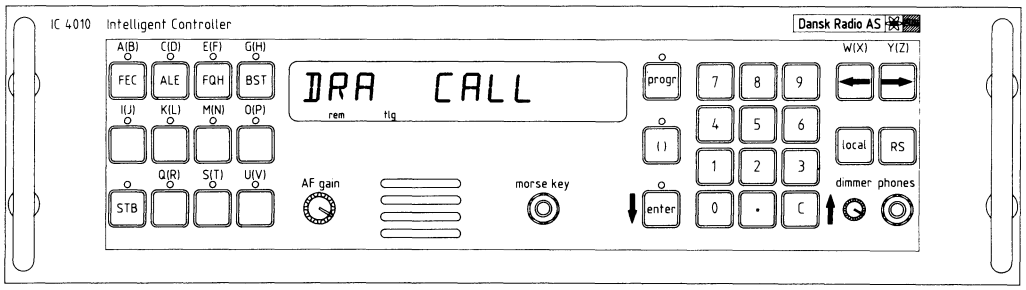
Technical Manual

IC4010
Intelligent Controller

Version 001



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FSCM R0567

Document No. 235450 HT, Rev A

May 1993

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SAFETY SUMMARY

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment. Dansk Radio AS assumes no liability for the customer's failure to comply with these requirements.

GROUND THE EQUIPMENT

To minimize shock hazard, the equipment chassis and cabinet must be connected to an electrical ground. The equipment is equipped with a three-conductor ac power socket. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove equipment covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

SAFETY SUMMARY (continued)

DO NOT SERVICE OR ADJUST ALONE

Do not attempt internal service or adjustments unless another person, capable of rendering first aid and resuscitation is present.

DO NOT SUBSTITUTE PARTS OR MODIFY EQUIPMENT

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the equipment.

DANGEROUS PROCEDURE WARNINGS

Warnings, such as the example below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this equipment. Use extreme caution when handling, testing and adjusting.

TABLE OF CONTENTS

1 GENERAL INFORMATION

1.1 Introduction

This Technical Manual contains information required to install, operate, test, adjust and service the Intelligent Controller IC4010.

1.2 Overall Description

This section describes the overall application of the Intelligent Controller IC4010 as an integrated part of a complete HF communication system.

IC4010 is an Intelligent Controller for control of the Exciter SE4010 and the Receiver RX4010. Together with a linear power amplifier and antenna, the system constitutes a complete intelligent system for advanced HF communication including Automatic Link Establishment (ALE), Forward Error Correction (FEC) and Burst operation (BST). A Personal Computer for remote control of IC4010 may be connected in order to enhance the system's usability. This computer may also act as data terminal or an external data terminal may be added. The principal system configuration of the IC4010-system is shown in figure 1.

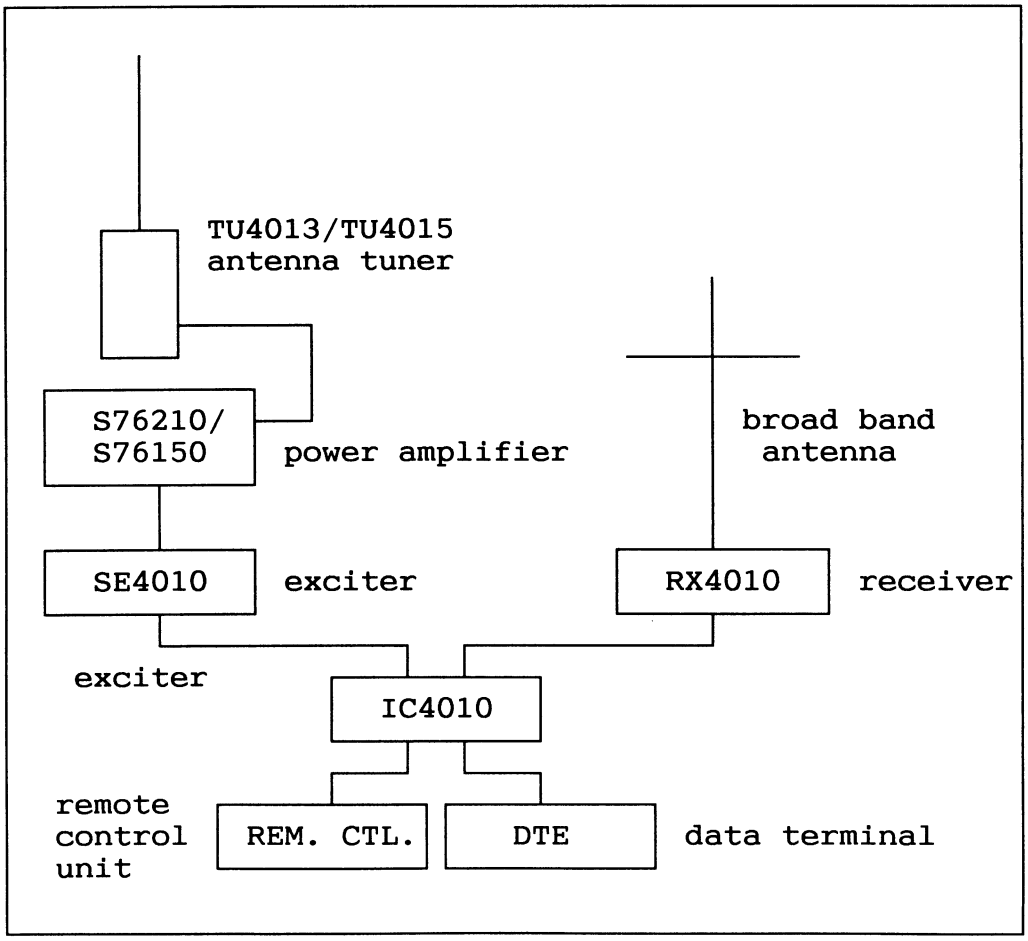


Figure 1 Principal configuration of IC4010-system

During operation in the Automatic Link Setup mode, a broadband antenna is required for the receiver. For further information about the IC4010 system, please refer to chapter 2 "INSTALLATION".

The Intelligent Controller contains several features:

* Fully remotely controllable.

* Battery back-upped memory for data stored via program functions.

* Built-in diagnostic routines (BITE) for error detection down to assembly level.

* Error conditions automatically displayed on front panel.

* AEL automatic error log with date and time.

The front panel of the IC4010 contains an alphanumeric keyboard and a 14-segment alphanumeric LED display which in conjunction with LED indicators and LED bars monitor all relevant information for the operator.

During mains drop-out the settings of the IC4010 as well as the information contained in the user-programmed memory storage is energized from a built-in battery. When the drop-out is terminated, the IC4010 settings are automatically recalled to the front panel.

A detailed operating instruction is contained in chapter 3 "OPERATION".

The IC4010 contains four operation modes:

1. **Automatic Link Establishment**
   Used to establish an HF link automatically between two stations.

2. **Burst**
   The IC4010 is loaded with an ASCII telegram from a data terminal. Afterwards the IC4010 converts the telegram to Morse code and compresses it. The telegram is then transmitted as a burst. At the receiving station the burst is decompressed, converted back to ASCII and sent to the data terminal.

3. **Forward Error Correction**
   Forward Error Correction is a highly reliable data communication mode for broadcast operation.

4. **Stand-by**
The Stand-by mode is used to route the remote and data signals directly through IC4010. SE4010 and RX4010 are not under control of IC4010, and may be operated in the same way as if IC4010 was not present.

Optional modes for IC4010 are:

5. **ARQ**
Automatic Repeat Request is used for highly reliable data communication between two stations. Acknowledge for correctly received data is required.

6. **Frequency hopping**
The Frequency hop mode is a data communication mode where the carrier frequency is changing several times per second. The hop frequencies are selected after a pseudo-random code. The mode eliminates jamming and tracking.

1.3 Technical Specification

MODES

ALE Automatic Link Establishment based on MIL.STD 188-141A.

BST Burst transmission according to STANAG 4203, ANNEX B (section 5. b).

FEC Forward Error Correction according to MIL.STD. 188-141A, DBM BASIC.

STB Remote and data signals are routed through IC4010.

DATA SPEED, FEC
375 bps coded data rate
160 bps throughput maximum data rate

CODING, FEC
Golay (24,12,3) and interleaving within 588 bits.
Error correction of 3 bits within a 12 bit word.

TRANSMISSION SPEED, BST
300 wpm.

STORAGE CAPACITY, BST
Dedicated memories for both transmission and reception. Each with capacity for storage of 2000 characters.

FREQUENCY STABILITY, TEMPERATURE
1.0E-8 -15°C to + 55°C

FREQUENCY STABILITY, AGEING
1.0E-10 per day
3.0E-8 per year

STANDARD FREQUENCY OUTPUT
Two outputs of 5MHz, 0dBm +/-3dB, 50 ohms.

FSK MODULATOR
8-ARY: Frequencies programmable in 10Hz steps.

Output: 600 ohms balanced, -20dBm to +10dBm adjustable.

FSK DEMODULATOR
8-ARY: 750, 1000, 1250, 1500, 1750, 2000, 2250 and 2500Hz

4-ARY: 1000, 1500, 2000 and 2500Hz (future applications)

Input: 600 ohms balanced, -14dBm to 0dBm adjustable.

DATA TERMINAL INTERFACE
Interface: RS232C, 7 bit standard ASCII format.
Baud rate: 600, 1200, 2400 or 9600 programmable.

REMOTE CONTROL INTERFACE
Interface: RS232C
Baud rate: 600, 1200, 2400 or 9600 programmable.
Remote Protocol according to DANSK RADIO:
COMMUNICATION PROTOCOL, Doc. No. 236743 HT.

SELF-TEST PROGRAM (BITE)
Automatic self-test program provided.

MTBF
>5000 hours (MIL-HDBK-217F)

MEMORY
Built-in battery for typically 2 year' memory back-up.

POWER SUPPLY
Single phase 47-63 Hz, 99-138V, 198-280V

POWER CONSUMPTION
Typically 40VA

CONDUCTED EMISSION
VDE0871, Level K.

OPERATING ENVIRONMENT

Temperature:	Full performance range 0°C to +55°C Operating range -25°C to +55°C Storage -40°C to +70°C
Humidity:	Up to 95% relative humidity at 40°C, non-condensing.
Vibration:	MIL-STD-810D-516.3, Procedure II (30g for 20mS).

WEIGHT

15kg

DIMENSIONS

Height:	133mm (3 x $1^3/_4$")
Width:	428mm (19"), Front Panel 483mm
Depth:	439mm ($17^3/_4$")

1.4 Accessories available

The following items are available for use with the controller:

Rack Slides kit, Slides with lock, part No. BR458872.

Rack Slides kit, Slides with lock and tilt, part No. BR496146.

Extension card with cable for 36 p edge connector, part No. BR497231.

Extension card with cable for 64 p Europe connector, part No. 210900-001.

Standard Spare Parts Kit IC4010, part No. 240670-001.

Depot Spares Kit. Consult factory.

Interconnection Kit IC4010, part No. 240612-001.

I/O Panel, part No. 210803-001.

2 INSTALLATION

2.1 Introduction

This section of the manual provides instructions for initial inspection and installation of the IC4010 as an integrated part of a system which contains receiver, exciter, power amplifier and antenna tuner. It also includes information about external connectors and strapping of the controller.

2.2 Initial Inspection

WARNING

To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the front or rear panel or outer covers. Read the safety summary at the front of this manual before installing or operating the IC4010.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, make sure not to discard it until the contents have been checked for completeness and the controller has been checked mechanically and electrically. If the contents are incomplete, if there is a mechanical damage or defect, or if the controller does not pass the performance tests, notify the nearest Dansk Radio agent. If the shipping container is damaged, or if the cushioning material shows signs of stress, notify the carrier as well as the Dansk Radio agent.

A full report of the damage should also be forwarded to Dansk Radio.

Include the following:

Order number
Model and serial number
Name of transportation agency

2.2.1 Repacking for Shipment

The shipping container for the controller has been carefully designed to protect the controller and its accessories during shipment. This container and its packing material should be used when repacking for shipment. If shipping to Dansk Radio for service is planned, attach a tag indicating the type of service required, return address, model number and full serial number. Mark the container "FRAGILE" to ensure careful handling.

If the original shipping container is not available, the following general instructions should be used for repacking with commercially available materials:

Wrap the controller in heavy paper or plastic. If shipping to Dansk Radio for service, attach a tag indicating the type of service required, return address, model number and full serial number.

Use a strong shipping container, eg. a double walled carton of 160 kg test material.

Protect the control panel with cardboard and place a 7 to 10 cm layer of shock absorbing material between all surfaces of the equipment and the sides of the container.

Seal the shipping container securely.

Mark the shipping container "FRAGILE" to ensure careful handling.

2.3 System Interconnection

The necessary system interconnection for IC4010 control of SE4010 and RX4010 is shown on "INTERCONNECTION SYSTEM IC4010", doc. No. 210820 EB at the end of this chapter.

The connection kit containing the cables may be ordered from Dansk Radio as part No. 240612-001.

The In/Output Panel may be ordered from Dansk Radio as part No. 210803-001.

If the system is operated in the ALE mode it is important that RX4010 is connected to an antenna with a bandwidth which is not smaller than the width of the scanned frequencies. If the transmitter of the system uses an antenna tuner, RX4010 may be connected to a separate long-wire antenna.

2.3.1 Strapping of TLX-key

Pin 1 and 2 on W1 must always be connected with a jumper when the FSK Modulator A6, assembly 237688 is used in IC4010.

If an FSK Modulator, assembly 498351, 237641 or 237688 is used in SE4010, pin 1 and 2 on W1 must be connected with a jumper.

When IC4010 is not in the STB mode, the TLX-key input on connector A7J2 on SE4010 must not be grounded.

2.3.2 Strapping of Remote Modules

The Remote Module A9, 490598 in SE4010 and RX4010 must be strapped for remote communication with IC4010.

The addresses of SE4010 and RX4010 must be strapped in accordance with the addresses selected via program 19 in IC4010.

The baud rate of the remote communication must be strapped in accordance with the system remote communication baud rate (BAU. IC SYS) selected via program 20 in IC4010.

The remote communication uses the control signal DSR as DCD. Therefore S1: F must be set on.

If a remote unit for control of IC4010 is used, this must also be set up for the baud rate selected in program 20. The remote unit may consist of a computer or the Dansk Radio remote units TC4010 and RC4010.

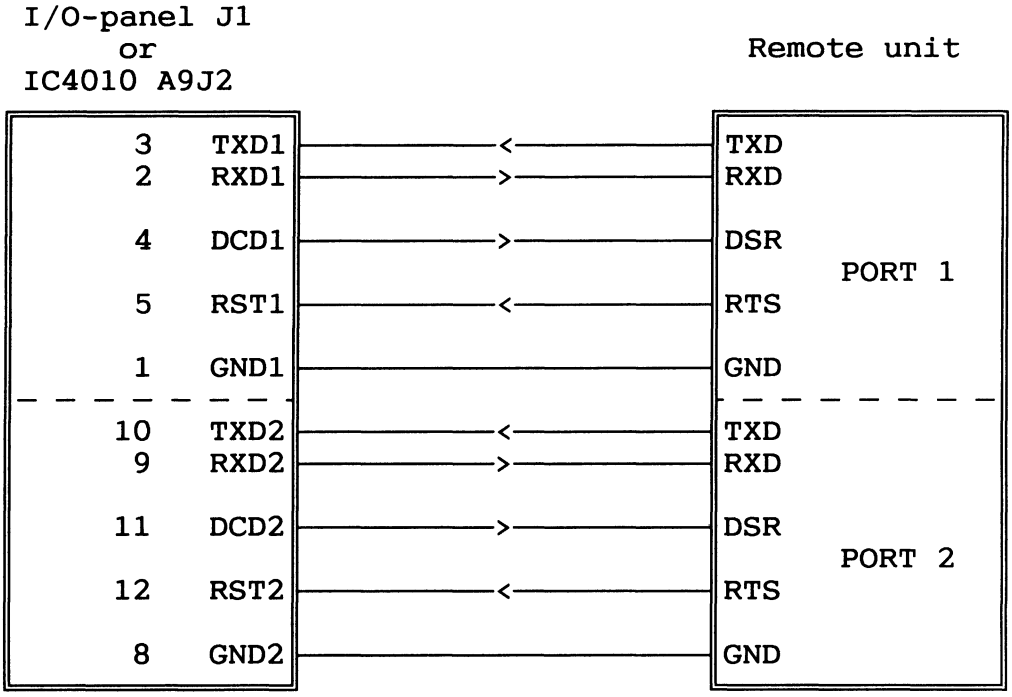
Programming of program 19 and 20 is described in chapter 3. In order to implement the required strapping, please refer to the manuals for SE4010 and RX4010.

2.4 Remote Communication

Remote control of IC4010 requires a computer with two RS232 ports. The one port controls both IC4010 and RX4010. The second port controls only SE4010.

The remote control may also be implemented via the Dansk Radio RC4010 and TC4010. In such a configuration, the RC4010 will both control IC4010 and RX4010, while SE4010 is controlled by TC4010.

A recommended connection for remote control of IC4010 is shown in figure 2.1.



The serial RS232 remote communication of IC4010 uses the "DSR" signal as "DCD"!

Figure 2.1 Connection for remote control of IC4010

Port 1 of the remote unit carries out the remote control of SE4010. The port may consist of a serial RS232 port of a computer or the serial RS232 port of TC4010.

Port 2 of the remote unit carries out the remote control of IC4010 and RX4010. The port may consist of a serial RS232 port of a computer or the serial RS232 port of RC4010.

The protocol for the remote communication is described in "COMMUNICATION PROTOCOL", Doc. No. 236743 HT.

2.5 Data Communication

Data communication with IC4010 requires a data terminal or a computer with an RS232 port.

A recommended connection for data communication with IC4010 is shown in figure 2.2.

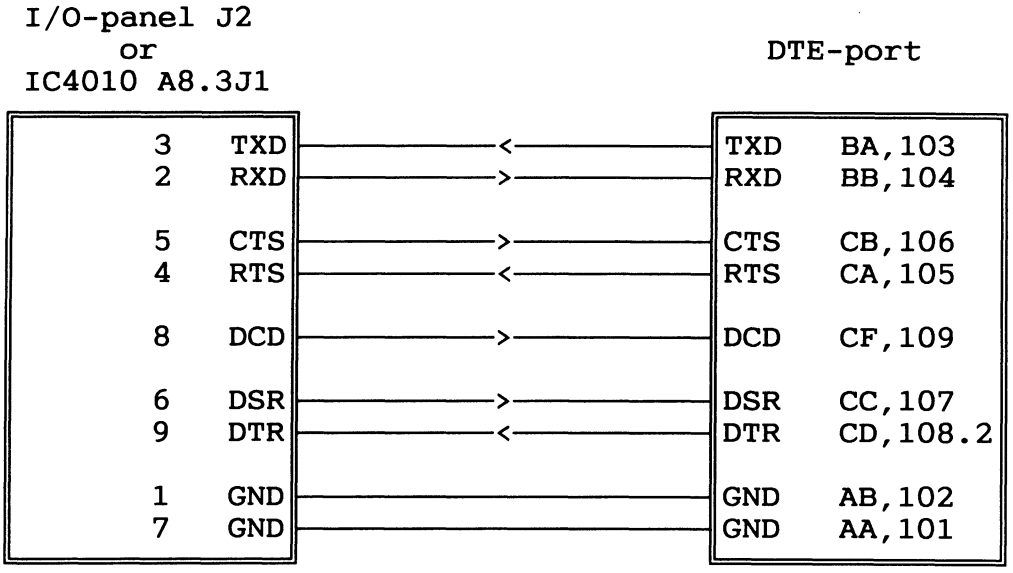


Figure 2.2 Connection for data communication with IC4010

The DTE-port may consist of a serial RS232 port of a personal computer or a data terminal.

The data communication via IC4010 is carried out at standard 7 bit ASCII format as shown below:

Com. standard: RS232C

Data format:
- 1 start bit
- 7 data bits (ASCII)
- 1 parity bit (odd parity)
- 1 stop bit

The timing of the control signals is shown in figure 2.3 and figure 2.4.

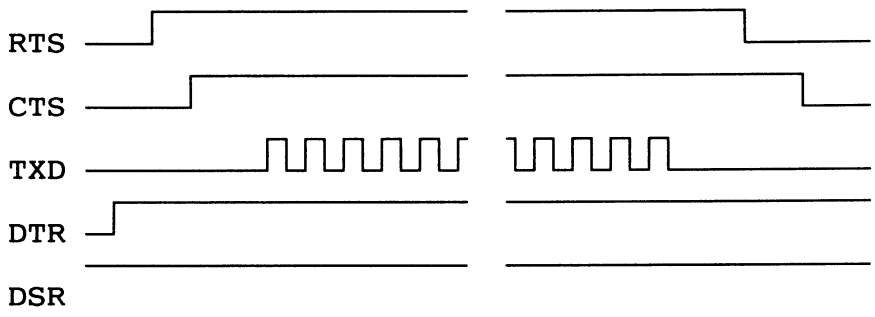


Figure 2.3 Data communication from data terminal to IC4010

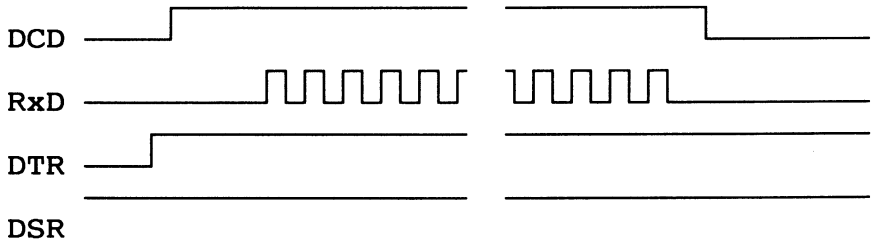


Figure 2.4 Data communication from IC4010 to data terminal

Data transmitted from the data terminal to IC4010, must always be initiated with an Start-Of-Header character (ASCII 01H) and finished with a End-Of-Transmission character (ASCII 04H). In the same manner, data transmitted from IC4010 to the data terminal is always initiated with a Start-Of-Header character and finished with an End-Of-Transmission character.

2.6 Power Requirements

99 - 138 V_{AC}, 198 - 280 V_{AC}, 45 - 63 Hz, 40 VA.

CAUTION

The controller is normally set at the factory for 220 V_{AC}.

The selection of 110 volt nominal mains voltage is made by changing connections on the PC board of the power supply assembly A10. To change the mains voltage setting, proceed as follows:

a. Disconnect the input power cord from the controller.

b. Remove the eight screws positioned at the edge of the power supply rear panel A10 and withdraw the power supply assembly.

c. Change connections on A10 in accordance with Figure 2.5.

d. Reposition the power supply assembly in the controller.

e. Connect the input power cord to the controller.

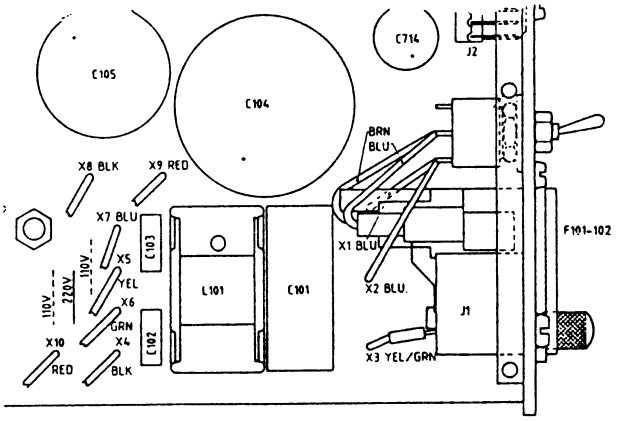


Figure 2.5 Mains strapping

2.6.1 Fuses

The fuses on the Rear Panel of the power supply assembly A10 must be rated as listed below:

Nominal mains voltage: $110V_{AC}$
Fuses, F101 and F102 : 2A T

Nominal mains voltage: $220V_{AC}$
Fuses, F101 and F102 : 1A T

2.6.2 Power Cable

In accordance with international safety standards the controller is equipped with a three terminal power connector. When connected with an appropriate power cable, the controller cabinet should be grounded via the power connector center tap.

If the power cable is terminated with a mains plug, this should only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by the use of a power cable without a protective conductor

(grounding).

2.7 Start-Up

A recommended start-up procedure is described below.

1. Connect the system as described in section 2.3.

2. Switch on the mains for all equipment in the system except IC4010.

3. Switch on the mains for IC4010 via the switch on the rear panel and turn the DIMMER control to full light.

4. The display will show "**DRA IC. 4010**" and afterwards modules which are not mounted will be indicated.

   Check that indication of missing modules is in accordance with the actual configuration.

5. Execute an automatic self-test of IC4010 as described in chapter 6.

6. Now the controller is started up. In order to check if the whole system operates correctly it is initially recommended to execute an automatic link setup with another system. Please refer to chapter 3 which describes operation of IC4010.

2.8 Interface

The following sections describes the external connectors and strapping possibilities of the controller. Information about the assemblies is given in order of reference designation (A2, A5, A6.1, A6.2 etc.).

The rear panel of the controller is shown in figure 2.18. The figure shows location of assemblies and external connectors.

2.9 Frequency Standard, A2

Assembly 210843

2.9.1 External Connectors

External Standard Output, A2J1 and A2J2
BNC, Female

5MHz, 0dBm.

2.10 FSK Demodulator, A6.1
Assembly 210816

2.10.1 External Connectors

Audio input, A6J1
Sub-D, Female, 9 poles.

The connector provides the audio input to the FSK demodulator from the receiver.

pin	designation	description
1	GND	Ground
2	NC	
3	LINE 2 CENTER	600 ohm balanced common
4	LINE 1 IN	600 ohm balanced input
5	LINE 1 IN	600 ohm balanced input
6	NC	
7	LINE 2 IN	600 ohm balanced input
8	LINE 2 IN	600 ohm balanced input
9	LINE 1 CENTER	600 ohm balanced common

Figure 2.6 FSK audio input

The line input may be connected to LINE 1 or LINE 2 depending on strapping.

The supplied line input level must be within -14dBm to 0dBm. From the factory the input sensitivity of the FSK demodulator is adjusted to match the AF line output level of the receiver RX4010. If an adjustment of the input sensitivity should become necessary, R8 should be adjusted in such a way that the green LED is continuously switched on, when an AF signal is supplied to the line input. If the yellow or the red LED is switched on, the supplied AF signal is respectively too big or too small.

The line input of the FSK demodulator has a dynamic input level range of minimum 6dB. It is recommended to adjust R8 to the middle position of the range where the green LED is switched on.

R8 and the three LEDs are located on the FSK demodulator immediately below the upper side of the chassis of the controller. Adjustment of R8 and control of the LEDs are carried out via the perforations in the chassis profiles.

Morse Interface, A6J2
Sub-D, Female, 9 poles.

The connector provides the morse key interface (optional).

pin	designation	description
1	MORSEKEY	Morse key input
2	GND	Morse key ground
3	AUDIO BURST	600 ohm balanced output
4	Common	600 ohm balanced common
5	AUDIO BURST	600 ohm balanced output
6	NC	
7	NC	
8	NC	
9	NC	

Figure 2.7 Morse interface

MORSEKEY : Keying by connecting input to a ≤ 8.2k ohm to GND.
On current ≤ 1.5mA$_{DC}$.
Off voltage 15V$_{DC}$.

2.10.2 Strapping

Audio input

In order to use the same type of cable to lead the AF output of RX4010 to the AF input of IC4010 three straps exist on the FSK Demodulator A6.1. The AF signal from RX4010 must be fed to the LINE 1 input or the LINE 2 input depending on the type of the receiver.

receiver	input	strapping of W4, W5 and W6
ISB	LINE 1	between pin 2 and 3
SSB	LINE 2	between pin 1 and 2

From the factory W4, W5 and W6 is strapped between pin 1 and 2.

2.11 FSK Modulator, A6.2
Assembly 237688

2.11.1 External Connectors

Control Inputs, A6J1
Sub-D Male, 9 poles.

The connector provides 3 inputs for selection of frequencies, and 1 input for activating of the FSK Modulator.

pin	designation	description
1	GROUND	Protective ground
2	FC0/MARK	LSB of frequency
3	FC2	MSB of frequency
4	FC1	Bit of frequency
7	ACTIVATE RTS	Key input
8	RxD IN	Input from demodulator
9	NC	

Figure 2.8 Control inputs

All input levels are according to RS232 levels.

FC0/MARK, FC1 and FC2 are used to control the frequency of the transmitted tone.

For 2-tone FSK only FC0/MARK is connected:

FC0/MARK	Frequency
0	Freq 1
1	Freq 2

For 4-tone FSK both FC0/MARK and FC1 must be connected:

FC1	FC0/MARK	Frequency
0	0	Freq 1
0	1	Freq 2
1	0	Freq 3
1	1	Freq 4

For 8-tone FSK both FC0/MARK, FC1 and FC2 must be connected:

FC2	FC1	FC0/MARK	Frequency
0	0	0	Freq 1
0	0	1	Freq 2
0	1	0	Freq 3
0	1	1	Freq 4
1	0	0	Freq 5
1	0	1	Freq 6
1	1	0	Freq 7
1	1	1	Freq 8

0 means +12V to +15V.
1 means -12V to -15V or floating.

ACTIVATE RTS : Activates AF output.

RxD IN : No function when the assembly is used in IC4010.

For further information, refer to the description of strapping of the assembly.

Audio outputs A6J2
Sub-D Male, 9 poles.

The connector provides all the outputs from the FSK Modulator.

pin	designation	description
1	GROUND	Protective ground
2	LINE OUT	600 ohm balanced output
3	LINE CT	600 ohm balanced common
4	LINE OUT	600 ohm balanced output
6	KEY OUT	keying output

Figure 2.9 Audio outputs

LINE OUT : Output level is adjustable from -20 dBm to +10 dBm. The output may be used for external modulation.

KEY OUT : Open collector output activated by the ACTIVATE input. The signal may be used for external keying.

For further information, refer to the description of strapping of the assembly.

Teleprinter interface A6J3
Sub-D Female, 9-poles.

The teleprinter interface provides connections for two or four-wire operation via a teleprinter. The connector has no function when the assembly is mounted in IC4010!

pin	designation	description
1	RxD IN	Input from demodulator
2	+12V	Output to ext. key
3	ACTIVATE RTS	Input from ext. key
4	+12V 20/40mA	Out
5	TX SENSE +	
6	TX SENSE -	
7	HL OUT	Output to teleprinter
8	GND	Ground
9	HL RETURN	Return from teleprinter

Figure 2.10 Teleprinter interface

2.11.2 Strapping

For location of straps, please refer to the Service Sheets for the assembly.

When pin 1 and 2 on W1 are connected by the jumper, the FSK modulator will be activated when the ACTIVATE input is connected to a voltage between 0V and -15V, or is floating.

When pin 2 and 3 on W1 are connected by the jumper, the FSK modulator will be activated when the ACTIVATE input is connected to a voltage between +12V and +15V.

The FSK Modulator is strapped by the factory as listed below. This strapping must always exist when the assembly is used in IC4010.

Strap	Strapped between
W1	pin 1 and 2
W2	pin 2 and 3

Straps W3 to W8 have no function when the assembly is used in IC4010.

2.12 Microcomputer Modules, A8.1 and A8.2
Assembly 487740

2.12.1 External Connectors

Control Input/Output, A8J1
Sub-D, Female, 15-poles.

The control input/output connector provides possibility of different kinds of control signals, depending on use of assembly. The connector has no function when the assembly is mounted in IC4010!

pin	designation	description
1	RS232 IN	serial input
2	GND	ground
3	MUTE -	optocoupler input
4	MUTE +	optocoupler input
5	DUPLEX -	optocoupler input
6	DUPLEX +	optocoupler input
7	SCAN STOP	optocoupler input
8	SCAN STOP	optocoupler input
9	RS232 OUT	serial output
10	GND	ground
11	MUTE	input
12	DUPLEX	input
13	SCAN STOP	input
15	RST 6.5	input

Figure 2.11 Control input/output

Open Collector Outputs, A8J2
Sub-D, Female, 9-poles.

The connector provides an 8 bits output port. The connector has no function when the assembly is mounted in IC4010!

pin	designation	description
1	OC1	Open collector output
2	OC2	Open collector output
3	OC3	Open collector output
4	OC4	Open collector output
5	OC5	Open collector output
6	OC6	Open collector output
7	OC7	Open collector output
8	OC8	Open collector output
9	GND	Ground

Figure 2.12 Open collector outputs

2.12.2 Strapping

Strapping of S1 to S6 depends on the types of EPROMS used. The table below shows the strapping.

S1,S2,S3	S4	S5	S6	U23	U24	U25
32	32	32	32	2732	2732	2732
64	-	32	-	2764	2732	N.U.
64	-	-	32	2764	2764	2732
64	-	-	-	2764	2764	2764
128	128	32	-	27128	2732	N.U.
128	128	64	-	27128	2764	N.U.
128	128	128	-	27128	27128	2764
128	128	128	128	28128	28128	27128

(N.U. = not used).

If U45 is mounted it must always be of size 64k bit. Therefore no strap exists for U45.

S7 must be strapped between pin 1 and 2 when used in SE4010, and between pin 2 and 3 when used in RX4010. The strap has no function when used in other equipment (including IC4010).

2.13 Microcomputer Module, A8.3

Assembly 210847

2.13.1 External Connectors

Data Communication, A8J1
Sub-D, Female, 9 poles.

The connector provides the serial RS232 data communication with an data terminal. For further information please refer to section 2.5.

pin	designation	description
1	GND	Ground
2	RXD	Output, RS232
3	TXD	Input, RS232
4	RTS	Input, RS232
5	CTS	Output, RS232
6	DSR	Output, RS232
7	GND	Ground
8	DCD	Output, RS232
9	DTR	Input, RS232

Figure 2.13 Data communication

External FSK Control, A8J2
Sub-D, Female, 9 poles.

IC4010 offers possibility of routing the serial RS232 signals from a connected data terminal to connector A8J1, through IC4010 to A8J2 and further to an FSK modulator mounted in SE4010 and a FSK demodulator mounted in RX4010.

pin	designation	description
1	GND	Ground
2	MARK	FSK output, SE4010
3	RXD	FSK input, RX4010
4	ACK RST RX	optional use
5	$\overline{\text{ACK}}$ RST TX	optional use
6	KEY	key output
7	ACTIVATE	FSK output, SE4010
8	DCD	FSK input, RX4010
9	RST RX	optional use

Figure 2.14 External FSK control

MARK : data output for control of frequencies on FSK modulator mounted in SE4010, RS232 level.

RXD : data input from FSK demodulator mounted in RX4010, RS232 level.

$\overline{\text{KEY}}$: output for keying of TLX-key on SE4010, open drain.

ACTIVATE : output for activate control of FSK modulator mounted in SE4010, RS232 level.

DCD : input from FSK demodulator mounted in RX4010, RS232 level.

For further information about the data switch, please refer chapter 4.

Internal FSK Control, A8J3
Sub-D, Female, 9 poles.

The connector provides control of the internal FSK Modulator A6.2 mounted in IC4010. Connector J3 on A8.3 must always be connected to connector J1 on A6.2 via W5.

pin	designation	description
1	GND	
2	MARK	frequency control output
3	SPEC2	frequency control output
4	SPEC1	frequency control output
6	AUX OUT	auxiliary output, TTL
7	ACTIVATE	activate control output
8	RST RX	optional use
9	RST TX	optional use

Figure 2.15 Internal FSK control

MARK : data output for control of
SPEC2 frequencies on internal FSK modulator
SPEC1 mounted in IC4010, RS232 level.

ACTIVATE : output for activate control of internal FSK modulator mounted in IC4010, RS232 level.

2.13.2 Strapping

Strapping of W1 and W2 depends on the size of EPROMS used. The table below shows the strapping.

W1	U17
1-2	27512
2-3	27256

W2	U18
1-2	27512
2-3	27256

2.14 Remote Module, A9
Assembly 210821

2.14.1 External Connectors

Remote Communication: RX/SE, A9J1
Sub-D, Female, 15 poles.

The connector provides remote control of SE4010 and RX4010.

pin	designation	description
1	GND1	Ground SE4010
2	RXD1	output SE4010, RS232
3	TXD1	input SE4010, RS232
4	DCD1	output SE4010, RS232
5	RTS1	input SE4010, RS232
6	CTS1 in	input SE4010, RS232
7	CTS1 out	output SE4010, RS232
8	GND2	Ground RX4010
9	RXD2	output RX4010, RS232
10	TXD2	input RX4010, RS232
11	DCD2	output SE4010, RS232
12	RTS2	input RX4010, RS232
13	CTS2 in	input RX4010, RS232
14	CTS2 out	output RX4010, RS232
15	MUTE	future use, open drain

Figure 2.16 Remote communication with SE4010 and RX4010

Remote Communication: remote unit, A9J2
Sub-D, Female, 15 poles.

The connector provides remote control of IC4010 via a remote unit. Another feature offered is to route the serial RS232 signals from a remote unit to connector A9J1, through IC4010 to A9J2 and further to SE4010 and RX4010.

The remote unit may consist of a Personal Computer or the Dansk Radio remote units RC4010 and TC4010. For further information about the remote switching, please refer to chapter 4.

pin	designation	description
1	GND1	ground remote unit/TC4010
2	RXD1	output remote unit/TC4010
3	TXD1	input remote unit/TC4010
4	DCD1	output remote unit/TC4010
5	RTS1	input remote unit/TC4010
6	CTS1 in	input remote unit/TC4010
7	CTS1 out	output remote unit/TC4010
8	GND2	ground remote unit/RC4010
9	RXD2	output remote unit/RC4010
10	TXD2	input remote unit/RC4010
11	DCD2	output remote unit/RC4010
12	RTS2	input remote unit/RC4010
13	CTS2 in	input remote unit/RC4010
14	CTS2 out	output remote unit/RC4010

Figure 2.17 Remote communication with remote unit

2.14.2 Strapping

W1 and W2 are used to indicate the version of the assembly. The straps are mounted by the factory and must not be altered!

W3 indicates if the remote communication uses the RS232 control signal DSR as DSR or as DCD. The strap is mounted between pin 1 and 2 by the factory, and must normally be set this way.

W4 to W13 offer future possibilities of different kinds of remote communication. All straps are mounted between pin 1 and 2 by the factory, and must normally be set this way.

2.15 Power Supply, A10

Assembly 494186

2.15.1 External Connectors

Mains connector J1
Three terminal, Female, 3 poles.

+24V output J2
Male, 12 poles.

The connector has no function when used in IC4010.

2.15.2 Strapping

The assembly must be strapped to $110V_{AC}$ or $220V_{AC}$ mains. A yellow label on the rear plate indicates the actual mains strapping of the assembly. Normally the assembly is trapped to $220V_{AC}$ from factory.

Section 2.6 describes how to change the strapping.

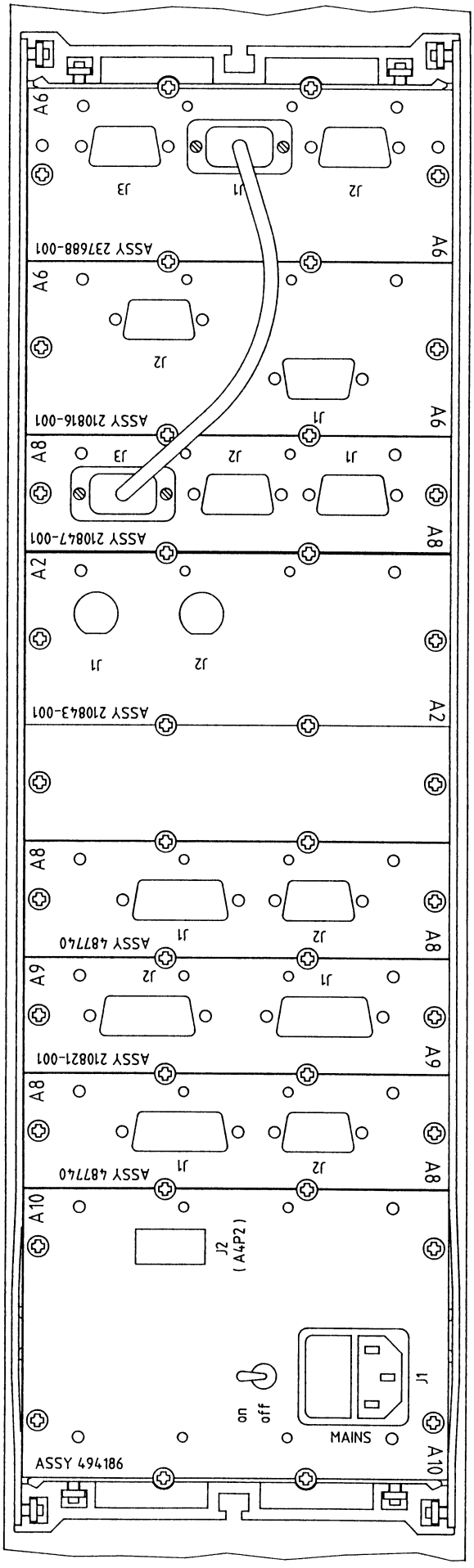
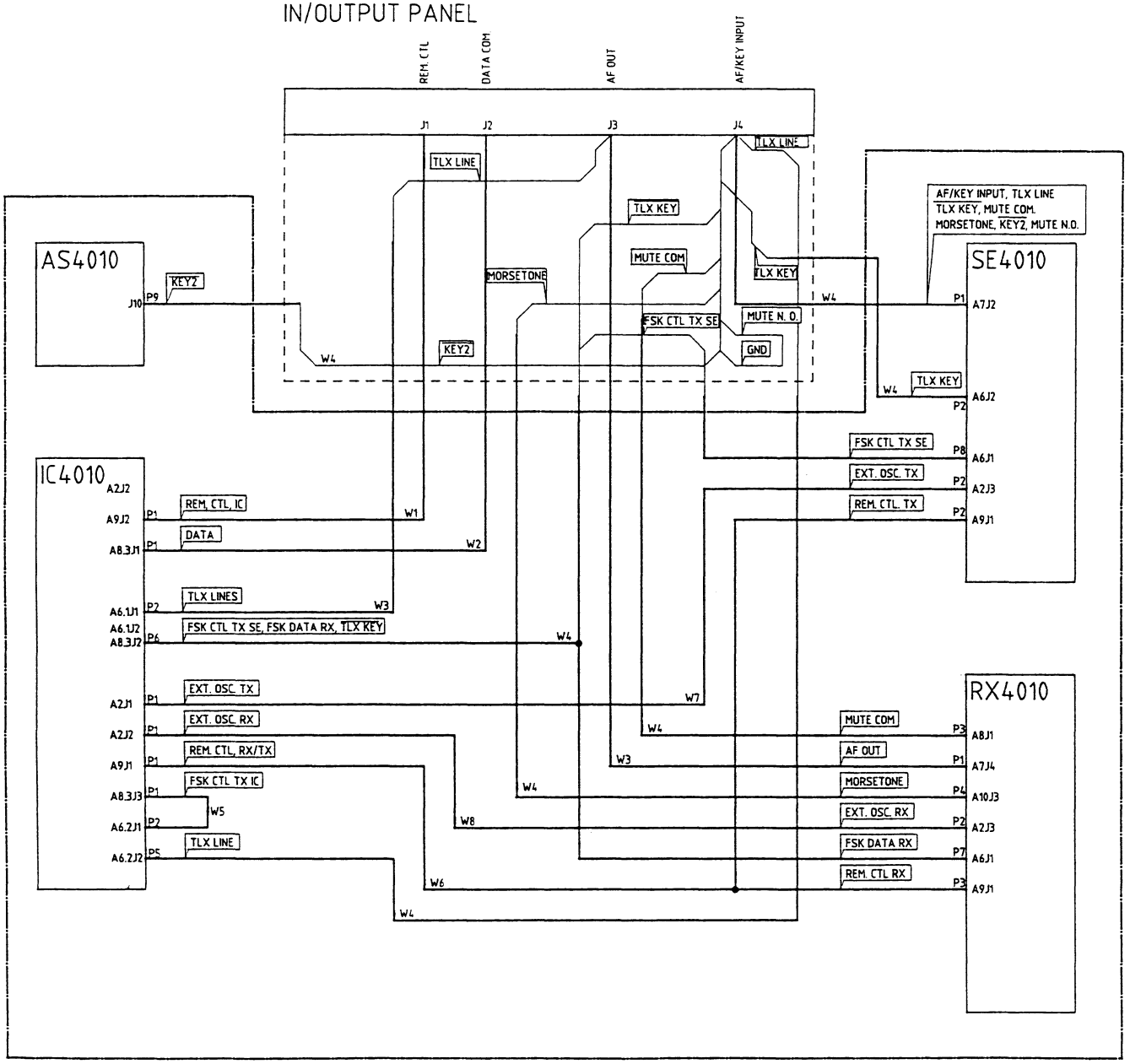


Figure 2.18 IC4010 rear panel

IN/OUTPUT PANEL



CHANGE ORDER/REVISION									
CO:	9927	REV.	B	CO:	REV.	CO:	REV.	CO:	REV.
AUT:		CK:	JG	AUT:	CK:	AUT:	CK:	AUT:	CK:

MATERIEL:	GENERAL TOLERANCE:		TERMA Elektronik AS CODE IDENT NO567 MOVHAVEN 4, DK-8520 LYSTRUP, DENMARK		
REVISION STATUS OF SHEETS (OTHER THAN):					
SHEET NO.:			TITLE: INTERCONNECTION SYSTEM IC4010		
REVISION:					
CODE: D2	1 SHEET (S)	INITIAL RELEASE: 930111	DATE OF THIS ISSUE: 930215	REV: B	
PREP: VH	CHKD: CSA	APVD: N/A	CK: JG	DOCUMENT NO.: 210820 EB	SHEET NO.: 1

3 OPERATION

3.1 Introduction

This section of the manual contains instructions for proper operation of the IC4010 intelligent controller.

3.2 Front Panel Features

Figure 3.1 identifies and describes the functions of the front panel controls, indicators and connectors.

3.3 Power-On

The main switch located on the rear panel can switch off the entire IC4010. As the controller contains a Crystal Oven, it is important that the controller remains connected to the power source to maintain a constant oven temperature, eliminating the need for a long warm-up period.

Before the power is switched on check that the dimmer control on the front panel has been turned fully clockwise.

The dimmer control on the front panel cannot be used to switch off the controller.

3.4 Initial Conditions

When the power has been switched on, the controller status will be as the setup from before the power was switched off. Still, burst telegrams contained in the memory will be cleared.

If the display reads "**NO AX.Y**" or "**NO AN**" (X, Y and N is a one-digit number) the corresponding assembly is not mounted in the equipment. A missing assembly may cause the internal communication between the processor assemblies to be impossible. In such cases the display will show the number of the processor assembly which the Remote Processor Assembly A8.1 cannot communicate with.

If the battery voltage on the A8.1 assembly is too low when the controller is switched on, if the battery has been changed or the RAM has been cleared via the "clear all" function the display reads "**ERR BATTERY**" for a short time.

If the mounted software does not support operation of the mounted assemblies, the display reads "**ERR SW VER.**".

3.5 Self-Test

The Intelligent Controller contains a built-in self-test program. The self-test operations are initiated

by utilizing program functions. The self-test is then carried out by the microprocessor assemblies. Refer to chapter 6 for further information.

3.6 Front Panel Operation

Please refer to figure 3.1 which shows the front panel of IC4010.

IC4010 contains two internal registers. A "display" register and a "control" register. The "display" register is the register for entry. The "control" register contains the information which controls IC4010. While operating in the "display" register a dot or a digit is flashing and IC4010 is still controlled by the information contained in the "control" register.

By pressing the **[enter]** key the displayed information is duplicated to the "control" register and IC4010 will be operated with the new settings.

3.6.1 Clear

This key is useful if an error is made when entering data. Pressing the **[C]** key the displayed will clear.

3.6.2 Recall Setting

By pressing the **[RS]** key the information contained in the control register is duplicated into the display register.

Example:

Keystrokes	Display
	XYZ CALL
[C]	-. CALL
[RS]	XYZ CALL

An underline denotes a flashing character.

3.6.3 Local Setting

By pressing the **[local]** key the controller is turned into local mode where the front panel keys can be operated. When the equipment is remotely controlled the "**rem**" annunciator is lit.

3.6.4 2nd Function

The **[()]** key is used for 2nd function key-in of letters. A 2nd function letter is indicated on the front panel with the letter printed within brackets.

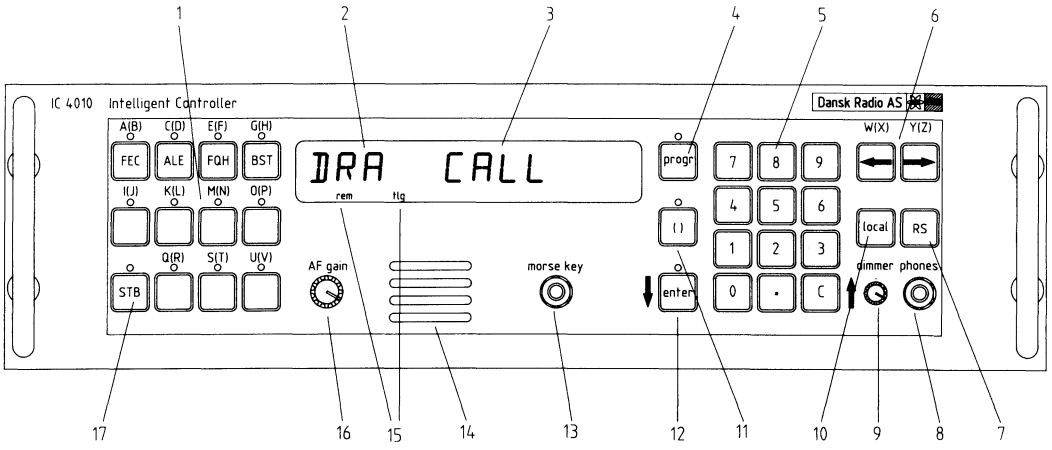


Figure 3.1 Front panel features

1 Mode keys. These keys select the primary mode of operation. Pressing any mode key automatically selects default values for the secondary mode.

The keys are also used for alphanumerical entry of station names.

2 3-digit alphanumeric display for status information and program operations.

3 7-digit alphanumeric display for display of secondary modes, error codes and program operations.

4 Program key. Key for entering the program mode.

5 Entry keys. These keys include the numeric data keys and the clear key. The clear key is also used for "up arrow" program operation.

6 Left/right arrow keys. These keys are used for selection of secondary mode and for "left arrow" key and "right arrow" key programming operation.

The keys are also used for alphanumerical entry of station names.

7 RS key. Recalls the setting of the intelligent controller.

8 Headphone. Output via jack connector.

9 Dimmer control. Used for control of the light intensity in the front panel display, annunciators and indicators.

10 Local key. Used to select local mode or remote control mode.

11 ( ) key. Used to enter alpha-characters printed in brackets.

12 Enter key. Used to accept an entry and as "down arrow" key by programming operation.

13 Morse key. Input via jack connector.

14 Loudspeaker.

15 Annunciators.

rem : Indicates that the controller is remotely controlled.

trfc : Indicates that communication traffic to or from the controller is going on.

tlg : Indicates that the controller has received a burst telegram which has not been replayed.

prg : Indicates that the program mode is selected.

first: Indicates that automatic link establishment on the first channel is selected.

best: Indicates that automatic link establishment on the best channel is selected.

16 AF gain. For volume control the loudspeaker.

17 Standby key. Will always select the standby mode for the controller.

3.7 Mode Selection

The controller has a number of function keys that allow the operator to select operating modes.

A lit indicator above any key denotes it as an active entry. For example, if the indicator above the **[ALE]** key is switched on it is not necessary to press that key if this is the desired mode.

The modes can be divided into primary and secondary modes.

3.8 Primary Modes

The controller can operate in four primary modes:

FEC (**F**orward **E**rror **C**orrection)
ALE (**A**utomatic **L**ink **E**stablishment)
BST (Bur**ST**)
STB (**ST**and **B**y)

The proper mode is selected by pressing one keys labelled **[FEC]**, **[ALE]**, **[BST]** or **[STB]**.

The **[FQH]** key is for future use and has no function.

3.9 Secondary Modes

The IC4010 has several secondary modes. Each of these are connected to a certain primary mode. When a primary mode is selected a default secondary mode is shown on the display. The secondary modes are scrolled using the [←] key or the [→] key. The **[enter]** key selects the secondary mode which is displayed. The table below shows the connection between primary and secondary modes together with the initial displayings.

Primary mode	Secondary mode	Initial displayings
FEC	receive*	. RX MODE
	transmit	. TX MODE
ALE	receive*	. RX MODE
	call	XYZ. CALL
BST	receive*	. RX MODE
	transmit	. TX MODE
	received playback	. RX PLB
	record	. REC DTE
STB	none	blank

* Default secondary mode.

An underline denotes a flashing dot.

In the ALE mode, SE4010 and RX4010 are fully controlled by the IC4010. In the FEC and BST mode, IC4010 act as a modem. Thus SE4010 and RX4010 must be set up for operation in the corresponding mode before the secondary mode is selected.

Once a secondary mode has been selected and accepted, a return to another secondary mode can only be accomplished by a reentry of the primary mode (press the key labelled with primary mode). If the secondary entries have not yet been accepted, the **[RS]** key may be used to return to the previous mode.

3.10 FEC operation

Forward **E**rror **C**orrection is a highly reliable data communication mode for broadcast operation. The data is coded and transmitted as an 8-ary FSK signal. At the receiving station errors in the received data are corrected.

In the FEC mode IC4010 is used as a modem. The ASCII characters are sent from the data terminal to IC4010 via the serial RS232 line. When the data have been Golay coded and interleaved, the coded data are converted to an 8-ary FSK signal. This signal is fed to SE4010 via a 600 ohms balanced line. In SE4010 the FSK signal is modulated on a carrier frequency and transmitted via the power amplifier and antenna tuner.

At the receiving station, RX4010 feeds the demodulated FSK signal to IC4010 via a 600 ohms balanced line. In IC4010 the FSK signal is converted back to digital bits, deinterleaved, Golay decoded and error corrected. The resulting ASCII characters are sent to the data terminal via the serial RS232 line.

The data communication between IC4010 and the data terminal is described in section 2.5.

Prior to entry of the secondary FEC mode, SE4010 and RX4010 must be set up for operation in the FEC mode and a frequency must be selected or found via the ALE mode. A recommended set up is shown below.

Set up for SE4010:

F1B mode
ext key
Program 30: Offset-frequency = 0.00kHz

During transmission the power amplifier must be switched on by pressing the **[Tx on]** key.

Set up for RX4010:

SSB/USB mode
AGC: fast
BFO: 0.00kHz

The "narr" and "vnar" filter cannot be used during FEC reception.

The following sections describe the secondary FEC modes.

3.10.1 FEC Receive

To initiate FEC reception implement the necessary set up of SE4010 and RX4010 and proceed as described below:

Keystrokes	Display
[FEC]	. **RX MODE**
[enter]	**RX MODE**

The system is now ready for FEC reception.

During reception of FEC data the display will read "**XX RX MODE**", where "**XX**" is the percentage error rate of the received data blocks. Due to error correction of the FEC mode, data may be correctly received although the indicated error rate is greater than 0%.

While FEC data are received and the received data are sent to the data terminal, the "**trfc**" annunciator is switched on.

When reception of the FEC data is finished, the loudspeaker will advise the operator by a tone.

3.10.2 FEC Transmit

To initiate FEC transmission, implement the necessary set up of SE4010 and RX4010 and proceed as described below:

Keystrokes	Display
[FEC]	. **RX MODE**
[→]	. **TX MODE**
[enter]	**TX MODE**

The system is now ready for FEC transmission.

When transmission of FEC data is finished, the display shows "**n TX MODE**" and the loudspeaker advises the operator by a tone. "**n**" indicates the number of FEC data that has been transmitted after the secondary mode was selected.

While FEC data are received from the data terminal, and the received data are transmitted as FEC coded data, the "**trfc**" annunciator is switched on.

FEC data may be transmitted as long as the secondary "TX" mode is still selected.

3.11 ALE Operation

Automatic **L**ink **E**stablishment is an easy way to provide a useable channel for communication between two HF stations.

In the ALE mode the controller automatically evaluates a number of channels and establishes a link with a preprogrammed station. When the ALE mode is used the IC4010 system may be compared with a telephone: The telephone number is keyed in and after a while the connection is established. In the ALE mode the name of the called station is keyed in. After a while the IC4010 system has established a connection.

In the ALE mode SE4010 and RX4010 are fully controlled by IC4010. When a link has been established, the frequency of SE4010 and RX4010 is automatically changed. No other previous settings (mode, power level etc.) are changed. The wanted communication mode after link establishment can be selected on SE4010 and RX4010 before the secondary ALE mode is selected or after the link has been established.

Example: Automatic Link Establishment followed by communication in J3E mode.

1. On SE4010, J3E/USB and power level is selected and the **[Tx on]** key is switched on. Select SSB/USB on RX4010.

2. Select ALE-CALL mode on IC4010 and key in the name of the wanted station.

3. When the link is established, pick up the microphone and talk!

Before ALE operation is possible, the following programs must be programmed:

Program 61:	ALE parameters
Program 65:	Channel table
Program 66:	Address table

The operator defines a pool of frequencies for Automatic Link Establishment in the channel table (program 65) which contains up to 99 duplex channels. In the address table (program 66) addresses of up to 99 stations (exclusive the station itself) are defined. For each station in the address table up to 10 channels and information about tune time of transmitter are defined.

The two tables in program 65 and 66 are defined for a communication network consisting of up to 100 stations. Together these two tables constitute the "Phone Book" for the net. Therefore it is important that changes in program 65 and 66 are carried out carefully!

The rest of this chapter contains a detailed description of how an Automatic Link Establishment is carried out.

The default mode for an ALE station is that the receiver scans the channels, which is defined for the station itself in the address table. The channels are scanned in the same order they are programmed.

When the operator has keyed in the name of a station he wants to call and directed the controller to initiate a call, the controller will search for the station name in the address table (program 66). The address table defines a number of channels which correspond to a number of frequencies in the channel table (program 65).

The call is initiated with a period where the first frequency is evaluated for other traffic before the calling sequence is broadcasted. If the amount of traffic on the frequency exceeds the preprogrammed

level in program 61, the call will not be broadcast on this frequency. Then the next frequency is evaluated before the calling sequence is broadcast. The period for the calling sequence depends on the number of frequencies which the called station scans and the tune time of the called station.

When the calling sequence has been broadcast on a frequency, the calling station will listen a period for an answer. This period allows time for the called station to tune and broadcast an answer to the calling station. If the calling station does not receive an answer it continues to broadcast the calling sequence on the next frequency. The calling station continues in this way until an answer is received from the called station or until all the calling sequence has been broadcast on all frequencies defined for the called station in program 65 and 66.

If the called station detects a call it will immediately stop scanning and evaluate the quality of the connection from the calling station to the called station. When the calling sequence is terminated, the called station tunes its antenna tuner and transmits an answer to the calling station. The answer contains information about the quality of the connection from the calling station to the called station.

When the calling station detects the answer from the called station it stays on the frequency and evaluates the quality of the connection (LQA) from the called station to the calling station. Upon receipt of this answer, the calling station transmits a final message to the called station. This message contains information about the quality of the connection from the called station to the calling station. The message also orders the called station to stay on the frequency or to continue scanning.

Via the exchange of qualities between the two stations, each station has knowledge of the quality of the established connection both ways. This knowledge is together with the preprogrammed settings in program 61 used by the calling station to decide if the called station is ordered to stay on the frequency or if it is ordered to continue scanning. Program 61 defines if the link should be established on the first channel with a quality which exceeds a preprogrammed value, or if the link should be established on the best value.

If the calling station is programmed to establish link on the first channel, the link is established when a channel is found with a quality which is better or as good as the preprogrammed value.

If the calling station is programmed to establish link on the best channel, the calling station will order the called station to continue scanning each time a channel has been evaluated. So the evaluation will continue until all the channels of the called station have been evaluated. Afterwards the calling station will call the called station on the channel with the best quality and establish a link. If the evaluation of two or more channels has resulted in equal quality, the calling station will establish link on the channel which is defined first in the address table (program 66).

The method used for evaluation of the channels is based on measurement of the Bit Error Rate (BER) via $^{2}/_{3}$-majority vote decoding. This method is suitable to derive a figure for the amount of atmospheric fading and jamming caused by other traffic. Because of the limited amount of data which are exchanged during a link establishment this measurement is not suitable as a stringent measurement of the signal to noise ratio. The measurement is a fast and suitable way to evaluate the capability of a channel to transmit data.

The approximate times for automatic establishment of a link may be calculated as described below.

Automatic link establishment on best channel:

$$T=(C+1)\cdot(t_{tA}+t_{tB}+t_C+t_{SC}+k_1)+C\cdot k_2$$

Automatic link establishment on first channel:

$$T=N\cdot(t_{tA}+t_{tB}+t_C+t_{SC}+k_1)+C\cdot k_2$$

T approximate time for establishment of a link

C number of channels which scanning station scans (defined in program 66)

N number of channels which are evaluated before a link is established

t_{tA} tune time for calling station (equals TI in program 66)

t_{tB} tune time for called station (equals TI in program 66)

t_C time for exchange of commands between IC4010, SE4010, RX4010 and TU4015 via the remote communication lines:

640mS for 1200 baud
320mS for 2400 baud
160mS for 4800 baud
80mS for 9600 baud

The baudrate equals the one which is defined as "**BAU. IC SYS.**" in program 66.

t_{SC} (2C+1)·392mS, necessary time to "catch" scanning station

k_1 9,280S (system constant)

k_2 1,176S (system constant)

The following sections describe the secondary ALE modes.

