OPERATING AND SERVICE MANUAL

RX 4010

COMMUNICATION RECEIVER

WARNING

To prevent potential fire or shock hazard, do not expose receiver to rain or moisture.

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The information given in this manual at the time of publication is valid. However, the products are, as a consequence of DANSK RADIO's continuous research and development, subject to alteration without obligation of prior notice.

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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 adjustment 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 CONTENT

Section Page

SECTION 1
GENERAL INFORMATION

1.1 Introduction

This Operating and Service Manual contains information required to install, operate, test, adjust and service the receiver.

Receiver specifications are listed in paragraph 1.7.
These specifications are the performance standards or limits against which the receiver is tested.

Due to the experience obtained from the production and operation of the equipment, minor differences between the receiver and the manual can occur.

Wherever possible such differences are covered in Section 7 "MANUAL CHANGES".

The electrical modules of the receiver are listed in Section 6.

1.2 Safety Considerations

This manual contains information, cautions and warnings which must be followed to ensure safe operation and to maintain the receiver in a safe condition.

1.3 Description

The communication receiver is a fully synthesized, dual conversion, superheterodyne receiver. It covers the frequency range 15 kHz to 29.99999 MHz in 10 Hz increments.

Operation modes are AM, CW, RTTY and SSB. Optionally ISB and FM are available.

The receiver is equipped with microprocessor control. This provides intelligence in the form of factory programmed instruction memory that introduces new concepts in communication receivers, providing improvements in performance, ease of operation and reliability.

The microprocessor control includes features such as:

- Instant pushbutton tuning
- Free tuning in 10 Hz to 1 kHz steps
- Battery back-up memory storage for 99 user programmable frequencies and reception modes (incl. BFO-tuning)

- Automatic selection of all CCIR recommended frequencies for SSB and RTTY communication

- Digital keyed AGC

- AGC hold-time synchronized with SIMPLEX or ARQ burst keying

- Scanning of user-selected and CCIR frequencies

- Built-in diagnostic routines

- Error conditions automatically displayed on front panel

- AGC threshold control

- Fully remote controlled (option)

The receiver controls are arranged in groups enabling the operator easily to identify and control receiver operation with a minimum of switching. Standard settings of the AGC and bandwidth controls are automatically selected when the operator presses the desired reception mode. The operator can override all preset settings and select AGC time constants and receiver bandwidths more suitable for his reception environment.

The receiver has several LED-displays which informs the operator about frequency, channel numbers, BFO, reception mode, receiver signal strength and other status information.

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

The receiver incorporates scanning facilities. During scanning the dwell time between channels is programmed by means of the normal frequency entry keyboard. Via the control input/output socket (at the rear panel of the receiver) the scan sequence may be temporarily terminated from an auxiliary decoder, enabling automatic reception of selcall communication.

The Scan sequence may also be temporarily terminated when a signal exceeds a pre-adjustable threshold level.

A detailed operating instruction is contained in section 3 of this manual.

1.4 Options
The following extends the usefulness of the Receiver.

1.4.1 RTTY Demodulator Module
DRA part no. 471577 featuring adaptive threshold control, RS232C output and strappable baud rate and mark/space frequencies.

1.4.2 RTTY Demodulator Module
DRA part no. 489670. As 1.4.1. but optimized for 150 Baud Data Rate.

1.4.3 RTTY Demodulator Module
DRA part no. 488275. As 1.4.1 but without internal audio input.

1.4.4 Remote Control
from RC4010 unit or a personal computer, to allow control over two pairs of telephone lines. Two systems are available.

1) Serial Remote Control Module DRA part no. 471666. 600/1200 bps, conform to V24/RS232C and V23, incl. AUX port for remote control of external equipment via the serial remote control system of the receiver.

2) Serial Remote Control Module DRA part no. 490598 . 75 to 9600 bps conform to RS232C, compatible to RS422 and RS485.

1.4.5 Power Supply
110/220V AC/24VDC alternative power supply to the standard mains only version DRA part no.448532.

Note that when this optional power supply is used in the RX4010, certain limitations exist in selecting other optional modules.

1.4.6 Frequency Generator Standard
DRA part no. 488232 with 5.12 MHz internal Standard Oscillator output.

1.4.7 Independent Sideband
DRA part no. 489913

1.5 Accessories Supplied.
The following accessories are supplied with the Receiver.

One Operating and Service Manual, DRA part no 493856
One Power Cord, DRA part no. 426652.

1.6 Accessories Available

The following items are available for use with the Receiver.

Receiver Cabinet, DRA part no. 475246

Rack Slides Kit, DRA part no. 458872

Connector Kit, basis receiver version, DRA part no.475505

Connector Kit for RTTY Demodulator, DRA part no. 485284

Connector Kit for Remote Control Module,DRA part no. 485292

Standard Spare Parts Kit, DRA part no. 475076

Depot Spares Kit, ISB, Filter Option 01, DRA part no. 493821

Special Tools Kit, DRA part no. 493848.

1.7 Specifications

FREQUENCY RANGE

15 kHz to 30 MHz in 10 Hz increments.
(15 kHz to 100 kHz with reduced performance)

ANTENNA IMPEDANCE

50 ohm

INPUT PROTECTION

30V EMF continuously
100V EMF for up to 15 minutes

OPERATING MODES

A1A, A2B, H2A, A3E, H3E, R3E, J3E, F1B.
B8E, B9E, B9W, J7B with optional ISB module.

FREQUENCY STABILITY

0.1 ppm -15 to +50°C
0.3 ppm -25 to +55°C
aging (after 30 days power on) < 0.01 ppm/day
< 0.04 ppm/month
< 0.1 ppm/year

FREQUENCY TUNE TIME

Typically 10 msec.

INPUT SELECTIVITY

10 fixed filters

IF SELECTIVITY

R3E, J3E, B8E, B9E, J7B-USB:
Passband ripple < 2dB
Passband ripple < 1dB within 575-2910 Hz
Relative att. < 6dB within 300 Hz to 3400 Hz 1:148
Stopband att. > 60dB at -450 Hz and + 4150 Hz
Group delay distortion <0.5 msec. within 575-2910 Hz

A1A, A2B, H2A, A3E, H3E, J7B-LSB, F1B:

Wide: -3dB at +/- 3.75 kHz, -60dB at +/-8.5 kHz
group delay distortion <0.2 msec. within +/-3 kHz

Inter: -3dB at +/- 1.5 kHz, -60 dB at +/-2.6 kHz
group delay distortion <0.5 msec. within +/-1.1 kHz

Narrow: -3dB at +/- 0.5 kHz, -60 dB at +/-1.0 kHz
group delay distortion <1 msec. within +/-400 Hz

Very Narrow: -3dB at +/-0.15 kHz, -60 dB at +/-0.6 kHz
group delay distortion <2 msec. within +/-100 Hz

SENSITIVITY

0.7 µV EMF for 10 dB SINAD in SSB
2.7 µV EMF for 10 dB SINAD in AM (1 kHz, 50%)

INTERMODULATION (Out-of-band)

100 dBµV EMF per signal more than 30 kHz offset from tune frequence produces less than an equivalent input signal of 40 dBµV EMF.

CROSS MODULATION

With a wanted J3E signal of 60 dBµV EMF, an unwanted signal of 110 dµV EMF 30%-400 Hz produces cross modulation output less than -30dB relative to wanted signal level.

BLOCKING

With a wanted signal of 60 dBµV EMF, an unwanted signal of 110 dµV EMF causes less than 3dB change in output level.

IMAGE REJECTION

Greater than 90 dB.

IF REJECTION

Greater than 90 dB

SPURIOUS RESPONSE REJECTION

Greater than 80 dB

INTERNALLY GENERATED SPURIOUS RESPONSE

Internally generated spurious signals will not produce a S/N ratio greater than 10 dB (BW=Inter).

SPURIOUS EMISSION

Less than 10 µV/50 ohm at antenna connector.

RF ATTENUATOR

0 dB or 10 dB.

AUTOMATIC GAIN CONTROL

Less than 4 dB change in output for 100 dB input signal variation from 6 dBuV EMF.

Time constants A1A, R3E, J3E, F1B, B8E, B9E, B9W, J7B:

Attack time:	0.5 msec. for 70 dB signal increase
Debounce time:	12 msec.
Attack-to-hold time:	
Wide:	20 msec.
Inter:	30 msec.
Narr:	50 msec.
Vnarr:	60 msec.
Hold time:	
Short:	30 msec.
Long:	2 sec.
Decay time:	Typical 10 dB per 100 msec.

Time constants A2B, H2A, A3E, H3E: 200 msec.

BFO RANGE

+/- 6.99 kHz synthesized in 10 Hz steps.

BFO TUNE TIME

Less than 1 msec.

NOTCH TUNE

Typical 30 dB variable from 300 Hz to 3400 Hz.

IF OUTPUT

-20 dBm/50 ohm.

LINE OUTPUT

Level	:	Adjustable up to +10 dBm
Impedance	:	600 ohm balanced, return loss better than 20 dB
Distortion	:	Less than 1% in J3E

TELEX OUTPUT

Level	:	0 dBm
Impedance	:	600 ohm balanced, return loss better than 20 dB

LINE INTERMODULATION (In-band)

Less than -45 dB relative to either of two 94 dBµV EMF signals (With RF Attenuator in "OFF").

SIDE TONE INPUT

Max. 500 mV/600 ohm.

MONITOR OUTPUT

Speaker	:	4W/4 ohm
Phones	:	10 mW/500 ohm

MUTING

Attenuation	:	60 dB typical
Attack time	:	0.1 msec. typical
Release time	:	0.5 msec. typical

MEMORY

Built-in Lithium battery for appr. 2 years memory back-up

INPUT POWER

110-125, 220-250 V, 50/60 Hz, 70 VA

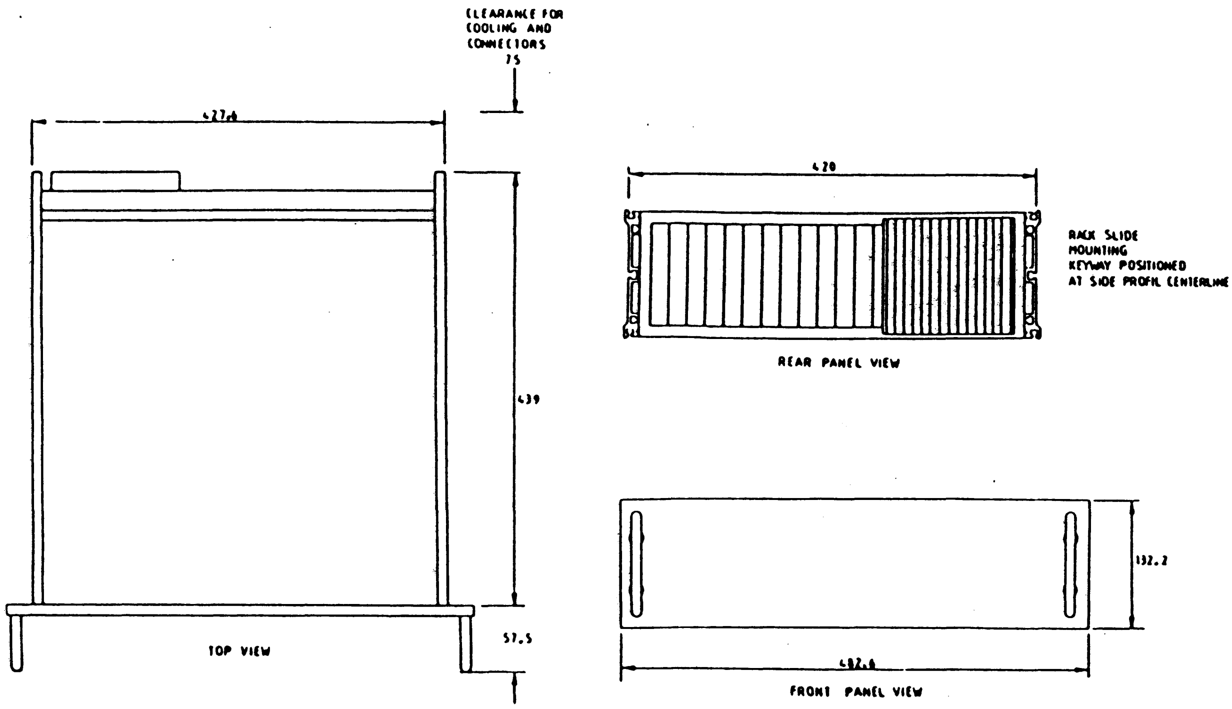
OPERATING ENVIRONMENT

Temperature	:	Full performance range 0°C to 50°C Operating range -25°C to 55°C
Humidity	:	To 95% relative humidity at 40°C
Vibration	:	MIL-STD-810D-514.3, Category 8, 514.3-1 (10-150 Hz),514.3-34, Category 9.
Shock	:	MIL-STD-810D-516.3, Procedure II (30 g for 20 msec.).

WEIGHT

15 kg incl. cabinet

DIMENSIONS



Receiver Cabinet (optional)

Height: 159 mm
Width: 509 mm
Depth: 463 mm

1.8 Operational Features

FREQUENCY TUNING

Numerical frequency keyboard entry plus single knob tuning.

99 user programmable channels including mode settings
176 pre-programmed CCIR-SSB channels
257 pre-programmed CCIR-RTTY channels

BFO TUNING

Numerical frequency keyboard entry plus single knob tuning. Default values automatically recalled when selecting reception modes.

AGC SYNCHRONIZATION

The AGC control is synchronized with the mute command

AGC THRESHOLD CONTROL

Threshold continuously variable

USER PROGRAMMABLE CHANNELS

Number of channels	:	99
Channel information	:	Receive frequency, reception mode, bandwidth, AGC-setting, RF attenuator and BFO frequency
Data storage time	:	Greater than 2 years

PREPROGRAMMED CHANNELS

Number of channels	:	433

SCANNING

Scanning of frequency bands, user programmed channels, CCIR channels and user designed scanning programs

Scan mode	:	Automatically or manually by tune knob
Dwell time	:	0.1 to 9 sec. selected by keyboard entry
Scan control	:	By built-in programmable timer or by scan stop (remote or manual) and AGC level

DIMMER CONTROL

Continuously variable

AUTO RESTART

Retention of receiver settings during power failure

USER CREATED SCAN PROGRAMS

Number of programs	:	49
Number of programing steps	:	6

USER PROGRAMMABLE TIMER

Number of clock alarms : 24

Number of programming steps : 2 (time and command)

1.9 User Programmable Features

The receiver is equipped with extended user programmable features such as:

- 99 addressable user programmable channels that allow the operator to store and recall complete receiver settings.
- 24 addressable day/hour clock alarms with programmable scanning, frequency change or muting.
- 49 user defined scanning programs each containing up to 6 intermixed scannings or frequency changes with selectable dwell time.
- a 24 hours' clock with battery back-up.

All these channels, clock alarms and scanning programs are stored in CMOS memory that maintain their content even though the receiver is turned off or disconnected from power sources.

When the receiver is turned on, it will restart at the last receiver settings before the power was turned off.

1.10 Specification of Options

1.10.1 Modem/Modem Interface Board A9 Assy 471666

Technical Specifications

Internal Modem :	V23 CCITT compatible modem Input output impedance 600 ohm balanced Strappable level to -10, -20 or -30 dB Baudrate 1200/600 bps. Operates on either 2 wire or 4 wire leased telephone lines
Modem Interface:	V24 modem interface for interfacing an external modem. 1200/600 bps.
AUX-port :	8/4 bit input/output AUX-port for external equipment, open collector output max. 15V 100mA.

1.10.2 Remote Interface A9 Assy 490598

Technical Specifications

Baudrate :	75/150/300/600/1200/2400/4800/9600 bps.
Interface Standards:	1) CCITT V24/RS232C 2) RS422 compatible 3) RS485 compatible
Line Output :	Balanced 600 ohm/0 dBm adjustable
Connection :	Sub-D female, 25 poles.

1.10.3 RTTY Demodulator A6 Assy 451577

Technical specifications

External audio input:	Input impedance 600 ohm, balanced input. level 0, -10, -20 or 30 dBm strappable
Center frequency :	1700 Hz
Deviation :	+/-42.5 Hz, +/-85 Hz, +/- 212 Hz or +/- 425 Hz, strappable
Keying speed :	50, 75 or 100 baud, strappable

RS232 output (J4): 25 pole D-conn.
RS232C
Received line signal detect output
Invert and Autostart control inputs
5 Volt and +/- 12 Volt outputs

Current loop output (J2):
9 pole D-conn.
60, 80, 100 or 120 Volt/ 20, 40 or 60 mA, strappable

Diversity input/output (J3/J4):
SMB connector
Two demodulators can be interconnected to perform predetection diversity combining.

1.10.4 RTTY Demodulator A6 Assy 489670

Technical Specifications

External audio input:
Input impedance 600 ohm, balanced input level 0, -10, -20 or -30 dBm strappable

Center frequency : 1700 Hz

Deviation : +/-42.5 Hz, +/-85 Hz, +/-250 Hz or +/-425 Hz, strappable

Keying speed : 50, 100 or 150 baud, strappable

RS232 output (J4): 25 pole D-conn.
RS 232 C
Received line signal detect output
Invert and Autostart control inputs
5 Volt and +/- 12 Volt outputs

Current loop output (J2):
9 pole D-conn.
60, 80, 100 or 120 Volt/20, 40 or 60 mA, strappable

Diversity input/output (J3/J4):
SMB connector
Two demodulators can be interconnected to perform predetection diversity combining.

1.10.5 RTTY Demodulator A6 Assy 488275

Technical Specifications

External audio input (no internal audio input):
Input impedance 600 ohm, balanced input level 0, -10, -20 or 30 dBm strappable

Center frequency : 1700 Hz

Deviation : +/-42.5 Hz, +/-85 Hz, +/-250 Hz or +/-425 Hz, strappable

Keying speed : 50, 100 or 150 baud, strappable

RS232 output (J4): 25 pole D-conn.
RS232C
Received line signal detect output
Invert and Autostart control inputs
5 Volt and +/- 12 Volt outputs

Current loop output (J2):
9 pole D-conn.
60, 80, 100 or 120 Volt/20, 40 or 60 mA, strappable

Diversity input/output (J3/J4):
SMB connector
Two demodulators can be interconnected to perform predetection diversity combining.

1.10.6 Frequency Generator Standard A2 Assy 488232

Technical Specifications

5.12 MHz internal Standard Oscillator output Level:
-7dBm/50 ohm

1.10.7 Independent Sideband A7 Assy 489919

Technical Specifications

The module enables the following reception modes :
B8E, B9E, B9W, J7B

Outputs :

Line 1:	Adjustable up to +10 dBm/600 ohm/Balanced Return loss better than 20 dB
Line 2:	As Line 1
Telex :	0 dBm/600 ohm/Balanced Return loss better than 20 dB.
IF:	1.4 MHz, -20 dBm/50 ohm

SECTION 2
INSTALLATION

2.1 Introduction

This section of the manual provides installation instructions for the RX4010 communication receiver. It also includes information about initial inspection and damage claims, preparation for use and repacking for shipment information.

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 receiver.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the receiver has been checked mechanically and electrically. If the contents are incomplete, if there is a mechanical damage or defect, or if the receiver 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

2.3 Storage

The receiver may be stored or shipped in temperatures within the limits -40°C to +75°C. It is advisable to protect the receiver from extreme temperature variation which can cause excessive condensation.

2.4 Repacking for shipment

The shipping container for the RX4010 has been carefully designed to protect the receiver and its accessories during shipment. This container and its associated 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 receiver 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, e.g. a double walled carton of 160 kg. test material.

- Protect the control panel with cardboard and insert 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.

2.5 Mounting information

The receiver may be conveniently mounted in a standard 19 inch rack using a pair of rack slides or chassis angles appropriate for the rack system.

The receiver in the rack mounted configuration requires a standard panel space 5.25 inches high.

The receiver may also be mounted in a cabinet for bench operation, part no. 475246. The cabinet is designed to be mounted on a table or on a shelf, fastened to the support by means of four bolts.

When operating the receiver, provide at least 75 mm of clearance at the rear and at least 7 mm on all sides of the receiver. Failure to allow adequate air circulation will result in excessive internal temperature, reducing receiver reliability.

2.6 Power Requirements

110 - 125V, 220 - 250V, 50/60 Hz 70 VA +/- 10%.

CAUTION

The receiver is normally set at the factory for 220 Vac.

The selection of 110 volt nominal mains voltage is made by changing connections on A10A2 on the power supply assembly A10. To change the mains voltage setting, proceed as follows: (refer to Fig. 2.1 and Fig. 2.20).

a. Disconnect the input power cord from the receiver.

b. Disconnect the regulation transistor cable from A10J2 and remove the power supply heat sink panel by removing the four retaining screws at the rear end of the receiver side profiles.

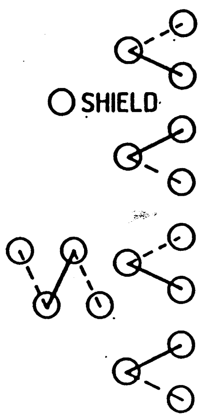
c. Remove the eight screws positioned at the edge of the power supply rear panel A10 and withdraw the power supply assembly.

d. Change connections on A10A2 as appropriate in accordance with Figure 2.1.

e. Reposition the power supply assembly in the receiver.

f. Reposition the power supply heat sink panel and connect the regulation transistor cable to A10J2.

g. Connect the input power cord to the receiver.



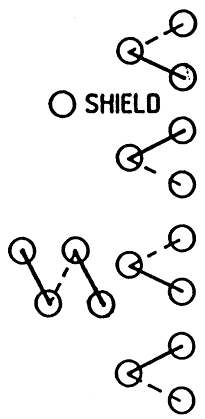


Fig. 2.1

2.7 Fuses

Table 2.1 Fuse Ratings

Rear Panel	F1	1A T
" "	F2	1A T
On A10A2	F3	6.3A T
" "	F4	6.3A T
" "	F5	6.3A T

2.8 Power Cable

In accordance with international safety standards this receiver is equipped with a three terminal power connector. When connected with an appropriate power cable, the receiver 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).

2.9 Inputs/Outputs

2.9.1 Audio Input/Output A10J3
Sub-D, Female, 15 poles, Sliding Lock.

The audio input/output socket (refer to Figure 2.2) provides loudspeaker output and sidetone input (later used during simplex A1 keying).

The audio input/output socket connections are as follows:

pin		
3	Sidetone input	100-500 mV/600 ohms
10	Sidetone GND	
6	Line output	
7	Line output centertab	600 ohms Balanced
8	Line output	
2	Line input	600 ohms Balanced
9	Line input	
11	Line GND	
14	Speaker output	4 W/4 ohms
13	Speaker GND	

Figure 2.2 Audio Input/Output Plug

Note that the line output will follow the monitored sideband in ISB modes. (As selected by the "mon" pushbutton on the front panel).

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.2 Line and Telex Output, A7J4
Sub-D, Male, 9 poles, Sliding Lock.

The output plug (refer to Fig. 2.3) provides the balanced AF line outputs for auxiliary equipment. The line output level may be adjusted from the A7 rear panel to a level between +10dBm and -20dBm/600 ohm. The Telex output has a level of 0 dBm/600 ohm.

pin		
1	GND	
6	Telex output	Balanced 600 ohms
2	Telex output	
7	Line 2 output	
3	Line 2 output centertab	Balanced 600 ohms
8	Line 2 output	
4	Line 1 output	
9	Line 1 output centertab	Balanced 600 ohms
5	Line 1 output	

(Note: Line 2 output and Telex output are for ISB versions only)

Figure 2.3 Line and Telex Outputs.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

The signals available at the outputs are shown in Table 2.1.

Mode	Line 1	Telex	Line 2
SSB/USB	+	+	-
SSB/LSB	+	+	+
AM	+	+	+
RTTY	+	+	+
CW	+	+	+
ISB	USB	LSB	LSB
USB + RTTY	USB	RTTY	RTTY
LSB + RTTY	RTTY	RTTY	LSB

Table 2.1

("+" denotes signal present, "-" denotes no signal)

2.9.3 Control Input/Output, A8J1

Sub-D, Female, 15-poles, Sliding Lock.

The control input/output socket (refer to Figure 2.4) provides the Mute input, the Scan stop input and an optional Duplex input.

The socket connections are as follows:

pin		
1	N.U.	
2	GND	
3	Mute input (-)	
4	Mute input (+)	
5	Duplex input (-)	Optional
6	Duplex input (+)	"
7	Scan Stop input (-)	
8	Scan Stop input (+)	
9	N.U.	
10	GND	

Figure 2.4 Control Input/Output Socket

All control inputs are floating, isolated and exercised by 24Vdc/10mA positive logic.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connnector Kit, part no. 475505.

2.9.4 IF Output, A7J1

BNC, Female

The receiver is equipped with a 1.4 MHz IF output socket (BNC) providing a -20 dBm/50 ohm 2nd IF signal for auxiliary equipment (Refer to Figure 2.7). The output signal is bandwidth filtered in accordance with the receiver bandwidth setting.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.5 Antenna Input, A4J1

BNC, Female.

The antenna input socket is protected against 100 V EMF/15 minutes burn-out.
The antenna input impedance is 50 ohm.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505

2.9.6 RTTY-Demodulator Data Output, A6J1 (Optional)

Sub-D, Female, 25-poles, Sliding Lock.

The socket A6J1 provides RTTY data output in accordance with RS232C standard and control of the demodulator.

The connections are as follows:

pin	Circuit	Description
1	AA	Protective ground
3	BB	Received data
6	CC	Data set ready
7	AB	Signal ground (common return)
8	CF	Received line signal detector
9	-	INVERT Data inverted when 0
10	-	AUTOSTART Circuit disabled when 0
11	-	+12V
18	-	-12V
25	-	+5V

Note: pin 9 and 10 are 1 when left open

Figure 2.5 RTTY Demodulator Data Output Socket.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.7 Line Input and Teleprinter Output A6J2 (Optional)

Sub-D, Female, 9-poles, Sliding Lock.

The line input plug provides the input signal to the RTTY-demodulator, as well as the output signal to the teleprinter.

The connections are as follows:

pin			
1	-12V/20-40mA		
2	+12V/20-40mA		
3	Tx sense (+)		
4	GND		
5	Current Loop Output		
6	Line Input	-10 dBm/600 ohms	Balanced
7	Line Input		
8	Tx sense (-)		
9	GND		

Figure 2.6 RTTY-Demodulator Socket

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.8 RTTY Diversity Input A6J3 and Output A6J4 (Optional)

SMB, Male.

The connections enables RTTY Diversity reception by cross-coupling the connectors of two receivers.

2.9.9 5.12 MHz Internal Standard Output (Optional)
BNC, Female.

The output socket is mounted on the rear frame of the receiver and provides a 5.12 MHz, -7dBm/50 ohm signal for auxiliary equipment.

2.9.10 Remote Control RS232/422/485 A9J7 (Optional)
Sub-D, Female, 25 poles, Sliding Lock.

The connector provides data signals, mute input (RS232C voltage level, positive logic) and a 0 dBm balanced line output adjustable by means of R12 located on the PCB.

The connections are as follows:

pin	circuit	description
1	GND	Protective GND
2	TXD	Transmitted data RS232
3	RXD	Received data RS232
4	RTS	Request to send RS232
5	CTS	Clear to send RS232
6	DSR	Data set ready RS232
7	GND	Signal GND
9	Line out	Balanced 600 ohm
10	Line out	"
11	MUTE	Receiver muting
18	TXD/A	Transmitted data RS422
19	TXD/B	Transmitted data RS422
23	RXD/TXD A	Received data RS422/Data RS485
24	RXD/TXD B	Received data RS422/Data RS485

Figure 2.7 Remote Control RS232/422/485

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.11 Modem/Modem Interface A9J7 (Optional)
Sub-D, Female, 25 poles, Sliding Lock.

The connector provides CCITT V24/RS232 modem interface and CCITT V23 telephone line signals.

The connections is as follows:

pin	circuit	description
9	Line A	Telephone line 600 ohms Bal.
10	Line A	"
11	Line B	Telephone line 600 ohms Bal.
25	Line B	"
2	TXD	Transmitted data
3	RXD	Received data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	GND
1	GND	GND
8	CD	Carrier detect
20	DTR	Data terminal ready

Figure 2.8 Modem/Modem Interface.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

2.9.12 Auxiliary Input/Output A9J6 (Optional).

Sub-D, Female, 15 poles, Sliding Lock.

The Connector provides a 4-bit Input port and an 8-bit Output port.

The Outputs are open collectors max. 15V/50 mA. The Inputs are RS232C level. The Enable is TTL. Input data transfer takes place only when Enable is low.

The connections are as follows:

pin	
9	+15 V
14	Enable
1	Input 0
2	Input 1
3	Input 2
4	Input 3
5	Output 4
6	Output 5
7	Output 6
8	Output 7
10	Output 3
11	Output 2
12	Output 1
13	Output 0
15	GND

Figure 2.9 Auxiliary Input/Output.

The appropriate cable connector may be ordered from Dansk Radio as part of Connector Kit, part no. 475505.

2 10 Installation Check-out

When the installation is complete, refer to section 3 (OPERATION) and fully check the operation of the receiver.

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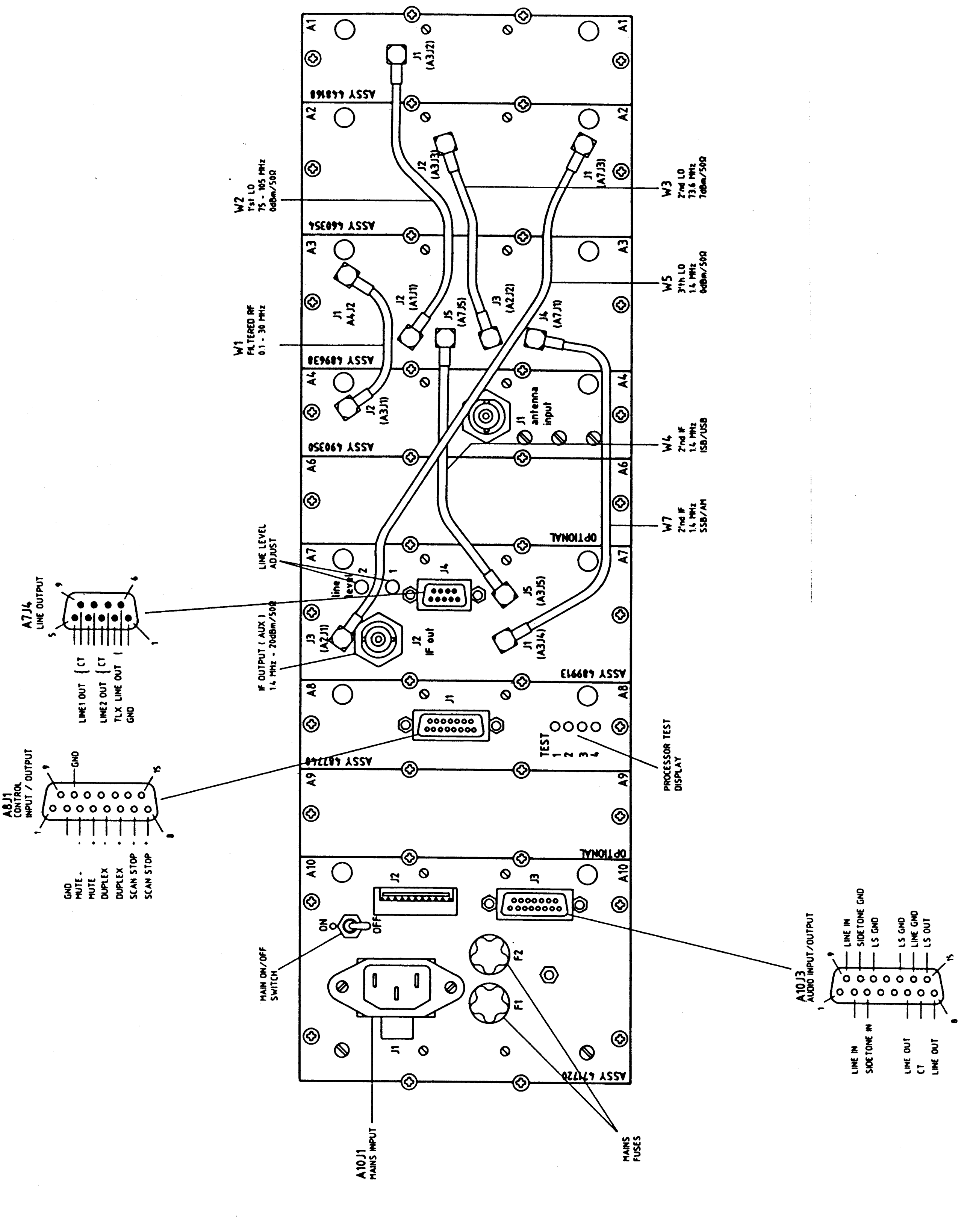


Figure 2.20 Rear Panel View.

SECTION 2
INSTALLATION

2.1 Introduction

This section of the manual provides installation instructions for the RX4010 communication receiver. It also includes information about initial inspection and damage claims, preparation for use and repacking for shipment information.

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 receiver.

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the receiver has been checked mechanically and electrically. If the contents are incomplete, if there is a mechanical damage or defect, or if the receiver 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

2.3 Storage

The receiver may be stored or shipped in temperatures within the limits -40°C to +75°C. It is advisable to protect the receiver from extreme temperature variation which can cause excessive condensation.

2.4 Repacking for shipment

The shipping container for the RX4010 has been carefully designed to protect the receiver and its accessories during shipment. This container and its associated 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 receiver 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, e.g. a double walled carton of 160 kg. test material.
- Protect the control panel with cardboard and insert 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.

2.5 Mounting information

The receiver may be conveniently mounted in a standard 19 inch rack using a pair of rack slides or chassis angles appropriate for the rack system.

The receiver in the rack mounted configuration requires a standard panel space 5.25 inches high.

The receiver may also be mounted in a cabinet for bench operation, part no. 475246. The cabinet is designed to be mounted on a table or on a shelf, fastened to the support by means of four bolts.

