metal film 2K70 5% 0.2W TC250	107-427
R 199	R Metal Film 6K98 1% 0.5W TC50	114-698
R 200	R Metal Film 6K98 1% 0.5W TC50	114-698
R 201	R Metal Film 6K98 1% 0.5W TC50	114-698
R 202	R Metal Film 6K98 1% 0.5W TC50	114-698
R 203	R Metal film 2K70 5% 0.2W TC250	107-427
R 204	R Metal Film 6K98 1% 0.5W TC50	114-698
R 205	R Metal Film 6K98 1% 0.5W TC50	114-698
R 206	R Metal film 649K 1% 0.4W TC50	116-649
R 207	R Metal film 100K 5% 0.2W TC250	107-610
R 208	R Metal Film 11K0 1% 0.5W TC50	115-110
R 210	R Metal Film 11K0 1% 0.5W TC50	115-110
R 211	R Metal film 649K 1% 0.4W TC50	116-649
R 212	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 213	R Metal film 4k99 0.1% 0.25w TC25	140-981
R 214	R Metal Film 6K19 1% 0.5W TC50	114-619
R 215	R Metal Film 2K43 1% 0.5W TC50	114-243
R 216	R Metal film 820E 5% 0.2W TC250	107-382
R 217	R Cermet Trimpot 4K7 20% 0.5W TC70	182-312
R 218	R Metal film 100E 5% 0.2W TC250	107-310
R 219	R Metal film 68K0 5% 0.2W TC250	107-568
R 220	R Metal film 100E 5% 0.2W TC250	107-310
R 221	R Metal film 68K0 5% 0.2W TC250	107-568
R 223	R Metal film 47K0 5% 0.2W TC250	107-547
R 226	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 227	R var 2K2 20% 0.5W	182-313
R 228	R Metal film 100E 5% 0.2W TC250	107-310
R 229	R Metal Film 4K75 1% 0.5W TC50	114-475
R 230	R Metal Film 3K16 1% 0.5W TC50	114-316
R 231	R Metal Film 2K00 1% 0.5W TC50	114-200
R 232	R Metal film 10E0 5% 0.2W TC250	107-210
R 233	R Metal film 100E 5% 0.2W TC250	107-310
R 234	R Metal film 100K 5% 0.2W TC250	107-610
R 235	R Metal Film 20K0 1% 0.5W TC50	115-200
R 236	R Metal Film 10K0 1% 0.5W TC50	115-100
R 237	R Metal film 10E0 5% 0.2W TC250	107-210
R 238	Potentiometer Tandem 2x22K LOG	180-308
R 239	R Metal film 100E 5% 0.2W TC250	107-310
R 240	R Metal film 100K 5% 0.2W TC250	107-610
R 241	R Metal Film 20K0 1% 0.5W TC50	115-200
R 242	R Metal Film 10K0 1% 0.5W TC50	115-100
R 243	R Metal film 10E0 5% 0.2W TC250	107-210
R 244	R Metal film 10E0 5% 0.2W TC250	107-210
R 245	R Cermet Trimpot 10K 20% 0.5W TC70	182-301
R 246	R Metal film 22K0 5% 0.2W TC250	107-522

R 248	R Metal film 4K70 5% 0.2W TC250	107-447
R 249	R var 2K2 20% 0.5W	182-313
R 250	R Metal film 680E 5% 0.2W TC250	107-368
R 251	R Metal film 3K30 5% 0.2W TC250	107-433
R 252	R Metal film 33K0 5% 0.2W TC250	107-533
R 253	R Metal film 33K0 5% 0.2W TC250	107-533
R 254	R Metal film 47E0 5% 0.2W TC250	107-247
R 255	R Metal film 6K80 5% 0.2W TC250	107-468
R 256	R Metal film 33K0 5% 0.2W TC250	107-533
R 257	R Metal film 3K30 5% 0.2W TC250	107-433
R 258	R Metal film 3K30 5% 0.2W TC250	107-433
R 259	R Metal film 33K0 5% 0.2W TC250	107-533