3.11.1 ALE Receive

To set the controller in ALE receive mode proceed as described below:

Keystrokes	Display
[ALE]	**. RX MODE**
[enter]	**RX MODE**

RX4010 will now start to scan the channels defined in the address table (program 66) for the station itself (STAT 0).

If the name of the station has not been programmed with its own name, the display shows "**ERR NAME**".

When a link is established the display shows "**XYZ LINK n**" and the loudspeaker advises the operator by a tone. "**XYZ**" is the name of the calling station and "**n**" is a figure of merit between 0 and 7 indicating the quality of the established link. "7" indicates the quality for a link without errors, and "0" is the quality for a completely useless link.

If "**NO. ANSWER**" is selected via program 62 and a call is detected, the receiver will stop scanning, the display will show "**XYZ CALLING**" and the loudspeaker advises the operator by a tone.

The wanted communication mode after link establishment may be selected on SE4010 and RX4010 before the secondary ALE receive mode is selected. All settings of SE4010 and RX4010 (exclusive frequency) are recalled when a link is established.

3.11.2 ALE Call

To initiate call of a station via ALE proceed as described below:

Keystrokes	Display
[ALE]	**. RX MODE**
[→]	**XYZ. CALL**

where "**XYZ**" is the name of the station which was called the last time ALE call was used.

The name of the station can be accepted by the **[enter]** key or cleared by the **[C]** key and then altered using the numeric keys and the alpha-keys. Note that if the second letter printed in brackets below the alpha-keys should be used it is necessary to push the **[()]** key first.

To alter the name of the station, proceed as follows:

Keystrokes	Display	
[C]	**-. CALL**	
[()]	**-. CALL**	
[A(B)]	**B. CALL**	
[3]	**B3. CALL**	
[4]	**B34. CALL**	name of station
[enter]	**B34 CALL**	"B34" is keyed-in

The name of the station consists of up to three alpha numerical characters. The possible characters are:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

If the name of the station has not been defined or if no channels have been allocated to the station, the **[enter]** key has the same effect as if the **[C]** key was pressed.

If the name of the station itself has not been defined the display shows "**ERR NAME**".

When the link has been established, the display shows "**B34 LINK n**", and the loudspeaker advises the operator by a tone. "**n**" is the figure of merit 7 which indicates the quality of the established link.

If a call on each of the channels of the called station does not result in an established link, the display changes to "**B34 NO LINK**".

In order to indicate if link establishment on the first or the best channel is selected via program 61, one of the annunciators "**first**" or "**best**" will be switched on when the "ALE CALL" mode is selected.

3.12 Burst Operation

The **BurST** mode is used for high speed broadcast of conventional one-tone morse telegraphy.

In conjunction to the FEC mode which contains two secondary modes, the BST mode contains four secondary modes. The overall function of these modes are described below.

Before transmission of a burst telegram the telegram must be transmitted to IC4010. This is carried out in the secondary "REC DTE" mode. From the data terminal the burst telegram is sent as ASCII characters via the serial RS232 line to a memory in IC4010. In IC4010 the ASCII characters are converted to Morse code. The burst telegram is not transmitted

yet.

The burst telegram is transmitted in the secondary "TX" mode. IC4010 transmits the Morse code of the burst telegram as 1kHz high speed on/off keying. This signal is transmitted to SE4010 via a 600 ohms balanced line. In SE4010 the 1kHz high speed Morse signal is modulated on a carrier frequency and transmitted via the power amplifier and antenna tuner.

At the receiving station the burst telegram is received in the secondary "RX" mode. The RX4010 feeds the demodulated 1kHz high speed Morse signal to IC4010 via a 600 ohms balanced line. In IC4010 the signal is converted back to ASCII characters and stored in a memory. The burst telegram has not yet been sent to the data terminal.

In the secondary "RX PLB" mode, the received burst telegram is transmitted from IC4010 to the data terminal via the serial RS232 line.

The data communication between IC4010 and the data terminal is described in section 2.5.

Prior to entry of the secondary "TX" or "RX" modes, SE4010 and RX4010 must be set up for operation in the BST mode and a frequency must be selected or found via the ALE mode. A recommended set up is shown below.

Set up for SE4010:

F1B mode
ext key
Program 30: Offset-frequency = 0.00kHz

During transmission the power amplifier must be switched on by pressing the **[Tx on]** key.

Set up for RX4010, selection of filter not possible:

SSB/USB mode
AGC: fast
BFO: 0.00kHz

The "inter" filter is automatically selected.

Set up for RX4010, selection of filter possible:

RTTY mode
AGC: fast
Displayed frequency: displayed frequency of SE4010 + 1.00kHz.
BFO: 1.00kHz

Filter bandwidth can be selected as wanted.

Note: Selection of the "vnar" filter will cause considerable distortion of the received Morse code!

The following sections describe the secondary BST modes.

3.12.1 BST Record

To load the memory in IC4010 with a telegram which is to be transmitted as a burst, proceed as described below:

Keystrokes	Display
[BST]	**. RX MODE**
[←]	**. REC DTE**
[enter]	**REC DTE**

The controller is now ready to be loaded with a telegram from the data terminal. During loading of the telegram the "**trfc**" annunciator is switched on. When the telegram is loaded, the display shows "**n REC DTE**" and the loudspeaker advises the operator by a tone. "**n**" indicates the number of burst telegrams which have been loaded into the memory.

If the memory runs out the display changes to "**ERR REC DTE**" and the loudspeaker advises the operator by a tone.

Due to the fact that not all characters of the 7 bit ASCII character set are contained in the Morse alphabet, only a subset of the ASCII character set can be transmitted in the BST mode. The ASCII characters which IC4010 can transmit via the BST mode are listed in the table 3.1.

Table 3.1 Characters used in the BST mode

Character	ASCII-code	Character	ASCII-code
space	20H	A	41H
"	22H	B	42H
'	27H	C	43H
(	28H	D	44H
)	29H	E	45H
+	2BH	F	46H
,	2CH	G	47H
-	2DH	H	48H
.	2EH	I	49H
/	2FH	J	4AH
0	30H	K	4BH
1	31H	L	4CH
2	32H	M	4DH
3	33H	N	4EH
4	34H	O	4FH
5	35H	P	50H
6	36H	Q	51H
7	37H	R	52H
8	38H	S	53H
9	39H	T	54H
:	3AH	U	55H
=	3DH	V	56H
?	3FH	W	57H
		X	58H
		Y	59H
		Z	5AH

Although small letters are not contained in the table above, these are also legal.

If IC4010 receives a character from the data terminal which is not contained in the table, the unlegal character will be substituted with a space in the burst telegram. If more unlegal characters are followed by each other, these will only be substituted with a single space in the burst telegram.

The equipment has memory for 2000 characters (standard 7 bit ASCII).

3.12.2 BST Transmit

To initiate transmission of the burst telegrams, implement the necessary set up of SE4010 and RX4010 and proceed as described below:

Keystrokes	Display
[BST]	**. RX MODE**
[→]	**n. TX MODE**
[enter]	**TX MODE**

"**n**" indicates the number of burst telegrams which the data terminal have loaded into the memory in the secondary "REC DTE" mode.

The controller will now transmit all telegrams in the memory.

When all telegrams in the memory have been transmitted the loudspeaker advises the operator by a tone and display shows "**TX DONE**".

If no telegram has been recorded the **[enter]** key will cause the display to show "**ERR NO TLGM**" and no transmission takes place.

While burst telegrams are transmitted the "**trfc**" annunciator is switched on.

Due to the fact that the AGC of the receiver needs time to adjust the amplification, IC4010 will automatically insert "eeeeeeeee" at the beginning of each transmitted telegram.

3.12.3 BST Receive

To initiate reception of burst telegrams, implement the necessary set up of SE4010 and RX4010 and proceed as described below:

Keystrokes	Display
[BST]	**. RX MODE**
[enter]	**RX MODE**

The system is now ready to receive burst telegrams.

When a burst telegram has been received, the "**tlg**" annunciator will be switched on and the loudspeaker advises the operator by a tone. The display shows "**n RX MODE**". "**n**" indicates the number of burst telegrams which have been received and are stored in the memory. The "**tlg**" annunciator will be switched on until the burst telegrams have been transmitted to the data terminal in the secondary "RX PLB" mode.

While a burst telegram is received, the "**trfc**" annunciator is switched on.

If the memory runs out, the reception stops and the display shows "**ERR RX STOP**" and the loudspeaker advises the operator by a tone.

The controller has memory for 2000 characters.

In order to prevent noise and interfering signals from filling the memory in the secondary "RX" mode, the controller will not start to receive a telegram until three different characters have been detected. The three characters may include a space.

When no Morse signals have been received within a period which equals 20 spaces, the burst telegram is assumed to be finished. Reception of a new telegram will not start until three different characters have been detected again.

Because of noise and interference a burst signal which is transmitted from one station to another may be more or less distorted. Upon reception of a burst telegram containing codes which cannot be converted to the codes contained in the Morse alphabet, each unlegal code which is assumed to represent a single character is substituted with a "#" (ASCII 23H) when the telegram is sent to the data terminal in the secondary "RX PLB" mode.

If more spaces followed by each other are received, these will only be substituted with a single space when the telegram is sent to the data terminal in the secondary "RX PLB" mode.

3.12.4 BST Received Playback

To transmit the received burst telegrams which are stored in the memory, proceed as described below:

Keystrokes	Display
[BST]	**. RX MODE**
[→]	**. TX MODE**
[→]	**. RX PLB**
[enter]	**n RX PLB**

"**n**" indicates the number of burst telegrams which have been received and are stored in the memory. The controller will now transmit all burst telegrams in the memory to the data terminal. During this transmission the "**trfc**" annunciator is switched on. When the transmission is finished the display shows "**END RX PLB**" and the loudspeaker advises the operator by a tone.

When the mode is left, the "**tlg**" annunciator will switch off, but it is still possible to enter the mode again and transmit the received burst telegrams to the data terminal again. The contents of the

memory will not be cleared until the secondary "RX" mode is entered.

If the secondary "RX PLB" mode is selected when the memory contains no telegram, the display will show "**ERR NO TLGM**" and the loudspeaker advises the operator by a tone.

3.13 Standby Operation

The **[STB]** key turns the controller into the **STandBy** mode.

In the standby mode RX4010 and SE4010 are not controlled by IC4010 and all remote and data signals are routed directly through IC4010. RX4010 and SE4010 may be operated exactly as if IC4010 was not present.

3.14 Introduction to the Program Function

The program function is selected by pressing the **[progr]** key followed by the program number. The program number is accepted by pressing the **[enter]** key. Now a main menu for the selected program is displayed. By using the horizontal arrow keys, sub menus will be displayed (if any).

A menu (main or sub) is accepted by pressing the **[enter]** key. Now the display is scrolled through messages using the vertical arrow buttons. If sub messages exist to a message, these are recalled by the horizontal arrow buttons.

The last message is followed by a return to the former setting of the IC4010 when the downwards arrow button is pressed.

When in a program function, the **[RS]** key may be used to return to the former setting of the controller.

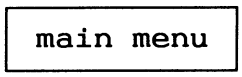
Selection of a program function does not effect the actual setting of the controller. Settings which are changed in a program are not transferred to the control register until a primary mode is selected.

As long as a program is operated, the "**prg**" annunciator is switched on.

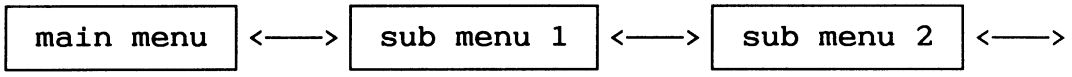
Operation of the programs can be illustrated in the following way:

1) Select the program.

2) The main menu will be displayed.

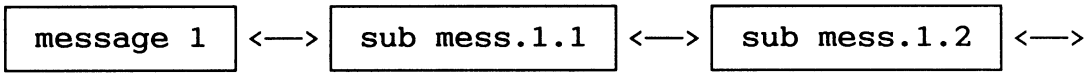


3) The menus are scrolled by [←] and [→] keys.

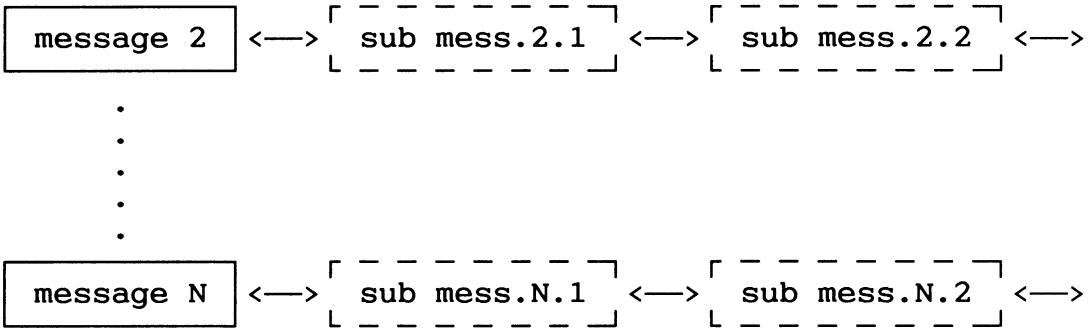


4) The first message is displayed when a menu is selected by pressing **[enter]** key while the menu is shown.

5) Sub messages may be scrolled using [←] and [→] keys.



6) Messages are scrolled using the [↓] and [↑] keys.



7) Pressing the [↓] key after the last message returns the controller to the former setting.

The intelligent controller has several programs:

Program 1:	Clock Viewing and Setting
Program 19:	Remote Addressing
Program 20:	Baudrate Selection
Program 40:	AEL Automatic Error Log
Program 41:	ARTEL Automatic Remote Transmission Error Log
Program 42:	Accumulated On-Time
Program 49:	Automatic self-test (see section 6)
Program 61:	ALE parameters
Program 62:	Disabling of back answer
Program 65:	Channel table
Program 66:	Address table

3.14.1 Clock Viewing and Setting
Program 1

When program 1 is selected the display shows "**CLO. RCL.**". By using the [→] key, the display is changed to "**CLO. STO.**".

"**CLO. RCL.**" is for Clock Viewing and "**CLO. STO.**" is for Clock Setting. Scrolling between the two displays is accomplished by using the [←] and [→] keys.

The wanted menu is selected by the **[enter]** key. Pressing the [↑] key after a menu has been selected, returns display to the menu.

After selection of menu, date and time are scrolled using [↑] and [↓] keys.

In "clock store" mode a flashing digit indicates the digit which might be changed entering a new digit by the numeric keyboard.

The [←] and [→] keys are used to select the digit which is going to be changed. The date is changed first and accepted by the **[enter]** key. Then the time is displayed and changes accepted by the **[enter]** key.

Example, Clock Viewing:

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[1]	**PRG NO. 1**	select program 1
[enter]	**CLO. RCL.**	
[enter]	**DAT. 93-10.12**	oct. 12. 1993
[enter]	**TI. 16-44.48**	16h 44min 48sec
[enter]	**RX MODE**	

Example, Clock Setting:
Change date to jan. 14. 1993 and the time to 16.54.00.

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[1]	**PRG NO. 1**	select program 1
[enter]	**CLO. RCL.**	
[→]	**CLO. STO.**	
[enter]	**DAT. 93-10.12**	store date
[→]	**DAT. 93-10.12**	
[→]	**DAT. 93-10.12**	
[0]	**DAT. 93-00.12**	
[1]	**DAT. 93-01.12**	
[→]	**DAT. 93-01.12**	
[4]	**DAT. 93-01.14**	jan. 14. 1993
[enter]	**TI. 16-44.48**	store time
[→]	**TI. 16-44.48**	
[→]	**TI. 16-44.48**	
[5]	**TI. 16-54.48**	
[→]	**TI. 16-54.48**	
[0]	**TI. 16-54.08**	
[0]	**TI. 16-54.00**	16h 54min 00sec
[enter]	**RX MODE**	

An underline denotes flashing digit.

3.14.2 Remote Addressing

Program 19

This program is used to select the addresses for the remote communication with the connected SE4010 and RX4010. Before using the controller in the ALE mode, these addresses must be selected in accordance with the addresses which the two units are strapped for.

The addresses for the remote communication are selected as described below. When program 19 is selected the display will show "**ADR. SE n**", where "**n**" is a number between 1 and 31 which is the last selected remote address of the connected SE4010. The address may be accepted by pressing the **[enter]** key, or another address may be selected via entry of the numeric data keys followed by entry of the **[enter]** key.

By pressing the **[enter]** key, the display will change to "**ADR. RX n**", which indicates the remote address of the connected RX4010. This address is selected as described above.

Example:
Change remote address of connected RX4010 from 30 to 1.

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[1][9]	**PRG NO. 19**	select program 19
[enter]	**ADR. SE 1**	
[enter]	**ADR. RX 30**	
[1]	**ADR. RX 1**	select address 1
[enter]	**RX MODE**	

An underline denotes flashing digit.

3.14.3 Baudrate Selection

Program 20

This program is used to select baudrates for the serial remote communication and the serial data communication with a connected data terminal. These baudrates must be selected before the controller can be used.

The baudrate for the remote communication is selected as described below. When program 20 is selected the display will show "**BAU. IC SYS**". By pressing the **[enter]** key the last selected baudrate (e.g. "**BAU. 1200**") will appear on the display. By using the [←] and [→] keys the baudrate is changed. Baudrate is accepted by the **[enter]** key.

Example:
Change baudrate of remote communication from 1200 to 4800 baud.

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[2][0]	**PRG NO. 20**	select program 20
[enter]	**BAU. IC SYS.**	
[enter]	**BAU. 1200**	
[→]	**BAU. 2400**	
[→]	**BAU. 4800**	select 4800 bps
[enter]	**RX MODE**	

An underline denotes flashing digit.

The baudrate for communication with the data terminal is selected as described below. By using the [←] and [→] keys immediately after program 20 has been selected the display will show "**BAU. DTE**". By pressing the **[enter]** key the last selected baudrate (e.g. "**BAU. 1200**") will appear on the

display. By using the [←] and [→] keys the baudrate is changed. Baudrate is accepted by pressing the **[enter]** key.

The baudrates to be chosen are between 1200 and 9600 baud.

3.14.4 AEL Automatic Error Log
Program 40

The controller continuously monitors the remote communication to the connected SE4010 and RX4010. If a fault occurs, an error message appears at the display. Such error condition is stored in the automatic error log together with the date and the time. At a later time the error conditions can be recalled from the log.

When program 40 is selected the display will show "**AEL. DISPLAY.**". When this message is shown, the error log may be viewed for displayings of errors. By using the [←] and [→] keys immediately after program 40 has been selected, the display changes to "**AEL. CLEAR.**" When this message is shown, the error log may be cleared.

To select error log displaying press the **[enter]** key when the display shows "**AEL. DISPLAY.**". The error codes are now scrolled using the [↓] and [↑] keys. Sub messages (date and time) are scrolled using the [←] and [→] keys. If the [↓] key is pressed while a sub message (date and time) is displayed the next error code will appear. When "**AEL. END.**" is displayed the [↓] key returns the controller to the former setting.

To select error log clearing press the **[enter]** key when the display shows "**AEL. CLEAR.**". This will cause the display to show "**CLR. = ENTER.**". Pressing the **[enter]** key will clear the error log. If the **[RS]** key is pressed instead of the **[enter]** key, this will return the controller to former setting without clearing the error log.

Example, Error log displaying:

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[4][0]	**PRG NO. 40**	select program 40
[enter]	**AEL. DISPLAY.**	
[enter]	**BAU. 1200**	
[→]	**BAU. 2400**	
[enter]	**ERR. SYST. SE**	error code 1
[→]	**D.10 12-09.40**	oct. 12., 09h 40m
[enter]	**ERR. SYST. RX**	error code
[enter]	**AEL. END**	
[enter]	**RX MODE**	

The error codes which are stored in the log are listed below.

Error message	Description
ERR. SYST. SE	Remote communication to SE4010 has failed or antenna tuner not tuned.
ERR. SYST. RX	Remote communication to RX4010 has failed.
ERR. EXT	Remote communication to both SE4010 and RX4010 has failed.

Example, Error log clearing:

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[4][0]	**PRG NO. 40**	select program 40
[enter]	**AEL. DISPLAY.**	
[→]	**AEL. CLEAR.**	
[enter]	**CLR. = ENTER.**	accept clearing of log
[enter]	**RX MODE**	

3.14.5 ARTEL Automatic Remote Transmission Error Log Program 41

The quality of the remote transmission which controls the IC4010 is continuously registered.

By recalling program 41 the number of possible transmission errors occurred and the number of correctly received transmissions since the controller has been switched on can be displayed.

When program 41 is selected the display will show "**R.FR.**", followed by a number between 0 and 65535. In cases where the number exceeds 65535, counter(s)

are reset and the counting proceeds from 0.

The program is stepped through using the [↓] and [↑] keys. The display messages together with the corresponding information are listed below.

Display	Information
R.FR.	Number of received frames (MOD 256)
R.BT.	Number of received bytes (MOD 256)
SYN.	Number of synchronizing retransmissions.
HD.E.	Number of header errors.
TO.E.	Number of timeout errors.
FR.E.	Number of framing errors.
OR.E.	Number of overrun errors.
PT.E.	Number of parity errors.
TO.S.	This message has no function.

For further information please refer to the protocol for remote communication described in "COMMUNICATION PROTOCOL", Doc. No. 236743 HT.

3.14.6 Accumulated On-Time
Program 42

An internal counter in the controller counts the number of hours the controller has been switched on.

When program 42 is selected the display appears as "**P.ON xxxxxx**", where "**xxxxxx**" is the accumulated power on-time for controller. To leave the program press the **[enter]** or **[RS]** key.

3.14.7 ALE Parameters
Program 61

With program 61 it is possible to:

1) select that an automatic link establishment should be carried out on the best of preprogrammed channels or on the first of preprogrammed channels with a link quality equal to or better than a programmed threshold.

2) select the receiver agc threshold level which is the limit for the amount of signal on the receiver antenna input, which is allowed if an ALE call has to be carried out in the channel.

When program 61 is selected the display shows "**. BEST**" as the default parameter. Pressing the **[enter]** key continues the program, pressing the **[RS]** key leaves the program without altering the parameter.

To change the parameter use the [←] or [→] keys. This will cause the display to change to "**. FIRST n**", where "**n**" is a figure of merit between 0 and 7 of the quality of the link. "**n**" can be changed using the numeric keys and the parameter accepted by the **[enter]** key.

"7" indicates the quality for a link without errors, and "0" is the quality for a completely useless link.

One of the annunciators "**first**" or "**best**" will be switched on when the "ALE CALL"-mode is selected.

After the **[enter]** key has been pressed, the display shows "**. AGC m**", where "**m**" is a number between 0 and 15 indicating the receiver agc threshold level. If a signal on the receiver antenna input exceeds this level before an ALE call is carried out on the channel, the call will be skipped and the controller continue on the next channel. "**m**" can be changed using the numeric keys and the parameter accepted by the **[enter]** key.

Each step corresponds to approximate 10dB increase of agc level. The threshold level with m = 0 is approximately -120dBm for a Dansk Radio receiver RX4010.

3.14.8 Disabling of Back Answer

Program 62

In order to disable the controller from answering a calling station in the "ALE RX"-mode, program 62 can be used. The controller will still scan the assigned frequencies and try to detect calls.

When program 62 is selected the display shows "**. ANSWER**" or "**NO. ANSWER**", depending on the former setting. When the display shows "**. ANSWER**", the controller will answer a calling station and try to establish an automatic link. When the display shows "**NO. ANSWER**", the answer is disabled and no message will automatically be transmitted from the station.

To change between "**.** **ANSWER**" and "**NO.** **ANSWER**" use the [←] and [→] keys. Accept via the **[enter]** key.

If "**NO.** **ANSWER**" is selected and a call is detected in the "ALE RX"-mode, the receiver will stop scanning, the display will show "**XYZ** **CALLING**" and the loudspeaker advises the operator by a tone. "**XYZ**" is the name of the calling station.

3.14.9 Channel Table
Program 65

Before an automatic link establishment can start, the frequencies of the communication network must be defined in the channel table. The program defines the channels which receivers of the different ALE stations scan. Via the channel table, these channels are converted to frequencies. Up to 99 duplex channels can be defined in program 65.

When program 65 is selected the display shows "**ALE.** **FRQ.**". After pressing of the **[enter]** key, the channels can be scrolled using the [↓] key and altered using the **[C]** key followed by a new frequency entry. The new frequency is accepted by the **[enter]** key. The receive frequencies are indicated by a "**R**" in the left hand display and the transmitter frequencies by a "**T**".

Note that the "**R**" and "**T**" are valid for the calling station itself. Hence a call is transmitted at the frequency defined for the "**T**", and received at the frequency defined for the "**R**".

A simplex channel is simply defined by setting the frequency defined for "**R**" and "**T**" equal.

The **[RS]** key returns the controller to the former setting.

Example:

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[6][5]	**PRG NO. 65**	select program 65
[enter]	**ALE. FRQ.**	
[enter]	**R 1. 1232.00**	
[enter]	**T 1. 1232.00**	simplex channel
[enter]	**R 2. 18545.00**	
[enter]	**T 2. 23975.00**	duplex channel
[enter]	**R 3 20345.00**	
[enter]	**T 3 21234.00**	
[C]	**T 3. 0.00**	clear and change
[2]	**T 3. 2.00**	transmitter freq.
[8]	**T 3. 20.00**	of channel 3
[3]	**T 3. 203.00**	
[5]	**T 3. 2035.00**	
[5]	**T 3. 20355.00**	
[enter]	**T 3 20355.00**	accept
	.	
	.	
	.	
[enter]	**R25. 8500.00**	
[enter]	**T25. 8500.00**	
[enter]	**R26. 0.00**	
[RS]	**RX MODE**	return

As long as a channel is shown in the display the "**ch.**" annunciator is lit.

3.14.10 Address Table
Program 66

The name of the radio stations in the communication network together with the allocated channels and information about tune time are defined in program 66.

The names consist of up to three alpha numerical characters. The possible characters are:

A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.

If program 66 has not yet been programmed when it is selected, the display shows "**. STAT 0**". In order to define the name of the station the **[C]** key is pressed and the name is keyed in via the alpha-numerical keys.

If program 66 has already been programmed when it is selected the display shows "**XYZ. STAT 0**" telling that station No. 0 which is this station itself has the name "**XYZ**". By using the **[←]** or **[→]** keys the

display is scrolled between the other stations of which there can be up to 99.

It is important to define the name of the station itself as station No. 0!

Example, define station No. 3.:

Keystrokes	Display	Comments
	RX MODE	
[progr]	**PRG NO.**	
[6][6]	**PRG NO. 66**	select program 66
[enter]	**. STAT 0**	
[→]	**. STAT 1**	
[→]	**. STAT 2**	
[→]	**. STAT 3**	define station
[C]	**-. STAT 3**	no. 3
[A(B)]	**A. STAT 3**	give the name
[()]	**A. STAT 3**	"AX2"
[W(X)]	**AX. STAT 3**	
[2]	**AX2. STAT 3**	
[enter]	**AX2. TI 0.0**	accept name

the total tune time (max. 99.9 sec.) for the transmitter of station AX2 must now be defined in steps of 0.1 sec.:

[1]	**AX2. TI 1.0**	
[.]	**AX2. TI 1.0**	total tune time
[2]	**AX2. TI 1.2**	set to 1.2 sec.
[enter]	**AX2. 1. CH 0**	accept tune time

channels as stored in program 65 must now be allocated to station AX2:

[6]	**AX2. 1. CH 6**	select ch. 6
[enter]	**AX2. 2. CH 0**	
[1]	**AX2. 2. CH 1**	
[8]	**AX2. 2. CH 18**	select ch. 18
[enter]	**AX2. 3. CH 0**	
[2]	**AX2. 3. CH 2**	
[5]	**AX2. 3. CH 25**	select ch. 25
[enter]	**AX2. 4. CH 0**	
[3]	**AX2. 4. CH 3**	
[9]	**AX2. 4. CH 39**	select ch. 39
[enter]	**AX2. 5. CH 0**	
[5]	**AX2. 5. CH 5**	
[7]	**AX2. 5. CH 57**	select ch. 57
[enter]	**AX2. 6. CH 0**	

Each station can have up to 10 channels. The channels must be programmed in the same order in which they are to be evaluated.

An **[RS]** leaves the program and returns the controller to the former settings.

Recommended tune times for program 66 when the Dansk Radio power amplifier S76150/S76210 and antenna tuner TU4013/TU4015 is used:

TI=1.5S if the antenna tuner has not been tuned at the frequency before.

TI=0.3S if the antenna tuner has been tuned at the frequency before.

3.15 Clear All

WARNING!
This routine erases all data
stored in the programmable memory.

To clear all user-programmable channels and programs press **[STB]** and **[→]** at the same time. The display will show "**CLR. ALL**".

If the **[→]** key is pressed within 2.5S, the command will be executed. If no key is pressed within 2.5S or if another key but the **[→]** key is pressed, the "Clear ALL" function will be left and the controller will return to the former mode.

The accumulated power on-time in program 42 will not be cleared by the "Clear All" function.

4 FUNCTIONAL DESCRIPTION

4.1 Introduction

This chapter describes functions of the controller which are not described elsewhere in this manual. Functions described elsewhere in the manual are listed below.

CHAPTER 1:	Overall Description.
CHAPTER 2:	Remote Communication. Data Communication.
CHAPTER 7:	Detailed block diagrams descriptions of assemblies. Detailed circuit descriptions of assemblies.

4.2 Overall Technical Description

The overall block diagram of IC4010: "CONFIGURATION IC4010", doc. No. 235450 EB is shown at the end of this chapter.

The Remote Processor A8.1 handles all control of IC4010. This control may be carried out via the keyboard and display on the Front Panel A11 or via the serial remote communication.

Interface for the serial remote communication is located on the Remote Module A9.

The line designated "REM. CTL. IC/RX IN" is used both for remote control of IC4010 or remote control of RX4010 through IC4010. Via the line designated "REM. CTL. TX IN", SE4010 may be remote-controlled through IC4010. Via the lines designated "REM. CTL. RX OUT" and "REM. CTL. TX OUT", SE4010 and RX4010 are controlled by IC4010 in the ALE mode.

When SE4010 and RX4010 are not controlled by IC4010 they may be controlled by a remote control unit. This is implemented via a switching function located on the A9 Remote Module and causes the "REM. CTL. IC/RX IN" line to be routed to the "REM. CTL. RX OUT" line and the "REM. CTL. TX IN" line to be routed to the "REM. CTL. TX OUT".

The remote control may be carried out via a PC or the Dansk Radio remote control units TC4010 and RC4010.

A dedicated latch located on the A9 Remote Module enables the A8.1 Remote Processor to communicate with the A8.2 Control Processor.

The A8.2 Control Processor carries out the overall control of main tasks in IC4010 and carries out the remote control of SE4010 and RX4010 in the ALE mode.

The A2 Frequency Standard contains a highly stable OCXO which is used as standard for the internal timing signals in IC4010. The OCXO also provides the standard for the two external frequency outputs, which may be used as external frequency standard inputs for SE4010 and RX4010.

A dedicated latch located on the A2 Frequency Standard enables the A8.2 Control Processor to communicate with the A8.3 Code Processor.

All coding and decoding (Golay coding, interleaving etc.) is carried out by the A8.3 Code Processor, which is specially designed for this kind of tasks. It also contains interface for the serial data communication with the data terminal. Via a switching function located on the assembly, the RS232 signals of the data terminal are split in two parts and routed through the assembly to the A6 FSK Demodulator of RX4010 and the A6 FSK modulator of SE4010.

The A6.1 8-ARY FSK Demodulator is fed via a 600 ohms balanced line from the AF output of RX4010. The received tones are demodulated to a one byte word, which is sampled by the A8.3 Code Processor.

The set-up of the A6.2 8-ARY FSK Modulator is carried out by the A8.3 Code Processor via the internal Motherboard. The A8.3 controls the transmitted tones via an external cable on the rear of IC4010. The tones are fed to the AF input of SE4010 via a 600 ohms balanced line.

The A10 Power Supply generates the necessary DC voltages for the assemblies.

The A5 Assembly is optional for future applications.

An example of the internal task sharing between the three processor modules is described below:

The A8.1 Remote Processor receives a mode change command from FEC to STB (from the keyboard on the A11 Front Panel or from the remote control unit via the A9 Remote Module). Upon receipt of the command the A8.1 Remote Processor transmits the command to the A8.2 Control Processor via the A9 Remote Module. The A8.2 Control Processor initiates the change of mode by transmitting a command to the A8.3 Code Processor via a dedicated latch located on the A2

Frequency Standard. This causes the A8.3 Code Processor to discontinue the tasks which are carried out in accordance to the FEC mode. The A8.2 Control Processor also causes the A9 Remote Module to route the remote lines directly through the Module.

Please note that, in order to create a logical designation of the assemblies in IC4010, the three processor assemblies are designated "A8.1", "A8.2" and "A8.3". The designation "A8" refers to a processor assembly, and the leading digit refers to the functionality of the processor assembly. The FSK demodulator and FSK modulator assemblies are designated A6.1 and A6.2 respectively. The leading digit of the designations is only used as a convenient way to designate the assemblies in the IC4010 configuration!

4.3 Remote Switching

The Remote Module A9 contains a circuit for switching of the remote communication lines. This circuit makes it possible to remote-control both IC4010 and the connected SE4010 and RX4010 via two serial RS232 lines. Figure 4.1 shows the overall functional diagram of the remote switching function.

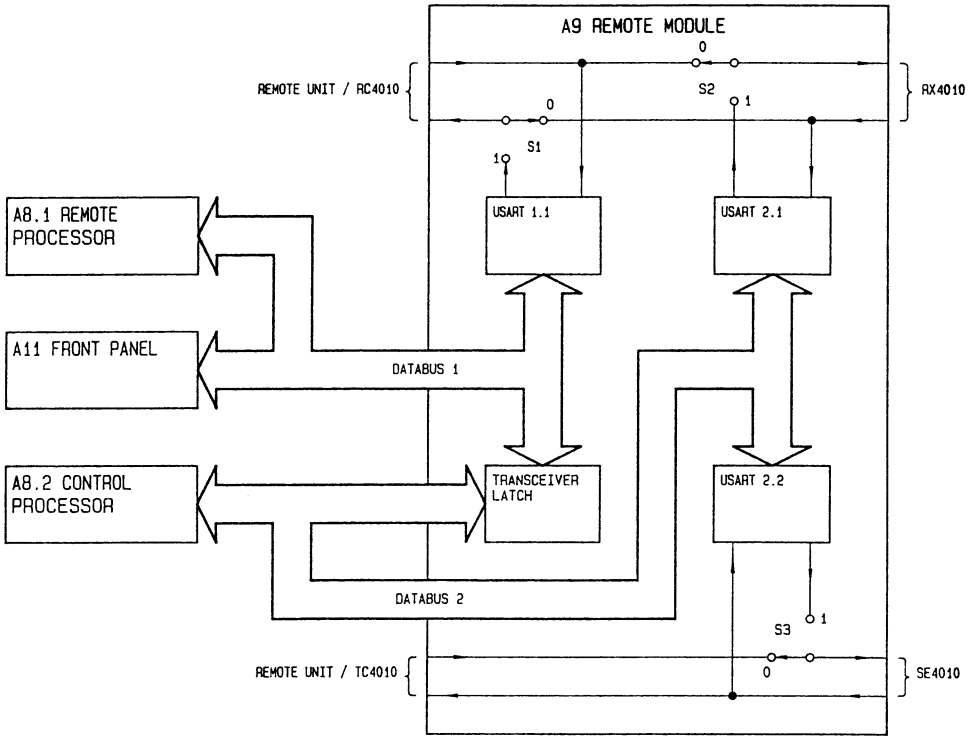


Figure 4.1 Remote switching function

The remote lines of the Remote Switch Circuit are switched via the three switches S_1, S_2, and S_3. These switches consist electrically of several integrated switches but in order to describe the function of the circuit, they are drawn as single switches.

The remote unit may consist of a computer containing two serial RS232 lines, or it may consist of the Dansk Radio remote units RC4010 and TC4010.

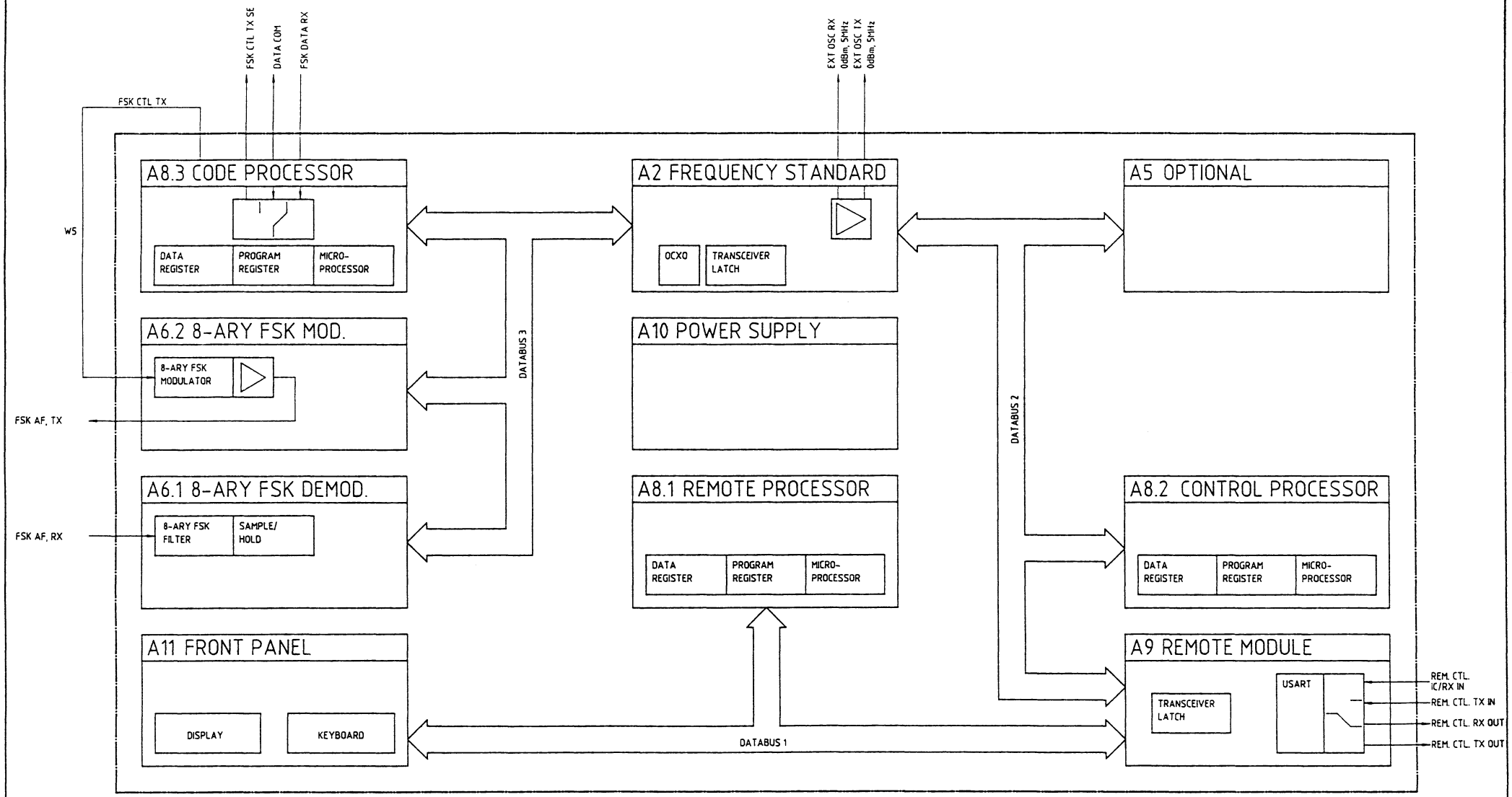
When all three switches are set in position "0" as shown in figure 4.1, the serial RS232 lines from the remote unit are routed directly through the IC4010. Thus RX4010 and SE4010 are directly remote-controlled by the remote unit. The remote commands from the Remote Unit/RC4010 will always be supervised by the IC4010 via USART 1.1. When the Remote Unit/RC4010 wants to control IC4010, the Remote Unit/RC4010 will disaddress RX4010 and address IC4010. This will cause IC4010 to switch S_1 to position "1". Now IC4010 is able to communicate with the Remote Unit/RC4010. The Remote Processor A8.1 carries out the remote communication between the Remote Unit/RC4010 and IC4010.

In the ALE mode, RX4010 and SE4010 is fully controlled by IC4010. Then S_2 and S_3 are switched to position "1". With the switches in this position, RX4010 is remotely controlled by IC4010 via USART 2.1 and SE4010 is remotely controlled by IC4010 via USART 2.2. Remote control of RX4010 and SE4010 by the Remote Unit is disabled when RX4010 and SE4010 are controlled by IC4010, but the remote commands from the Remote Unit/RC4010 are still supervised by IC4010 via USART 1.1. The Control Processor A8.1 carries out the remote control of RX4010 and SE4010 when they are controlled by IC4010.

4.4 Data Switching

The Code Processor Module A8.3 contains a circuit for switching of the signals in the serial RS232 line between the controller and the data terminal. This circuit provides possibility of interfacing the serial RS232 line of the data terminal to the controller, or to route the RS232 signals through the controller to the FSK Modulator in SE4010 and the FSK Demodulator in RX4010. Figure 4.2 shows the principal diagram of the data switching function.

CHANGE ORDER/REVISION									
CO:	9959	REV:	B	CO:	REV:	CO:	REV:	CO:	REV:
AUT:	CSA	CK:	JG	AUT:	CK:	AUT:	CK:	AUT:	CK:



MATERIEL:	GENERAL TOLERANCE:		TERMA Elektronik AS CODE IDENT NO.567 MOVHARKEN 4, DK-8520 LYSTRUP, DENMARK	
REVISION STATUS OF SHEETS (OTHER THAN):				
SHEET NO.:			TITLE: CONFIGURATION IC4010	
REVISION:				
CODE: D2	1 SHEET (S)	INITIAL RELEASE: 910906	DATE OF THIS ISSUE: 930317	REV: B
PREP: VH	CHKD: CSA	APVD: CK:	DOCUMENT NO.: 235450 EB	SHEET NO.: 1

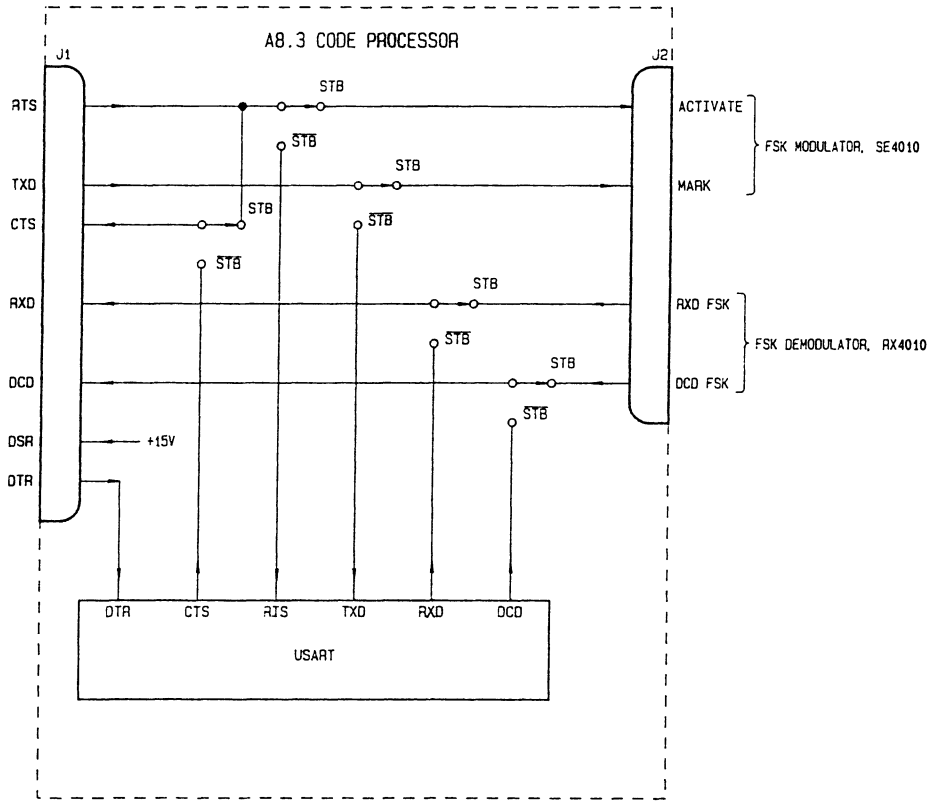


Figure 4.2 Data switching function

The data and control signals of the serial RS232 line between the controller and the data terminal are switched via five switches. These switches consist electrically of several integrated switches but in order to describe the function of the circuit they are drawn as single switches.

When the controller is in the primary STB mode, all switches will automatically switch to the "STB" position as shown in figure 4.2. In this position the RTS and TXD signal from the data terminal are routed through the controller and can control the FSK Modulator in SE4010. In the same way, the RXD and DCD signal from the FSK Demodulator in RX4010 are routed through the controller to the data terminal.

When the controller is not in the primary STB mode, all switches will automatically switch to the "STB" position. In this position the data terminal can exchange data with the controller. This is used in the primary FEC and BST modes.

5 REPLACEABLE PARTS

5.1 Introduction

This section contains information for ordering parts.

5.2 Replaceable Parts List

The following pages contain parts lists of the assemblies. The parts lists are listed in order of part number of the assemblies.

To order a part listed in the parts lists, quote the quantity and the part number of the wanted part and address the order to:

Dansk Radio
Maarkaervej 2
2630 Taastrup
Denmark

If the wanted part is an armament in an assembly which is not produced by Terma/Dansk Radio, please also inform about the name of the external producer.

To order a part that is not listed in the parts lists, please inform about the equipment model number, equipment serial number and function of the part.

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	BR487848	PWB,MICROCOMP.RTC A8	3				
2	1,000	ST	20	BR391921	BATTERY 3V LITHIUM	4			BT1	
3	2,000	ST	22	BR459410	CAP. ELEC 10U 10 M	4			C1,C47	
4	1,000	ST	22	BR451339	CAP. ELEC 15J 10 M	4			C2	
5	1,000	ST	22	BR357650	CAP. CER. 22N 63 A HI-K	4			C3	
6	1,000	ST	22	BR437395	CAP. CER. 220P 100 G N750	4			C4	
7	6,000	ST	22	BR450510	CAP. CER. 100N 63 S	4			C5,C6,C7,C28,C52,C54	D3
8	3,000	ST	22	BR357642	CAP. CER. 10N 100 S HI-K	4			C9,C11,C15	
9	1,000	ST	22	BR492795	CAP. PLST 33N 63 K	4			C10	
10	1,000	ST	22	BR349070	CAP. PLST 680N 100 K	4			C12	
11	1,000	ST	22	BR202991	CAP. PLST 220N 100 K	4			C13	
12	1,000	ST	22	BR454117	CAP. PLST 68N 250 K	4			C14	
13	3,000	ST	22	BR450529	CAP. ELEC 6J8 25 M	4			C16,C17,C18	
14	1,000	ST	22	BR357634	CAP. CER. 2N2 100 K HI-K	4			C42	
15	3,000	ST	23	BR228001	DIO SCHOT BAT 85 SI 200MA	4			CR1,CR11,CR19	
16	9,000	ST	23	200352-001	DIODE 1N4148	4			CR4,CR5,CR6,CR7,CR8,CR9, CR10,CR12,CR14	J4
18	1,000	ST	23	BR328324	DIO SIGN. AAZ 15 GE 140MA	4			CR23	
19	5,000	ST	51	BR458694	SCREW M 2,5X 5 CHM CU SN	4			H1	
20	4,000	SE	31	222836-140	CONN FEMALE SCREW 4-40	4			H2	J1
21	5,000	ST	26	BR392707	TRANS.ACCESS PAD TO-18	4			H3	D6
22	15,000	MM	34	222837-004	TAPE, DOUBLE-SIDED 1.6MM	4			H4	E
23	1,000	ST	45	201197-049	STRAP, CABLE, NAT Ø20X2.5	4			H6	J3
24	1,000	ST	31	212654-022	CONN D-TYPE 15S/ANGLE	4			J1	J1
25	3,000	ST	25	BR363944	COIL,CHOKE HF WIDE BAND	4			L1,L2,L3	
26	1,000	ST	41	BR489808	REAR PLATE A 8 MICROC.RTC	1			MP1	
27	1,000	ST	45	BR448095	RETAINER,PC 5X5X109 MM	3			MP2	
28	2,000	ST	41	210841-001	THUMBSCREW	3			MP3	J2
29	3,000	ST	26	BR392820	TRANS.LOPOW 2N2222A SI-N	4			Q1,Q2,Q3	
30	1,000	ST	26	BR273899	TRANS.LOPOW BC 547B SI-N	4			Q8	
31	1,000	ST	26	BR273910	TRANS.LOPOW BC 177 SI-P T	4			Q9	
32	1,000	ST	26	BR392839	TRANS.LOPOW 2N2907A SI-P	4			Q11	
33	1,000	ST	21	BR240451	RES CARB. 2K2 1/4J SFR25	4			R1	
34	3,000	ST	21	BR240745	RES CARB. 100K 1/4J SFR25	4			R2,R3,R78	
35	1,000	ST	21	BR357693	RES CARB. 150K 1/4J SFR25	4			R4	
36	29,000	ST	21	BR240400	RES CARB. 1K0 1/4J SFR25	4			R5,R7,R10,R11,R12,R13,R19,	D

TERMA Elektronik AS
FSCM R0567
Hovmarken 4, DK-8520 Lystrup, Denmark

TERMA

TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
MICROCOMPUTER ASSY A8 RTC	BR487740 (487740)	J4	1 OF 4

A4 Form 200473 FA Rev B

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
107	0,500	M	32	BR438227	FLEX TEFLON Ø0,7X Ø1,2	4				D1
108	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				D7
109	0,080	M	32	200843-009	WIRE COP TIN-CTD Ø0.6 MM	4				F
110	7,000	ST	31	208802-002	CONN B-JUMP	4				H
**********					BILL OF DOCUMENTATION	**********				
			AS	201350	WORKMANSHIP					
			AS	206460	ESD, PROTECTION & MARKING					
			EB	BR487740	MICROCOMPUTER ASSY A8					
			EC	BR487740	MICROCOMPUTER ASSY A8 -RT					
			ND	BR487740	MICROCOMP. A8,LOG POINT					
			PD	BR487740	MICROCOMPUTER ASSY A8 -RT					
			TP	BR487740	MICROCOMPUTER A8 RTC					
**********					NEXT ASSY **********					
	2,000	ST		235450-001	IC4010	1				

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FSCM R0567
Hovmarken 4, DK-8520 Lystrup, Denmark

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
MICROCOMPUTER ASSY A8 RTC	BR487740 (487740)	J4	4 OF 4

A4 Form 200473 FA Rev B

PARTS LIST
for
externally produced items

ASSY 4941861, POWER SUPPLY ASSEMBLY A10

Supplier	:	powerlab
Type No.	:	PL0761
Issue	:	October 1991
No. of sheets:		27

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
Sheet: 1 /27

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C101	470nF/250V X	2222 330 41474	PHI	11547400	
C102	2n2/250V Y	MP3Y 2200/250	PBU	11522203	
C103	2n2/250V Y	MP3Y 2200/250	PBU	11522203	
C104	4700uF/63V ELEC.	2222 050 58472	PHI	11547807	
C105	1000uF/63V ELEC.	2222 050 58102	PHI	11510805	
C106	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C107	22pF/100V CER	2222 683 10229	PHI	11502200	
C108	100pF/100V CER	2222 683 58101	PHI	11510101	
C109	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C110	NOT USED				
C111	22pF/100V CER	2222 683 10229	PHI	11502200	
C112	NOT USED				
C113	330nF/63V X7R	B37984-M5334-M	SIE	11533402	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R101	1k8 5% 0.4W METALF.	SFR25	PHI	11018010	
R102	8k2 1% 1/4W METALF.	MBA0204	TRA	11182010	
R103	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R104	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R105	150k 1% 1/4W METALF.	MBA0204	TRA	11115030	
R106	NOT USED	MBA0204	TRA		
R107	24k 1% 1/4W METALF.	MBA0204	TRA	11124020	
R108	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R109	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R110	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R111	270k 1% 1/4W METALF.	MBA0204	TRA	11127030	
R112	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R113	51k 1% 1/4W METALF.	MBA0204	TRA	11151020	
R114	910k 1% 1/4W METALF.	MBA0204	TRA	11191030	
R115	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R116	910k 1% 1/4W METALF.	MBA0204	TRA	11191030	
R117	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R118	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R119	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R120	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R121	150k 1% 1/4W METALF.	MBA0204	TRA	11115030	
R122	11k 1% 1/4W METALF.	MBA0204	TRA	11111020	
R123	S05K275 VARISTOR	Q69-X3034		11090005	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR101	KBPC 2506	KBPC 2506	NE	12025060	
Q102	BC547	BC547	PHI	12054700	
VR103	BZX79C12	BZX79C12	PHI	12001200	
CR104	1N4448	1N4448	PHI	12044480	
CR105	1N4448	1N4448	PHI	12044480	
CR106	TL431	uA431AWC	DAN	12043100	
CR107	1N4448	1N448	PHI	12044480	
U101	LM2901	LM2901	DAN	12029010	
U102	4069UB	HEF4069UBP	PHI	12040690	
U103	4017B	HEF4017BP	PHI	12040170	
L101	2x6.8mH/2A	B82724-J2202-N	SIE	14020680	
L102	15uH/4A	B82111-B-C23	SIE	14001501	
T101	2x110V/31V	5914A	TRE	14010427	
X101	1.8432MHz	HC-33US 1843.2	PIE	140XXXXX	
S1	AFBRYDER	T20/1/A/X	TOP	15092000	
J2	STIK	MO. 22-12-1062	FØL	15000096	
J1	NETBRØND	4301.0503/1403	MUL	15000454	

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C202	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C203	NOT USED				
C204	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C205	100pF/100V	2222 683 5A101	PHI	11510101	
C206	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C207	330pF/100V CER	2222 630 19222	PHI	11533100	
C208	2n2/100V CER	222 630 19222	PHI	1152220	
C209	470pF/100V CER	2222 630 19471	PHI	11547102	
C210	220pF/100V CER	2222 630 19221	PHI	11522103	
C211	470pF/500V CER	2222 655 19471	PHI	11547103	
C212	470pF/500V CER	2222 655 19471	PHI	11547103	
C213	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C214	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C215	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C216	3n3/100V CER	2222 630 06332	PHI	11533104	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R201	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R202	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R203	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R204	1k5 1% 1/4W METALF.	MBA0204	TRA	11115010	
R205	4k7 1% 1/4W METALF.	MBA0204	TRA	11157010	
R206	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R207	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R208	1R0 1% 1/4W METALF.	MBA0204	TRA	11100100	
R209	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R210	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R211	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R212	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R213	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R214	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R215	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R216	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R217	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R218	15k 1% 1/4W METALF.	MBA0204	TRA	11115020	
R219	150k 1% 1/4W METALF.	MBA0204	TRA	11115030	
R220	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R221	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R222	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R223	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R224	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R225	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R226	22R 5% 0.4W METALF.	SFR25	PHI	11002200	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R227	13k 1% 1/4W METALF.	MBA0204	TRA	11113020	
R228	91k 1% 1/4W METALF.	MBA0204	TRA	11191030	
R229	3k0 1% 1/4W METALF.	MBA0204	TRA	11130010	
R230	13k 1% 1/4W METALF.	MBA0204	TRA	11113020	
R231	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R232	13k 1% 1/4W METALF.	MBA0204	TRA	11113020	
R233	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	
R234	1k5 5% 0.4W METALF.	SFR25	PHI	11015010	
R235	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR201	TL431	uA431AWC	DAN	12043100	
CR202	1N4448	1N4448	PHI	12044480	
Q203	BC557	BC557	PHI	12055700	
Q204	2N5061	2N5061	DIS	12025061	
CR205	BYV27-200	BYV27-200	PHI	12027000	
CR206	1N4448	1N4448	PHI	12044480	
Q207	BC557	BC557	PHI	12055700	
Q208	BC557	BC557	PHI	12055700	
Q209	BC547	BC547	PHI	12054700	
CR210	BYV10-30	BYV10-30	PHI	12010300	
CR211	1N4448	1N4448	PHI	12044480	
VR212	BZX79C15	BZX79C15	PHI	12001500	
Q213	IRF640	IRF640	IR	12064002	
CR214	BYW29-150	BYW29-150	PHI	12080000	
Q215	BC547	BC547	PHI	12054700	
Q216	BC547	BC547	PHI	12054700	
CR217	1N4448	1N4448	PHI	12044480	
U201	UC2844A	UC2844A	DEL	12028440	
L201	1.8uH/4A	15191004	FLU	15191004	
T201	FLYBACK TRAFO	14210026-2	FLU	14210026	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C301	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C302	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C303	NOT USED				
C304	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C305	100pF/100V	2222 683 58101	PHI	11510101	
C306	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C307	330pF/100V CER	2222 630 19331	PHI	11533100	
C308	1n0/100V CER	2222 630 19102	PHI	11510200	
C309	100pF/100V CER	2222 683 58101	PHI	11510101	
C310	220pF/100V CER	2222 630 19221	PHI	11522103	
C311	470pF/500V CER	2222 655 19471	PHI	11547103	
C312	1nF/500V CER	2222 655 19102	PHI	11510207	
C313	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C314	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C315	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C316	3n3/100V CER	2222 630 06332	PHI	11533104	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R301	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R302	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R303	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R304	1k8 1% 1/4W METALF.	MBA0204	TRA	11118010	
R305	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R306	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R307	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R308	1R0 1% 1/4W METALF.	MBA0204	TRA	11100100	
R309	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R310	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R311	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R312	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R313	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R314	2K2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R315	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R316	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R317	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R318	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R319	510k 1% 1/4W METALF.	MBA0204	TRA	11151030	
R320	2k0 1% 1/4W METALF.	MBA0204	TRA	11120010	
R321	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R322	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R323	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R324	0R47 1% 1/4W METALF.	R20J	PRA	11100047	
R325	0R47 5% 1/4W METALF.	R20J	PR	11100047	
R326	10R 5% 0.4W METALF.	SFR25	PHI	11001000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R327	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R328	1k5 5% 0.4W METALF.	SFR25	PHI	11015010	
R329	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R330	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
Sheet: 11 /27

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR301	TL431	uA431AWC	DAN	12043100	
CR302	1N4448	1N4448	PHI	12044480	
Q303	BC557	BC557	PHI	12055700	
Q304	2N5061	2N5061	DIS	12025061	
CR305	BYV27-200	BYV27-200	PHI	12027000	
CR306	1N4448	1N4448	PHI	12044480	
Q307	BC557	BC557	PHI	12055700	
Q308	BC557	BC557	PHI	12055700	
Q309	BC547	BC547	PHI	12054700	
CR310	BYV10-30	BYV10-30	PHI	12010300	
CR311	1N4448	1N4448	PHI	12044480	
VR312	BZX79C15	BZX79C15	PHI	12001500	
Q313	IRF640	IRF640	IR	12064002	
CR314	BYW29-150	BYW29-150	PHI	12080000	
CR315	1N4448	1N4448	PHI	12044480	
U301	UC2844A	UC2844A	DEL	12028440	
L301	1.8uH/4A	15191004	ELU	15191004	
T301	FLYBACK TRAFO	14210024-3	ELU	14210024	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
Sheet: 12 /27