When operating the receiver, provide at least 75 mm of clearance at the rear and at least 7 mm on all sides of the receiver. Failure to allow adequate air circulation will result in excessive internal temperature, reducing receiver reliability.

2.6 Power Requirements

110/220V, +/-10%, 50-60 Hz. Optional: 24VDC, +30/-10%

CAUTION

The receiver is normally set at the factory for 220 Vac.

The selection of 110 volt nominal mains voltage is made by changing connections on A10A2 on the power supply assembly A10. To change the mains voltage setting, proceed as follows:
(refer to Fig. 2.1 and Fig. 2.20).

a. Disconnect the input power cord from the receiver.

b. Disconnect the regulation transistor cable from A10J2 and remove the power supply heat sink panel by removing the four retaining screws at the rear end of the receiver side profiles.

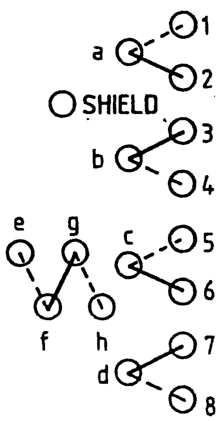
c. Remove the eight screws positioned at the edge of the Power supply rear panel A10 and withdraw the power supply assembly.

d. Change connections on A10A2 as appropriate in accordance with Figure 2.1.1 for the AC only version and Figure 2.1.2 for the AC/DC version.

e. Reposition the power supply assembly in the receiver.

f. Reposition the power supply heat sink panel and connect the regulation transistor cable to A10J2.

g. Connect the input power cord to the receiver.



Mains strapping 220V

Voltage	Straps
110V	e-f, g-h, a-2, b-3, c-6, d-7
115V	e-f, g-h, a-2, b-4, c-6, d-8
120V	e-f, g-h, a-1, b-3, c-5, d-7
125V	e-f, g-h, a-1, b-4, c-5, d-8
220V	f-g, a-2, b-3, c-6, d-7
225V	f-g, a-2, b-4, c-6, d-7
230V	f-g, a-2, b-4, c-6, d-8
235V	f-g, a-2, b-4, c-5, d-7
240V	f-g, a-1, b-3, c-5, d-7
245V	f-g, a-1, b-4, c-5, d-7
250V	f-g, a-1, b-4, c-5, d-8

Figure 2.1.1 AC version

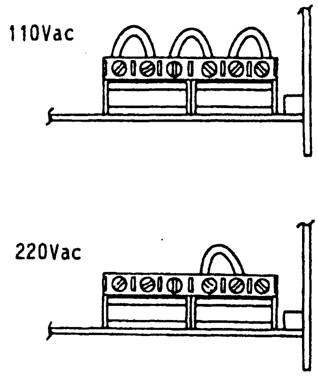


Figure 2.1.2 AC/DC version

2.7 Fuses

Table 2.1 Fuse Ratings

Fuse		Fuse Rating AC version	AC/DC version
Rear Panel	F1	1A T (220 V) 2A T (110 V)	1A T (220 V) 2A T (110 V)
" "	F2	1A T (220 V) 2A T (110 V)	6.3A T (24 V)
On A10A2	F3	6.3A T	
" "	F4	6.3A T	
" "	F5	6.3A T	

2.8 Power Cable

In accordance with international safety standards this receiver is equipped with a three terminal power connector. When connected with an appropriate power cable, the receiver 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).

2.9 Inputs/Outputs

(For options that are not mentioned here, refer to chapter 4.)

2.9.1 Audio Input/Output A10J3

The audio input/output socket (refer to Figure 2.2.1 and 2.2.2) provides loudspeaker output and sidetone input (sidetone is used during simplex A1 keying).

2.9.1.1 Assembly 471720

Sub-D, Female, 15 poles, Screwing lock

The audio input/output socket connections are as follows:

pin		
3	Sidetone input	100-500 mV/600 ohms
10	Sidetone GND	
6	Line output	
7	Line output centertap	600 ohms Balanced
8	Line output	
2	Line input	600 ohms Balanced
9	Line input	
11	Line GND	
14	Speaker output	4 W/4 ohms
13	Speaker GND	

Figure 2.2.1 Audio Input/Output Plug. Assembly 471720.

Note that the line output will follow the monitored sideband in ISB modes. (As selected by the "mon" pushbutton on the front panel).

The appropriate cable connector may be ordered from Dansk Radio. Part no. 495980.

2.9.1.2 Assembly 448532

Sub-D, Female, 9 poles, Screwing lock.

The audio input/output socket connections are as followa:

pin		
1	Sidetone input	100-500 mV/600 ohms
2	Sidetone GND	
4,7	Speaker output	4 W/4 ohms
5,6	Speaker GND	

Figure 2.2.2 Audio Input/Output Plug. Assembly 448532.

The appropriate cable connector may be ordered from Dansk Radio. Part no. 496006.

2.9.2 Line and Telex Output, A7J4

Sub-D, Male, 9 poles, Screewing lock.

The output plug (refer to Fig. 2.3) provides the balanced AF line outputs for auxiliary equipment. The line output level may be adjusted from the A7 rear panel to a level between +10dBm and -20dBm/600 ohm. The Telex output has a level of 0 dBm/600 ohm.

pin		
1	GND	
6	Telex output	Balanced 600 ohms
2	Telex output	
7	Line 2 output	
3	Line 2 output centertab	Balanced 600 ohms
8	Line 2 output	
4	Line 1 output	
9	Line 1 output centertab	Balanced 600 ohms
5	Line 1 output	

(Note: Line 1 output and Telex output are for ISB versions only)

Figure 2.3 Line and Telex Outputs.

The appropriate cable connector may be ordered from Dansk Radio. Part no. 495999.

The signals available at the outputs are shown in Table 2.1.

Mode	Line 1	Telex	Line 2
SSB/USB	+	+	-
SSB/LSB	+	+	+
AM	+	+	+
RTTY	+	+	+
CW	+	+	+
ISB	USB	LSB	LSB
USB + RTTY	USB	RTTY	RTTY
LSB + RTTY	RTTY	RTTY	LSB

Table 2.1

("+" denotes signal present, "-" denotes no signal)
Note: In SSB versions Line 2 carries always the audio signal.

2.9.3 Control Input/Output, A8J1

Sub-D, Female, 15-poles, Screewing lock.

The control input/output socket (refer to Figure 2.4) provides the Mute input, the Scan stop input and an optional Duplex input.

The socket connections are as follows:

pin	
1	RS232 TXD
2	GND
3	Mute input (-)
4	Mute input (+)
5	Duplex input (-) Optional
6	Duplex input (+) "
7	Scan Stop input (-)
8	Scan Stop input (+)
9	RS232 RXD
10	GND
11	Mute
12	Duplex
13	Scan Stop
14	RST 6.5

Figure 2.4 Control Input/Output Socket

Inputs pin 3 to pin 8 are floating, isolated and activated by 24Vdc/10mA positive logic.

Inputs pin 11 to pin 13 are active low, internal pulled up to 5 Volts. The inputs must be driven by an OC source only, capable to sink 5 mA.

Input pin 14 is active low, internal pulled up to 5 Volts. The input must be driven by a driver capable to sink 5 mA.

The appropriate cable connector may be ordered from Dansk Radio. Part no. 495980.

2.9.4 IF Output, A7J1

BNC, Female

The receiver is equipped with a 1.4 MHz IF output socket (BNC) providing a -20 dBm/50 ohm 2nd IF signal for auxiliary equipment (Refer to Figure 2.20). The output signal is bandwidth filtered in accordance with the receiver bandwidth setting. Dependable of Crystal Filter version the center frequency may be offset from 1.4 MHz.

The appropriate cable connector may be ordered from Dansk Radio Part no. 473774.

2.9.5 Antenna Input, A4J1

BNC, Female.

The antenna input socket is protected against 100 V EMF/15 minutes burn-out.
The antenna input impedance is 50 ohm.

The appropriate cable connector may be ordered from Dansk Radio Part no 473774.

2.9.6 5.12 MHz Internal Standard Output (Optional)

BNC, Female.

The output socket is mounted on the rear frame of the receiver and provides a 5.12 MHz, -7dBm/50 ohm signal for auxiliary equipment.

2.9.7 Remote Control RS232/422/485 A9J7 (Optional)

Sub-D, Female, 25 poles, Screwing lock.

The connector provides data signals, mute input (RS232C voltage level, positive logic) and a 0 dBm balanced line output adjustable by means of R12 located on the PCB.

The connections are as follows:

pin	circuit	description
1	GND	Protective GND
2	TXD	Transmitted data RS232
3	RXD	Received data RS232
4	RTS	Request to send RS232
5	CTS	Clear to send RS232
6	DSR	Data set ready RS232
7	GND	Signal GND
9	Line out	Balanced 600 ohm
10	Line out	"
11	MUTE	Receiver muting
18	TXD/A	Transmitted data RS422
19	TXD/B	Transmitted data RS422
23	RXD/TXD A	Received data RS422/Data RS485
24	RXD/TXD B	Received data RS422/Data RS485

Figure 2.5 Remote Control RS232/422/485

The appropriate cable connector may be ordered from Dansk Radio Part no. 496014.

2.9.8 Modem/Modem Interface A9J7 (Optional)

Sub-D, Female, 25 poles, Screwing lock.

The connector provides CCITT V24/RS232 modem interface and CCITT V23 telephone line signals.

The connections are as follows:

pin	circuit	description
9	Line A	Telephone line 600 ohms Bal.
10	Line A	"
11	Line B	Telephone line 600 ohms Bal.
25	Line B	"
2	TXD	Transmitted data
3	RXD	Received data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	GND
1	GND	GND
8	CD	Carrier detect
20	DTR	Data terminal ready

Figure 2.6 Modem/Modem Interface.

The appropriate cable connector may be ordered from Dansk Radio Part no. 496014.

2.9.9 Auxiliary Input/Output A9J6 (Optional).

Sub-D, Female, 15 poles, Screwing lock.

The Connector provides a 4-bit Input port and an 8-bit Output port.

The Outputs are open collectors max. 15V/50 mA. The Inputs are RS232C level. The Enable is TTL. Input data transfer takes place only when Enable is low.

The connections are as follows:

pin	
9	+15 V
14	Enable
1	Input 0
2	Input 1
3	Input 2
4	Input 3
5	Output 4
6	Output 5
7	Output 6
8	Output 7
10	Output 3
11	Output 2
12	Output 1
13	Output 0
15	GND

Figure 2.7 Auxiliary Input/Output.

The appropriate cable connector may be ordered from Dansk Radio Part no. 495980.

2.9.10 External Frequency Standard Input (Optional)

BNC, Female.

The input socket is mounted on the rear frame of the receiver and accepts 1, 5 or 10 MHz (strappable) input from externalfrequency standards. The acceptable level is from 0 to +20 dBm/50 ohms.
A switch on the rear plate of the A2 assembly selects internal/ external frequency standard.

2.9.11 Open Collector Outputs A8J2

Sub-D, Female, 9-poles, Screwing lock.

The Connector provides an 8-bit Output port.

The connections are as follows:

pin	
1	OC1
2	OC2
3	OC3
4	OC4
5	OC5
6	OC6
7	OC7
8	OC8
9	GND

Figure 2.8 Open Collector Outputs.

The Outputs are open collectors max. 30V/40 mA.

The appropriate cable connector may be ordered from Dansk Radio Part no. 496006.

2.10 Strapping

In order to get a proper function of the receiver, it is nescessary that some of the assemblies are strapped correctly.
Normally the receiver is delivered from the factory with the correct strapping. If a module is exchanged, the strapping should be checked.

Strapping of the A7 assembly and the A8 Assembly are covered in the circuit description of the assemblies. See diagram section.
Strapping of the Power Supply is covered in the beginning of this section. Strapping of other assemblies than above mentioned are covered in Section 4, OPTIONS and Section 5, REMOTE CONTROL.

2.11 Installation Check-out

When the installation is complete, refer to section 3 (OPERATION) and fully check the operation of the receiver.

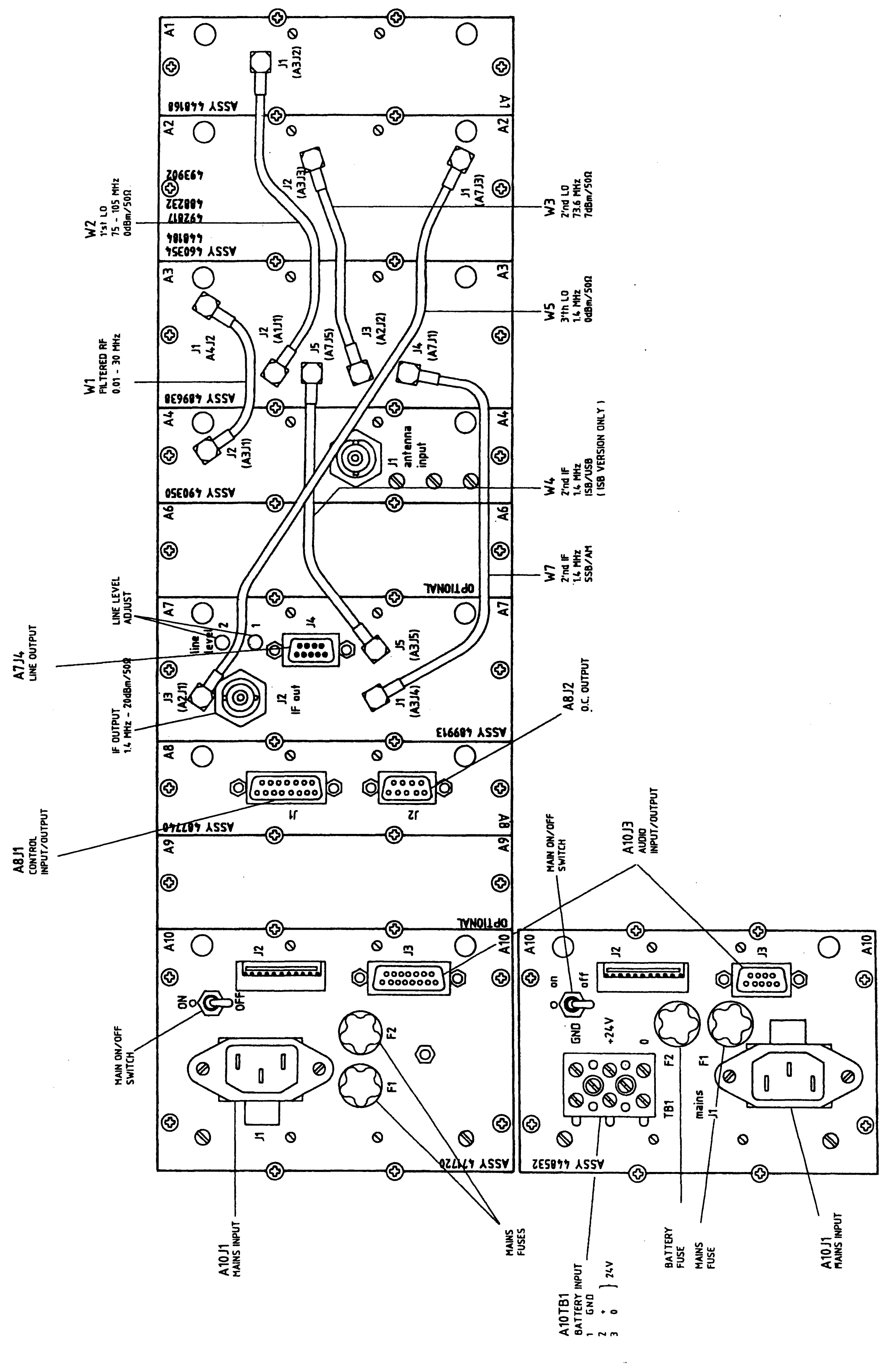


Figure 2.20 Rear Panel View

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SECTION 3
OPERATION

3.1 Introduction

This section of the manual contains instructions for proper operation of the RX4010 communication receiver.

3.2 Front Panel Features

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

3.3 Power/Warm-up

The model requires a power source between 110 or 250Vac, single phase. The selection of power source is described in Section 2, Installation.

The power switch on the front panel (see Figure 3.1) has two positions, OFF and ON. Power is applied to some circuits at any time the receiver is connected to the power source. As the receiver may have a crystal Oven Assembly installed, it is important that it remains connected to the power source to maintain a constant oven temperature, eliminating the need for a long warm-up period. A master main switch on the rear panel (see Figure 2.20) can switch off the entire receiver.

3.4 Initial Conditions

After the power has been switched on, the receiver status will be as the setup from before the power was switched off.

NOTE

1. If the display reads OSC.FAIL, the frequency synthesis circuits are not operating properly.
2. If no Ann (nn is a two-digit number) momentarily appears in the display after turn-on, some of the initial test indicate a failure. Refer to Section 8, Service, for failure identification.
3. If the display reads bAt.FAIL, the battery back-up is faulty.
4. If either of the above conditions occur, refer the receiver to qualified service personnel for repair.

3.5 Self Test

The self test operation is initiated by pressing the (progr) key, and then the (4), (9), (enter) key. The self test is then carried out by the built-in microprocessor by means of a ROM-based diagnostic program package.
Press the (C) key several times to leave the self test program. For further information see Paragraph 8.4.

12 REGISTER group. These keys are used for storing and recalling of user-programmed receiver settings. The recall key is also used for selection of international communication channels.

13 MONITOR connects the speaker to LSB or USB in ISB mode.

14 PHONES output. Connection for head phones. Disconnects the internal speaker.

15 DIMMER/POWER control. Used for control of the light intensity in the front panel indicators. In the OFF position, power is only applied to the oven (optional) and to part of the power supply circuits.

16 LOCAL key. Used to bring the receiver in local mode when operated in a remote system.

17 TUNE key. Enables/disables free tuning by the control knob.

18 BFO key. Enables/disables the BFO control mode.

19 PROGRAM key. Key for entering the program mode.

20 TUNING control. Used for free-tuning of the receiving frequency and the BFO frequency.

21 LOUDSPEAKER

22 RF-GAIN/SQUELCH control. Used during AGC " off" manually to adjust the intermediate frequency gain.

23 AF-GAIN control. Manual adjustment of the audio frequency gain.

24 NOTCH-TUNE control. Manual adjustment of an audio frequency notch filter, tunable in the range 300 Hz to 3400 Hz. Used to attenuate undesired interfering signals in the audio output.

25 LOUDSPEAKER ON/OFF switch mounted on bottom of frontpanel.

3.6 Frequency Selection

The frequency resolution can be selected by pressing (.) to 1 kHz, 100 Hz or 10 Hz an appropriate number of times.

3.6.1 Clear Display

Pressing the (C) key, clears the display to zero. This key is useful when an error is made while entering data.

3.6.2 Keyed Tuning

Key in the desired frequency by pressing numbers in sequence, just as they are written on a piece of paper.
The display immediately shows the number sequence in right entry display format, i.e. the numbers appear in the rightmost display character and are shifted left, one character on each number entry. The decimal point must be keyed if it is part of the number (unless it has to be right of the last frequency digit in kHz).
For example to key in 7501.65 kHz, simply press the following keys in sequence:

Press	Display
(C)	0.00
(7)	7.00
(5)	75.00
(0)	750.00
(1)	7501.00
(.)	7501.00
(6)	7501.60
(5)	7501.65

3.6.3 Free Tuning

The tuning control is activated by pressing (tune) .By rotating the tuning knob the receiving frequency is varied in continuous steps.
Pressing (tune) the second time disables the free tuning.

3.6.4 BFO Control

The BFO-frequency is entered and displayed with 3-digit resolution on the left display . The frequency can be entered from the keyboard and/or tuned by the tuning control knob.

To enter the BFO-frequency from the keyboard:
- Press (BFO)
- Press (0) to select the proper signal (+/-)
- Press the number keys of the applicable BFO-frequency, entering the decimal point in the proper place.

To adjust the BFO-frequency by the frequency tuning knob:
- Press (BFO)
- adjust the BFO-frequency by means of the tuning knob.

Pressing (BFO) the second time disables the BFO-control.
Not active in AM mode.

3.7 Mode Selection

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

NOTE

> A lighted indicator above any key denotes it as an active entry. For example, if the "wide" key indicator is on, it is not necessary to press that key if this is the desired bandwidth.

The receiver can operate in six modes:
AM, SSB, CW, and optionally: RTTY, ISB and SSB+RTTY.
The proper mode is selected by pressing one or two keys labelled (AM), (SSB), (CW), (RTTY), (SSB)+(AM) (ISB), (SSB)+ (RTTY).
After pressing (SSB) the USB mode is selected.
LSB is selected by pressing (SSB) once more.
After pressing (SSB)+(AM) = ISB the speaker is connected to USB, indicated by AF1-led. Press (mon) to switch to LSB, indicated by AF2-led.
Before pressing (SSB)+ (RTTY) the SSB sideband is selected by pressing (SSB) once or twice. The USB-led or LSB-led indicate the SSB sideband. The (mon) key connects speaker to USB or LSB, indicated by AF1-led or AF2-led.

Pressing a mode key automatically selects default values for secondary control keys. However, these default settings can be altered by the operator by manual entry after the mode selection.

The following default settings are used:

Mode	AGC	Bandwidth	BFO	Monitor
AM	slow	wide	----	---
SSB	slow	----	0.00	---
CW	slow	narr	0.80	---
RTTY	fast	narr	1.70	---
ISB	slow	----	0.00	USB(=AF1)
SSB+RTTY (SSB=USB)	slow	narr	0.00	USB(=AF1)
SSB+RTTY (SSB=LSB)	slow	inter	0.00	LSB(=AF2)

3.7.1 AM Operation

- Key in the desired frequency
- Press the (AM) key
- Adjust AF-GAIN for convenient volume

3.7.2 SSB, CW and RTTY Operation

- Key in the desired frequency
- Press (SSB) (USB), (CW) or (RTTY)
- Adjust AF-GAIN for a convenient volume
- For LSB press (SSB) twice

3.7.3 ISB operation

- Key in the desired frequency.
- Press (SSB)+(AM)
- Adjust AF-GAIN for a convenient volume.
- Use (mon) key to connect the speaker to LSB(AF2) or USB(AF1).

3.7.4 SSB+RTTY operation

- Key in the desired frequency.
- Select SSB sideband with (SSB) key
- Press (SSB)+ (RTTY)
- Adjust AF-GAIN for a convenient volume.
- Use (mon) key to connect the speaker to LSB(AF2) or USB(AF1).

3.7.5 AGC control

The AGC keys control the AGC time constants. Press any of the keys labelled (off) , (slow) or (fast) to select the desired mode.
In the AGC "off" mode the gain can be adjusted by means of the RF-GAIN control knob.

NOTE

The MODE keys will affect the time constants of the AGC-circuit. The AGC control keys are used for supplementary control of the AGC time constants. For further information refer to the receiver specifications.
In AM mode you can't change the AGC time constant.

3.7.6 AGC Threshold Control

The AGC threshold control may be activated when the receiver is operated in either of the two automatic gain control modes, i.e. "slow" and "fast".

- Press the key labelled (slow) or (fast) to select the desired AGC time constants.
- Press the active AGC key again to enter the threshold mode.

(Not active in AM mode).

3.7.7 Attenuator Control

The Antenna Attenuator is controlled by the (att) key.

3.7.8 Bandwidth Control

The bandwidth keys (wide) , (inter) , (narr) and (vnar) select the IF bandwidth of the receiver. These keys can only be used in the AM, RTTY, CW and SSB(USB)+RTTY receiver modes, and will not respond to commands when the receiver is operated in SSB, ISB and SSB(LSB)+RTTY mode. In SSB(USB)+RTTY wide bandwidth is disabled and it is the RTTY bandwith which is selectable.

3.7.9 RTTY Operation (Optional)

The RTTY-demodulator can be installed in either RX4010 or RC4010. When the RTTY button is activated once, the receiver will enter the RTTY mode and a frequency setup can be entered.

At a second activation of the RTTY button the display of the unit where the demodulator is installed, will show:

```
---
---
```

where the lower and upper segments represent mark/space levels.

Depending on the level, few or many segments will be lit. To ensure proper reception, the two rows must be equal and this can be done by tuning. When a signal is present, the demodulator will be activated and start up the telex printer.

3.8 User Programmable Channels

The receiver contains 99 addressable user programmable channels (UPC) which allow the operator manually to store and recall complete receiver settings.
A complete receiver setting includes reception mode, frequency, AGC mode, bandwidth, BFO and attenuation.

3.8.1 Store a User Programmable Channel.

To store a complete receiver setting

- Press (sto)
- Display will show first free channel no *.
  Example: 'sto FrEE 14' channel no. 14 is first free channel.
  (* if no free channel exists the display shows 'OCCUP.')
- Press (sto) to store at the shown channel number.
- Enter the number of the applicable channel (00-99), if you don't want to store at the shown channel number.

The channel number is shown in left display, frequency in right display. The channel number is shown until receiver mode, freqency, AGC mode, bandwidth, BFO or attenuation are changed. When returning to the last stored or recalled setup, the channel number will be shown again.
To delete a channel store the frequency 0.00 KHz in the channel.

3.8.2 Recall a User Programmable Channel.

- Press (rcl)
- Press (1) to select the UPC
- Enter the applicable channel number (00 through 99)

The channel number is shown in left display, frequency in right display. The channel number is shown until receiver mode, frequency, AGC mode, bandwidth, BFO and attenuation are changed.

When returning to the last stored or recalled setup, the channel number will be shown again.
The error message: 'not. dEF.' indicates that the channel is empty.

3.8.3 Channel 00

The channel 00 always contains the present receiver setting except any free tuned frequency offset.

After a free tuning sequence, simply press
(rcl)(1)(0)(0) to restore the original frequency setting.

If after a re-adjustment the operator wants to update the receiver setting to reflect the current receiving frequency, he should press (sto) (0)(0) .

3.9 Preprogrammed Channels.

The receiver contains information on all CCIR recommended frequencies as 433 preprogrammed channels (PPC) for

- Voice duplex communication in the coaststation bands 4, 6, 8, 12, 16 and 22 MHz
- Telex communication in the coaststation bands 4, 6, 8, 12, 16 and 22 MHz

When preprogrammed channels are selected, the receiver will automatically generate all settings for that particular channel.

The preprogrammed channels are stored in non-volatile memory and it is not possible to change these channels unless done by the factory.

3.9.1 Recall a Preprogrammed Channel.

To recall a preprogrammed channel

- Press (rcl)
- Press (2) to select the PPC
- Press (SSB) or (RTTY) once or twice to select the reception mode (see 3.7.2)
- Enter the desired frequency band (4, 6, 8, 12, 16 or 22)
- Enter the desired channel number

Illegal band and channel selection is ignored by the receiver.

3.9.2 International Calling Channels.

To select an international channel, press the (.) decimalpoint instead of the channel number.

3.10 The SCAN Function

The receiver is equipped with a manual and an automatic scanning function that allows scanning in the following modes:

Mode 1: Scanning of user programmable channels
Mode 2: Scanning of preprogrammed channels
Mode 3: Scanning of user program
Mode 4: Scanning of frequency bands

To initiate the SCAN function
- Press (scan) to select the scan mode
- Press the applicable mode number (1,2,3 or 4) ← RCL → STO

Once a scanning is initiated, the receiver will continue to scan from the lowest part towards the highest part.
The dwell time between each change is defaulty set to 9 sec.

To select another dwell time
- Press any of the number keys 1 through 9 to select the dwell time in seconds
- Press (0) to select 100 msec. dwell time
- Press (.) to stop scanning, start again by press any of the number keys 1 through 9.

An external input signal connected to plug A8J1 on the microcomputer sub-assembly A8 can be used to interupt the scanning sequence (See Paragraph 2.9.3).

3.10.1 Scan threshold mode.

If the AGC is in threshold mode during scanning, the receiver will dwell only briefly, i.e. 100ms, at channels with signals level below the AGC threshold. If signal level exceeds the threshold, the receiver dwells at the channel for the time selected with the keys 0-9 and then continues the scanning.
If dwell time (.) is selected, the receiver will dwell at the channel as long as the signal level exceeds the threshold value.

3.10.2 Manual Scanning

When scanning is initiated, the manual scanning can be selected.
- Press (scan)
  The manual scan mode is indicated by a flashing scan label
  Manual Scanning is carried out by rotating the tuning knob

To leave the manual SCAN mode
- Press (scan) to reenter the automatic scan or
- Press (C) to leave scanning mode

NOTE

Only scan , C and numeric keys may be activated during scanning.

All other keys are blocked.

3.10.3 Scanning User Programmable Channels

Mode 1:
to initate the Scan function
- Press scan
- Press 1 to select (UPC)
- Enter the lowest applicable channel
- Enter the highest applicable channel

Then the receiver will begin scanning from the lowest towards the highest chanel ignoring the undefinded channels in between

Example: Scan user program. channel 3,4,5 and 6, dwell time 2 sec.

Press	Display	Comments
scan	SCAN _	
1	_ _ _ _	Sellect scan no. 1
0	0 _ _ _	
3	0 3 _ _	lo channel no.
0	0 3 0 _	
6	0 3 0 6	hi channel no.

Now the scanning is started.
Press 2 to select 2 sec. dwell time.

3.10.4 Scanning preprogrammed channels

Mode 2:
To initiate the SCAN function
- Press scan
- Press 2 to select PPC
- Select a reception mode by pressing SSB or RTTY once or twice
- Enter the appliable coast station frequency band (4, 6, 8, 12, 16 or 22)
- Enter the lowest applicable channel number
- Enter the highest applicable channel number

Then the receiver will start scanning.
Illegal channel and band entries will be ignored.

If all channels in a band are to be scanned, just press the . decimal key instead of entering the low channel.

Example 1: Scan preprogram. frequency in SSB band 12 from channel 4 to 10, dwell time 9 sec.

Press	Display	Comments
scan	SCAN _	
2	_ _ _ _ _ _	select scan no. 2
SSB	_ _ _ _ _ _	select SSB (USB)
1	1 _ _ _ _ _	

2	1 2 _ _ _ _	select band 12
0	1 2 0 _ _ _	
4	1 2 0 4 _ _	lo channel no.
1	1 2 0 4 1 _	
0	1 2 0 4 1 0	hi channel no.

Now the scanning is started with dwell time 9 sec. (default)

Example 2: Scan all preprogram. channel in RTTY band 6, dwell time 5 sec.

Press	Display	Commments
scan	SCAN _	
2	_ _ _ _ _ _	select scan no. 2
RTTY	_ _ _ _ _ _	select RTTY
0	0 _ _ _ _ _	
6	0 6 _ _ _ _	select band 6
.	0 6 0 1 2 3	select all channels

Now the scanning is started.
Press 5 to select 5 sec. dwell time.

3.10.5 Program Scanning

Mode 3:
In this scanning mode it is possible for the operator to scan a user program. To do this a scan program has to be made first. See Paragraph 3.11.3.
A scanning program is a sequence of up to 6 different user defined receiver modes.(A receiver mode is either a scanning or a recall).

When scanning a program the receiver is set to the first receiver mode in the program. After the global dwell time is expired, the receiver is set to the next receiver mode and so on until the last mode is reached. Then the process will start all over again.

To select the program scanning
- Press the scan key to select the SCAN function
- Press 3 to select the program scanning
- Enter an applicable program number (01-49)

If the addressed scan program is undefined, an error message will appear as

"not. dEF."

and a new program has to be entered.
The dwell time is set to the value in the program and can't be changed.

When manual scan mode is selected the foreward scan will run through all channels in a local scan.

But a backward scan will only show the start channel and thereafter the former receiver mode in the program.

Example: Scan user program no. 12

Press	Display	Comments
scan	SCAN _	
3	pr. no. _ _	select scan no. 3
1	pr. no. 1 _	
2	pr. no. 1 2	select program no. 12

Now the scanning is started.
To program scan-program see Paragraph 3.11.3.

3.10.6 Frequency Scanning

Mode 4:
In this scanning mode the receiver is able to scan between two desired frequencies in the range from 15 kHz to 29999.99 kHz in steps from 10 Hz up to 999.99 kHz in all reception modes.
To select the Scan function

- Enter mode, bandwidth and AGC
- Press the scan key
- Press 4 to select the frequency scan

Start frequency entry.

- Enter the desired start frequency in kHz, press the decimal point once to enter fractions of a kHz or press it twice to complete the start frequency entry.

Step frequency entry.
The max. step size is 999.99 kHz.

- Enter the desired step frequency in kHz, if less than 1 kHz press the decimal point once and enter 100 and 10 Hz fractions, else press it twice to complete the step frequency entry.

Stop frequency entry.

- Enter the desired stop frequency in kHz, press the decimal point once to enter kHz fractions or press it twice to complete the stop frequency entry.

If the stop frequency is too small or the step size too big, an error message will appear as "ILLEGAL" and a new stop frequency has to be entered.

After the stop frequency is accepted the receiver will start to scan from the start towards the stop frequency. When the actual scanning frequency reaches the nearest frequency below the stop frequency, it starts all over. If manual scanning is selected it is not possible to scan below the start frequency.

Example: Scan from 245.50 KHz to 1000.00 KHz with a step of 50.00 KHz, dwell time 1 sec.

Press	Display	Comments
scan	SCAN _	
4	0.00	select scan no. 4
2	2.00	start frequency
4	24.00	
5	245.00	

.	245.00	
5	245.50	
0	0.00	
5	5.00	step freqency
0	50.00	
.	50.00	
.	0.00	
1	1.00	stop frequency
0	10.00	
0	100.00	
0	1000.00	
.	1000.00	
.	245.50	

Now the scanning is started.
Press 1 to select 1 sec. dwell time.

3.11 Introduction to the Program Function

Selecting the program function.

The program function is selected by pressing the PROGR key. The display and the indicators will turn off, a PRG display and a flashing cursor will welcome you, indicating that the receiver is waiting at your command. The radio will continue receiving at the chosen setup. (A setup is a complete receiver setting including frequency and BFO).
Once in the program function it is left by pressing the PROGR key again and the last receiver setup will appear again on the front panel display.