TESTPOINTS

TP 1	Term. strip 50pol mod 2	806-072
TP 2	Term. strip 50pol mod 2	806-072
TP 3	Term. strip 50pol mod 2	806-072
TP 5	Term. strip 50pol mod 2	806-072
TP 6	Term. strip 50pol mod 2	806-072
TP 8	Term. strip 50pol mod 2	806-072
TP 9	Term. strip 50pol mod 2	806-072
TP 10	3 Pin AMP mod II Terminal List, Straight	805-894
TP 11	Term. strip 50pol mod 2	806-072
TP 12	Term. strip 50pol mod 2	806-072
TP 14	Term. strip 50pol mod 2	806-072
TP 16	Term. strip 50pol mod 2	806-072
TP 18	Term. strip 50pol mod 2	806-072
TP 19	Term. strip 50pol mod 2	806-072
TP 20	Term. strip 50pol mod 2	806-072
TP 21	3 Pin AMP mod II Terminal List, Straight	805-894
TP 22	3 Pin AMP mod II Terminal List, Straight	805-894
TP 23	Term. strip 50pol mod 2	806-072
TP 24	Term. strip 50pol mod 2	806-072
TP 25	3 Pin AMP mod II Terminal List, Straight	805-894
TP 26	3 Pin AMP mod II Terminal List, Straight	805-894
TP 27	3 Pin AMP mod II Terminal List, Straight	805-894

MISCELLANEOUS

	Screw pozidriv panhead M2.5x8	008-208
	Hexagon Cylinder Screw M2.5x8 Rustproof	010-208
	Tubular Rivet 2.5X10	060-310
	Cable For RE331 RF Scanner	618-058
	Adjusting Knob Ø14.5 Black Axle 4mm	852-617
	Knob Cap 0 14.5 Black	852-625
	L-piece for PCB	857-041
	Sheild Box For RE331 Iss1	881-044
	Plate F.RE331	933-307
	Pcb For RE331 HF-Scanner	971-482
	Cover Plate For-Scanner	973-006
GND1	Solder Terminal 0.1 O2	823-303
GND2	Solder Terminal 0.1 O2	823-303
GND3	Solder Terminal 0.1 O2	823-303

GND4	Solder Terminal 0.1 O2	823-303
QAS1	8 Pin Dil Socket	816-132
QAS9	8 Pin Dil Socket	816-132
QAS10	8 Pin Dil Socket	816-132
QAS11	8 Pin Dil Socket	816-132
QDS2	24 Pin DIL Socket w. 3 modul spacing	816-274
SO 1	Connector jacks	816-306
SO 2	Connector jacks	816-306
SO 3	Connector jacks	816-306
SO 4	Connector jacks	816-306
X 1	Quarts crystal 4,0MHz	910-159
XS 1	Isolating Plate F.Crystal	816-287

23. TROUBLESHOOTING

This section contains a number of hints which will help you pinpoint and correct problems encountered while working with the RE 331 RDS Decoder.

Sync LED is active although an MPX Signal with RDS is being received.

In the following discussion the front input of the RE 331 is used and the LED in the [LOCAL] key is on. If not, you should press the [LOCAL] key once. If the LEDs in the [ACCEPT]/[CANCEL] keys start blinking, press the [ACCEPT] key.

1 Check that the LED in the [MPX(0)] key is on. If not, you should press the [MPX(0)] key.

2 Enter the MEAS. MENU by pressing the [MEAS. MENU] key once. Turn the cursor wheel until the RDS level measurements appear in the display of the RE 331. Check that the level of the RDS signal is correct and that the Pilot/RDS and RDS/VRF phase relationships are correct.

3 Connect the signal to the LEMO connector at the rear of the RE 331 and press [MPX(0)] to switch to the rear input. If the RDS signal is demodulated and shown on the display you should check the connection between front panel LEMO connector and Demodulator board. This is easily done by removing the bottom plate of the RE 331.

4 Try to exchange the COMM/SYNC board and the Demodulator board with boards from a unit that is known to work. In this way you will be able to pinpoint the problem on a board level.

5 If the error is found to be a defective Demodulator board you should check that QA11 is of type LM833N as earlier versions had amplifiers installed that could become unstable thus ruining the RDS signal. If exchanging QA11 does not help, the board should be returned to your local RE distributor or the factory for repair/adjustment.