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C401	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C402	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C403	NOT USED				
C404	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C405	100pF/100V	2222 683 58101	PHI	11510101	
C406	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C407	330pF/100V CER	2222 630 19331	PHI	11533100	
C408	1n0/100V CER	2222 630 19102	PHI	11510200	
C409	220pF/100V CER	2222 630 19221	PHI	11522103	
C410	220pF/100V CER	2222 630 19221	PHI	11522103	
C411	470pF/500V CER	2222 655 19471	PHI	11547103	
C412	1nF/500V CER	2222 655 19102	PHI	11510207	
C413	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C414	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C415	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C416	3n3/100V CER	2222 630 06332	PHI	11533104	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R401	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R402	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R403	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R404	7k5 1% 1/4W METALF.	MBA0204	TRA	11175010	
R405	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R406	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R407	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R408	1RO 1% 1/4W METALF.	MBA0204	TRA	11100100	
R409	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R410	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R411	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R412	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R413	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R414	2K2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R415	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R416	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R417	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R418	8k2 1% 1/4W METALF.	MBA0204	TRA	11182010	
R419	150k 1% 1/4W METALF.	MBA0204	TRA	11115030	
R420	15k 1% 1/4W METALF.	MBA0204	TRA	11115020	
R421	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R422	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R423	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R424	0R47 1% 1/4W METALF.	R20J	PPA	11100047	
R425	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R426	10R 5% 0.4W METALF.	SFR25	PHI	11001000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R427	16k 1% 1/4W METALF.	MBA0204	TRA	11116020	
R428	100R 5% 0.4W METALF.	SFR25	PHI	11010000	
R429	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R430	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR401	TL431	uA431AWC	DAN	12043100	
CR402	1N4448	1N4448	PHI	12044480	
Q403	BC557	BC557	PHI	12055700	
Q404	2N5061	2N5061	DIS	12025061	
CR405	BYV27-200	BYV27-200	PHI	12027000	
CR406	1N4448	1N4448	PHI	12044480	
Q407	BC557	BC557	PHI	12055700	
Q408	BC557	BC557	PHI	12055700	
Q409	BC547	BC547	PHI	12054700	
CR410	BYV10-30	BYV10-30	PHI	12010300	
CR411	1N4448	1N4448	PHI	12044480	
VR412	BZX79C15	BZX79C15	PHI	12001500	
Q413	IRF640	IRF640	IR	12064002	
CR414	BYW29-150	BYW29-150	PHI	12080000	
CR415	1N4448	1N4448	PHI	12044480	
U401	UC2844A	UC2844A	DEL	12028440	
L401	1.8uH/4A	15191004	FLU	15191004	
T401	FLYBACK TRAFO	14210025-2	FLU	14210025	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C501	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C502	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C503	NOT USED				
C504	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C505	100pF/100V	2222 683 58101	PHI	11510101	
C506	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C507	330pF/100V CER	2222 630 19331	PHI	11533100	
C508	2n2/100V CER	2222 630 19222	PHI	11522203	
C509	100pF/100V CER	2222 683 58101	PHI	11510101	
C510	220pF/100V CER	2222 630 19221	PHI	11522103	
C511	470pF/500V CER	2222 655 19471	PHI	11547103	
C512	470pF/500V CER	2222 655 19471	PHI	11547103	
C513	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C514	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C515	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C516	3n3/100V CER	2222 630 06332	PHI	11533104	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R501	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R502	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R503	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R504	1k8 1% 1/4W METALF.	MBA0204	TRA	11118010	
R505	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R506	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R507	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R508	1RO 1% 1/4W METALF.	MBA0204	TRA	11100100	
R509	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R510	NOT USED				
R511	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R512	NOT USED				
R513	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R514	2K2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R515	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R516	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R517	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R518	7k5 1% 1/4W METALF.	MBA0204	TRA	11175010	
R519	510k 1% 1/4W METALF.	MBA0204	TRA	11151030	
R520	2kO 1% 1/4W METALF.	MBA0204	TRA	11120010	
R521	1kO 1% 1/4W METALF.	MBA0204	TRA	11110010	
R522	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R523	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R524	0R47 1% 1/4W METALF.	R20J	PPA	11100047	
R525	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R526	22R 5% 0.4W METALF.	SFR25	PHI	11002200	

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PARTS LIST

Type no.: PL0761
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R527	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R528	1k5 5% 0.4W METALF.	SFR25	PHI	11015010	
R529	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R530	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR501	TL431	uA431AWC	DAN	12043100	
CR502	1N4448	1N4448	PHI	12044480	
Q503	BC557	BC557	PHI	12055700	
Q504	2N5061	2N5061	DIS	12025061	
CR505	BYV27-200	BYV27-200	PHI	12027000	
CR506	1N4448	1N4448	PHI	12044480	
Q507	NOT USED				
Q508	BC557	BC557	PHI	12055700	
Q509	BC547	BC547	PHI	12054700	
CR510	BYV10-30	BYV10-30	PHI	12010300	
CR511	1N4448	1N4448	PHI	12044480	
VR512	BZX79C15	BZX79C15	PHI	12001500	
Q513	IRF640	IRF640	IR	12064002	
CR514	BYW29-150	BYW29-150	PHI	12080000	
U501	UC2844A	UC2844A	DEL	12028440	
L501	1,8uH/4A	15191004	FLU	15191004	
T501	FLYBACK TRAFO	14210024-2/3	FLU	14210024	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C601	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C602	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C603	NOT USED				
C604	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C605	100pF/100V	2222 683 58101	PHI	11510101	
C606	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C607	330pF/100V CER	2222 630 19331	PHI	11533100	
C608	10n/100V CER	2222 630 19103	PHI	11510309	
C609	100pF/100V CER	2222 683 58101	PHI	11510101	
C610	220pF/100V CER	2222 630 19221	PHI	11522103	
C611	470pF/500V CER	2222 655 19471	PHI	11547103	
C612	470pF/500V CER	2222 655 19471	PHI	11547103	
C613	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C614	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C615	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C616	3n3/100V CER	2222 630 06332	PHI	11533104	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R601	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R602	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R603	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R604	7k5 1% 1/4W METALF.	MBA0204	TRA	11175010	
R605	22k 1% 1/4W METALF.	MBA0204	TRA	11122020	
R606	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R607	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R608	1R0 1% 1/4W METALF.	MBA0204	TRA	11100100	
R609	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R610	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R611	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R612	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R613	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R614	2K2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R615	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R616	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R617	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R618	15k 1% 1/4W METALF.	MBA0204	TRA	11115020	
R619	150k 1% 1/4W METALF.	MBA0204	TRA	11115030	
R620	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R621	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R622	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R623	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R624	1R0 1% 1/4W METALF.	MBA0204	TRA	11100100	
R625	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R626	22R 5% 0.4W METALF.	SFR25	PHI	11002200	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R627	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R628	470R 5% 0.4W METALF.	SFR25	PHI	11047000	
R629	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R630	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR601	TL431	uA431AWC	DAN	12043100	
CR602	1N4448	1N4448	PHI	12044480	
Q603	BC557	BC557	PHI	12055700	
Q604	2N5061	2N5061	DIS	12025061	
CR605	BYV27-200	BYV27-200	PHI	12027000	
CR606	1N4448	1N4448	PHI	12044480	
Q607	BC557	BC557	PHI	12055700	
Q608	BC557	BC557	PHI	12055700	
Q609	BC547	BC547	PHI	12054700	
CR610	BYV10-30	BYV10-30	PHI	12010300	
CR611	1N4448	1N4448	PHI	12044480	
VR612	BZX79C15	BZX79C15	PHI	12001500	
Q613	IRF640	IRF640	IR	12064002	
CR614	BYW29-150	BYW29-150	PHI	12080000	
U601	UC2844A	UC2844A	DEL	12028440	
L601	1.8uH/4A	15191004	FLU	15191004	
T601	FLYBACK TRAFO	14210027-2	FLU	14210027	

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PARTS LIST

Type no.: PL0761
PCB: 96
Issue: 1.1
Sign.: OCT
Sheet: 24 /27

REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
C701	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C702	100uF/35V ELEC.	SXE 100/35	PBU	11510706	
C703	NOT USED				
C704	1uF/50V MKT	B32529-A105-K	SIE	11510501	
C705	100pF/100V	2222 683 58101	PHI	11510101	
C706	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C707	330pF/100V CER	2222 630 19331	PHI	11533100	
C708	1n0/100V CER	2222 630 19102	PHI	11510200	
C709	100pF/100V CER	2222 683 58101	PHI	11510101	
C710	220pF/100V CER	2222 630 19221	PHI	11522103	
C711	470pF/500V CER	2222 655 19471	PHI	11547103	
C712	1nF/500V CER	2222 655 19102	PHI	11510207	
C713	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C714	1000uF/35V ELEC.	HFQ 1000/35	DAN	11510807	
C715	100nF/63V MKT	B32529-A104-K	SIE	11510403	
C716	3n3/100V CER	2222 630 06332	PHI	11533104	

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PARTS LIST

Type no.: PL0761
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R701	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R702	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R703	10k 1% 1/4W METALF.	MBA0204	TRA	11110020	
R704	2k4 1% 1/4W METALF.	MBA0204	TRA	11124010	
R705	24k 1% 1/4W METALF.	MBA0204	TRA	11124020	
R706	5k1 1% 1/4W METALF.	MBA0204	TRA	11151010	
R707	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R708	1R0 1% 1/4W METALF.	MBA0204	TRA	11100100	
R709	10R 1% 1/4W METALF.	MBA0204	TRA	11101000	
R710	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R711	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R712	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R713	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R714	2K2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R715	510R 1% 1/4W METALF.	MBA0204	TRA	11151000	
R716	51R 1% 1/4W METALF.	MBA0204	TRA	11105100	
R717	20k 1% 1/4W METALF.	MBA0204	TRA	11120020	
R718	39k 1% 1/4W METALF.	MBA0204	TRA	11139020	
R719	510k 1% 1/4W METALF.	MBA0204	TRA	11151030	
R720	1k3 1% 1/4W METALF.	MBA0204	TRA	11113010	
R721	1k0 1% 1/4W METALF.	MBA0204	TRA	11110010	
R722	22R 1% 1/4W METALF.	MBA0204	TRA	11102200	
R723	100R 1% 1/4W METALF.	MBA0204	TRA	11110000	
R724	0R47 1% 1/4W METALF.	R20J	PPA	11100047	
R725	0R47 5% 1/4W METALF.	R20J	PP	11100047	
R726	10R 5% 0.4W METALF.	SFR25	PHI	11001000	

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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
R727	11k 1% 1/4W METALF.	MBA0204	TRA	11111020	
R728	1k8 5% 0.4W METALF.	SFR25	PHI	11018010	
R729	2k2 1% 1/4W METALF.	MBA0204	TRA	11122010	
R730	220R 1% 1/4W METALF.	MBA0204	TRA	11122000	
R731	1kΩ 1% 1/4W METALF.	MBA0204	TRA	11110010	

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PARTS LIST

Type no.: PL0761
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REF	DESCRIPTION	MANUFAC. P/N	MAN	PL. P/N	QTY
CR701	TL431	uA431AWC	DAN	12043100	
CR702	1N4448	1N4448	PHI	12044480	
Q703	BC557	BC557	PHI	12055700	
Q704	2N5061	2N5061	DIS	12025061	
CR705	BYV27-200	BYV27-200	PHI	12027000	
CR706	1N4448	1N4448	PHI	12044480	
Q707	BC557	BC557	PHI	12055700	
Q708	BC557	BC557	PHI	12055700	
Q709	BC547	BC547	PHI	12054700	
CR710	BYV10-30	BYV10-30	PHI	12010300	
CR711	1N4448	1N4448	PHI	12044480	
VR712	BZX79C15	BZX79C15	PHI	12001500	
Q713	IRF640	IRF640	IR	12064002	
CR714	BYW29-150	BYW29-150	PHI	12080000	
U701	UC2844A	UC2844A	DEL	12028440	
L701	1.8uH/4A	15191004	FLU	15191004	
T701	FLYBACK TRAFO	14210026-2	FLU	14210026	

Parts List

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210779-001	PWB,MOTHERBD A12A1,IC4010	3				
2	4,000	ST	31	237727-002	CONN. DIN41612/C F. 64P	4			XA2P1,XA5P1,XA9P1,XA83P1	
3	5,000	ST	31	BR451509	CONN PWB EDGE 36P FEMALE	4			XA10P1,XA61P1,XA62P1, XA81P1,XA82P1	
4	3,250	ST	31	237727-100	CONN. CODING PINS	4				
5	6,000	ST	21	206088-011	RES NETW 7X 2K2 / 0.18G	4			R1-6	
6	8,000	ST	31	BR454419	CONN PWB ACCES CODE PIN	4				B
**********					********** BILL OF DOCUMENTATION					
1001			PD	210778	MOTHERBOARD A12A1, IC4010					
1003			EC	210778	MOTHERBOARD A12A1, IC4010					
1007			AS	201350	WORKMANSHIP					
**********					********** NEXT ASSY **********					
	1,000	ST		237634-001	CHASSIS ASSY A12	1				

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MOTHERBOARD A12A1, IC4010	210778-001	B	1 OF 1

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210317-001	PWB, DEMODULATOR A6	3				
2	1,000	ST	41	237613-001	REAR PLATE A6.1	2				
3	1,000	ST	41	210840-001	RETAINER	3				
4	2,000	ST	41	210841-001	THUMBSCREW	3				
5	5,000	ST	51	202185-003	SCREW M2.5X 5SLTD.CYL.BRS	4				
6	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
7	6,000	ST	52	BR491543	STAY NUT M3 X31.5 N5	3				
8	12,000	ST	51	202185-017	SCREW M 3X 6 SLTD.CYL.BRS	4				
9	12,000	ST	53	200556-003	WASHER FLAT 3.2X0.5MM	4				
10	2,000	SÆ	31	222836-140	CONN FEMALE SCREW 4-40	4				
11	8,000	ST	31	208802-001	CONN MINI JUMP	4				
12	1,000	ST	60	210818-001	DEMODULATOR SJBASS A6A1	1				
13	2,000	ST	22	235010-001	CAP. ELC 100 / 25M	4			C146,C176	
14	6,000	ST	22	235010-007	CAP. ELC 10U / 25M	4			C155,C156,C158,C159,C161, C162	
15	35,000	ST	22	221220-007	CAP. PLAST 100N / 63K	4			C142,C148,C149,C151,C152, C157,C160,C163,C168, C177-202	
16	4,000	ST	22	221220-009	CAP. PLAST 220N / 63K	4			C143,C144,C145,C164	
17	1,000	ST	22	235003-001	CAP. PLAST 1N0 / 100K	4			C169	
18	2,000	ST	22	235170-045	CAP. ELC 470U / 25M	4			C150,C153	
19	1,000	ST	22	235010-004	CAP. ELC 3U3 / 25M	4			C154	
24	6,000	ST	22	221220-003	CAP. PLAST 22N / 63K	4			C147,C165,C166,C167,C174, C175	
25	73,000	ST	23	230973-001	DIODE SCHOTTKY 60V/400MW	4			CR112,CR38-109	
26	2,000	ST	23	200352-001	DIODE 1N4148	4			CR110,CR111	
27	1,000	ST	31	212654-021	CONN D-TYPE 9S/ANGLE	4			J2	C1
28	3,000	ST	25	200351-015	COIL, RF 22U / 65K	4			L1,L2,L3	
29	1,000	ST	26	235036-001	TRANSISTOR, FET BST76A	4			Q2	
30	2,000	ST	26	235024-002	TRANSISTOR, BC557B	4			Q3,Q4	
31	1,000	ST	26	235031-003	TRANSISTOR, NPN, BC547B	4			Q5	
32	40,000	ST	21	235004-097	RES FILM 10K / 0.5 J	4			R254,R256,R258,R259,R261, R263,R264,R266,R267,R268,	
									R270,R271,R272,R274,R275, R276,R278,R279,R280,R282, R283,R284,R286,R287,R288,	

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
DEMODULATOR A6	210816-001	D	1 OF 3

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
									R289,R291,R292,R296,R298, R300,R301,R302,R303,R304, R305,R307,R312,R314,R333	
33	8,000	ST	21	235005-241	RES FILM 2K61 / 0.4 F	4			R255,R260,R265,R269,R273, R277,R281,R285	
34	2,000	ST	21	235004-049	RES FILM 100R / 0.5 J	4			R294,R295	
35	1,000	ST	21	206038-017	RES NETW 9X 10K / 0.18G	4			R293	
36	4,000	ST	21	235004-121	RES FILM 100K / 0.5 J	4			R297,R299,R318,R342	
37	1,000	ST	21	235004-067	RES FILM 560R / 0.5 J	4			R306	
38	1,000	ST	21	235004-129	RES FILM 220K / 0.5 J	4			R308	
39	1,000	ST	21	235004-013	RES FILM 3R3 / 0.5 J	4			R309	
40	1,000	ST	21	235004-090	RES FILM 5K1 / 0.5 J	4			R310	D
42	1,000	ST	21	235004-065	RES FILM 470R / 0.5 J	4			R313	
43	2,000	ST	21	235004-103	RES FILM 18K / 0.5 J	4			R315,R316	
44	1,000	ST	21	235004-081	RES FILM 2K2 / 0.5 J	4			R317	
45	1,000	ST	21	235004-123	RES FILM 120K / 0.5 J	4			R322	
47	2,000	ST	21	235004-057	RES FILM 220R / 0.5 J	4			R326,R331	
48	4,000	ST	21	235004-072	RES FILM 910R / 0.5 J	4			R327,R328,R329,R330	
49	0,250	ST	31	224533-172	CONN DOUBLE ROW 2X36PIN	4			S1	
50	1,000	ST	25	BR491497	TRAFO,LINE 600:600R MOULD	4			T2	
51	2,000	ST	24	215176-003	IC, LM339N	4			U39,U40	
52	2,000	ST	24	200399-015	IC, LP311, COMPARATOR	4			U41,U70	
53	5,000	ST	24	200466-095	IC, --74HCT08, AND GATES	4			U42,U54,U55,U56,U57	
54	2,000	ST	24	200484-095	IC, --74HCT73, FLIP-FLOP	4			U43,U48	
55	2,000	ST	24	200493-095	IC, CD74HCT193E	4			U44,U45	
56	3,000	ST	24	204778-095	IC, --74HCT163, COUNTER	4			U46,U47,U49	
57	1,000	ST	24	211905-095	IC, --74HCT390, COUNTER	4			U50	
58	3,000	ST	24	235899-095	IC, --74HCT4017, COUNTER	4			U51,U52,U53	
59	2,000	ST	24	200464-095	IC, --74HCT04, HEX INVERT	4			U58,U65	
60	2,000	ST	24	200497-095	IC, --74HCT32	4			U59,U60	
61	2,000	ST	24	206072-095	IC, --74HCT138	4			U61,U62	
62	1,000	ST	24	207437-095	IC, --74HCT374	4			U63	
63	1,000	ST	24	213289-095	IC, CD74HCT373E	4			U64	
64	1,000	ST	24	232315-004	IC, LM2903N	4			U66	C
65	1,000	ST	24	235164-003	IC, AUDIO POWER AMP. 4W	4			U67	
66	1,000	ST	24	235008-001	IC, OPR. AMP. DUAL	4			U68	

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
DEMODULATOR A6	210816-001	D	2 OF 3

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
67	1,000	ST	21	235004-095	RES FILM 8K2 / 0.5 J	4			R319	
68	1,000	ST	26	202373-002	TRANSISTOR, MPS2369	4			Q1	
69	2,000	ST	21	235004-089	RES FILM 4K7 / 0.5 J	4			R311,R320	D
70	1,000	ST	24	203520-021	IC, --79L05AC TO-92	4			U69	
71	0,222	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			TP1-TP9	C
72	1,000	ST	31	206133-002	SOCKET, 14PIN	4			J4	
73	1,000	ST	31	211918-137	CONN PCB STRAIGHT 26P	4			J3	
76	8,000	ST	21	235004-145	RES FILM 1M0 / 0.5 J	4			R334-341	
77	1,000	ST	24	235071-095	IC, --74HCT4316	4			U71	
78	1,000	ST	22	221220-010	CAP. PLAST 330N / 63K	4			C203	
**********					BILL OF DOCUMENTATION	**********				
1001			PD	210816	DEMODULATOR A6					
1002			EB	210816	DEMODULATOR A6					
1003			EC	210816	DEMODULATOR A6					
1004			TP	210816	DEMODULATOR A6					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
1008			TC	210909	TEST IC4010					
1009			TC	210910	TEST IC4010					
1010			TC	237667	TEST IC4010					
**********					NEXT ASSY	**********				
	1,000	ST		235450-001	IC4010	1				

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TITLE: DEMODULATOR A6

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Parts List

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PARTS LIST PER.. 93/06/05

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210819-001	PWB, DEMODUL SUBASSY A6A1	3				
2	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
3	2,000	ST	22	221220-003	CAP. PLAST 22N / 63K	4			C1,C2	
4	33,000	ST	22	235010-001	CAP. ELC 100 / 25M	4			C3,C4,C6,C7,C8,C14,C15, C16,C17,C27,C28,C40,C41, C42,C43,C53,C54,C66,C67,	
									C68,C69,C79,C80,C92,C93, C94,C95,C105,C106,C115, C119,C123,C127	
5	1,000	ST	22	202542-043	CAP. CER 39P / 100G	4			C5	
6	26,000	ST	22	221220-007	CAP. PLAST 100N / 63K	4			C9,C10,C21,C22,C34,C35, C47,C48,C60,C61,C73,C74,	
									C86,C87,C99,C100,C112, C113,C117,C118,C121,C122, C125,C126,C129,C130	
7	7,000	ST	22	200327-055	CAP. PLAST 10N / 63F	4			C11,C31,C37,C57,C83,C91, C98	
8	15,000	ST	22	202542-096	CAP. CER 33P / 100G	4			C12,C19,C25,C32,C38,C45,	
									C51,C58,C64,C71,C77,C84, C90,C97,C103,C110	
9	6,000	ST	22	200327-140	CAP. PLAST 2N2 / 250F	4			C13,C20,C26,C33,C39,C46	
10	6,000	ST	22	200327-069	CAP. PLAST 9N1 / 63F	4			C18,C44,C70,C78,C85,C109	
11	16,000	ST	22	235003-001	CAP. PLAST 1N0 / 100K	4			C23,C36,C49,C62,C75,C88, C101,C114,C131,C132,C133,	
									C134,C135,C136,C137,C138	
12	4,000	ST	22	200327-070	CAP. PLAST 11N / 63F	4			C24,C50,C63,C76	
13	2,000	ST	22	200327-146	CAP. PLAST 3N9 / 160F	4			C52,C59	
14	2,000	ST	22	200327-150	CAP. PLAST 5N6 / 160F	4			C65,C72	
15	2,000	ST	22	200327-156	CAP. PLAST 12N / 63F	4			C89,C102	
16	1,000	ST	22	200327-154	CAP. PLAST 8N2 / 63F	4			C96	
18	2,000	ST	22	200327-159	CAP. PLAST 22N / 63F	4			C104,C111	
21	17,000	ST	23	230973-001	DIODE SCHOTTKY 60V/400MW	4			CR1,CR6,CR7,CR8,CR9,CR10, CR11,CR12,CR13,CR14,CR15,	
									CR16,CR17,CR18,CR19,CR20, CR21	
22	1,000	ST	23	222813-010	DIODE LED, ANGLE RED	4			CR3	

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DEMODULATOR SUBASS A6A1	210818-001	E	1 OF 5

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PARTS LIST PER.. 93/06/05

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
23	1,000	ST	23	222813-011	DIODE LED, ANGLE YEL	4			CR4	
24	1,000	ST	23	222813-012	DIODE LED, ANGLE GRN	4			CR5	
25	15,000	ST	23	200352-001	DIODE 1N4148	4			CR22,CR23,CR24,CR25,CR26,	
									CR27,CR28,CR29,CR30,CR31, CR32,CR33,CR34,CR35,CR36, CR37	
26	1,000	ST	31	212654-051	CONN D-TYPE 9S/ANGLE	4			J1	B1
27	4,000	ST	21	235004-072	RES FILM 910R / 0.5 J	4			R1,R2,R5,R6	
28	2,000	ST	21	235004-057	RES FILM 220R / 0.5 J	4			R3,R4	
29	2,000	ST	21	235004-077	RES FILM 1K5 / 0.5 J	4			R7,R20	B
30	1,000	ST	21	202118-012	RES VAR 1K / 0.50M	4			R8	
31	33,000	ST	21	235004-049	RES FILM 100R / 0.5 J	4			R9,R11,R12,R14,R15,R30,	
									R31,R32,R33,R54,R55,R78, R79,R80,R81,R101,R102, R125,R126,R127,R128,R148,	
									R149,R171,R172,R173,R174, R194,R195,R210,R216,R222, R228	
32	89,000	ST	21	235005-301	RES FILM 10K0 / 0.4 F	4			R10,R25,R26,R29,R36,R37, R38,R42,R43,R44,R45,R49, R50,R51,R59,R60,R61,R64,	
									R65,R66,R67,R73,R74,R75, R84,R85,R86,R90,R91,R92, R93,R97,R98,R99,R107,R108,	
									R109,R112,R113,R114,R115, R120,R121,R122,R131,R132, R133,R137,R138,R139,R140,	
									R144,R145,R146,R153,R154, R155,R158,R159,R160,R161, R166,R167,R168,R177,R178,	
									R179,R183,R184,R185,R186, R190,R191,R192,R199,R200, R201,R204,R205,R206,R207,	
33	1,000	ST	21	235005-419	RES FILM 154K / 0.4 F	4			R234,R235,R236,R237,R238, R239,R240,R241 R13	

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Parts List

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PARTS LIST PER.. 93/06/05

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
34	1,000	ST	21	235004-138	RES FILM 510K / 0.5 J	4			R16	
35	1,000	ST	21	235005-273	RES FILM 5K62 / 0.4 F	4			R17	
36	1,000	ST	21	235005-255	RES FILM 3K65 / 0.4 F	4			R18	
37	1,000	ST	21	235005-247	RES FILM 3K01 / 0.4 F	4			R19	
39	2,000	ST	21	235004-099	RES FILM 12K / 0.5 J	4			R21,R22	
40	3,000	ST	21	235005-394	RES FILM 93K1 / 0.4 F	4			R23,R71,R130	
41	1,000	ST	21	235005-422	RES FILM 165K / 0.4 F	4			R24	
42	1,000	ST	21	235005-473	RES FILM 562K / 0.4 F	4			R27	
43	1,000	ST	21	235005-331	RES FILM 20K5 / 0.4 F	4			R28	
44	2,000	ST	21	235005-395	RES FILM 95K3 / 0.4 F	4			R34,R83	
45	2,000	ST	21	235005-418	RES FILM 150K / 0.4 F	4			R35,R175	
46	1,000	ST	21	235005-470	RES FILM 523K / 0.4 F	4			R39	
47	2,000	ST	21	235005-327	RES FILM 18K7 / 0.4 F	4			R40,R147	
48	8,000	ST	21	235005-239	RES FILM 2K49 / 0.4 F	4			R41,R63,R89,R111,R136, R157,R182,R203	
49	8,000	ST	21	235005-251	RES FILM 3K32 / 0.4 F	4			R46,R68,R94,R116,R141, R162,R187,R208	
50	8,000	ST	21	235004-102	RES FILM 16K / 0.5 J	4			R47,R69,R95,R117,R142, R163,R188,R209	
51	4,000	ST	21	235005-390	RES FILM 84K5 / 0.4 F	4			R48,R105,R152,R189	
52	3,000	ST	21	235005-333	RES FILM 21K5 / 0.4 F	4			R52,R100,R193	
53	1,000	ST	21	235005-191	RES FILM 866R / 0.4 F	4			R53	
54	3,000	ST	21	235005-391	RES FILM 86K6 / 0.4 F	4			R58,R96,R119	
55	1,000	ST	21	235005-332	RES FILM 21K0 / 0.4 F	4			R62	
56	1,000	ST	21	235005-423	RES FILM 169K / 0.4 F	4			R70	
57	1,000	ST	21	235005-205	RES FILM 1K10 / 0.4 F	4			R72	
58	1,000	ST	21	235005-475	RES FILM 590K / 0.4 F	4			R76	
59	1,000	ST	21	235005-351	RES FILM 33K2 / 0.4 F	4			R77	
60	1,000	ST	21	235005-417	RES FILM 147K / 0.4 F	4			R82	
61	1,000	ST	21	235005-476	RES FILM 604K / 0.4 F	4			R87	
62	1,000	ST	21	235005-345	RES FILM 28K7 / 0.4 F	4			R88	
63	1,000	ST	21	235005-209	RES FILM 1K21 / 0.4 F	4			R106	
64	1,000	ST	21	235005-328	RES FILM 19K1 / 0.4 F	4			R110	
65	2,000	ST	21	235005-421	RES FILM 162K / 0.4 F	4			R118,R164	
66	1,000	ST	21	235005-446	RES FILM 294K / 0.4 F	4			R123	
67	1,000	ST	21	235005-334	RES FILM 22K1 / 0.4 F	4			R124	

Parts List

PRINTET..... 93/06/17
PARTS LIST PER.. 93/06/05

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
68	1,000	ST	21	235005-416	RES FILM 143K / 0.4 F	4			R129	
69	1,000	ST	21	235005-439	RES FILM 249K / 0.4 F	4			R134	
70	1,000	ST	21	235005-329	RES FILM 19K6 / 0.4 F	4			R135	
71	2,000	ST	21	235005-392	RES FILM 88K7 / 0.4 F	4			R143,R198	
72	1,000	ST	21	235005-319	RES FILM 15K4 / 0.4 F	4			R156	
73	1,000	ST	21	235005-389	RES FILM 82K5 / 0.4 F	4			R165	
74	1,000	ST	21	235005-440	RES FILM 255K / 0.4 F	4			R169	
75	1,000	ST	21	235005-344	RES FILM 28K0 / 0.4 F	4			R170	
76	1,000	ST	21	235005-401	RES FILM 100K / 0.4 F	4			R176	
77	1,000	ST	21	235005-432	RES FILM 210K / 0.4 F	4			R180	
78	1,000	ST	21	235005-341	RES FILM 26K1 / 0.4 F	4			R181	
79	1,000	ST	21	235005-325	RES FILM 17K8 / 0.4 F	4			R202	
80	8,000	ST	21	235004-129	RES FILM 220K / 0.5 J	4			R211,R214,R217,R220,R223, R226,R229,R232	
81	8,000	ST	21	235004-137	RES FILM 470K / 0.5 J	4			R213,R215,R219,R221,R225, R227,R231,R233	
82	1,000	ST	25	BR491497	TRAFO,LINE 600:600R MOULD	4			T1	
83	20,000	ST	24	237729-001	IC, TLE2024, OP. AMP.	4			U3,U4,U5,U6,U7,U8,U9,U10, U11,U12,U13,U14,U15,U16, U17,U18,U31,U32,U33,U34	
84	1,000	ST	24	200399-015	IC, LP311, COMPARATOR	4			U2	
85	8,000	ST	24	235071-095	IC, --74HCT4316	4			U19,U20,U21,U22,U35,U36, U37,U38	
86	8,000	ST	24	235372-001	IC, 4TH ORDER LP. FILTER	4			U23,U24,U25,U26,U27,U28, U29,U30	
87	1,000	ST	23	203527-011	DIODE ZENER 6V2/0.5W J	4			VR1	
88	1,000	ST	89	237605-003	FLATCABLE ASSY	1				B
89	1,000	ST	24	213271-004	IC, TL074IN	4			U1	
90	2,000	SE	31	222836-140	CONN FEMALE SCREW 4-40	4				
91	2,000	ST	51	202185-018	SCREW M 3X 8 SLTD.CYL BRS	4				
92	2,000	ST	53	BR452955	WASHER,NYLON Ø 3,0	4				B
93	2,000	ST	52	202218-008	NUT M 3 PLAIN HEX, BRASS	4				
94	0,250	ST	31	224533-036	CONN MINI-JUMP, 36-PINS	4			W4-6	
95	3,000	ST	31	208802-002	CONN B-JUMP	4				
96	2,000	ST	53	222253-002	WASHER, LOCK, M2.5 SST	4				E

TERMA Elektronik AS
FSCM R0567
Hovmarken 4, DK-8520 Lystrup, Denmark

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TITLE: DEMODULATOR SJBASS A6A1

DOCUMENT NO.: 210818-001

REV: E

SHEET NO.: 4 OF 5

Parts List

PRINTET..... 93/06/17
PARTS LIST PER.. 93/06/05

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
**********	**********	**	**	**********	********** BILL OF DOCUMENTATION	**********			**********	******
1001			PD	210818	DEMODULATOR SUBASS A6A1					
1002			EB	210818	DEMODULATOR SJBASS A6A1					
1003			EC	210818	DEMODULATOR SJBASS A6A1					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
**********	**********	**	**	**********	********** NEXT ASSY **********	**********			**********	******
	1,000	ST		210816-001	DEMODULATOR A6	1				

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FSCM R0567
Hovmarken 4, DK-8520 Lystrup, Denmark

TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
DEMODULATOR SJBASS A6A1	210818-001	E	5 OF 5

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210822-001	PWB, REMOTE MODUL A9	3				
2	1,000	ST	41	210823-001	REAR PLATE A9	2				
3	1,000	ST	41	210840-001	RETAINER	3				
4	2,000	ST	41	210841-001	THUMBSCREW	3				
5	5,000	ST	51	202185-003	SCREW M2.5X 5SLTD.CYL.BRS	4				
6	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
7	4,000	SÆ	31	222836-140	CONN FEMALE SCREW 4-40	4				
8	11,000	ST	31	208802-002	CONN B-JUMP	4				
9	15,000	MM	34	222837-004	TAPE, DOUBLE-SIDED 1.6MM	4				
10	0,040	M	32	200843-008	WIRE COP TIN-CTD Ø0.8 MM	4				
11	0,250	ST	31	237727-100	CONN. CODING PINS	4				
12	42,000	ST	22	221220-001	CAP. PLAST 10N / 63K	4			C1,C2,C3,C4,C5,C6,C7,C8,	
									C9,C10,C11,C12,C13,C14, C15,C16,C17,C18,C20,C22, C26,C27,C28,C29,C30,C31,	
									C32,C33,C34,C35,C36,C37, C38,C39,C40,C43,C44,C45, C46,C52,C68,C69	
13	4,000	ST	22	202542-016	CAP. CER 68P / 100G	4			C48,C92,C94,C95	
14	1,000	ST	22	235010-001	CAP. ELC 1U0 / 25M	4			C49	
15	1,000	ST	22	221220-006	CAP. PLAST 68N / 63K	4			C50	
16	1,000	ST	22	202542-093	CAP. CER 18P / 100G	4			C51	E
17	24,000	ST	22	221721-010	CAP. CER 1N0 / 100K	4			C53,C54,C55,C56,C57,C62, C63,C64,C65,C66,C67,C70,	
									C71,C72,C73,C74,C75,C80, C81,C82,C83,C84,C85,C93	
18	3,000	ST	22	235010-007	CAP. ELC 10U / 25M	4			C86,C88,C90	
19	3,000	ST	22	221220-009	CAP. PLAST 220N / 63K	4			C87,C89,C91	
20	5,000	ST	23	200352-001	DIODE 1N4148	4			CR1-CR5	
21	2,000	ST	31	212654-022	CONN D-TYPE 15S/ANGLE	4			J1,J2	E1
22	3,000	ST	25	200351-015	COIL, RF 22U / 65K	4			L1,L2,L3	
23	1,000	ST	31	237727-022	CONN. DIN41612/C MALE 64P	4			P1	
24	4,000	ST	21	235004-073	RES FILM 1KO / 0.5 J	4			R1,R2,R10,R11	
25	3,000	ST	21	235004-113	RES FILM 47K / 0.5 J	4			R3,R4,R8	
26	1,000	ST	21	235004-063	RES FILM 390R / 0.5 J	4			R5	
27	1,000	ST	21	235004-069	RES FILM 680R / 0.5 J	4			R6	

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
REMOTE MODULE, A9	210821-001	E1	1 OF 3

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
28	1,000	ST	21	235004-129	RES FILM 220K / 0.5 J	4			R7	
29	1,000	ST	21	235004-121	RES FILM 100K / 0.5 J	4			R9	
30	0,166	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			TP1-6	
31	3,000	ST	24	207432-095	IC, --74HCT245E	4			U1,U2,U16	
32	5,000	ST	24	207437-095	IC, --74HCT374	4			U3,U4,U7,U8,U27	
33	3,000	ST	24	200497-095	IC, --74HCT32	4			U5,U6,U14	
34	2,000	ST	24	206072-095	IC, --74HCT138	4			U9,U15	
35	1,000	ST	24	200464-095	IC, --74HCT04, HEX INVERT	4			U10	
36	1,000	ST	24	200465-075	IC, --74HC05N	4			U11	
37	2,000	ST	24	200469-095	IC, --74HCT20, NAND GATE	4			U12,U17	
38	2,000	ST	24	200463-095	IC, --74HCT02	4			U13,U18	
39	1,000	ST	24	200888-095	IC, --74HCT74	4			U20	
40	2,000	ST	24	213289-095	IC, CD74HCT373E	4			U22,U26	
41	3,000	ST	24	230989-002	IC, USARD, MSM82C51ARS	4			U28,U34,U35	
42	1,000	ST	24	200466-095	IC, --74HCT08, AND GATES	4			U29	
43	1,000	ST	24	200464-026	IC, SN74LS04N	4			U30	
44	1,000	ST	24	200488-026	IC, SN74LS90N	4			U31	
45	1,000	ST	24	213541-095	IC, CD74HCT161E	4			U32	
46	1,000	ST	24	207434-095	IC, --74HCT253, SEL/MUX	4			U33	
47	3,000	ST	24	203518-095	IC, --74HCT157, 2 - 1 MUX	4			U36,U37,U38	
48	3,000	ST	24	208798-002	IC, --C88, DRIVER, LINE	4			U39,U43,U44	
49	3,000	ST	24	208799-002	IC, --C89, RECEIVER, LINE	4			U40,U45,U46	
50	1,028	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			W1,W2,W3,W4,W5,W6,W7,W8, W9,W10,W11,W12,W13	
51	1,000	ST	20	229306-018	CRYSTAL 18PF 5.144MHZ	4			X1	
**********					BILL OF DOCUMENTATION					
1001			PD	210821	REMOTE MODULE, A9					
1003			EC	210821	REMOTE MODULE, A9					
1004			TP	210821	REMOTE MODULE, A9					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
1008			TC	210909	TEST IC4010					
1009			TC	210910	TEST IC4010					

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TITLE: REMOTE MODULE, A9

DOCUMENT NO.: 210821-001

REV: E1

SHEET NO.: 2 OF 3

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
**********	**********	**	**	**********	********** NEXT ASSY **********	*	**********	**********	**********	**********
	1,000	ST		235450-001	IC4010	1				

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FSCM R0567
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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
REMOTE MODULE, A9	210821-001	E1	3 OF 3

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210844-001	PWB,FREQUENCY STANDARD A2	3				
2	1,000	ST	41	237660-001	REAR PLATE A2	2				D
3	1,000	ST	41	210840-001	RETAINER	3				
4	2,000	ST	41	210841-001	THUMBSCREW	3				
5	8,000	ST	51	202185-003	SCREW M2.5X 5SLTD.CYL.BRS	4				
6	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
7	0,250	ST	31	237727-100	CONN. CODING PINS	4				C
8	22,000	ST	22	221220-001	CAP. PLAST 10N / 63K	4			C1-C22	
9	5,000	ST	22	221220-009	CAP. PLAST 220N / 63K	4			C23,C24,C25,C28,C29	
10	2,000	ST	22	235010-007	CAP. ELC 10U / 25M	4			C26,C27	
11	4,000	ST	22	202542-016	CAP. CER 68P / 100G	4			C31-C34	
12	4,000	ST	22	221220-007	CAP. PLAST 100N / 63K	4			C35-C38	
13	4,000	ST	22	202542-103	CAP. CER 120P / 100G	4			C39-C42	
14	4,000	ST	23	200352-001	DIODE 1N4148	4			CR1-CR4	
15	2,000	ST	31	235228-001	CONN BNC ANGLE, 50R	4			J1,J2	
16	2,000	ST	25	232311-015	CHOKE, EMI 22UF	4			L1,L2	
17	2,000	ST	25	232311-011	CHOKE, EMI 10UH	4			L3,L4	
18	1,000	ST	25	200351-014	COIL, RF 15U / 55K	4			L5	E
19	2,000	ST	25	200351-015	COIL, RF 22U / 65K	4			L6,L7	E
20	1,000	ST	31	237727-022	CONN. DIN41612/C MALE 64P	4			P1	
21	2,000	ST	26	202373-002	TRANSISTOR, MPS2369	4			Q1,Q2	
22	6,000	ST	21	235004-073	RES FILM 1KO / 0.5 J	4			R1-R6	
23	2,000	ST	21	235004-059	RES FILM 270R / 0.5 J	4			R7,R8	
24	4,000	ST	21	235004-049	RES FILM 100R / 0.5 J	4			R9-R12	
25	2,000	ST	21	235004-045	RES FILM 68R / 0.5 J	4			R13,R14	
26	0,166	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			TP1-TP6	
27	3,000	ST	24	207432-095	IC, --74HCT245E	4			U1,U2,U10	
28	4,000	ST	24	207437-095	IC, --74HCT374	4			U3,U4,U7,U8	
29	3,000	ST	24	200497-095	IC, --74HCT32	4			U5,U6,U15	
30	2,000	ST	24	206072-095	IC, --74HCT138	4			U9,U19	
31	2,000	ST	24	200464-095	IC, --74HCT04, HEX INVERT	4			U11,U20	
32	1,000	ST	24	200465-075	IC, --74HC05N	4			U12	
33	1,000	ST	24	200463-095	IC, --74HCT02	4			U13	
34	1,000	ST	24	200469-095	IC, --74HCT20, NAND GATE	4			U14	
35	1,000	ST	24	200888-095	IC, --74HCT74	4			U16	
36	2,000	ST	24	213289-095	IC, CD74HCT373E	4			U17,U18	

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
FREQUENCY STANDARD, A2	210843-001	E1	1 OF 2

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
37	1,000	ST	24	211905-095	IC, --74HCT390, COUNTER	4			U21	
38	1,000	ST	24	206084-075	IC, --74HC160N	4			U22	
39	1,000	ST	20	237730-005	OSCILLATOR 5MHZ	4			Y1	
41	2,000	ST	31	235228-010	NUT, HEX, 1/2-20UNEF	4				
42	2,000	ST	31	235228-011	WASHER, LOCK	4				
**********					********** BILL OF DOCUMENTATION	**********				
1001			PD	210843	FREQUENCY STANDARD, A2					
1003			EC	210843	FREQUENCY STANDARD, A2					
1004			TP	210843	FREQUENCY STANDARD A2					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
1008			TC	210909	TEST IC4010					
1009			TC	210910	TEST IC4010					
1010			TC	237667	TEST IC4010					
**********					********** NEXT ASSY **********					
	1,000	ST		235450-001	IC4010	1				

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TITLE:	DOCUMENT NO.:	REV:	SHEET NO.:
FREQUENCY STANDARD, A2	210843-001	E1	2 OF 2

Parts List

PRINTET..... 93/05/08
PARTS LIST PER.. 93/05/06

FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	210848-001	PWB, MICROPROCESSOR A8	3				
2	1,000	ST	41	237606-001	REAR PLATE A8	2				
3	1,000	ST	41	210840-001	RETAINER	3				
4	2,000	ST	41	210841-001	THUMBSCREW	3				
5	4,000	ST	51	202185-003	SCREW M2.5X 5SLTD.CYL.BRS	4				
6	15,000	MM	34	222837-004	TAPE, DOUBLE-SIDED 1.6MM	4				
7	0,025	M	32	200843-008	WIRE COP TIN-CTD Ø0.8 MM	4				
8	6,000	ST	31	222836-140	CONN FEMALE SCREW 4-40	4				
9	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
10	2,000	ST	31	206133-007	SOCKET, 28PIN	4				
11	1,000	ST	31	206133-010	SOCKET, 64PIN	4				
12	0,250	ST	31	237727-100	CONN. CODING PINS	4				
13	2,000	ST	22	202542-012	CAP. CER 33P / 100G	4			C1,C2	
14	5,000	ST	22	202542-054	CAP. CER 330P / 100G	4			C3,C16,C17,C18,C19	
15	44,000	ST	22	221220-001	CAP. PLAST 10N / 63K	4			C4,C24,C25,C26,C27,C28,	
									C29,C30,C31,C32,C33,C34,	
									C35,C36,C37,C38,C39,C40,	
									C41,C42,C43,C44,C45,C47,	
									C48,C50,C51,C52,C53,C54,	
									C55,C57,C58,C59,C61,C62,	
									C63,C64,C65,C66,C67,C68,	
									C69,C70	
16	3,000	ST	22	235010-006	CAP. ELC 6U8 / 25M	4			C20,C21,C22	
17	3,000	ST	22	221220-007	CAP. PLAST 100N / 63K	4			C23,C46,C49	
18	3,000	ST	31	212654-021	CONN D-TYPE 9S/ANGLE	4			J1,J2,J3	D1
19	0,600	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			J4	
21	3,000	ST	25	200730-003	COIL,RF	4			L1,L2,L3	
22	1,000	ST	31	237727-022	CONN. DIN41612/C MALE 64P	4				
23	6,000	ST	21	235004-089	RES FILM 4K7 / 0.5 J	4			R2,R3,R4,R5,R6,R8	D
24	1,000	ST	21	235004-073	RES FILM 1K0 / 0.5 J	4			R1	
25	1,000	ST	20	215153-005	CRYSTAL OSC 8.0000MHZ	4			U1	
26	1,000	ST	24	235236-004	IC, --68HC000 PROCESSOR	4			U2	
27	1,000	ST	24	235018-010	IC, WATCHDOG, MAX/MP694	4			U3	
28	2,000	ST	24	200464-095	IC, --74HCT04, HEX INVERT	4			U4,U20	
29	1,000	ST	24	200469-095	IC, --74HCT20, NAND GATE	4			U5	
30	2,000	ST	24	200466-095	IC, --74HCT08, AND GATES	4			U6,U9	

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31	2,000	ST	24	207432-095	IC, --74HCT245E	4			U7,U22	
32	2,000	ST	24	207431-095	IC, CD74HCT244E	4			U8,U32	
33	1,000	ST	24	207438-095	IC, --74HCT393, COUNTERS	4			U10	
34	3,000	ST	24	206072-095	IC, --74HCT138	4			U11,U12,U38	
35	1,000	ST	24	206090-095	IC, --74HCT175, FLIP-FLOP	4			U13	
36	2,000	ST	24	200888-095	IC, --74HCT74	4			U14,U19	
37	2,000	ST	24	222232-004	IC, SRAM, 32KX8B 120NS	4			U15,U16	
38	2,000	ST	24	200497-095	IC, --74HCT32	4			U21,U35	
39	2,000	ST	24	200498-006	IC, SN7437N	4			U23,U39	
40	1,000	ST	24	235897-001	IC, MC68901	4			U24	
41	2,000	ST	24	208799-002	IC, --C89, RECEIVER, LINE	4			U25,U26	
42	3,000	ST	24	208798-002	IC, --C88, DRIVER, LINE	4			U27,U33,U34	
43	3,000	ST	24	211620-002	IC, CD4066BC	4			U28,U29,U30	
44	1,000	ST	24	223893-001	IC, MC68230	4			U31	
45	1,000	ST	24	200465-075	IC, --74HC05N	4			U37	
46	2,000	ST	31	208802-001	CONN MINI JUMP	4			W1,W2	
47	1,000	ST	20	229306-006	CRYSTAL 32PF 2.4576MHZ	4			Y1	
48	2,000	ST	26	235036-001	TRANSISTOR, FET BST76A	4			Q1,Q2	
49	23,000	ST	22	221721-027	CAP. CER 10N / 100S	4			C56,C5-8,C10-15,C71-82	
50	1,000	ST	21	235004-049	RES FILM 100R / 0.5 J	4			R7	
**********					BILL OF DOCUMENTATION					
1001			PD	210847	MICROPROCESSOR A8					
1003			EC	210847	MICROPROCESSOR A8					
1004			TP	210847	MICROPROCESSOR A8					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
**********					NEXT ASSY					
	1,000	ST		235450-001	IC4010	1				

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1	1,000	ST	37	210853-001	PWB,FRONT PANEL CIR A11A1	3				
2	2,000	ST	21	235004-073	RES FILM 1K0 / 0.5 J	4			R1,R14	
3	1,000	ST	21	206088-017	RES NETW 9X 10K / 0.18G	4			R2	
4	4,000	ST	21	206088-066	RES NETW 5X 10K / 0.18G	4			R3,R9,R11,R36	
5	2,000	ST	21	203237-013	RES NETW 8X 1K0 / 0.25G	4			R4,R6	C
6	1,000	ST	21	203237-022	RES NETW 8X 1K5 / 0.25G	4			R5	
7	3,000	ST	21	206088-063	RES NETW 5X 4K7 / 0.18G	4			R7,R8,R10	
9	1,000	ST	21	235004-075	RES FILM 1K2 / 0.5 J	4			R12	
10	1,000	ST	21	235004-093	RES FILM 6K8 / 0.5 J	4			R13	
12	1,000	ST	21	235004-115	RES FILM 56K / 0.5 J	4			R15	
13	23,000	ST	21	235004-037	RES FILM 33R / 0.5 J	4			R22,R16-19,R29-30,R31-35, R37-41,R45-50	
14	2,000	ST	21	235004-085	RES FILM 3K3 / 0.5 J	4			R20,R21	
15	6,000	ST	21	235004-045	RES FILM 68R / 0.5 J	4			R23-28	
16	2,000	ST	21	235004-097	RES FILM 10K / 0.5 J	4			R42,R44	
17	1,000	ST	21	235004-089	RES FILM 4K7 / 0.5 J	4			R43	
18	10,000	ST	22	200514-204	CAP. CER 100N / 50K	4			C2,C4,C7,C9,C10,C12,C14, C16,C17,C20	
19	2,000	ST	22	235010-006	CAP. ELC 6U8 / 25M	4			C13,C15	
20	1,000	ST	22	235010-018	CAP. ELC 33U / 10M	4			C19	
21	1,000	ST	22	235010-007	CAP. ELC 10U / 25M	4			C18	
22	2,000	ST	25	200730-003	COIL,RF	4			L1,L2	
23	12,000	ST	23	202543-035	DIODE LED T-1 RED	4			CR1-CR12	
24	1,000	ST	23	200352-001	DIODE 1N4148	4			CR13	
25	3,000	ST	23	230973-001	DIODE SCHOTTKY 60V/400MW	4			CR14,CR15,CR16	
26	24,000	ST	26	237737-001	TRANSISTOR, PNP, 2N3906	4			Q10,Q13,Q1-Q8,Q14-Q27	
27	1,000	ST	26	200368-004	TRANSISTOR, NPN MJE3055T	4			Q9	
28	2,000	ST	26	235034-001	TRANSISTOR NPN DARLINGTOR	4			Q11,Q12	
29	2,000	ST	26	202373-002	TRANSISTOR, MPS2369	4			Q28,Q29	
31	1,000	ST	24	206072-095	IC, --74HCT138	4			U1	
32	1,000	ST	24	200463-095	IC, --74HCT02	4			U2	
33	2,000	ST	31	206133-007	SOCKET, 28PIN	4			U4,U6	
34	1,000	ST	24	213289-095	IC, CD74HCT373E	4			U5	
35	2,000	ST	24	200896-095	IC, --74HCT164, REGISTER	4			U7,U8	
36	1,000	ST	24	211115-075	IC, MM74HC240N	4			U9	
37	2,000	ST	24	211907-001	IC, ULN2003A ARRAY	4			U10,U12	

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TITLE: FR PAN CKT A11A1 IC4010

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45	31,000	ST	33	236604-001	SWITCH, PUSH BUTTOM	4			S1-S31	
47	1,000	ST	43	BR459011	KNOB,WHITE,BLK.TEXT "9"	3			MP5	
48	1,000	ST	43	BR459038	KNOB,WHITE,BLK.TEXT "6"	3			MP6	
49	1,000	ST	43	BR459046	KNOB,WHITE,BLK.TEXT "3"	3			MP7	
50	1,000	ST	43	BR474959	KNOB,WHITE,BLK.TEXT "C"	3			MP8	
51	1,000	ST	43	BR471402	KNOB,BLK,WHT.TEXT "PROGR"	3			MP32	
52	1,000	ST	43	BR459100	KNOB,WHITE,BLK.TEXT "7"	3			MP13	
53	1,000	ST	43	BR459119	KNOB,WHITE,BLK.TEXT "4"	3			MP14	
54	1,000	ST	43	BR459127	KNOB,WHITE,BLK.TEXT "1"	3			MP15	
55	1,000	ST	43	BR459135	KNOB,WHITE,BLK.TEXT "0"	3			MP16	
56	1,000	ST	43	BR471410	KNOB,BLK,WHT.TEXT "LOCAL"	3			MP22	
57	1,000	ST	43	BR488372	KNOB,BLACK,WHT.TEXT "RS"	3			MP23	
58	1,000	ST	43	BR459267	KNOB,WHITE,BLK.TEXT "8"	3			MP28	
59	1,000	ST	43	BR459275	KNOB,WHITE,BLK.TEXT "5"	3			MP29	
60	1,000	ST	43	BR459283	KNOB,WHITE,BLK.TEXT "2"	3			MP30	
61	1,000	ST	43	BR459291	KNOB,WHITE,BLK.TEXT "."	3			MP31	
62	7,000	ST	43	BR474967	KNOB,BLACK NO TEXT	3			MP4	
63	1,000	ST	41	237623-001	KNOB "ENTER"	1				
64	2,000	ST	41	237623-002	KNOB "-"	1				
65	1,000	ST	41	237623-003	KNOB "FEC"	1				
66	1,000	ST	41	237623-004	KNOB "ALE"	1				
67	1,000	ST	41	237623-005	KNOB "FQH"	1				
68	1,000	ST	41	237623-006	KNOB "BST"	1				
69	1,000	ST	41	237623-007	KNOB "STB"	1				
70	1,000	ST	41	237623-008	KNOB "()"	1				
71	1,000	ST	33	237726-001	SWITCH, SLIDE, PCB SPDT	4			S33	
72	1,000	ST	51	202185-018	SCREW M 3X 8 SLTD.CYL BRS	4				
73	1,000	ST	52	202218-008	NUT M 3 PLAIN HEX, BRASS	4				
74	16,000	ST	51	202185-016	SCREW M 3X 5 SLTD.CYL BRS	4				
75	8,000	ST	53	202228-009	WASHER FLAT 3.2X7.0X0.5MM	4				C
76	1,000	ST	46	BR448117	GUIDE SHEET 1 A11	1			MP33	
77	1,000	ST	46	BR448125	GUIDE SHEET 2 M 3000 A11	1			MP34	
78	8,000	ST	52	BR453129	STAY NUT M3 X 7 N5	3			MP35	
79	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
80	0,260	M	32	BR220140	FLEX SILICONE 0,5/1 TRAN	4				
81	1,000	ST	37	BR459550	FLATCABL.ASSY W1 A11	3				

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82	2,000	ST	89	237677-001	FLAT CABLE IC4010	1				
83	0,110	M	32	202264-021	WIRE, ELEC 0.25MM2 BRN	4				
84	0,110	M	32	202264-022	WIRE, ELEC 0.25MM2 RED	4				
85	0,110	M	32	202264-023	WIRE, ELEC 0.25MM2 ORN	4				
86	0,110	M	32	202264-024	WIRE, ELEC 0.25MM2 YEL	4				
87	0,110	M	32	202264-025	WIRE, ELEC 0.25MM2 GRN	4				
88	0,110	M	32	202264-026	WIRE, ELEC 0.25MM2 BLU	4				
89	0,110	M	32	202264-027	WIRE, ELEC 0.25MM2 VIO	4				
90	0,110	M	32	202264-028	WIRE, ELEC 0.25MM2 GRY	4				
91	0,110	M	32	202264-029	WIRE, ELEC 0.25MM2 WHT	4				
92	0,330	M	32	202264-030	WIRE, ELEC 0.25MM2 BLK	4				
93	0,015	M	32	200843-008	WIRE COP TIN-CTD Ø0.8 MM	4				C
94	1,000	ST	30	240629-001	FIRMWARE, ALL IC4010	1				B
95	1,000	ST	53	200559-002	WASHER LOCK 3.1X0.8MM	4				C
**********					BILL OF DOCUMENTATION					
1001			PD	210849	FR PAN CKT A11A1 IC4010					
1003			EC	210849	FR PAN CKT A11A1 IC4010					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
**********					NEXT ASSY					
	1,000	ST		237636-001	FRONT PANEL A11 IC4010	1				

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TITLE: FR PAN CKT A11A1 IC4010

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1	1,000	ST	37	210855-001	PWB,DISPLAY BOARD	3				
2	2,000	ST	21	235004-073	RES FILM 1K0 / 0.5 J	4			R1,R2	
3	2,000	ST	21	213452-066	RES NETW 5X 1K0 / 0.20G	4			R3,R4	
4	12,000	ST	26	237735-001	TRANSISTOR NPN DARLINGTON	4			Q1-Q12	
5	6,000	ST	24	236601-001	IC, 2X14SEGMENT 0.54" RED	4			U1,U2,U3,U4,U5,U6	
6	12,000	ST	23	221575-010	LED ARRAY 2 LED RED	4			U9-U20	
8	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
**********					BILL OF DOCUMENTATION					
1001			PD	210854	DISPLAY BOARD A11A2					
1003			EC	210854	DISPLAY BOARD A11A2					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
**********					NEXT ASSY **********					
	1,000	ST		237636-001	FRONT PANEL A11 IC4010	1				

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1	1,000	ST	60	210778-001	MOTHERBOARD A12A1, IC4010	1			A1	
2	2,000	ST	41	210996-001	PLATE, ARC	2				
3	20,000	ST	52	BR450588	NUT M 3 SQUARE 3X7X2,2MM	4			H2	A1
4	16,000	ST	51	230433-023	SCREW M 3X 8 CTSK.HD. A2	4			H3	
5	4,000	ST	51	200553-001	SCREW M 3X 8 CON.SOCH SST	4			H4	
6	36,000	ST	51	200683-009	SCREW ND4X 9.5 TPG PH SST	4			H5	
7	10,000	ST	51	222790-012	SCREW M 3X10 POZIDR. A2	4			H6	
8	12,000	ST	51	BR495239	SCREW M 4 X 4 CHJ Z	4			H7	
9	1,000	ST	41	237631-001	PLATE,JUNCTION IC4010	1			MP1	
10	3,000	ST	41	BR487120	PROFILE,PC 1,5M DRL	3			MP8	
11	7,000	ST	41	BR445894	PROFILE,PC 1M DRILL	3			MP3	
12	6,000	ST	41	BR495026	SPLICE-PIECE A12	1			MP7	
13	2,000	ST	41	BR487112	PROFILE,SIDE DRILL.	3			MP5	
14	2,000	ST	41	BR458600	RAIL SECTION A12	1			MP6	
**********					BILL OF DOCUMENTATION					
1001			PD	237634	CHASSIS ASSY, IC4010					
1007			AS	201350	WORKMANSHIP					
**********					NEXT ASSY					
	1,000	ST		235450-001	IC4010	1				

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1	1,000	ST	60	210849-001	FR PAN CKT A11A1 IC4010	1			A1	
2	1,000	ST	48	237619-001	DISPLAY WINDOW IC4010	3				
3	1,000	ST	21	235004-036	RES FILM 30R / 0.5 J	4			R2	
4	4,000	ST	51	230433-053	SCREW M 5X12 CTSK.HD. A2	4			H3	
5	4,000	ST	51	200683-002	SCREW NO2X 4.5 TPG PH SST	4			H4	
7	8,000	ST	53	BR245674	WASHER,NYLON Ø10MM	4			H6	
8	1,000	ST	43	BR454435	KNOB,CAB 3,3X Ø7,2	4			H7	
9	1,000	ST	43	BR454443	KNOB Ø10MM BLCK	4			H8	
10	2,000	ST	43	BR216674	HANDLE F.5 1/4" 111MM	3			MP1	
11	4,000	ST	51	BR260827	THUMBSCREW,KNURLED M6	3			MP2	
12	4,000	ST	46	BR268682	GUIDE F/THUMBSCREW 260827	2			MP3	
13	1,000	ST	41	237617-001	FRONT PLATE IC4010	1				
14	1,000	ST	41	237618-001	GUIDE SHEET	2				
15	2,000	ST	46	BR445827	BRACKET,FRONTPLATE A11	1			MP6	
16	4,000	ST	53	BR267015	WASHER,NYLON Ø12MM X15MM	3			MP7	
17	2,000	ST	45	201197-049	STRAP, CABLE, NAT Ø20X2.5	4				
18	1,000	ST	41	237633-001	SHIELD	2				
21	1,000	G	76	201715-001	ADHESIVE, NO. 2963	4				
22	14,000	ST	53	200559-002	WASHER LOCK 3.1X0.3MM	4				
23	0,500	M	34	BR490075	TAPE,DOUBLE SIDE 0,13X10	4				
24	1,000	ST	20	235075-001	LOUDSPEAKER, 1.5 INCH	4				
25	0,400	D2	20	BR475239	CLOTH,LOUDSPEAK BLK 60X60	4				
26	7,000	ST	52	BR460338	STAY NUT M3 X13,3 N5	3				
27	7,000	ST	53	200556-003	WASHER FLAT 3.2X0.5MM	4				
28	14,000	ST	51	222790-010	SCREW M 3X 6 POZIDR. A2	4				
29	1,000	ST	60	210854-001	DISPLAY BOARD A11A2	1			A2	
30	4,000	ST	41	237632-001	DISTANCE SLEEVE	1				
31	1,000	ST	43	203493-012	KNOP Ø14.5/Ø1/8" MAT/BLK	4				B
32	1,000	ST	43	BR454451	KNOB,CAB 4,8X Ø11	4				
33	1,000	ST	21	203461-003	RES VAR 10K / 1.0 K	4				G
34	1,000	ST	31	206165-002	CONN, JACK, SWITCH, 6.3MM	4				F
35	1,000	ST	21	237678-001	POTMETER AFKORTET	1				
36	4,000	ST	52	200560-003	NUT, PLAIN HEX M 3	4				
37	0,100	ML	76	201242-002	ADHESIVE, LOCTITE 242	4				
38	1,000	ST	48	221391-001	LABEL MARKING 1.0"X0.5" W	4				E
39	1,000	ST	31	BR454575	CONN JACK CHAS 2P FEMALE	4				F

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TITLE: FRONT PANEL A11 IC4010

DOCUMENT NO.: 237636-001

REV: G

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
**********				**********	BILL OF DOCUMENTATION	**********				
1001			PD	237636	FRONT PANEL A11 IC4010					
1004			TP	237636	FRONT PANEL A11 IC4010					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					
1008			TC	210909	TEST IC4010					
**********				**********	NEXT ASSY **********					
	1.000	ST		235450-001	IC4010	1				