Selecting the program mode.
The program function contains the following 5 modes:
Mode 1: 24 hours' clock
Mode 2: Alarm programming
Mode 3: Scan programming
Mode 4: Alarm viewing
Mode 5: Alarm clearing
Mode 6: Antenna selection (optional)
To select a mode, just press the associated mode number. A detailed discussion of the program modes is contained in later sections.

When a new alarm or scanning program is created, the cursor will be empty, i.e. a flashing underscore.

When an existing alarm or scanning program is accessed, the cursor will be full, i.e. either a digit or a letter will flash.

Throughout the program function, a flashing cursor indicates that the receiver is waiting for a key entry.

3.11.1 Clock Viewing and Setting

Mode 1:
When mode 1 is selected, the time will appear at the display as a 4 digit number with a bar flashing in the middle to indicate the seconds. The displayed time will be updated every minute.

Setting the clock.
If corrections have to be made, it is done by pressing the decimal point. The cursor will now appear at the 10 hours and the changes in the hours' count can be undertaken. If the hours counted are correct, pressing the decimal point again will advance the cursor and the minutes are ready for changing.

When the correction has been accepted and stored in the memory, a small red dot will light in the right corner.

If another mode is desired, press the decimal point, the cursor will then appear and a new mode can be entered.

To return to normal receiver mode, press the PROGR key and the last receiver setup will appear at the front panel display.

Example: Set the clock to 8:55

Press	Display	Comments
progr	PrG. _	
1	09-04	select prog. no 1 (display = old time)
.	09-04	select set the clock
0	09-04	set to new clock
8	08-04	
5	08-54	
5	08-55	

3.11.2 Clock Alarm Programming

Mode 2:
When program mode 2 is selected, the following mode message will appear at the display: "Al.no. - -". An empty cursor will flash at the first underscore.
To select a specific alarm, enter a two digit alarm number between 00 and 23. If the selected alarm already is created, the alarm time will appear as under the clock mode. Then the alarm can either be left or revised/changed or deleted.

If the alarm is unused, the display will show: "__ _. - __ __"
with the cursor at the first underscore.
A new alarm is created by entering the alarm time and the receiver mode.

A clock alarm consists of 2 parts:
a) The alarm time
b) A receiver mode (action)
Each part is covered

a) THE ALARM TIME.
The alarm can be chosen to be either a day alarm, coming once a day, or an hour alarm, coming once an hour.
A day alarm is made by entering both the hour and minute number.
An hour alarm is made by entering a decimal point instead of the hours and entering the minute number as normal.
The clear key deletes the last entry and illegal keys are ignored.

b) THE RECEIVER MODE (ACTION).
The receiver mode has to be selected among the following menus:
1. Recall of a user programmable channel
2. Recall of a preprogrammed channel
3. Scanning of user programmable channels with dwell time.
4. Scanning of preprogrammed channels with dwell time.
5. Scanning of user scan program with dwell time.
6. Silence (receiver muted)

When selecting 1 through 5 the entry syntax is as under normal use of the RX4010, se Paragraphs 3.8.2, 3.9.1, 3.10.3, 3.10.4, 3.10.5.

Silence
If the operator desires the receiver muted at a specified time, a mute mode is selected by entering any digit and the display will show "SILENCE". By pressing a digit key again the muting is accepted or by pressing the clear key the muting is deleted, and another mode can be entered.
Example: Alarm no. 1 = 12:05 scan from user progr. channel 01 to 05, dwell time 2 sec.

Press	Display	Comments
progr	PrG. _	
2	AL. no. _ _	select program no. 2
0	AL. no. 0 _	select alarm no. 1
1	AL. no. 0 1	
	_ _ - _ _	
1	1 _ - _ _	clock
2	1 2 - _ _	
0	1 2 - 0 _	
5	1 2 - 0 5	
scan	SCAN _	select scan no. 1
1	_ _ _ _ _	
0	0 _ _ _ _	lo. channel
1	0 1 _ _ _	
0	0 1 0 _ _	hi. channel
5	0 1 0 5 _	
2	0 1 0 5 2	dwell time
	AL. no. _	
progr		

The receiver will now scan from user progr. channel 1 to 5 at the time 12:05.

Example 2: Now change alarm no. 1 to : time = 12:00, scan from user progr. channel 2 to 5.

Press	Display	Comments
progr	PrG. _	
2	AL. no. _ _	select program no. 2
0	AL. no. 0 _	select alarm no. 1
1	AL. no. 0 1	
	1 2 - 0 5	
.	1 2 - 0 5	accept the time
0	1 2 - 0 5	change the minuts
0	1 2 - 0 0	
	0 1 0 5 2	
0	0 1 0 5 2	change the lo. channel no.
2	0 2 0 5 2	
.	0 2 0 5 2	
.	0 2 0 5 2	
.	0 2 0 5 2	
	AL. no. _	
progr		

3.11.3 Creating/Revising Scanning Programs

Mode 3:
This mode is used for creating, revising/changing or deleting scanning programs. Each scanning program can contain up to 6 different receiver modes, and 49 programs can be created.

Selecting a scanning program:
When program mode 3 is selected, the display will show "Pr.no.--"
To select a specific program, a program number between 01 and 49 has to be entered.
Depending on whether the chosen program already is created or not,the display will show a receiver mode or an empty cursor.

a) CREATING A SCANNING PROGRAM
In case of an empty cursor appears on the display, a new scanning program can be created.
This is done by selecting a receiver mode.
See 3.8.2, 3.9.1, 3.10.3, 3.10.4, 3.10.5.
When the first receiver mode is entered, the display will be cleared and new receiver modes can be entered in the same manner.

The program is stored in memory when the program mode is left.
After 6 modes have been entered, the display will show "no SPACE".
Leaving the program mode is undertaken by pressing PROGR
or a new program can be accessed by pressing the decimal point.

b) REVISING/CHANGING SCANNING PROGRAMS
After a program has been created, it is possible to revise and/or change it. This is done by accessing it with its program number and then by revising it by means of the decimal point.

Changing a complete receiver mode is undertaken by clearing it and after revising the rest of the program by entering a new receiver mode.

Changing a receiver mode parameter, i.e. band no. or channel no. is undertaken by entering the new values when revising.

Example 1: program 5 = scan user progr. channel 2 to 7 dwell time 2 sec. + recall user progr. channel 15 + scan from preprogr.: SSB band 6 all channels, dwell time 1 sec.

Press	Display	Comments
progr	PrG. _	
3	Pr. no. _ _	select program 3
0	Pr. no. 0 _	program no. 5
5	Pr. no. 0 5	
scan	SCAN _	
1	_ _ _ _ _	select scan 1
0	0 _ _ _ _	lo. channel
2	0 2 _ _ _	
0	0 2 0 _ _	hi. channel
7	0 2 0 7 _	
2	0 2 0 7 2	dwell time
	_	
rcl	rCL _	
1	rCL _ _	select recall 1 (user progr.)
1	rCL 1 _	channel 15
5	rCL 1 5	
scan	SCAN _	
2	_ _ _ _ _ _ _	select scan 2
SSB	_ _ _ _ _ _ _	select SSB(USB)
0	0 _ _ _ _ _ _	band no.
6	0 6 _ _ _ _ _	
.	0 6 0 1 0 6 _	all channel
1	0 6 0 1 0 6 1	dwell time
	_	
progr		

The program can now be used in alarm or scan.

Example 2: Delete recall 15 in program 5.

Press	Display	Comments
progr	PrG. _	
3	Pr. no. _ _	select program 3
0	Pr. no. 0 _	select program no. 5
5	Pr. no. 0 5	
	0 2 0 7 2	
.	0 2 0 7 2	not changed lo. channel
.	0 2 0 7 2	not changed hi. channel
.	rCL 15	not changed dwell time
C	0 6 0 1 0 6 1	clear recall 15
.	0 6 0 1 0 6 1	not changed band no.
.	0 6 0 1 0 6 1	not changed lo. channel
.	0 6 0 1 0 6 1	not changed hi. channel
.	_	not changed dwell time
progr		

3.11.4 Alarm Viewing
Mode 4:
When this mode is selected, all active alarms will be shown in turn on the display.
Each active alarm will be shown with the alarm number first and after that the alarm time.
When all active alarms have been shown, program 2 mode will welcome you, if any changes or deletions have to be made.

3.11.5 Alarm Clearing
Mode 5:
With this mode all alarms can be cleared at a time.
The display will show "clr. Alr." for a moment, and then "PRESS.C."
If the clear key is pressed, the command will be executed. If any other key is pressed down or after 2.5 sec., the program function will be left and the receiver will return to receiver mode.

3.12 Clear All
WARNING:
This rutine erases all data stored in the programmable memory.
To clear all user programmable channels, scanning programs and clock alarms
- press (sto) and AGC (off) at the same time.
- the display will show CLr ALL.

If the (sto) key is pressed down within 2.5 sec., the command will be executed.
If no key is pressed down within 2.5 sec. or if any other key but "sto" is pressed down, the program function will be left and the receiver will return to receive mode.

3.13 Short-form instruction

STO To store a full set up
key: sto, _ _ (channel no. 00-99)
sto, sto (store at first free chan.)

RCL 1 To recall a user progr. channel.
key: rcl, 1, _ _ (channel no. 00-99)

RCL 2 To recall a preprogr. channel
key: rcl, 2, SSB/RTTY, _ _ (band no.), _ _ (ch.no.)
(ch.no.= '.': international calling channel)

SCAN 1 Scanning of user progr. channel.
key: scan, 1, _ _ (lo. chan.), _ _ (hi. chan.)

SCAN 2 Scanning of preprogrammed channels.
key: scan, 2, SSB/RTTY, _ _ (band no.), _ _(lo.ch.)
_ _ (hi. ch.)
(lo. chan.='.':all channel)

SCAN 3 Scanning of user program.
key: scan, 3, _ _ (prog. no. 01-49)

SCAN 4 Frequency sweep.
key: ___.__ (lo. freq.), ___.__ (step freq.),
___.__ (hi. freq.)

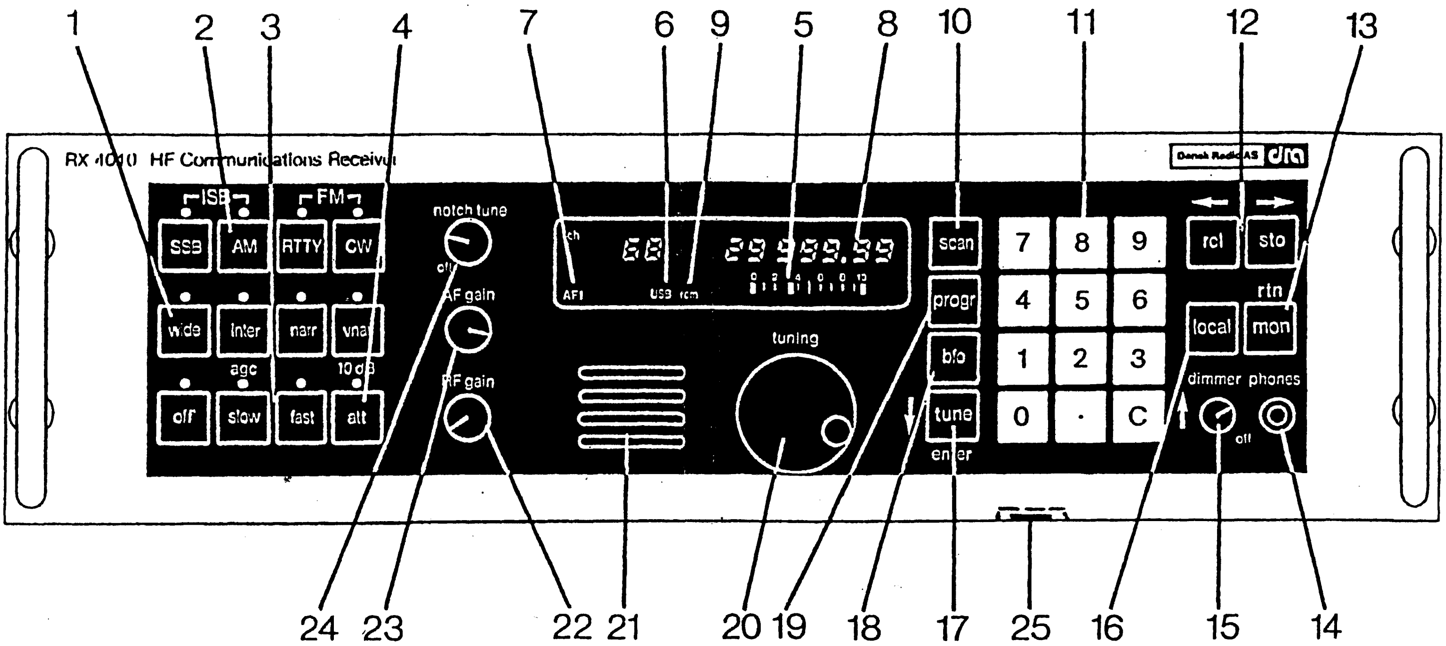
PROGR. 1 Clock viewing/ setting.
key: progr, 1, C (clear old time), __ (hours),
__ (minutes), progr

PROGR. 2 Alarm programming.
key: progr, 2, _ _ (alarm no. 00-23), __ __ (start time), what to do, progr
* what to do = RCL 1
RCL 2
SCAN 1 + dwell time
SCAN 2 + dwell time
SCAN 3 + dwell time

PROGR. 3 Scan programming.
key: progr, 3, _ _ (progr. no. 01-49), what to do (six steps), progr
* what to do = RCL 1
RCL 2
SCAN 1 + dwell time
SCAN 2 + dwell time

PROGR. 4 Alarm viewing/setting.
diplay: shows all alarms with alarm no. and time.
when finished it goes to PROGR. 2.

Figure 3.1
Front Panel Features



1 BANDWIDTH group. These keys select the IF-bandwidth when the receiver is operated in AM- , RTTY or CW mode.

2 MODE group. These are the primary mode selection keys for reception. Pressing any mode key automatically selects default values for the secondary keys.

3 AGC control group. These keys select the proper AGC time constants. These constants are also affected by the MODE keys. In the "OFF" mode, RF-gain is manually controlled.

4 ATTENUATOR key. Inserts a 10dB attenuator in the receiver front end. Used to further improve the receiver's large-signal response.

5 S-METER. Analogue indication of the received signal strength.

6 LSB/USB indicator.

7 MONITOR indicator.

8 ALPHANUMERIC display. Displays the receiving frequency, the BFO-frequency, error codes and failure modes.

9 REMOTE annunciator. Indicates that the receiver is remotely controlled by a master.

10 SCAN key. Selects the automatic and the manual scanning mode.

11 ENTRY group. This group includes the numeric data keys and the clear key.

12 REGISTER group. These keys are used for storing and recalling of user-programmed receiver settings. The recall key is also used for selection of international communication channels.

13 MONITOR connects the speaker to LSB or USB in ISB mode.

14 PHONES output. Connection for head phones. Disconnects the internal speaker.

15 DIMMER/POWER control. Used for control of the light intensity in the front panel indicators. In the OFF position, power is only applied to the oven (optional) and to part of the power supply circuits.

16 LOCAL key. Used to bring the receiver in local mode when operated in a remote system.

17 TUNE key. Enables/disables free tuning by the control knob.

18 BFO key. Enables/disables the BFO control mode.

19 PROGRAM key. Key for entering the program mode.

20 TUNING control. Used for free-tuning of the receiving frequency and the BFO frequency.

21 LOUDSPEAKER

22 RF-GAIN/SQUELCH control. Used during AGC "off" manually to adjust the intermediate frequency gain.

23 AF-GAIN control. Manual adjustment of the audio frequency gain.

24 NOTCH-TUNE control. Manual adjustment of an audio frequency notch filter, tunable in the range 300 Hz to 3400 Hz. Used to attenuate undesired interfering signals in the audio output.

25 LOUDSPEAKER ON/OFF switch mounted on bottom of frontpanel.

3.6 Frequency Selection

The frequency resolution can be selected by pressing (.) to 1 kHz, 100 Hz or 10 Hz an appropriate number of times.

3.6.1 Clear Display

Pressing the (C) key, clears the display to zero. This key is useful when an error is made while entering data.

3.6.2 Keyed Tuning

Key in the desired frequency by pressing numbers in sequence, just as they are written on a piece of paper.
The display immediately shows the number sequence in right entry display format, i.e. the numbers appear in the rightmost display character and are shifted left, one character on each number entry.
The decimal point must be keyed if it is part of the number (unless it has to be right of the last frequency digit in kHz).
For example to key in 7501.65 kHz, simply press the following keys in sequence:

Press	Display
C	0.00
7	7.00
5	75.00
0	750.00
1	7501.00
.	7501.00
6	7501.60
5	7501.65

3.6.3 Free Tuning

The tuning control is activated by pressing (tune) .By rotating the tuning knob the receiving frequency is varied in continuous steps.
Pressing (tune) the second time disables the free tuning.

3.6.4 BFO Control

The BFO-frequency is entered and displayed with 3-digit resolution on the left display . The frequency can be entered from the keyboard and/or tuned by the tuning control knob.

To enter the BFO-frequency from the keyboard:

- Press (BFO)
- Press (0) to select the proper signal (+/-)
- Press the number keys of the applicable BFO-frequency, entering the decimal point in the proper place.

To adjust the BFO-frequency by the frequency tuning knob:

- Press (BFO)
- adjust the BFO-frequency by means of the tuning knob.

Pressing BFO the second time disables the BFO-control.
Not active in AM mode.

3.7 Mode Selection

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

NOTE

> A lighted indicator above any key denotes it as an active entry. For example, if the "wide" key indicator is on, it is not necessary to press that key if this is the desired bandwidth.

The receiver can operate in six modes:
AM, SSB, CW, RTTY and optionally: ISB, SSB+RTTY and FM.
The proper mode is selected by pressing one or two keys labelled
AM , SSB , CW , RTTY ,
SSB + AM (ISB), SSB + RTTY , RTTY + CW (FM)
After pressing SSB the USB mode is selected.
LSB is selected by pressing SSB once more.
After pressing SSB + AM = ISB the speaker is connected to USB, indicated by AF1-led. Press mon to switch to LSB, indicated by AF2-led.
Before pressing SSB + RTTY the SSB sideband is selected by pressing SSB once or twice. The USB-led or LSB-led indicate the SSB sideband. The mon key connects speaker to USB or LSB, indicated by AF1-led or AF2-led.

Pressing a mode key automatically selects default values for secondary control keys. However, these default settings can be altered by the operator by manual entry after the mode selection.

The following default settings are used:

Mode	AGC	Bandwidth	BFO	Monitor
AM	slow	wide	----	---
SSB	slow	----	0.00	---
CW	slow	narr	0.80	---
RTTY	fast	narr	1.70	---
ISB	slow	----	0.00	USB(=AF1)
SSB+RTTY (SSB=USB)	slow	narr	0.00	USB(=AF1)
SSB+RTTY (SSB=LSB)	slow	inter	0.00	LSB(=AF2)
FM	slow	----	----	---

3.7.1 AM and FM (optional) Operation

- Key in the desired frequency
- Press the AM key for AM reception
- Press RTTY + CW keys for FM reception
- Adjust AF-GAIN for convenient volume

3.7.2 SSB, CW and RTTY Operation

- Key in the desired frequency
- Press (SSB) ((USB)), (CW) or (RTTY)
- Adjust AF-GAIN for a convenient volume
- For LSB press (SSB) twice

3.7.3 ISB (optional) operation

- Key in the desired frequency.
- Press (SSB) + (AM)
- Adjust AF-GAIN for a convenient volume.
- Use (mon) key to connect the speaker to LSB(AF2) or USB(AF1).

3.7.4 SSB+RTTY (optional) operation

- Key in the desired frequency.
- Select SSB sideband with (SSB) key
- Press (SSB) + (RTTY)
- Adjust AF-GAIN for a convenient volume.
- Use (mon) key to connect the speaker to LSB(AF2) or USB(AF1).

3.7.5 AGC control

The AGC keys control the AGC time constants. Press any of the keys labelled (off), (slow) or (fast) to select the desired mode.

In the AGC "off" mode the gain can be adjusted by means of the RF-GAIN control knob.

NOTE

The MODE keys will affect the time constants of the AGC-circuit. The AGC control keys are used for supplementary control of the AGC time constants. For further information refer to the receiver specifications.

In AM and FM mode you can't change the AGC time constant.

3.7.6 AGC Threshold Control

The AGC threshold control may be activated when the receiver is operated in either of the two automatic gain control modes, i.e. "slow" and "fast".

- Press the key labelled (slow) or (fast) to select the desired AGC time constants.
- Press the active AGC key again to enter the threshold mode. (Not active in AM and FM mode).

3.7.7 Attenuator Control

The Antenna Attenuator is controlled by the (att) key.

3.7.8 Bandwidth Control

The bandwidth keys (wide) , (inter) , (narr) and (vnar) select the IF bandwidth of the receiver. These keys can only be used in the AM, RTTY, CW and SSB(USB)+RTTY receiver modes, and will not respond to commands when the receiver is operated in SSB, ISB , SSB(LSB)+RTTY and FM mode. In SSB(USB)+RTTY wide bandwidth is disabled and it is the RTTY bandwith which is selectable.

3.7.9 RTTY Operation (Optional)

The RTTY-demodulator can be installed in either RX4010 or RC4010. When the RTTY button is activated once, the receiver will enter the RTTY mode and a frequency setup can be entered.

At a second activation of the RTTY button the display of the unit where the demodulator is installed, will show:

---

where the lower and upper segments represent mark/space levels.

Depending on the level, few or many segments will be lit. To ensure proper reception, the two rows must be equal and this can be done by tuning. When a signal is present, the demodulator will be activated and start up the telex printer.

3.8 User Programmable Channels

The receiver contains 99 addressable user programmable channels (UPC) which allow the operator manually to store and recall complete receiver settings.
A complete receiver setting includes reception mode, frequency, AGC mode, bandwidth, BFO and attenuation.

3.8.1 Store a User Programmable Channel.

To store a complete receiver setting

- Press (sto)
- Display will show first free channel no *.
  Example: 'sto FrEE 14' channel no. 14 is first free channel.
  (* if no free channel exists the display shows 'OCCUP.')
- Press (sto) to store at the shown channel number.
- Enter the number of the applicable channel (00-99), if you don't want to store at the shown channel number.

The channel number is shown in left display, frequency in right display. The channel number is shown until receiver mode, frequency, AGC mode, bandwidth, BFO or attenuation are changed. When returning to the last stored or recalled setup, the channel number will be shown again.
To delete a channel store the frequency 0.00 KHz in the channel.

3.8.2 Recall a User Programmable Channel.

- Press rcl
- Press 1 to select the UPC
- Enter the applicable channel number (00 through 99)

The channel number is shown in left display, frequency in right display. The channel number is shown until receiver mode, frequency, AGC mode, bandwidth, BFO and attenuation are changed.

When returning to the last stored or recalled setup, the channel number will be shown again.
The error message: 'not. dEF.' indicates that the channel is empty.

3.8.3 Channel 00

The channel 00 always contains the present receiver setting except any free tuned frequency offset.

After a free tuning sequence, simply press
rcl 1 0 0 to restore the original frequency setting.

If after a re-adjustment the operator wants to update the receiver setting to reflect the current receiving frequency, he should press
sto 0 0 .

3.9 Preprogrammed Channels.

The receiver contains information on all CCIR recommended frequencies as 433 preprogrammed channels (PPC) for

- Voice duplex communication in the coaststation bands
  4, 6, 8, 12, 16 and 22 MHz
- Telex communication in the coaststation bands
  4, 6, 8, 12, 16 and 22 MHz

When preprogrammed channels are selected, the receiver will automatically generate all settings for that particular channel.

The preprogrammed channels are stored in non-volatile memory and it is not possible to change these channels unless done by the factory.

3.9.1 Recall a Preprogrammed Channel.

To recall a preprogrammed channel

- Press rcl
- Press 2 to select the PPC
- Press SSB or RTTY once to select the reception mode (see 3.7.2)
- Enter the desired frequency band
  (4, 6, 8, 12, 16 or 22)
- Enter the desired channel number

Illegal band and channel selection is ignored by the receiver.

3.9.2 International Calling Channels.

To select an international channel, press the (.) decimalpoint instead of the channel number.

3.10 The SCAN Function

The receiver is equipped with a manual and an automatic scanning function that allows scanning in the following modes:

- Scanning of User Programmable Channels (UPC).
- Scanning of PreProgrammed Channels (PPC).
- Scanning of up to 10 scan programs.
- Scanning of frequency bands.

To initiate the scan function press the (scan) key.
Display shows: "Scn. Cont." if last scanning can be continued or
"Scn. UPC"
Scrolling between the different mode is accomplished, by using "forward arrow" key and "back arrow" key:

Scn. Cont. (scanning continue), Scn. UPC (scanning UPC),
Scn. PPC (scanning PPC), Scn. ProG. (scanning scan programs),
Scn. Fr. (scanning frequency bands).

The wanted mode is selected by the (enter) key.

Press (rtn) to leave the scan set-up mode.

3.10.1 Scanning continued (Scn Cont).

The last scanning will be continued from the point where it was interrupted.

3.10.2 Scanning of UPC.

After selecting this mode the display shows "Lo. Chn."

The low UPC channel number is entered by the numeric keyboard and accepted by the (enter) key.

The display will then show "Hi. Chn."

The high UPC channel number is entered by the numeric keyboard and accepted by the (enter) key.

Display shows "Scn. ti."

The scanning time (the time the receiver will stay on each channel) is entered by the numeric keyboard. The time should be in step of 0.5 sec. The (C) key selects 0.1 sec scanning time. Accept with the (enter) key.

Now the scanning is started.

Error message : "Err. Chn."   High channel < low channel

Example : scan from UPC channel 2 to 6, scan time 3.5.

keystrokes	display	12345.60
scan	Scn.	UPC
enter	Lo.	Chn.
2	Lo.	Chn. 2
enter	Hi.	Chn.
6	Hi.	Chn. 6
enter	Scn.	ti.
3	Scn.	ti. 3
.	Scn.	ti. 3.
5	Scn.	ti. 3.5
enter		

3.10.3 Scanning of PPC.
After selecting this mode the display shows "tyP. OF rcPt." (Type of reception).

Press SSB or rtty key to select the mode.

The display then shows "bAnd", after which the band number should be entered by the numeric keyboard and accepted by the enter key.

The display shows "Lo. Chn.". Then the low PPC channel is entered by the numeric keyboard and accepted by the enter key.

The display shows "Hi. Chn.". The high PPC channel is entered and accepted by the enter key.

Then the display shows "Scn. ti.". The scanning time should be selected in steps of 0.5 sec. except from 0.1 sec. scanning time where "0.1" should be keyed in. The enter key accepts the entry.

Now the scanning has started.

Error message : "Err. Chn."   Illegal channel number or high channel < low channel.
"Err. bAnd"   Illegal band number.

Example: scan PPC ssb band 4 channel 2 to 5, scan time 0.1 sec.

keystrokes	display	
		12345.60
scan	Scn.	UPC
-->	Scn.	PPC
enter	tyP.	OF rcPt.
SSB		bAnd
4		bAnd 4
enter	Lo.	Chn.
2	Lo.	Chn. 2
enter	Hi.	Chn.
5	Hi.	Chn. 5
enter	Scn.	ti.
.	Scn.	ti. 0.
1	Scn.	ti. 0.1
enter		

3.10.4 Scanning of scan-programs.

After selecting this mode the display shows "PrG. no.".

Enter the scan-program number by the numeric keyboard and accept with enter key.

Enter up to 10 scan-program numbers in this way.

To start scanning press enter twice.

If the last scanning has been a program scanning, this mode will show the number of the entered program. A program number can be deleted by pressing C or changed by using the numeric keyboard.

Example: scan scan-program no. 3, 5, 2

keystrokes	display	
		12345.60
scan	Scn.	UPC
-->	Scn.	PPC
-->	Scn.	PrG.
enter	PrG.	no.
3	PrG.	no. 3
enter	PrG.	no.
5	PrG.	no. 5
enter	PrG.	no.
2	PrG.	no. 2
enter	PrG.	no.
enter		

Example: Delete scan-prog. no. 5 and scan only scan-programs 3 and 2.

keystrokes	display	
		12345.60
scan	Scn.	cont.
-->	Scn.	UPC
-->	Scn.	PPC
-->	Scn.	PrG.
enter	PrG.	no. 3
enter	PrG.	no. 5
C	PrG.	no.
enter	PrG.	no. 2
enter	PrG.	no.
enter		

3.10.5 Scanning of frequency bands.

After selecting this mode the display will show "Lo."

After the low frequency (start frequency) is entered by the numeric keyboard and accepted by the enter key, the display shows "Hi.".

Then the high frequency (stop frequency) is entered by the numeric keyboard and accepted by the enter key.

Display shows "StP." after which the step frequency is entered by the numeric keyboard (max. step frequency 9999.99 kHz) and accepted by the enter key.

Then the display shows "Scn. ti.". The selected scanning time should be in steps of 0.5 sec. except from 0.1 sec. scanning time, where "0.1" should be keyed in. The entry is accepted by the enter key.

Now the scanning has started.

Example: scan 1000 kHz - 2000 kHz in steps of 100 kHz, with scan time 84 sec.

keystrokes	display	
		12345.60
scan	Scn.	UPC
-->	Scn.	PPC
-->	Scn.	PrG.
-->	Scn.	Fr.
enter	Lo.	
1	Lo.	1.00
0	Lo.	10.00
0	Lo.	100.00
0	Lo.	1000.00
enter	Hi.	

2	Hi. 2.00
0	Hi. 20.00
0	Hi. 200.00
0	Hi. 2000.00
enter	StP.
1	StP. 1.00
0	StP. 10.00
0	StP. 100.00
enter	Scn. ti.
8	Scn. ti. 8
4	Scn. ti. 84
enter	

3.10.6 Change scan/dwell time.

Press (.) to change scan/dwell time.

The display shows "Scn. ti. xx.x" (xx.x = last entered scan time)

Enter the scanning time by the numeric keyboard. The time should be in steps of 0.5 sec. except of 0.1 sec. scanning time which should be entered as "0.1". Accept by the (enter) key.

The scanning now continues.

When in threshold mode, it is the dwell time which is being changed.

Example: change scan time from 84 sec to 5 sec.

keystrokes	display
	12345.60
.	Scn. ti. 84
5	Scn. ti. 5
enter	

3.10.7 Scan threshold mode.

If the receiver is in scanning threshold mode it will stay for the scan time selected on channels with signal level below the threshold level. If signal level exceeds the threshold level, the receiver stay for the dwell time selected on the channel.

Press (slow) or (fast) key to select threshold mode.

Display shows "dll. ti. xx.x" (xx.x = last entered dwell time)

Enter dwell time by the numeric keyboard. The time should be in step of 0.5 sec. except from 0.1 sec. dwell time which should be entered as "0.1". Accept by the (enter) key.

Scan threshold mode is now selected.

Slow/fast led will flash to indicate threshold mode.

Change dwell time by pressing (.) (see section 3.10.6).

To leave threshold mode press (slow) or (fast) key.

Example: select threshold mode, fast agc and dwell time 10 sec.

keystrokes	display	
		12345.60
(fast)	dll.	ti. 0.1
(1)	dll.	ti. 1
(0)	dll.	ti. 10
(enter)		

3.10.8 Manuel scanning.

Press (scan) key to select manual scanning.

Manual scanning is indicated by a flashing scan annunciator.

Manual scanning is carried out by rotating the tuning knob.

Press (scan) key to return to automatic scanning.

3.10.9 Leave scanning.

To leave the scanning press the (C) key.

3.11 Introduction to the Program Function

Selecting 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.

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 (enter) (.)
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 receiver when the downwards arrow button is pressed.

When in a program function the (rtn) key may be used to return to the former setting of the receiver.

Selection of a program function does not effect the setting of the receiver. I.e. the receiver will continue receiving as before the program function was entered.

The operation of the programs can be illustrated in this way:

1) Select the program.

2) The main menu will be displayed.

| main menu |

3) The menus are scrolled by <-- and --> keys.

| main menu | <——> | sub menu 1 | <——> | sub menu 2 | <——>

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

| message 1 |

5) Sub messages may be scrolled using <-- and --> keys.

| message 1 | <—> | sub mess.1.1 | <—> | sub mess.1.2 | <—>

6) Messages are scrolled using the down arrow and the up arrow keys.

| message 2 | <—> sub mess.2.1 <—> sub mess.2.2 <—>

*

*

*

*

| message N | <—> sub mess.N.1 <—> sub mess.N.2 <—>

7) Pressing the down-arrow key after the last message returns the receiver to the former setting.

The receiver has several programs:

Program 1 : 24 hours clock.
Program 2 : Alarm programming/clearing.
Program 3 : Scan program programming.
Program 4 : Scan program clearing.
Program 39: Select sunchron or pair mode.
Program 41: ARTEL Automatic Remote Transmission Error Log.
Program 42: Accumulated On-time.
Program 49: Self test (see section 8).

3.11.1 Clock Viewing and Setting

Program 1.

When program 1 is selected "CLO. rcl." will appear on the display. By using "forward arrow" 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 "forward arrow" key and "back arrow" key.

The wanted menu is selected by the (enter) key.
Pressing the "up-arrow" key after a menu has been selected, returns display to the menu.
After selection of menu, date and time are scrolled using "up arrow" and "down arrow" keys.

In "clock store" mode a flashing digit indicates the digit which might be changed by entering a new digit by the numeric keyboard. The "forward arrow" and the "back arrow" keys are used to select the digit 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	
		12345.60	
(progr)	PrG	no.	
(1)	PrG	no. 1	
(enter)	CLO.	rcl.	
(enter)	dAt.	90-10.12	(oct. 12. 1990)
(enter)	ti.	16-44.48	(16h 44min 48sec)
(enter)		12345.60	

Example, Clock Setting:
Change date to jan. 14. 1990 and the time to 16.54.00.
(an underline denotes flashing digit).

keystrokes		display
		12345.60
(progr)	PrG	no.
(1)	PrG	no. 1
(enter)	CLO.	rcl.
(-->)	CLO.	Sto.

enter	dAt.	90-10.12
-->	dAt.	90-10.12
-->	dAt.	90-10.12
0	dAt.	90-00.12
1	dAt.	90-01.12
-->	dAt.	90-01.12
4	dAt.	90-01.14
enter	ti.	16-44.48
-->	ti.	16-44.48
-->	ti.	16-44.48
5	ti.	16-54.48
-->	ti.	16-54.48
0	ti.	16-54.08
0	ti.	16-54.08
enter		12345.60

3.11.2 Alarm programming/clearing.

Program 2

The alarm function forces the receiver to carry out a programmed function at a programmed date and/or time. The following functions are possible:

- Scanning a scan-program.
- Mute the receiver (receiver off).
- Demute the receiver (receiver on).
- Recall UPC.
- Recall PPC.