No Communication via the Terminal Iinterface

Mostly these problems are due to the wrong type of cable and/or the wrong parameter setting in the RE 331 or the attached PC/Terminal thus

1 Refer to section 5 of this manual (TEST MENU) in order to check the interface using a test plug.

and check that

2 The parameters for the Terminal interface (V. 24 MENU) are exactly the same as those set up in the attached terminal/PC.

3 The Terminal interface of the RE 331 has been opened for communication (V. 24 MENU).

4 The cable between PC and RE 331 should be a a one to one connection like a flat cable.

5 The LED in the [FRONT] key is on. If not, the RE 331 will not be able to receive any commands from the external terminal/PC.

If this does not help then

6 Try to connect the PC to the rear terminal interface. If this works, check that the cable from the front terminal connector to the Keyboard/Display unit is plugged into the connector of the latter. This is easily checked by removing the bottom plate of the RE 331.

The Display Does Not Change when I Alter my RDS Data.

The RE 331 is probably displaying RDS information from the internal display memory. Press the [DISP 1] key to switch to normal dynamic data display.

The Attached RDS Coder Does Not Receive Data via the Data bridge.

Again most problems are due to wrong parameters and cables.

Check that

1 The interface is electrically OK by using a test plug and the built-in test procedures. Refer to section 5 of this manual. If an error is found, check the UARTs of the interface to see whether the error is due to a defective Line driver/receiver chip. All Line driver/receiver chips are easily exchanged as they all are installed in the PCB using sockets.

2 The RDS coder and the RDS Decoder are connected using a one to one cable.

3 The settings (baud rate, number of data bits, parity) for Line B are the same as those settings found in the RDS coder. In the RE 331 these parameters are found in the V.24 MENU.

4 The information that you want to re-braodcast is enabled in the SELECT MENU. Information that is enabled via Line B has got a "-" below its name while information that has been disabled has got a B below its name. The SELECT MENU has got an entry marked "STATUS B" where all information that is transmitted via the Line B interface is listed.

5 The RDS coder really is able to transmit the received information, that is to re-broadcast Radio Text the RDS Coder must have 2A groups in the group order.

Following Installation of a Scanner Board, the RE 331 Does Not Accept any Commands Relating to the Scanner.

Try to issue the command "?" via the Terminal interface. If the scanner is not listed as an installed option, switch number 4 on the Computer board should be switched to "open".

Certain Commands Issued via the Remote Port are Not Accepted or Certain Alarms are Never Issued.

Check the Alarm/Remote ports using a cable as described in section 3. The test procedure is described in section 5 of this manual.

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24. EQUIPMENT AND ACCESSORIES

24.1 Optional Equipment and Accessories

Optional equipment and accessories to be used with the RE 331 RDS Decoder:

Code	Type	Description
617-904		Multicable for inter-connecting the RE 331 Terminal interface and an IBM PC or Compatible, length 2m
901-805		96-pole DIN Extender Board
901-864		48-pole DIN Extender Board
902-018		MPX Scanner
902-169		MPX Adapter Box for MPX Scanner option
902-061		RF Scanner
906-145		Phase & Level measuring unit
906-243		Power Supply, 100 V AC option (Japan)

Table 24.1 - Optional Equipment and Accessories

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25. SPECIFICATIONS

RE 331 RDS Decoder

RDS Signal Sensitivity (No Error Correction)

RDS input signal range: -53 to -13 dBu.

An RDS signal having a level of -53 dBu results in less than 10% block errors (no L&R, Pilot or VRF signals.)

A combined RDS/VRF signal (SK level = -15.2 dBu, BK = F, DK off, RDS level > -31 dBu) results in less than 10 % block errors.

A combined RDS/VRF signal (SK level = -15.2 dBu, BK = F, DK on, RDS level > -27.5 dBu) results in less than 10 % block errors.

Receiving an RDS signal (level = -24.5 dBu) from a re-braodcast receiver with an RF input level that leads to an S/N ration of 25 dB (stereo) measured according to DIN 45405 results in less than 10 % block errors.