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
1	1,000	ST	37	237642-001	PWB,FSK MODULATOR ASSY A6	3				
2	1,000	ST	22	235010-003	CAP. ELC 2U2 / 25M	4			C1	
3	2,000	ST	22	221721-027	CAP. CER 10N / 100S	4			C2,C68	
4	1,000	ST	22	235003-004	CAP. PLAST 3N3 / 100K	4			C4	
5	2,000	ST	22	202542-054	CAP. CER 330P / 100G	4			C5,C13	
6	1,000	ST	22	202542-051	CAP. CER 180P / 100G	4			C6	
7	1,000	ST	22	221220-002	CAP. PLAST 15N / 63K	4			C7	
8	1,000	ST	22	235003-006	CAP. PLAST 6N8 / 100K	4			C9	
9	1,000	ST	22	221721-008	CAP. CER 680P / 100K	4			C10	
10	1,000	ST	22	221220-004	CAP. PLAST 33N / 63K	4			C11	
11	47,000	ST	22	221220-007	CAP. PLAST 100N / 63K	4			C14,C16,C22,C30,C31,C32, C33,C34,C35,C36,C37,C38,	E
									C39,C40,C41,C42,C43,C44, C48,C50,C72,C73,C74,C75, C76,C77,C78,C79,C80,C81,	
									C82,C83,C84,C85,C86,C87, C88,C89,C90,C91,C92,C93, C94,C95,C96,C97,C98	
12	7,000	ST	22	235010-007	CAP. ELC 10U / 25M	4			C17,C28,C47,C49,C51,C59, C71	
13	1,000	ST	22	202542-012	CAP. CER 33P / 100G	4			C25	
14	3,000	ST	22	200514-204	CAP. CER 100N / 50K	4			C60,C69,C70	
15	1,000	ST	22	202542-020	CAP. CER 150P / 100G	4			C61	
16	1,000	ST	22	235010-005	CAP. ELC 4U7 / 25M	4			C66	
17	1,000	ST	22	202542-015	CAP. CER 56P / 100G	4			C67	
18	1,000	ST	22	221721-002	CAP. CER 220P / 100K	4			C65	
19	1,000	ST	22	235170-041	CAP. ELC 220U / 25M	4			C52	
20	1,000	ST	22	200327-036	CAP. PLAST 1N5 / 250F	4			C58	
21	1,000	ST	22	200514-004	CAP. CER 4N7 / 200K	4			C62	
22	4,000	ST	22	201566-003	CAP. PLAST 150N / 100K	4			C53,C54,C55,C56	
23	1,000	ST	22	200514-012	CAP. CER 100N / 100M	4			C57	
24	1,000	ST	22	200514-006	CAP. CER 10N / 200K	4			C63	
25	1,000	ST	22	201566-018	CAP. PLAST 47N / 250K	4			C64	
26	8,000	ST	23	200352-001	DIODE 1N4148	4			CR2,CR3,CR4,CR5,CR6,CR7, CR8,CR9	
27	1,000	ST	23	201202-004	DIODE 1N4948	4			CR1	

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
28	1,000	ST	33	201270-012	FUSE 5X20 SLOW 315MA	4			F1	
29	1,000	ST	25	200730-003	COIL,RF	4			L5	
30	1,000	ST	89	210809-001	SMPS COIL A6	1			L4	
31	1,000	ST	25	232316-005	CHOKES 1.5A/25UH	4			L3	
32	2,000	ST	25	232311-011	CHOKE, EMI 10UH	4			L1,L2	
33	2,000	ST	31	212654-026	CONN D-TYPE 9P/ANGLE	4			J1,J2	C1
34	1,000	ST	31	212654-021	CONN D-TYPE 9S/ANGLE	4			J3	C1
35	6,000	SE	31	222836-140	CONN FEMALE SCREW 4-40	4				
36	1,000	ST	41	210840-001	RETAINER	3				
37	2,000	ST	41	210841-001	THUMBSCREW	3				
38	4,000	ST	51	202185-003	SCREW M2.5X 5SLTD.CYL.BRS	4				
39	1,000	ST	48	214073-004	LABEL, ADHESIVE, ESD	2				
40	2,000	ST	51	202185-017	SCREW M 3X 6 SLTD.CYL.BRS	4				
41	2,000	ST	52	202218-008	NUT M 3 PLAIN HEX, BRASS	4				
42	1,000	ST	41	237689-001	REAR PLATE FSK MOD A6	1				
43	8,000	ST	31	208802-001	CONN MINI JUMP	4				
44	0,770	ST	31	208801-001	CONN MINI-JUMP 36 PIN	4			W1-8,TP1-7	
45	0,111	ST	31	224533-172	CONN DOUBLE ROW 2X36PIN	4			W4	
46	2,000	ST	26	235031-003	TRANSISTOR, NPN, BC547B	4			Q1,Q5	
47	1,000	ST	26	235024-002	TRANSISTOR, BC557B	4			Q2	
48	1,000	ST	26	202373-002	TRANSISTOR, MPS2369	4			Q4	
49	1,000	ST	26	224544-010	TRANSISTOR FET 200V/ 9.5A	4			Q6	
50	1,000	ST	26	211107-001	TRANSISTOR BF422	4			Q7	
51	1,000	ST	26	202375-010	TRANSISTOR, NPN BUX85	4			Q8	
52	1,000	ST	21	235004-105	RES FILM 22K / 0.5 J	4			R1	
53	15,000	ST	21	235004-097	RES FILM 10K / 0.5 J	4			R7,R8,R9,R10,R11,R12,R17, R20,R34,R51,R52,R53,R72, R76,R87	
54	1,000	ST	21	208010-173	RES FILM 562R / 0.25F	4			R95	F
55	2,000	ST	21	235004-090	RES FILM 5K1 / 0.5 J	4			R3,R4	
56	7,000	ST	21	235004-121	RES FILM 100K / 0.5 J	4			R6,R36,R41,R47,R48,R85, R88	
57	4,000	ST	21	235004-115	RES FILM 56K / 0.5 J	4			R13,R14,R15,R16	
58	1,000	ST	21	202118-002	RES ADJ 1K0 / 0.50M	4			R18	
59	10,000	ST	21	235004-073	RES FILM 1K0 / 0.5 J	4			R35,R37,R54,R57,R77,R78, R81,R82,R83,R90	

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
60	1,000	ST	21	202118-003	RES ADJ 10K / 0.50M	4			R38	
61	2,000	ST	21	235004-101	RES FILM 15K / 0.5 J	4			R39,R84	
62	4,000	ST	21	235004-055	RES FILM 180R / 0.5 J	4			R40,R73,R74,R89	
63	1,000	ST	21	235004-033	RES FILM 22R / 0.5 J	4			R42	
64	2,000	ST	21	235004-061	RES FILM 330R / 0.5 J	4			R43,R44	
65	2,000	ST	21	235004-077	RES FILM 1K5 / 0.5 J	4			R45,R46	
66	3,000	ST	21	235004-065	RES FILM 470R / 0.5 J	4			R49,R68,R69	
67	1,000	ST	21	235004-099	RES FILM 12K / 0.5 J	4			R50	
68	1,000	ST	21	235004-039	RES FILM 39R / 0.5 J	4			R55	
69	2,000	ST	21	235004-053	RES FILM 150R / 0.5 J	4			R56,R67	
70	2,000	ST	21	235004-075	RES FILM 1K2 / 0.5 J	4			R58,R59	
71	2,000	ST	21	235004-009	RES FILM 2R2 / 0.5 J	4			R60,R61	
72	1,000	ST	21	235004-041	RES FILM 47R / 0.5 J	4			R62	
73	1,000	ST	21	235004-107	RES FILM 27K / 0.5 J	4			R63	
74	2,000	ST	21	235004-103	RES FILM 18K / 0.5 J	4			R64,R65	
75	1,000	ST	21	235004-109	RES FILM 33K / 0.5 J	4			R66	
76	1,000	ST	21	235004-049	RES FILM 100R / 0.5 J	4			R80	
77	1,000	ST	21	202118-006	RES ADJ 2K0 / 0.50M	4			R70	
78	2,000	ST	21	235004-081	RES FILM 2K2 / 0.5 J	4			R71,R79	
79	1,000	ST	21	235004-089	RES FILM 4K7 / 0.5 J	4			R75	
80	1,000	ST	21	235004-145	RES FILM 1M0 / 0.5 J	4			R86	
81	4,000	ST	21	235004-067	RES FILM 560R / 0.5 J	4			R91,R92,R93,R94	
82	1,000	ST	25	BR362859	TRAFO,LINE 600:600R	4			T1	
84	4,000	ST	24	206072-095	IC, --74HCT138	4			U1,U5,U6,U42	
85	1,000	ST	24	207432-095	IC, --74HCT245E	4			U2	
86	1,000	ST	24	213289-095	IC, CD74HCT373E	4			U3	
87	3,000	ST	24	206235-095	IC, --74HCT273 D-TYPE F-F	4			U4,U32,U33	
88	1,000	ST	24	200497-095	IC, --74HCT32	4			U7	
89	1,000	ST	24	200466-095	IC, --74HCT08, AND GATES	4			U8	
90	1,000	ST	24	200464-095	IC, --74HCT04, HEX INVERT	4			U9	
91	1,000	ST	24	200462-095	IC, --74HCT00, NAND GATE	4			U10	
92	17,000	ST	24	207437-095	IC, --74HCT374	4			U11,U12,U13,U14,U15,U16, U17,U18,U19,U20,U21,U22, U23,U24,U25,U26,U35	
93	1,000	ST	24	206084-075	IC, --74HC160N	4			U27	
94	1,000	ST	24	213541-095	IC, CD74HCT161E	4			U28	

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
95	3,000	ST	24	207435-095	IC, --74HCT283, ADDERS	4			U29,U30,U31	
96	1,000	ST	24	207443-004	IC, EPROM, 8KX8	4			U34	
97	1,000	ST	24	207485-002	IC, DAC08BC	4			U36	
98	1,000	ST	24	213271-004	IC, TL074IN	4			U37	
100	1,000	ST	24	203469-006	IC, SN7406N	4			U39	
101	1,000	ST	24	235008-001	IC, OPR. AMP. DUAL	4			U41	
102	1,000	ST	24	208799-002	IC, --C89, RECEIVER, LINE	4			U43	
103	1,000	ST	24	200487-075	IC, MM74HC86N	4			U44	
104	1,000	ST	24	235374-001	IC, PWM CONTROLLER UC3845	4			U45	
105	2,000	ST	24	BR424684	IC LIN 4N26 OPTOCOUPL	4			U46,U47	
106	1,000	ST	24	200463-095	IC, --74HCT02	4			U48	
107	1,000	ST	24	203927-095	IC, --74HCT14, INVERTERS	4			U49	
108	2,000	ST	23	203527-009	DIODE ZENER 5V1/0.5W J	4			VR1,VR3	
109	1,000	ST	23	203527-024	DIODE ZENER 22V /0.5W J	4			VR2	
110	1,000	ST	23	203527-020	DIODE ZENER 15V /0.5W J	4			VR4	
111	3,000	ST	23	203527-004	DIODE ZENER 3V3/0.5W J	4			VR5,VR6,VR7	
112	1,000	ST	20	BR498440	CRYSTAL 3,2763 MHZ	4			Y1	
113	15,000	MM	34	222837-004	TAPE, DOUBLE-SIDED 1.6MM	4				
114	0,050	M	32	200843-010	WIRE COP TIN-CTD Ø0.5 MM	4				
115	1,000	ST	31	206133-007	SOCKET, 28PIN	4				
116	1,000	ST	48	221391-001	LABEL MARKING 1.0"X0.5" W	4				
117	2,000	ST	56	200515-005	INSULATOR PLATE TO-220	4				
118	1,000	ST	21	235004-085	RES FILM 3K3 / 0.5 J	4			R2	
119	2,000	ST	31	201268-001	CLIP, ELEC	4				
120	2,000	ST	22	221721-006	CAP. CER 470P / 100K	4			C23,C24	
121	1,000	ST	21	208010-177	RES FILM 619R / 0.25F	4			R5	F
**********					********** BILL OF DOCUMENTATION	**********				
1001			PD	237688	FSK MODULATOR A6					
1003			EC	237688	FSK MODULATOR A6					
1004			TP	237688	FSK MODULATOR A6					
1005			SP	BR498823	SOFTWARE BESKRIVELSE					
1006			AS	206460	ESD, PROTECTION & MARKING					
1007			AS	201350	WORKMANSHIP					

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FIND NO.	QTY RQD	U M	CL NO.	ITEM OR DOCUMENT NUMBER	NOMENCLATURE	I T	PREP NO.	BIN	REFERENCE DESIGNATION	LINE REV
**********	**********	**	**	**********	********** NEXT ASSY **********	*	**********	**********	**********	********
	1,000	ST		235450-001	IC4010	1				

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6 SERVICE

6.1 Introduction

This chapter provides information for maintenance and fault location on the controller.

Tables containing information about error messages is located in the end of this chapter.

6.2 Maintenance

This section contains information about maintenance of the controller.

6.2.1 Preventive Maintenance

It is recommended to replace the built-in battery BT1 of the Remote Processor Assembly A8.1 No. 487740 approximately once a year; replacement intervals should not exceed two years. After replacement of the battery, the RAM must be cleared using the "clear all" function and a complete reprogramming of the programmed settings must be carried out.

No permanent data are stored in the RAM on the Control Processor Assembly A8.2. Therefore it is not necessary to replace the battery on this assembly.

6.2.2 Corrective Maintenance

The push button switches in this controller have been designed for long, troublefree service. If one of these switches should become defective, replacement rather than repair is recommended.

Trouble shooting of the controller is described separately in section 6.3.

6.2.3 General Maintenance Instructions

The following subsections contain general instructions for handling of the controller during maintenance and service.

6.2.3.1 Cleaning

Painted surfaces can be cleaned with a commercial, spray-type window cleaner or with a mild soap and water solution.

Avoid the use of chemical cleaning agents that might damage the plastics used in this controller.

6.2.3.2 Front Panel Assembly Removal

To remove the front panel assembly proceed as follows:

a) Remove the four screws holding the front panel. The four screws are located at the exterior side of the controller side profiles.

b) Carefully withdraw the front panel assembly and disconnect the ribbon cable connector from the motherboard.

6.2.3.3 PC Board Assembly Removal

To remove a PC board assembly, proceed as follows:

a) Disconnect all cables running to the concerned assembly.

b) Remove the six or eight star screws positioned at the edge of the concerned assembly rear panel and pull out the assembly via the two thumb screws. If the assembly is stuck in the chassis frame, it may be necessary to carefully release the assembly by keying a screwdriver in between the rear panel and the main frame.

Due to the use of self-tapping screws holding the assembly rear panel to the chassis frame, carefully reinsert the screws in the threads when reinstalling assemblies.

6.2.3.4 Servicing PC Boards

All the PC boards have plated-through component holes. This allows components to be removed or replaced by unsoldering or soldering from either side of the board. When removing integrated circuits, cut all pins and remove the pins afterwards with a soldering iron.

6.2.3.5 MOS Handling Precautions

All MOS devices are subject to damage from static charge build-up. The generation of static charges is not a problem, but the accumulation of static charges is. In general, any device not connected directly to ground can accumulate static charges. Electrical discharge can occur to ground or to any object or person having a lower potential. Therefore, handling precautions are recommended for all personnel coming into contact with MOS devices.

When handling or testing MOS devices, observe the following precautions.

a) Ground test equipment and tools used in testing or handling MOS devices.

b) In order to prevent accumulated static charges to discharge through MOS devices, establish electrical connection between ground and handling personnel which are handling the MOS devices.

WARNING

For safety reasons resistance of 1M ohms must be placed between handling personnel and hard electrical ground.

c) Apply no power to board assembly while MOS device is being installed. This permits accumulated static charges on MOS device to be safely removed before power is applied.

d) Avoid the use of plastics, rubber, and silk in MOS areas. Do not use any material susceptible to static charge accumulation. Use anti-electrostatic plastic for packing of assemblies containing MOS devices.

e) Handle circuit boards and modules containing MOS devices in the same manner as individual MOS devices. Regardless of configuration, whenever leads of MOS devices are exposed, damage due to static charge build-up can occur.

f) Use conductive, grounded table tops in MOS work area.

g) Humidity in work area should be maintained above 50%. Static charge generation increases exponentially as relative humidity decreases.

6.3 Trouble-Shooting

Faults which cause IC4010 to operate incorrect can be divided in three categories:

* Incorrect programming.
* Internal malfunction.
* External malfunction.

Faults which are included in these three categories are described in the following sections.

6.3.1 Incorrect Programming

Contrary to a receiver or an exciter, the IC4010 can not be operated as a stand-alone unit. Programming of the controller is the basis for correct operation of the system of which it is part.

Some typical faults which can be caused by incorrect programming are listed below together with a description of the parameter which might be incorrectly programmed:

Program 19: Remote communication to SE4010 and RX4010 fails.

Wrong address programmed or address of SE4010 or RX4010 not strapped correctly.

Program 20: Remote communication or data communication fails.

Wrong baud rate(s) programmed or baud rates of SE4010, RX4010 or data terminal not correctly selected.

Program 61: During the secondary ALE CALL mode, the controller scans all channels of the called station without transmitting the call.

Programmed receiver agc threshold is too low.

Program 62: During the secondary ALE RX mode, the controller does not answer when it is called by another station. The display shows "**XYZ CALLING**", where "**XYZ**" is the name of the calling station.

"**NO ANSWER**" selected.

Program 66: During the secondary ALE RX mode, RX4010 does not stop scanning when the station is called by another station.

Name of the station itself is not correctly programmed.

Note that the list above only gives some of the most probable examples of incorrect programming of the controller. A number of other faults may also be caused by incorrect programming. For further information refer to Chapter 3.

6.3.2 Internal Malfunction

WARNING

Read the Safety Summary at the start of this manual before trouble shooting the controller.

By use of front panel controls note as many symptoms of the malfunction as possible. The Automatic Self-Test Program (program 49) and the Fault Analysis Table (Table 6.2) can be used as a guide.

When a problem has been isolated to a particular assembly or circuit, the faulty component(s) may be located using the Service Sheets located in section 7. The Service Sheets explains with the aid of block diagrams the operation of functional assemblies. Detailed theory of operation is located opposite the schematics in the Service Sheets.

6.3.3 External Malfunction

As a consequence of the complexity of the system of which IC4010 is an integrated part, a fault which causes the controller to fail may often be located to the system outside the controller. A list of such faults is shown below:

- Fault in the cabling which connects IC4010 to the other units of the system.
- Malfunction of receiver RX4010.
- Malfunction of exciter SE4010.
- Malfunction of power amplifier S76150/S76210.
- Malfunction of antenna tuner TU4013/TU4015.
- Antenna tuner is not able to tune at the frequency.

For faults related to SE4010, RX4010, S76150/S76210 or TU4013/TU4015 please refer to the related manuals.

6.4 Automatic Self-Test Program 49.

The controller contains an automatic self-test program which can be used during trouble shooting of the controller.

The test sequence which the controller runs through when program 49 is selected is listed below:

1. Display of software versions.

2. Manual test of Front Panel.

3. Automatic test:

   Test of assemblies controlled by A8.1.

   Test of assemblies controlled by A8.2.

   Test of assemblies controlled by A8.2.

4. Display of error messages.

Before program 49 is selected, the controller must be set in the primary STB mode.

When program 49 is selected the display shows "**TST. IC. 4010**". Press the **[enter]** key to continue and return to the former setting using the **[RS]** key.

If program 49 is selected when the controller is set in any other mode than the STB mode, the display will show "**ERR. MODE**". To continue press the **[STB]** key and select program 49 again.

The sequence which the controller runs through during the automatic self-test program is described in the following subsections.

6.4.1 Display of Software Versions

The version of the mounted software for the Remote Processor Assembly A8.1 is displayed as:

SW.1 x.y z

"**x**" and "**z**" is a letter or blank
"**y**" is a number or blank

Press the **[enter]** key to continue.

In order to get information about the mounted software version for the Control Processor Assembly A8.2, the Remote Processor A8.1 transmits a command to the Control Processor A8.2 via the Remote Module

A9. Upon receipt of the command the Control Processor A8.2 returns a message containing information about the mounted software version.

The version of the mounted software for the Control Processor A8.2 is displayed as:

SW.2 x.y z

"**x**" and "**z**" is a letter or blank
"**y**" is a number or blank

If the Remote Processor A8.1 does not receive an answer from the Control Processor A8.2 when the command is transmitted the display shows:

SW.2 UNKNOWN

This message indicates that the Control Processor A8.2 or the Remote Module A9 is defect or missing.

Press the **[enter]** key to continue.

The Remote processor A8.1 gets information about the mounted software version for the Code Processor A8.3, by transmission of a command which is transmitted to the Control Processor A8.2 and further to the Code Processor A8.3 via the Remote Module A9 and the Frequency Standard Assembly A2. Upon receipt of the command, the Code Processor A8.3 returns a message containing information about the mounted software version.

The version of the mounted software for the Control Processor A8.2 is displayed as:

SW.3 x.y z

"**x**" and "**z**" is a letter or blank
"**y**" is a number or blank

If the Remote Processor A8.1 does not receive an answer from the Code Processor A8.3 when the command is transmitted the display shows:

SW.3 UNKNOWN

This message indicates that one of the modules: A9, A8.2, A2 or A8.3 is defective or missing.

Turn the AF gain button quite clockwise and press the **[enter]** key to continue.

6.4.2 Manual Test of Front Panel

All segments in the display and all annunciators shall now switch on. Provided that none of the messages "**SW.2 UNKNOWN**"or "**SW.3 UNKNOWN**" are displayed, the loudspeaker will emit a short tone at the same time.

Press the **[enter]** key to continue.

The display will now show:

TST. BUTTON

By pressing the keys of the Front Panel it is tested that the activated key operate well. The display will show a code which identifies the pressed key. These codes are shown i table 6.1 at the end of this chapter.

Pressing the **[RS]** key will cause the controller to interrupt the test and return to primary STB mode.

Pressing the **[enter]** key will cause the controller to continue with the next step in the self-test.

6.4.3 Automatic Self-Test

The display will now show:

TST. ACTIVE

indicating that the automatic self-test is going on.

The tests which are performed during the automatic self-test is described in the following subsections.

6.4.3.1 Test of Assemblies Controlled by A8.1

The microprocessor on the Remote Processor A8.1 performs a test of the integrated real time clock on the assembly.

It is tested if the Remote Module A9 is present.

6.4.4 Test of Assemblies Controlled by A8.2

It is tested if the Remote Module A9 and the Frequency Standard Assembly A2 are present.

If the Remote Module A9 is not present or defective, the test will be interrupted and continue with display of error codes.

6.4.5 Test of Assemblies Controlled by A8.3

The microprocessor on the Code Processor A8.3 performs several tests:

1. It is tested that the integrated parallel interface/timer 68230 located on the Code Processor Assembly A8.3 generates an interrupt within a certain time period.

2. It is tested that the integrated multi-function peripheral circuit 68230 located on the Code Processor Assembly A8.3 generates an interrupt within a certain time period.

3. It is tested that the 10kHz clock signal from the Frequency Standard A2 interrupts the Code Processor A8.3.

4. The primary ALE mode is selected. Then it is tested that the 8-ary FSK Demodulator A6.1 interrupts the Code Processor A8.3 with 2mS intervals.

It is tested if the Frequency Standard Assembly A2, the 8-ary FSK Demodulator A6.1 and the 8-ary FSK modulator A6.2 are present.

If one of the assemblies: A2, A5, A8.2, A8.3 or A9 is not present or defective, the test will be interrupted and continue with display of error codes.

6.4.6 Display of Error Codes.

If errors are detected during performance of the automatic self-test, the error code of these errors will now be displayed. Each error code must be acknowledged by pressing the **[enter]** key.

The error codes are shown in table 6.2.

When the automatic self-test has finished the display shows:

TST. END

When the **[enter]** key is pressed, the controller will return to the primary STB mode.

Table 6.1 Key codes during self-test

Key	Display
FEC	TST. FEC A+B
ALE	TST. ALE C+D
FQH	TST. E+F
BST	TST. BST G+H
I(J)	TST. I+J
K(L)	TST. K+L
M(N)	TST. M+N
O(P)	TST. O+P
STB	TST. STB
Q(R)	TST. Q+R
S(T)	TST. S+T
U(V)	TST. U+V
←	TST. ←- W+X
→	TST. -→ Y+Z
progr	TST. PROGRAM
()	TST. ()
C	TST. CLR +↑
0	TST. 0
1	TST. 1
2	TST. 2
3	TST. 3
4	TST. 4
5	TST. 5
6	TST. 6
7	TST. 7
8	TST. 8
9	TST. 9
.	TST. .

Table 6.1 Self-test fault analysis table.

Error message	Description	Note
NO A2	A2 not mounted or defective.	1
NO A2 - 9	A2 can not be controlled from A8.3.	2
ERR. A2 - 1	10kHz clock signal from A2 or interrupt on A8.3 has failed.	2
NO A5	A5 not mounted or defective.	1
NO A6.1	A6.1 not mounted or defective.	3
NO A6.1 - 9	A6.1 can not be controlled from A8.3.	3
ERR. A6.1 - 1	The INT2-3 interrupt to A8.3 has failed.	3
NO A6.2	A6.2 not mounted or defective.	3
NO A8.2	A8.2 not mounted or defective.	5
NO A8.2 - 9	A8.2 defective.	5
ERR. A8.1 - 1	Real time clock has failed.	4
NO A8.3	A8.3 not mounted or defective.	6
NO A8.3 - 9	A8.3 defective.	6
ERR. A8.3 - 1	Timer 68230 has failed.	3
ERR. A8.3 - 2	USART and timer 68901 has failed.	3
NO A9	A9 not mounted or defective.	4

Notes:
1. A8.2 and A9 are present and operate correctly.
2. A8.2, A8.3 and A9 is present and operate correctly.
3. A2, A8.2, A8.3 and A9 is present and operate correctly.
4. A8.2 is present and operate correctly.
5. A9 is present and operate correctly.
6. A2, A8.2 and A9 are present and operate correctly.

Table 6.3 Error messages related to the ALE-mode

Error message	Description
ERR. SYST. SE	*Remote communication between IC4010 and SE4010 is not operating correctly or antenna tuner is not tuned.
ERR. SYST. RX	*Remote communication between IC4010 and RX4010 is not operating correctly.
ERR. EXT	*Remote communication between IC4010 and both RX4010 and SE4010 is not operating correctly.
ERR. NAME	Name of own station has not been defined in program 66.

* Errors stored in the Automatic Error Log (see section 3).

Table 6.4 Error messages related to the BST-mode

Error message	Description
ERR. RX STOP	Memory has run out during reception.
ERR. NO TLGM	No telegram has been recorded or no telegram has been received.
ERR. REC DTE	Memory has run out during recording.

Table 6.5 General error and status messages

Error message	Description
ERR. MODE	Self-test is only available in the STB-mode.
ERR. SYSTEM	The internal communication has failed.
WAIT	A new mode has been selected before the controller has finished the old mode. The new mode must be selected again.

7 SCHEMATICS

7.1 Introduction

This chapter contains Service Sheets for all electrical assemblies of which the controller is made up. With the aid of block diagrams the Service Sheets explain the operation of functional assemblies. Detailed theory of operation is located opposite the schematics in the Service Sheets.

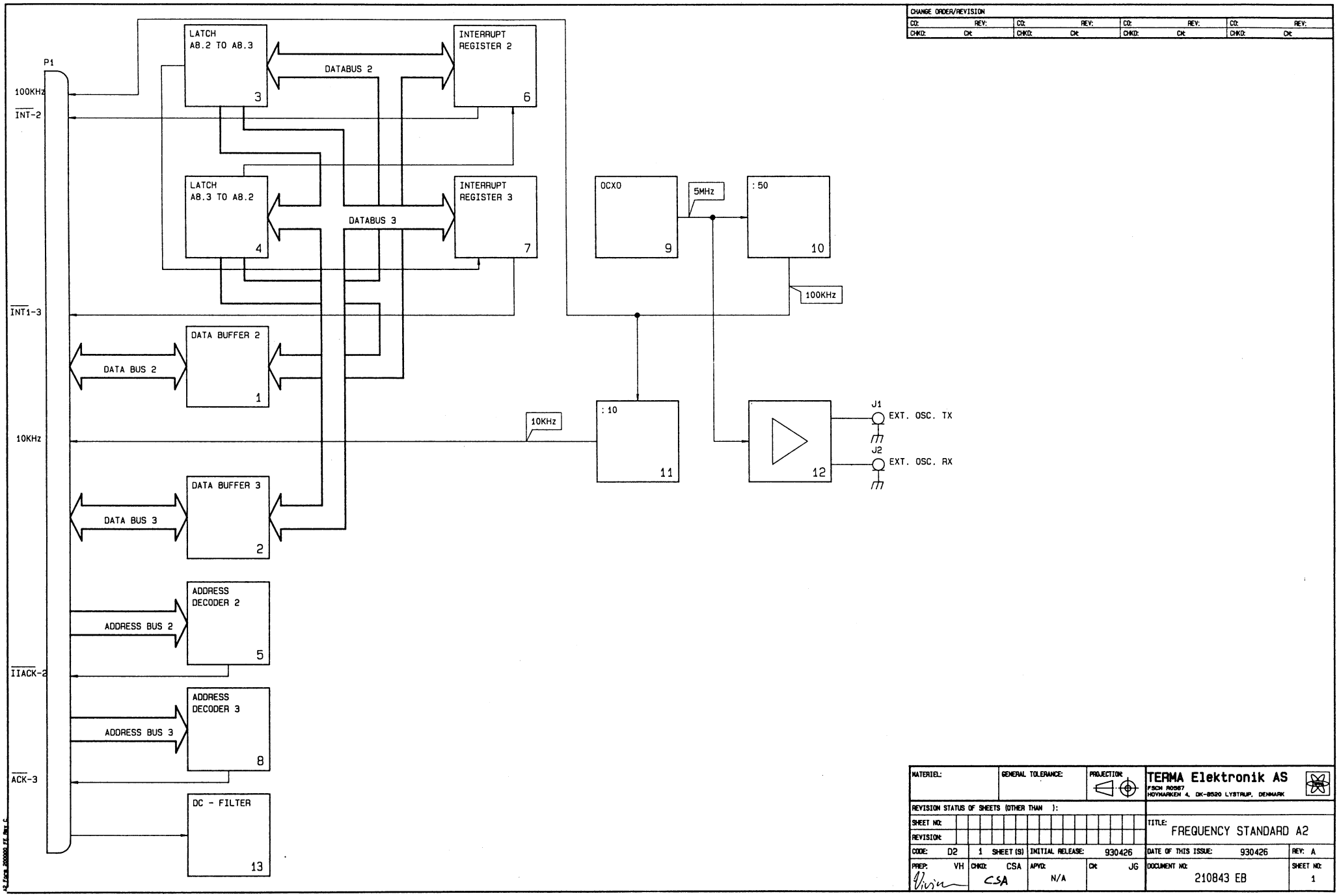
ASSY 210843, FREQUENCY STANDARD

Service Sheet A2

Assy 210843, Frequency Standard **Configuration**

The module contains a highly stable 5MHz OCXO. The output from the OCXO is fed to a buffer where it is split in two lines which are used for external frequency standard outputs to SE4010 and RX4010. The 5MHz signal is also divided to a 100kHz and a 10kHz signal. The 100kHz signal is used as timing signal on the Demodulator Assembly A6. The 10kHz signal is used as timing on the Microprocessor Assembly A8.3.

A circuit consisting of two latches and two Interrupt Registers makes data communication between A8.2 and A8.3 possible.



CHANGE ORDER/REVISION							
CO:	REV:	CO:	REV:	CO:	REV:	CO:	REV:
CHKD:	Ck:	CHKD:	Ck:	CHKD:	Ck:	CHKD:	Ck:

MATERIEL:	GENERAL TOLERANCE:	PROJECTION:	TERMA Elektronik AS FSCM 80567 HOVMARKEN 4, DK-8520 LYSTRUP, DENMARK
REVISION STATUS OF SHEETS (OTHER THAN):			
SHEET NO:			TITLE: FREQUENCY STANDARD A2
REVISION:			
CODE: D2	1 SHEET (S)	INITIAL RELEASE: 930426	DATE OF THIS ISSUE: 930426 / REV: A
PREP: VH	CHKD: CSA	APVD: N/A	Ck: JG / DOCUMENT NO: 210843 EB / SHEET NO: 1

Service Sheet A2

1/2. Data Buffers
U1 and U2 are used as bidirectional data buffers.

3/4. Transceiver Latches
The circuits are used to transmit data between A8.2 and A8.3. When A8.2 wants to transmit data to A8.3 it writes a one byte data word to the data register U3 and a one byte status word to the status register U4. The status word indicates which kind of data is contained in the data register. When A8.2 writes a status word to the status register this will cause an interrupt to A8.3.

When A8.3 receives the interrupt it will read the data in the two registers and then answer back to A8.2 to tell that the data have been received. A8.3 is doing this by writing to the status register U8. This causes an interrupt back to A8.2. When A8.2 receives the interrupt it will read the status register and know that A8.3 has received the data.

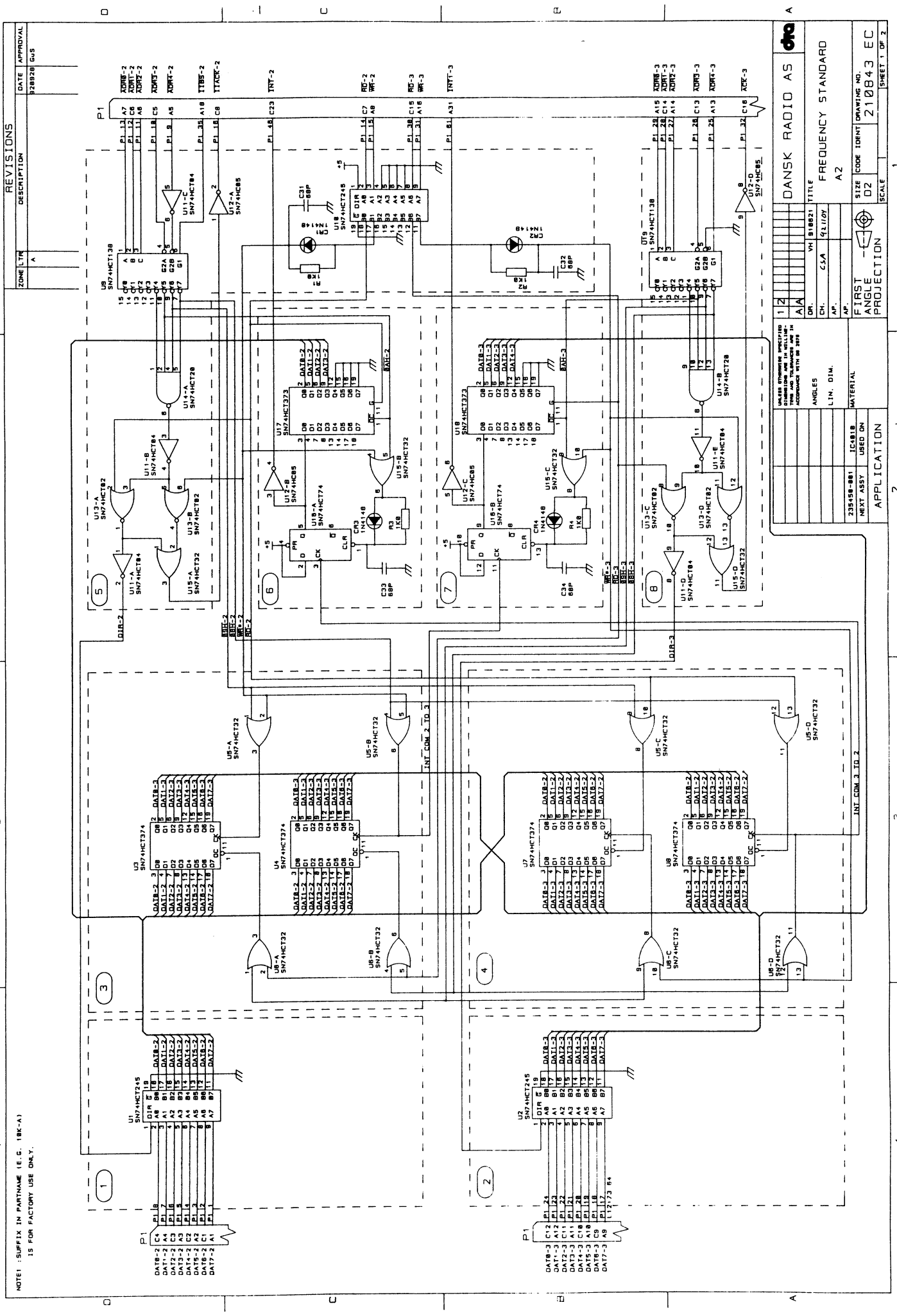
The transmission of data the opposite way takes place in an equal manner.

5. Address Decoder for A8.2
The circuit decodes the addresses of the databus from A8.2. When an address is decoded the circuit will respond with an acknowledge back to A8.2. U10 is used as a buffer for read and write signals.

6. Interrupt Register for A8.2
The output of the D-Flip/Flop U16-A is set high if the level of the clock input shifts from a low to a high level. This will cause an interrupt to A8.2. When A8.2 receives the interrupt it will among other things read the latch U17 to detect which signal caused the interrupt. After this it will reset the Flip/Flop by writing to address 0AH. CR3, R3 and C33 are inserted to prevent spikes and noise on the databus to reset the Flip/Flop.

7. Interrupt Register for A8.3
The circuit operates in an equal manner as block 6.

8. Address Decoder for A8.3
The circuit decodes the addresses of the databus from A8.3. When an address is decoded the circuit will respond with an acknowledge back to A8.3.



Service Sheet A2

9. 5MHz OCXO
This circuit is a highly stable **O**ven **C**ontrolled **X**-tal **O**scillator, which is used as time base for the timing signals.

10. Divider
U21 is coupled to divide the 5MHz signal from the OCXO to 100kHz.

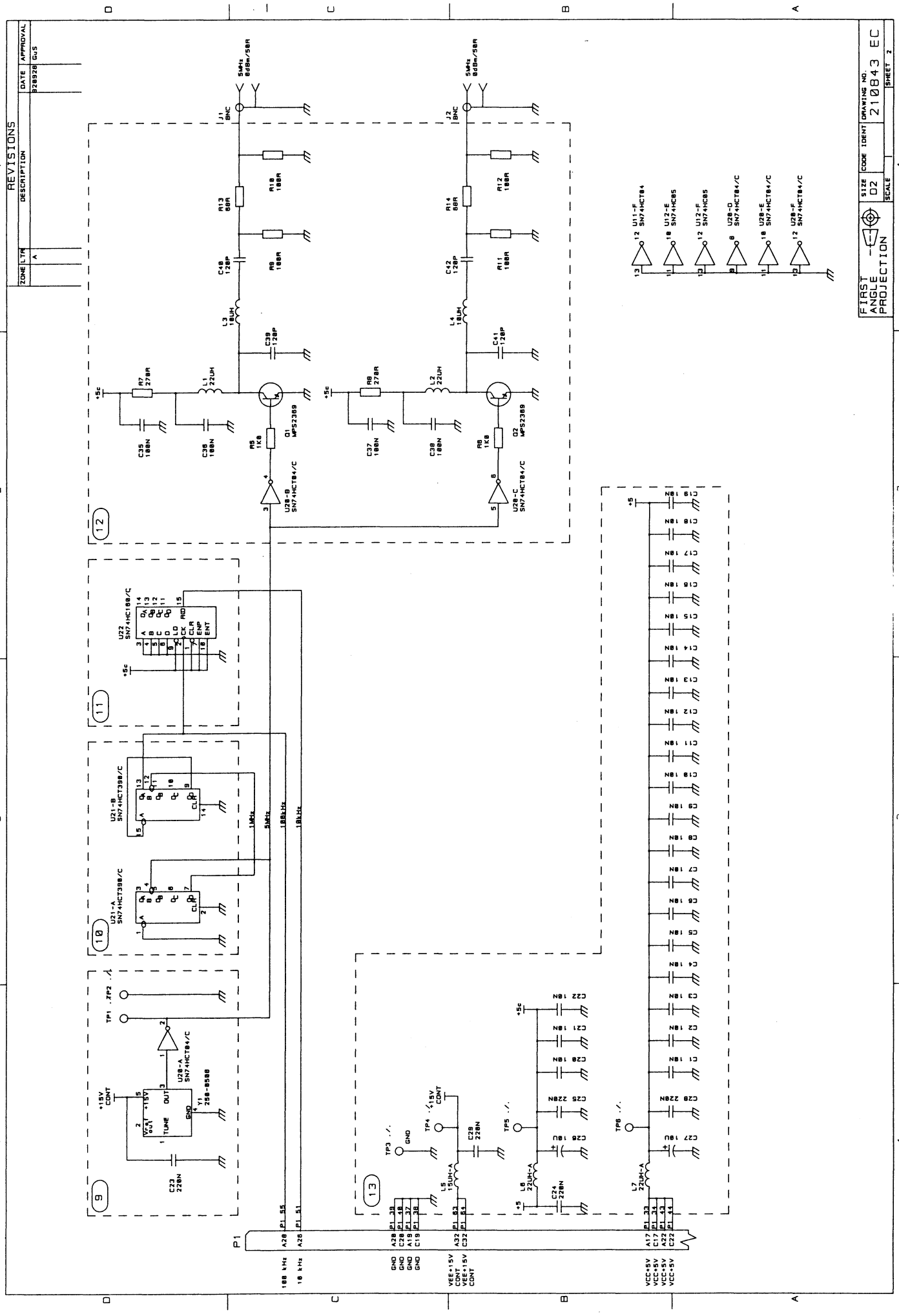
The 100kHz output is used for timing on the Demodulator Assembly A6.

11. Divider
U22 divides the 100kHz signal to 10kHz.

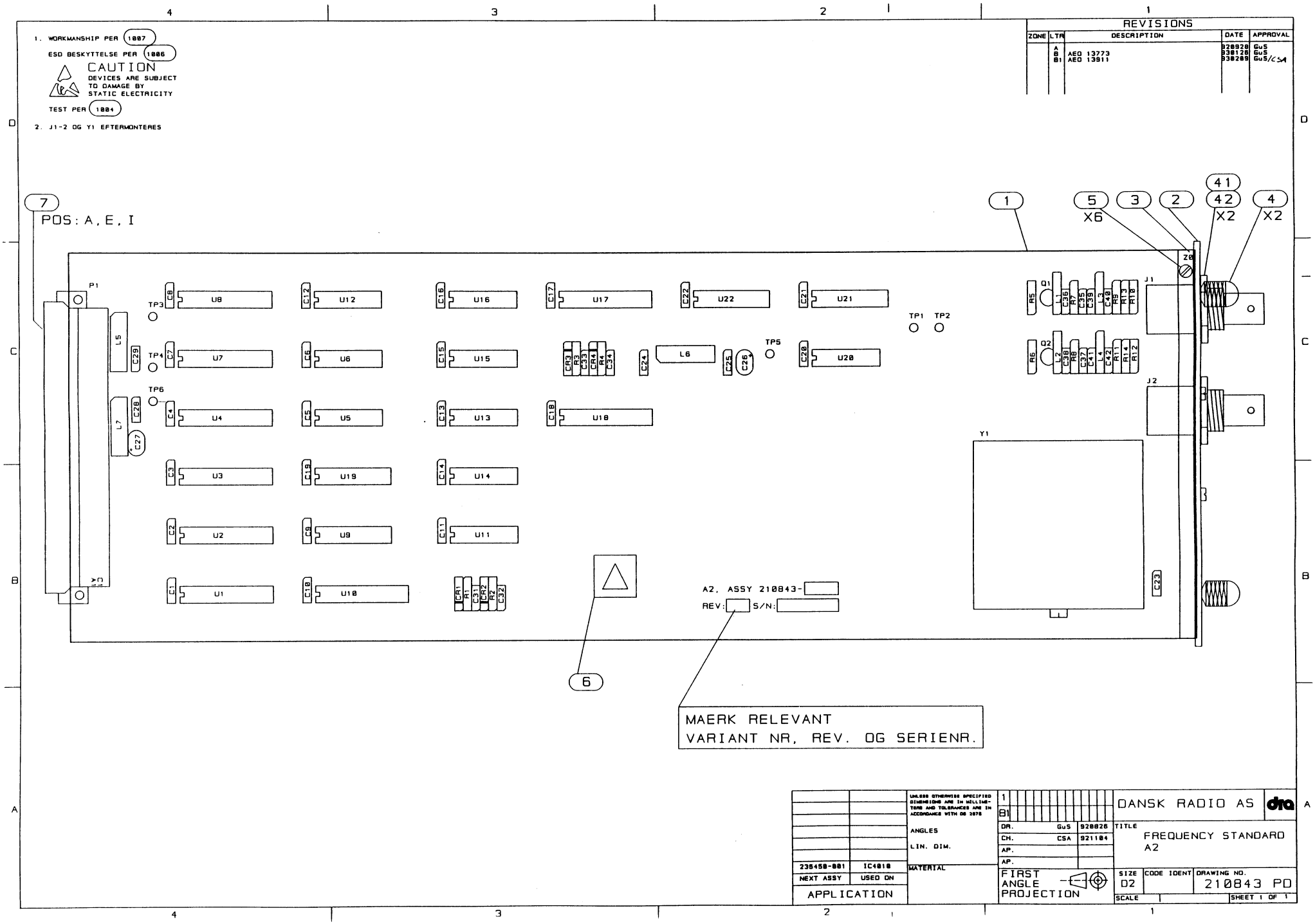
The 10kHz output is used for timing on the Microprocessor Assembly A8.3.

12. Buffers for External Oscillator Outputs
The purpose of the buffers is to convert the 5MHz signal from the OCXO to a nearly sinewave and turn the output impedance into 50 ohms. The two buffers are identical and constructed as class E amplifiers followed by 10dB attenuators to improve the voltage standing wave ratio of the following 50 ohms line. The output level is approximately 0dBm.

13. DC Filter
The circuit consists of chokes and capacitors which filter out noise and hum on the supply voltages to the assembly.



Service Sheet A2



Service Sheet A2

ASSY 210816, DEMODULATOR

Service Sheet A6

Assy 210816, Demodulator Assembly **Configuration**

The Demodulator is divided into two circuit boards. One unit being assembly A6, one being the subassembly A6A1.

Subassembly A6A1
The Audio signal for the Demodulator A6 comes from a receiver and is balanced. The input circuit (1) is balanced through a transformer with the option of gain adjustment.
The level of the input signal is supervised and displayed with three light emitting diodes in (2).

The audio signal is bandpass filtered in (3) through (10). The bandwidth of the filters in (3)-(5)-(7)-(9) are controlled by the microprocessor while the rest of the filters have fixed bandwidths.

The filtered signal is frequency doubled in (11) through (18) in order to decrease the detection time.

In order to subtract the DC-component of the signal the frequency doubled signal is filtered in a lowpass filter (19) through (26) which has microprocessor controlled bandwidths.

The eight signals are sampled in the measure and sample circuit (27) through (34) before passed on to the control unit.

Assembly A6 (exclusive A6A1)
The eight sampled signals from the subassembly are compared in the Largest Detect Circuit (1) through (8) in order to detect which are active. If a signal is detected, (9) is used to synchronize a timing circuit used for frequency hopping.

The Second tone pulse suppressor and sync generator (10) receives a 100 kHz clock and a 20 kHz clock used to suppress the second tone in a tone sequence when frequency hopping. The enable of the suppression is made by the signal from (9).

The 100 kHz signal from the frequency standard is either passed directly through the LPF clock selector (11), or divided by two, to the lowpass filters .

The clock signal for the timing system, controlling the sampling system, is derived from the 100 kHz reference signal in the Timing clock selector (12) by dividing by either 5 or 50 in (12).

The timing system (13) is 3 cascaded counters with two counting lengths. One being used for Burst and Frequency hopping and one used for ALE, FEC and Burst record.

The address and data interface (14) uses the same address both for input and output data. Each time the module is addressed an acknowledge pulse is generated.

The morse key input (15) is used to control the sidetone generator. The morse key input accepts inputs, for control of the sidetone generator and generation of telegrams, from both an input on the rear of the module and from the front panel via the motherboard. For replay of recorded telegrams a BURST CTL is provided for microcomputer control of the sidetone generator.

The sidetone amplifier (16) is a low-frequency amplifier used to drive the speaker located in the front panel. The gain of the amplifier is controlled by a DC-voltage from the front panel.

The DC-voltages for the module are filtered in (17) and a - 5 V DC is made from the - 15 V.

The sidetone generator (18) is a simple sidetone generator controlled by the Morse key interface (15).

The sidetone is brought out on the line interface (19) for monitor purposes.

Assy 210818 Demodulator Subassembly **Schematic 1**

1. Input circuit

The AF signal from RX4010 must be fed to the LINE 1 input or the LINE 2 input depending on the type of the receiver.

From the factory W4, W5 and W6 are all strapped between pin 1 and 2.

The input uses a resistive attenuator to decrease the reflection on balanced input lines. The sensitivity can be adjusted, by R8, in a range of 20 dB.

2. Level display

The input level, adjusted in the input circuit, is displayed by 3 light emitting diodes. One diode (RED) to indicate a too high signal, one diode (GREEN) to indicate a correct signal level and one diode (YELLOW) to indicate a too low level.

3. 2500 Hz switchable bandpass filter

The bandpass filter has a fixed center frequency of 2500 Hz and a microprocessor controlled bandwidth between 250 and 400 Hz.

4. 2250 Hz fixed filter

The bandpass filter has a fixed center frequency of 2250 Hz and a fixed bandwidth of 250 Hz.

11. Frequency doubler, 2500 Hz -> 5000 Hz

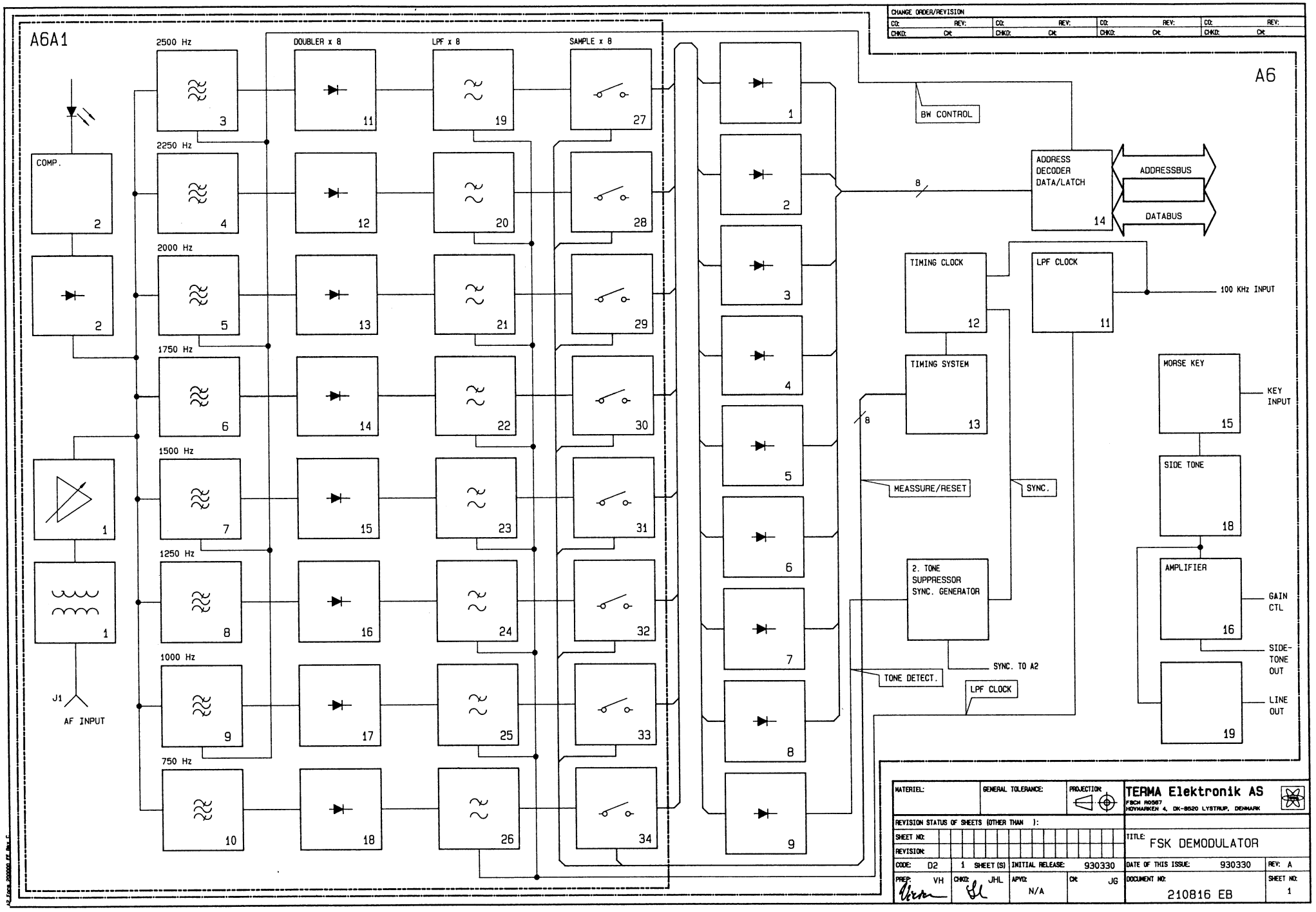
In order the decrease the detection time the signal is frequency doubled.
The frequency doubler is a full wave rectifier doubling the input frequency from 2500 Hz to 5000 Hz.

12. Frequency doubler, 2250 Hz -> 4500 Hz

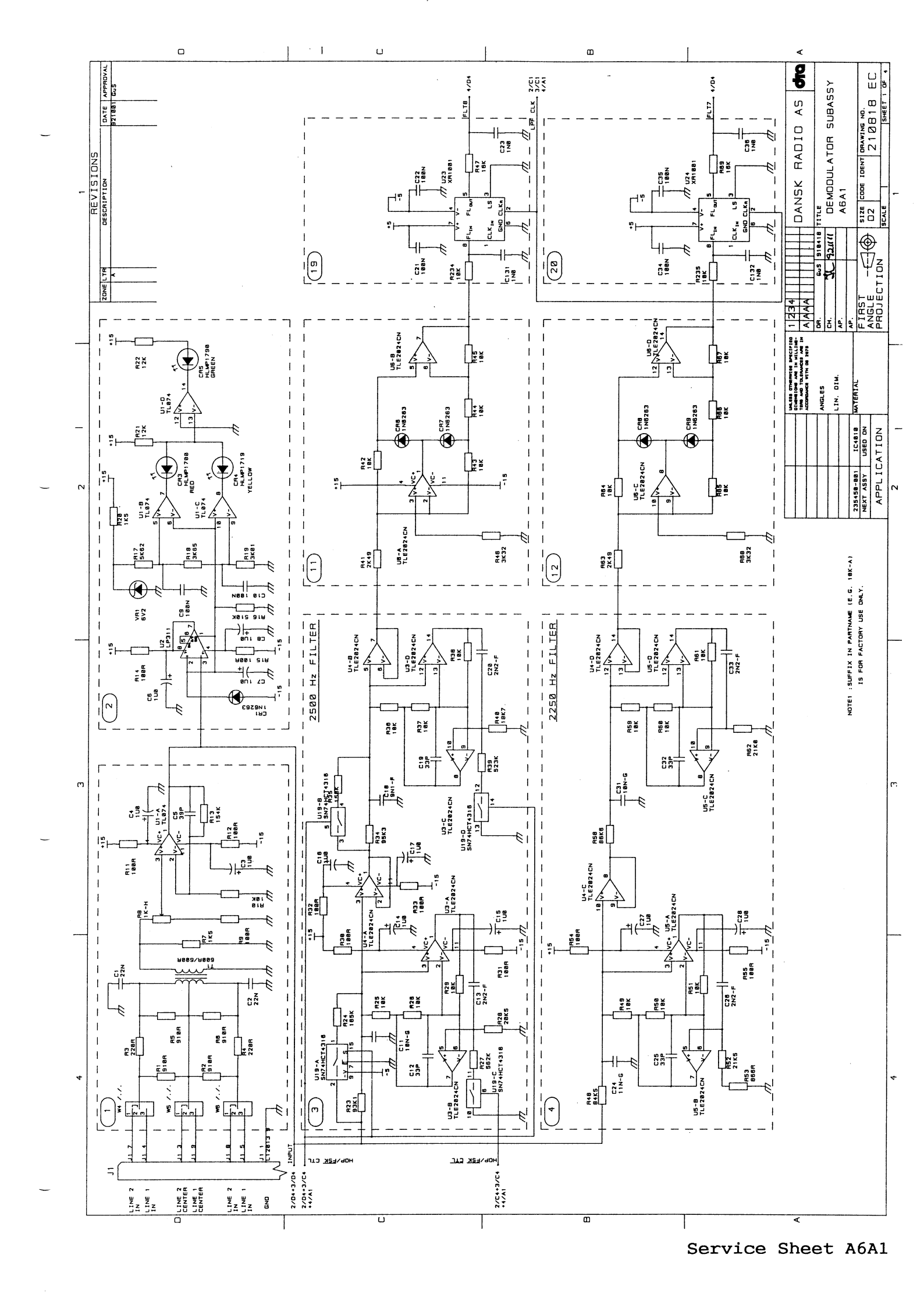
Same function as 11.

19/20. Lowpass filters

In order to suppress the high frequency components after the doubling the signal is lowpass filtered.
The lowpass filter is a switch capacitor filter controlled by a common LPF clock. The filter is terminated by a discrete lowpass filter.



Service Sheet A6



Service Sheet A6A1

5. 2000 Hz switchable bandpass filter
Same function as 3.

6. 1750 Hz fixed filter
Same function as 4.

7. 1500 Hz switchable bandpass filter
Same function as 3.

13. Frequency doubler, 2000 Hz -> 4000 Hz
Same function as 11.

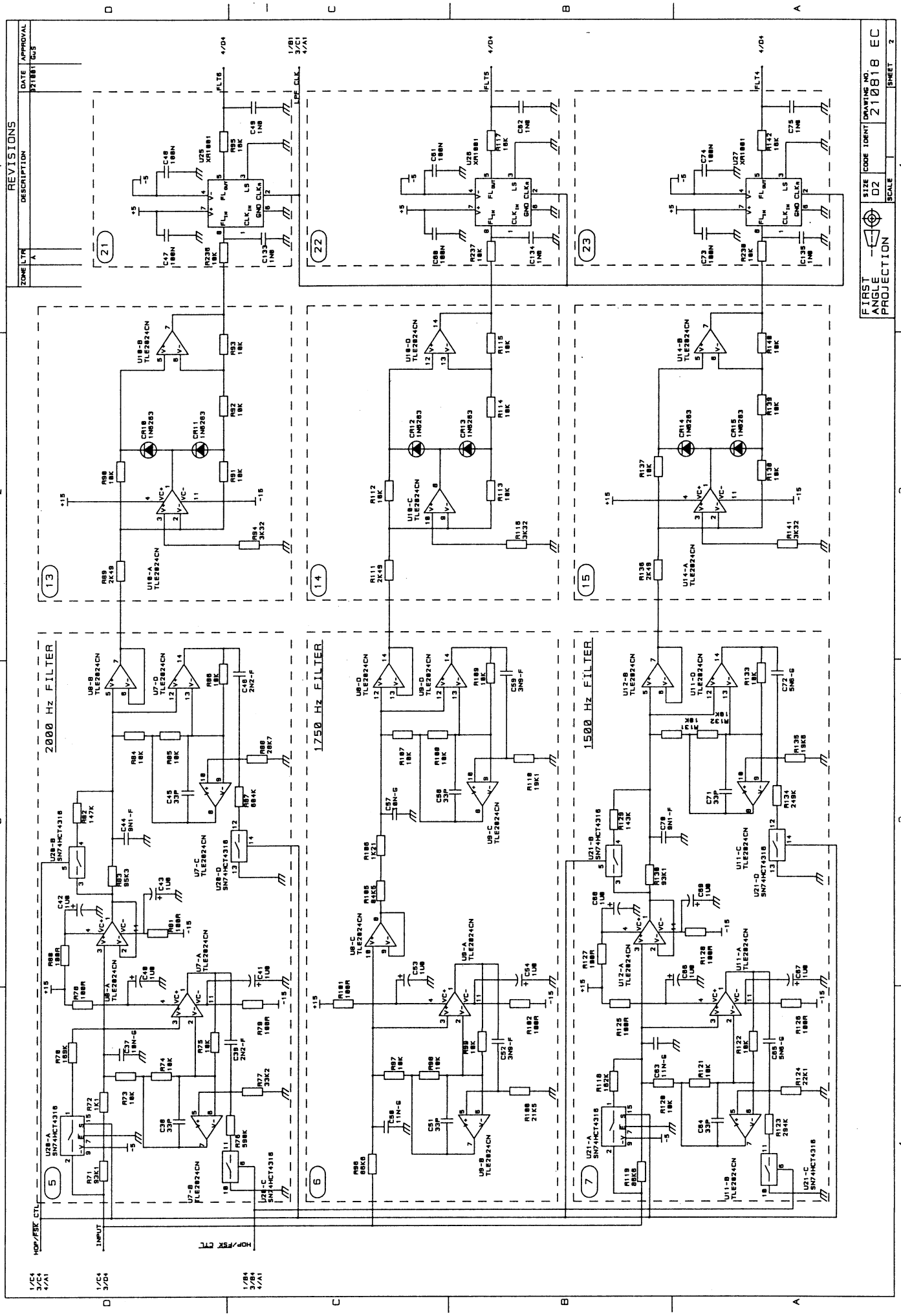
14. Frequency doubler, 1750 Hz -> 3500 Hz
Same function as 11.