A flashing dot in the rightmost display indicates that an alarm is executed.

When program 2 is selected "Alr. SEt." will appear on the display. By using "forward arrow" key the display is changed to "Alr. CLR.". "Alr. SEt." is for alarm Viewing/setting and "Alr. CLr." is for alarm clearing. Scrolling between the two displays is accomplished by using "forward arrow" key and "back arrow" key.

The wanted menu is selected by the enter key.

If alarm clearing is selected the display shows "CLr. Alr.".

Enter the alarm number by the numeric keyboard and press enter to clear the alarm.

If alarm viewing/setting is selected the display shows "Alr. no.".

Enter the alarm number by the numeric keyboard and accept with the enter key.

The display shows "Alr. dA. xx.xx" where xx.xx is the date.
"__" indicates that this is a don't care.

A flashing digit indicates the digit which might be changed by entering a new digit by the numeric keyboard. The "forward arrow" and the "back arrow" keys are used to select the digit to be changed. Press (C) key to select don't cares. Accept the date by the (enter) key.

Display shows "Alr. ti. xx.xx" where xx.xx is the time. "__" indicates that this is a don't care.

A flashing digit indicates the digit which might be changed by entering a new digit by the numeric keyboard. The "forward arrow" and the "back arrow" keys are used to select the digit to be changed. Press (C) key to select don't cares. Accept the time by the (enter) key.
Note: Minutes can't be don't cares.

Display shows: "Alr. not dEF." if this alarm is not defined or
"Alr. dEF." if this alarm is defined.

If an alarm is not defined the different mode can be scrolled using "forward arrow" key and "back arrow" key :

Scn. PrG. (scan program), rEC OFF (receiver mute), rEC on (receiver demute), UPC (recall upc), PPC (recall PPC)

The wanted mode is selected by the (enter) key.

If an alarm is defined, the "forward arrow" key can be used to see the mode for this alarm.

To delete the mode press (C) key.
To view the mode press (enter) key.

3.11.2.1 Scan-program mode.

If scan-program mode is selected the display shows "Alr. P.no. xx". (xx = scan-program no.).

Enter the scan-program number by the numeric keyboard. Accept by the (enter) key.

Example: Alarm no. 1: scan scan-program no. 43 every hour at minutes = 15.

keystrokes	display
	12345.60
(progr)	PrG. no.
(2)	PrG. no. 2
(enter)	ALr. SEt
(enter)	ALr. no.
(1)	ALr. no. 1
(enter)	ALr. dA. __.__

enter	ALr. ti. 00.00
C	ALr. ti. __.00
-->	ALr. ti. __.00
-->	ALr. ti. __.00
1	ALr. ti. __.10
5	ALr. ti. __.15
enter	ALr. not. dEF.
-->	ALr. Scn. PrG.
enter	ALr. P.no.
4	ALr. P.no. 4
5	ALr. P.no. 45
enter	ALr. no.
rtn	12345.60

3.11.2.2 Recall UPC mode.

If UPC is selected the display shows "Alr. Chn. xx".
(xx = channel no.)

Enter UPC channel number by the numeric keyboard. Accept by the enter key.

Example: Alarm no. 2: recall UPC 2 every day in july at time = 11.05.

keystrokes	display
	12345.60
progr	PrG. no.
2	PrG. no. 2
enter	ALr. SEt
enter	ALr. no.
2	ALr. no. 2
enter	ALr. dA. __.__
0	ALr. dA. 0_.__
7	ALr. dA. 07.__
enter	ALr. ti. 00.00
1	ALr. ti. 10.00
1	ALr. ti. 11.00
0	ALr. ti. 11.00
5	ALr. ti. 11.05
enter	ALr. not. dEF.
-->	ALr. Scn. PrG.
-->	ALr. rEC. OFF
-->	ALr. rEC. on
-->	ALr. UPC
enter	ALr. Chn.
2	ALr. Chn. 2
enter	ALr. no.
rtn	12345.60

3.11.2.3 Recall PPC mode.
If PPC is selected the display shows "Alr. ty. rcPt.".

Press (SSB) or (rtty) key to select the mode (mode led indicates selected mode). Accept by (enter) key.

Then the display shows "Alr. bAnd xx". (xx = band no.).
Enter band number by the numeric keyboard and accept by the (enter) key.

The display shows "Alr. Chn. xx".(xx = channel no.).
The PPC channel no. is entered by the numeric keyboard and accepted by the (enter) key.

Example: Alarm no. 3: recall PPC, ssb, band no. 4, channel no. 2, every day at time = 15.55.

keystrokes	display	
	12345.60	
progr	PrG. no.	
2	PrG. no. 2	
enter	ALr. SEt	
enter	ALr. no.	
3	ALr. no. 3	
enter	ALr. dA. __.__	
enter	ALr. ti. 00.00	
1	ALr. ti. 10.00	
5	ALr. ti. 15.00	
5	ALr. ti. 15.05	
5	ALr. ti. 15.55	
enter	ALr. not. dEF.	
-->	ALr. Scn. PrG.	
-->	ALr. rEC. OFF	
-->	ALr. rEC. on	
-->	ALr. UPC	
-->	ALr. PPC	
enter	ALr. ty. rcPt.	
SSB	ALr. ty. rcPt.	(ssb led on)
enter	ALr. bAnd 0	
4	ALr. bAnd 4	
enter	ALr. Chn. 0	
2	ALr. Chn. 2	
enter	ALr. no.	
rtn	12345.60	

3.11.3 Scan-program programming.
Program 3

This mode is used for creating, revising scanning programs. Each scanning program can contain up to 6 steps of commands, and 49 programs can be created.

Following modes can be used in a scan-program:

- Recall UPC.
- Recall PPC.
- Scanning UPC.
- Scanning PPC.
- Scanning frequency bands.

When program 3 is selected the display shows "Scn. P.no."

Enter the scan-program number by the numeric keyboard.

The display shows "Scn. ti. xx.x", where xx.x is the scan time. Enter scanning time by the numeric keyboard. The time should be selected in steps of 0.5 sec., except from 0.1 sec. scanning time which is entered as "0.1". Accept by the enter key.

Display shows: "xx.y not dEF." if this program step is not defined
or
"xx.y dEF." if this program step is defined.

where xx = program number and y = step number.

If a program step is not defined, scrolling between the different modes is accomplished by using "forward arrow" key and "back arrow" key:
UPC (recall UPC), PPC (recall PPC), Scn UPC (scanning UPCs), Scn PPC (scanning PPCs), Scn. Fr. (scanning frequency bands)

The wanted mode is selected by the enter key.

If a program step is defined, use the "forward arrow" key to see the mode in this program step, or use the enter key to go to the next program step.

To delete the mode press the C key.
To view the mode press the enter key.

3.11.3.1 Recall UPC.
If UPC is selected the display shows "xx.y Chn. zz".
(zz = channel no.)

Enter UPC channel number by the numeric keyboard. Accept by the enter key.

Example: Scan-program 1, step 1 = recall UPC channel no. 2, scan time = 4 sec.

keystrokes	display	
		12345.60
progr	PrG.	no.
3	PrG.	no. 3
enter	Scn.	P.no.
1	Scn.	P.no. 1
enter	Scn.	ti. 0.1
4	Scn.	ti. 4
enter	1.1	not dEF.
-->	1.1	UPC
enter	1.1	Chn.
2	1.1	Chn. 2
enter	1.2	not dEF.
rtn		12345.60

3.11.3.2 Recall PPC.

If PPC is selected the display shows "xx.y ty. rcPt.".

Press SSB or rtty key to select the mode (mode led indicates selected mode). Accept by the enter key.

The display shows "xx.y bAnd zz". (zz = band no.). The band number is selected by the numeric keyboard and accepted by the enter key.

The display then shows "xx.y Chn. zz" (zz = channel no.). Enter PPC channel number by the numeric keyboard. Accept with the enter key.

Example: Scan-program 1, step 1 unchanged, step 2 = recall PPC, rtty, band no. 4, channel no. 4, scan time = 4 sec.

keystrokes	display		
		12345.60	
progr	PrG.	no.	
3	PrG.	no. 3	
enter	Scn.	P.no.	
1	Scn.	P.no. 1	
enter	Scn.	ti. 4.0	
enter	1.1	dEF.	
enter	1.2	not dEF.	
-->	1.2	UPC	
-->	1.2	PPC	
enter	1.2	ty. rcPt.	
rtty	1.2	ty. rcPt.	(rtty led on)
enter	1.2	bAnd 0	
4	1.2	bAnd 4	
enter	1.2	Chn. 0	
4	1.2	Chn. 4	
enter	1.3	not dEF.	
rtn		12345.60	

3.11.3.3 Scanning UPC.
If scan UPC is selected the display will show "xx.y Lo. zz" (zz = low channel no.).

Enter the low UPC channel number by the numeric keyboard. Accept by the (enter) key.

The display shows "xx.y Hi. zz". (zz = high channel no.).
Enter the high UPC channel number by the numeric keyboard. Accept by the (enter) key.

Example: Scan-program 1, step 1 and 2 unchanged, step 3 = scan
UPC channel 1 to 5, scan time = 4 sec.

keystrokes	display	
		12345.60
(progr)	PrG.	no.
(3)	PrG.	no. 3
(enter)	Scn.	P.no.
(1)	Scn.	P.no. 1
(enter)	Scn.	ti. 4.0
(enter)	1.1	dEF.
(enter)	1.2	dEF.
(enter)	1.3	not dEF.
(-->)	1.3	UPC
(-->)	1.3	PPC
(-->)	1.3	Scn. UPC
(enter)	1.3	Lo.
(1)	1.3	Lo. 1
(enter)	1.3	Hi.
(5)	1.3	Hi. 5
(enter)	1.4	not dEF.
(rtn)		12345.60

3.11.3.4 Scanning PPC.
If scan PPC is selected the display will show "xx.y ty. rcPt.".

Press (SSB) or (rtty) key to select mode (mode led indicates selected mode). Accept by the (enter) key.

The display shows "xx.y bAnd zz". (zz = band no.). Enter the band number by the numeric keyboard. Accept by the (enter) key.

The display shows "xx.y Lo. zz". (zz = low channel no.).
Enter the low PPC channel number by the numeric keyboard. Accept by the (enter) key.

The display shows "xx.y Hi. zz". (zz = high channel no.).
Enter the high PPC channel number by the numeric keyboard. Accept by the (enter) key.

Example: Scan-program 1, step 1, 2 and 3 unchanged, step 4 = scan PPC, ssb, band no. 12, channel 2 to 7, scan time = 4 sec.

keystrokes	display	
	12345.60	
progr	PrG. no.	
3	PrG. no. 3	
enter	Scn. P.no.	
1	Scn. P.no. 1	
enter	Scn. ti. 4.0	
enter	1.1 dEF.	
enter	1.2 dEF.	
enter	1.3 dEF.	
enter	1.4 not dEF.	
-->	1.4 UPC	
-->	1.4 PPC	
-->	1.4 Scn. UPC	
-->	1.4 Scn. PPC	
enter	1.4 ty. rcPt.	
SSB	1.4 ty. rcPt.	(ssb led on)
enter	1.4 bAnd 0	
1	1.4 bAnd 1	
2	1.4 bAnd 12	
enter	1.4 Lo. 0	
2	1.4 Lo. 2	
enter	1.4 Hi. 0	
7	1.4 Hi. 7	
enter	1.5 not dEF.	
rtn	12345.60	

3.11.3.5 Scanning frequency bands.

If scan frequency is selected the display shows "xx.y ty. rcPt."

Enter the mode by the mode keys (mode led indicates selected mode). Accept by the enter key.

The display shows "Lo. Fr." for 0.5 sec and then the low frequency. (The start frequency). Enter the low frequency by the numeric keyboard and accept by the enter key.

The display then shows "Hi. Fr." for 0.5 sec. and then the high frequency. (The stop frequency). Enter the high frequency by the numeric keyboard. Accept by the enter key.

The display shows "StEP Fr." for 0.5 sec. and then the step frequency. Enter step frequency by the numeric keyboard (max. step frequency 9999.99 kHz). Accept by the enter key.

Example: Scan-program 1, step 2 = scan frequency, AM mode, 100 kHz to 300 kHz, step freq. 25 kHz, scan time = 4 sec.

keystrokes	display	
	12345.60	
progr	PrG. no.	
3	PrG. no. 3	
enter	Scn. P.no.	
1	Scn. P.no. 1	
enter	Scn. ti. 4.0	
enter	1.1 dEF.	
enter	1.2 dEF.	
-->	1.2 PPC	
C	1.2 not dEF.	
-->	1.2 UPC	
-->	1.2 PPC	
-->	1.2 Scn. UPC	
-->	1.2 Scn. PPC	
-->	1.2 Scn. Fr.	
enter	1.2 ty. rcPt.	
AM	1.2 ty. rcPt.	(AM led on)
enter	1.2 Lo. Fr.	(0.5 sec.)
	1.2 0.00	
1	1.2 1.00	
0	1.2 10.00	
0	1.2 100.00	
enter	1.2 Hi. Fr.	(0.5 sec.)
	1.2 0.00	
3	1.2 3.00	
0	1.2 30.00	
0	1.2 300.00	
enter	1.2 StEP Fr.	(0.5 sec.)
	1.2 0.00	
2	1.2 2.00	
5	1.2 25.00	
enter	1.3 dEF.	
rtn	12345.60	

3.11.4 Scan program clearing.

Program 4

This mode is used for clearing scan-programs.

When program 4 is selected the display shows "Clr. PrG."

Enter scan-program number by the numeric keyboard. Accept by the enter key.

Example: Clear scan-program 1.

keystrokes	display
	12345.60
progr	PrG. no.
4	PrG. no. 4
enter	Clr. PrG.

1	Clr. PrG. 1
enter	CLr. PrG.
rtn	12345.60

3.11.5.1 RTTY Demodulator (A6) setting
Program 34

If the optional programmable RTTY Demodulator is installed, the FSK centerfrequency, baudrate and frequency shift can be set using program 34. (for an overview of possible settings see chapter "Specification of Options")

When program 34 is selected, the display shows the actual CENTERFREQUENCY. If this setting must be changed, the "back-arrow" or "forward-arrow" (left or right) are used to scroll between the possible centerfrequencies. The chosen frequency is then accepted by pressing the enter key.

After the wanted centerfrequency has been selected, the display shows the actual BAUDRATE. This setting can now be changed by using back- and forward-arrows and the enter key.
If the selected baudrate is higher than possible with the actual shift-setting, the display will flash. Accepting this baudrate by pressing the enter key will automatically increase the shift-setting to a possible value. The message "Shift changed" will then be displayed.

After the wanted baudrate has been selected, the display shows the actual total SHIFT. (total means here that a shift of +/-85Hz is displayed as 170Hz, +/-42.5Hz as 85Hz and so on).
The shift setting can also be changed with back- and forward- arrows and enter key. (or upward-arrow can be used once or twice to jump back to baudrate or centerfrequency-menu)
If the selected shift is lower than possible with the actual baudrate-setting, the shift will not be accepted. The display shows "Baud too high" and returns to the previous shift setting.
(upward-arrow can be used to jump back for changing baudrate)
After the shift has been selected, program 34 is terminated.

3.11.5.2 RTTY ON/OFF and Invert.
Program 35

When this program is entered, the display shows the actual setting of the demodulator-output ON/OFF .
ON or OFF can be selected with back- and forward-arrows and the enter key. In OFF-mode (and when the receiver is not in RTTY-mode) the output of the modulator is in the Mark-Hold state.

After this selection, the display shows the actual setting of NORMAL/INVERT. Selection can be accomplished by the back- and forward-arrows and enter key. Program 35 terminates upon this.

3.11.7 Select Synchron or Pair Mode.

Program 39

This mode is used to select Synchron or Pair Mode.
(See section 5 for description of Synchron and Pair modes).

When program 39 is selected the display shows:
"OFF SEriAL" when synchron and pair mode is off.
"On Synchrn" when synchron mode is on.
"On PAir" when pair mode is on.

Scrolling between the different modes is accomplished by using "forward arrow" key and "back arrow" key: off serial, on synchron and on pair.

The wanted mode is selected by the enter key.

The display on a RX4010 which is controlld by a master RX4010 will only show "On SEriAL".

3.11.8 ARTEL Automatic Remote Transmission Error Log

Program 41

By installations where the equipment is remote-controlled, the quality of the remote transmission is continuously registered.

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

The maximum number which can be displayed is 65535. In cases where the number exceeds 65535, counter(s) are reset and the counting proceeds from 0.

After the program has been selected, "down arrow" and "up arrow" keys are used to step through the program.

In Section 8, SERVICE, the codes used in the program are listed.

3.11.9 Accumulated On-time

Program 42

An internal counter in the receiver counts the number of hours for which the receiver has been switched on.
When program 42 is selected the display appears as
"P.on XXXXXXX".

XXXXXXX is the accumulated on-time for the receiver

To leave the program press (enter) or (rtn) (.)

3.11.10 Program Function Error messages.

Err.	P.no	: Illegal scan program number.
Err.	bAnd	: Illegal band no.
Err.	chanEL	: Illegal channel no.
Err.	Lo Hi	: High channel no. < low channel no. or high freq. < low freq.
Err.	FrEq.	: Illegal frequency (10.00 <= freq. < 30000.00).
Err.	StEP Fr.	: Illegal step frequency (step freq. < 10000.00).

3.12 Clear All

WARNING:

This rutine erases all data stored in the programmable memory.
To clear all user programmable channels, scanning programs and clock alarms

- press (sto) and (AGC) (off) at the same time.
- the display will show CLr ALL.

If the (sto) key is pressed down within 2.5 sec., the command will be executed.
If no key is pressed down within 2.5 sec. or if any other key but "sto" is pressed down, the program function will be left and the receiver will return to receive mode.

3.13 Short-form instruction

STO To store a full set up
key: sto, _ _ (channel no. 00-99)
sto, sto (store at first free chan.)

RCL 1 To recall a user progr. channel.
key: rcl, 1, _ _ (channel no. 00-99)

RCL 2 To recall a preprogr. channel
key: rcl, 2, SSB/RTTY, _ _ (band no.), _ _ (ch.no.), (ch.no.= '.': international calling channel)

SCAN UPC Scanning of user progr. channel.
key: scan,enter, _ _ (lo. chan.),enter, _ _ (hi. chan.),enter,_ _._ (scan time),enter

SCAN PPC Scanning of preprogrammed channels.
key: scan, -->,enter, SSB/RTTY, _._ (band no.), enter, _ _(lo.ch.),enter,_ _ (hi. ch.),enter, _ _._ (scan time),enter

SCAN PrG Scanning of user program.
key: scan,-->,-->,enter, _ _ (prog. no. 01-49), enter,_ _ (prog. no.),enter, ...,_ _ (prog.no.), enter,enter
(up to 10 prog. no.)

SCAN Fr. Frequency sweep.
key: scan,-->,-->,-->,enter,___.__ (lo.freq.), enter, ___.__ (hi. freq.),enter,___.__ (step.freq.), enter,_ _._(scan time),enter

PROGR. 1 Clock setting.
key: progr, 1,enter, enter, __.__ (date), enter, __.__(time), enter

Clock viewing.
key: progr, 1, enter, -->, enter, __.__(date), enter, __.__(time),enter

PROGR. 2 Alarm programming.
key: progr, 2, enter, enter, __(alarm no.), enter, __.__(date), enter,__.__(time), enter, "command"
"command" = scan program no.
receiver off (mute)
receiver on (demute)
recall UPC channel no.
recall PPC channel no.

Alarm clearing.
key: progr, 2, enter, -->, enter,_ _(alarm no.)

PROGR. 3 — Scan programming.
key: progr, 3, enter, _ _ (progr. no. 01-49), enter, _
_._(scan time), enter, "command 1", enter, ...
..."command 6", enter
"command" = recall UPC channel
recall PPC channel
scan UPC channels
scan PPC channels
scan frequency band

PROGR. 4 — Scan program clearing.
key: progr, 4, enter, _ _(scan program no. 1-49), enter.

PROGR. 34 — RTTY Demodulator Setting.
key: progr, 3, 4, enter, <-- or -->, enter, <-- or -->, enter, <-- or -->, enter.

PROGR. 35 — RTTY ON/OFF, INVERT.
key: progr, 3, 5, enter, <-- or -->, enter, <-- or -->, enter.

PROGR. 41 — Automatic Remote Transmission Error Log.
key: progr, 4, 1, enter.

PROGR. 42 — Accumulated on-time.
key: progr, 4, 2, enter, power on-time shown

SECTION 4
OPTIONS

4.1 Introduction.

This section provides information about optional modules.

4.2 RTTY Demodulator Assembly A6
Assy 471577, 488275 and 489670

4.2.1 Description.

The functional blockdiagram of the RTTY Demodulator is shown in figure 4.1.

The assembly demodulates the received RTTY signals, and presents the data in the RS232 output and in the high voltage Current loop output.
The assembly is capable of receiving data for transmitting, and the microprocessor is able to send data messages to the RS232 output.
The demodulator can receive input both from the 600 ohm line input and the AFDET input (From the IF/AF module).
Note that Demodulator Assy 488275 does not incorporate the AFDET input.

The Mark and Space frequencies are filtered out in 2 bandpass filters and each output is rectified. The rectified Mark signal is subtracted from the Space signal. The resulting data signal passes through the diversity combiner. With the diversity output from a second RTTY Demodulator, connected to the diversity input of the present module, the combiner will average the 2 signals. Then the signal is fed through a third order lowpass filter to the ATC (Automatic Threshold Control). There the dc-component is removed, and the signal is converted to TTL-levels. Upon convertion it is possible to invert the data signal, and this can be done from the microprocessor and from an external invert line.

For some TELEX printers long periods with Space are undesired.
To avoid this, the signal is passed through an antispace circuit, that will switch to Mark after a certain space period. The antispace function can be disabled by the microprocessor.

After the Antispace, the signal is led to the Autostart, and here the data signal will be enabled or disabled, depending on the signal level. The signal level is measured after the ATC.

The Autostart can be put out of function by the microprocessor or from the external autostart the datasignal is led to the microprocessor and the 2 Received Data outputs, current loop and RS232 output.

In the demodulator a FM discriminator is included, and the output from this is read by the microprocessor, together with the detected Mark and Space levels.
As previously mentioned the assembly is supplied with an RS232 receiver and a current loop sense circuit, and the data from these can be read by the microprocessor.

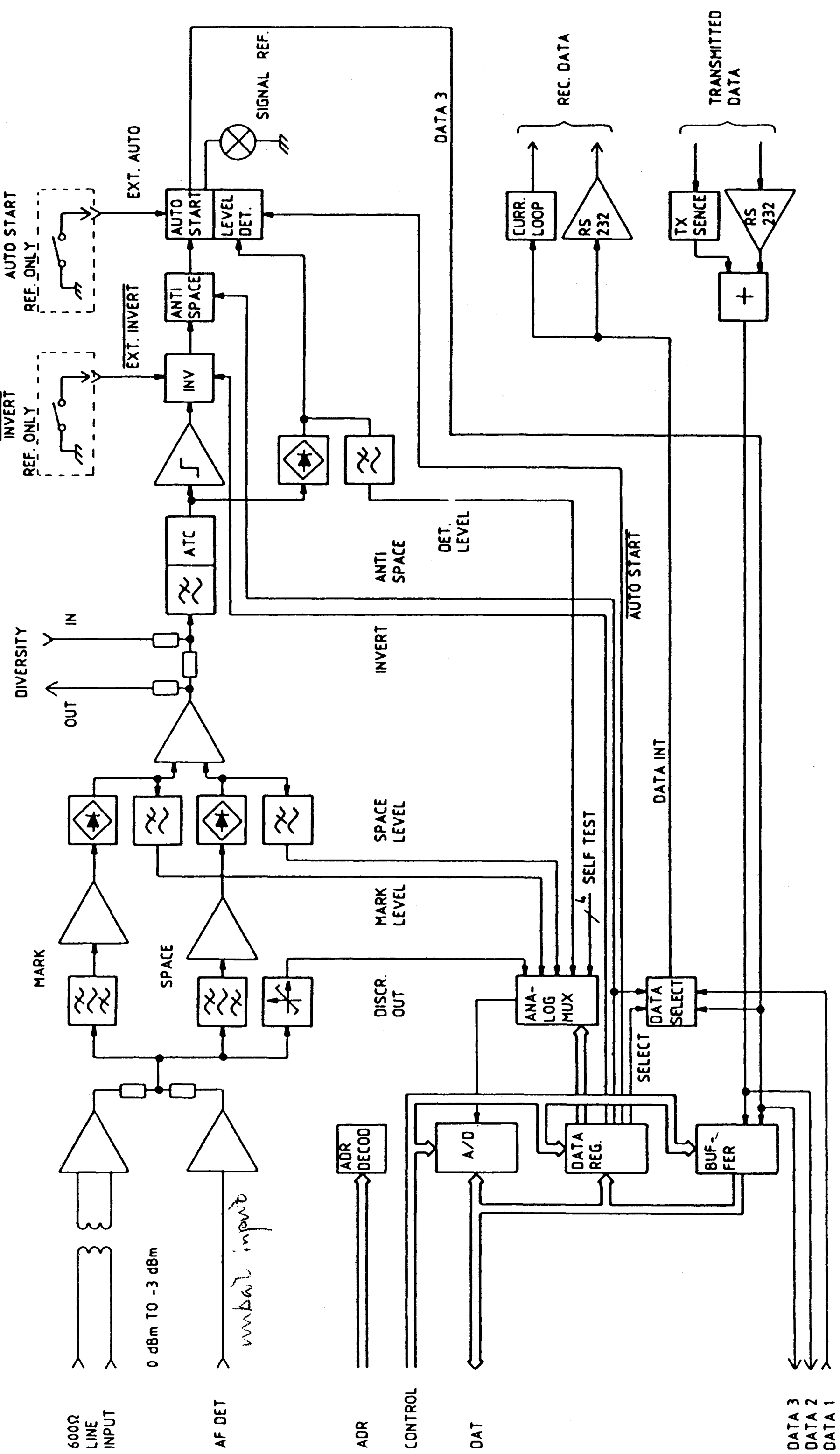


Figure 4.1 RTTY Demodulator Assembly.
(Note: Assy 488275 does not incorporated the AFDET input).

4.2.2 Inputs/Outputs

A. RTTY-Demodulator Data Output, A6J1

Sub-D, Female, 25-poles, Sliding Lock.

The socket A6J1 provides RTTY data output in accordance with RS232C standard and control of the demodulator.

The connections are as follows:

pin	Circuit	Description
1	AA	Protective ground
3	BB	Received data
6	CC	Data set ready
7	AB	Signal ground (common return)
8	CF	Received line signal detector
9	-	INVERT Data inverted when 0
10	-	AUTOSTART Circuit disabled when 0
11	-	+12V
18	-	-12V
25	-	+5V

Note: pin 9 and 10 are 1 when left open

Figure 4.2 RTTY Demodulator Data Output Socket.

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

B. Line Input and Teleprinter Output A6J2

Sub-D, Female, 9-poles, Sliding Lock.

The line input plug provides the input signal to the RTTY-demodulator, as well as the output signal to the teleprinter.

The connections are as follows:

pin			
1	-12V/20-40mA		
2	+12V/20-40mA		
3	Tx sense (+)		
4	GND		
5	Current Loop Output		
6	Line Input	-10 dBm/600 ohms	Balanced
7	Line Input		
8	Tx sense (-)		
9	GND		

Figure 4.3 RTTY-Demodulator Socket

The appropriate cable connector may be ordered from Dansk Radio as part of the Connector Kit, part no. 475505.

C. RTTY Diversity Input A6J3 and Output A6J4
SMB, Male.

The Connectors enable RTTY Diversity reception by cross-coupling the connectors of two receivers.

4.2.3 Strapping.

In order to get maximum performance of the RTTY Demodulator, it is nescessary to strap the interface circuits (current loop and Line input level) and to strap the filters to correct baud rate and frequency shift. Figure 4.4 shows the location of the strappable switches on the board.

A. Current Loop Strapping.

Current	S12 a	S12 b
20 mA	off	off
40 mA	on	off
60 mA	on	on

Voltage	S11
120 V	open
100 V	a
80 V	b
60 V	c

B. Line Input Level strapping.

Level	S1
0 dBm	c
-10 dBm	b
-20 dBm	a
-30 dBm	open

C. Automatic Threshold Control (ATC).

ATC	S9
on	off
off	on

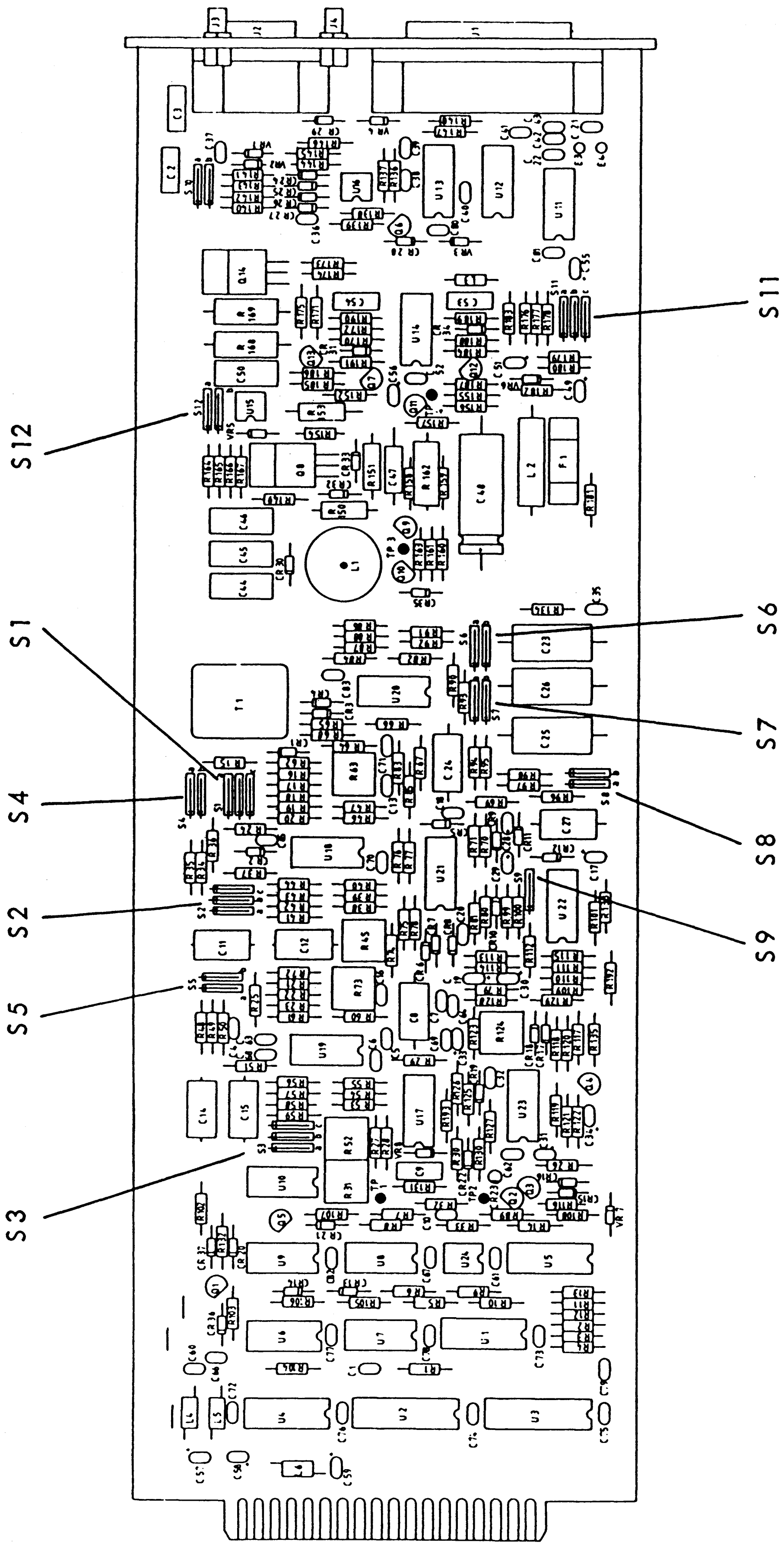


Figure 4.4 RTTY Demodulator, Component Location.

D. Baud rate and frequency shift strapping.

D.1. Assy 471577.

Frequency shift	Baud rate 50	75	100
+/-42.5 Hz	2a	2a 6a, 7a, 8a	2a 6b, 7b, 8b
+/-85 Hz	2b, 3a	2b, 3a 4a, 5a 6a, 7a, 8a	2b, 3a 4a, 5a 6b, 7b, 8b
+/-212.5 Hz	2c, 3b	2c, 3b 4a, 5a 6a, 7a, 8a	2c, 3b 4b, 5b 6b, 7b, 8b
+/-425 Hz	3c	3c 4a, 5a 6a, 7a, 8a	3c 4b, 5b 6b, 7b, 8b

D.2. Assy 488275 and Assy 489670

Frequency shift	Baud rate 50	100	150
+/-42.5 Hz	2a	2a 6b, 7b, 8b	2a 6a, 7a, 8a
+/-85 Hz	2b, 3a	2b, 3a 4b, 5b 6b, 7b, 8b	2b, 3a 4a, 5a 6a, 7a, 8a
+/-250 Hz	2c, 3b	2c, 3b 4b, 5b 6b, 7b, 8b	2c, 3b 4a, 5a 6a, 7a, 8a
+/-425 Hz	3c	3c 4b, 5b 6b, 7b, 8b	3c 4a, 5a 6a, 7a, 8a

ASSY 497037, RTTY Demodulator

Service Sheet A6

1. Address Decoder

When a correct address is present at the address bus, output U1-Y4 or U1-Y5 go low to enable the relevant chip in block (2) or (3). U6 and U7 provide the acknowledge signal IIACK to the microprosessor.