Receiving an RDS signal (level = -24.5 dBu) together with a disturbing signal according to the table below, the RE 331 RDS Decoder will have less than 0.1 % block errors.

Frequency range	Level
≤44 kHz	12.0 dBu
44.0 to 53.0 kHz	6.0 dBu
53.0 to 54.6 kHz	-26.0 dBu
54.6 to 59.4 kHz	-32.0 dBu
59.4 to 61.0 kHz	-26.0 dBu
>61 kHz	6.0 dBu

Inputs

MPX(0)

Type	Balanced
Level	< 16 dBu
Limiting level	≈24 dBu
Impedance	> 10 kΩ
Type of connector	LEMOSA, Triax

MPX(1)

Type	Balanced
Level	< 16 dBu
Limiting level	≈24 dBu
Impedance	> 10 kΩ
Type of connector	LEMOSA, Triax

Remote

Control signals	Active low TTL
Input pulse width	≥ 100 msec
Type of connector	25-pole, Sub-D, female

Outputs

RDS Clock

Frequency	1187.5 Hz
Level	TTL
Type of connector	BNC

RDS Data

Level	TTL
Type of connector	BNC

RDS Status/Alarm

Outputs	Relays indicating status and errors
Type of connector	50-pole, Sub-D, female

VRF Alarm

Outputs	Relays indicating VRF alarms
Type of connector	15-pole, Sub-D, female

Inputs/Outputs

Terminal (Front)

Standards	RS-232-D, V24/28, DIN 66020
Baud rate	75 to 19200
Duplex	Full
Parity	Even, odd or none
Stop bits	1 or 2
Data bits	7 or 8
Type of connector	25-pole, Sub-D, female

Terminal (Rear)

Standards	RS-232-D, V24/28, DIN 66020
Baud rate	75 to 19200
Duplex	Full
Parity	Even, odd or none
Stop bits	1 or 2
Data bits	7 or 8
Type of connector	25-pole, Sub-D, female

Line B (RDS Coder)

Standards	RS-232-D, V24/28, DIN 66020
Baud rate	75 to 19200
Duplex	Full
Parity	Even, odd or none
Stop bits	1 or 2
Data bits	7 or 8
Type of connector	25-pole, Sub-D, male

Line C (TPZ)

Standards	RS-232-D, V24/28, DIN 66020
Baud rate	75 to 19200
Duplex	Full
Parity	Even, odd or none
Stop bits	1 or 2
Data bits	7 or 8
RDS Clock	Pin 9
Level	DIN 6259
Meßstart	Pin 10 (active on receiving IH channel 31)
Level	DIN 6259
Type of connector	25-pole, Sub-D, male

Line D (IH)

Standards	RS-232-D, V24/28, DIN 66020
Baud rate	75 to 19200
Duplex	Full
Parity	Even, odd or none
Stop bits	1 or 2
Data bits	7 or 8
Type of connector	25-pole, Sub-D, male

IEEE 488 Interface

IEEE functions	SH1, AH1, T6, L4, SR1, RL1, PP1, DC1, DT0, C0, E2
Type of connector	24-pole, Champ

Measuring Option[2]

RDS Level Measurement[3]

General

RDS nominal input range	-53 to -13 dBu
RDS display range	-53 to -11.7 dBu
RDS carrier frequency	57 kHz ±6 Hz
Basic accuracy	±0.4 dB (typ. ±0.1 dB) @ -24.5 dBu ±0.4 dB (typ. ±0.2 dB) @ -42.5 to -13.0 dBu

RDS synchronous RMS detector

Frequency response of detector indicated as offset from 57 kHz

	Lower end	Upper end
-1 dB	±107 Hz	±1800 Hz
-3 dB	±55 Hz	±2100 Hz
-10 dB	±21 Hz	±2500 Hz
-20 dB	±9 Hz	±2900 Hz
-40 dB	±2.5 Hz	±3700 Hz

Equivalent Noise Bandwidth 4.1 kHz

Additional sources of error

1. VRF to RDS modulation crosstalk

The quadrature between the VRF and RDS detectors combined with the notch at 57 kHz in the RDS detector minimises the influence from the VRF signal on the RDS measurement. However, the VRF modulation leaks into the RDS spectrum when the VRF carrier and the suppressed RDS carrier are not in quadrature. As a consequence a higher RDS level is measured:

-14.1 dBu VRF with 30 % DK, 60 % BK and -24.5 dBu RDS:

RDS/VRF Phase 90°	≈ 0.0 dB
RDS/VRF Phase 90° ±10	≈ + 0.3dB

-13 dBu VRF with 50 % DK, 75 % BK and -28.6 dBu RDS:

RDS/VRF Phase 90°	≈ 0.0 dB
RDS/VRF Phase 90° ±10°	≈ +1.7 dB

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2 In the specifications the unit dBu is used. 0 dBu is the voltage which gives 1 mW dissipation in a 600 Ω load. Hence 0 dBu ≈ 775 mV_{rms}.
The level and phase inaccuracies from the RF Scanner or the MPX Scanner are added to the above mentioned inaccuracies in case one of these two scanners are used.

3 When using the RF Scanner it should be observed that the RF Scanner is calibrated in such a manner that ±20 kHz deviation equals 0 dBu output level.

2. Influence from unwanted signals

+12 dBu MPX signal @ 53 kHz	Approx. 0.1 dB additional RDS level error
-42 dBu noise power in RDS spectr.	Approx. 0.1 dB additional RDS level error
-34 dBu noise power in RDS spectr.	Approx. 0.5 dB additional RDS level error

VRF Measurements

General

VRF nominal input range	-34.6 to -13 dBu
VRF display range	-34.6 to -11.7 dBu
VRF carrier frequency	57 kHz ±6 Hz
Basic accuracy	±0.4 dB (typ. ±0.2 dB) @ -14.1 dBu ±0.4 dB (typ. ±0.3 dB) @ -28.6 dBu

VRF synchronous detector

Frequency response	-3 dB @ 57 kHz ±72 Hz
Noise bandwidth	Approx. 145 Hz

BK modulation

Nominal measurement range	5 to 75 %
Accuracy @ 5.3 % VRF	±2 percentage points
Frequency response of BK detector	3.6 to 72 Hz, -3 dB
Noise bandwidth of BK detector	Approx. 140 Hz
BK area codes	A, B, C, D, E or F (see table)
BK area code monitoring	Selected by user: A to F
BK area code alarm	After 30 seconds
Area Code Calculation	The area code is found by calculating the ratio between the BK modulation frequency and the 57 kHz carrier and subsequently comparing the calculated ratio with the ratio intervals:

	A	B	C	D	E	F
Min.	2300	1916	1532	1340	1148	956
Nom.	2400	2016	1632	1440	1248	1056
Max.	2500	2116	1732	1540	1348	1156

DK modulation

Nominal measurement range	5 to 50 %
Accuracy @ 5.3 % VRF	±2 percentage points
Frequency response of DK detector	115 to 330 Hz, -3 dB
Noise bandwidth of DK detector	Approximately 430 Hz
DK modulation freq. to carrier ratio	406 to 506 (nominal 456)
DK modulation alarm	After 30 seconds

Phase Measurements[4]

Pilot frequency	19 kHz ±2 Hz
RDS-Pilot phase measurement	
Resolution	0.1°
Display range	-45.0° to +135.0°
Minimum pilot level	-28 dBu
Minimum RDS level	-53 dBu
Basic accuracy	±4° (typ. ±1.5°) @ -24.5 dBu RDS & -9.5 dBu pilot ±4° (typ. ±2°) @ -42.5 to -13 dBu RDS & -9.5 dBu pilot
RDS-VRF phase measurement	
Resolution	0.1°
Display range	-45.0° to +135.0°
Minimum VRF level	-34.6 dBu
Minimum RDS level	-53 dBu
Basic accuracy	±4° (typ. ±1.5°) @ -13 dBu VRF & -24.5 dBu RDS ±4° (typ. ±2°) @ -28.6 dBu VRF & -24.5 dBu RDS
VRF-Pilot phase measurement	
Resolution	0.1°
Display range	-180.0° to +180.0°
Minimum RDS level	-53 dBu
Minimum pilot level	-28 dBu
Minimum VRF level	-34.6 dBu
Basic accuracy	±4° (typ. ±2°) @ -13 dBu VRF & -9.5 dBu pilot

[4] A warm-up period of 15 min. with pilot and RDS signal present is mandatory before the phase measurement readings are within specifications.