15. Frequency doubler, 1500 Hz -> 3000 Hz
Same function as 11.

21. Lowpass filter
Same function as 19.

22. Lowpass filter
Same function as 19.

23. Lowpass filter
Same function as 19.



Service Sheet A6A1

8. 1250 Hz fixed filter
Same function as 4.

9. 1000 Hz switchable bandpass filter
Same function as 3.

10. 750 Hz fixed filter
Same function as 4.

16. Frequency doubler, 1250 Hz -> 2500 Hz
Same function as 11.

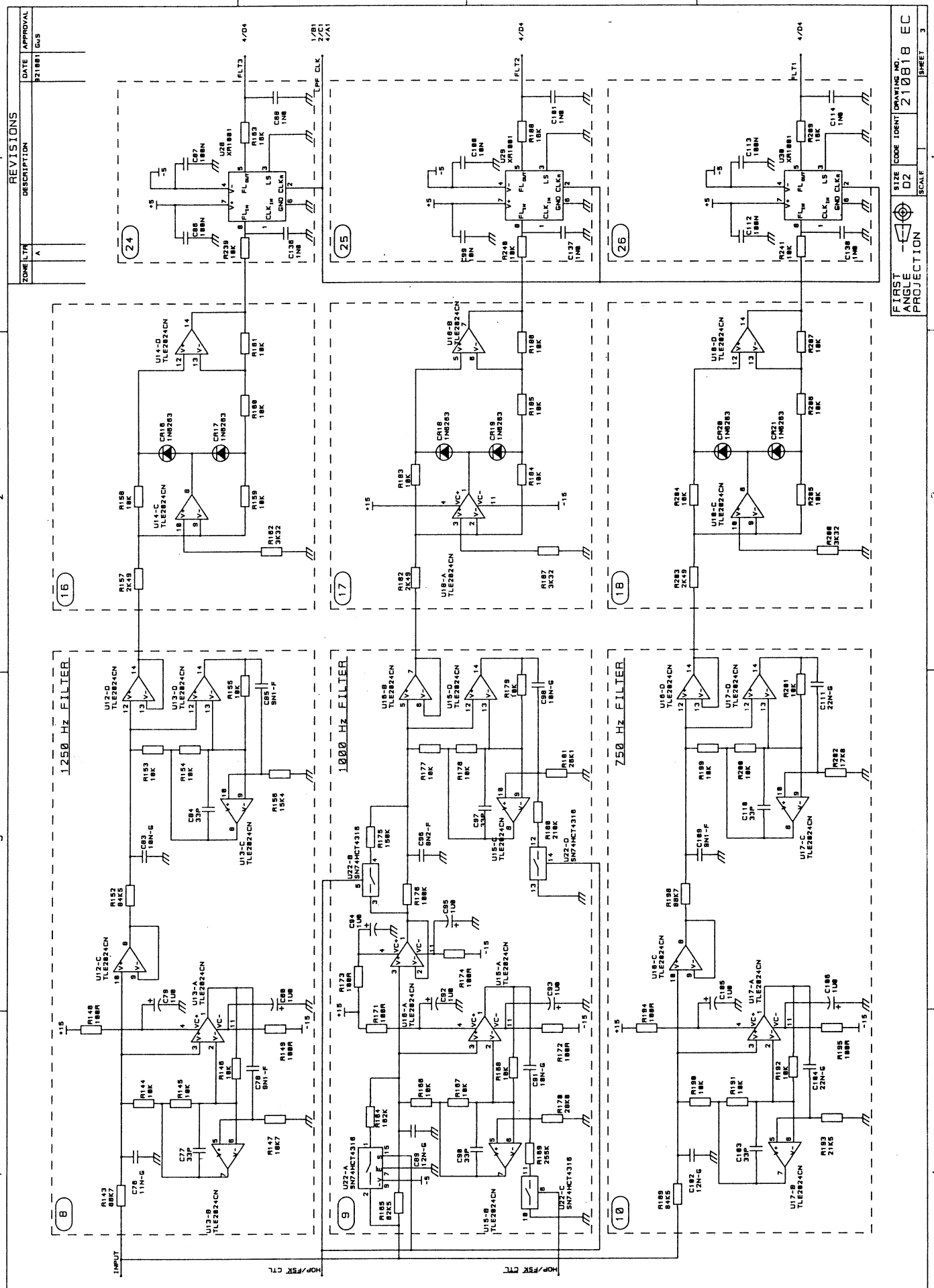
17. Frequency doubler, 1000 Hz -> 2000 Hz
Same function as 11.

18. Frequency doubler, 750 Hz -> 1500 Hz
Same function as 11.

24. Lowpass filter
Same function as 19.

25. Lowpass filter
Same function as 19.

26. Lowpass filter
Same function as 19.



Service Sheet A6A1

27. Measure and sample circuit
The measure switch U39a is used to sample the appropriate filter outputs. The enabling of the switch is controlled by the mode information and timing circuit.
The switch U39b is used to reset the Hold condensator C115 before a measurement is made. The Reset is controlled by the timing system.

28. Measure and sample circuit
Same function as 27.

29. Measure and sample circuit
Same function as 27.

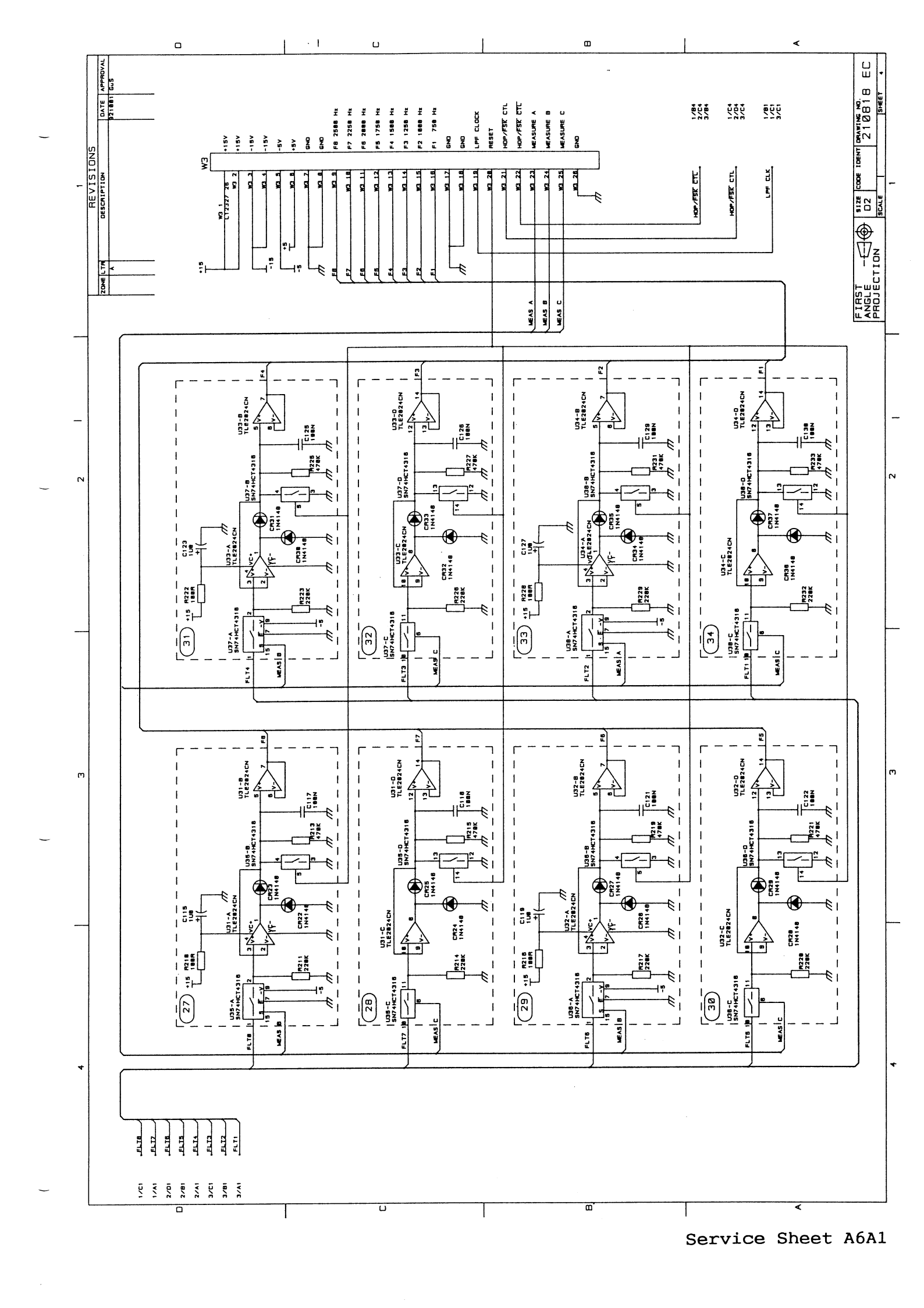
30. Measure and sample circuit
Same function as 27.

31. Measure and sample circuit
Same function as 27.

32. Measure and sample circuit
Same function as 27.

33. Measure and sample circuit
Same function as 27.

34. Measure and sample circuit
Same function as 27.



Service Sheet A6A1

1. Largest Detect Circuit, 2500 Hz
The 2500 Hz signal amplitude is attenuated by 2 dB and compared with the 7 other signals. If the 2500 Hz signal is 2 dB greater than the largest of the other signals a logic 0 is generated.

2. Largest Detect Circuit, 2250 Hz
Same function as 1

3. Largest Detect Circuit, 2000 Hz
Same function as 1.

4. Largest Detect Circuit, 1750 Hz
Same function as 1.

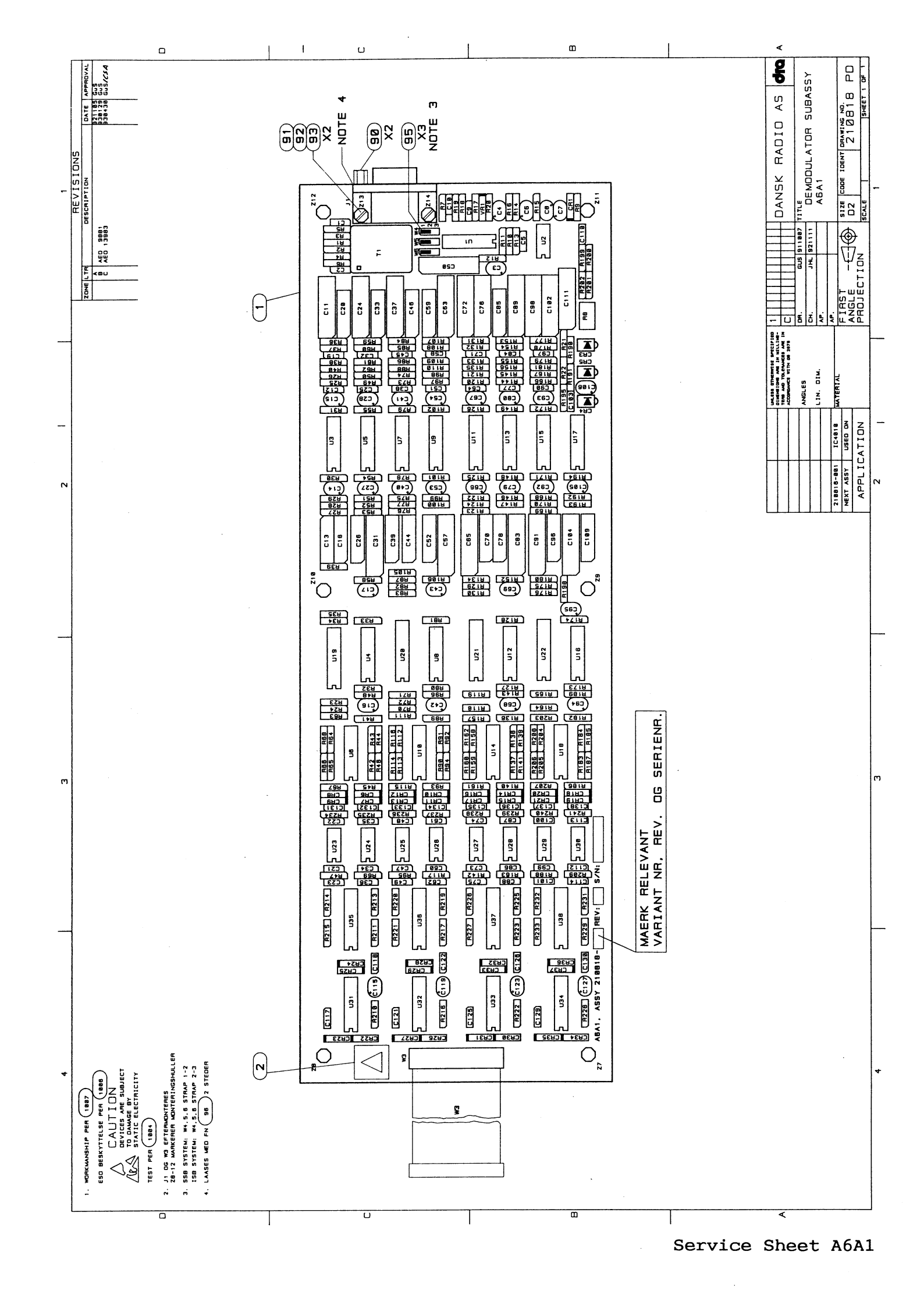
5. Largest Detect Circuit, 1500 Hz
Same function as 1.

6. Largest Detect Circuit, 1250 Hz
Same function as 1.

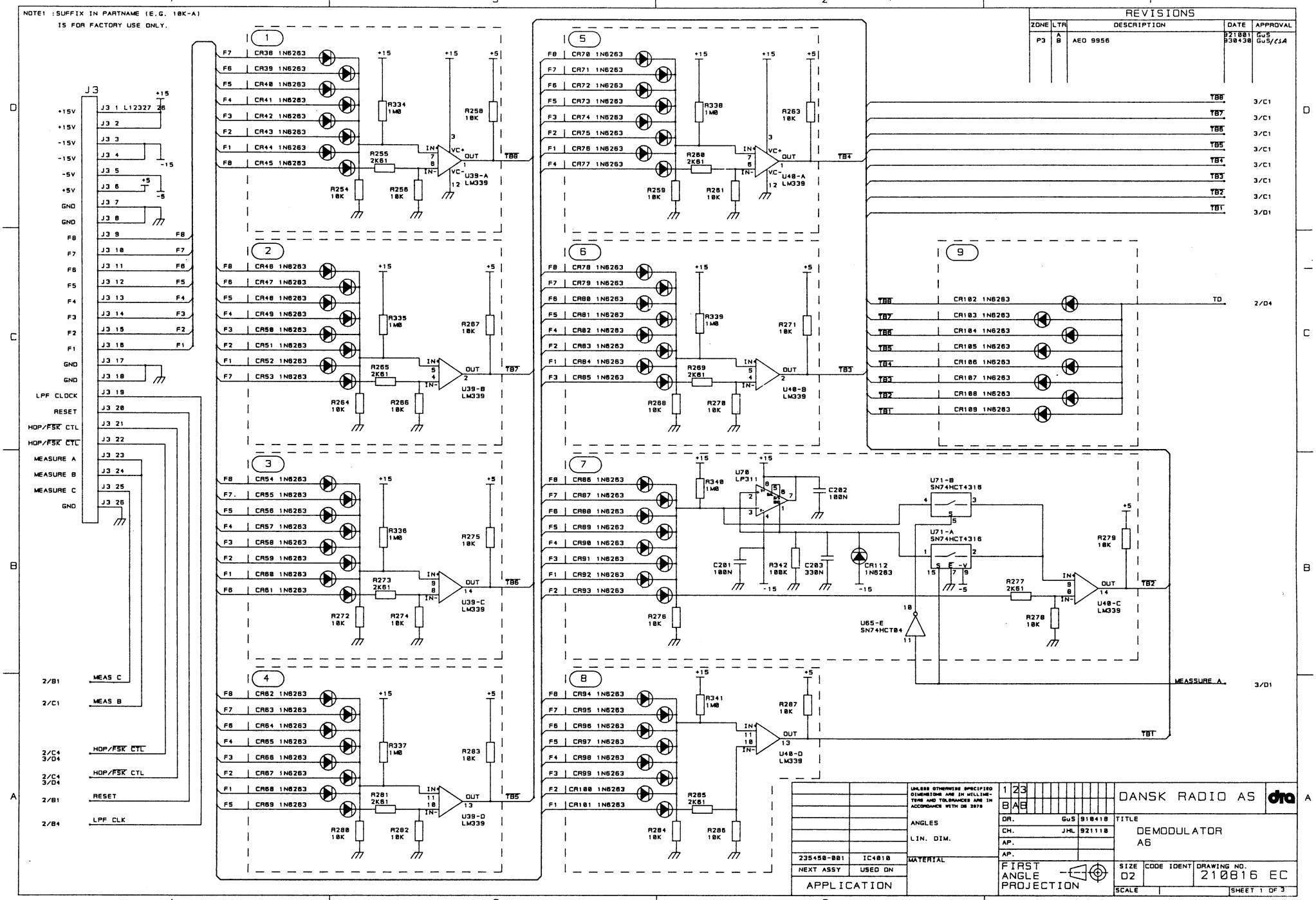
7. Largest Detect Circuit, 1000 Hz
Same function as 1, except that a peak detector (U70) is inserted in burst mode to suppress noise spikes.

8. Largest Detect Circuit, 750 Hz
Same function as 1.

9. Tone detected signal
The tone detected signal is used in frequency hopping to generate a synchronization signal for the frequency hop timer.



Service Sheet A6A1


NOTE1 :SUFFIX IN PARTNAME (E.G. 10K-A) IS FOR FACTORY USE ONLY.
REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
P3 A AEO 9956 921001 GuS
B 930430 GuS/CSA
J3
+15V
+15V
-15V
-15V
-5V
+5V
GND
GND
F8
F7
F6
F5
F4
F3
F2
F1
GND
GND
LPF CLOCK
RESET
HOP/FSK CTL
HOP/FSK CTL
MEASURE A
MEASURE B
MEASURE C
GND
MEAS C
MEAS B
HOP/FSK CTL
HOP/FSK CTL
RESET
LPF CLK
U39-A LM339
U39-B LM339
U39-C LM339
U39-D LM339
U48-A LM339
U48-B LM339
U48-C LM339
U48-D LM339
U70 LP311
U71-A SN74HCT4316
U71-B SN74HCT4316
U65-E SN74HCT04
MEASSURE A
TD
DANSK RADIO AS
DEMODULATOR A6
DRAWING NO. 210816 EC
SIZE D2
SHEET 1 OF 3
FIRST ANGLE PROJECTION
APPLICATION
Service Sheet A6

10. Second tone pulse suppressor and sync generator

In order to generate a sync pulse from the first tone, in a frequency hop sequence, for the hop timer, a programmable counter is initiated by the detection of the first tone in a tone sequence.
The counter can be preset, through S1 to S128, to generate a sync pulse after a predetermined time, and thereby suppress the detection of the succeeding tone in the sequence.

11. LPF clock selector

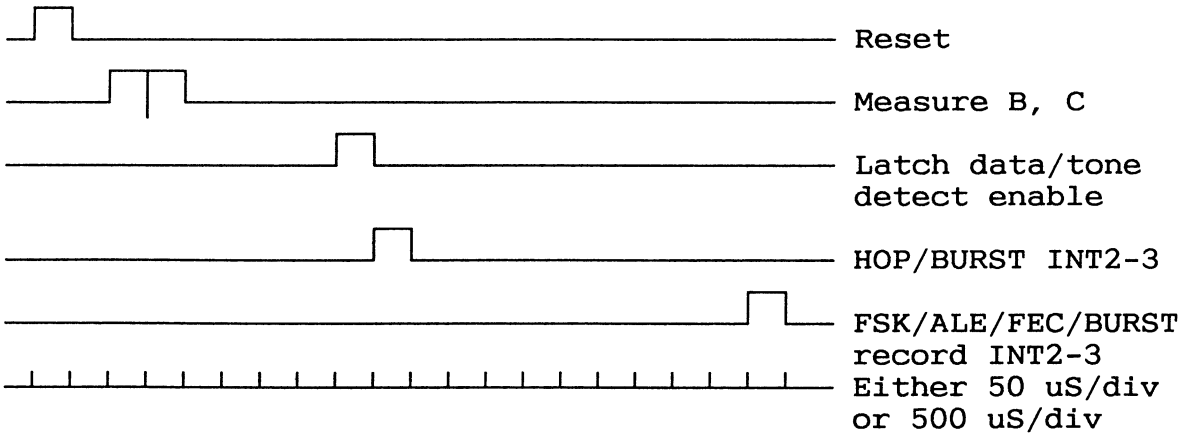
The 100 kHz reference is, in frequency hop and burst mode, fed directly to the switch capacitor lowpass filters through U55a. In FEC and ALE the 100 kHz are divided by 2 in U48a before fed to the lowpass filters.

12. Timing clock selector

In order to limit the amount of data for the code processor the timing measurement system clock can be selected between 2 and 20 kHz.
In burst message record mode the 100 kHz reference signal is divided by 50, through U49 and U50a, giving 0,5 mS pulses. In frequency hopping, FEC, ALE and burst the 100 kHz signal is divided by 5 in U49, giving 50 uS pulses for the timing system.

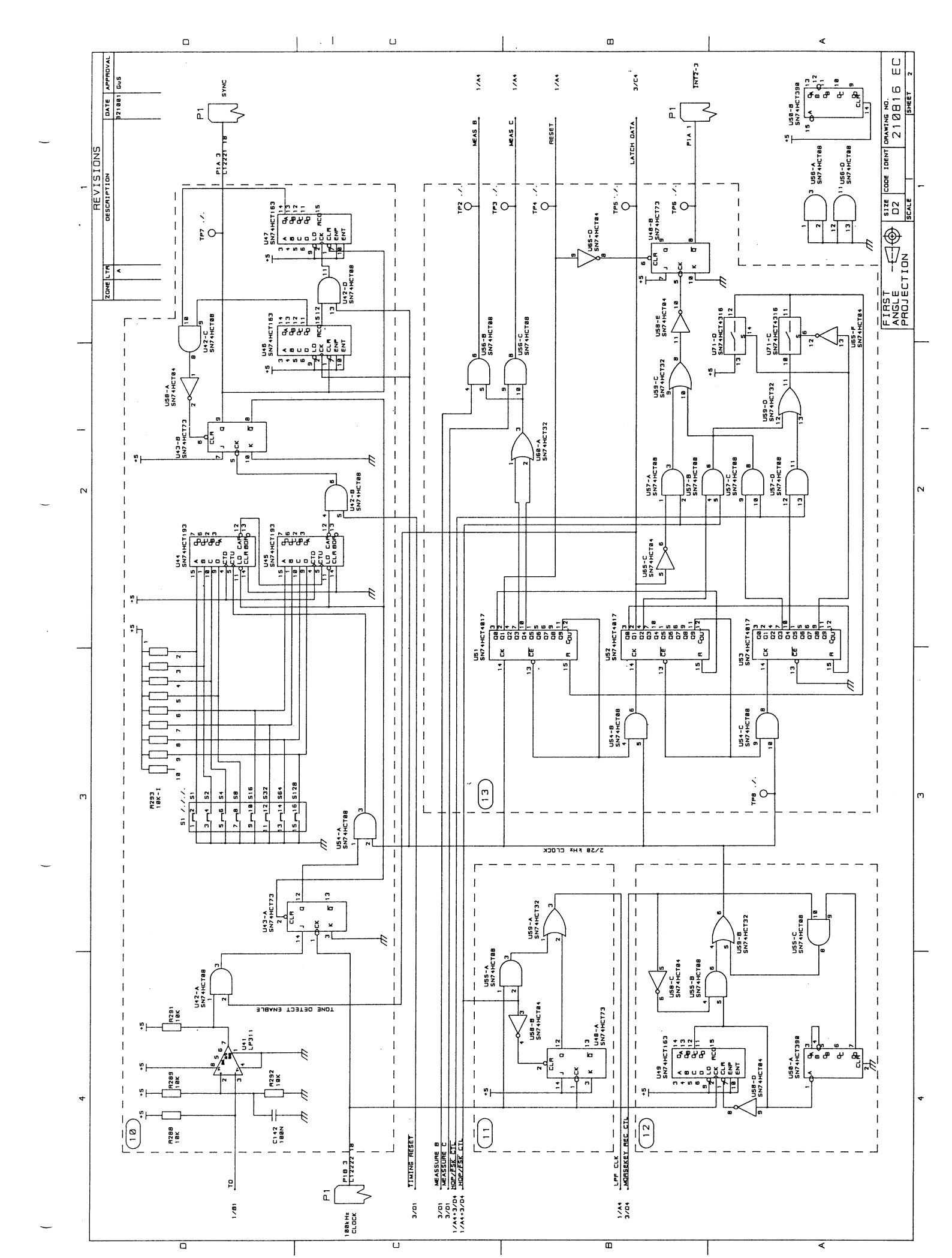
13. Timing system

The timing system is made by three Johnson counters with a maximum length of 20 pulses. This length depends on the mode. Depending on the mode data are transferred to the code processor at a rate of either 0,5 mS (HOP/BURST), 1 mS (ALE/FEC) or 10 mS (BURST record).
The timing sequence is shown below:



Timing sequence

Service Sheet A6



Service Sheet A6

14. Address decoder
The code processor controls the input data for the demodulator through the address decoder U61 and the input latch U63.
The data from the demodulator are read by the code processor through the address decoder U62 and the output latch U64.
Through U55d, U65b and Q1 the code processor receives acknowledge each time the demodulator is addressed.

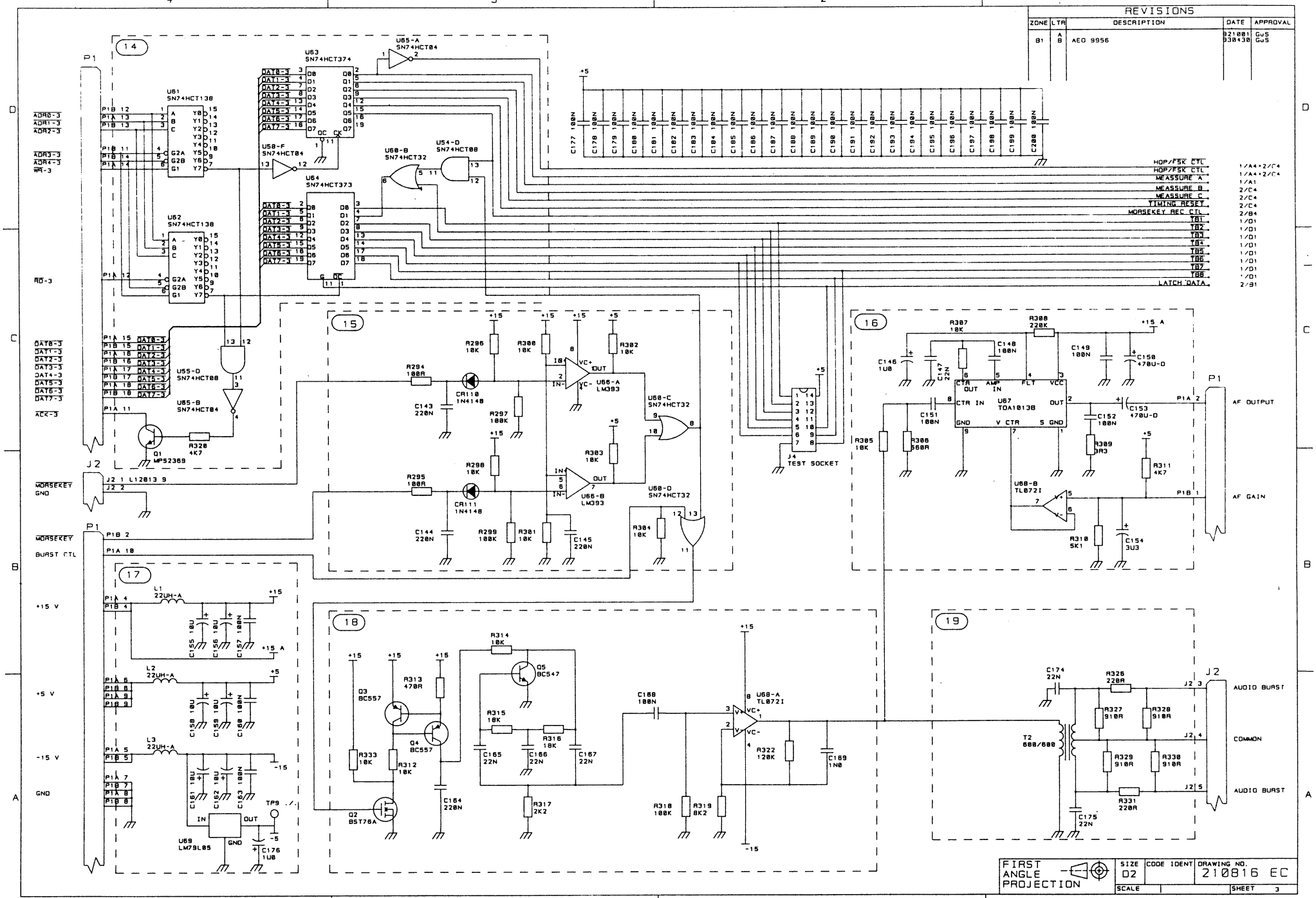
15. Morse key input
The morse key input interfaces the input from the front panel, the code processor and the input on the demodulator.

16. Sidetone amplifier
The sidetone amplifier drives a built-in loudspeaker in the front panel.

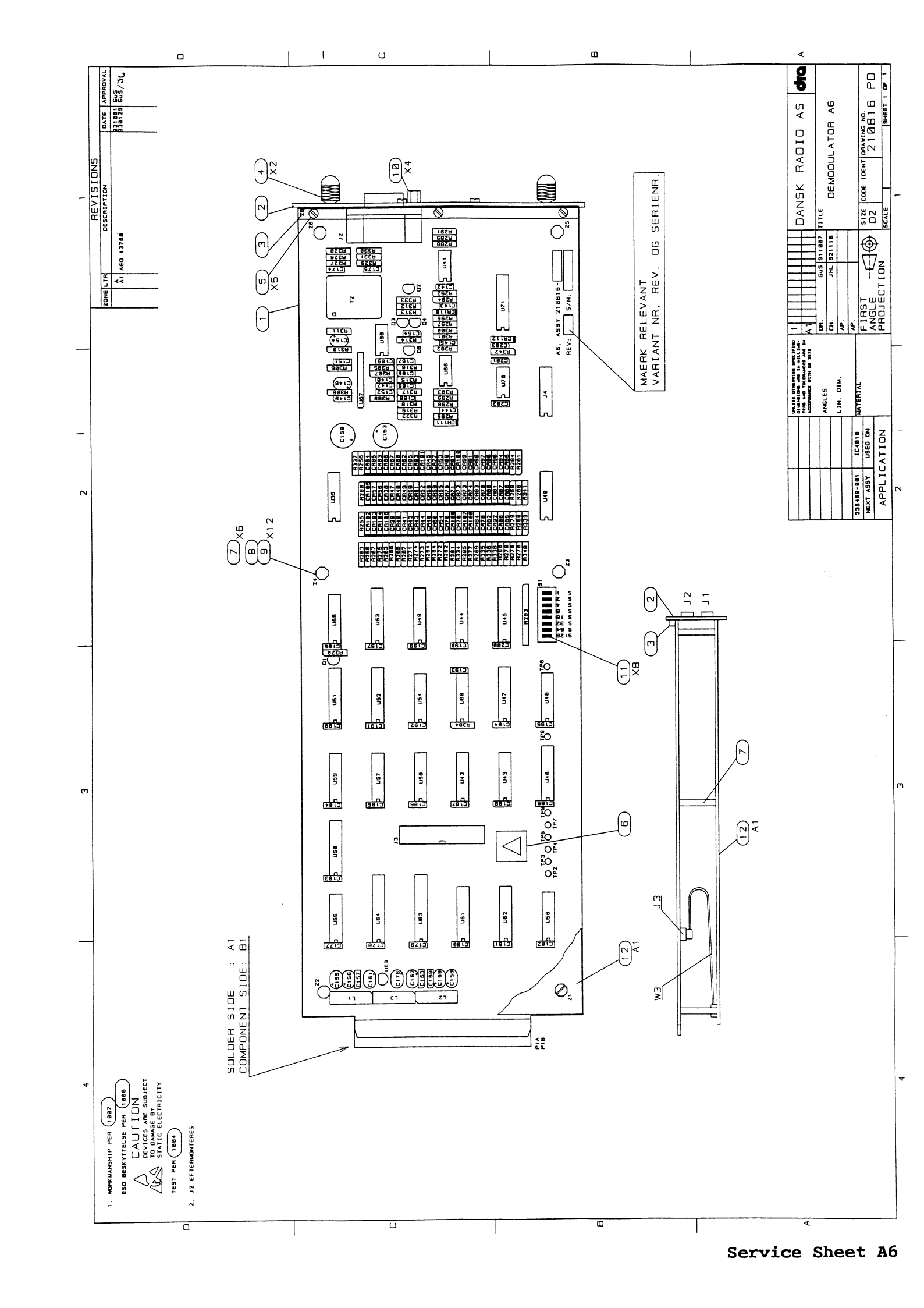
17. Power supply filters
U69 generates a - 5 V from the - 15 V.

18. Sidetone generator
The sidetone generator generates a sidetone of approximately 800 Hz controlled by the morse key input. The sidetone generator is buffered and amplified by U86a.

19. Line interface
The line interface converts the impedance of the sidetone buffer/amplifier to 600 ohm, with an output level of approximately 0 dBm.



Service Sheet A6



Service Sheet A6

ASSY 237688, FSK MODULATOR

Service Sheet A6

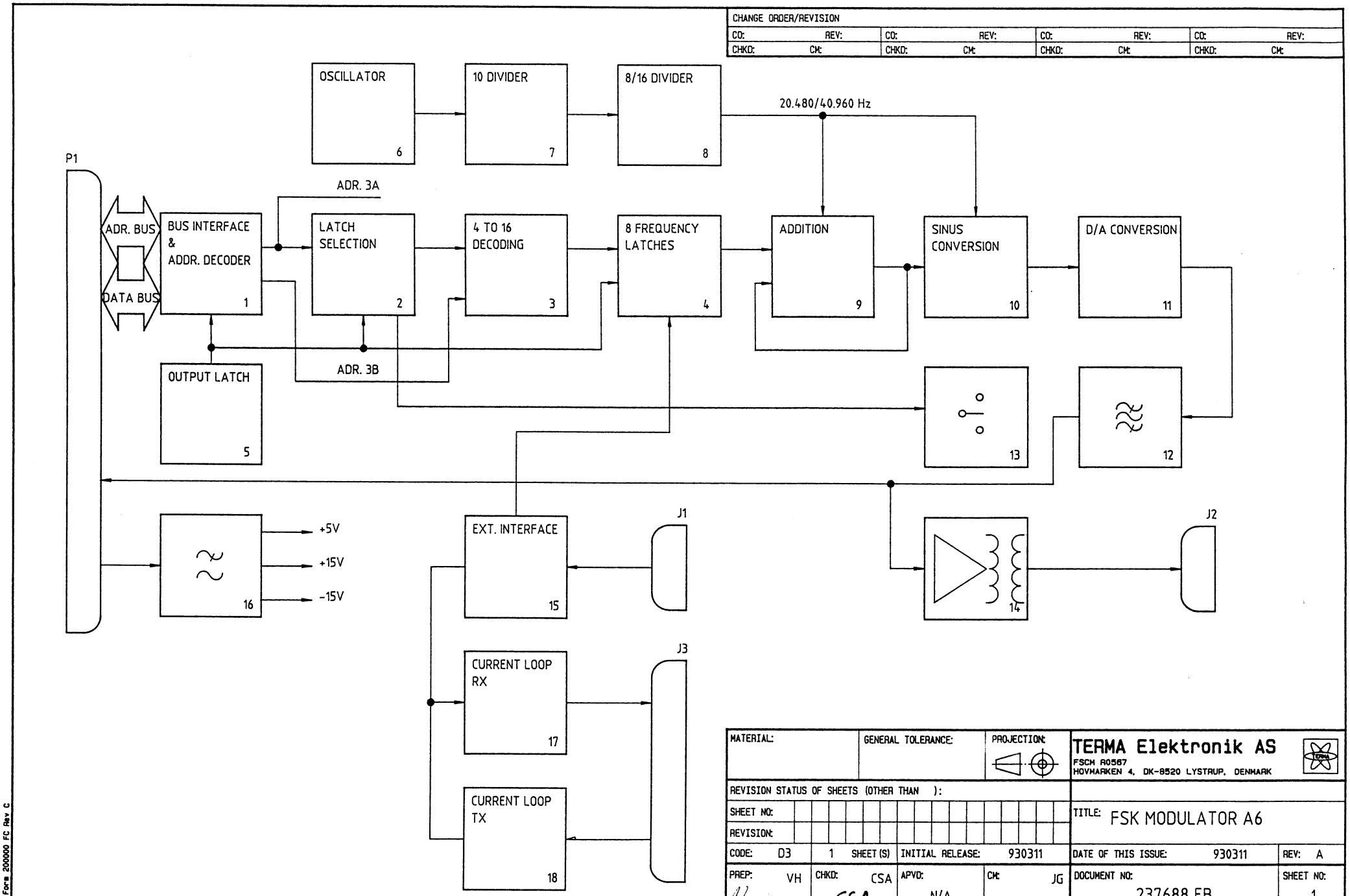
The principle in the FSK Modulator is a digital sine wave generator.

The frequencies are latched into the modulator from the micro-processor one by one. One of the frequencies is selected by the external interface and added to the sum from the previous addition. The addition is performed 20480 or 40960 times per second.

The output which is constantly increasing until 4095 where it starts from 0, is converted to a digital sine wave curve.

The digital sine wave curve is converted to an analogue voltage and filtered through a 3 kHz low pass filter. The filtered signal is transferred to the motherboard and to the rear panel connector J2.

Transmission data can be interfaced from RS232 or a loop current circuit. The transmitted data can be routed to the Rx loop output (loopback) together with the received data if this is needed, to print the transmitted data.



Service Sheet A6

A3 Form 200000 FC Rev C

1. Bus interface and address decoding

U1 decodes the address. 2 addresses are used, 3AH addresses the frequency latch selections and 3BH addresses the frequency latches.

2. Latch selection

In address 3AH, four data bits are used for selection of frequency latches. Four data bits are used for controlling of the Modulator.

3. 4-to-16 decoding

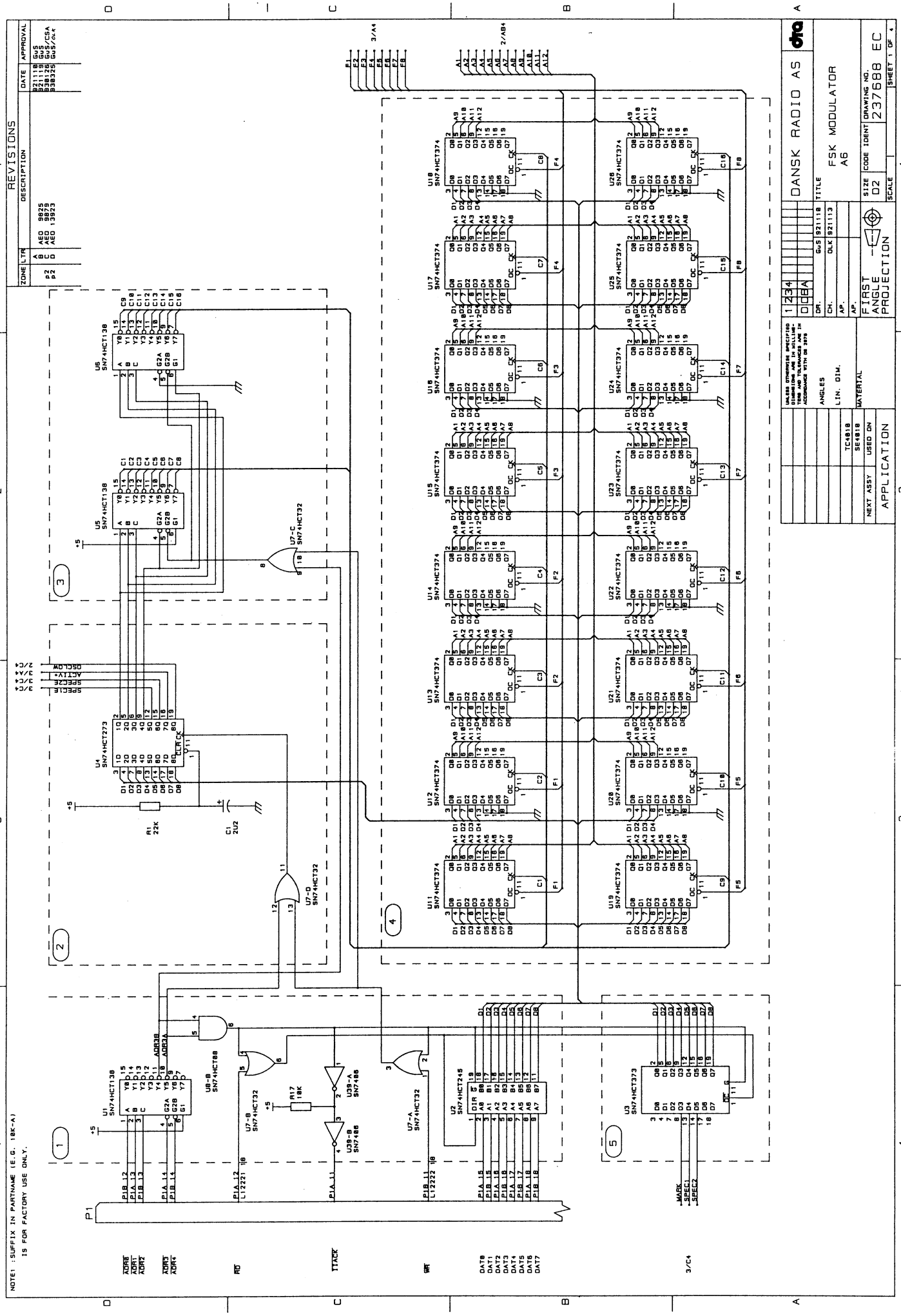
In address 3BH the four bits are decoded in U5 and U6 for enabling 1 of 16 latches.

4. Frequency latches

The total frequency information from the microprocessor consists of 12 bits for each of the eight possible frequencies.
Freq 1 is latched into U11 and U12
Freq 2 is latched into U13 and U14
Freq 3 is latched into U15 and U16
Freq 4 is latched into U17 and U18
Freq 5 is latched into U19 and U20
Freq 6 is latched into U21 and U22
Freq 7 is latched into U23 and U24
Freq 8 is latched into U25 and U26

5. Output latch

U3 latches data from the modulator to the microprocessor.



Service Sheet A6

6. Oscillator

The oscillator consists of a crystal with the frequency 3.2768 MHz.

7. 10-divider

U27 is a decimal counter. The output at TP 3 has the frequency 327.68 kHz.

8. 8/16-divider

U28 is a binary counter. The output at TP4 has the frequency 40.96 kHz and the output at TP 5 has the frequency 20.48 kHz. The microprocessor selects the frequency to be used in the modulator.

9. Addition

The 12 bits from a pair of frequency latches are added in U29, U30 and U31 to the result from the previous addition 20480 or 40960 times a second. The previous result is stored in U32 and U33. U32 and U33 are reset when the modulator is not ACTIVE. This ensures that an addition always starts from 0.

10. Conversion to a sine wave curve

The 12 bits result from the addition is converted in the EPROM U34 to an 8 bit digital sine wave curve and latched into U35.

11. Digital to analog conversion

The latched 8 bits sine wave curve is converted to analog curve in U36.

12. Filtering

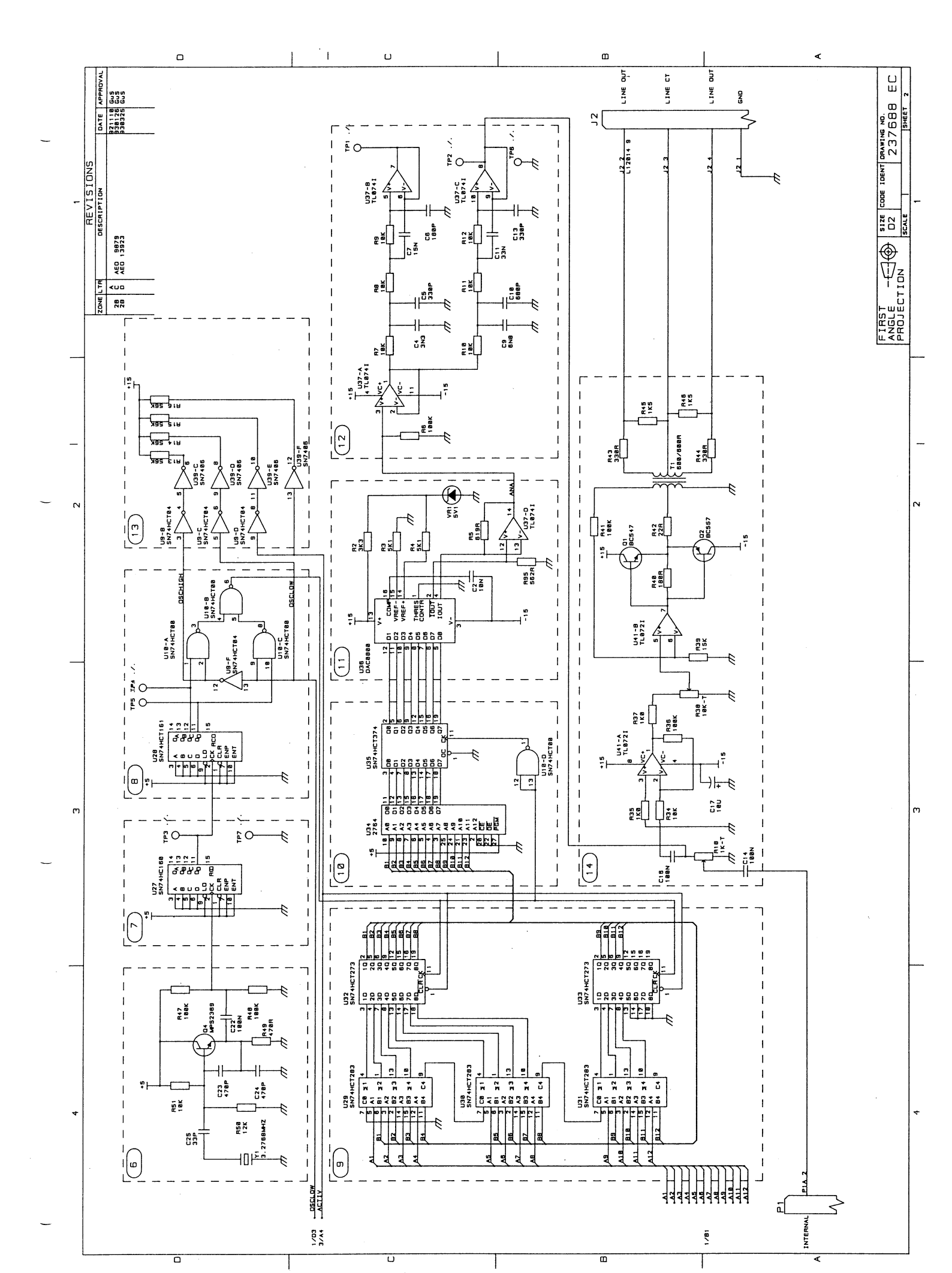
The signal is lowpass filtered in a 3 kHz filter.

13. Filter selection

This circuit is not used.

14. Output amplifier

The signal is attenuated by R18/P1, amplified by U41 and via T1 fed to J2. The output impedance at J2 is 600 ohms and the level is adjustable by means of R38 between -20 dBm and +10 dBm.



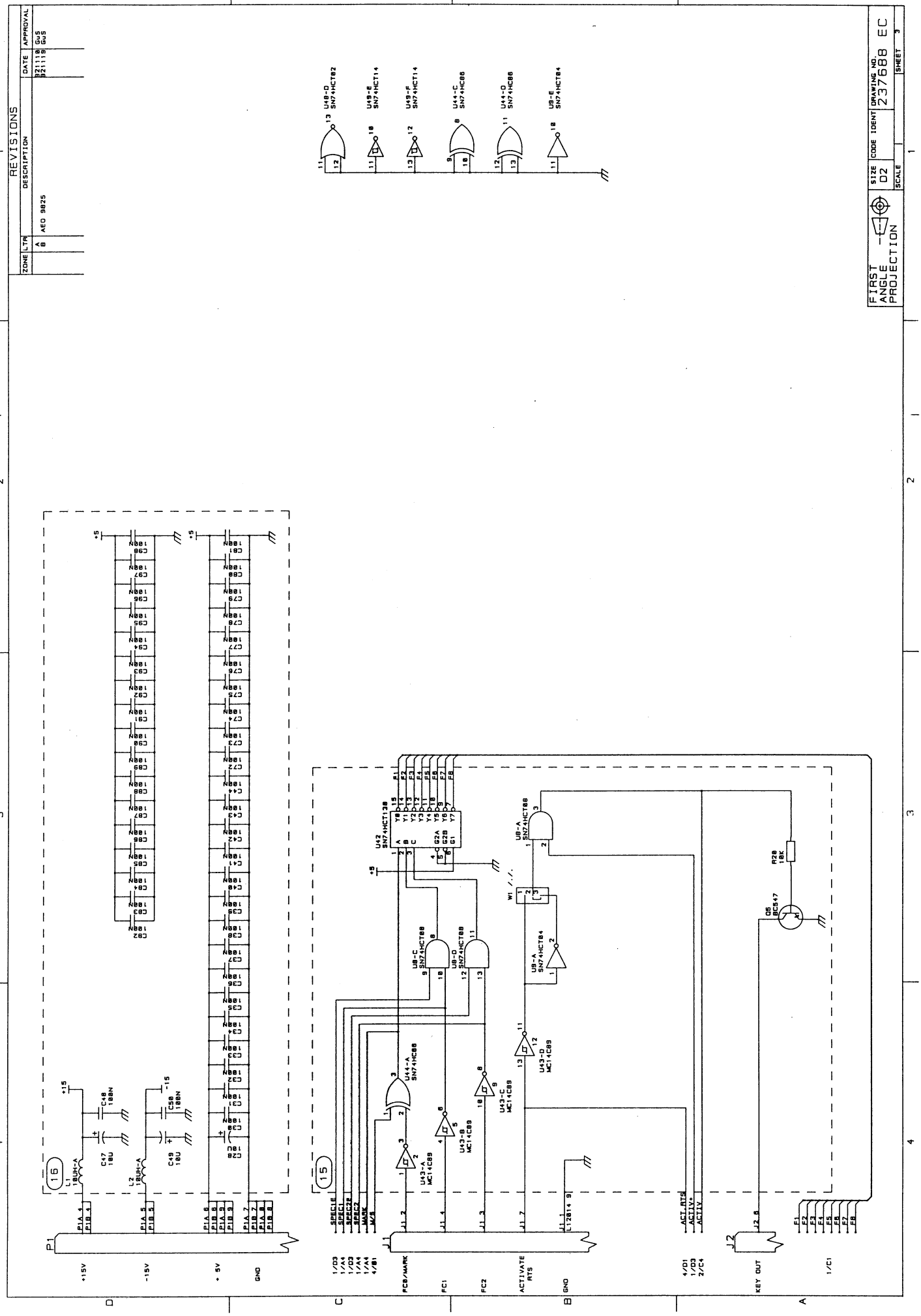
Service Sheet A6

15. External interface

Five RS232C signals may be connected to J1.
FC0/MARK, FC1 and FC2 selects the frequencies. FC1 and FC2 can be disabled from the microprocessor. All three signals can be read from the microprocessor.
ACTIVATE may be active high or low depending of the jumper on W1. The signal is "ANDed" with a signal from the microprocessor. The output, ACTIVE enables the modulator and is connected to J2 through Q6.
RXD IN connects signals from a demodulator board to a teletype machine.

16. Filter

Suppresses hum and noise on the supply voltages to the assembly.



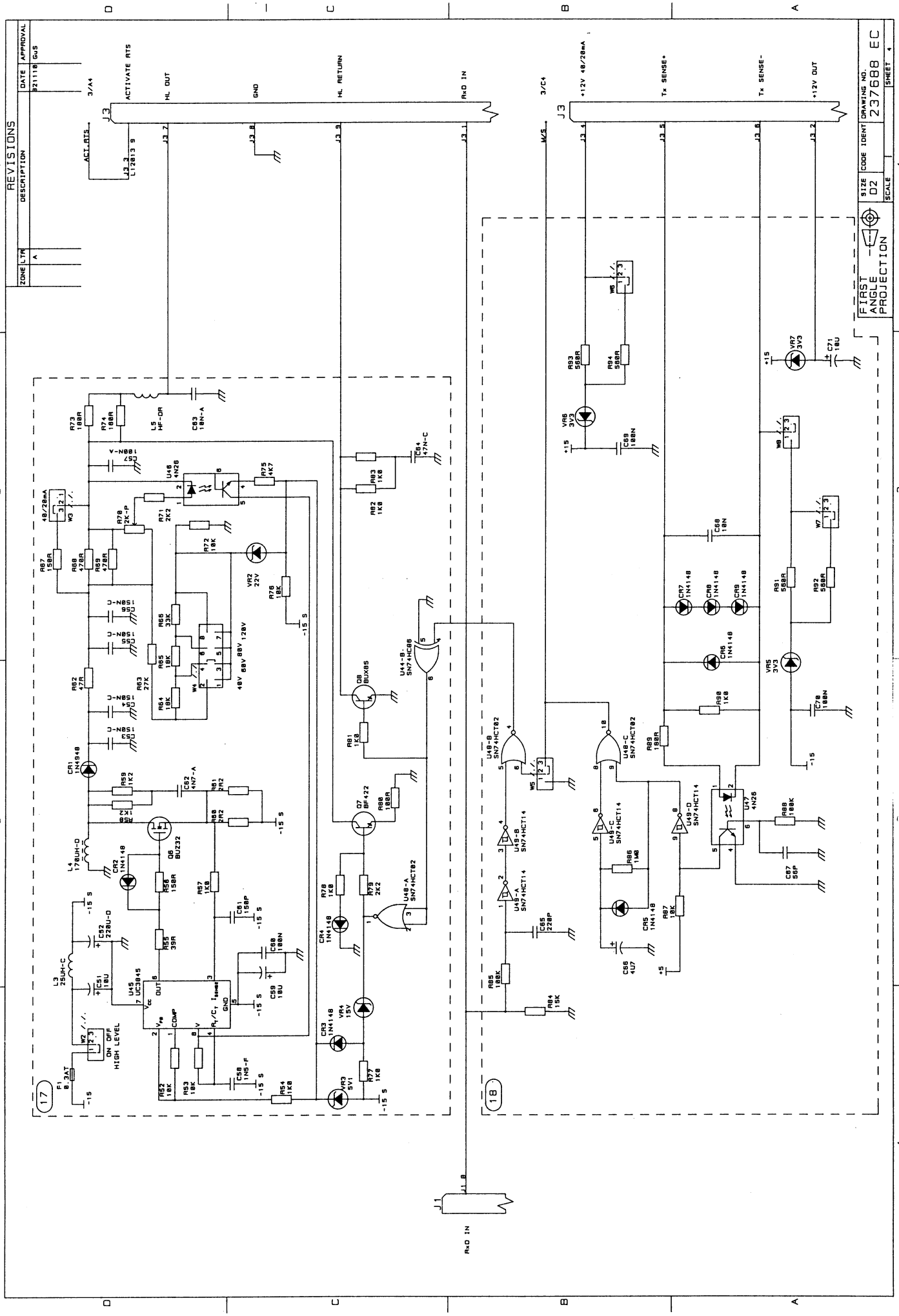
Service Sheet A6

17. High-level power supply

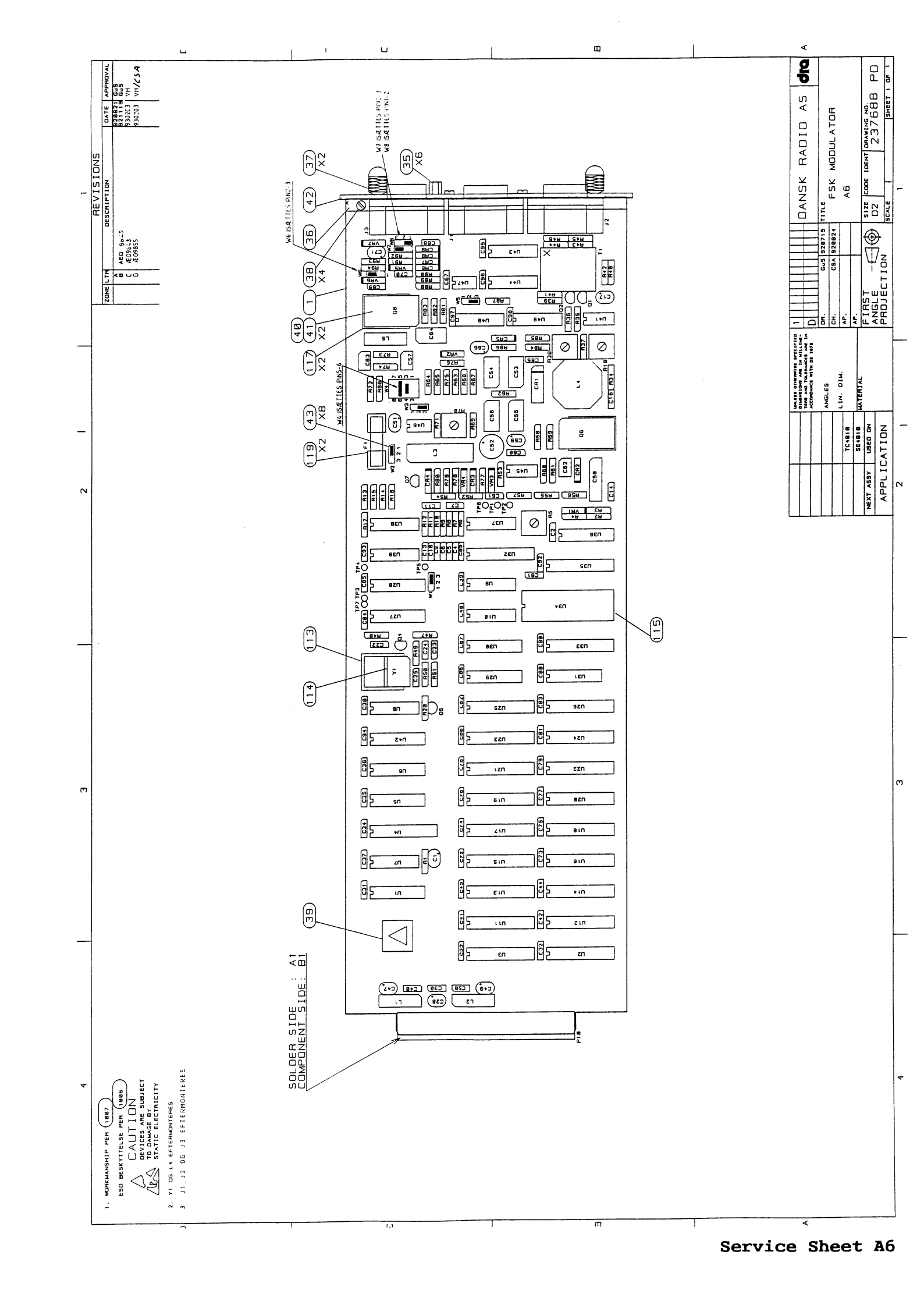
The circuit with U45 and L4 is a current mode power converter that can be turned ON (Mark) or OFF (Space) via U44-B. Current and open circuit voltage are strappable. Q8 should be used as loop current return when operating highly inductive telex equipment.

18. Current loop interface

The TX sense circuit is a floating current detector with opto-coupler U47. It can be placed in series with the TX or RX current loop. The circuit around U48-C makes it possible to leave the TX sense pins open when not used, because it returns to Mark when sensing a Space or an open circuit for more than 5 sec. For low level current loop purposes 20 or 40 mA +/-12V are available.
If a TX key is required besides the teletype machine, a +12V output can be used in combination with the RTS input.



Service Sheet A6



Service Sheet A6

ASSY 487740, MICROCOMPUTER ASSEMBLY

Service Sheet A8

The assembly consists of an 8085 microprocessor large scale integrated circuit that controls all basic functions within the exciter.

The operating system software for the microcomputer is stored in three programmable read-only memories (PROM's). Each PROM is capable of storing 16K x 8-bit words.

A random access memory chip (RAM), capable of storing 8k x 8-bit words, is required for the temporary storage and manipulation of input and output data. During power failure and receiver standby, the RAM is powered from a 3V battery back-up preventing interruptions from disturbing the stored data.