2. A/D Converter

U2 is a selfcontained A/D converter. The input range to U2-6 is 0-5V. U24b supplies a 2.5V reference. U5 is an analogue multiplexer with 8 input channels. The multiplexer is controlled by the microprocessor via latch U3. Channels 0 and 1 are used during the self-test program to measure +15V and -15V supply voltages.

Channels 2 through 6 supervise the RTTY demodulator.

Channel 7 is used during the self-test program to monitor the function of the current loop generator. The current loop output at J2 shall be open-circuited during this test.

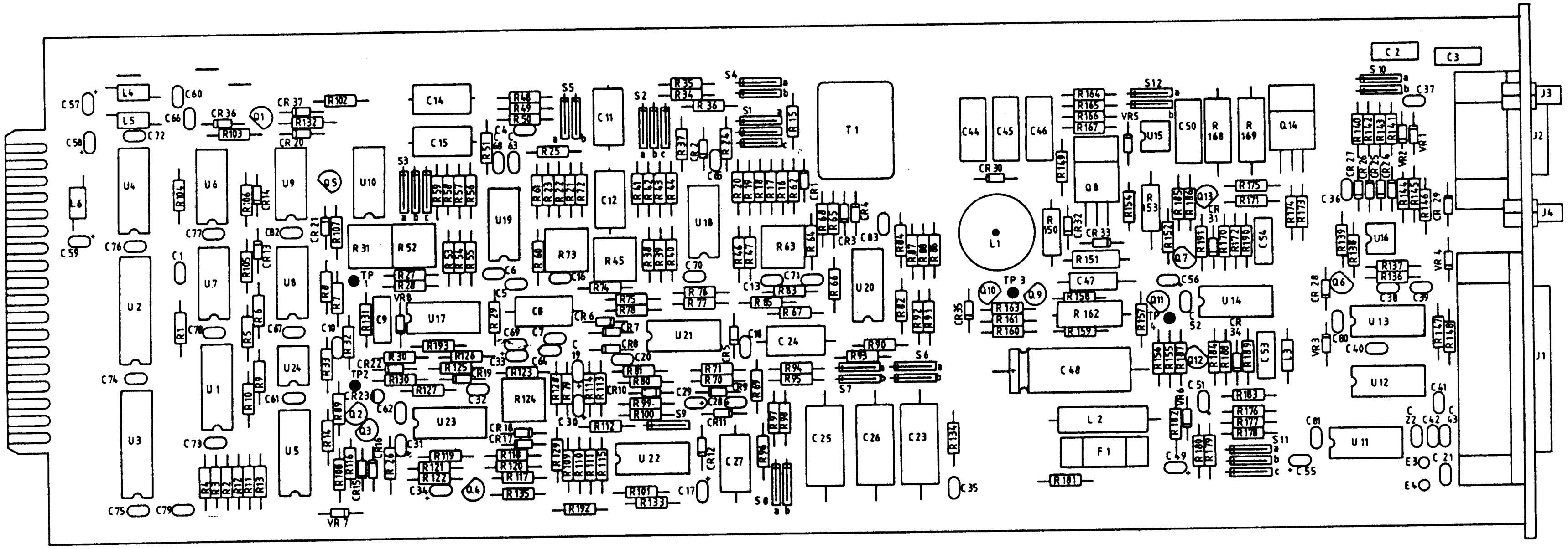
3. Bus Interface and Data Selector

U3 is an 8 bit latch which delivers control data to the demodulator.

U4 is a 6 bit tri-state buffer which allows the microprocessor to read information- and control data from the demodulator.

The data selector U8 is controlled by U3 - Q7, "SELECT EXT". When U3 - Q7 is low, "DATAINT" is connected to "DATA 1" from the motherboard, provided "ANTISPACE" is low. This configuration allows optional data-processing equipment to communicate via the RS232/current loop-port at the RTTY demodulator assy. It also allows the microprocessor to write out status messages to the teleprinter using the "ANTISPACE" line as a serial dataline.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



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

ANGLES

LIN. DIM.

MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON
APPLICATION	

DR.	VH	21.8 1989
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
RTTY DEMODULATOR A6 SMK
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		49 70 37-A
SCALE 2:1		SHEET 1 OF 1

4. AF-Amplifier

The AF-amplifier is divided into a 600 ohm balanced line input amplifier and an unbalanced AF-amplifier. The input level to the line imput amplifier can be strapped (S1) to 0 dBm, -10 dBm, -20 dBm and -30 dBm.

The unbalanced AF-amplifier receives input signal from the IF/AF-module (A7) via the motherboard. The input level is 280 mVpp. The mixed output from the 2 amplifiers is 590 mVpp.

5. Center Frequency Discriminator

The discriminator is a PLL-type FM-discriminator. The center frequency is determined by R27, 28, 31 and C8, max. frequency deviation by R29 and loop damping by C9. The output from the discriminator is lowpass filtered through R30 and C10. The difference between DISCR. REF and DISCR. OUT is displayed on the front panel meter.

6. Mark/Space Filters

Both these filters are single pole bandpass filters of the gyrator type.

The center frequency is selected by the straps S2a-c and S3a-c, the bandwidth is selected by the straps S4a-b and S5a-b.
The center frequency is fine tuned with R45 and R52.
Both filters are buffered and the output level from the buffers is 1.8Vpp.

7. Mark/Space Level Detectors

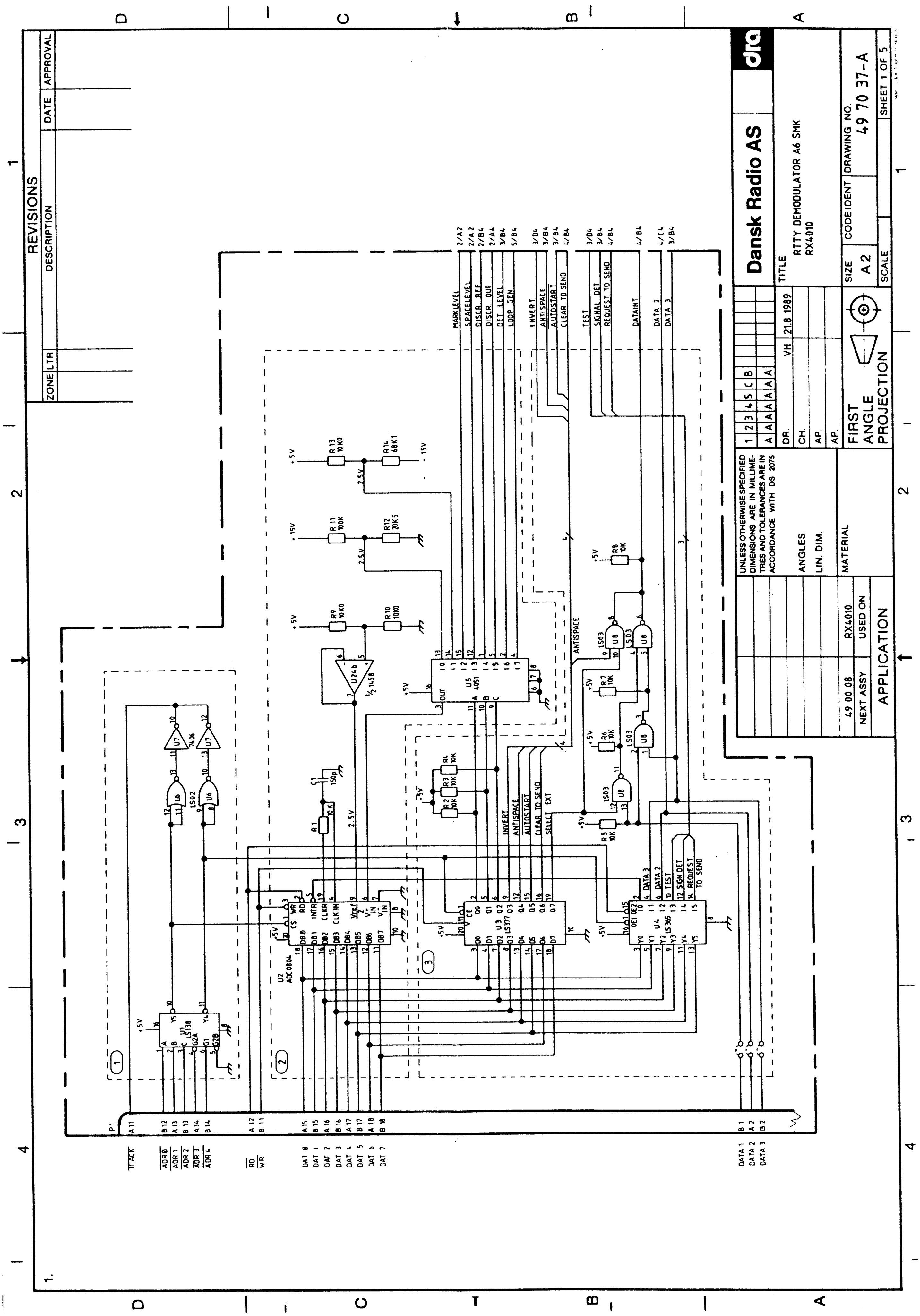
The mark/space level detectors consist of a fullware rectifier, followed by a peak detector.
The output from the peak detector is led to the A/D-converter and shown at the front panel LED-display. The input to the rectifier is adjusted to give full scale deflection on the meter with nominal input level. To protect the multiplexer in front of the A/D-converter, the output from the peak detector is limited to 5V. Output from the peak detector: 4.5Vpp.

8. Mark/Space Subtractor and Filter

The rectified mark signal is subtracted from the rectified space signal. The resulting data signal is filtered in a 3 pole lowpass filter. The cut-off frequency is strapped by S6-8.

A diversity combining amplifier is placed between the subtractor and the filter.

With the output J4 from a second RTTY-demodulator, connected to the diversity-input J3 on the present RTTY-demodulator, the amplifier will average the 2 modulated signals (post detection combining).
Output level from the LP-filter: 3Vpp.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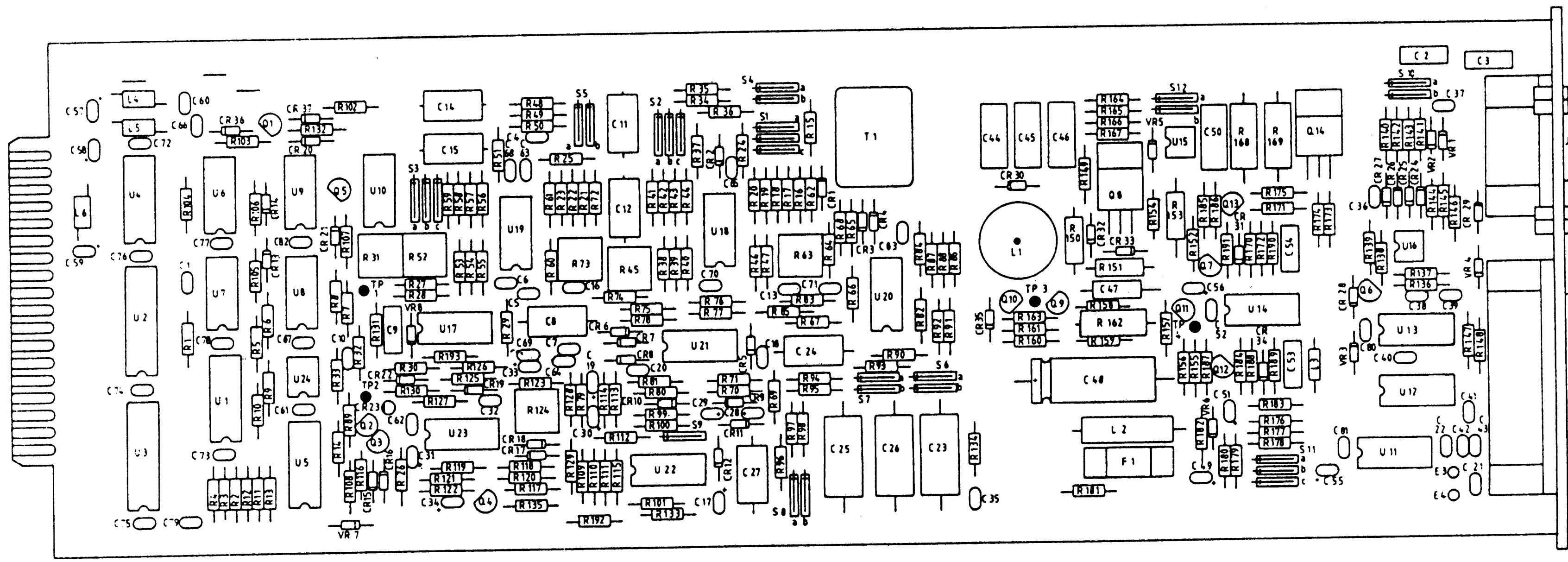
DESCRIPTION
DATE
APPROVAL
Dansk Radio AS
TITLE
RTTY DEMODULATOR A6 SMK
RX4010
DR. VH 21.8 1989
CH.
AP.
AP.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 49 70 37-A
SCALE
SHEET 1 OF 5
49 00 08
RX4010
NEXT ASSY
USED ON
APPLICATION



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

ANGLES

LIN. DIM

MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

DR VH 21.8.1989

CH

AP

AP

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
RTTY DEMODULATOR A6 SMK
RX4010

SIZE A1 | CODE IDENT | DRAWING NO 49 70 37-A

SCALE 2:1 | SHEET 1 OF 1

9. Automatic Threshold Control

The dc-component is removed and the signal is transferred into TTL-level. The ATC-function is ignored when S9 is closed.

10. Invert Circuit

When EX-INV and INVERT are low, the REC.DATA output at J1 is normal. If one or both inputs are high, the output is inverted.

11. Anti Space Control

If the signal is in Space more than 0.3 sec., the data output is switched to Mark.

When receiving a normal RTTY-signal, C30 is discharged each time a Mark is present. When Mark is missing, the output from U22 will go high and U4-6 will go low.

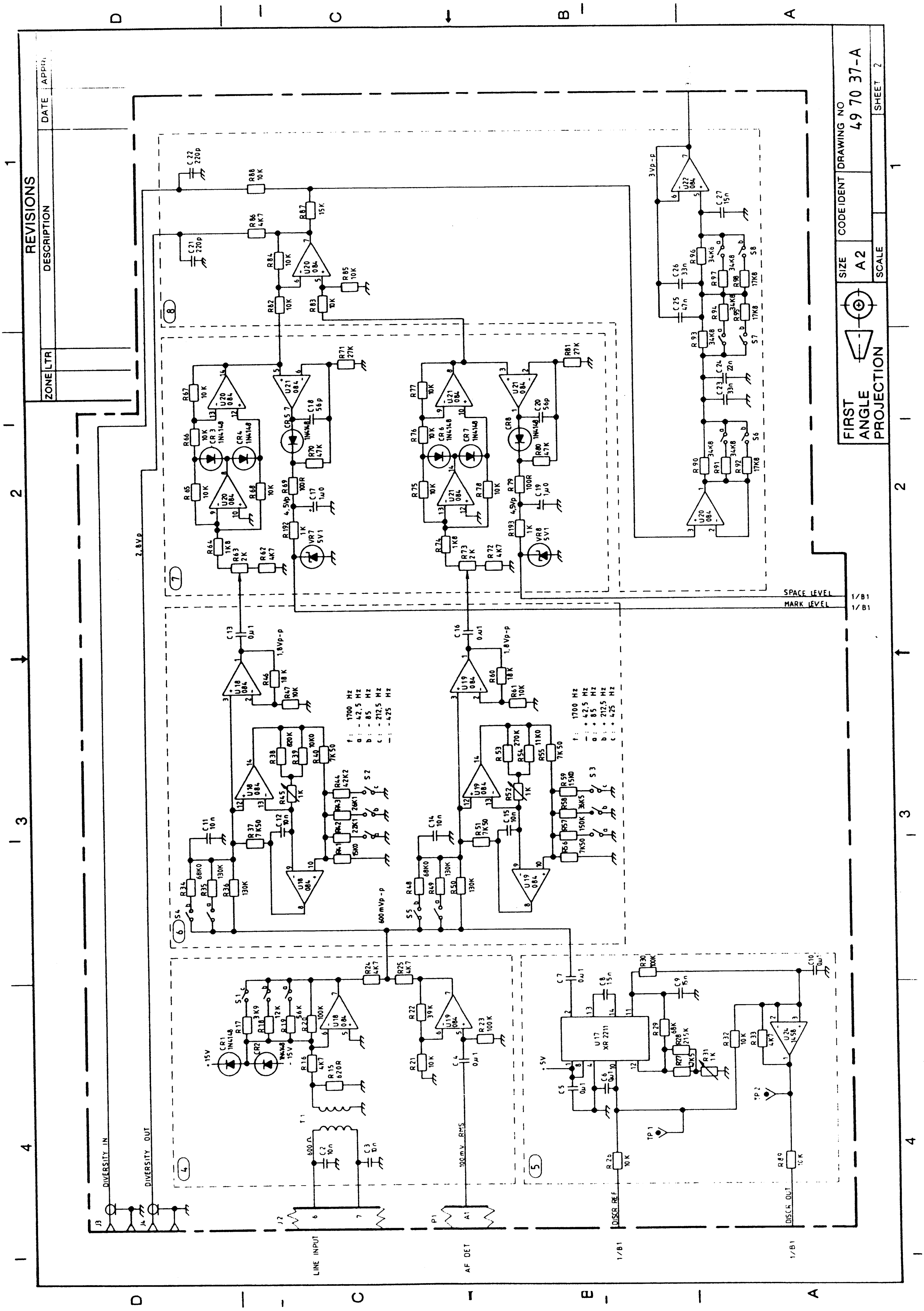
12. Data Signal Level Detector

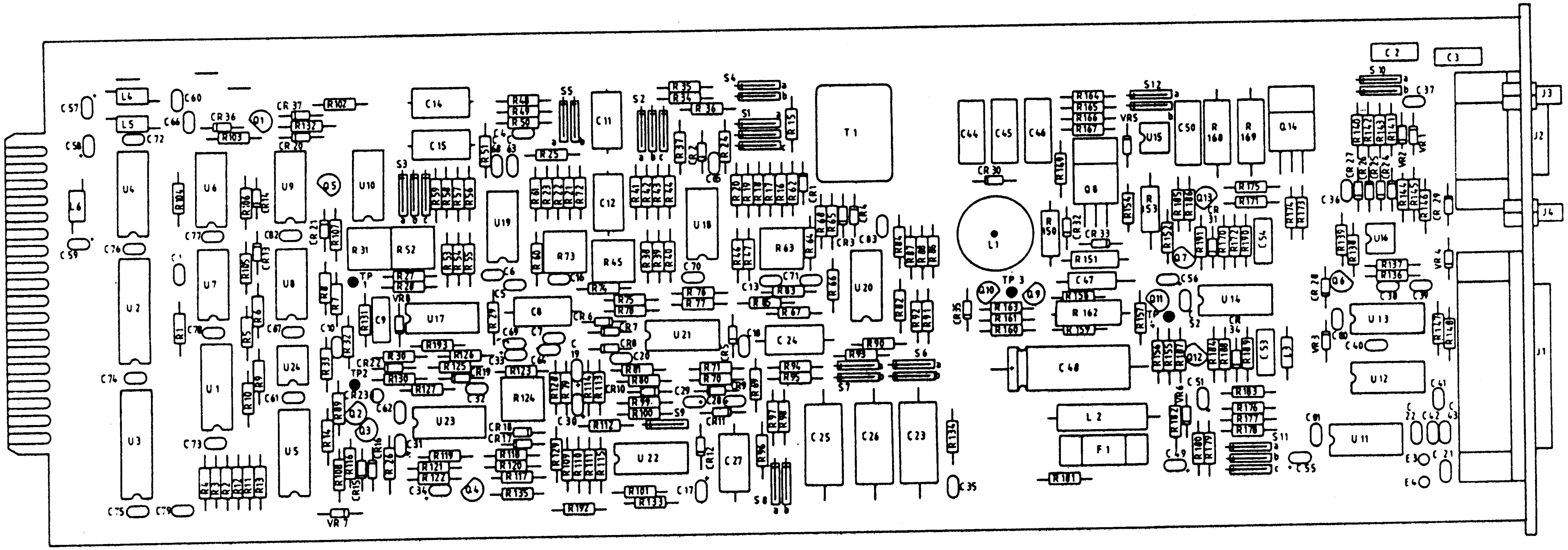
The level detector is a full wave rectifier followed by a lowpass filter. The output from the detector, DET. LEVEL, can be read by the microprocessor.

13. Auto Start Control

The auto start control disables the data signal when it comes under a chosen level too often. The threshold level is set at R124. The capacitor C33 averages the time under threshold and when that value exceeds 3.3V, the output U23-14 goes negative and the U10 output goes high.

The LED on the PCB, CR23 lights when the signal level is sufficient. The disable of the data signal is delayed approx. 1 sec. and the enable approx. 3 sec.
The auto start control can be blocked from the microprocessor (AUTOSTART) and by shortening J1-10 to ground (EXT.AUTO).


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPR.
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO
49 70 37-A
SHEET 2
SCALE
SPACE LEVEL
MARK LEVEL
DIVERSITY IN
DIVERSITY OUT
LINE INPUT
AF DET
DISCR REF
DISCR OUT
600mVp-p
100mV RMS
XR 2211



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ANGLES

LIN. DIM

MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

DR	VH	21.8.1989
CH		
AP		
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
RTTY DEMODULATOR A6 SMK
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		49 70 37-A
SCALE 2:1		SHEET 1 OF 1

14. Tx Circuit

A low voltage current loop for transmitting is present in J2. The short-circuit current can be strapped to 20mA and 40mA and it can be used with both unbalanced 12V and balanced 24V output.

The TX-sense circuit is a floating loop made with an opto-coupler (U16) and it can be placed in series with the TX- or the RX-current loop.
The TX-sense circuit is activated with a current greater than 4mA. The data output from the opto-coupler is led to the microprocessor.

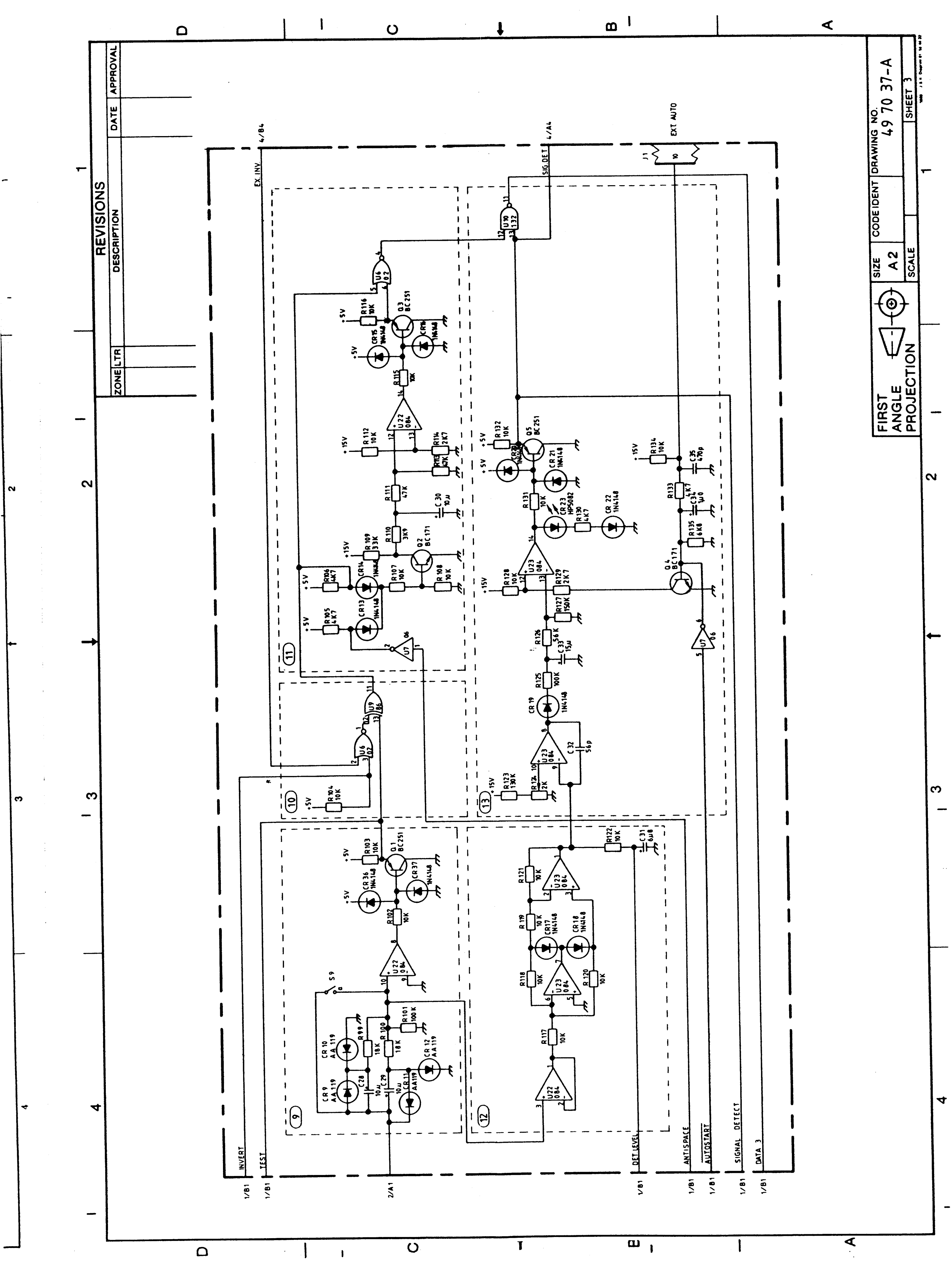
15. RS232C Port

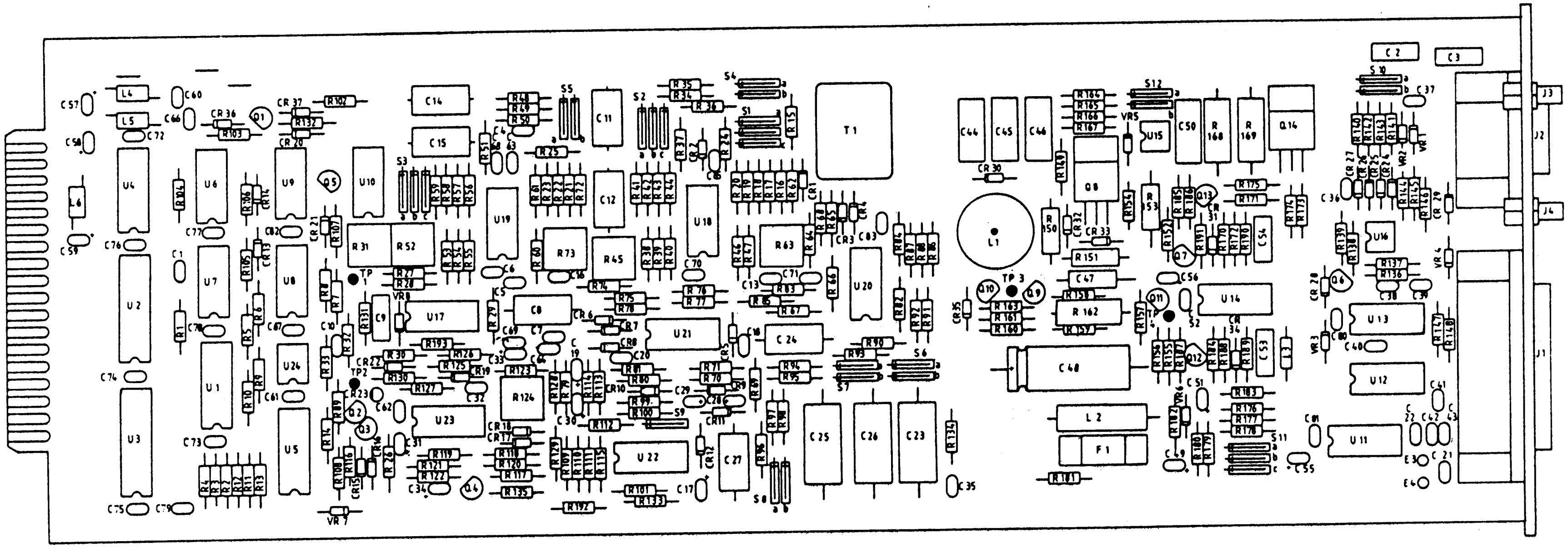
U13: RS232C line receiver.
The TRANSMIT DATA input is gated together with the data signals from the TX-sense.

U12: RS232C line driver.
The RS232C socket has +/-12V and +5V to supply an external modem.

16. Oscillator and Pulse width Modulator

R190 and C54 determine the operating frequency, approx. 20 kHz.
R188, 189 and C53 form a oneshot and the pulsewidth modulation is made by changing the discharge time of C53. The output is used to drive the converter output stage.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
SCALE
CODE IDENT
DRAWING NO.
49 70 37-A
SHEET 3
EXT AUTO
INVERT
TEST
DET LEVEL
ANTISPACE
AUTOSTART
SIGNAL DETECT
DATA 3



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075

ANGLES

LIN. DIM

MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

DR. VH 21.8.1989

CH.

AP

AP

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
RTTY DEMODULATOR A6 SMK
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		49 70 37-A

SCALE 2:1 SHEET 1 OF 1

17. Output Stage

The output signal from the pulsewidth modulator is amplified in the driver stage (Q9-11) and then fed to the output transistor Q8.
When Q8 is switched on, the current in L1 will raise linear.
When the current has reached a sufficient value, Q8 is turned off and the voltage over L1 will raise to the level, where CR30 conducts. L1 will then deliver its energy to the storage capacitors C44-46. Q8 is shunted by a "snubber" network in order to damp oscillations when L1 is without load.
R149 and C46 damp the high frequency ripple caused by the switching.
The function of Q7 is to stop the output pulse if the collector current raises further than approx. 1A. R154 and CR35 prevent Q8 to break down in case the driver network fails. The collector current in Q8 will be limited to 1.5A and this will cause the -15V fuse F1 to blow off.

18. Voltage and Current Regulator

The output voltage is set with the straps S11a-c and the voltage regulation is made with VR6 and Q12.

The output current limiter is set with the straps S12a-b and the current regulation is made with VR5 and U15.

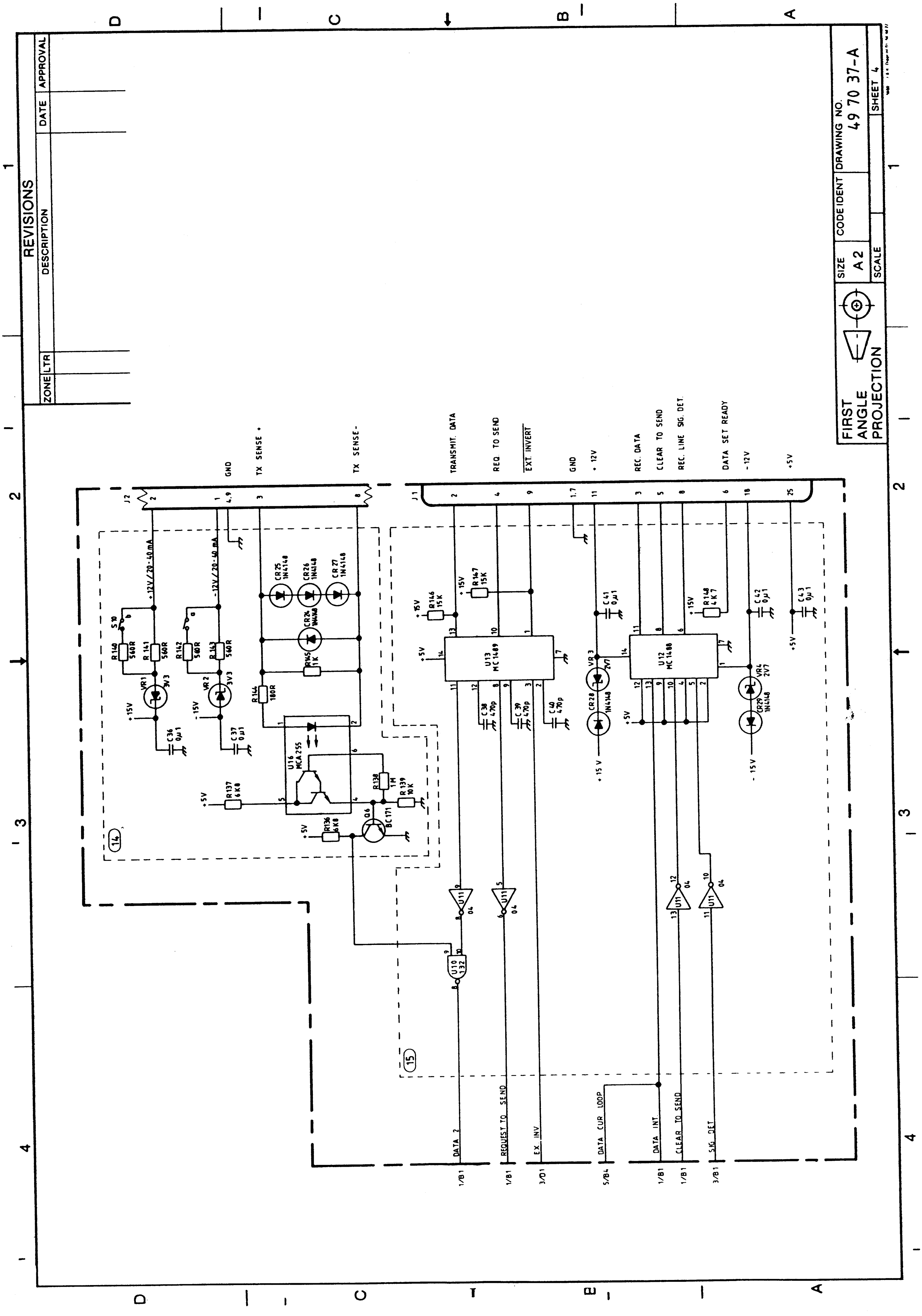
Both the voltage- and current regulation change the discharge time of C53 in the oneshot.