MPX Scanner Option

Inputs

Number of inputs	8
Type of inputs	Balanced
Input impedance	10 kΩ
Common mode rejection	Typ. 40 dB
Crosstalk	≤−70 dB, typ. -85 dB @ 57 kHz
Max. MPX input level	+13 dBu
Max. RDS/VRF input level	+12 dBu
Max. DC level	+70 V
Type of connector	37-pole, Sub-D, female

Frequency Response

Gain @ 1 kHz	0 dB, ±0.2 dB
3 dB limits	1 Hz to 1 MHz
200 kHz	±0.2 dB

Phase Response

Linear phase	200 Hz to 100 kHz
Deviation from linear phase	±0.5°
Max. measuring error introduced due to scanner	0.25°

Unweighted Noise Level

10 Hz to 20 kHz	Typ. 20 μV
Equivalent S/N ratio @ 1.2 kHz deviation	73 dB (using BW of Measuring Unit)

RF Scanner Option

Inputs

Input connection	BNC, 75 Ω
Frequency span	87.5 to 108.0 MHz in 10 kHz steps (as controlled by the RE 331 software)
Input level	≤ +110 dBμV ≤ +130 dBμV with built-in attenuator (RF level indicated in specs. is valid when the built-in attenuator is bypassed)

Output

Output level	+11.4 dBu @ 75 kHz dev.
Level accuracy	±0.2 dB @ 57 kHz mod.
MPX output	600 Ω load, source ≤ 10 Ω unbalanced

Main Parameters

Change of level by temperature	Typ. 0.1 dB, 5 °C to 40 °C
RF level for constant RDS level measured by RE 331	
@1.6% RDS	0.1 dB change, typ. +35 dBμV
@1.6% RDS	0.4 dB change, typ. +28 dBμV
RF level @0% errors in RE 331	
Correction:	typ. +24 dBμV
Detection:	typ. +27 dBμV
Change of level by detuning	±20 kHz, 57 kHz mod.: < 0.1 dB
LF cutoff	-3 dB @ < 2 Hz
HF cutoff	-3 dB @ > 100 kHz
Phase error	< 1°, 19 to 57 kHz
Noise level	Typ. 3 mVrms unweighted, +60 dBμV RF
Distortion of MPX signall1 kHz mod.	
2nd (%)	≤ 0.1, typ. 0.05
3rd (%)	≤ 0.1, typ. 0.05
Image rejection	Typ. 56 dB
IF rejection	Typ. 90 dB
Selectivity	Main signal: CW Disturbing signal: ±22.5 kHz dev., 1 kHz mod. -30 dB interference level (broadband RMS) referred to 22.5 kHz dev.

±300 kHz	+17 dB rel. to main signal
±600 kHz	+34 dB rel. to main signal

Headphone Output

Monitor output	6.35 mm stereo jack, ≥ 600 Ω load, 100 Ω source
Monitor level	Max. 8 Vpp @ ±75 kHz dev., 1 kHz mod. (adjustable)
Deemphasis	50 µs
Stereo/mono switch level	Approx. 8 µV
Frequency response	5 Hz to 15 kHz, -3 dB
SNR	Typ. 75 dB (unweighted), ±75 kHz dev., +60 dBµV RF, mono
Channel separation	Typ. 40 dB @ 1 kHz
Sensitivity for 26 dB SNR	2 µV, ±40 kHz dev., mono
Distortion	±75 kHz dev., 1 kHz mod., mono, +60 dBµV 2nd: ≤ 0.1%, 3rd: ≤ 0.2%

General

Temperature

Operation	5 °C to 45 °C (41 °F to 113 °F)
Storage	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	20 to 80 %, non-condensing

Line

Voltage	95 V to 130 V AC 190 V to 260 V AC
Frequency	47.5 to 63 Hz
Power consumption	70 VA (all options installed)