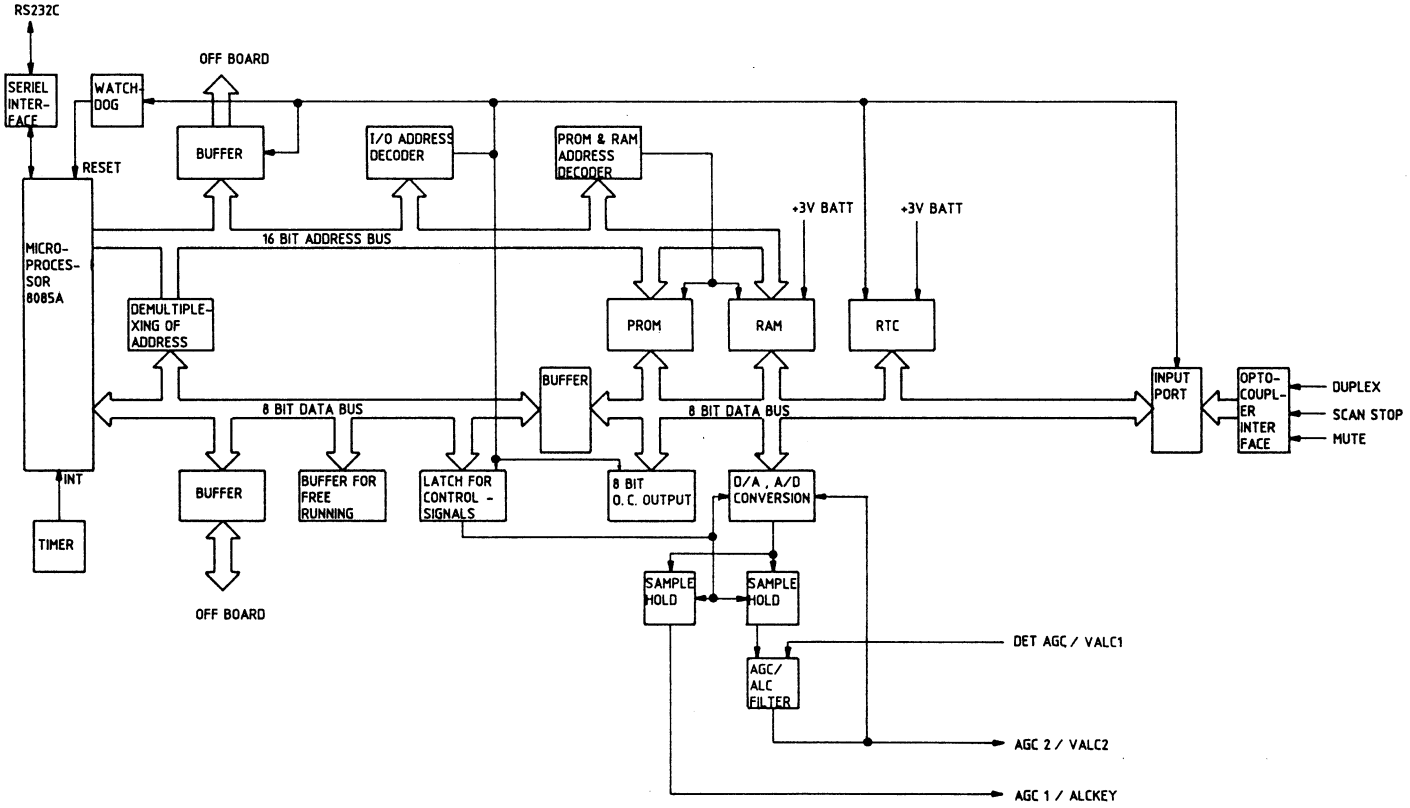
Various buffers and decoders assure proper drive levels and timing to and from various circuits and input/output ports.

A battery back-upped real time clock integrated circuit is mounted to ensure correct time keeping even during power failure or exciter standby.

Timing of the assembly is via a 6.144MHz crystal oscillator contained in the CPU.

The Microprocessor Assembly performs the automatic level control ALC. Analogue loops provides fast attack ALC-levels for the IF assembly. The peak voltage of **VALC1** is held by a sample and hold circuit. As long as **ALCKEY** is a logical "1", the microcomputer will approach **VALC2** to **VALC1**.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		ÆM88110	18.11.88	VH
		ÆM89032	9.5.89	VH



471909	RC4000
471712	RX4000
488240	RX4009
488100	SE4010
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075

ANGLES

LIN. DIM.

MATERIAL

DR.	VH	22.5.87
CH.		
AP.	NIF	11.05.87
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
CONFIGURATION
MPU BOARD
RC4000, RX4000, RX4009, SE4010

SIZE	CODE IDENT	DRAWING NO.
A2		48 77 40-B
SCALE		SHEET 1 OF 1

Service Sheet A8

Assy 487740, Microcomputer Assembly **Schematic 1**

1. Microprocessor Circuit

This circuit contains an 8085 microprocessor with associated 6.144MHz crystal for internal clock-stabilization. U12 is an eight bit latch for multiplexing address line **DB0** to **DB7**. U13 is a buffer for command signals etc.

2. Watch-Dog

Watch-dog for surveillance of correct start-up and system software operation.

At system start-up R4 and C1 ensures that a reset pulse of approx. 10msec is generated. This pulse is routed to the microprocessor through U2.

U2 is a retrigger astable multivibrator with a period of 1sec. Under normal operation, the software ensure that U2 is retriggered at appropriate intervals so that the reset signal to the microprocessor is disabled. Appearance of software error causes the retrigger to cease and the reset pulse generation will start-up.

3. 15msec No-Acknowledge Timer

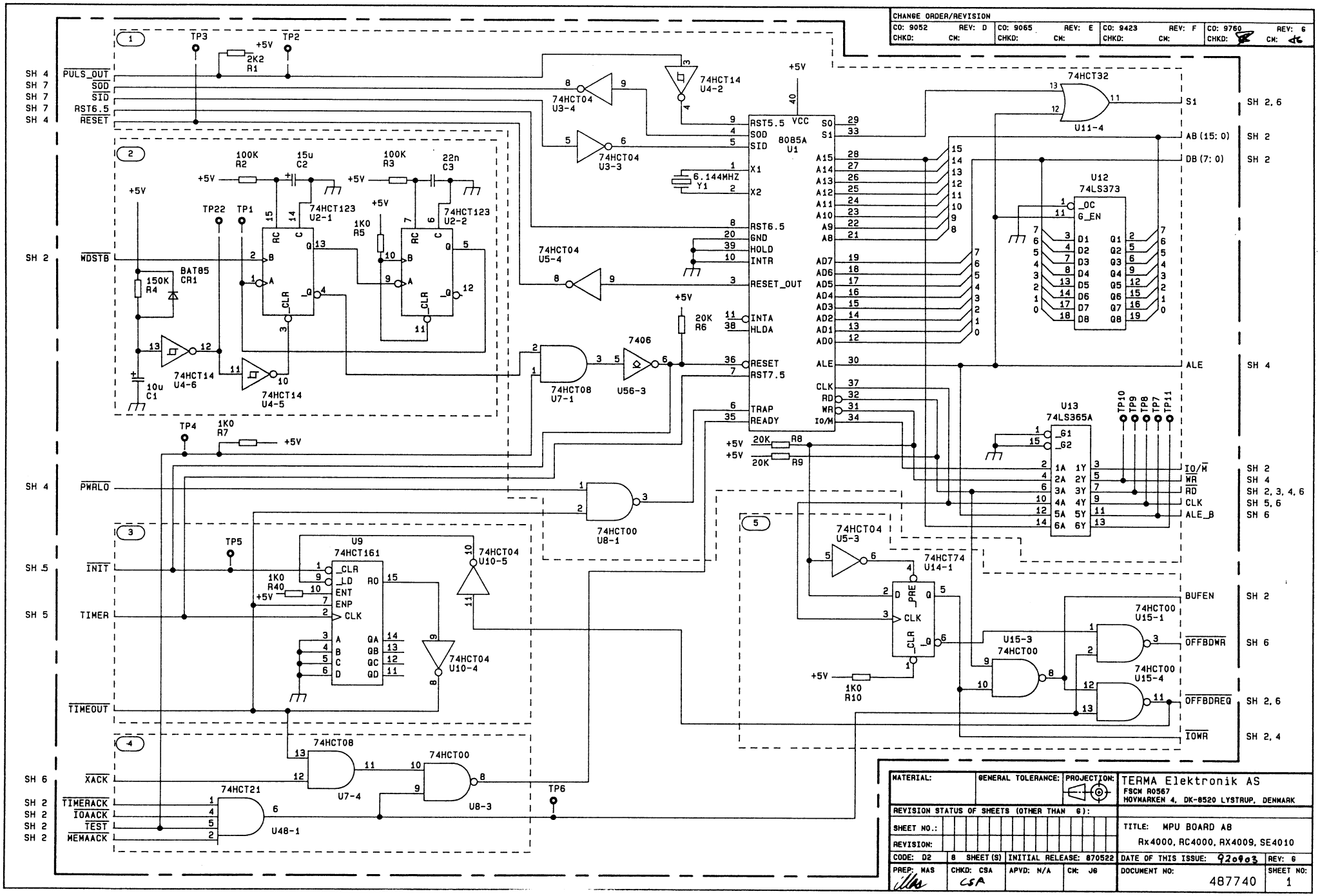
This timer starts counting when **OFF BD REQ** goes low. If the timer counts out, no acknowledge signal has been received within the last 15 msec, and a trap-interrupt is generated to the micro-processor. In normal operation, acknowledge signals should be received within 15 msec.

4. Acknowledge Network

The circuit converts the different acknowledge signals to a ready-signal to the microprocessor.

5. OFF Board Request

The J/K flip-flop U14 delays the start of the **WR**-signal one half of a clock period which ensures that **BUFEN**-signal delays the enable of buffer U17 in accordance with the timing. **OFF BD REQ** and **OFF BD WR** are only generated if no acknowledge signal on board has been received before start of **BUFEN**.



Service Sheet A8

6. Test Buffer
U16 is an 8 bit buffer which is enabled during "free-running", i.e. when **TEST** is low. When "free-running" is selected, U16 forces the microprocessor to read NOP-instructions, regardless of the microprocessor addressing.

7. Data Buffer
U17 is an 8 bit bidirectional data buffer which is enabled during on-board operations.

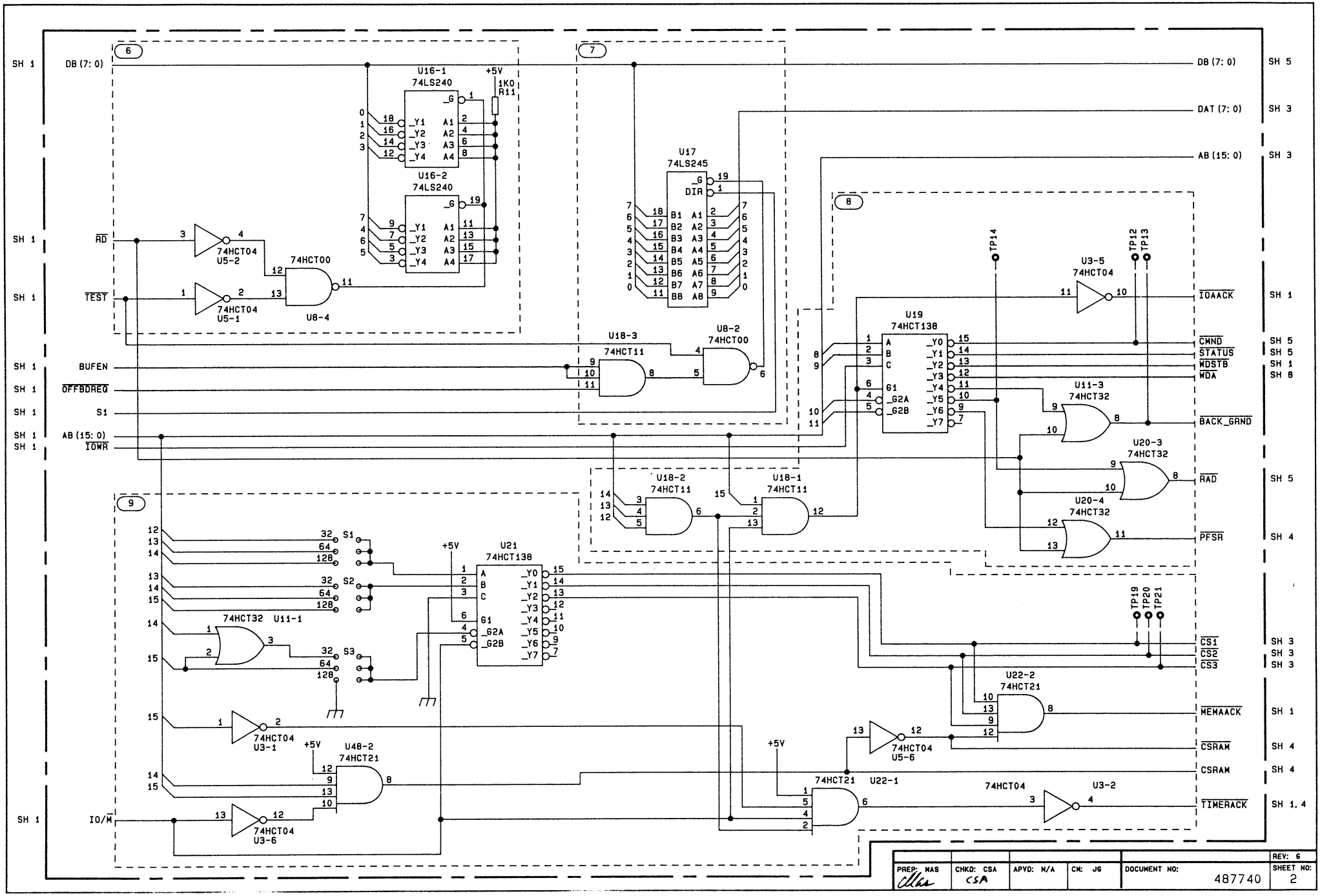
8. Internal Address Decoding
Address decoding for generating on-board chip selects for I/O operations. An acknowledge signal I/O AACK is generated for every
I/O-address, as handshaking signal to the microprocessor.

9. Address Decoding for Memory
Address decoding for generating on-board chip selects for memory
operations. An acknowledge signal MEM-AACK is generated for every
memory address, as handshaking signal to the microprocessor.

The S1, S2 and S3 strap fields determine the address range of CS1, CS2 and CS3

S1,S2,S3	32	64	128
CS1	0-0FFFH	0-1FFFH	0-3FFFH
CS2	1000-1FFFH	2000-3FFFH	4000-7FFFH
CS3	2000-2FFFH	3000-4FFFH	8000-BFFFH

The address range from C000H to FFFFH is reserved for RAM memory.



PREP: MAS	CHKD: CSA	APVD: N/A	CM: JG	DOCUMENT NO: 487740	REV: 6 SHEET NO: 2

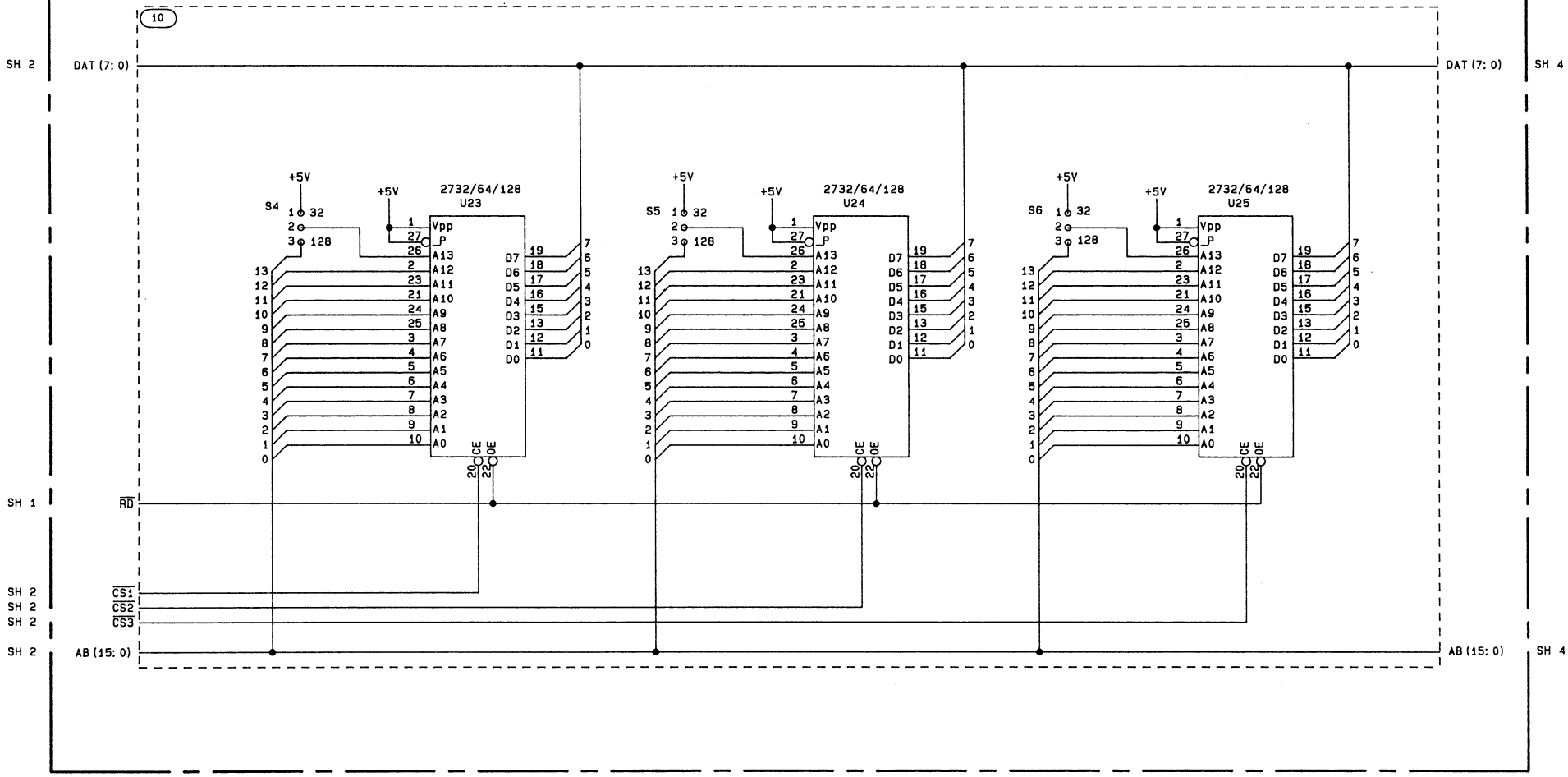
Service Sheet A8

10. EPROM Area

The contents of 2732 are 4K x 8 bit.
The contents of 2764 are 8K x 8 bit.
The contents of 27128 are 16K x 8 bit.

S1,S2,S3	S4	S5	S6	U23	U24	U25
32	32	32	32	2732	2732	2732
64	-	32	-	2764	2732	N.U.
64	-	-	32	2764	2764	2732
64	-	-	-	2764	2764	2764
128	128	32	-	27128	2732	N.U.
128	128	64	-	27128	2764	N.U.
128	128	128	-	27128	27128	2764
128	128	128	128	28128	28128	27128

(N.U. = not used).



STRAPPING:	S4	S5	S6
2732	1-2	1-2	1-2
2764	NA	NA	NA
27128	2-3	2-3	2-3

PREP: MAS	CHKD: CSA	APVD: N/A	CM: JG	DOCUMENT NO: 487740	REV: 6
	CSA				SHEET NO: 3

Service Sheet A8

11. Back-Up Circuit

Circuit which ensures power to CMOS-gates U49-U51, CMOS-RAM U45 and U46 (if large RAM area is required) and RTC (U26) during power off.

BT1 is a lithium battery and R51 protects the battery against serious damage if a short circuit appears.

12. RAM Area

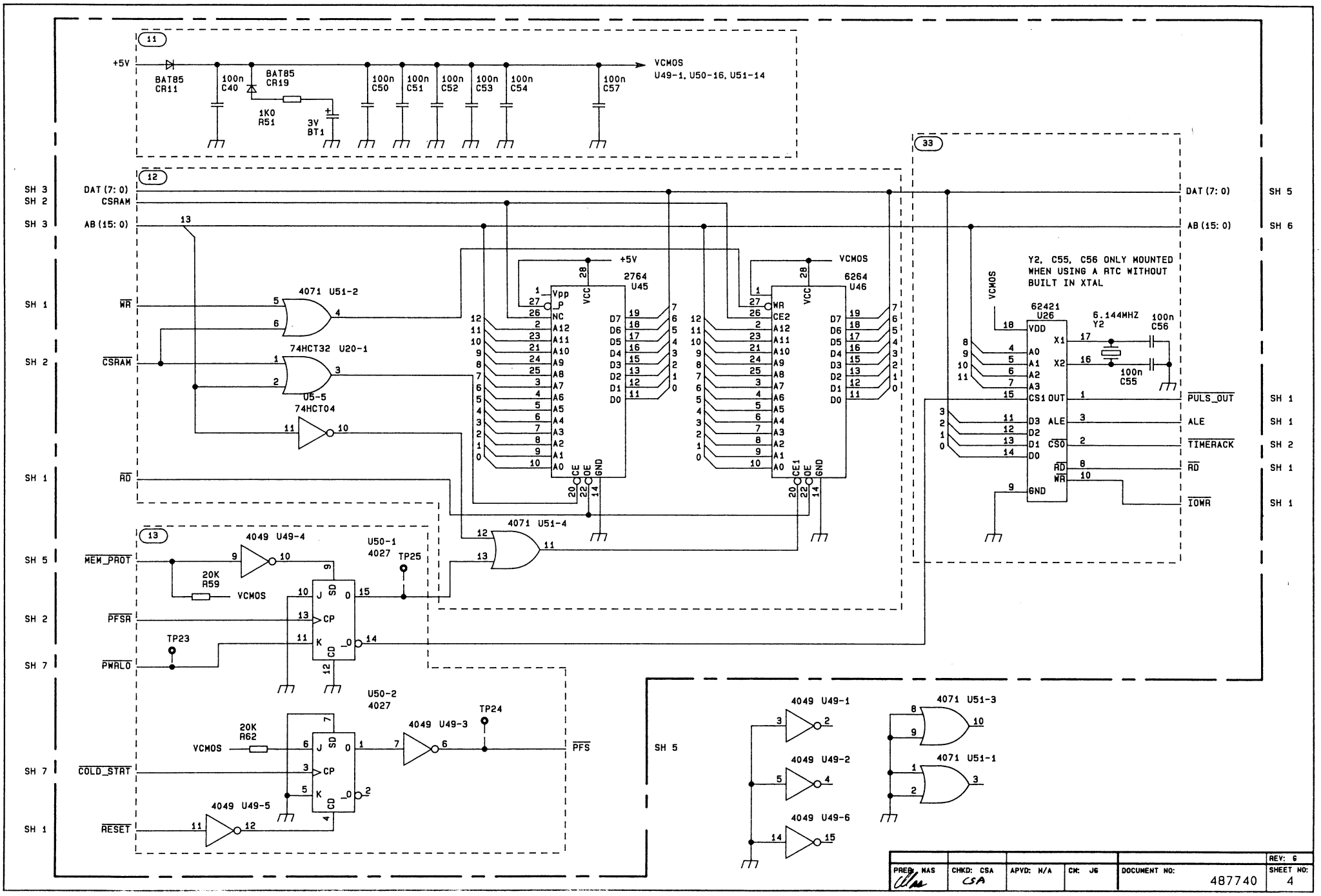
The RAM area consists of one 8K x 8 bit. The RAM area can be extended to 16K x 8 bit by placing an additional 8K x 8 bit RAM circuit in socket U46.
When U45 is used as RAM memory, the strap S8 must be strapped between a and b.
When large PROM memory is required, the strap S8 must be strapped between b and c. In this case, the U45 must be a PROM memory
and U46 must be a RAM memory.

13. RAM Protection

When power is removed intentionally by PWR OFF on the front panel, U50a is set. The **PWR LO** will interrupt the microprocessor. This will read the status of U50a and store relevant information in the CMOS RAM (U45 and U46) and hereafter protect the CMOS RAM against writing by setting U50b. During start-up U50a will be cleared by **RESET** and the CMOS RAM will be enabled by clearing U50b.

33. Real Time Clock

The real time clock consists of a battery back-upped integrated circuit U26. If the integrated circuit has a built-in oscillator crystal, the external components C35, C36 and Y2 are not mounted.


11
+5V
BAT85 CR11
100n C40
BAT85 CR19
1K0 R51
3V BT1
100n C50
100n C51
100n C52
100n C53
100n C54
100n C57
VCMOS
U49-1, U50-16, U51-14
12
SH 3 DAT (7: 0)
SH 2 CSRAM
SH 3 AB (15: 0)
13
SH 1 WR
SH 2 CSRAM
SH 1 RD
4071 U51-2
74HCT32 U20-1
U5-5
74HCT04
+5V
2764 U45
VCMOS
6264 U46
4071 U51-4
33
DAT (7: 0) SH 5
AB (15: 0) SH 6
Y2, C55, C56 ONLY MOUNTED WHEN USING A RTC WITHOUT BUILT IN XTAL
62421 U26
6.144MHZ Y2
100n C56
100n C55
PULS_OUT SH 1
ALE SH 1
TIMERACK SH 2
RD SH 1
IOWR SH 1
13
SH 5 MEM_PROT
4049 U49-4
20K R59
VCMOS
U50-1 4027
TP25
SH 2 PFSR
SH 7 PWRLO
TP23
U50-2 4027
20K R62
VCMOS
4049 U49-3
TP24
PFS
SH 7 COLD_STRT
4049 U49-5
SH 1 RESET
SH 5
4049 U49-1
4049 U49-2
4049 U49-6
4071 U51-3
4071 U51-1
PREP: MAS
CHKD: CSA
APVD: N/A
CM: J6
DOCUMENT NO: 487740
REV: G
SHEET NO: 4

14. 1msec Timer

This timer counts on the **CLK**-signal from the microprocessor. The output gives an RST 7.5 interrupt to the microprocessor for every 1ms, and a clock pulse to 3.

15. Input Buffer for Internal Signals

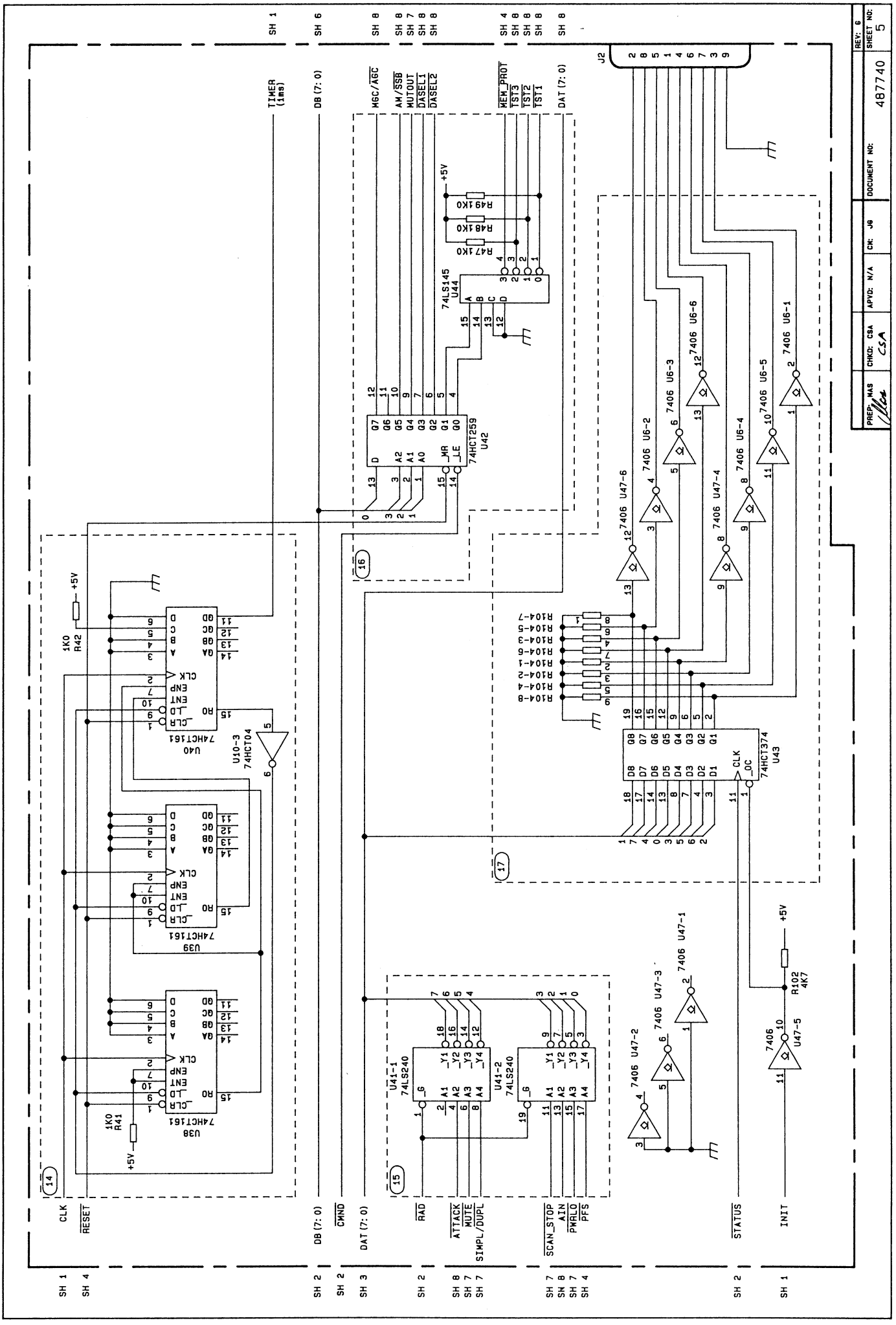
8 bit input port.

16. Control Latch

U42 is an 8 bit addressable latch used for control signals. U44 is a one out-of-four decoder with associated pull-up resistors used for control signals.

17. 8 bit Open Collector Output Circuit

Each output consists of an unprotected open collector inverter capable to sink max. 24 mA. The open collector voltage must not exceed 30 Volt. The 8 bit output is available via the connector J2 on the rear plate.



Service Sheet A8

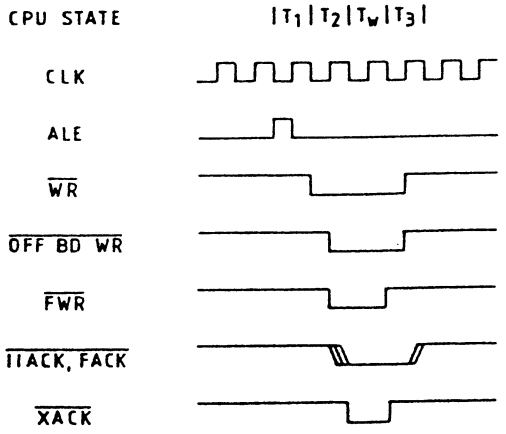
18. Supply Filters

19. Off-Board Data Latch

U27 is an 8 bit bidirectional data bus buffer, which is enabled during off-board operations.

20. Off-Board Acknowledge

Circuit to provide at least 1 wait-state in the microprocessor timing, during off-board write operations. This ensures that data is valid on the rising edge of **FWR**.

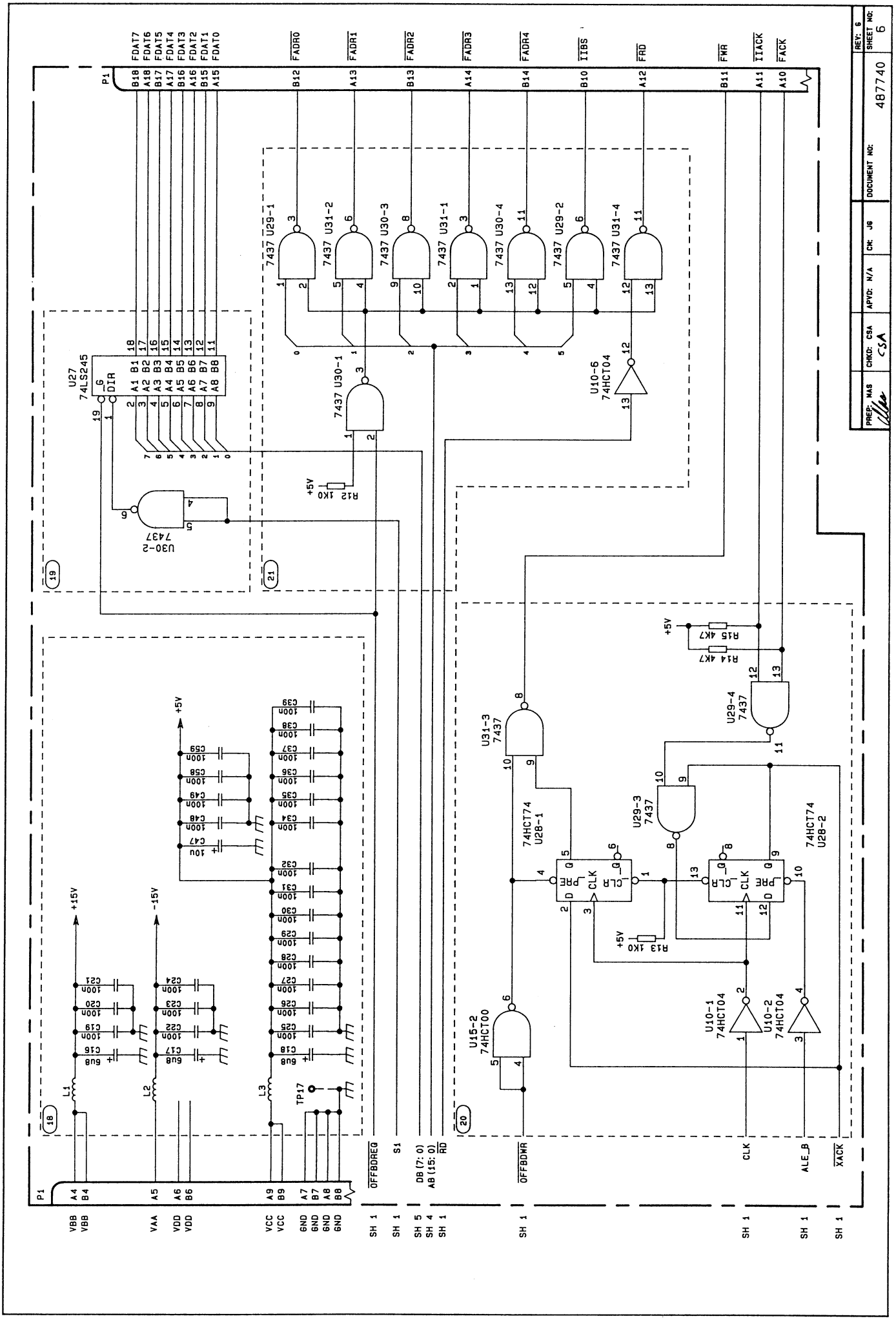


Timing diagram for generating of 1 wait-state.

21. Off-Board Address Buffer

Buffers for Off-board address and command signals.

Service Sheet A8



Service Sheet A8

22. RS232 Interface (Optional)
RS232 interface for serial communication.

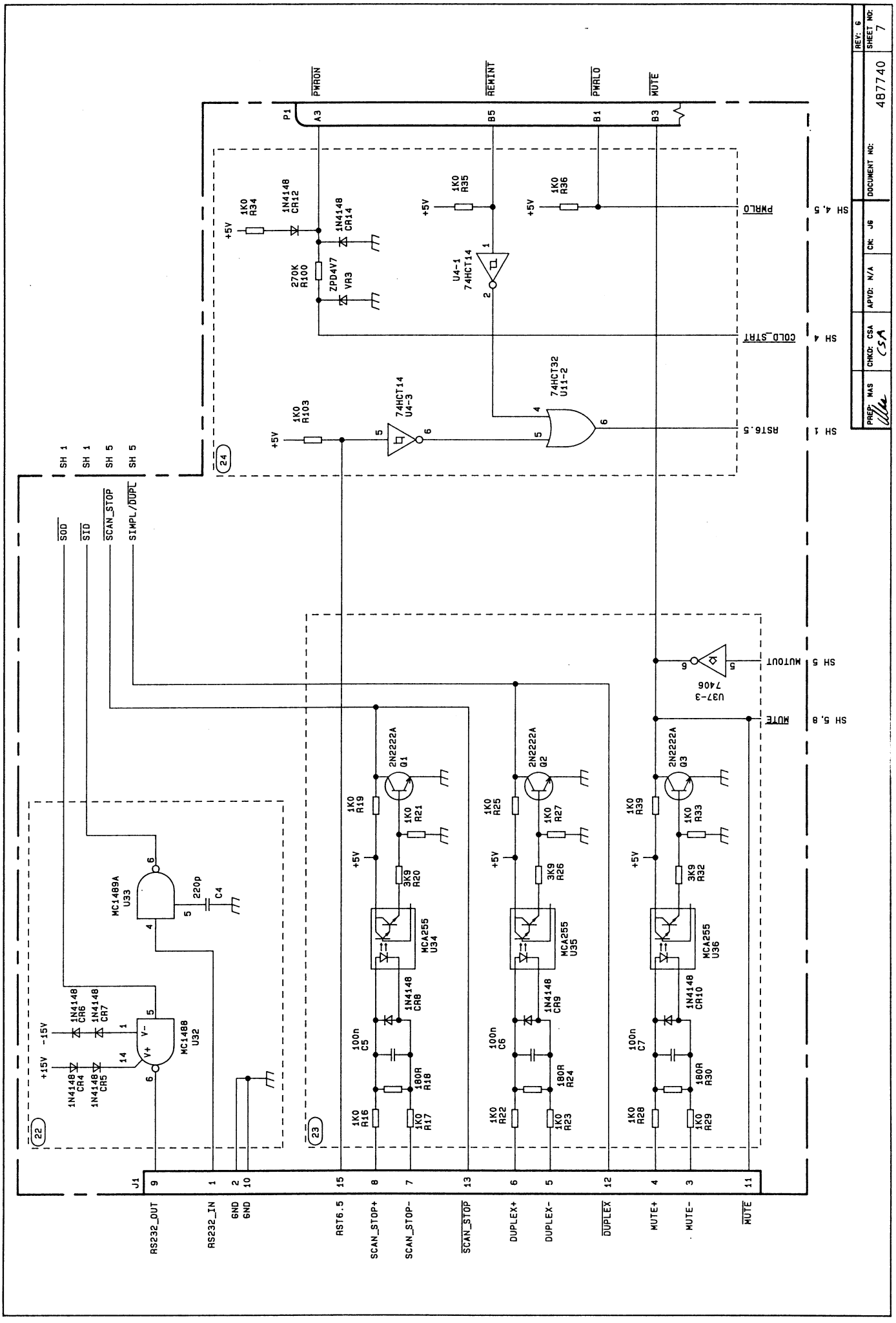
23. Optocoupler Interface
Octocoupler interface to ensure electrical separation between incoming signals and on-board signals.

External signal generators shall be 24V, 10mA to provide a proper TTL-signal on Q1's, Q2's or Q3's collector.

The duplex input is used only in RX4010.

24. Power Control Inputs
Diode network CR13 and CR14 are protection diodes. R34 and CR12 ensure current through the connector when **PWRON** is low.

If power is removed by turning "PWR OFF" on the front panel, **PWRON** goes high, and enables U50a in 13 to be cleared, by means of **COLD STRT**.


PWRON
REMINT
PWRLO
MUTE
P1
A3
B5
B1
B3
+5V
1K0 R34
1N4148 CR12
1N4148 CR14
270K R100
ZPD4V7 VR3
VR3
1K0 R35
U4-1 74HCT14
1K0 R36
PWRLO
SH 4, 5
COLD_START
SH 4
74HCT32 U11-2
1K0 R103
74HCT14 U4-3
RST6.5
SH 1
24
SH 1
SH 1
SH 5
SH 5
SOD
SID
SCAN_STOP
SIMPL/DUPL
MUTOUT
SH 5
7406 U37-3
MUTE
SH 5, 8
2N2222A Q1
2N2222A Q2
2N2222A Q3
1K0 R19
1K0 R21
3K9 R20
1K0 R25
1K0 R27
3K9 R26
1K0 R39
1K0 R33
3K9 R32
MCA255 U34
MCA255 U35
MCA255 U36
1N4148 CR8
1N4148 CR9
1N4148 CR10
100n C5
100n C6
100n C7
180R R18
180R R24
180R R30
1K0 R16
1K0 R17
1K0 R22
1K0 R23
1K0 R28
1K0 R29
MC1489A U33
220p C4
MC1488 U32
1N4148 CR6
1N4148 CR7
1N4148 CR4
1N4148 CR5
-15V
+15V
22
23
J1
RS232_OUT
RS232_IN
GND
GND
RST6.5
SCAN_STOP+
SCAN_STOP-
SCAN_STOP
DUPLEX+
DUPLEX-
DUPLEX
MUTE+
MUTE-
MUTE
REV: 6
SHEET NO: 7
DOCUMENT NO: 487740
CK: JG
APVD: N/A
CHKD: CSA
PREP: MAS

25. D/A Converter
U52 is an 8 bit latch. U53 is a bit digital to analogue converter with associated resistor network. U54 is an operational amplifier with an output to be range set by R67. The maximum output may be adjusted to 10V.

26. ATTACK Detector
Circuit to provide an **ATTACK** as long as Q9 is open. To avoid spikes to cause an **ATTACK**, R91, C10 determines the minimum time Q9 has to be open. R70, R71 and C10 holds the **ATTACK** to ensure the microprocessor to read the **ATTACK**.

27. MUTE Buffer
A MUTE Signal will force the AGC2/VALC2 and the AGC1/ALCKEY to +15 VDC. (Optionally).

28. Analogue Switch
U57 is an analogue switch. When the microprocessor assembly is used in SE4010 this switch will always be closed. CR23 protects U57 against negative levels.

29. Gain Control Filter/Strap
Only when the microcomputer assembly is used in SE4010, the strap S7 must be strapped between a and b. This will minimize the effect of the filter and cause the transfer function to equal 1 approximately.
Otherwise the strap S7 must be strapped between b and c.

If **VALC1/AGCDET** exceeds **Vhold** + Vbe (Q8) (**Vhold** is the voltage on the output of U54b) an **ATTACK** is fed to the microcomputer causing **Vhold** to increase.

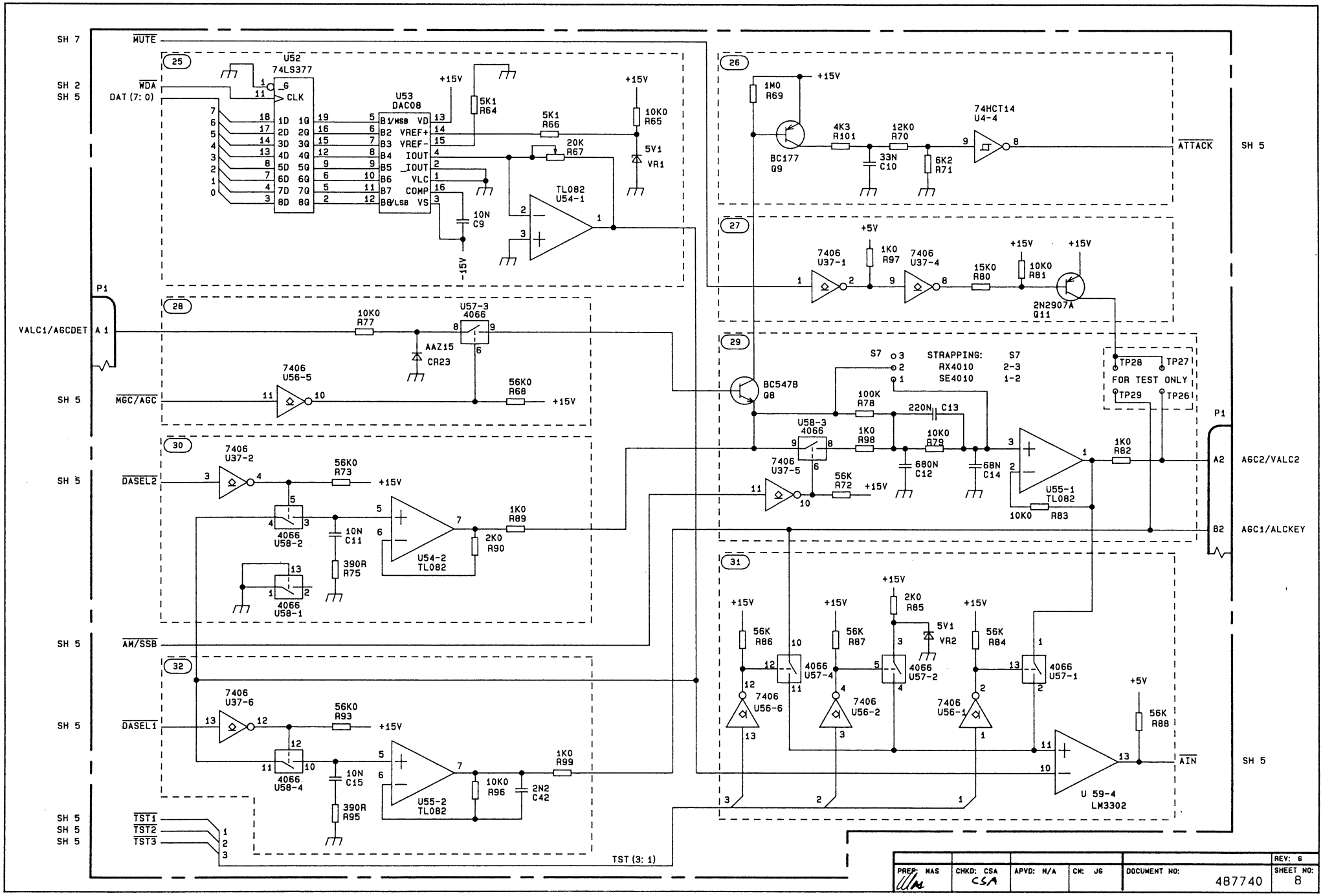
When used in SE4010 **Vhold** decreases slowly when no **ATTACK** is present provided that **AGC1/ALCKEY** is on logical "1".

When used in a receiver **Vhold** decreases according to the AGC time constants.

30. Sample and Hold Circuit for Vhold
Sample and hold circuit supplying **Vhold**.

31. Test Circuit
By means of the comparator U59 and the D/A-converter in (25), an A/D-conversion of either **AGC1/ALCKEY**, **AGC2/VALC2** or a test level can be performed.

32. Sample and Hold Circuit for AGC1
When used in receivers the circuit supplies AGC-voltage to **AGC1**.

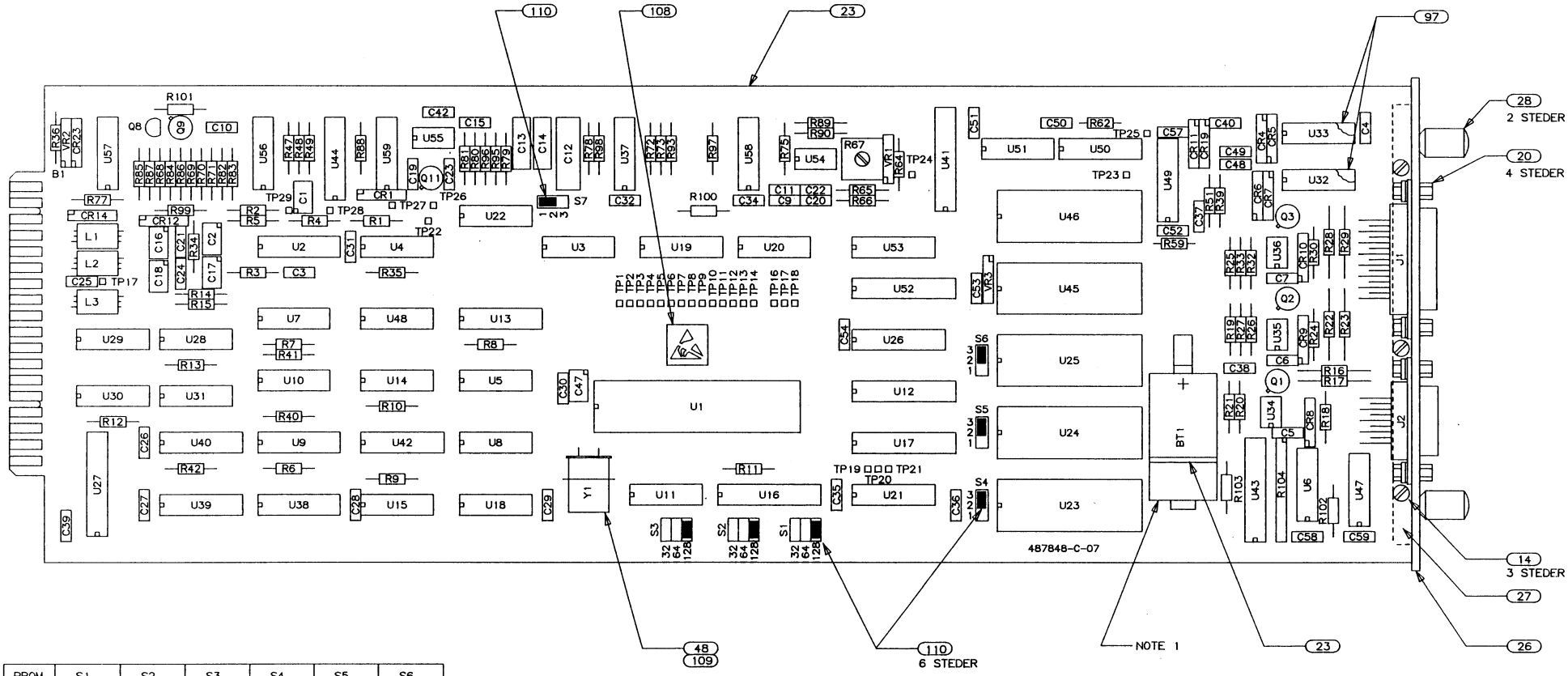


PREP: MAS	CHKD: CSA	APVD: N/A	CM: JG	DOCUMENT NO: 487740	REV: G SHEET NO: 8

Service Sheet A8

1. BT1 (BATTERY) LODDES PA - POL
   + POL MA IKKE HAVE FORBINDELSE.
   + POL PALODDES NAR MODUL MONTERES I UNIT.
   THE + POLE OF THE BATTERY IS SOLDERED
   TO THE CIRCUIT AT DELIVERY.

CHANGE ORDER/REVISION					
CO: 9760	REV: K	CO: 13600	REV: K1	CO:	REV:
AUT:	CM:	AUT:	CM:	AUT:	CM:



PROM	S1	S2	S3	S4	S5	S6
2732	POS 32	POS 32	POS 32	POS 1-2	POS 1-2	POS 1-2
2764	POS 64	POS 64	POS 64	-	-	-
27128	POS 128	POS 128	POS 128	POS 2-3	POS 2-3	POS 2-3

* STANDARD STRAP

STRAPPING OF S7	
SE4010	POS 1-2
RX4010	POS 2-3

* STANDARD STRAP

MATERIAL:	GENERAL TOLERANCE:	PROJECTION:	TERMA Elektronik AS FSCM R0567 HOVMARKEN 4, DK-8520 LYSTRUP, DENMARK
REVISION STATUS OF SHEETS (OTHER THAN K1):			
SHEET NO.:			TITLE: COMPONENT LOCATION MPU BOARD A8
REVISION:			
CODE: D2	1 SHEET(S)	INITIAL RELEASE: 900118	DATE OF LATEST REV.: 921104 / REV.: K1
PREP: IN	CHKD: CSA	APVD: N/A	CM: JG / DOCUMENT NO.: 487740 / SHEET NO.: 1

Service Sheet A8

ASSY 210847, MICROPROCESSOR ASSEMBLY

Service Sheet A8

Assy 210847, Microprocessor Assembly

Configuration

The assembly consists af a 68000 microprocessor.
The software for the module is stored in EPROM, and data (burst telegram, fec data block, baudrate etc.) are stored in RAM.

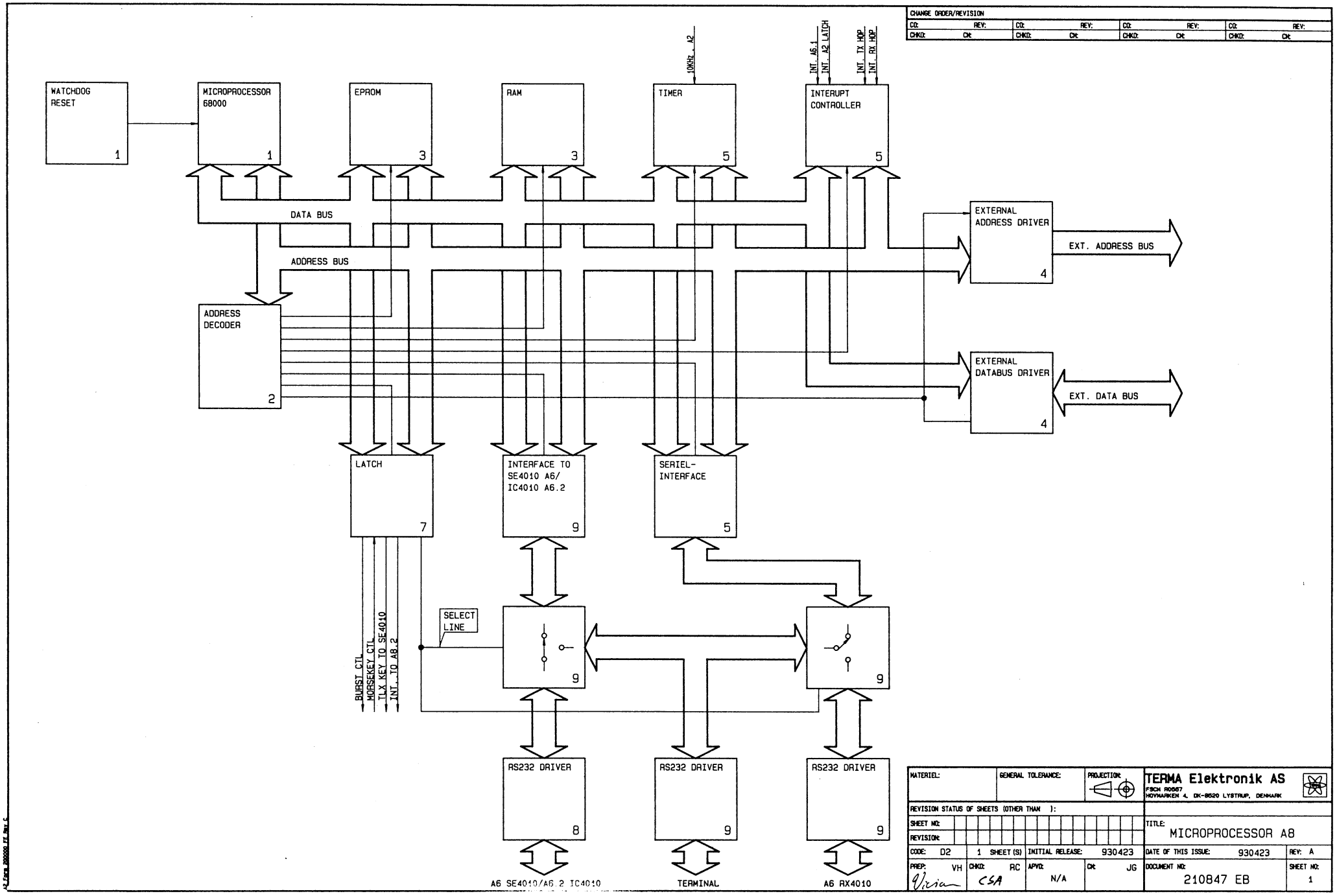
Programmable timers are used for internal timing of the software.

All incoming interrupts are serviced by the interrupt controller.

Serial interface is used to communicate with the external data terminal.

Switch circuit switches the data terminal between the IC4010 and the FSK modulator/demodulator in SE4010/RX4010

The assembly contains drivers for address and databus used for communication with other assemblies.



Service Sheet A8

1. Microprocessor Circuit

U2 is a 68000 microprocessor with 8MHz oscillator (U1).
U7 and U8 are buffers for address and databus.
U3 is watchdog for surveillance of correct reset pulse at system start up, and reset pulse at timeout if the software does not write to the watchdog within a period of 1.6 sec.

2. Address decoding and bus error circuit

U11 is address decoding of memory:

EPROM	:	Address 00000H-0FFFFH
RAM	:	Address 10000H-1FFFFH

U12 is address decoding of interface circuit:

MFP 68901:		Address 80080H-800FFH
PIT 68230:		Address 80100H-8017FH
Test	:	Address 80300H-8037FH
Watch-dog:		Address 80380H-803FFH

U38 is address decoding of offboard circuit:

Offboard	:	Address 80000H-8007FH

U10 generates a bus error pulse if no data acknowledge pulse is received within a period of 8 µs.

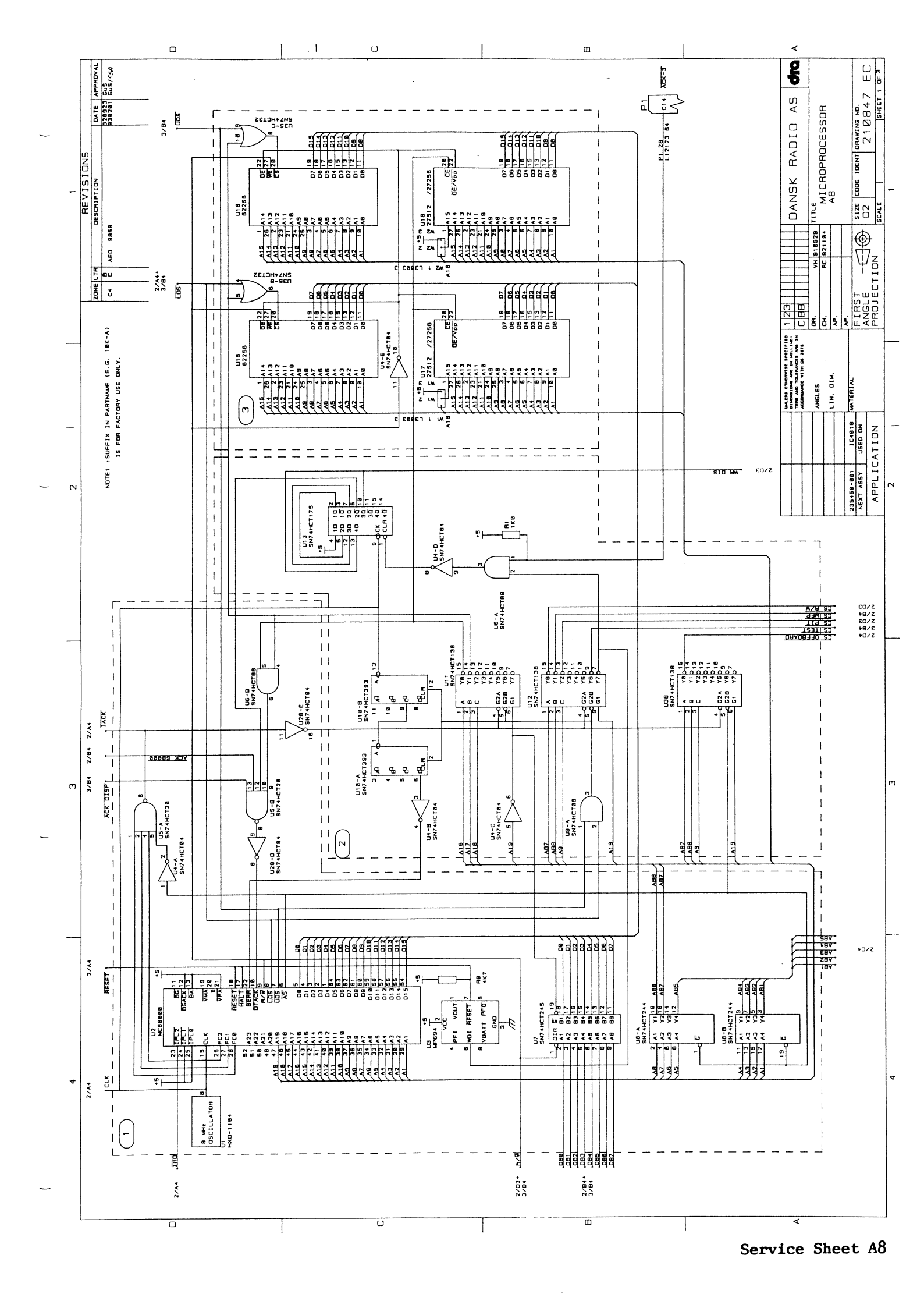
U13 generates 1 wait state under read/write to watchdog and offboard addresses.

3. Memory Circuit

RAM circuit:
U15 is 8 LSB of data.
U16 is 8 MSB of data.

EPROM circuit:
U17 is 8 LSB of data.
U18 is 8 MSB of data.

Switch W1 and W2 select between 27512 EPROM (64K) or 27256 EPROM (32K).



Service Sheet A8

4. Offboard Circuit
U22 is databus buffer.
U23 and U39 are address bus buffers.
U20, U21 and U35 generate read and write pulse.

5. Multi Function Peripheral circuit (MFP)
U19 generates 4MHz system clock to MFP.

U24 is the MFP who contain: - 8 parallel i/o pin.
- Interrupt controller.
- 4 timers.
- Serial receiver/transmitter.