The output signal from the converter is modulated with Q13 and Q14. When a high is present on the DATA CUR. LOOP, the RX+ output will be active.

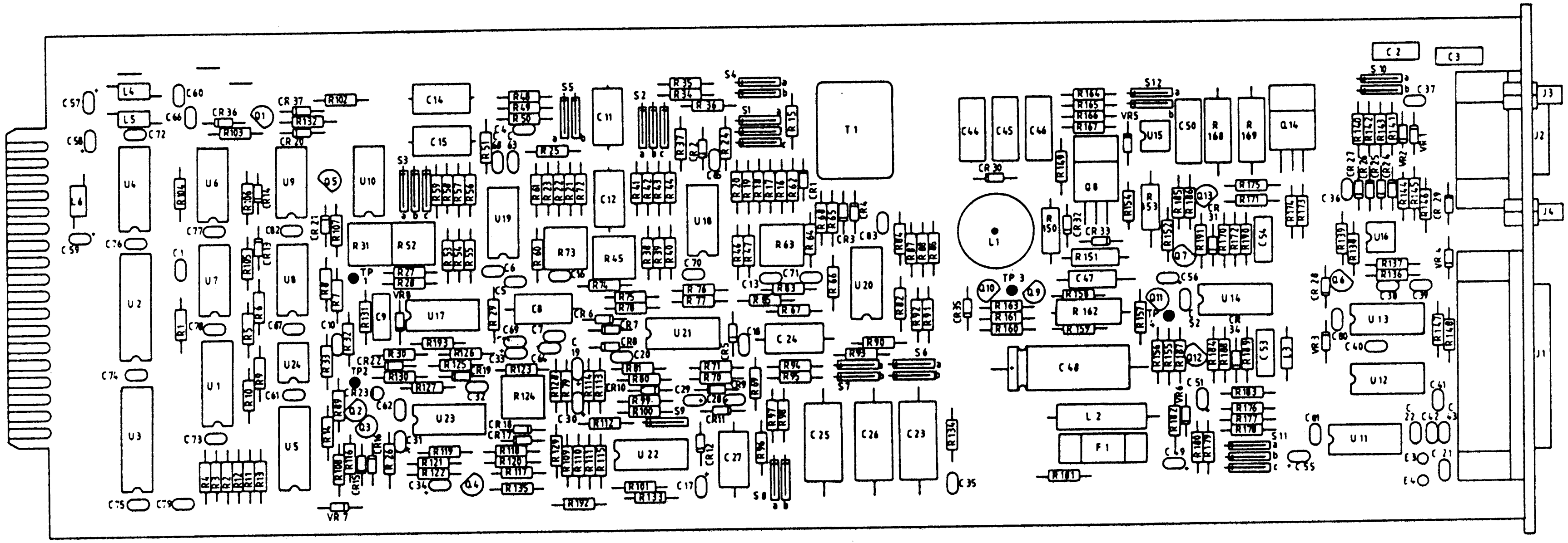
19. Separate +5V Line Filter

to the converter +5V, marked "(+5V)".

20. +15V, -15V and 5V Line Filters and Decoupling Capacitors


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
49 70 37-A
SCALE
SHEET 4
TRANSMIT. DATA
REQ. TO SEND
EXT. INVERT
GND
+12V
REC. DATA
CLEAR TO SEND
REC. LINE SIG. DET.
DATA SET READY
-12V
+5V
TX SENSE +
TX SENSE -
U13 MC1489
U12 MC1488
U16 MCA255
DATA 2
REQUEST TO SEND
EX. INV
DATA CUR. LOOP
DATA INT
CLEAR TO SEND
SIG. DET

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVAL



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075

ANGLES	
LIN. DIM	
MATERIAL	

DR	VH	21.8.1989
CH		
AP		
AP		

FIRST ANGLE PROJECTION

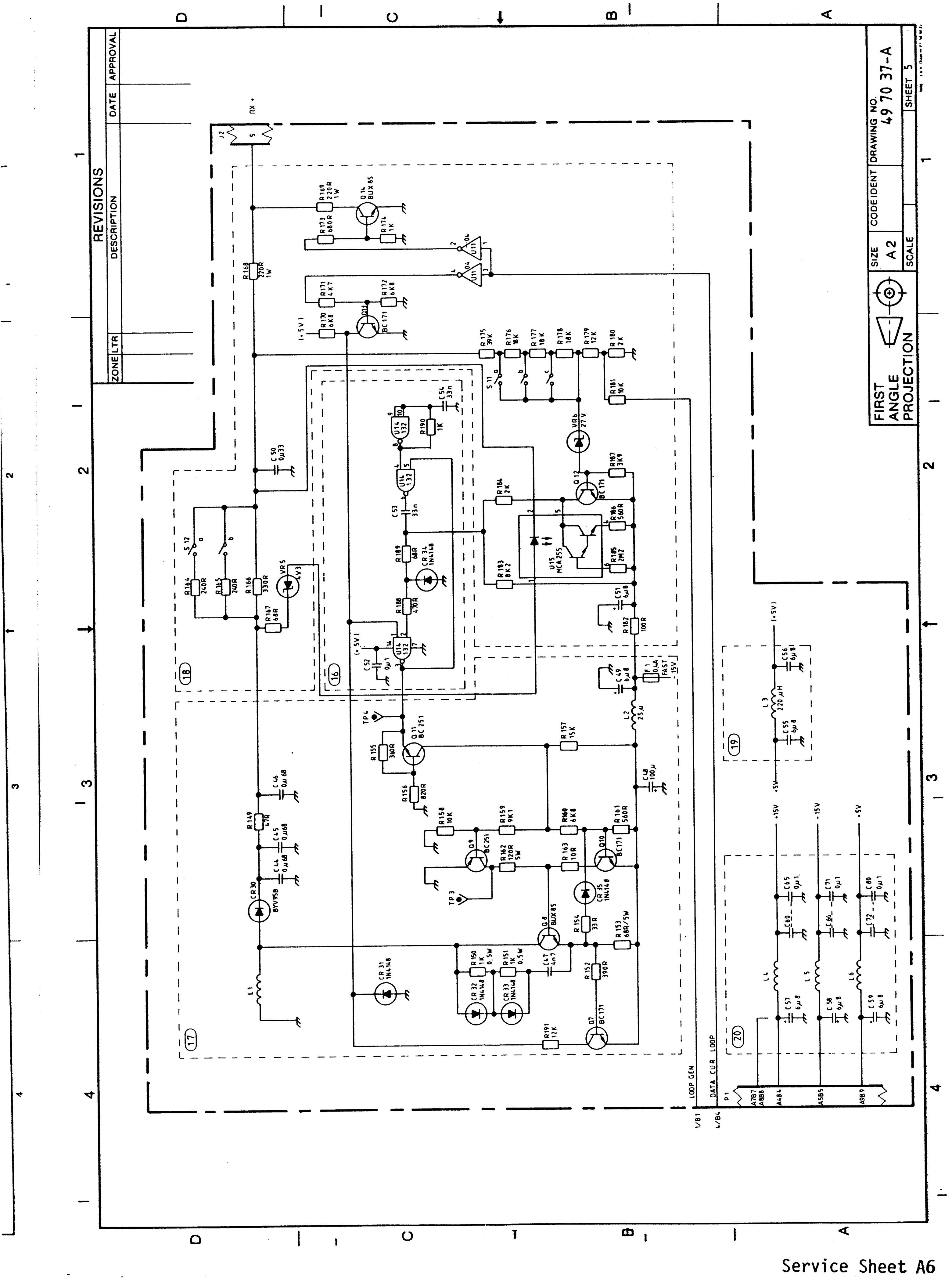
49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

Dansk Radio AS

TITLE
COMPONENT LOCATION
RTTY DEMODULATOR A6 SMK
RX4010

SIZE	CODE IDENT	DRAWING NO
A1		49 70 37-A
SCALE 2:1		SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
49 70 37-A
SCALE
SHEET 5
LOOP GEN
DATA CUR LOOP

SECTION 5

REMOTE CONTROL

5.1 Introduction

This section provides information on Remote Control of the receiver by means of optionally A9 module, Assy 471666.

5.20 RC/RX Configurations

The configurations of controlling RX4000 receiver(s) from the RC4000 Remote Control Unit can be done in several ways. Page 5-15 through 5-21 show how to strap the modem board A9 for different applications.

A Internal modem

Fig. 5.1 - 5.2 - 5.3 show applications where the internal modem is used.
The AF signal from each RX4000 receiver is transferred through a separate pair of 600 ohm leased telephone lines.

The data transmission can either be simplex (2 wire) or half duplex (4 wire) on leased 600 ohm telephone lines.

A maximum of 8 RX4000 receivers can be controlled from one RC4000, when using the internal modem. Each receiver must have a unique address in the range from 01 to 31. When controlling only one receiver with RC4000 (point to point operation), the receiver must be strapped to address 00.

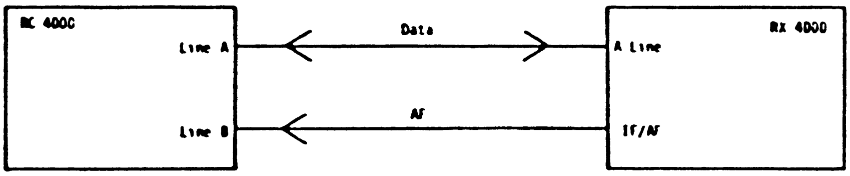


Fig. 5.1 4-wire operation with separate Data/AF.

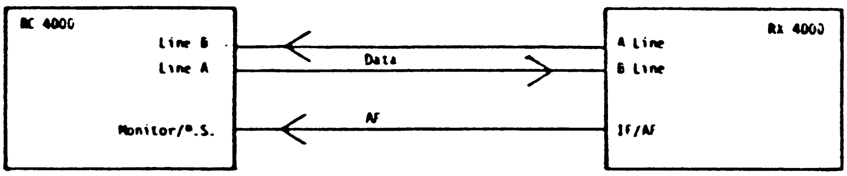


Fig. 5.2 6-wire operation with separate Data/AF

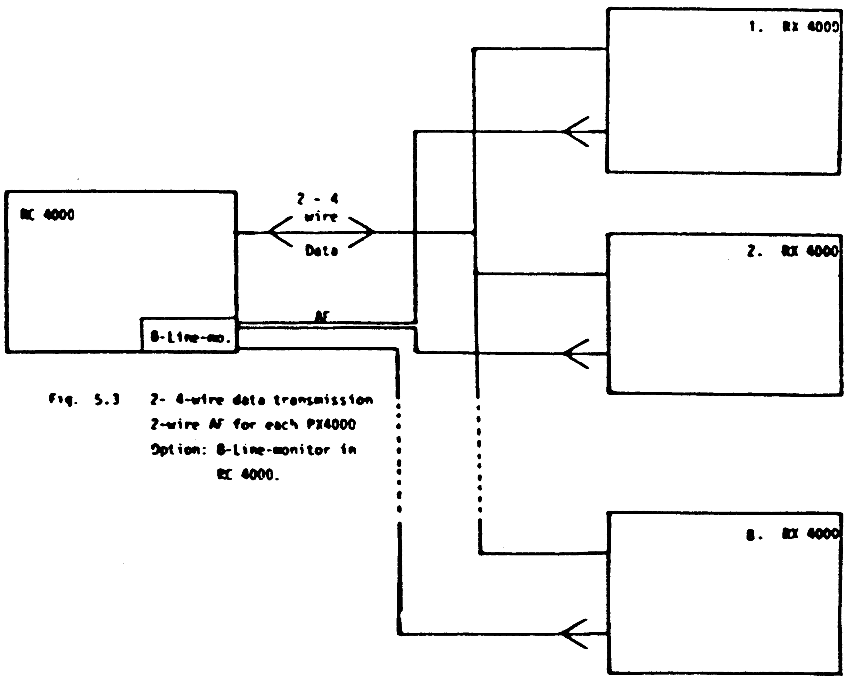


Fig. 5.3 2- 4-wire data transmission
2-wire AF for each RX4000
Option: 8-Line-monitor in RC 4000.

B External modem

Fig. 5.4 - 5.5 show applications where an external modem is used. This can be of interest if the internal modem is not sufficient, or where the telecommunication authorities do not allow private modems.

An external 1200/600 bps modem is connected to the V24 interface on A9. The baudrate on A9 must be strapped in accordance with the baudrate of the modem.

The audio signal is transferred on separate 600 ohm leased telephone lines, from A7J4 on RX4000 to either the A10J7 or the optional 8-line monitor on RC4000.

A maximum of 31 RX4000 can be controlled from one RC4000, when using external modem. In case of controlling more than one receiver, each receiver must have a unique address in the interval 01 to 31. A special multidrop device must be added between the modem and the receiver, to allow the receivers to be connected to the same modem.

When controlling only one receiver from RC4000 (point to point operation), the receiver must be strapped to address 00.

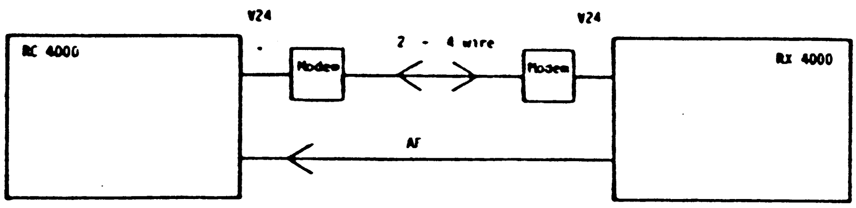


Fig. 5.4 2- 4-wire data operation with external modem.

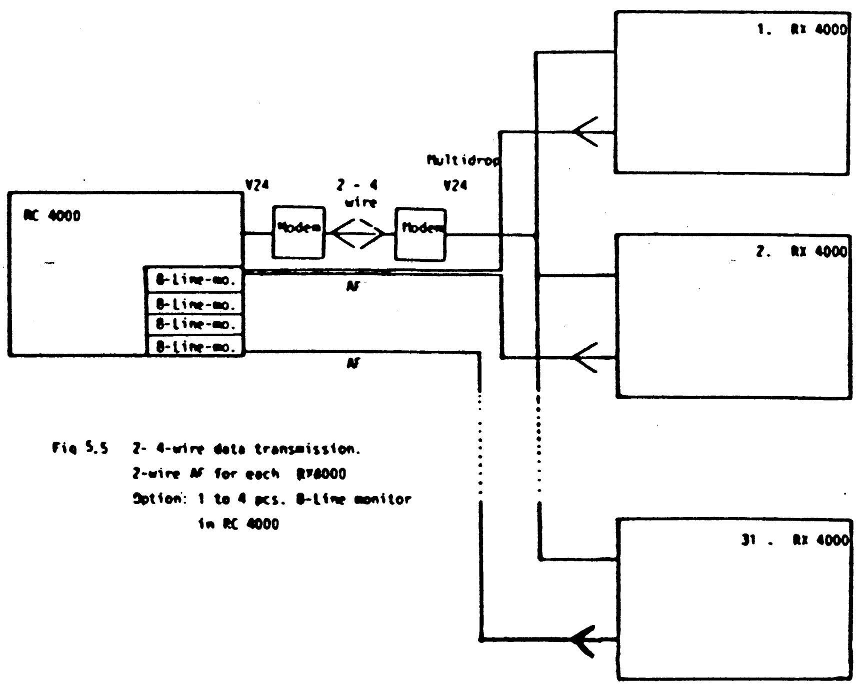


Fig 5.5 2- 4-wire data transmission.
2-wire AF for each RX4000
Option: 1 to 4 pcs. 8-Line monitor in RC 4000

5.30

A9 Modem/modem interface board

Technical Specifications

Internal Modem	:	V23 CCITT compatible modem. Input output impedance 600 ohm balanced. Strappable level to -10, -20 or -30 dB. Baudrate 1200/600 bps. Operates on either 2 wire or 4 wire leased telephone lines.
Modem Interface	:	V24 modem interface for interfacing an external modem. 1200/600 bps.
Aux-port	:	8/4 bit input/output aux port for external equipment, open collector output max. 15V/100mA.

5.40 A9 Modem input/output sockets

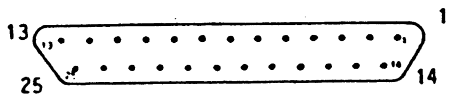
The modem board is equipped with two input/output sockets.

Modem input/output socket A9J7

The 25-pole J7 socket contains the V24 modem interface and the two 600 ohm balanced lines. See fig. 5.6.

5.41 AUX input/output socket A9J7

The 15-pole J6 socket contains the AUX input/output port and depending on whether it is a RC4000 or a RX4000, the configuration is as shown in fig. 5.7 - 5.8.



Pin	Circuit	Description
9	Line A	Telephone line 600 ohm
10	Line A	
11	Line B	Telephone line 600 ohm
25	Line B	
2	TXD	Transmit data
3	RXD	Recieved data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	GND	Ground
1	GND	Ground
8	CD	Carry detecd
20	DTR	Data terminal ready

Data input output A9J7

Fig. 5.6

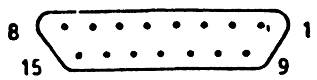
The AUX port can be used to control an antenna switch or to turn on/off external devices like TTY's or lights etc.

The AUX port is able to transfer an 8 bit data word from RC4000 to the addressed RX4000, as well as to transfer a 4 bit data word in the opposite direction.

The data transfer takes place only when the inputs are enabled by OV or on pin 14.

The input is RS232 compatible and the output is open collector max. 15V/100mA.

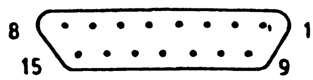
The socket connections are as follows:



Pin	Circuit	Description
9	+ 15 V	
14		Enable
1	I_0	Input 0
2	I_1	Input 1
3	I_2	Input 2
4	I_3	Input 3
5	I_4	Input 4
6	I_5	Input 5
7	I_6	Input 6
8	I_7	Input 7
9		
10	O_3	Output 3
11	O_2	Output 2
12	O_1	Output 1
13	O_0	Output 0
15	GND	

AUX input output A9J6
RC4000 site

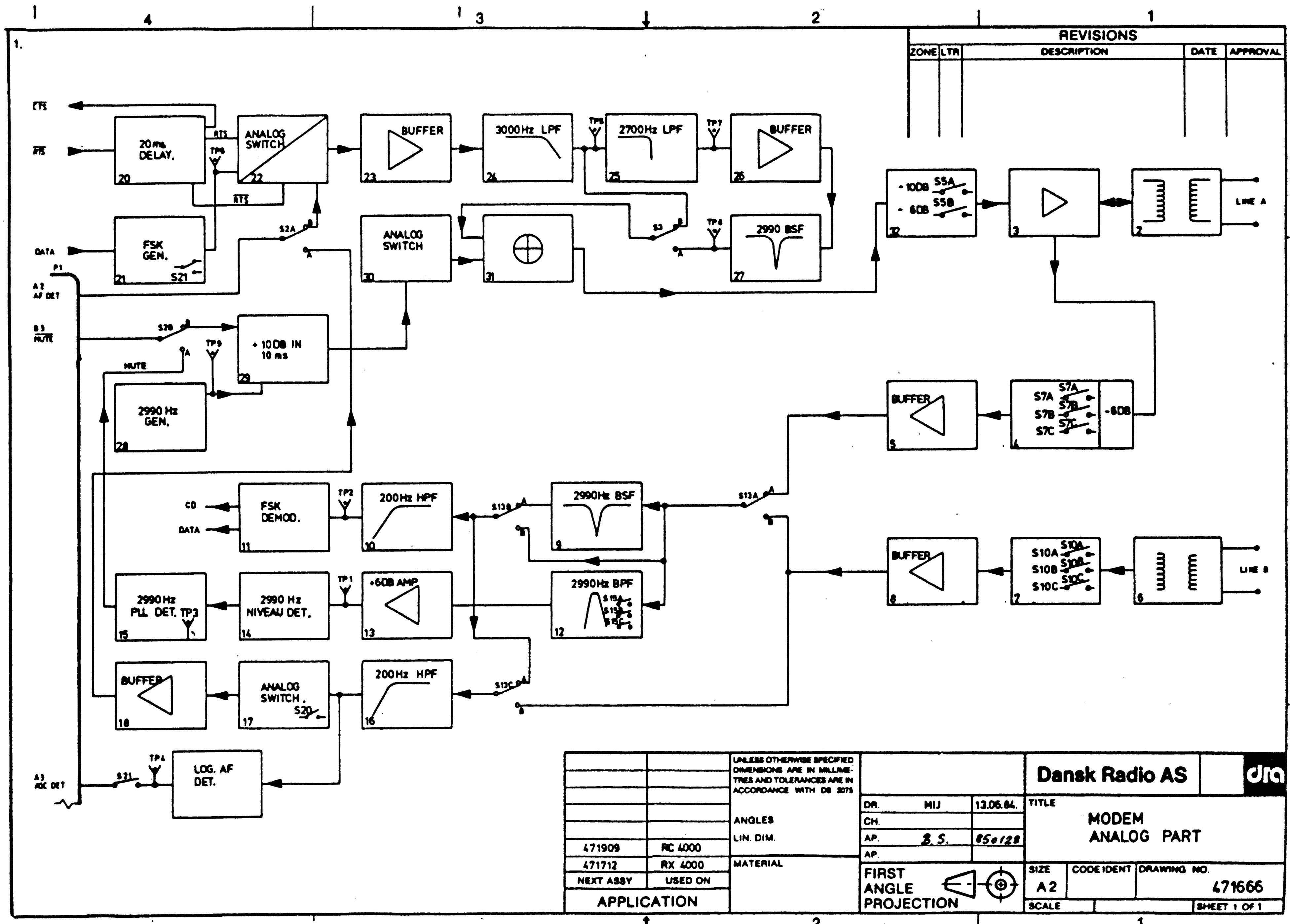
Fig. 5.7



Pin	Circuit	Description
9	+ 15 V	
14		Enable
1	I_0	Input 0
2	I_1	Input 1
3	I_2	Input 2
4	I_3	Input 3
5	O_4	Output 4
6	O_5	Output 5
7	O_6	Output 6
8	O_7	Output 7
9		
10	O_3	Output 3
11	O_2	Output 2
12	O_1	Output 1
13	O_0	Output 0
15	GND	

AUX input output A9J6
RX4000 site

Fig. 5.8



REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
CTS
RTS
DATA
P1
A2 AF DET
B3 MUTE
A3 AGC DET
20 ms DELAY.
ANALOG SWITCH
BUFFER
3000Hz LPF
2700Hz LPF
BUFFER
2990 BSF
FSK GEN.
S21
S2A
S2B
S3
ANALOG SWITCH
+10DB IN 10 ms
2990 Hz GEN.
MUTE
TP9
TP6
TP5
TP7
TP8
-10DB S5A
-6DB S5B
LINE A
LINE B
S7A
S7B
S7C
-6DB
BUFFER
S10A
S10B
S10C
S13A
S13B
S13C
CD
DATA
FSK DEMOD.
200Hz HPF
2990Hz BSF
2990Hz BPF
S15A
S15B
S15C
TP2
TP1
2990 Hz PLL DET. TP3
2990 Hz NIVEAU DET.
+6DB AMP
ANALOG SWITCH.
S20
LOG. AF DET.
TP4
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
471909
RC 4000
471712
RX 4000
NEXT ASSY
USED ON
APPLICATION
DR.
MIJ
13.06.84.
CH.
AP.
B.S.
850128
FIRST ANGLE PROJECTION
Dansk Radio AS
dra
TITLE
MODEM ANALOG PART
SIZE
A2
CODE IDENT
DRAWING NO.
471666
SCALE
SHEET 1 OF 1

5.50

Modem Strapping

Table 5.1 Sensitivity selection of the modem

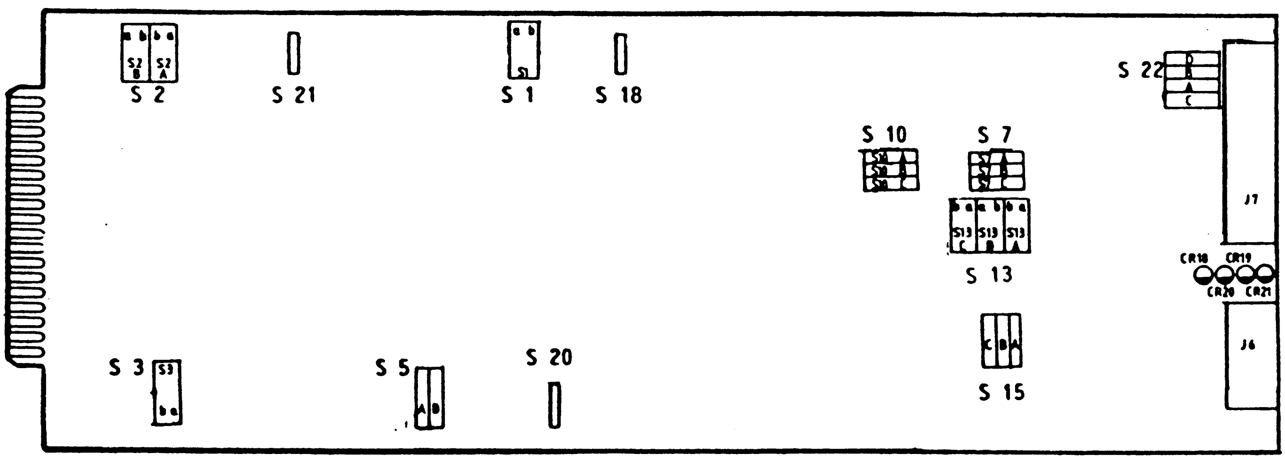
The sensitivity of the modem is about -36 dBm, but for proper operation the received FSK signal must be between -30 dBm and 0 dBm.

S7a on will reduce the received signal on line A about 30 dB.
S7b on will reduce the received signal on line A about 20 dB.
S7c on will reduce the received signal on line A about 10 dB.

S10a on will reduce the received signal on line B about 30 dB.
S10b on will reduce the received signal on line B about 20 dB.
S10c on will reduce the received signal on line B about 10 dB.

Table 5.2 Baud rate selection, analogue

	600 baud	1200 baud
S1	a	b
S18	on	off



Switch on analogue modem
Fig. 5.10

Table 5.4 Transmission selection, RX 4000 site

	S2b	S21	S20	S13c	S13b
All modes	off	off	x	x	a

With internal modem:

Operation	S2a	S3	S13a	S15a S15b S15c	fig.
4 wire with separate Data/AF Line A Data RX/TX Audio from IF/AF	off	a	a	off	5.1 5.3
6 wire with separate Data/AF Line A Data TX Line B Data RX Audio from IF/AF	off	b	b	on	5.2 5.3

With external modem:

Operation	S2a	S3	S13a	S15a S15b S15c	fig.
2 or 4 wire Data transmission 2 wire AF Line A Audio TX	b	a	a	off	5.4
2 or 4 wire Data transmission Audio from IF/AF	off	x	x	x	5.5

(S15a, S15b, S15c off is always allowed, but on causes a faster mute response).

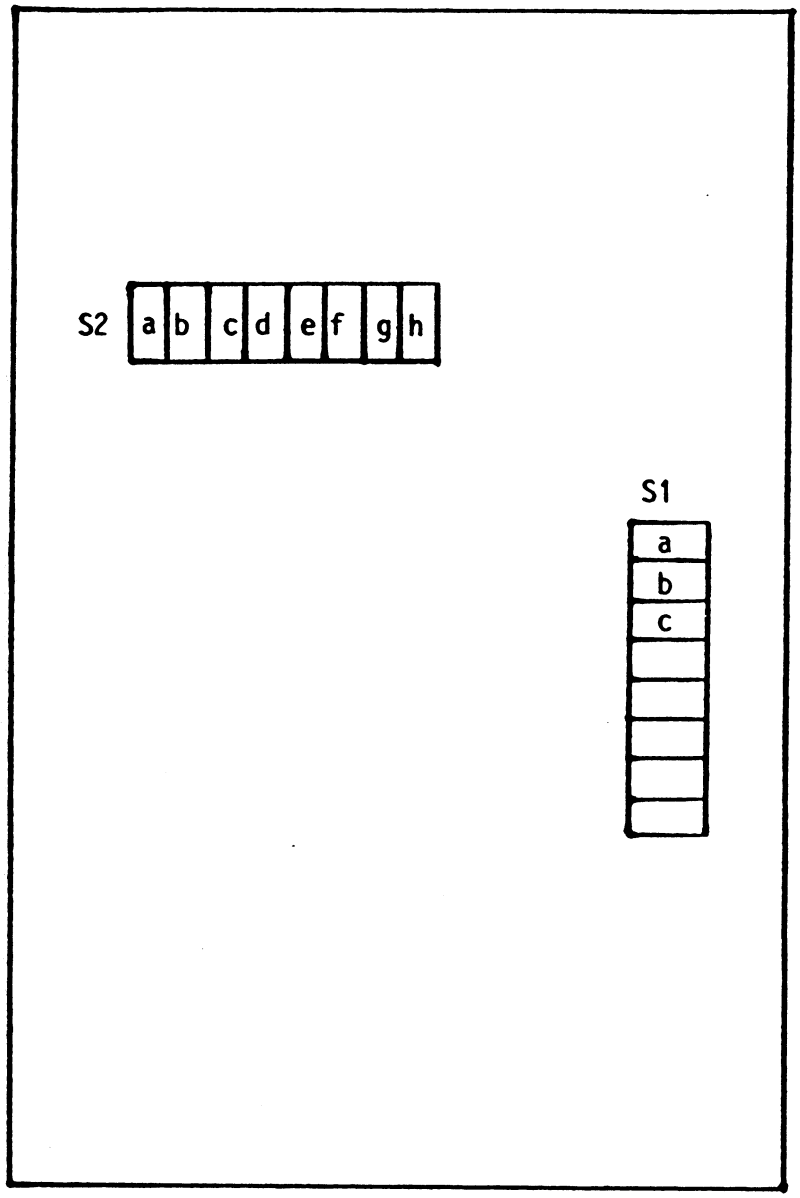


Fig. 5.11 Swich position

RX 4000 Modem Strapping (digital part)

Table 5.8

Baudrate control Switch S1

S1	600 baud	1200 baud
b	on	off
c	off	on

Note: a must always be off.

Table 5.9

Communication control Switch S2

Remote unit address select

S2	ON switch value	OFF switch value
a	1	0
b	2	0
c	4	0
d	8	0
e	16	0

The remote unit address is the sum of the switch values.

E.g.: If an RX 4000 shall have an address of 21.

Then switch e, c and a must be ON and
switch b and d must be OFF

or another address e.g. 27.

Then switch e, d, b and a must be ON and
switch c must be OFF.

Modem select:

Table 5.10

S2	Internal	External
g	on	off

Data - AF select

S2	Common	Separate
h	on	off

NOTE: Switch "h" must always be OFF.

SECTION 6
REPLACEABLE PARTS

6.1 Introduction

This section contains information for ordering parts. Table 6.1 lists abbreviations used in the parts list, table 6.2 lists all replaceable parts in reference designator order, and table 6.3 contains names that correspond to the manufacturer's code numbers.

6.2 Abbreviations

Table 6.1 lists abbreviations used in the parts list, the schematics, and throughout the manual.

6.3 Replaceable Parts List

Table 6.2 lists replaceable parts and is organized as follows:

a. Electrical assemblies in alphanumerical order by reference designation.

b. Chassis-mounted parts in alphanumerical order by reference designation.

c. Electrical assemblies and their components by alphanumerical order by reference designation.

The information given for each part consists of the following:

a. Complete reference designation

b. Dansk Radio stock number

c. Description of part

d. Typical manufacturer of part in identifying code

e. Total quantity in first higher level

The total quantity in first higher level for each part is given only once - at the first appearance of the part number per lower level.

6.4 Ordering Information

To order a part listed in the replaceable parts table, quote the DRA part number, indicate the quantity required and address the order to Dansk Radio.

To order a part that is not listed in the replaceable parts list, include the receiver model number, receiver serial number, the description and function of the part, and the number of parts required. Address the order to Dansk Radio.