Dimensions and Weight

Height	133 mm (5.2")
Width	440 mm (17.3")
Depth	437 mm (17.2")
Net weight	12 kg (26.5 lbs)
Shipping weight	17 kg (37.5 lbs)

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27. MISCELLANEOUS

27.1 Mechanical Assembly

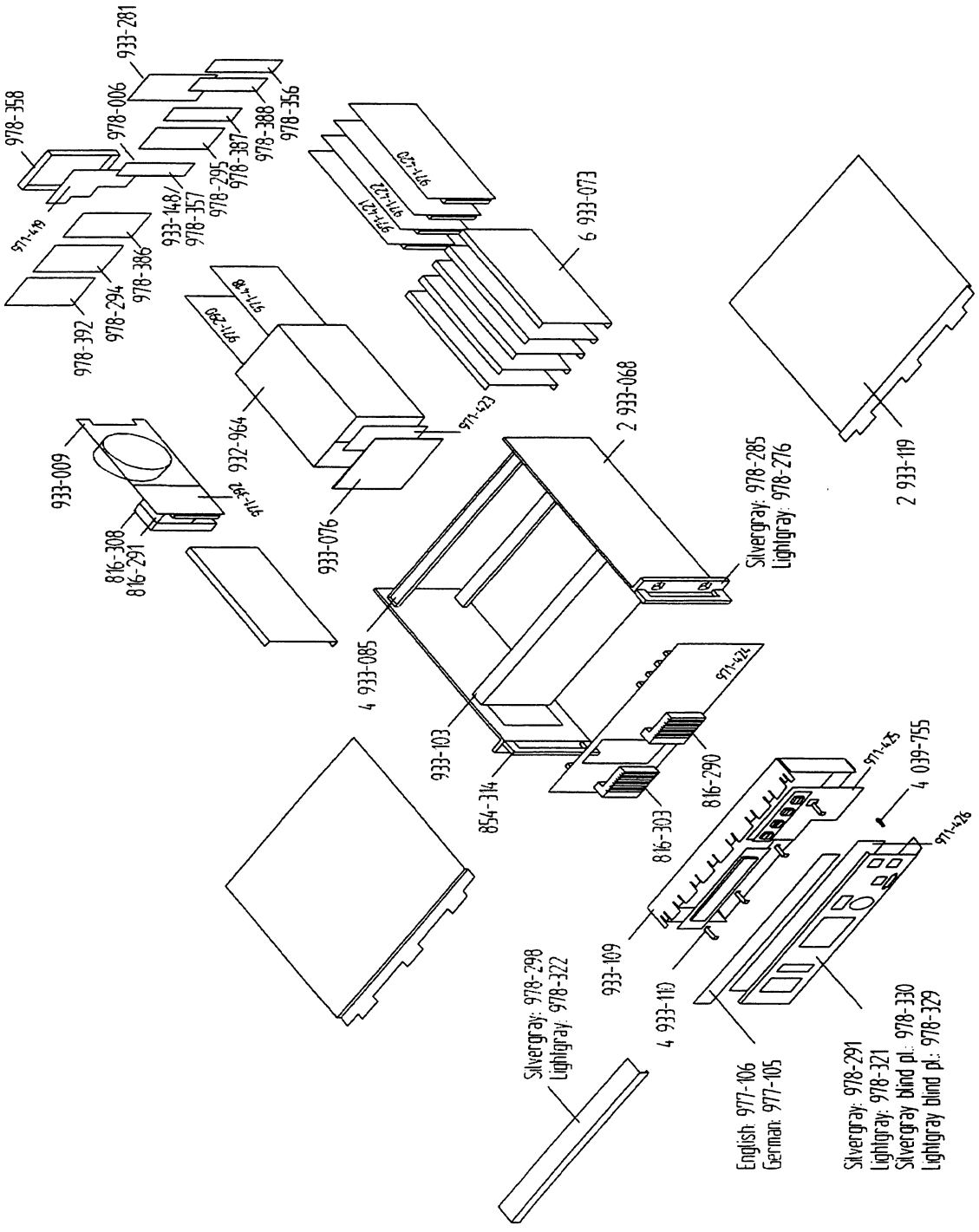

Fig. 27.1 - Mechanical Assembly Drawing

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