Timer A and B are clocked externally by 10kHz clock from P1, pin A26. Timer C and D are clocked by crystal Y1 (2.4576MHz). Timer D output is connected to the serial receiver/transmitter clock and generates the baudrate.

6. Parallel Interface/Timer circuit (PIT)
U31 is the PIT which contains: - 24 parallel i/o pin.
- 24 bit timer.

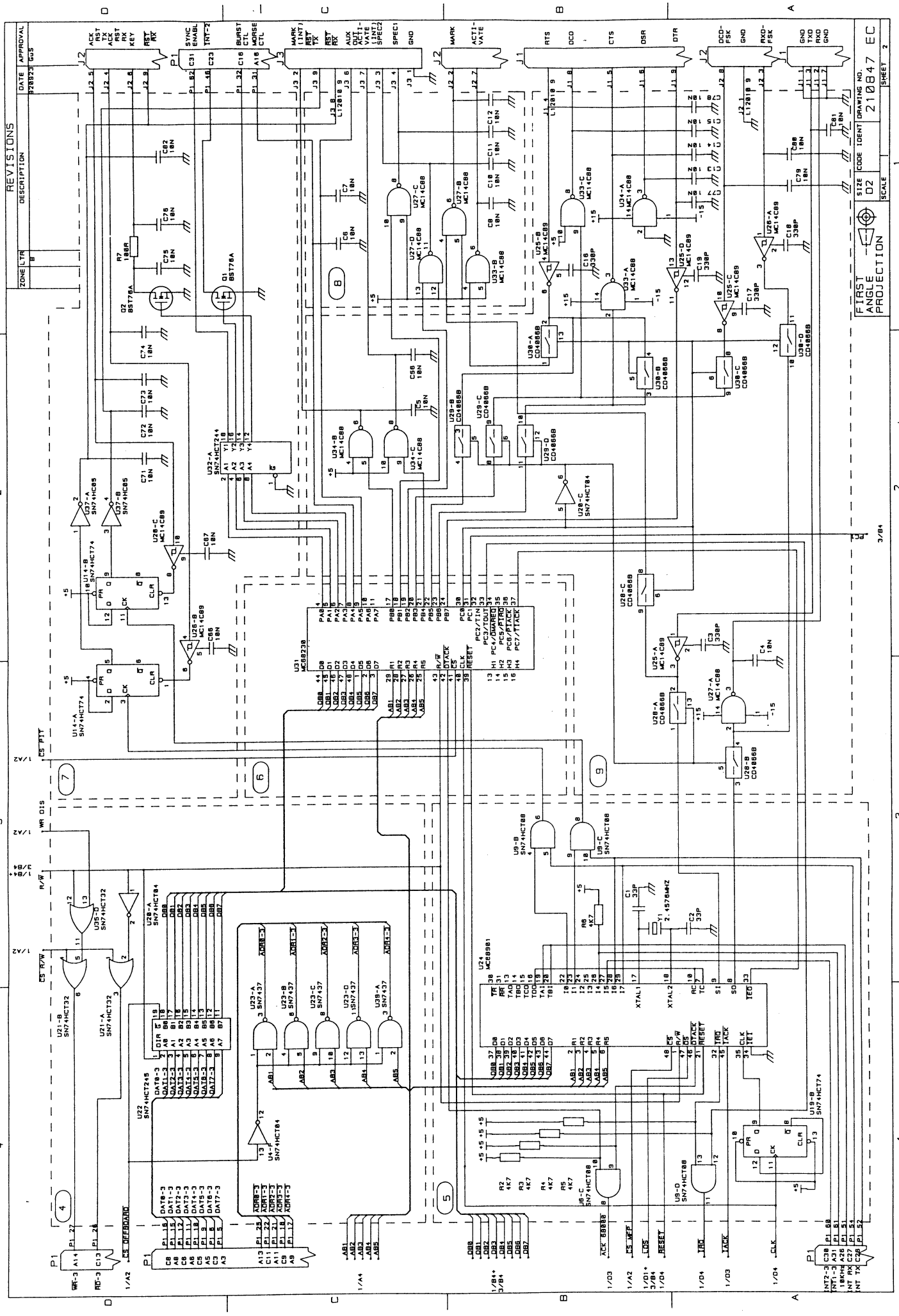
7. Interrupt generation circuit to RX4010/SE4010
U14-A generates interrupt to RX4010. When RX4010 detect the interrupt it is reset by the clear input.

U14-B generates interrupt to SE4010. When SE4010 detect the interrupt it is reset by the clear input.

U32 is a buffer to the parallel outputs. Q1 is an open collector output to generate interrupt to A8.2 processor. Q2 is an open collector to key the output of SE4010.

8. RS232 output buffer
U27 and U33 output signals are converted to RS232 level.

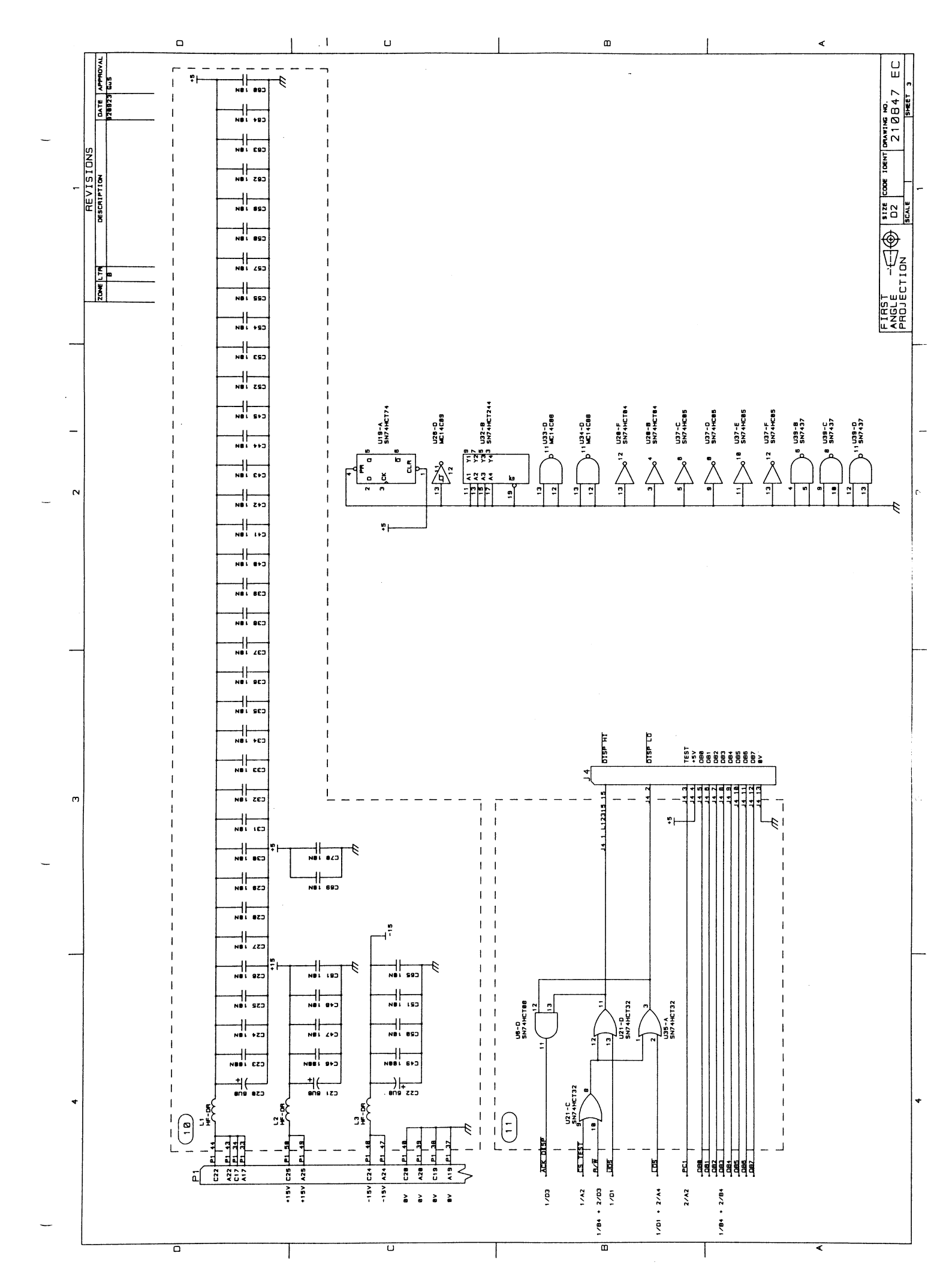
9. Serial buffer and switch circuit
U27, U33 and U34 convert output signals to RS232 level.
U25 and U26 convert RS232 input signals to TTL level.
U28, U29 and U30 switch Telex terminal (connected on J1) between the serial in/out in MFP, or the FSK modulator (connected on J2 pin 2 and 7) and the FSK demodulator (connected on J2 pin 3 and 8).



Service Sheet A8

10. Decoupling of supply lines

11. Interface to test jig
Circuit is only used under factory test.



Service Sheet A8

1. WORKMANSHIP PER 1007

ESD BESKYTTELSE PER 1008

CAUTION
DEVICES ARE SUBJECT TO DAMAGE BY STATIC ELECTRICITY

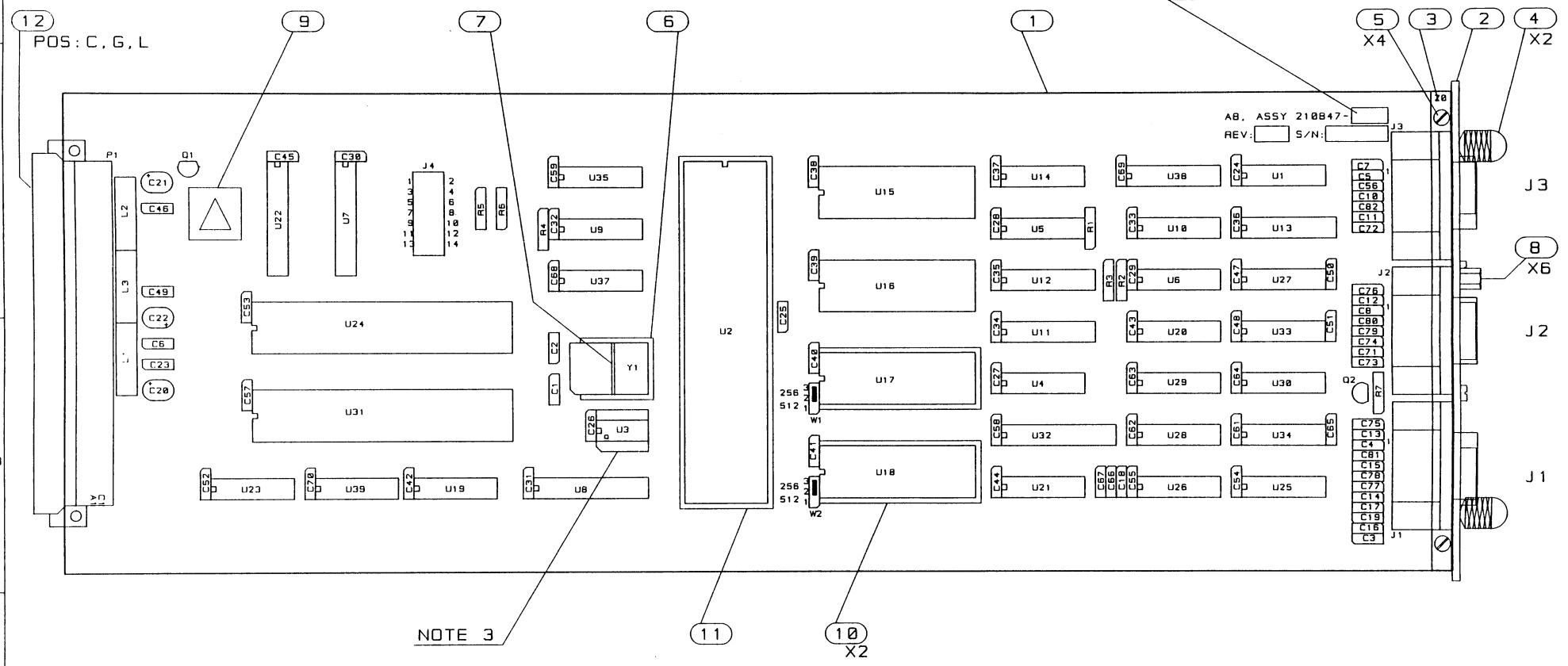
TEST PER 1004

2. J1-3 OG Y1 EFTERMONTERES

3. R8 MONTERES PAA LODDESIDE MELLEM U3 PIN 2 OG PIN 7.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	B		920923	GuS
	C	AEO 13774	930201	GuS
	D	AEO 9858	930201	GuS/CSA

MAERK RELEVANT VARIANT NR, REV. OG SERIENR.



235458-881	IC4818	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS AND TOLERANCES ARE IN ACCORDANCE WITH DS 3578

ANGLES

LIN. DIM.

DR.	GuS	910812
CH.	RC	921104
AP.		
AP.		

FIRST ANGLE PROJECTION

DANSK RADIO AS

TITLE: MICROPROCESSOR A8

SIZE	CODE IDENT	DRAWING NO.
D2		210847 PD

SCALE | SHEET 1 OF 1

Service Sheet A8

ASSY 210821, REMOTE MODULE

Service Sheet A9

The assembly contains the necessary hardware for remote control of IC4010 via a Host Computer. This is done by setting Switch 1 in position "1". The Host Computer will then communicate with A8.1 via the interface circuits and the USART 1.1.

By setting Switch 2 in position "1" the microprocessor A8.2 is capable of remote-controlling RX4010 via the interface circuits and USART 2.1.

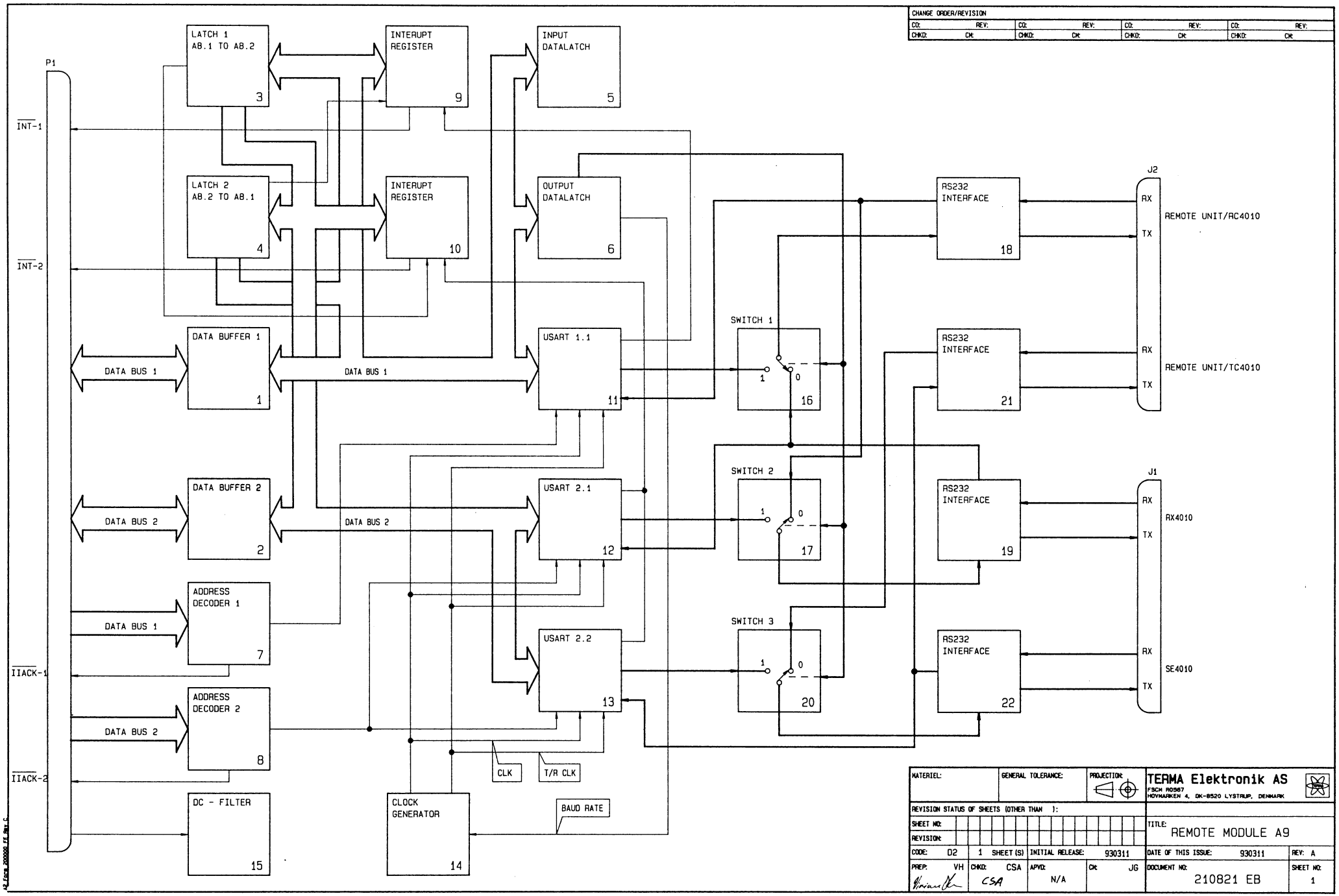
If both Switch 1 and Switch 2 are set in position "0" RX4010 may be remote-controlled by a Host Computer or a TC4010.

When the Switch 3 is set in position "1" the microprocessor A8.2 of IC4010 is capable of remote-controlling SE4010 via the interface circuits and USART 2.2. If Switch 3 is set in position "0" SE4010 may be remote-controlled by a Host Computer or a TC4010.

The three switches are controlled by A8.1 via the output latch.

The clock signals for the USARTs are generated by a circuit where the baud rate can be selected by A8.1 via the output latch.

A circuit consisting of two Latches and two Interrupt Registers makes data communication between A8.1 and A8.2 possible. Data sent from A8.1 to A8.2 are written to Latch 1. This causes an interrupt to A8.2 via Interrupt Register 2. When A8.2 receives the interrupt it will read the data in Latch 1 and then write a message back to Latch 2 to show that the data have been received. This causes an interrupt to A8.1 through Interrupt Register 1. When A8.1 receives the interrupt it will read the data in Latch 2 and thereby know that the transmitted data have been received by A8.2.



Service Sheet A9

1/2. Data Buffers
U1 and U2 are used as bidirectional data buffers.

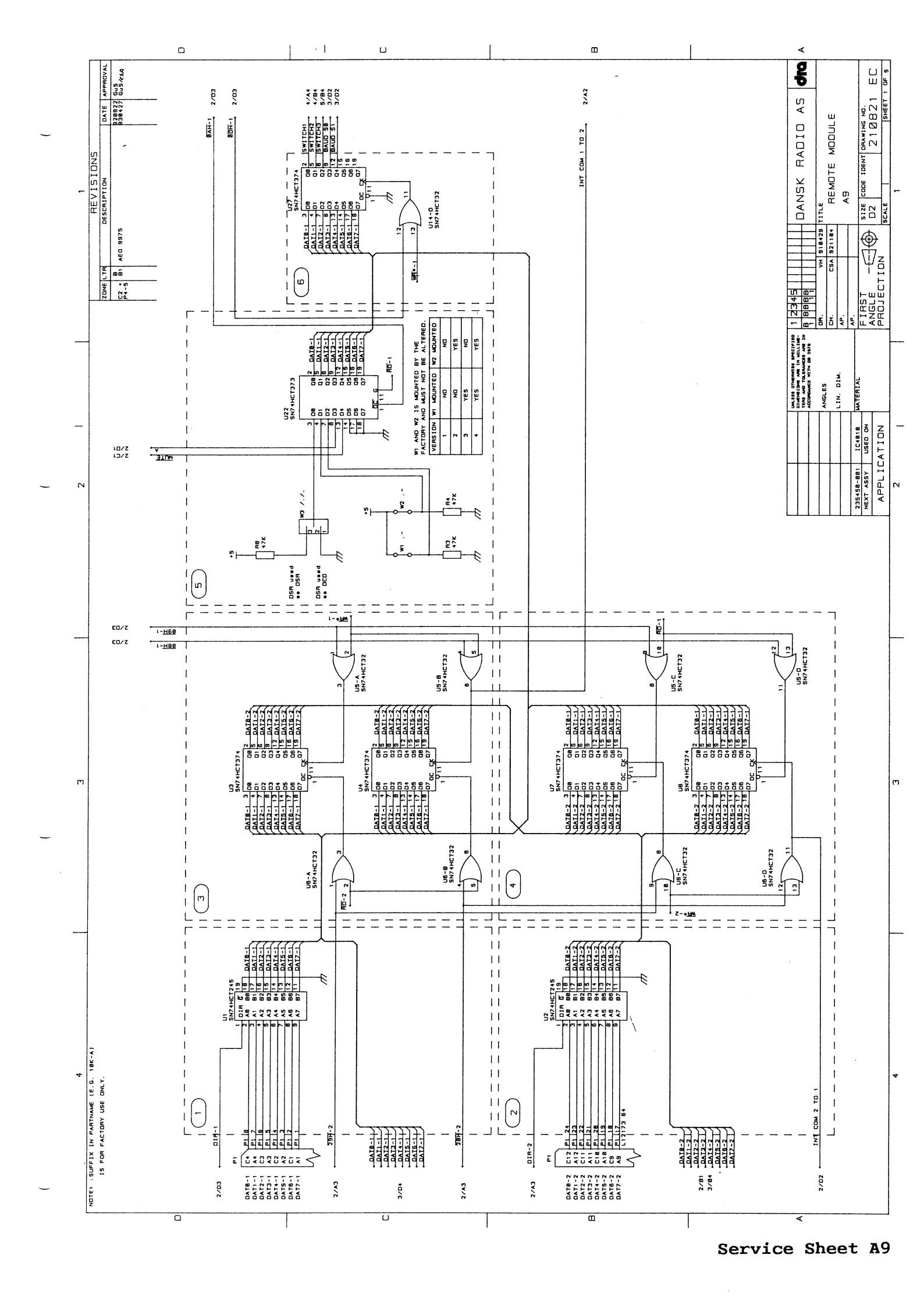
3/4. Transceiver Latches
The circuits are used to transmit data between A8.1 and A8.2. When A8.1 wants to transmit data to A8.2 it writes a one byte data word to the data register U3 and a one byte status word to the status register U4. The status word indicates which kind of data is contained in the data register. When A8.1 writes a status word to the status register this will cause an interrupt to A8.2.

When A8.2 receives the interrupt it will read the data in the two registers and then answer back to A8.1 to tell that the data have been received. A8.2 is doing this by writing to the status register U8. This causes an interrupt back to A8.1. When A8.1 receives the interrupt it will read the status register and know that A8.2 has received the data.

The transmission of data the opposite way takes place in an equal manner.

5. Input Latch for A8.1
U47 is an input latch which can be read by A8.1. W13 must be set according to the mode of the serial communication which is used. W1 and W2 are mounted by the factory to indicate the version of the assembly and must not be changed by the customer.

6. Output Latch for A8.1
U27 is the output latch for the signals which are controlled by A8.1. Via this latch the baud rate of the serial communication can be changed. Also the switches which decide which units can communicate together are controlled by this output latch.



Service Sheet A9

7. Address Decoder for A8.1

The circuit decodes the addresses of the databus from A8.1. When an address is decoded the circuit will respond with an acknowledge back to A8.1.

8. Address Decoder for A8.2

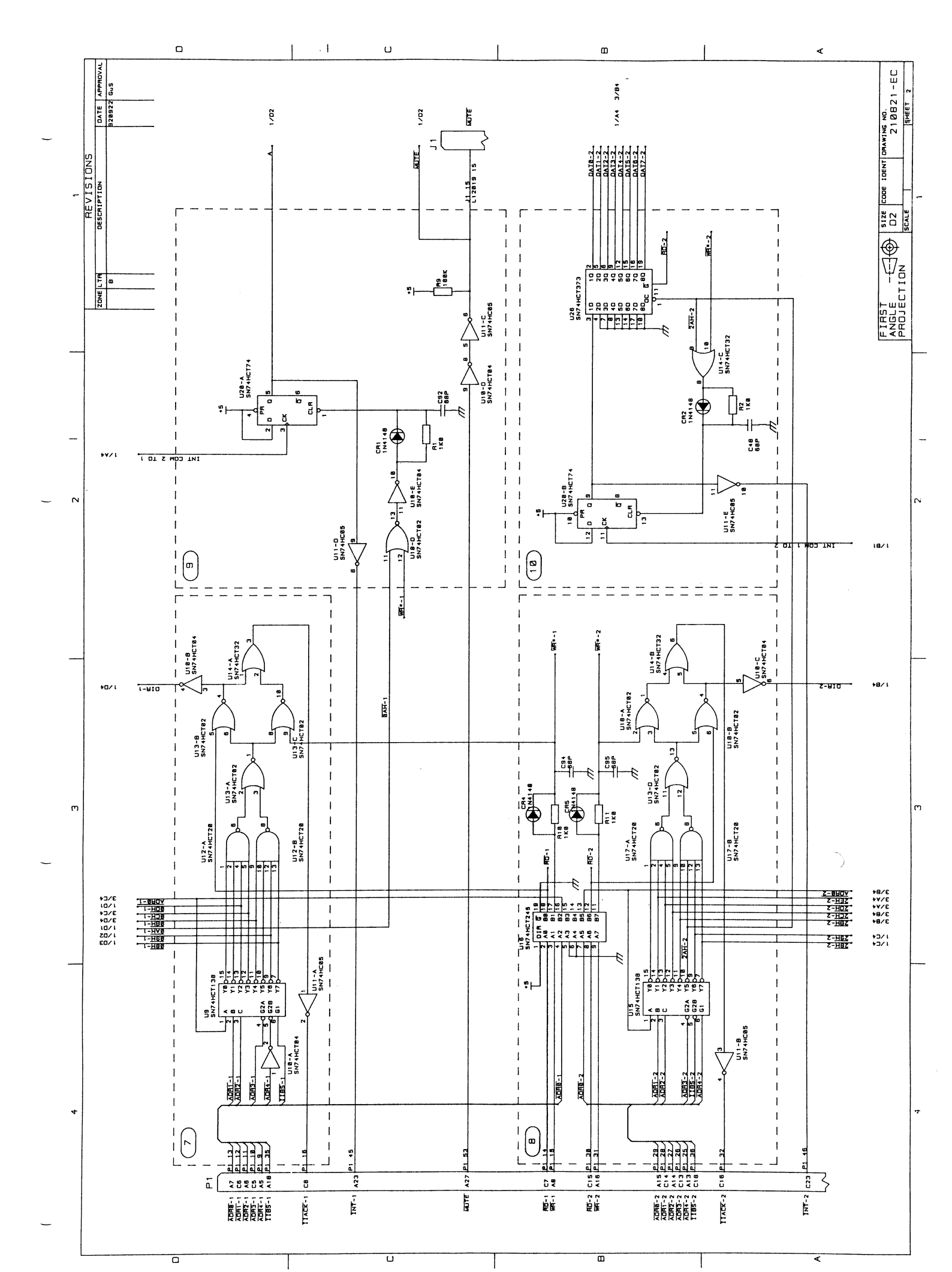
The circuit decodes the addresses of the databus from A8.2. When an address is decoded the circuit will respond with an acknowledge back to A8.2. U16 is used as a buffer for read and write signals.

9. Interrupt Register for A8.1

The output of the D Flip-Flops U19 and U20-A is set high if the level of the appropriate clock input shifts from a low to a high level. The outputs from the Flip-Flops are "ored" together in
U21-A and will cause an interrupt to A8.1 if one of the Flip-Flops is set. When A8.1 receives the interrupt it will read the output latch U22 to detect which signal caused the interrupt. After this it will reset the Flip-Flops by writing to address 0AH-1. CR1, R1 and C92 are inserted to prevent spikes and noise on the databus to reset the Flip-Flops.

10. Interrupt Register for A8.2

The output of the D Flip-Flops U20-B, U23 and U24 is set high if the level of the appropriate clock input shifts from a low to a high level. The outputs from the Flip-Flops are "ored" together in
U21-B and will cause an interrupt to A8.2 if one of the Flip-Flops is set. When A8.2 receives the interrupt it will read the output latch U26 to detect which signal caused the interrupt. After this it will reset the Flip-Flops by writing to address 2AH-2. CR2, R2 and C48 are inserted to prevent spikes and noise on the databus to reset the Flip-Flops.



Service Sheet A9

11. USART for remote control of IC4010

This circuit makes it possible to control IC4010 by a remote control unit via a serial data line. The USART U28 is controlled by A8.1 and the TX EMPTY and RX READY signals are fed to the Interrupt Register for A8.1.

U30-D and adjacent components will reset the USARTs during start-up of the system.

12. USART for remote control of RX4010

This circuit makes it possible for IC4010 to control RX4010 via a serial data line. The USART U34 is controlled by A8.2 and the TX EMPTY and RX READY signals are fed to the Interrupt Register for A8.2.

13. USART for remote control of SE4010

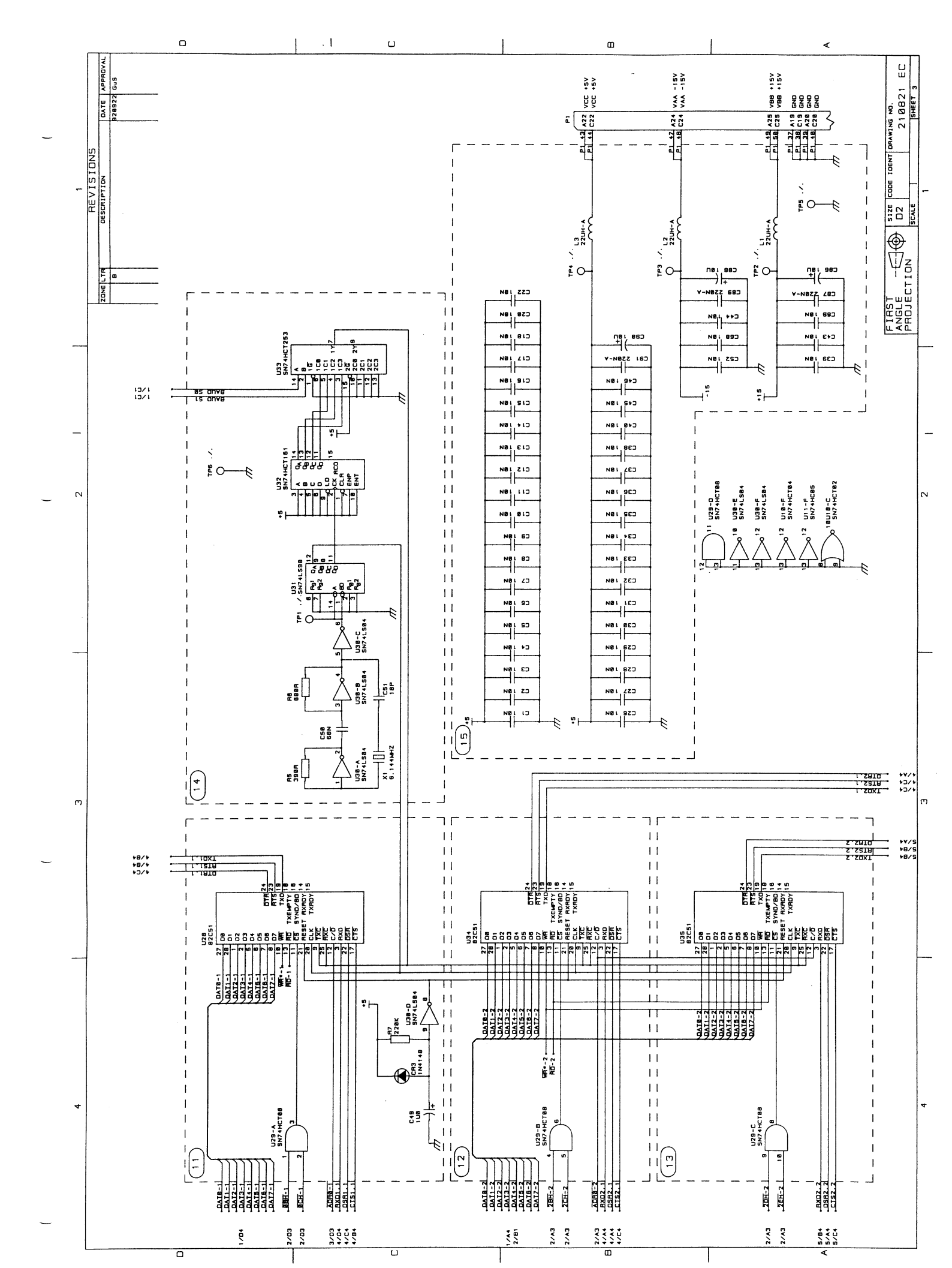
This circuit makes it possible for IC4010 to control SE4010 via a serial data line. The USART U35 is controlled by A8.2 and the TX EMPTY and RX READY signals are fed to the Interrupt Register for A8.2.

14. Clock Oscillator for serial communication

The circuit around X1 is a 6.144MHz digital crystal oscillator. U31 divides the signal from the oscillator. One output of U31 is the 3.072MHz clock signal for the USARTs. Another output of 1.229MHz is fed to U32. U32 is a binary counter which divides the input signal. The outputs of U32 are fed to the 4-input multiplexer U33 which is controlled by A8.1 via the output latch U27. The output of U33 is fed to the USARTs as the baud rate clock. The baud rate clock signal is internally divided by 64 in the USARTs. This way the baud rate of the serial communication may be selected at 1200, 2400, 4800 or 9600 baud.

15. DC Filter

The circuit consists of chokes and capacitors which filter out noise and hum on the supply voltages to the assembly.



Service Sheet A9

16. Switch S1

U36 is a quad 2-input multiplexer acting as a switch for the serial communication lines on TTL level. U36 is controlled by A8.1 via the output latch U27.

When the SWITCH1 signal is low the serial signals received from RX4010 will be lead directly to the Host Computer or RC4010 through the interface circuits of IC4010. If the SWITCH1 signal is set high the serial signals sent from the USART U28 for remote control of IC4010 are lead through the interface circuits to the Host Computer which controls IC4010.

The serial signals sent from the Host Computer which controls IC4010 are always lead to the USART U28.

W7 and W8 must be strapped according to the used communication standard.

17. Switch S2

U37 is a quad 2-input multiplexer acting as a switch for the serial communication lines on TTL level. U36 is controlled by A8.1 via the output latch U27.

When the SWITCH2 signal is low the serial signals received from the Host Computer or RC4010 will be lead directly to RX4010 through the interface circuits of IC4010. If the SWITCH2 signal is set high the serial signals sent from the USART U34 for remote control of RX4010 are lead through the interface circuits to RX4010.

The serial signals sent from RX4010 are always lead to the USART U37.

18. Interface Circuits

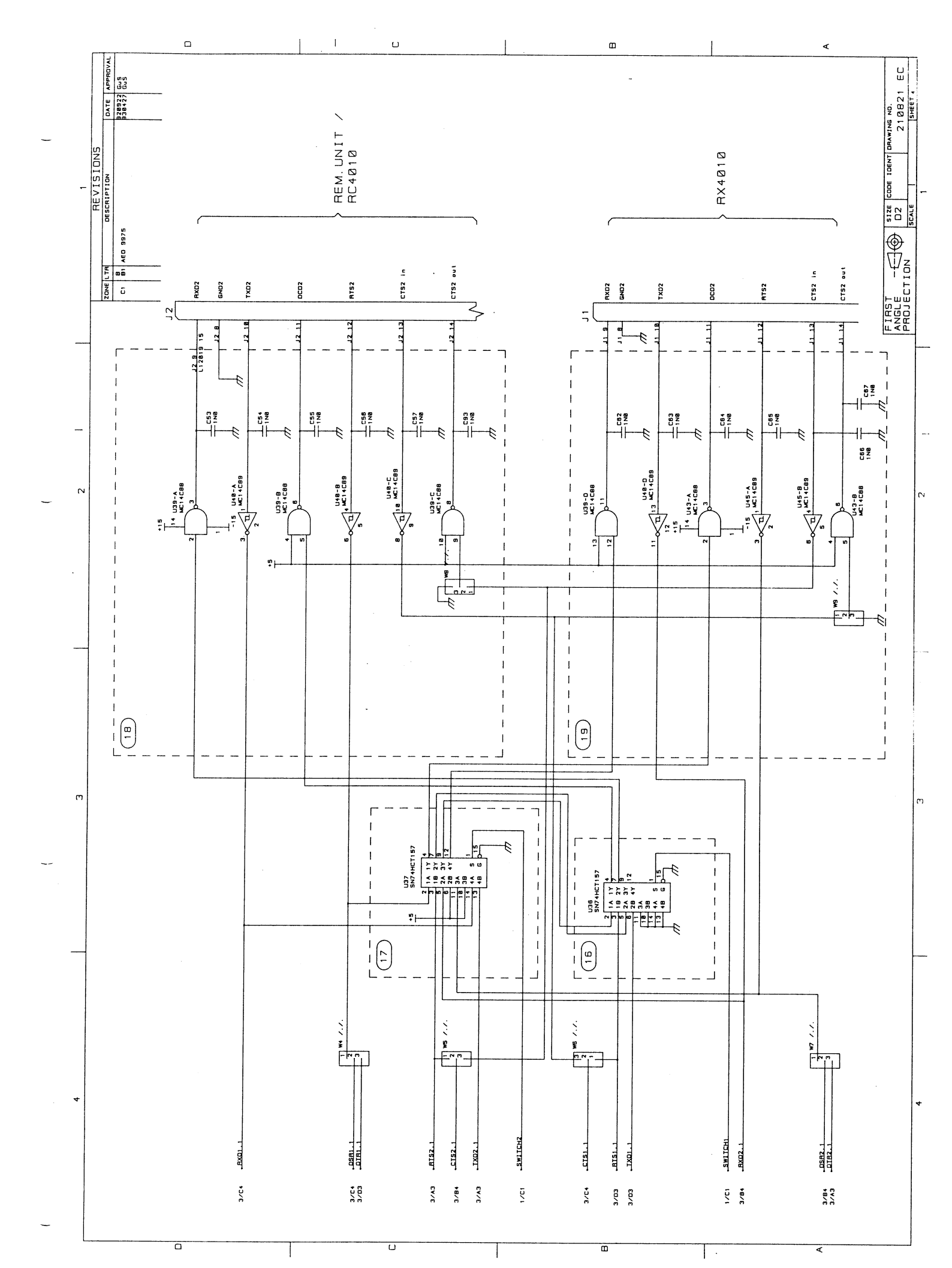
The circuit contains receivers and transmitters for serial communication via RS232 or RS422 standard between IC4010 and Host Computer or RC4010.

The capacitors on the pins of the connector are inserted to suppress RF on the lines.

19. Interface Circuits

The circuit contains receivers and transmitters for serial communication via RS232 or RS422 standard between IC4010 and RX4010. The capacitors on the pins of the connector are inserted to suppress RF on the lines.

W3 to W6 must be strapped according to the used communication standard.



Service Sheet A9

20. Switch S3

U38 is a quad 2-input multiplexer acting as a switch for the serial communication lines on TTL level. U38 is controlled by A8.1 via the output latch U27.

When the SWITCH3 signal is low the serial signals received from the Host Computer or TC4010 will be lead directly to SE4010 through the interface circuits of IC4010.

If the SWITCH3 signal is set high the serial signals sent from the USART U35 for remote control of SE4010 are lead through the interface circuits to SE4010.

The serial signals sent from SE4010 are always lead to the USART U35.

21. Interface Circuits

The circuit contains receivers and transmitters for serial communication via RS232 or RS422 standard between IC4010 and the Host Computer or TC4010.

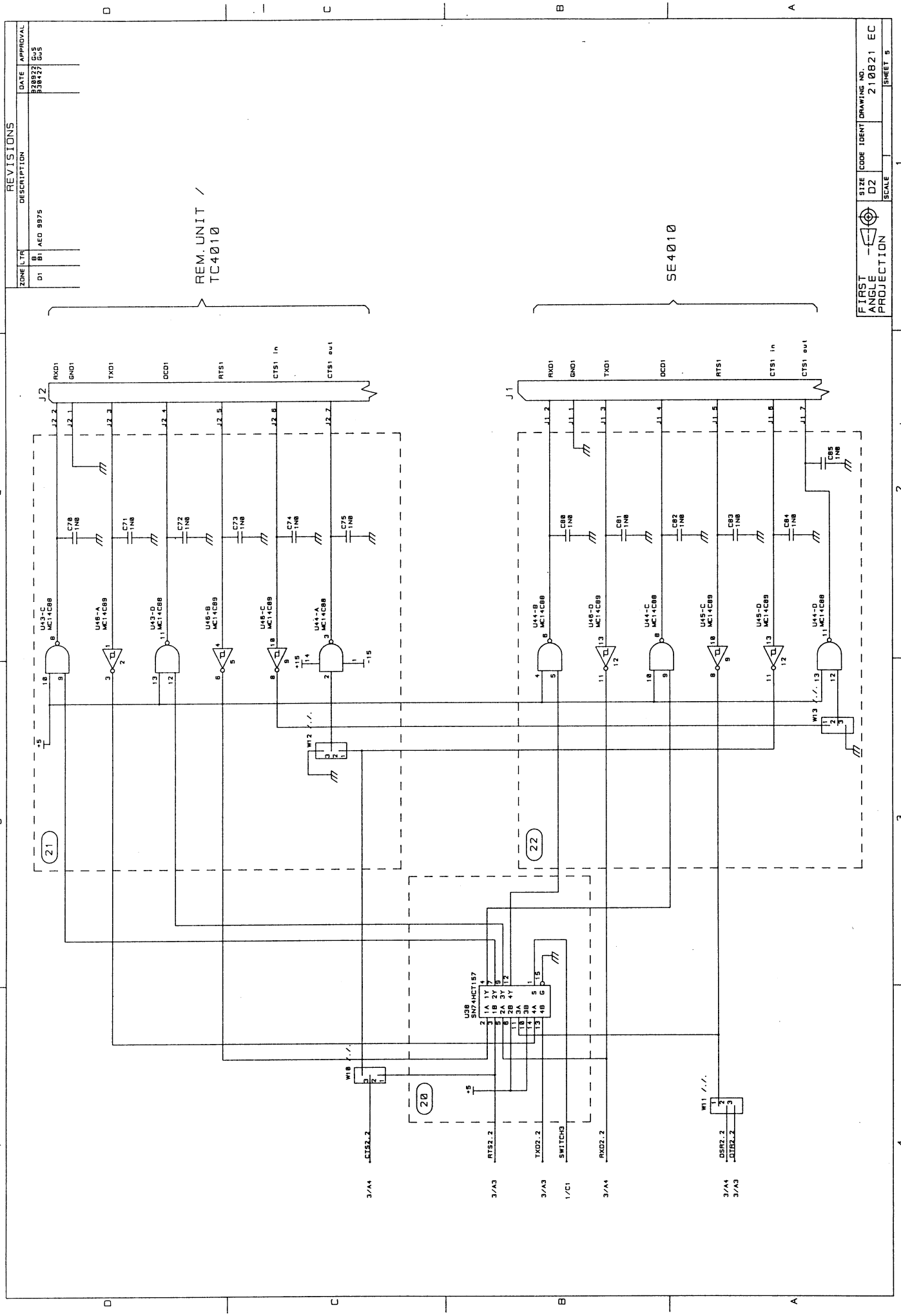
The capacitors on the pins of the connector are inserted to suppress RF on the lines.

22. Interface Circuits

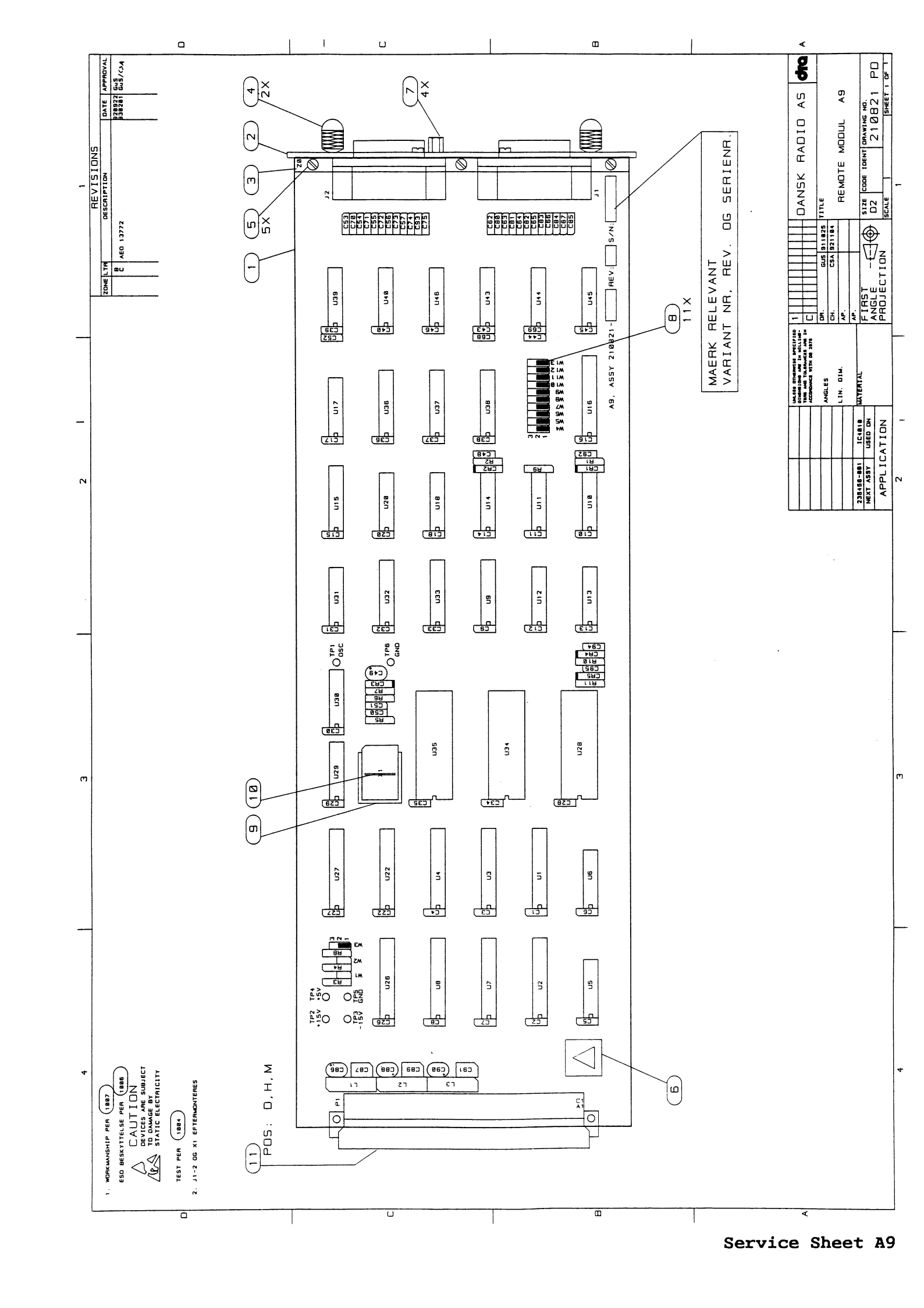
The circuit contains receivers and transmitters for serial communication via RS232 or RS422 standard between IC4010 and SE4010.

The capacitors on the pins of the connector are inserted to suppress RF on the lines.

W9 to W12 and W14 must be strapped according to the used communication standard.



Service Sheet A9



Service Sheet A9

ASSY 494186, POWER SUPPLY ASSEMBLY

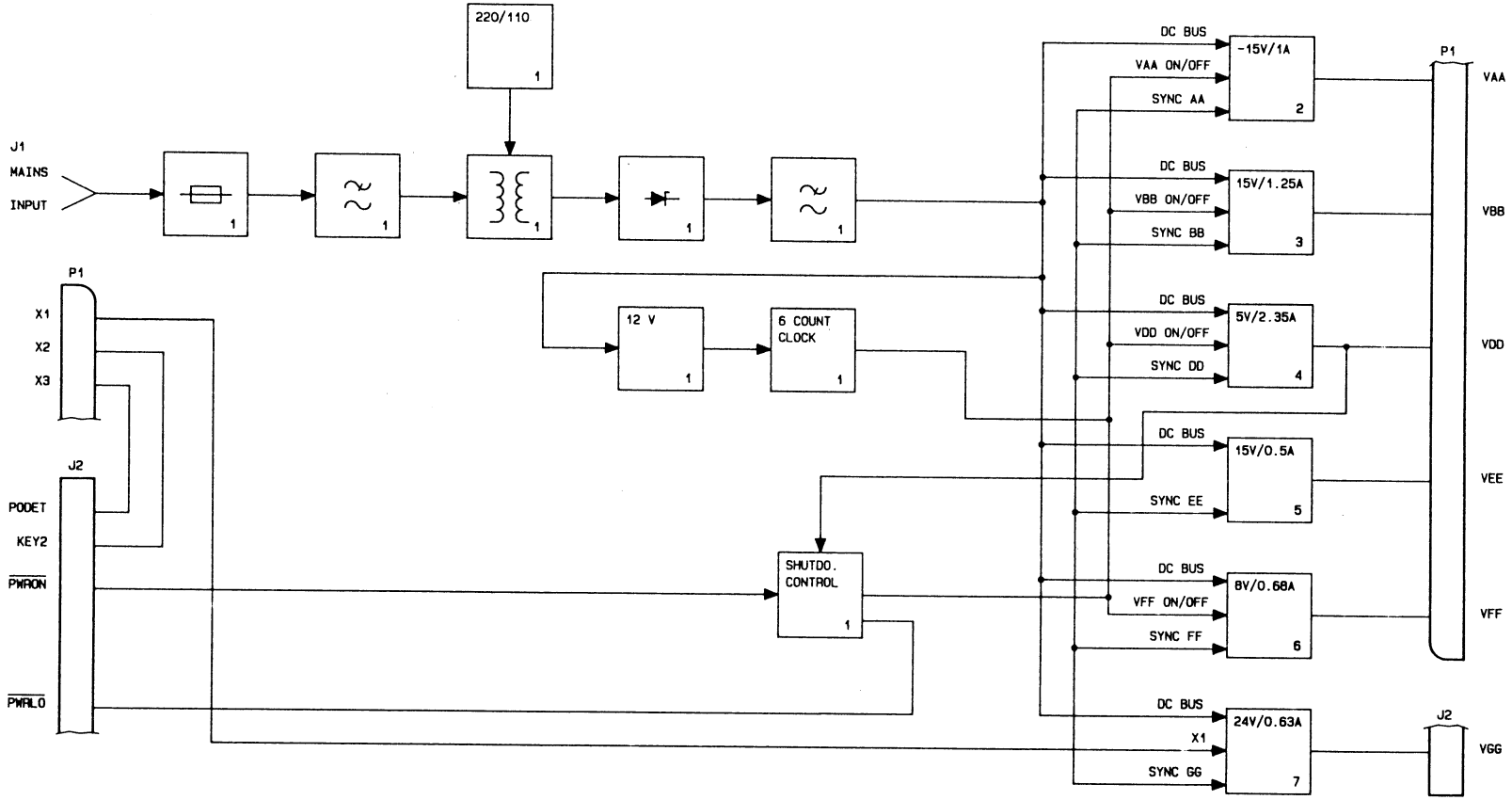
Service Sheet A10

Assy 494186, Power Supply Assembly — Configuration

The Power Supply Assembly is a secondary switch mode power supply with 6 output voltages and a total output power of 70W. A secondary switch mode power supply is a power supply where the mains are connected through a transformer, giving the galvanic insulation between input and output.

Block **1** contains the transformer, rectifier and filter and a 6-phase clock used for the 6 regulators. Blocks **2** to **7** contain the regulators for the 6 different output voltages. Further block **1** contains the Shutdown control, which controls the 5 regulators. The 6th regulator, **5** giving VEE can only be shut down by switching off the mains. The signal **PWRON** energizes the regulators giving VAA, VBB, VDD and VFF, while the regulator giving VGG is controlled by the signal **X1**.

All the regulators are overvoltage protected, as well as current limited.



CHANGE ORDER/REVISION			
CO: 9707 REV: B	CO: REV:	CO: REV:	CO: REV:
CHKD: CM:	CHKD: CM:	CHKD: CM:	CHKD: CM:

MATERIAL:	GENERAL TOLERANCE:	PROJECTION:	TERMA Elektronik AS FSCM 20567 HOVMARKEN 4, DK-8520 LYSTRUP, DENMARK
REVISION STATUS OF SHEETS (OTHER THAN):			
SHEET NO:			TITLE: CONFIGURATION POWER SUPPLY A10 SE4010
REVISION:			
CODE: D2	1 SHEET(S)	INITIAL RELEASE: 88-10-17	DATE OF THIS ISSUE: 92-05-04 REV: B
PREP: JBC	CHKD:	APVD: N/A	CM: JG DOCUMENT NO: 494186 EB SHEET NO: 1

Service Sheet A10

Assy 494186, Power Supply Assembly **Schematic 1**

1. Transformer and Mains Filter

The mains filter is a common mode filter. The filter prevents common mode noise from the power supply to reach the mains input. The filter also prevents noise on the mains to enter the Power Supply.

The filter contains a varistor preventing spikes on the mains to enter the transformer T101. The transformer T101 can be strapped to either 110V or 220V. The transformer has a built-in thermo switch for protection. The AC voltage is rectified in CR101 and filtered by C104, C105 and L102.

1. Regulator Supply and Clock Generator

VR103 and Q102 generate the voltage supply for the clock generator and the shutdown control.
The crystal, X101 generates the input signal to the Johnson-counter, U103 coupled for dividing by 6.
The 6 output signals have a mutual phase offset of 60 degrees and a frequency of 154 kHz.

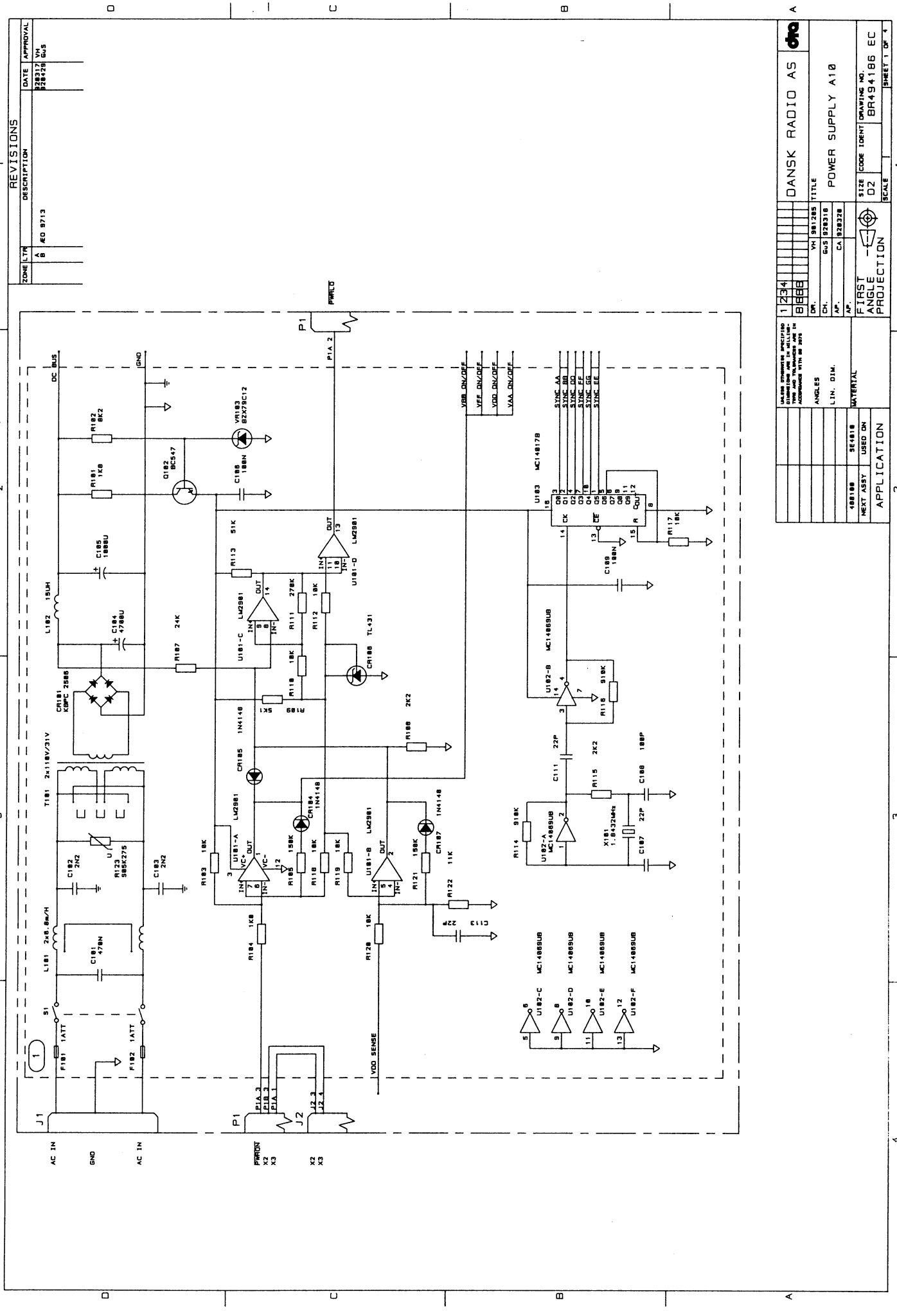
1. Shutdown Control

One of the regulators (VEE) operates continuously while all other regulators are controlled by control signals.

The $\overline{\textbf{PWRON}}$ signal controls the VAA, VBB, VFF and VDD regulators.

Three voltages are used for generating the $\overline{\textbf{PWRLO}}$ signal.
DCBUS is compared to a reference voltage from CR106. When the voltage at **DCBUS** is too low, **PWRLO** will be low.
VDD is also compared to the reference voltage. This ensures that
PWRLO cannot be activated before VDD has reached the voltage 4.75 V.

The diode, CR105 forces $\overline{\textbf{PWRLO}}$ to be low when $\overline{\textbf{PWRON}}$ goes high.



Service Sheet A10

2. VAA Regulator (-15V)

The converter is built as a current-mode controlled fly-back converter around the integrated controller U201.

The switch stage is performed by the power MOSFET, Q213. The current signal for the converter is made by the source resistors R224/R225.

The output stage is performed by the rectifier, CR214, followed by the coil, L201 and the capacitors, C214, C215 and C216.

The controller, U201 has a built-in undervoltage detector with an hysteresis of approx. 6 V. Until the start-up voltage for U201 is reached, the current consumption is very low. When the **DCBUS** voltage rises, C202 will be charged through R203 until the start-up voltage has been reached. When the converter is started, it generates its own voltage supply through CR206. If the converter is overloaded or shorted, the voltage across C202 will drop below the minimum voltage for U201. The converter will stop and a new start-up will take place. The timing constant R203/C202 controls the timing for the start-up.

Overvoltage at the output is detected by the shunt regulator, CR201. When overvoltage is detected, the cathode of CR201 is grounded; this connects pin 7 to pin 3 of U201 through R206 and CR202. U201 stops when the voltage at pin 3 is higher than 1 V. At the same time C202 will be discharged through Q204 and R208. Because of R202 the voltage supply must be removed before the converter will start-up again.

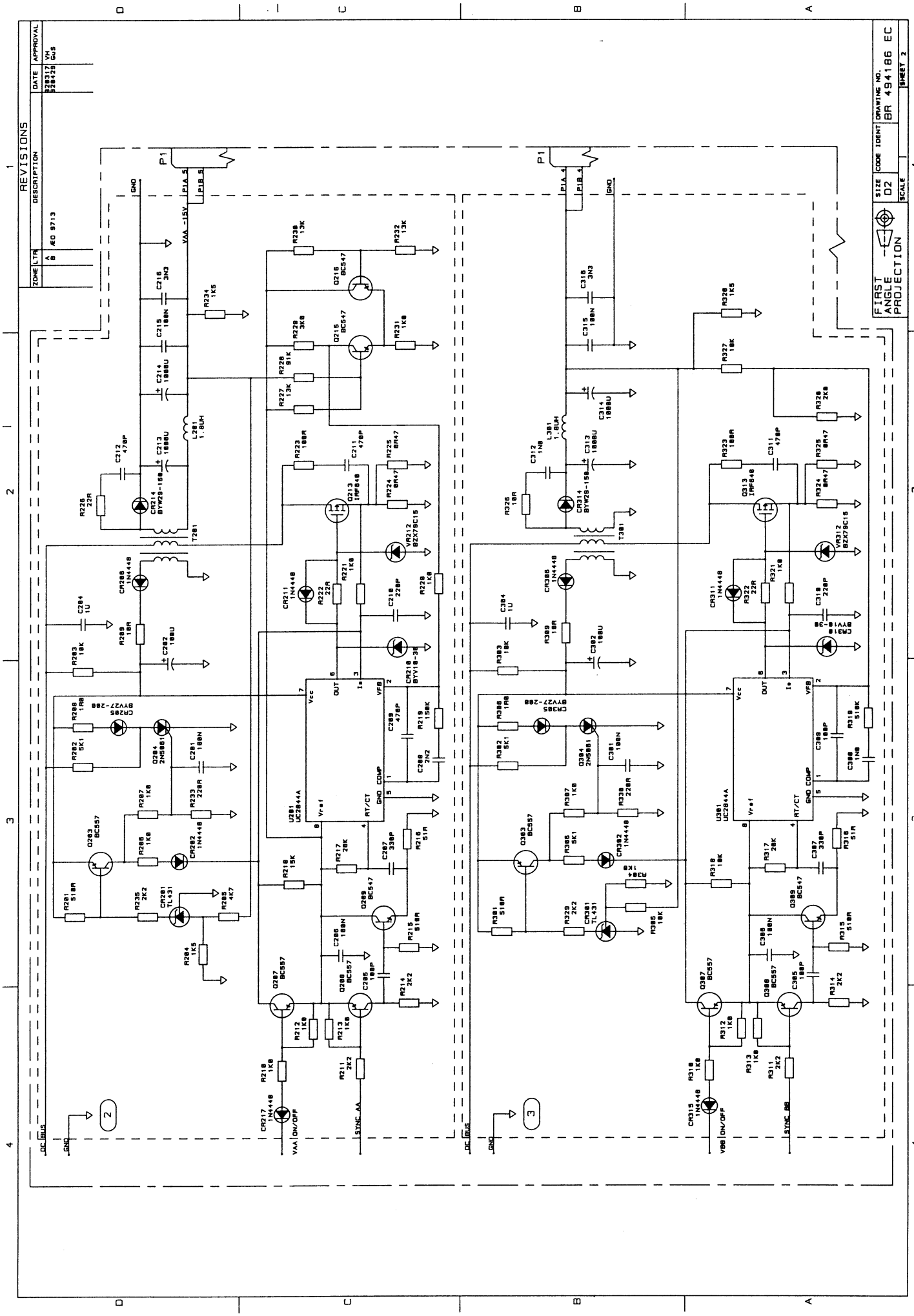
The synchronization of U201 is taken from Q208. The **SYNC AA** is differentiated through C205 and R215 and added to the timing condensator C207.