Table 6.1 Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A ... assembly
AT ... attenuator; isolator; termination
B ... fan; motor
BT ... battery
C ... capacitor
CP ... coupler
CR ... diode; diode thyristor; varactor
DC ... directional coupler
DL ... delay line
DS ... annunciator; signaling device (audible or visual); lamp; LED
E ... miscellaneous electrical part
F ... fuse
FL ... filter
H ... hardware
HY ... circulator
J ... electrical connector (stationary portion); jack
K ... relay
L ... coil; inductor
M ... meter
MP ... miscellaneous mechanical part
P ... electrical connector (movable portion); plug
Q ... transistor: SCR; triode thyristor
R ... resistor
RT ... thermistor
S ... switch
T ... transformer
TB ... terminal board
TC ... thermocouple
TP ... test point
U ... integrated circuit; microcircuit
V ... electron tube
VR ... voltage regulator; breakdown diode
W ... cable; transmission path; wire
X ... socket
Y ... crystal unit (piezo-electric or quartz)
Z ... tuned cavity; tuned circuit

ABBREVIATIONS

A ... ampere
ac ... alternating current
ACCESS ... accessory
ADJ ... adjustment
A/D ... analog-to-digital
AF ... audio frequency
AFC ... automatic frequency control
AGC ... automatic gain control
AL ... aluminum
ALC ... automatic level control
AM ... amplitude modulation
AMPL ... amplifier
APC ... automatic phase control
ASSY ... assembly
AUX ... auxiliary
avg ... average
AWG ... American wire gauge
BAL ... balance
BCD ... binary coded decimal
BD ... board
BE CU ... beryllium copper
BFO ... beat frequency oscillator
BH ... binder head
BKDN ... breakdown
BP ... bandpass
BPF ... bandpass filter
BRS ... brass
BWO ... backward-wave oscillator
CAL ... calibrate
ccw ... counter-clockwise
CER ... ceramic
CHAN ... channel
cm ... centimeter
CMO ... cabinet mount only
COAX ... coaxial
COEF ... coefficient
COM ... common
COMP ... composition
COMPL ... complete
CONN ... connector
CP ... cadmium plate
CRT ... cathode-ray tube
CTL ... complementary transistor logic
CW ... continuous wave
cw ... clockwise
cm ... centimeter
D/A ... digital-to-analog
dB ... decibel
dBm ... decibel referred to 1 mW
dc ... direct current
deg ... degree (temperature interval or difference)
...° ... degree (plane angle)
°C ... degree Celsius (centigrade)
°F ... degree Fahrenheit
°K ... degree Kelvin
DEPC ... deposited carbon
DET ... detector
diam ... diameter
DIA ... diameter (used in parts list)
DIFF AMPL ... differential amplifier
div ... division
DPDT ... double-pole, double-throw
DR ... drive
DSB ... double sideband
DTL ... diode transistor logic
DVM ... digital voltmeter
ECL ... emitter coupled logic
EMF ... electromotive force
EDP ... electronic data processing
ELECT ... electrolytic
ENCAP ... encapsulated
EXT ... external
F ... farad
FET ... field-effect transistor
F/F ... flip-flop
FH ... flat head
FIL H ... fillister head
FM ... frequency modulation
FP ... front panel
FREQ ... frequency
FXD ... fixed
g ... gram
GE ... germanium
GHz ... gigahertz
GL ... glass
GRD ... ground(ed)
H ... henry
h ... hour
HET ... heterodyne
HEX ... hexagonal
HD ... head
HDW ... hardware
HF ... high frequency
HG ... mercury
HI ... high
HPF ... high pass filter
HR ... hour (used in parts list)
HV ... high voltage
Hz ... Hertz
IC ... integrated circuit
ID ... inside diameter
IF ... intermediate frequency
IMPG ... impregnated
in ... inch
INCD ... incandescent
INCL ... include(s)
INP ... input
INS ... insulation
INT ... internal
kg ... kilogram
kHz ... kilohertz
kΩ ... kilohm
kV ... kilovolt
lb ... pound
LC ... inductance-capacitance
LED ... light-emitting diode
LF ... low frequency
LG ... long
LH ... left hand
LIM ... limit
LIN ... linear taper (used in parts list)
lin ... linear
LK WASH ... lock washer
LO ... low; local oscillator
LOG ... logarithmic taper (used in parts list)
log ... logrithm(ic)
LPF ... low pass filter
LV ... low voltage
m ... meter (distance)
mA ... milliampere
MAX ... maximum
MΩ ... megohm
MEG ... meg (10^6) (used in parts list)
MET FLM ... metal film
MET OX ... metallic oxide
MF ... medium frequency; microfarad (used in parts list)
MFR ... manufacturer
mg ... milligram
MHz ... megahertz
mH ... millihenry
mho ... mho
MIN ... minimum
min ... minute (time)
...' ... minute (plane angle)
MINAT ... miniature
mm ... millimeter
MOD ... modulator
MOM ... momentary
MOS ... metal-oxide semiconductor
ms ... millisecond
MTG ... mounting
MTR ... meter (indicating device)
mV ... millivolt
mVac ... millivolt, ac
mVdc ... millivolt, dc
mVpk ... millivolt, peak

Table 6.1 Reference Designations and Abbreviations (continued)

mVp-p ... millivolt, peak-to-peak
mVrms ... millivolt, rms
mW ... milliwatt
MUX ... multiplex
MY ... mylar
µA ... microampere
µF ... microfarad
µH ... microhenry
µmho ... micromho
µs ... microsecond
µV ... microvolt
µVac ... microvolt, ac
µVdc ... microvolt, dc
µVpk ... microvolt, peak
µVp-p ... microvolt, peak-to-peak
µVrms ... microvolt, rms
µW ... microwatt
nA ... nanoampere
NC ... no connection
N/C ... normally closed
NE ... neon
NEG ... negative
nF ... nanofarad
NI PL ... nickel plate
N/O ... normally open
NOM ... nominal
NORM ... normal
NPN ... negative-positive-negative
NPO ... negative-positive zero (zero temperature coefficient)
NRFR ... not recommended for field replacement
NSR ... not separately replaceable
ns ... nanosecond
nW ... nanowatt
OBD ... order by description
OD ... outside diameter
OH ... oval head
OP AMPL ... operational amplifier
OPT ... option
OSC ... oscillator
OX ... oxide
oz ... ounce
Ω ... ohm

P ... peak (used in parts list)
PAM ... pulse-amplitude modulation
PC ... printed circuit
PCM ... pulse-code modulation; pulse-count modulation
PDM ... pulse-duration modulation
pF ... picofarad
PH BRZ ... phosphor bronze
PHL ... Phillips
PIN ... positive-intrinsic-negative
PIV ... peak inverse voltage
pk ... peak
PL ... phase lock
PLO ... phase lock oscillator
PM ... phase modulation
PNP ... positive-negative-positive
P/O ... part of
POLY ... polystyrene
PORC ... porcelain
POS ... positive; position(s) (used in parts list)
POSN ... position
POT ... potentiometer
p-p ... peak-to-peak
PP ... peak-to-peak (used in parts list)
PPM ... pulse-position modulation
PREAMPL ... preamplifier
PRF ... pulse-repetition frequency
PRR ... pulse repetition rate
ps ... picosecond
PT ... point
PTM ... pulse-time modulation
PWM ... pulse-width modulation
PWV ... peak working voltage
RC ... resistance-capacitance
RECT ... rectifier

REF ... reference
REG ... regulated
REPL ... replaceable
RF ... radio frequency
RFI ... radio frequency interference
RH ... round head; right hand
RLC ... resistance-inductance-capacitance
RMO ... rack mount only
rms ... root-mean-square
RND ... round
ROM ... read-only memory
R&P ... rack and panel
RWV ... reverse working voltage
S ... scattering parameter
s ... second (time)
..." ... second (plane angle)
S-B ... slow-blow (fuse) (used in parts list)
SCR ... silicon controlled rectifier; screw
SE ... selenium
SECT ... sections
SEMICON ... semiconductor
SHF ... superhigh frequency
SI ... silicon
SIL ... silver
SL ... slide
SNR ... signal-to-noise ratio
SPDT ... single-pole, double-throw
SPG ... spring
SR ... split ring
SPST ... single-pole, single-throw
SSB ... single sideband
SST ... stainless steel
STL ... steel
SQ ... square
SWR ... standing-wave ratio
SYNC ... synchronize
T ... timed (slow-blow fuse)
TA ... tantalum
TC ... temperature compensating
TD ... time delay

TERM ... terminal
TFT ... thin-film transistor
TGL ... toggle
THD ... thread
THRU ... through
TI ... titanium
TOL ... tolerance
TRIM ... trimmer
TSTR ... transistor
TTL ... transistor-transistor logic
TV ... television
TVI ... television interference
TWT ... traveling wave tube
U ... micro (10^{-6}) (used in parts list)
UF ... microfarad (used in parts list)
UHF ... ultrahigh frequency
UNREG ... unregulated
V ... volt
VA ... voltampere
Vac ... volts, ac
VAR ... variable
VCO ... voltage-controlled oscillator
Vdc ... volts, dc
VDCW ... volts, dc, working (used in parts list)
V(F) ... volts, filtered
VFO ... variable-frequency oscillator
VHF ... very-high frequency
Vpk ... volts, peak
Vp-p ... volts, peak-to-peak
Vrms ... volts, rms
VSWR ... voltage standing wave ratio
VTO ... voltage-tuned oscillator
VTVM ... vacuum-tube voltmeter
V(X) ... volts, switched
W ... watt
W/ ... with
WIV ... working inverse voltage
WW ... wirewound
W/O ... without
YIG ... yttrium-iron-garnet
Z_o ... characteristic impedance

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
µ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

RESERVEDELSLISTE OVER RX 4010

LAGERNUMMER FOR RX4010 - 5820-22-284-9801

HID-NUMMER = 731 23 001

REFERENCENUMMER:	GENSTANDSNAVN.	LAGERNUMMER.
448168	Synthesizer PCB	5820-22-284-9802
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471720	Power supply assy PCB	5820-22-284-9808
489905	Front panel RX4010	5820-22-284-9809
489921	Filters for A3	5820-22-284-9810
457868	Coax Cable ass.w1-4, længde 120 mm	5820-22-284-9811
457906	Coax Cable assy w5, længde 198 mm	5820-22-284-9812
450480	Diode, led, red, diameter= 3 mm	5961-00-213-7950
262706	Fuse,1A/250v 5 x 20 mm	5920-12-167-4252
394629	Fuse,6,3A/250v 5 x 20 mm	5920-12-124-8968
262714	Fuse,2A/250v 5 x 20 mm	5920-12-124-7829

SECTION 6

REPLACEABLE PARTS

6.1 Introduction

This section contains information for ordering parts. Table 6.1 lists abbreviations used in the parts list, table 6.2 lists all replaceable parts in reference designator order, and table 6.3 contains names that correspond to the manufacturer's code numbers.

6.2 Abbreviations

Table 6.1 lists abbreviations used in the parts list, the schematics, and throughout the manual.

6.3 Replaceable Parts List

Table 6.2 lists replaceable parts and is organized as follows:

a. Electrical assemblies in alphanumerical order by reference designation.

b. Chassis-mounted parts in alphanumerical order by reference designation.

c. Electrical assemblies and their components by alphanumerical order by reference designation.

The information given for each part consists of the following:

a. Complete reference designation

b. Dansk Radio stock number

c. Description of part

d. Typical manufacturer of part in identifying code

e. Total quantity in first higher level

The total quantity in first higher level for each part is given only once - at the first appearance of the part number per lower level.

6.4 Ordering Information

To order a part listed in the replaceable parts table, quote the DRA part number, indicate the quantity required and address the order to Dansk Radio.

To order a part that is not listed in the replaceable parts list, include the receiver model number, receiver serial number, the description and function of the part, and the number of parts required. Address the order to Dansk Radio.

Table 6.1 Reference Designations and Abbreviations

REFERENCE DESIGNATIONS

A .... assembly
AT .. attenuator; isolator; termination
B .... fan; motor
BT .... battery
C .... capacitor
CP .... coupler
CR ...... diode; diode thyristor; varactor
DC ... directional coupler
DL .... delay line
DS ...... annunciator; signaling device (audible or visual); lamp; LED
E .... miscellaneous electrical part
F .... fuse
FL .... filter
H .... hardware
HY .... circulator
J ... electrical connector (stationary portion); jack
K .... relay
L .... coil; inductor
M .... meter
MP .... miscellaneous mechanical part
P ... electrical connector (movable portion); plug
Q ...... transistor: SCR; triode thyristor
R .... resistor
RT .... thermistor
S .... switch
T .... transformer
TB ...... terminal board
TC ...... thermocouple
TP .... test point
U ..... integrated circuit; microcircuit
V .... electron tube
VR .... voltage regulator; breakdown diode
W .... cable; transmission path; wire
X .... socket
Y .... crystal unit (piezo-electric or quartz)
Z .... tuned cavity; tuned circuit

ABBREVIATIONS

A .... ampere
ac .... alternating current
ACCESS ..... accessory
ADJ .... adjustment
A/D .... analog-to-digital
AF ..... audio frequency
AFC .... automatic frequency control
AGC ..... automatic gain control
AL .... aluminum
ALC .... automatic level control
AM ... amplitude modulation
AMPL .... amplifier
APC .... automatic phase control
ASSY .... assembly
AUX .... auxiliary
avg .... average
AWG .... American wire gauge
BAL .... balance
BCD ...... binary coded decimal
BD .... board
BE CU ...... beryllium copper
BFO ..... beat frequency oscillator
BH .... binder head
BKDN ...... breakdown
BP .... bandpass
BPF ..... bandpass filter
BRS .... brass
BWO ..... backward-wave oscillator
CAL .... calibrate
ccw .... counter-clockwise
CER .... ceramic
CHAN .... channel
cm .... centimeter
CMO .. cabinet mount only
COAX .... coaxial
COEF .... coefficient
COM .... common
COMP ..... composition
COMPL .... complete
CONN .... connector
CP ...... cadmium plate
CRT ... cathode-ray tube
CTL .... complementary transistor logic
CW ..... continuous wave
cw .... clockwise
cm .... centimeter
D/A .... digital-to-analog
dB .... decibel
dBm .... decibel referred to 1 mW
dc .... direct current
deg .. degree (temperature interval or difference)
° ...... degree (plane angle)
°C ...... degree Celsius (centigrade)
°F .... degree Fahrenheit
°K .... degree Kelvin
DEPC .. deposited carbon
DET .... detector
diam .... diameter
DIA ... diameter (used in parts list)
DIFF AMPL .. differential amplifier
div .... division
DPDT ..... double-pole, double-throw
DR .... drive
DSB .... double sideband
DTL .... diode transistor logic
DVM ... digital voltmeter
ECL .... emitter coupled logic
EMF .. electromotive force
EDP ..... electronic data processing
ELECT ..... electrolytic
ENCAP .... encapsulated
EXT .... external
F .... farad
FET .... field-effect transistor
F/F .... flip-flop
FH .... flat head
FIL H ..... fillister head
FM .. frequency modulation
FP .... front panel
FREQ .... frequency
FXD .... fixed
g .... gram
GE .... germanium
GHz .... gigahertz
GL .... glass
GRD .... ground(ed)
H .... henry
h .... hour
HET .... heterodyne
HEX .... hexagonal
HD .... head
HDW .... hardware
HF ...... high frequency
HG .... mercury
HI .... high
HPF ..... high pass filter
HR .... hour (used in parts list)
HV .... high voltage
Hz .... Hertz
IC .... integrated circuit
ID ...... inside diameter
IF .... intermediate frequency
IMPG ..... impregnated
in .... inch
INCD ..... incandescent
INCL .... include(s)
INP .... input
INS .... insulation
INT .... internal
kg .... kilogram
kHz .... kilohertz
kΩ .... kilohm
kV .... kilovolt
lb .... pound
LC .... inductance-capacitance
LED .. light-emitting diode
LF ...... low frequency
LG .... long
LH .... left hand
LIM .... limit
LIN ... linear taper (used in parts list)
lin .... linear
LK WASH ... lock washer
LO ... low; local oscillator
LOG .... logarithmic taper (used in parts list)
log .... logrithm(ic)
LPF ..... low pass filter
LV .... low voltage
m ...... meter (distance)
mA .... milliampere
MAX .... maximum
MΩ .... megohm
MEG .... meg (10^6) (used in parts list)
MET FLM .... metal film
MET OX .. metallic oxide
MF ... medium frequency; microfarad (used in parts list)
MFR ...... manufacturer
mg .... milligram
MHz .... megahertz
mH .... millihenry
mho .... mho
MIN .... minimum
min ..... minute (time)
...' ..... minute (plane angle)
MINAT .... miniature
mm .... millimeter
MOD .... modulator
MOM ...... momentary
MOS .... metal-oxide semiconductor
ms .... millisecond
MTG .... mounting
MTR ... meter (indicating device)
mV .... millivolt
mVac ...... millivolt, ac
mVdc ...... millivolt, dc
mVpk .... millivolt, peak

Table 6.1 Reference Designations and Abbreviations (continued)

mVp-p	millivolt, peak-to-peak
mVrms	millivolt, rms
mW	milliwatt
MUX	multiplex
MY	mylar
μA	microampere
μF	microfarad
μH	microhenry
μmho	micromho
μs	microsecond
μV	microvolt
μVac	microvolt, ac
μVdc	microvolt, dc
μVpk	microvolt, peak
μVp-p	microvolt, peak-to-peak
μVrms	microvolt, rms
μW	microwatt
nA	nanoampere
NC	no connection
N/C	normally closed
NE	neon
NEG	negative
nF	nanofarad
NI PL	nickel plate
N/O	normally open
NOM	nominal
NORM	normal
NPN	negative-positive-negative
NPO	negative-positive zero (zero temperature coefficient)
NRFR	not recommended for field replacement
NSR	not separately replaceable
ns	nanosecond
nW	nanowatt
OBD	order by description
OD	outside diameter
OH	oval head
OP AMPL	operational amplifier
OPT	option
OSC	oscillator
OX	oxide
oz	ounce
Ω	ohm
P	peak (used in parts list)
PAM	pulse-amplitude modulation
PC	printed circuit
PCM	pulse-code modulation; pulse-count modulation
PDM	pulse-duration modulation
pF	picofarad
PH BRZ	phosphor bronze
PHL	Phillips
PIN	positive-intrinsic-negative
PIV	peak inverse voltage
pk	peak
PL	phase lock
PLO	phase lock oscillator
PM	phase modulation
PNP	positive-negative-positive
P/O	part of
POLY	polystyrene
PORC	porcelain
POS	positive; position(s) (used in parts list)
POSN	position
POT	potentiometer
p-p	peak-to-peak
PP	peak-to-peak (used in parts list)
PPM	pulse-position modulation
PREAMPL	preamplifier
PRF	pulse-repetition frequency
PRR	pulse repetition rate
ps	picosecond
PT	point
PTM	pulse-time modulation
PWM	pulse-width modulation
PWV	peak working voltage
RC	resistance-capacitance
RECT	rectifier
REF	reference
REG	regulated
REPL	replaceable
RF	radio frequency
RFI	radio frequency interference
RH	round head; right hand
RLC	resistance-inductance-capacitance
RMO	rack mount only
rms	root-mean-square
RND	round
ROM	read-only memory
R&P	rack and panel
RWV	reverse working voltage
S	scattering parameter
s	second (time)
..."	second (plane angle)
S-B	slow-blow (fuse) (used in parts list)
SCR	silicon controlled rectifier; screw
SE	selenium
SECT	sections
SEMICON	semiconductor
SHF	superhigh frequency
SI	silicon
SIL	silver
SL	slide
SNR	signal-to-noise ratio
SPDT	single-pole, double-throw
SPG	spring
SR	split ring
SPST	single-pole, single-throw
SSB	single sideband
SST	stainless steel
STL	steel
SQ	square
SWR	standing-wave ratio
SYNC	synchronize
T	timed (slow-blow fuse)
TA	tantalum
TC	temperature compensating
TD	time delay
TERM	terminal
TFT	thin-film transistor
TGL	toggle
THD	thread
THRU	through
TI	titanium
TOL	tolerance
TRIM	trimmer
TSTR	transistor
TTL	transistor-transistor logic
TV	television
TVI	television interference
TWT	traveling wave tube
U	micro (10^{-6}) (used in parts list)
UF	microfarad (used in parts list)
UHF	ultrahigh frequency
UNREG	unregulated
V	volt
VA	voltampere
Vac	volts, ac
VAR	variable
VCO	voltage-controlled oscillator
Vdc	volts, dc
VDCW	volts, dc, working (used in parts list)
V(F)	volts, filtered
VFO	variable-frequency oscillator
VHF	very-high frequency
Vpk	volts, peak
Vp-p	volts, peak-to-peak
Vrms	volts, rms
VSWR	voltage standing wave ratio
VTO	voltage-tuned oscillator
VTVM	vacuum-tube voltmeter
V(X)	volts, switched
W	watt
W/	with
WIV	working inverse voltage
WW	wirewound
W/O	without
YIG	yttrium-iron-garnet
Z_o	characteristic impedance

MULTIPLIERS

Abbreviation	Prefix	Multiple
T	tera	10^{12}
G	giga	10^{9}
M	mega	10^{6}
k	kilo	10^{3}
da	deka	10
d	deci	10^{-1}
c	centi	10^{-2}
m	milli	10^{-3}
μ	micro	10^{-6}
n	nano	10^{-9}
p	pico	10^{-12}
f	femto	10^{-15}
a	atto	10^{-18}

RESERVEDELSLISTE OVER RX 4010

LAGERNUMMER FOR RX4010 - 5820-22-284-9801

HID-NUMMER = 731 23 001

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448168	Synthesizer PCB	5820-22-284-9802
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490350	Suboctav. standard PCB	5820-22-284-9805
489913	IF/AF assy ISB PCB	5820-22-284-9806
487740	Microcomputer assy PCB	5820-22-284-9807
471720	Power supply assy PCB	5820-22-284-9808
489905	Front panel RX4010	5820-22-284-9809
489921	Filters for A3	5820-22-284-9810
457868	Coax Cable ass.w1-4, længde 120 mm	5820-22-284-9811
457906	Coax Cable assy w5, længde 198 mm	5820-22-284-9812
450480	Diode, led, red, diameter= 3 mm	5961-00-213-7950
262706	Fuse,1A/250v 5 x 20 mm	5920-12-167-4252
394629	Fuse,6,3A/250v 5 x 20 mm	5920-12-124-8968
262714	Fuse,2A/250v 5 x 20 mm	5920-12-124-7829

SECTION 7

MANUAL CHANGES

7.1 INTRODUCTION
This section normally contains information for adapting this manual to equipment for which the contents does not apply directly.

7.2 CHANGES

Change 1:

Assy 448311 A3A5
Service Sheet A3, sheet 2
Value of R77 is factory adjusted.

Change 2:

Assy 489913, IF/AF assembly
Service Sheet A7, sheet 2
Add Capacitor C161, 4u7/25 V, DRA Part No. 479330
between P1-B1 (+) and Ground.

Change 3:

Assy 489913, IF/AF assembly
Service Sheet A7, sheet 4
Delete diodes CR19, CR20, CR21, CR22, CR23 and CR24.

Change 4:

Assy 487740, Microcomputer assembly
Service Sheet A8, sheet 8
Delete diodes CR20 and CR21.

Change 5:

Operating and Service Manual
Document No. 493856, Issue 88-05
Paragraph 3.9.1, fifth line
Delete "or twice".

SECTION 8
SERVICE

8.1 Introduction
This section provides information for servicing the receiver.

8.2 Theory of Operation
The overall theory of operation is explained beginning with paragraph 8.11. Each paragraph explains with the aid of block diagrams the operation of functional assemblies.

Detailed theory of operation is located opposite the schematics.

8.3 Trouble Shooting

WARNING

Read the Safety Summary at the front of this manual before trouble shooting the receiver.

By the use of front-panel controls, note as many symptoms of the malfunction as possible. From these symptoms it can usually be determined which assembly is malfunctioning. The Self-Test Program and the Fault Analysis Table (table 8.3) 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 detailed theory of operation shown on the page opposing the appropriate schematic.

8.4 Self-Test Program
Receiver Test Program. (See also table 8.2 and 8.3).

Self-test program is activated by pressing C and tune . The built-in test program goes through the folowing sequence:

a) Assembly test. The µP addresses modul A1 - A11 to see whether they are present. If any modul does not acknowledge the call, the µP displays e.g. "A3 FAIL" and then continues the test.

b) Real time clock test. the µp test the real time clock, and display "no CLOC" if something wrong with the real time clock.

c) Synthesizer lock test. The synthesizer is set up near the boundaries of the VCO ranges, which are equivalent to the receiving frequencies 5990, 6010, 11990, 12010, 19990, 20010· 29999.99 and 0. If the synthesizer does not lock up within 200 msec., the error message will be:

Frequency	Display
5990.00	Err. OSC.1 1
6010.00	Err. OSC.1 2
11990.00	Err. OSC.1 3
12010.00	Err. OSC.1 4
19990.00	Err. OSC.1 5
20010.00	Err. OSC.1 6
29999.99	Err. OSC.1 7
0.00	Err. OSC.1 8

d) BFO lock test. The BFO is set up to different frequencies. If the BFO does not lock up the error message will be:

Frequency	Display
3.00	Err. OSC.3 1
2.00	Err. OSC.3 2
1.00	Err. OSC.3 3
1.50	Err. OSC.3 4
0.80	Err. OSC.3 5
0.00	Err. OSC.3 6

e) Gain test. The synthesizer is set to 75 MHz and the feed-through in the signal path is measured at the AGC to be above a reasonable level.
Also the presence of audio output from the detector is examined. The test is repeated with different BFO frequencies and crystal filters.
If the BFO level is low or an error is present in the AGC or the detector, the display shows "no Audio".
If the gain in the signal path is low, or the synthesizer level is low, the display shows "GAin Lo".

E.g. a fault in one of the crystal filters or in an interconnecting cable will result in "GAin Lo".
An AGC fault can also cause this read-out.

Mode	BFO	BW	AGC	Display
RTTY	3.00	Vnar	fast	Err. no Audio 1 or Err. GAIn LO 1
RTTY	2.00	narr	fast	Err. no Audio 2 or Err. GAIn LO 2
RTTY	1.00	Inter	fast	Err. no Audio 3 or Err. GAIn LO 3
RTTY	1.50	wide	fast	Err. no Audio 4 or Err. GAIn LO 4

CW	0.80	narr	fast	Err. no Audio 5 or Err. GAIn LO 5
ISB	0.00	narr	fast	Err. no Audio 6 or Err. GAin LO 6

f) Display and led test. All LED's and segment's are lit.
Press (C) to continue.

g) The remote address and software version number is displayed.
Press (C) to continue.

h) Option displayed. "0000000" indicate no option.

i) Key test. Pressing any key but "C" results in the hexadecimal value of the key being shown.
See table 8.2.
Press (C) to leave test.

8.5 Preventive Maintenance

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

CAUTION

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

The pushbutton switches in this receiver were designed for long, troublefree service. If one of these switches should become defective, replacement rather than repair is recommended.

8.6 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 receiver side profiles.
b) carefully withdraw the front panel assembly and disconnect the ribbon cable connector from the mother-board.
c) to reinstall the front panel assembly, reverse removal procedure.

8.7 PC-Board Assembly Removal.

To remove a PC-board assembly, proceed as follows:

a) Disconnect the regulation transistor cable from A10J2 and remove the power supply heat sink panel by removing the four screws holding the panel. The four screws are located on the exterior side of the receiver side profiles.

b) Disconnect all cables running to the concerned assembly.

c) Remove the six (eight) screws positioned at the edge of the concerned assembly rear panel and withdraw the assembly. If the assembly is stuck in the chassis frame, it may be necessary carefully to release the assembly by keying a screwdriver in between the rear panel and the main frame.

d) To reinstall the assembly, reverse removal procedure. 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 reversing step d above.

8.8 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 large components,rotate the soldering iron tip from lead to lead while applying pressure to the part to lift it from the board.

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

c) When not in use, short all MOS leads. This prevents voltage differences from occurring on leads

WARNING

When accomplishing step d, never expose

personnel directly to hard electrical ground. For safety reasons, resistance of at least 100 Kohms should be placed between using personnel and hard electrical ground.

d) Do not handle MOS devices by their leads. Before handling any MOS device, personnel should touch electrical ground to discharge accumulate static charges.

e) Avoid use of plastics, rubber, and silk in MOS areas. Do not use any material susceptible to static charge accumulation.

f) 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.

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

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

8.10 Logic Devices

This receiver uses three different families of logic circuits: MOS, TTL and ECL. Most of the logic devices used in this receiver are TTL and are represented by unmarked logic symbols on the schematics. Logic elements, not belonging to the TTL Logic family, are so indicated on the schematics.
Table 8.1 below lists typical voltage levels associated with each family used in this receiver.

Table 8.1 Typical Logic Levels

Logic Family	High Level	Low Level
TTL	3 - 5V	0.2V
ECL	4.3 - 4.7V	3.4 - 3.7V
MOS	5 - 15V	0V

8.11 Basic Principles of Operation

The following paragraphs contain funcional descriptions keyed to the block diagrams. The block diagrams are drawn for function and do not show circuit details. Schematic and detailed descriptions of each circuit are located on subsequent service sheets.

8.12 Overall Operation

The overall functional block diagram of the receiver is shown in Figure 8.1.
The antenna signal is connected to the sub-octave filter assembly A4, which serves two objects, matching the 50 ohm antenna impedance and rejecting undesired signals.

From A4 the filtered signal is routed to the Front-End Assembly A3, where the signal is up-converted to the first intermediate frequency of 75 MHz and crystal filtered to approx. 12 kHz.
Following the first AGC-amplifier, the signal then is down-converted to the second intermediate frequency of 1.4 MHz and crystal filtered to the final information bandwidth.

In ISB versions an unfiltered signal is fed directly to the IF/AF assembly A7.

On the IF/AF assembly A7 the unfiltered signal is filtered, and final amplification with subsequent SSB/CW or AM demodulation is performed. An AGC-leveled IF output is accessible at the rear panel of the assembly.
The Power Supply Assembly A10 incorporates AF notch Filter and output amplifier for driving the operators headphone or loudspeaker.
The Power Supply Assembly accepts 110-125, 220-250 Vac.

The Syntheziser Assembly A1, generates the first local oscillator signal tunable from 75 MHz to 105 MHz in 10 Hz increments.

The Standard Assembly A2 generates the second local oscillator signal at 73.6 MHz, the Synthesizer Assembly reference signal, and the synthesized beat frequency oscillator signal tunable from 1.393 MHz to 1.407 MHz in 10 Hz increments.

The Microcomputer Assembly A8 performs the overall control of the receiver.
Typical tasks handled by the assembly:
- Control of the individual assemblies
- Keyboard and steptune reading
- Display refreshing
- AGC/MGC through multiplexed D/A-A/D conversion
- Programmable memory set-ups
- Scanning
- Channel stepping
- Squelch control
- Remote control
- Diagnostic routines

Communication between the Microcomputer Assembly and the remaining assemblies is conducted over an internal bus running on the mother PC-board and the front panel ribbon cable.

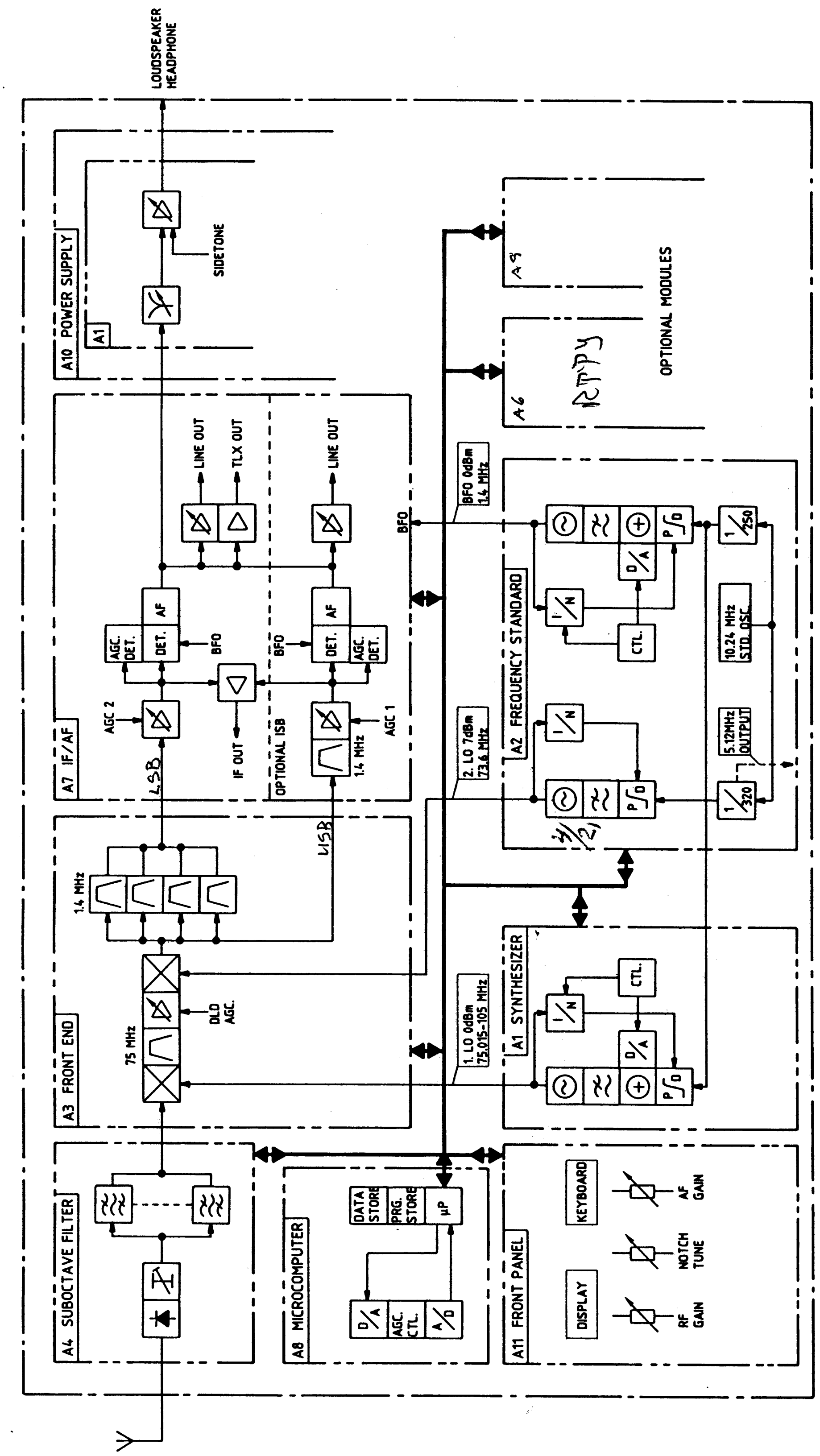

Figure 8.1 Overall Functional Block Diagram.

8.13 Synthesizer Assembly A1

The functional block diagram of the Synthesizer Assembly is show in Figure 8.2.