Start and stop are controlled by Q207. When **VAA ON/OFF** activates Q207, **VREF** is connected to pin 3 through Q207, stopping U201.

The differential stages Q215 and Q216 are used for changing the negative output voltage, VAA to a positive voltage (-VAA).

3. VBB Regulator (+15V)

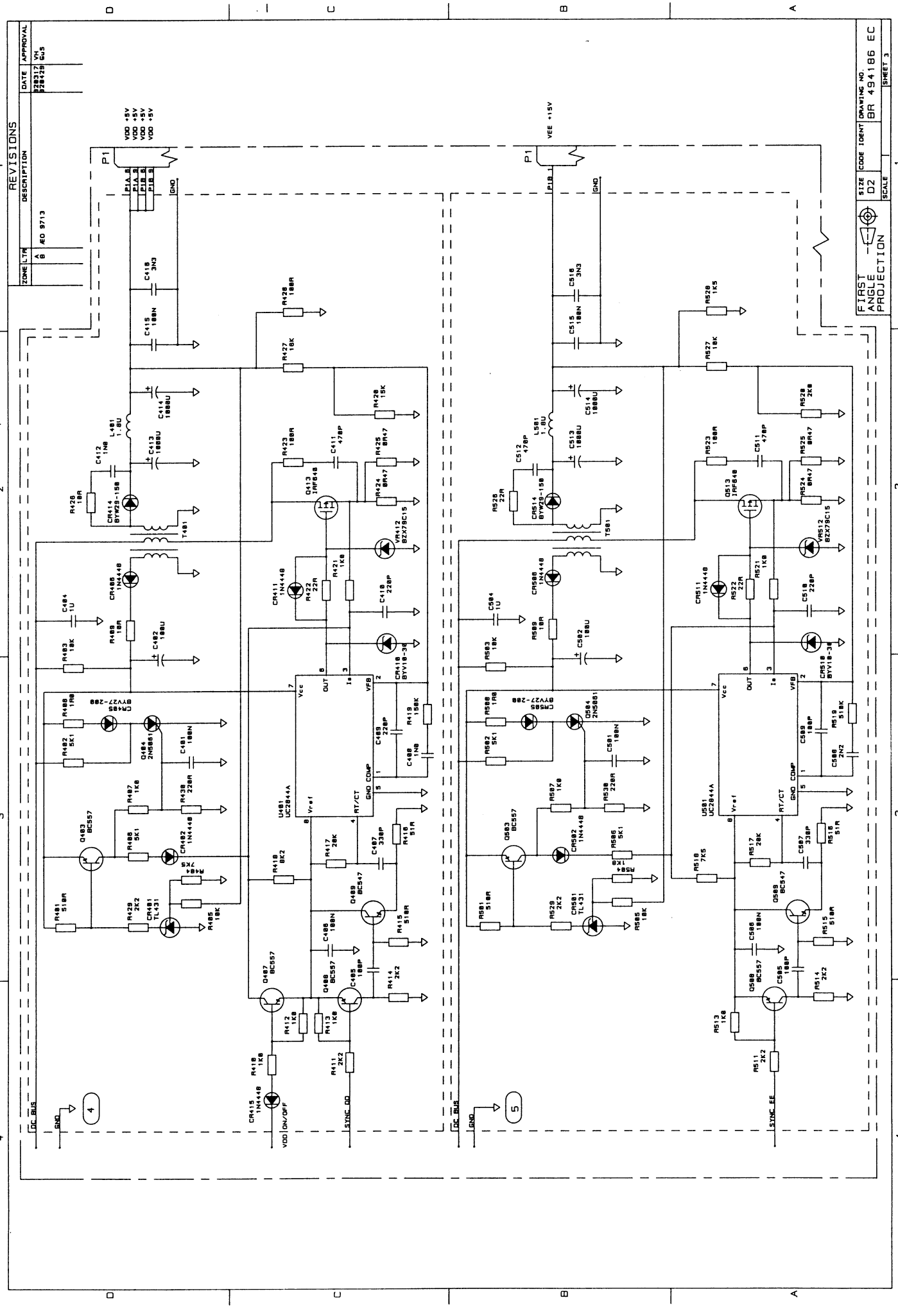
Operates in the same way as the regulator in **2**, except that no differential stage is present because of positive output voltage.



Service Sheet A10

4. VDD Regulator (+5V)
Operates in the same way as the regulator in 3.

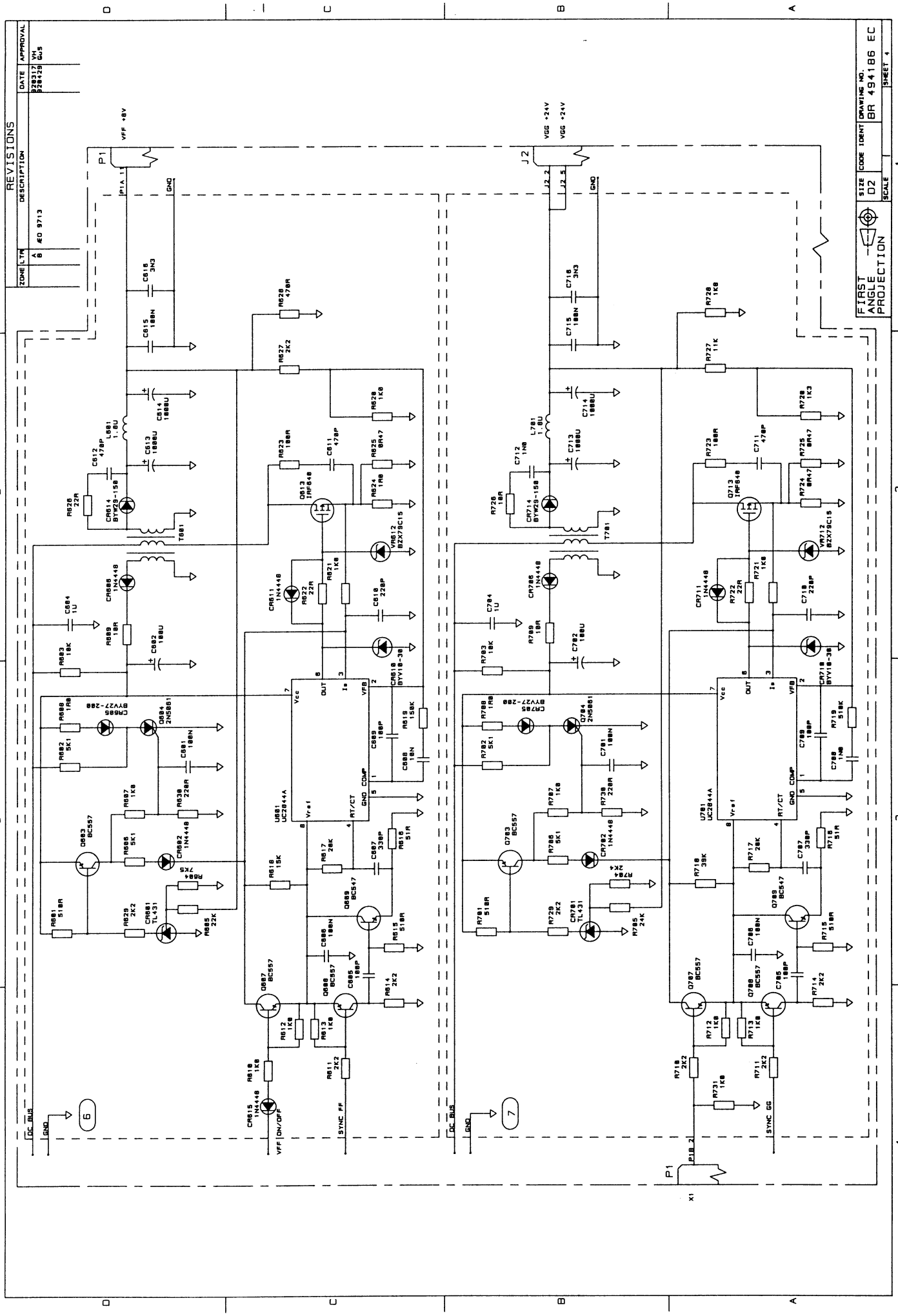
5. VEE Regulator (+15V const.)
Operates in the same way as the regulator in 3, except that it can only be deenergized by removal of the mains.



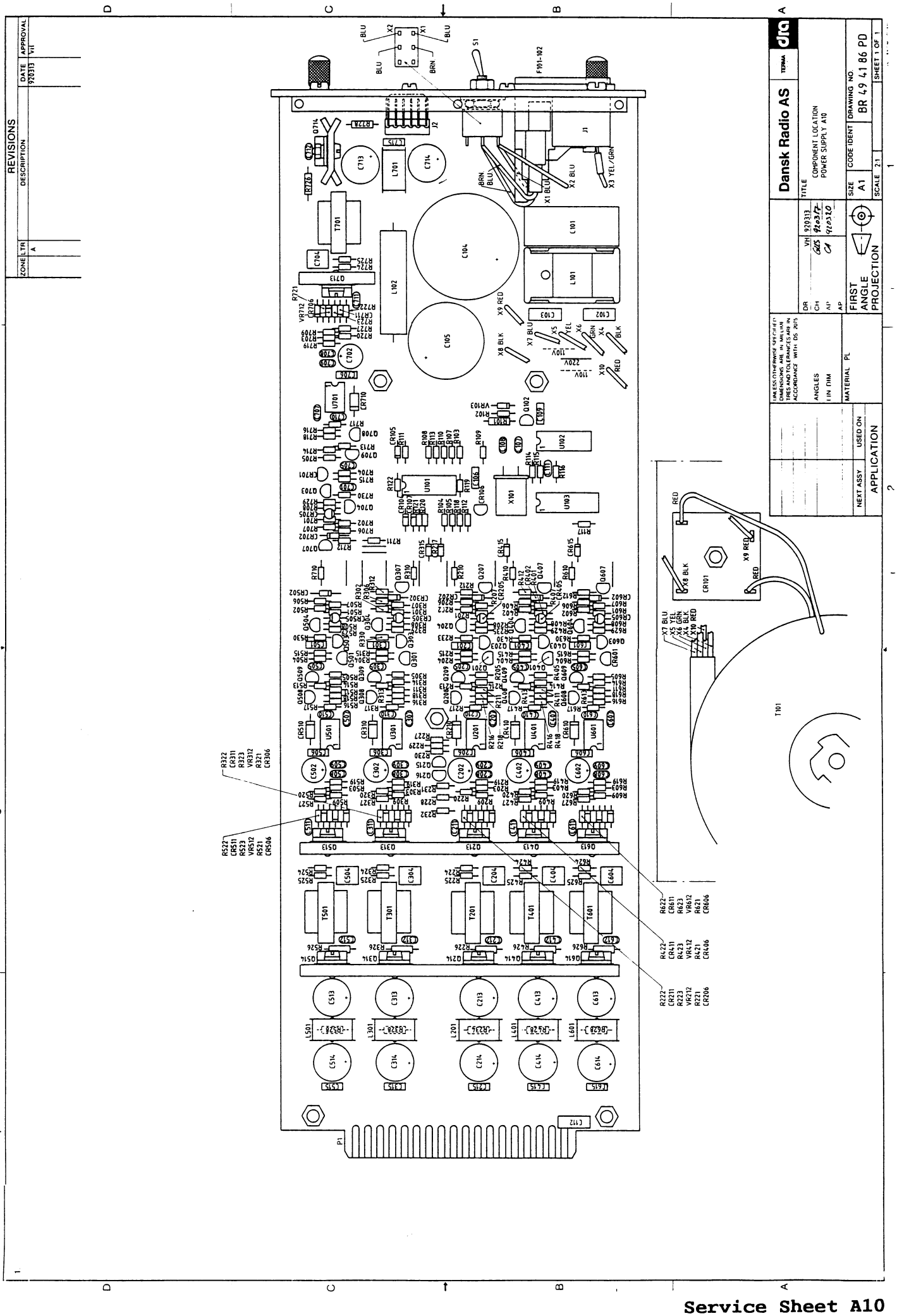
Service Sheet A10

6. VFF Regulator (+8V)
Operates in the same way as the regulator in 3.

7. VGG Regulator (+24V)
Operates in the same way as the regulator in 3 except that the signal X1 controls the VGG regulator.



Service Sheet A10



Service Sheet A10

ASSY 237636, FRONT PANEL

Service Sheet A11

The address decoder (1) is used by the microprocessor A8.1 to select either the Output latch, the shift register or the input latch.

The input Latch (3) contains the data from A8.1 to the front panel for the LED indicators and the display ROMs.

The Shift register (7) is used by A8.1 to multiplex the segments in the display and scan the keyboard.

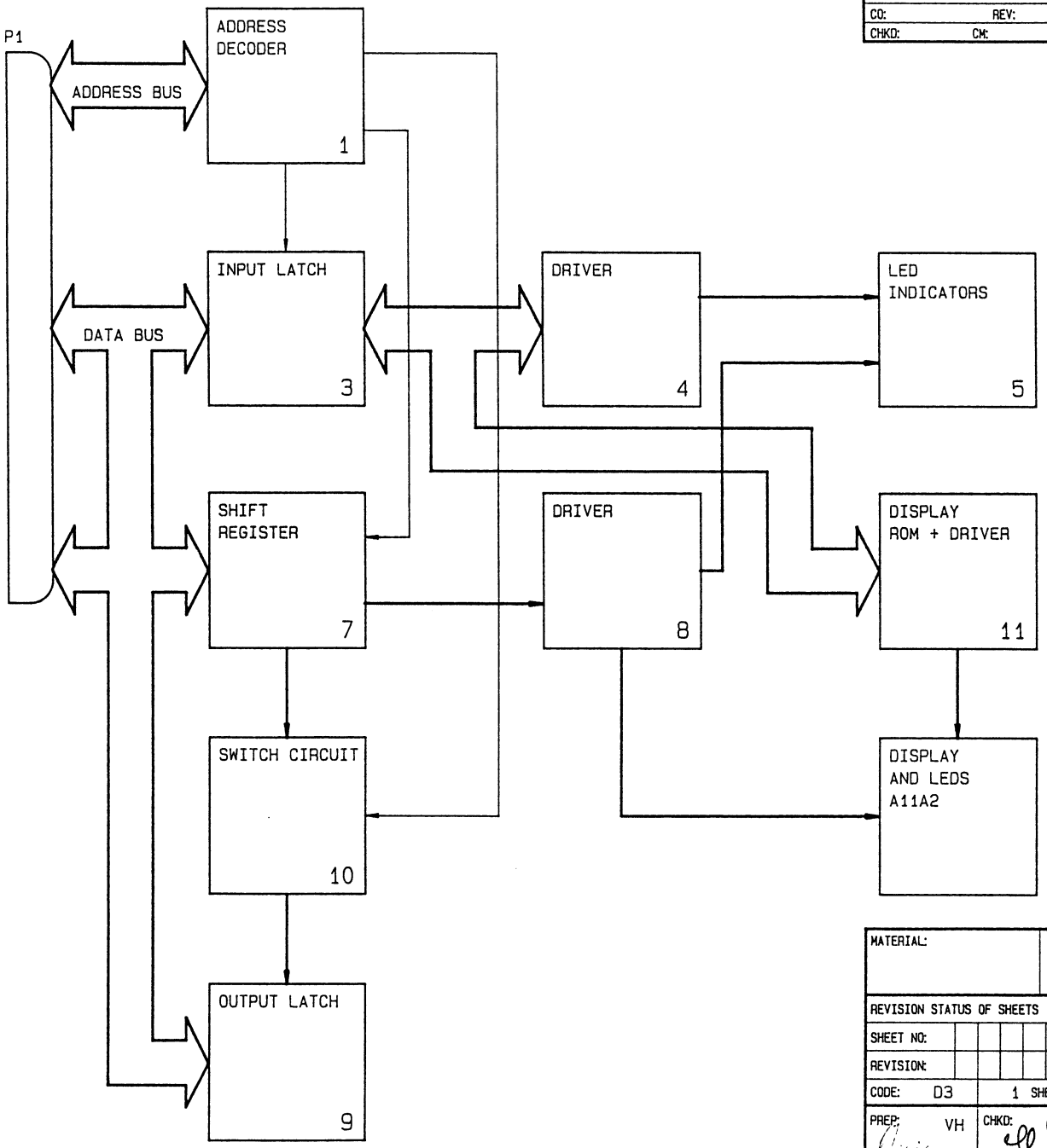
The switch circuit (10) is scanned by A8.1 through the shift register (7) and the result is sampled by the output Latch (9). The LED driver (4) supplies the current for the LED indicators on A11A1 (5) and the light bars on the display board, A11A2.

The control of the multiplexing of the LEDs and displays is buffered by a driver (8).

The dimmer circuit (6) controls the light intensity in the LEDs and display.

Two display ROMs (11) convert the eight-bit data word from A8.1 to the fourteen data lines used in the display.

The display (A11A2) is a fourteen segment display able to display the full capital alphabet. Annunciators are used to illuminate fixed messages.



CHANGE ORDER/REVISION							
CO:	REV:	CO:	REV:	CO:	REV:	CO:	REV:
CHKD:	CM:	CHKD:	CM:	CHKD:	CM:	CHKD:	CM:

MATERIAL:	GENERAL TOLERANCE:	PROJECTION:	TERMA Elektronik AS FSCM R0567 HOVMARKEN 4, DK-8520 LYSTRUP, DENMARK
REVISION STATUS OF SHEETS (OTHER THAN):			
SHEET NO:			TITLE: FRONT PANEL A11
REVISION:			
CODE: D3	1 SHEET (S)	INITIAL RELEASE: 930324	DATE OF THIS ISSUE: 930324 / REV: A
PREP: VH	CHKD: CSA	APVD: N/A / CM: JG	DOCUMENT NO: 237636 EB / SHEET NO: 1

Service Sheet A11

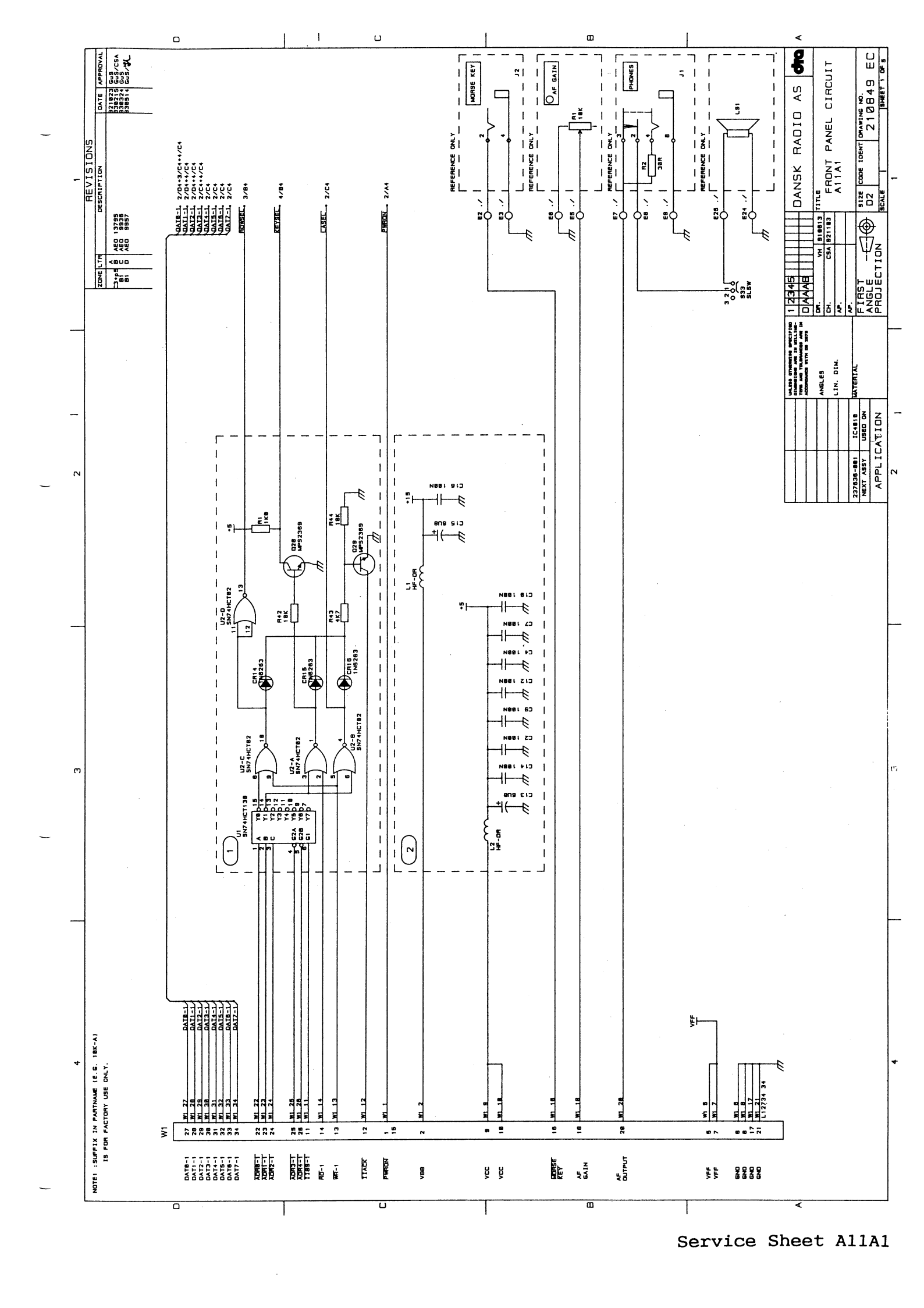
A3 Form 200000 FC Rev C

Assy 210849, Front Panel Circuit **Schematic 1**

1. Address Decoding

With associated gates for generation af acknowledge $\overline{\text{IIACK}}$, as handshaking signal for microcomputer A8.1.

2. Supply Filters



Service Sheet A11A1

3. Eight-bit Latch
Used for segment information to the display converter and the LEDs.

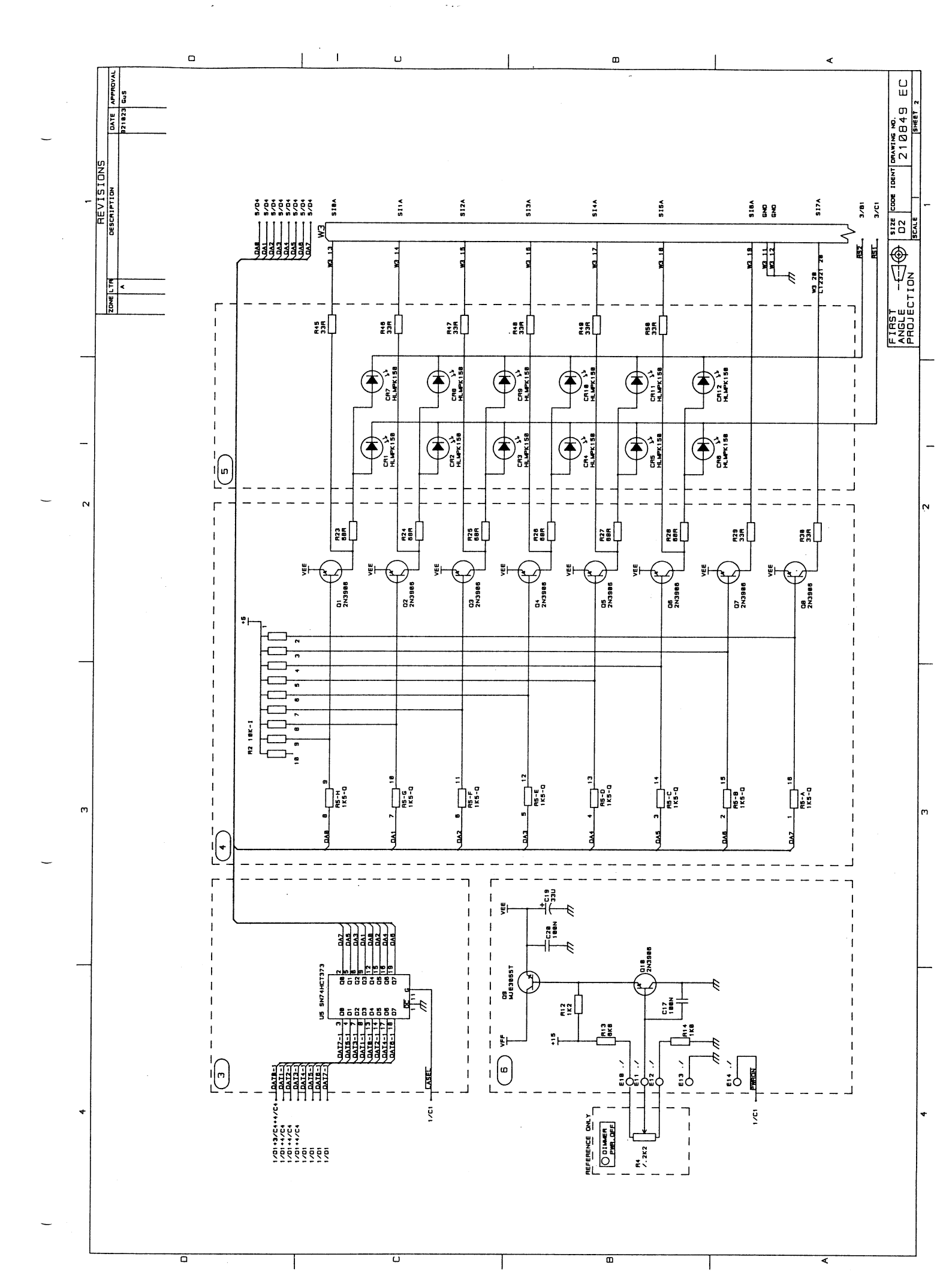
4. Q1-Q8
Drivers for segment information.

R23-R28	:	Current limiting resistors for the Light Emitting Diodes located at the switches.
R45-50, R29-30	:	Current limiting resistors for the display unit, A11A2.

5. LED Indicators

Cr.no.	Corresponding Switch
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

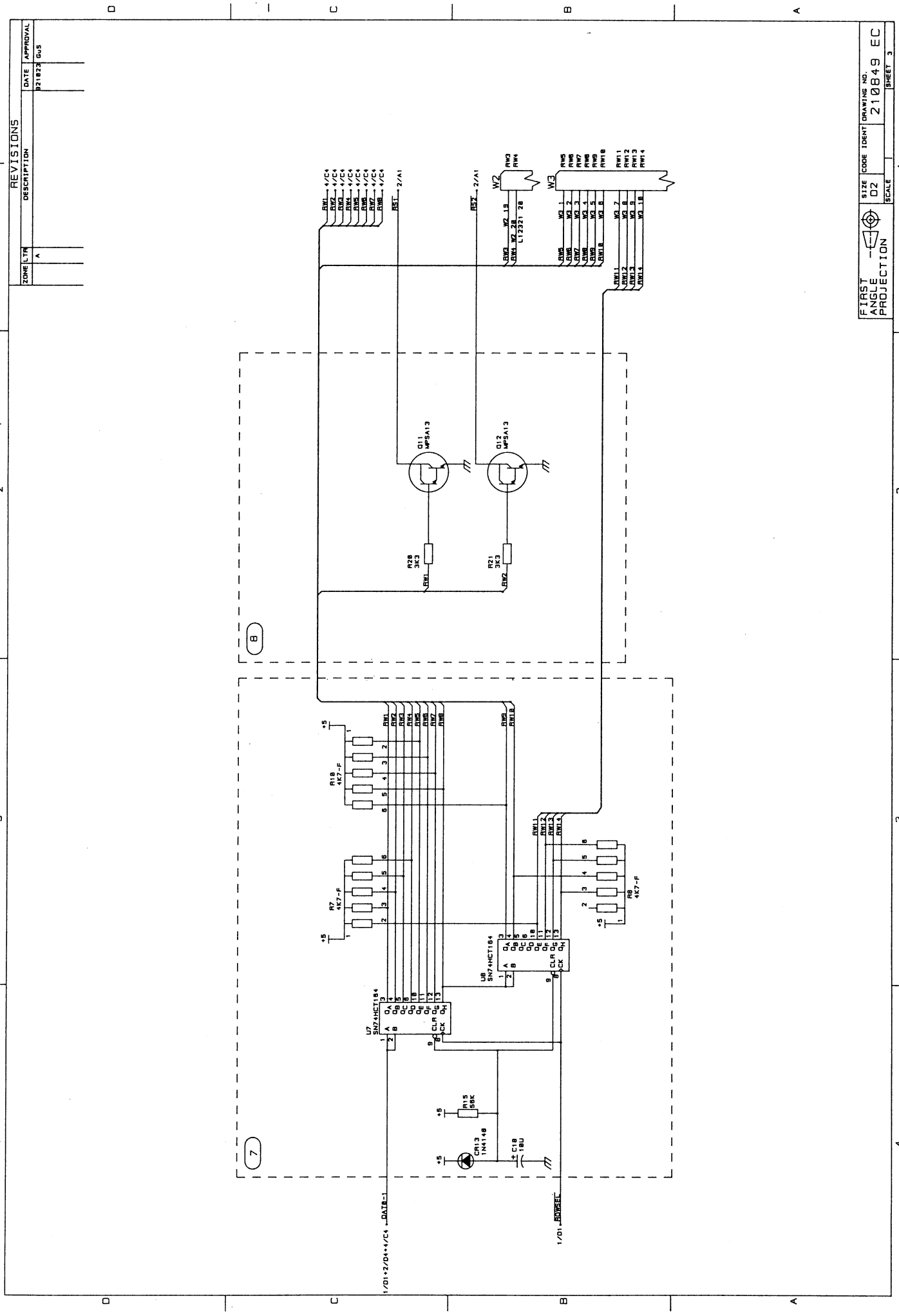
6. Dimmer Circuit
Controls the light in displays and LEDs.



Service Sheet A11A1

7. U7, U8
Shift registers with associated pull-up network, used for multiplexing displays, LEDs and switches.
R15, C13 clear U7-U8 during start-up.

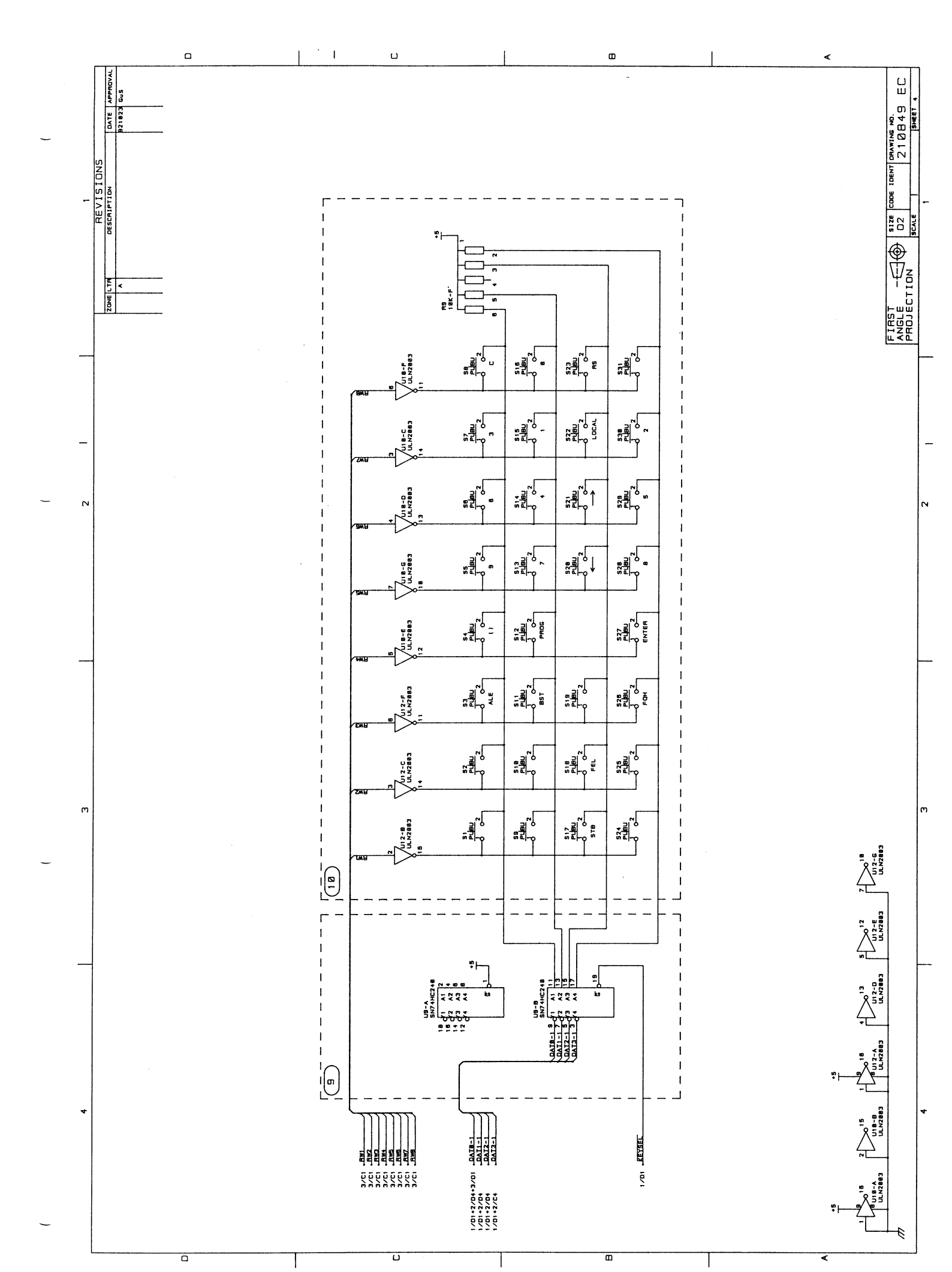
8. Drivers
Q11 and Q12 for multiplexing of LEDs.



Service Sheet A11A1

9. Four-bit Output Buffer
Read by Microprocessor A8.1

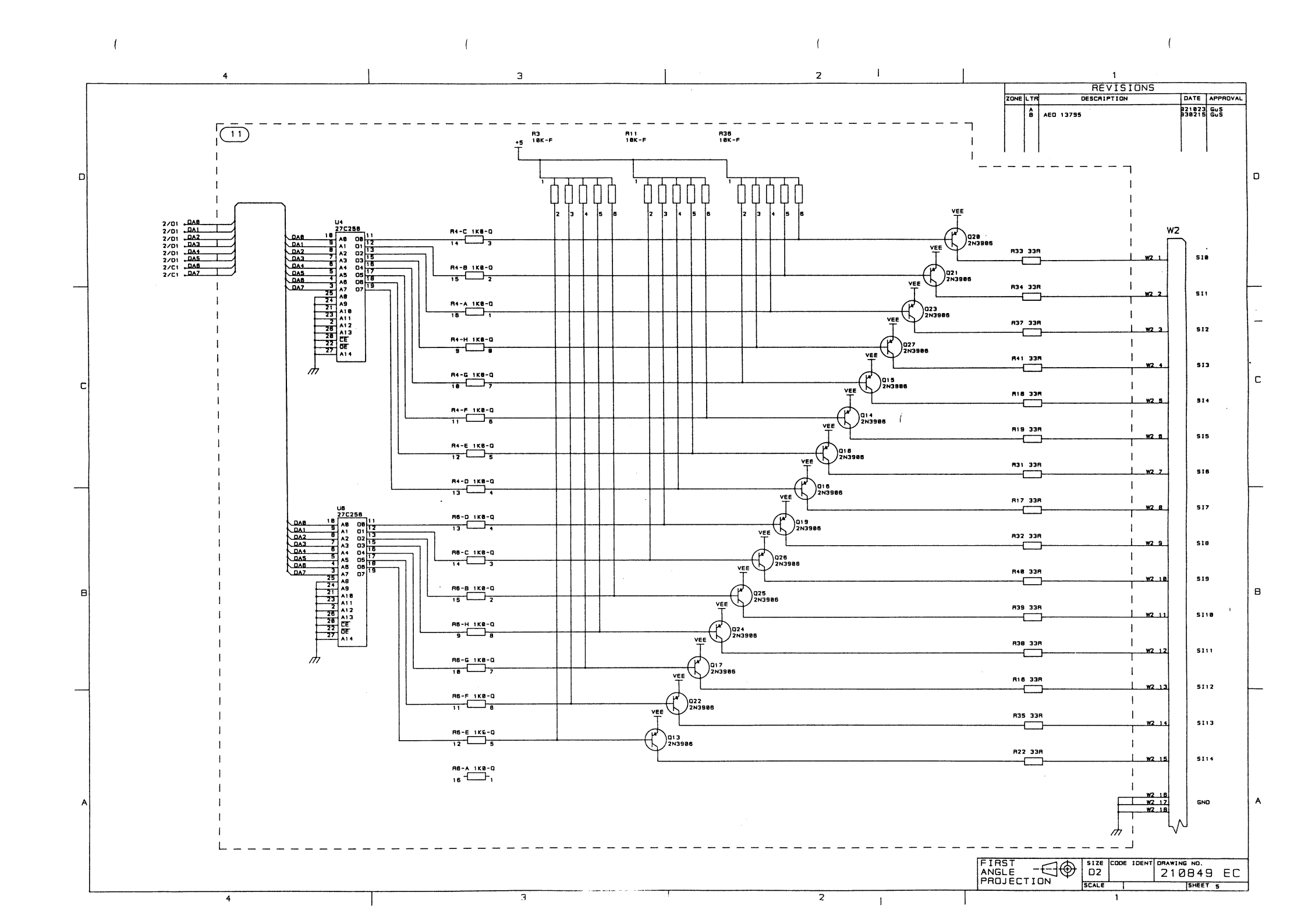
10. S1-S31, Switches SPSTNO
(Single Pole Single Through Normally Open) with associated pull-up network and open-collector selectors controlled by the microprocessor.



Service Sheet A11A1

10. Display Decoder Circuit

The eight data lines from Microprocessor A8.1 are decoded to fourteen lines used to control the fourteen segments in the display A11A2.


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A 921023 GuS
B AEO 13795 930215 GuS
11
+5
R3 10K-F
R11 10K-F
R36 10K-F
U4 27C256
U6 27C256
2/D1 DA0
2/D1 DA1
2/D1 DA2
2/D1 DA3
2/D1 DA4
2/D1 DA5
2/C1 DA6
2/C1 DA7
R4-C 1K0-Q
R4-B 1K0-Q
R4-A 1K0-Q
R4-H 1K0-Q
R4-G 1K0-Q
R4-F 1K0-Q
R4-E 1K0-Q
R4-D 1K0-Q
R6-D 1K0-Q
R6-C 1K0-Q
R6-B 1K0-Q
R6-H 1K0-Q
R6-G 1K0-Q
R6-F 1K0-Q
R6-E 1K0-Q
R6-A 1K0-Q
VEE
Q20 2N3906
Q21 2N3906
Q23 2N3906
Q27 2N3906
Q15 2N3906
Q14 2N3906
Q18 2N3906
Q16 2N3906
Q19 2N3906
Q26 2N3906
Q25 2N3906
Q24 2N3906
Q17 2N3906
Q22 2N3906
Q13 2N3906
W2
R33 33R W2 1 SI0
R34 33R W2 2 SI1
R37 33R W2 3 SI2
R41 33R W2 4 SI3
R18 33R W2 5 SI4
R19 33R W2 6 SI5
R31 33R W2 7 SI6
R17 33R W2 8 SI7
R32 33R W2 9 SI8
R40 33R W2 10 SI9
R39 33R W2 11 SI10
R38 33R W2 12 SI11
R16 33R W2 13 SI12
R35 33R W2 14 SI13
R22 33R W2 15 SI14
W2 16
W2 17
W2 18
GND
FIRST ANGLE PROJECTION
SIZE D2
CODE IDENT
DRAWING NO. 210849 EC
SCALE
SHEET 5

1. WORKMANSHIP PER (1007)

ESD BESKYTTELSE PER (1008)

CAUTION
DEVICES ARE SUBJECT TO DAMAGE BY STATIC ELECTRICITY

TEST PER (1004)

2. ALLE LYSDIODER MONTERES MED (88) 21mm

S1-31, S33, W1-3 OG CR1-12 EFTERMONTERES

W1 MONTERES PAA LODDESIDEN

(83) - (92) EFTERMONTERES IFLG. TABEL

3. Z1,2,7,8,11,12,15 MARKERER MONTERINGSHULLER

4. (75) UDELADES PAA LODDESIDE AF (1)

5. C16 OG C20 LAEGGES NED.
C15 OG C19 LAEGGES OVENPAA.

6. C13 LAEGGES NED MOD U12

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A		921023	GuS
	B	AEO 13795	930215	GuS/CSA
	B1	AEO 13915	930324	GuS/CSA
	C	AEO 9957	930514	GuS/CSA

NOTE 6

W2 AND W3 DETAIL

PWB

NOTE 5: C15/16 OG C19/20

PWB

NOTE 4

X8

NOTE 2

X7

MAERK RELEVANT VARIANT NR, REV. OG SERIENR.

TERM	COL	P/N
E 2	BLU	88
E 3	BLK	92
E 5	GRN	85
E 6	RED	84
E 7	GRN	87
E 8	VIO	89
E 9	BLK	92
E10	GRY	86
E11	BRN	83
E12	WHT	81
E24	BLK	92
E25	YEL	86

(83) - (92)

118 +/- 2 mm

4 +/- 1 mm

4 +/- 1 mm

237636-881	IC4010	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3078

ANGLES

LIN. DIM.

FIRST ANGLE PROJECTION

DANSK RADIO AS

DR.	GuS	920918
CH.	CSA	921103
AP.		
AP.		

TITLE: FRONT PANEL CIRCUIT A11A1

SIZE: D2 | CODE IDENT | DRAWING NO.: 210849 PD

SCALE | SHEET 1 OF 1

Service Sheet A11A1

Assy 210854, Display Board **Schematic 1**

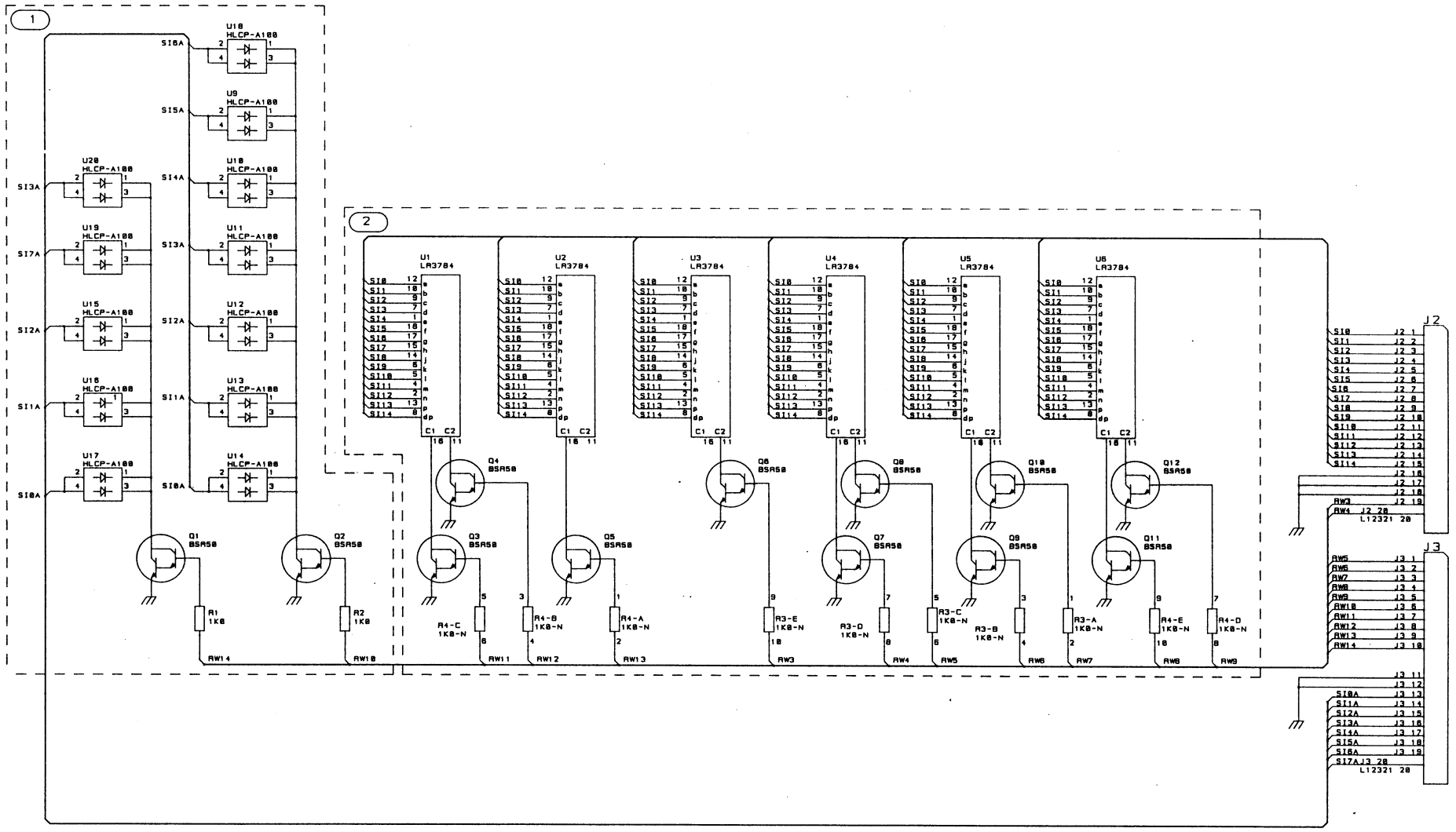
1. LED Annunciators
With associated drivers for multiplexing.

2. Dual Displays
With associated drivers for multiplexing.

Service Sheet A11A2

NOTE1 :SUFFIX IN PARTNAME (E.G. 10K-A)
IS FOR FACTORY USE ONLY.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A		921023	GuS



237838-881	IC4818		
NEXT ASSY	USED ON		
APPLICATION			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS AND TOLERANCES ARE IN ACCORDANCE WITH DS 2478

ANGLES

LIN. DIM.

MATERIAL

FIRST ANGLE PROJECTION

DR.	VH	910612	
CH.	CSA	921103	
AP.			
AP.			

DANSK RADIO AS

TITLE: DISPLAY BOARD A11A2

SIZE	CODE IDENT	DRAWING NO.
D2		210854 EC

SCALE | SHEET 1 OF 1

Service Sheet A11A2

1. WORKMANSHIP PER 1887

   ESD BESKYTTELSE PER 1885

   CAUTION
   DEVICES ARE SUBJECT TO DAMAGE BY STATIC ELECTRICITY

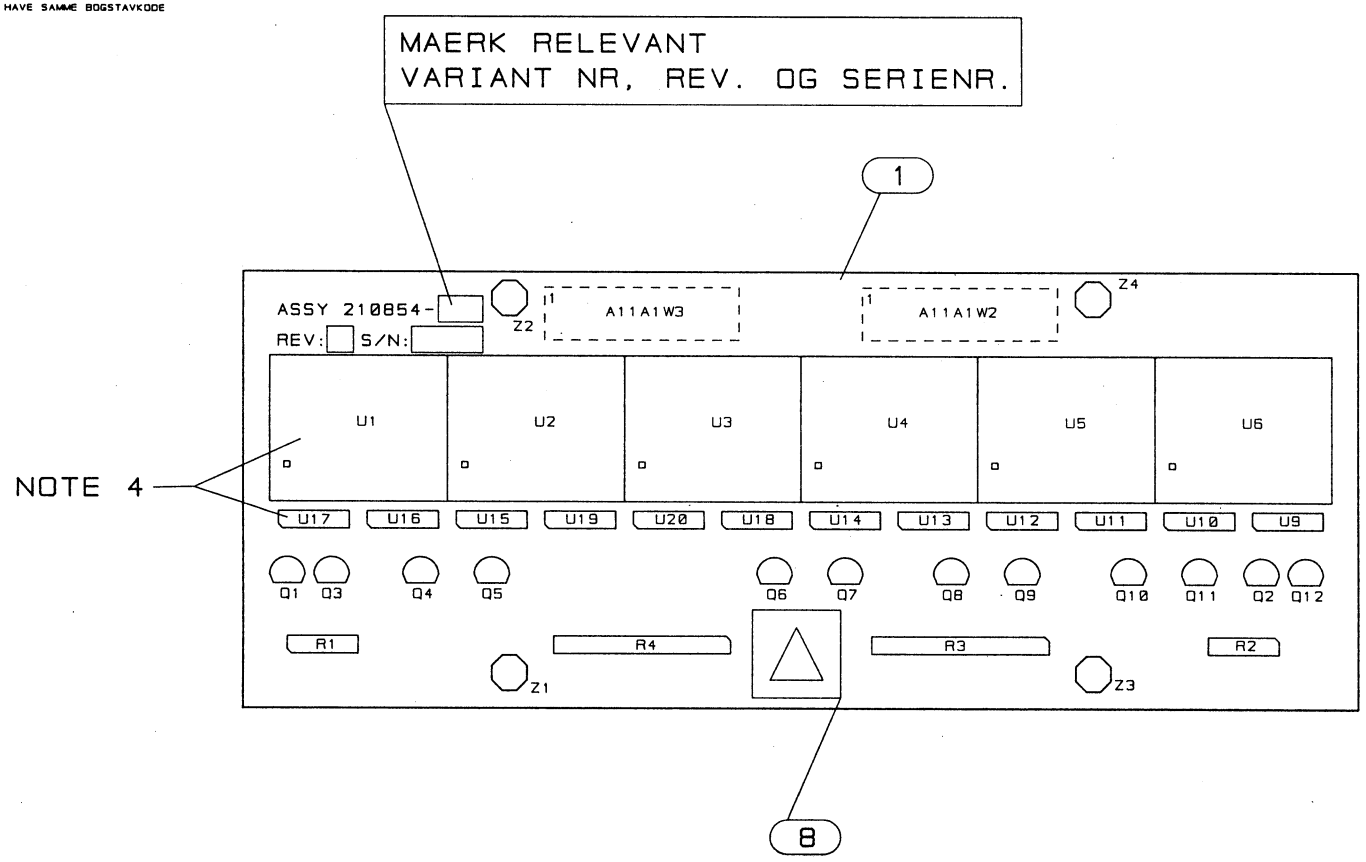
   TEST PER 1884

2. Z1-4 MARKERER MONTERINGSHULLER

3. A11A1W2-3 MONTERES PAA 1 ODDESIDE VED SAMLING AF A11

4. U1-8 SKAL HAVE SAMME BOGSTAVKODE
   U9-17 SKAL HAVE SAMME BOGSTAVKODE

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A		921023	GuS
	A1	AEO 13798	930215	GuS/CSA
	B	AEO 13912	930325	GuS/
	C	AEO 13985	930325	GuS/CSA



237636-881	IC4010	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS AND TOLERANCES ARE IN ACCORDANCE WITH DS 3078	1	DANSK RADIO AS	A
NEXT ASSY	USED ON	ANGLES	C		
APPLICATION		LIN. DIM.	DR. GuS 920918	TITLE	
		MATERIAL	CH. CSA 921103	DISPLAY BOARD A11A2	
			AP.		
			AP.		
			FIRST ANGLE PROJECTION	SIZE D2 / CODE IDENT / DRAWING NO. 210854 PD	
				SCALE / SHEET 1 OF 1	

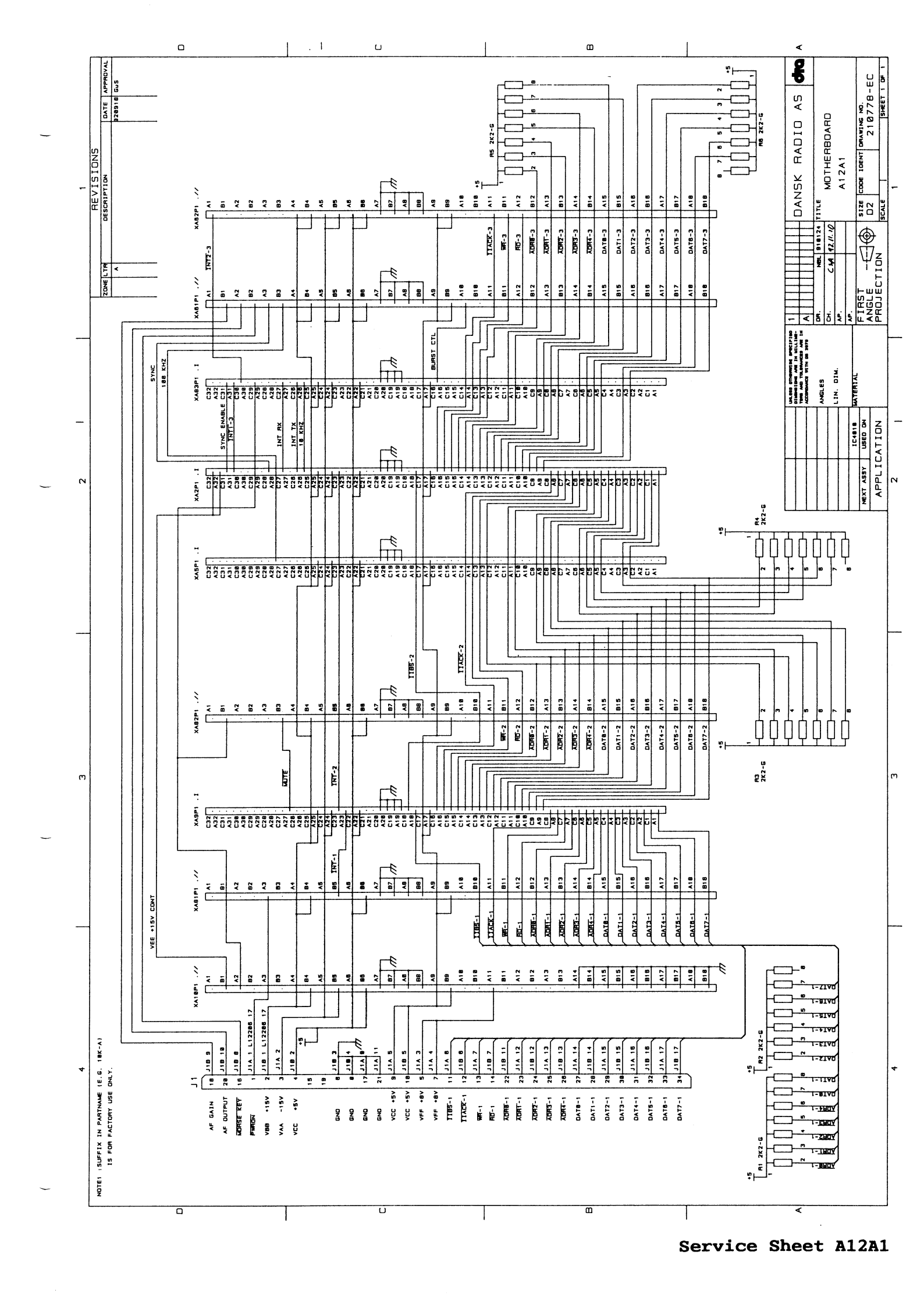
Service Sheet A11A2

ASSY 210778, MOTHERBOARD

Service Sheet A12A1

Assy 210778, Motherboard **Schematic 1**

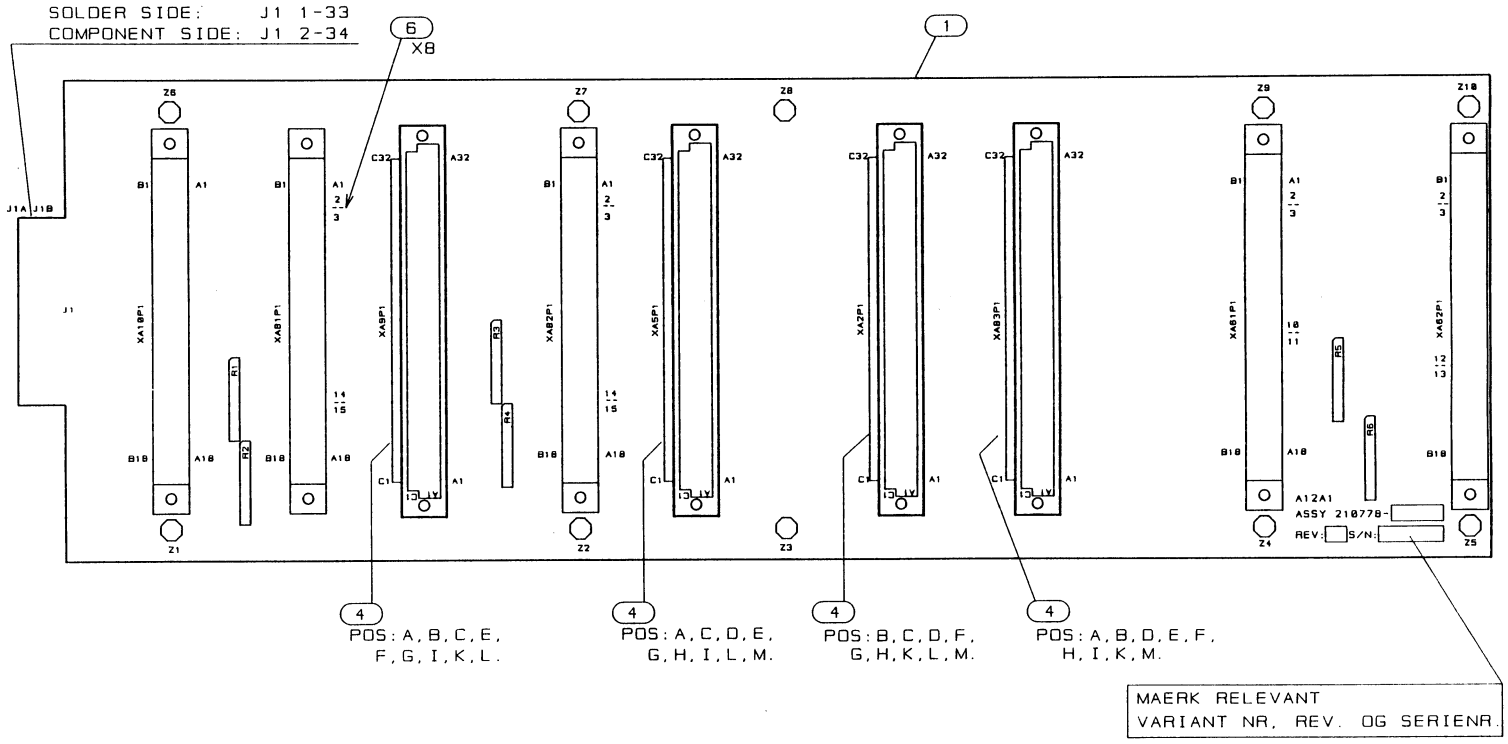
The Motherboard establishes the internal interconnection in order to route signals and supply voltages to the modules. In order to prevents noise on data and address busses from causing oscillations on the busses during the three state mode these is pulled up to +5V via resistors.



Service Sheet A12A1

1. WORKMANSHIP PER (1887)
2. Z1-18 MARKERER MONTERINGSHULLER

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A	AEO 13771	921109	GuS
	B		930126	GuS /CSA



237634-001	IC4818	DANSK RADIO AS	dra
NEXT ASSY	USED ON	DR. GuS 928782	TITLE: MOTHERBOARD A12A1
APPLICATION		CH. / AP. / AP.	SIZE: D2
		MATERIAL	CODE IDENT:
		ANGLES / LIN. DIM.	DRAWING NO.: 210778 PD
		FIRST ANGLE PROJECTION	SCALE / SHEET 1 OF 1

Unless otherwise specified dimensions are in millimeters and tolerances are in accordance with DS 2076

Service Sheet A12A1