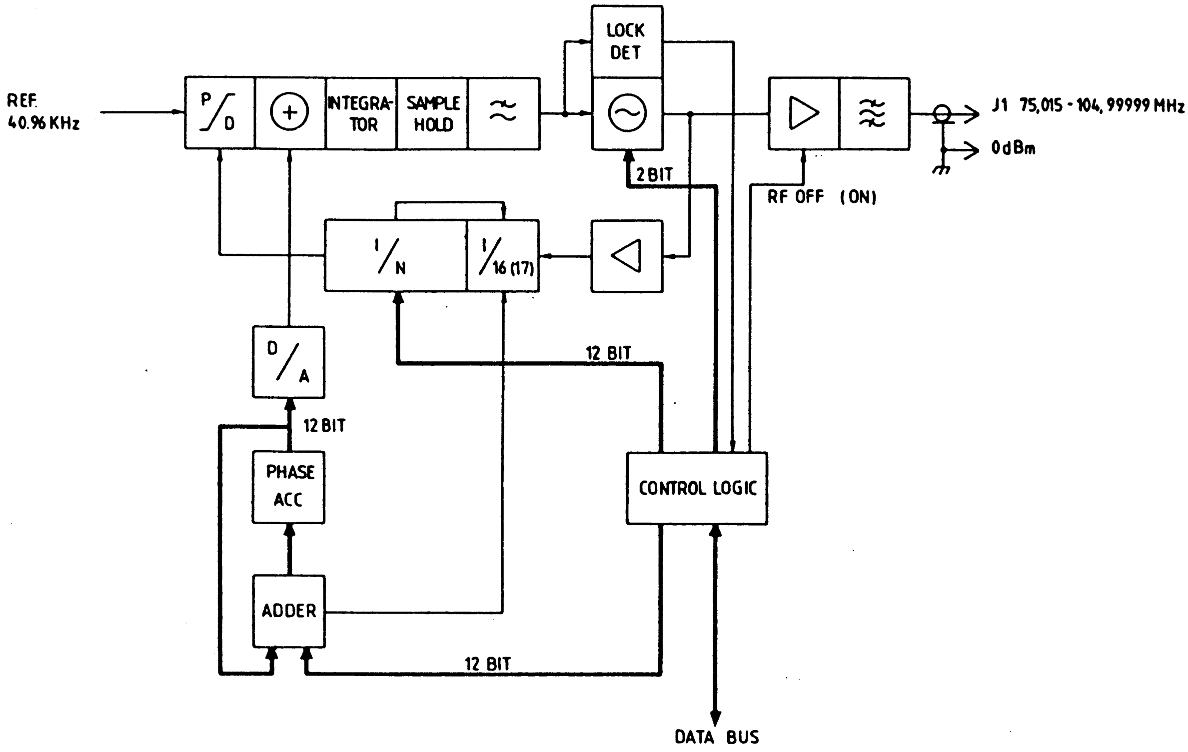

Figure 8.2 Synthesizer Assembly.

The assembly generates the 75.015-104.99999 MHz 1. Lo signal for the Front-End Assembly A3. The synthesizer uses a fractional N technique, where the loop output frequency is equal to the number N.P times the reference frequency, where N and P are positive integers. The output signal from the loop oscillator is routed through a 16(17) divider, controlled either by the N counter, or by the fractionalphase accumulator.

The N divider combined with the 16(17) divider changes division ratio between 1831 and 2563. This output is compared with the 40.96 kHz reference clock in a sample and hold phase detector. The ratio P is used as input to a digital loop adding the fractional ratio to an accumulated residual fraction. Every time the accumulated residual fraction overflows, the 16 (17) counter is commanded to delay the 17 to 16 count transition one reference clock period, which corresponds to deleting one puls from the signal feeding the N divider.

To compensate for puls delete sidebands on the synthesizer output signal, the residual fraction is converted to an analog signal and added to the error signal from the phase detector. The composed error signal is filtered before entering the control input of the voltage controlled oscillator.

8.14 Standard Assembly A2

the functional block diagram of the Standard Assembly is show in Figure 8.3.

The assembly holds three basic functions:

- 10.24 MHz stable master oscillator
- 73.6 MHz synthesized second LO
- 1.4 MHz synthezised BFO

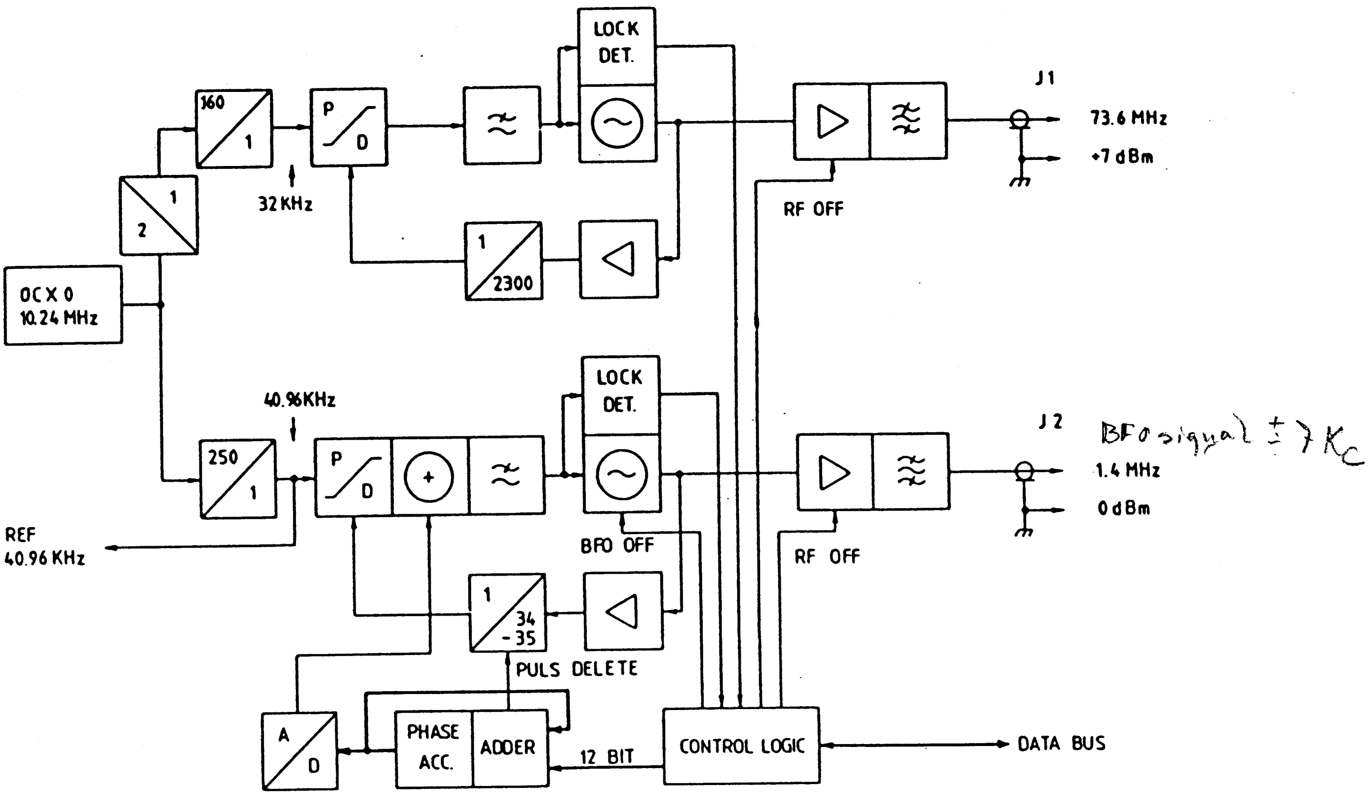

Figure 8.3 Standard Assembly.

The output signal from the temperature compensated crystal oscillator is applied to two divider chains. One generating 32 kHz reference clock for the 73.6 MHz loop, and one generating 40.96 kHz reference clock for the 1.4 MHz loop and the Syntheziser Assembly.

The 73.6 MHz oscillator is formed by a voltage controlled crystal oscillator ensuring low side-band noise. The loop has a 10 Hz bandwidth compensating for frequency drift.

The 1.4 MHz synthesizer is tunable in 10 Hz increments. The loop reference frequency is 40.96 kHz and the corresponding loop bandwidth approx. 800 Hz.

The loop uses a fractional N technique, where the loop output frequency is equal to the number of N.P. times the reference frequency, where N and P are positive integers. Due to the limited tuning requirements for the loop, the N number is fixed 34. The programmed number P is used as input to a digital loop adding the fractional ratio to an accumulated residual fraction.

Every time the accumulated residual fraction overflows, the N divider is commanded to divide by 35, deleting one vco clockpuls. The average vco frequency will be raised in this way with 40.96 kHz divided by P. To compensate for pulse delete sidebands on the 1.4 MHz signal, the residual fraction is converted to an analogue signal and added to the error signal from the phase detector. The composed error signal is filtered before entering the control input of the voltage controlled oscillator.

During AM mode reception the 1.4 MHz BFO signal is muted.

8.15 Front-End Assembly A3

The functional block diagram of the Front-End Assembly is shown in Figure 8.4.

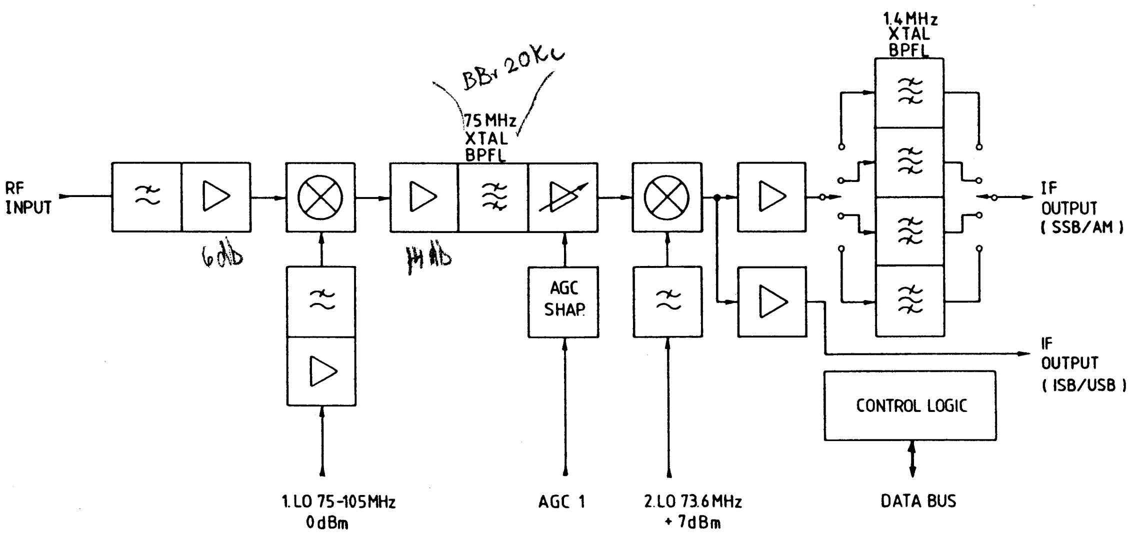

Figure 8.4 Front-End Assembly

The Front-End Assembly contains the RF preamplifier, the first and second mixer with associated injection amplifiers, the 75 MHz IF amplifier and the information crystal filters.

The 15 kHz to 30 MHz input signal is first preamplified approx. 6 dB before entering a high LO injection (+17 dBm) up-converting mixer. The high LO signal is derived from a broadband amplifier placed close to the mixer.

The up-converted 75 MHz first IF signal then is amplified 14 dB in a parallel FET circuit and crystal filtered to a bandwidth of approx. 12 kHz. The AGC1 amplifier following the crystal filter further amplifies the signal 9 dB with a 50 dB delayed AGC.

Delayed AGC is brought into operation when the received input level reaches about 30 dB above 1 microvolt.

The second mixer down-converts the signal to the second IF frequency of 1.4 MHz. The down-converted signal is amplified 23 dB and impedance matched to the four information crystal filters.

These filters determine the overall receiver selectivity.
The filters are switched by means of serie-diodes.
The unfiltered 1.4 MHz output is used in the ISB version.

8.16 Sub-Octave Filter Assembly A4

The functional block diagram of the Sub-Octave Filter Assembly is shown in Figure 8.5.

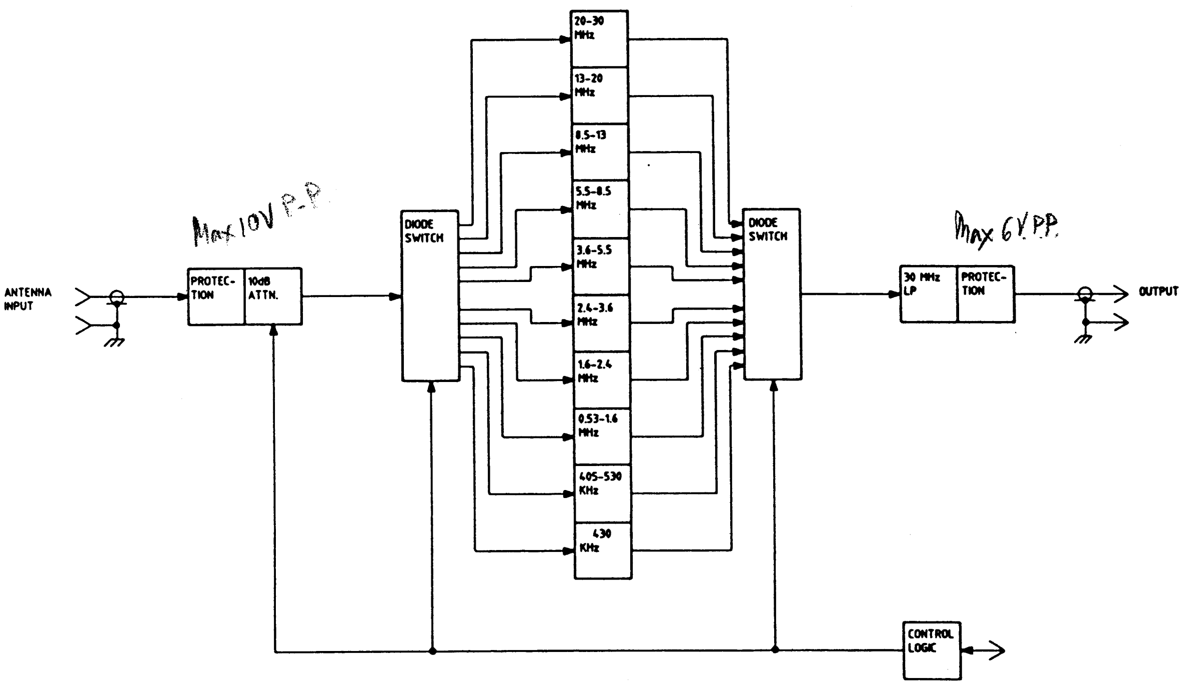

Figure 8.5 Sub-Octave Filter Assembly

The primary function of the Sub-Octave Filter Assembly is to provide selectivity ahead of the front-end preamplifier.

The frequency range 15 kHz to 30 MHz is covered by 10 fixed bandpass filters. The 7 filters covering the frequency range 1.6 - 30 MHz are all less than one octave wide.

To reduce interference from adjacent and/or high power transmitters, a 10 dB switchable pad is incorporated to attenuate incoming signals.
An input overload circuit protects the receiver against extreme antenna signals.

An output protection circuit prevents spike products from the switch circuits to reach the Front-End Assembly.

8.17 IF/AF Assembly A7

The functional block diagram of the IF/AF Assembly is shown in Fig. 8.6.1 for the ISB version.

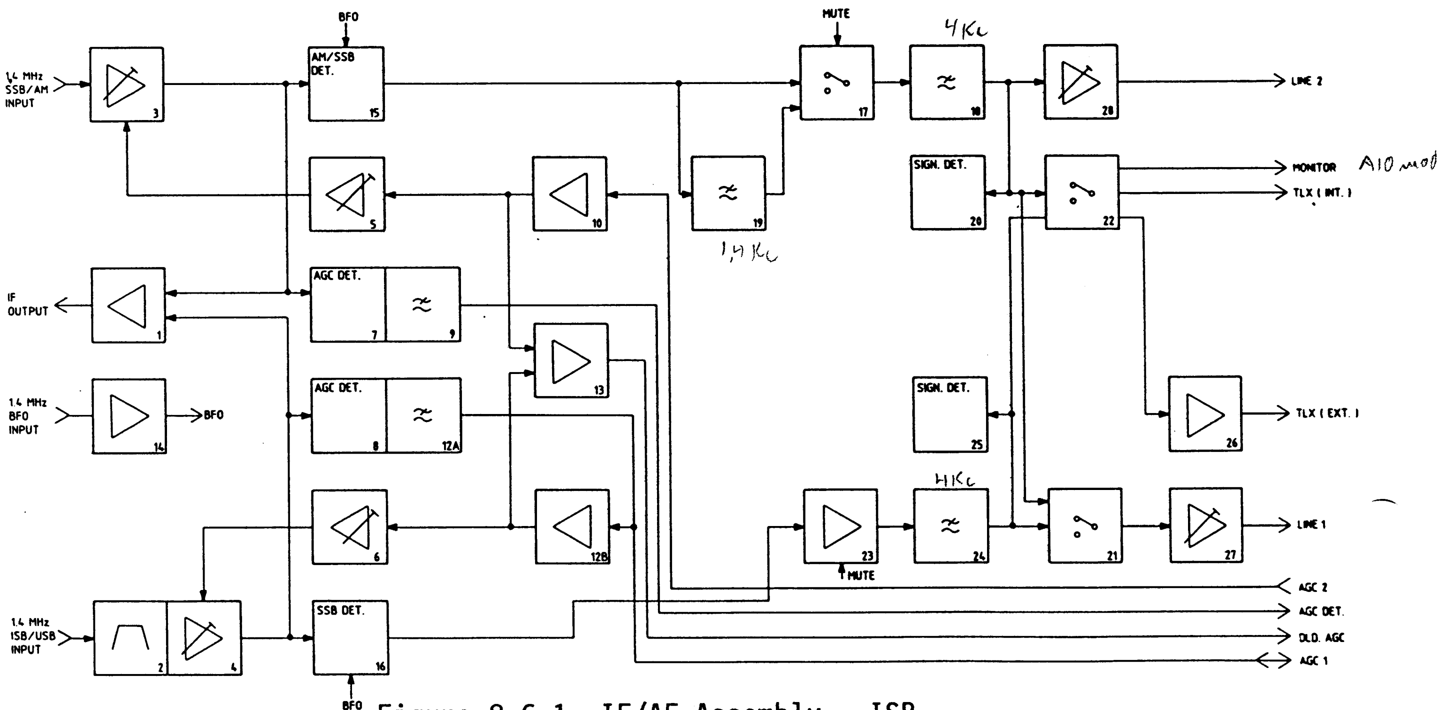

Figure 8.6.1 IF/AF Assembly - ISB

The IF/AF Assembly contains the 1.4 MHz second IF amplifiers, demodulators, AGC detector and AF line output circuits.

The filtered 1.4 MHz signal is amplified in block 3 before being fed to the AM/SSB demodulator, the age detector and the isolation amplifier for the IF output. The gain from the input of block 3 to the IF output is between approx. -15 dB and +75 dB controlled by the agc circuit.

The output signal from the demodulator is routed through a 1.4 kHz low-pass filter in CW/narr and vnar.
The mute circuit in block 17 enables the Microcomputer Assembly to mute the AF signal during simplex transmission, switch sequences and squelch operation.

Before the final amplification the signal is 4 kHz low-pass filtered. The signal level of the Line Output is adjustable up to +10 dBm/600 ohm. The signal level of the TLX Output is 0 dBm/600 ohm.

The signal detection in block 20 is used in self-test mode.

The AGC-detection is performed in the logarithmic detector in block 7. The output signal from the AGC-detector is routed to the Microcomputer Assembly for digitizing.

Block 13 contains circuit for the Front-End AGC.

In the ISB version the unfiltered 1.4 MHz signal is applied to a crystal filter in block 2. The now filtered signal is amplified and fed to the SSB demodulator, the AGC detector and the isolation amplifier for the IF output. The gain from the input of block 3 to the IF Output is between approx. -15 dB and +75 dB controlled by the AGC circuit.

The output signal from the demodulator is amplified, low-pass filtered and fed to the AF output.

8.18 Microcomputer Assembly A8

The functional block diagram of the Microcomputer Assembly is shown in Figure 8.7.

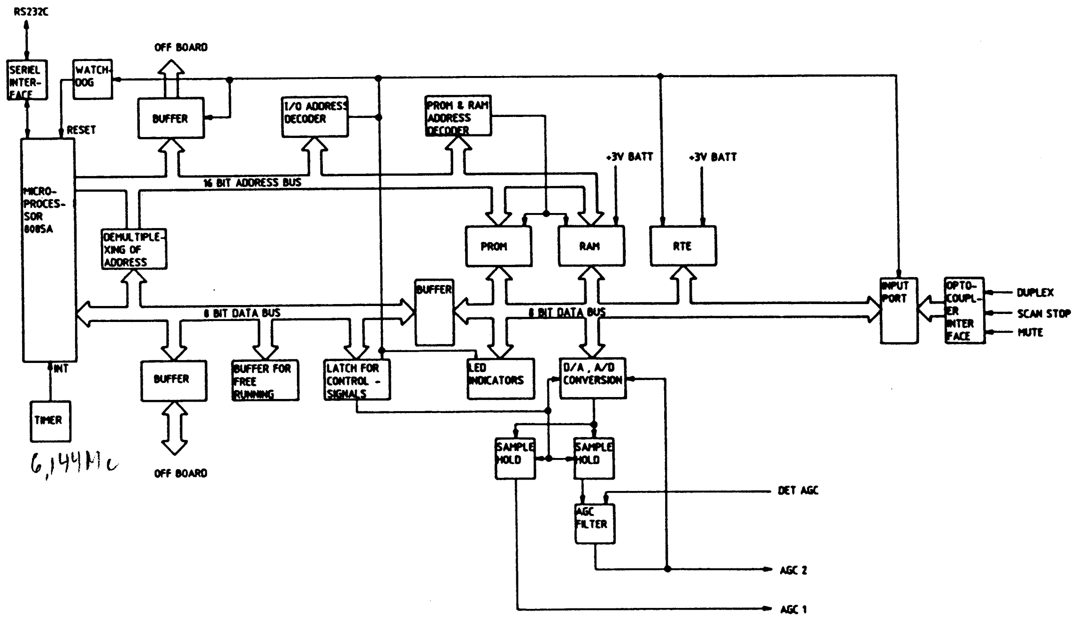

Figure 8.7 Microcomputer Assembly

The assembly consists of a 8085 microprocessor largescale integrated circuit that controls all basic functions within the receiver.

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 backup 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-uped real time clock integrated circuit is mounted to ensure correct time keeping even during power failure or receiver standby.

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

The Microprocessor Assembly performs the automatic gain control. Analogue loops provides fast attack AGC-levels for the IF/AF Assembly. A digital AGC2- and AGC1-levels are formed by an A/D conversion (Successive approximation by D/A-conversion) of the analogue AGC2-and AGC1-levels and controls the hold and decay parameters.

8.19 Power Supply Assembly A10

The functional block diagram of the Power Supply Assembly is shown in Figure 8.8.

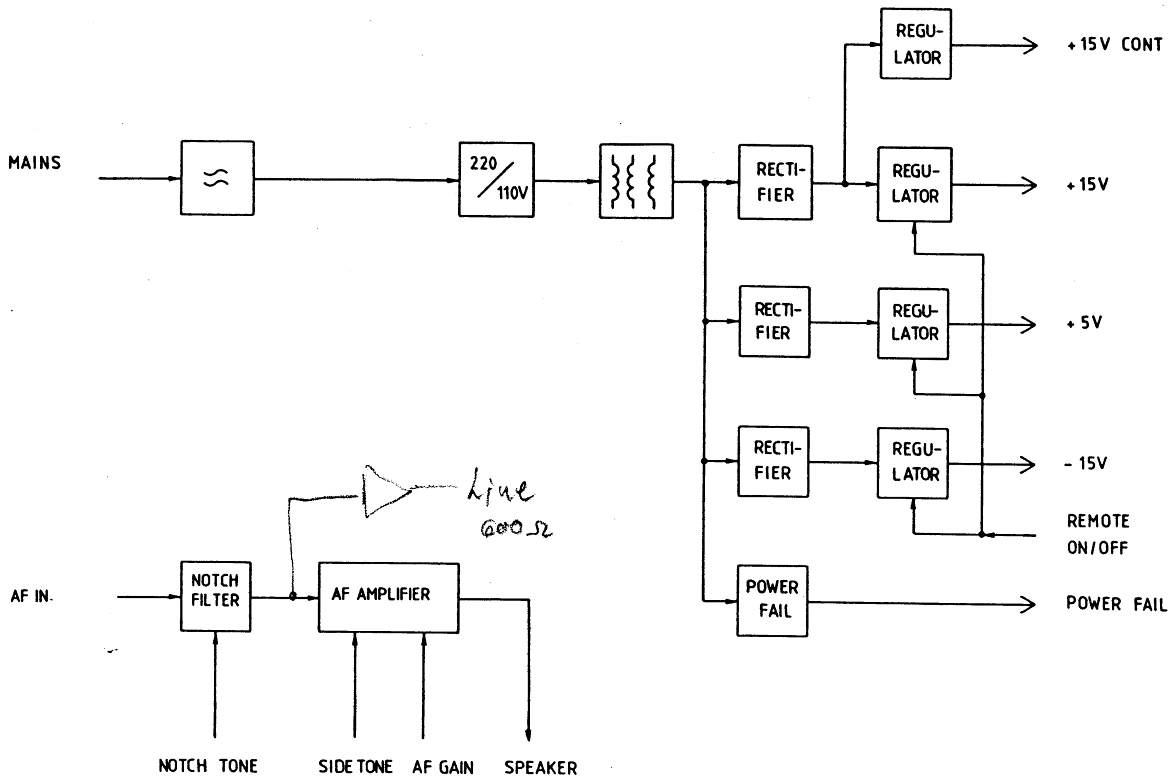

Figure 8.8 Power Supply Assembly

Part of the AF circuits, the notch filter and the AF power amplifier, are included in the assembly.

The AC mains is transformer-coupled to bridge rectifiers, followed by current limited voltage regulators (fold-back limited) delivering +5V, -15V and +15V.

The regulated output voltages are controlled by the front panel ON/OFF switch.

When the switch is turned off, the reference voltage for the regulators is grounded, causing the output voltages to be removed, while the remaining part of the assembly will continue to energize. An extra +15V regulator, servicing the oven-stabilized reference oscillator, is bypassed by the front panel ON/OFF switch.

By means of an on/off switch positioned on the assembly rear panel the receiver may be de-energized. To avoid information loss during supply drop-out, a power failure circuit sensing the mains transformer secondary voltage, generates a look-ahead warning for the Microcomputer Assembly.

The AF part of the assembly contains a voltage controlled notch filter covering the range 300 to 3400 Hz, a voltage controlled gain variable preamplifier and a 4W/4 ohm loudspeaker amplifier. A sidetone input, used during CW/SIMPLEX operation is mixed to the preamplifier AF signal.

8.20 Front Panel Assembly A11A1

The Front Panel Assembly mounts and interconnects most of the front panel controls, including power ON/OFF dimmer control, RF gain, AF gain, notch tune, mode select, bandwidth select, and receiver frequency/BFO tune. The LEDs, meter read-out, and phone connector are also mounted on this assembly.

All digital controlled pushbuttons, the tuning knob information and the digitized RF-gain setting are scanned by the Microcomputer Assembly. Synchronous the LED read-outs and the front panel meter are updated. The assembly incorporates A/D-D/A converters for converting the analogue RF-gain and meter information.

The only analogue signals routed to and from the assembly are the DC-voltages controlling the notch tune and gain setting of the AF circuits, and the phone signal for the front panel mounted phone jack.

A single ribbon cable interconnects the asembly to the receiver mother board.

8.21 Mother Board A12A1

The receiver mother board ties all parts of the receiver together. It routes the front panel controls, the microcomputer controls and the stabilized voltage to the remaining assemblies.

Table 8.2 Key Values During Self-Test

KEY DEPRESSED	VALUE DISPLAYED
SSB	11
AM	10
RTTY	12
CW	13
wide	18
inter	19
narr	1A
vnar	1B
off	20
slow	21
fast	22
att	24
scan	36
bfo	35
tune	34
C	37
.	8A
0	80
1	81
2	82
3	83
4	84
5	85
6	86
7	87
8	88
9	89
rcl	31
sto	30
local	32
mon	33
progr	38

Table 8.3 Fault Analysis Procedures

Find the symptoms below that match the fault condition and follow the hints.

SYMPTOM	POSSIBLE CAUSE
1. Receiver dead. Mains OK Fuse not blown. No LEDs lit.	A10 Power Supply. A11 Front Panel. on/off switch.
2. Receiver dead. Mains OK. Fuse blown and new fuse also blows	A10 Power Supply Diodes, seriestrans-istors, 75V Z-diodes
3. Front Panel dead. Noise is heard in the loudspeaker during power-up. No LEDs flashing on A8 back plane.	A8 Microcomputer A10 Power Supply 5V missing
4. Front Panel dead. Some LEDs flashing on A8 backplane	A11 Front Panel
5. Display very Weak. Receiver else OK	A11 Front Panel Dimmer Circuit A10 Power Supply 8V missing
6. Part of Display lights extremely bright while the rest do not lit. Receiver stops operation.	A8 Microcomputer 8085
7. The same display segment is missing in all figures.	A11 Front Panel Driver transistor Interconnection cab-le to motherboard
8. Display shows "bAt.FAIL" steady-ly or periodically. Pressing a key can cause an "OSC 1 Err" read-out.	A10 Power Supply VBB, VEE or VFF drifting or incor-rectly adjusted
9. The Display shows "An FAIL" during power-up or during keyboard operation.	Microcomputer inter-face on An is faulty

Table 8.3 continued

SYMPTOM	POSSIBLE CAUSE
10. "OSC 1 Err" during frequency or mode changes	A1 Synthesizer VCO out of lock
11. "OSC 3 Err"	A2 Standard 1.4 MHz oscillator out of lock
12. Receiving Frequency incorrect No error read-outs	A1 Synthesizer Digital circuits A2 Standard 40.96 kHz reference
13. Sensitivity poor	Signal path Oscillator levels
14. Sensitivity poor. Receiver runs test program without error read-outs	Antenna cable A4 Preselector Input Protection Range switches
15. "An FAIL" during test program	Microcomputer interface on An is faulty
16. "OSC 1 Err" during test program No errors during normal operation	A1 Synthesizer VCO range switch VCO adjustment
17. "GAin Lo" several times during test program	The signal path gain A3 Front-end A7 IF/AF A1 Synthesizer output level A2 Standard 73.6 MHz level Interconnection cables
18. "GAin Lo" and "no Audio" several times during test program	Same as 18.
19. "GAin Lo" and "no Audio" several times during test program	A1 Synthesizer Frequency wrong Digital error

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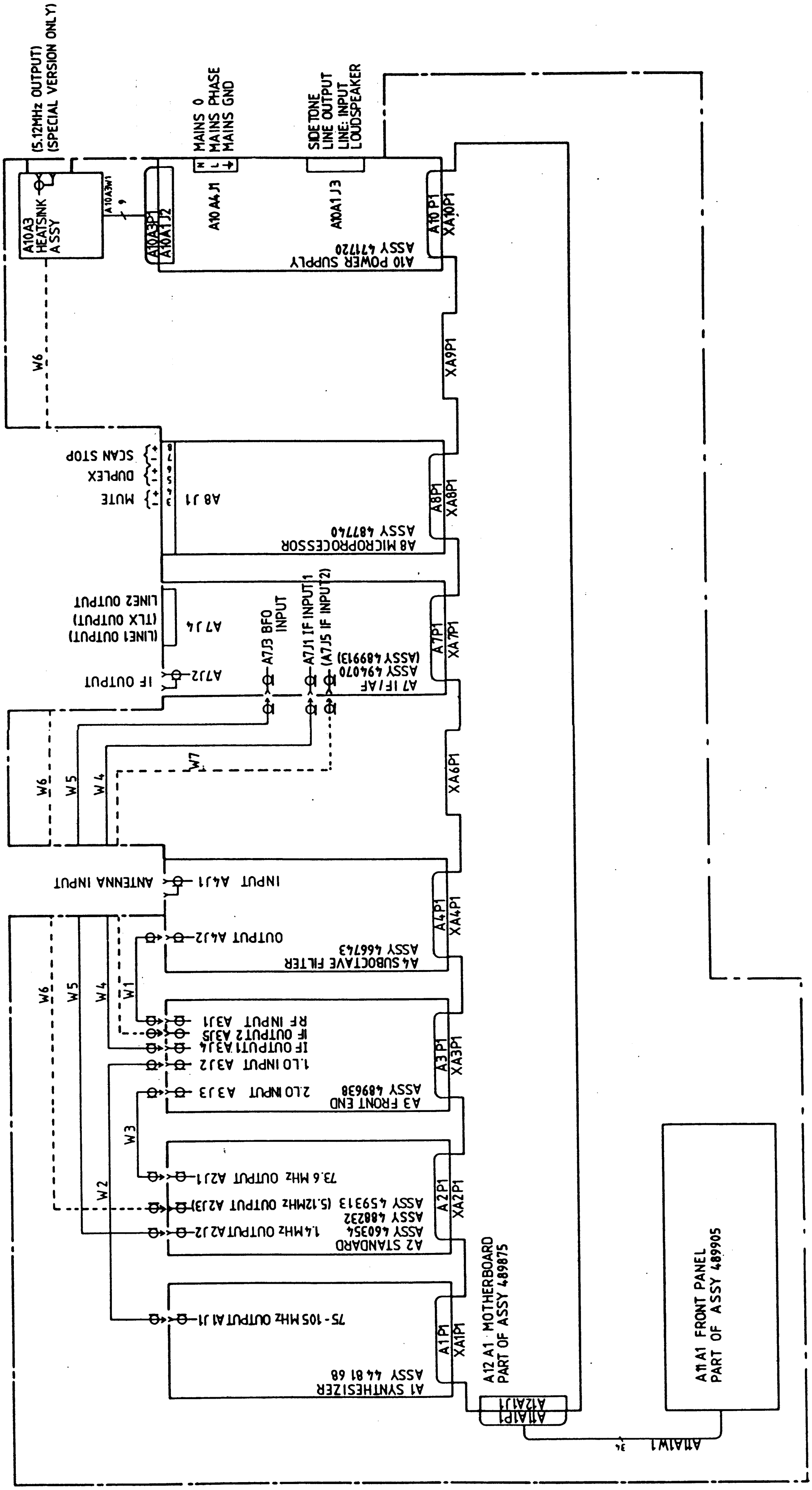
Table 8.3 continued

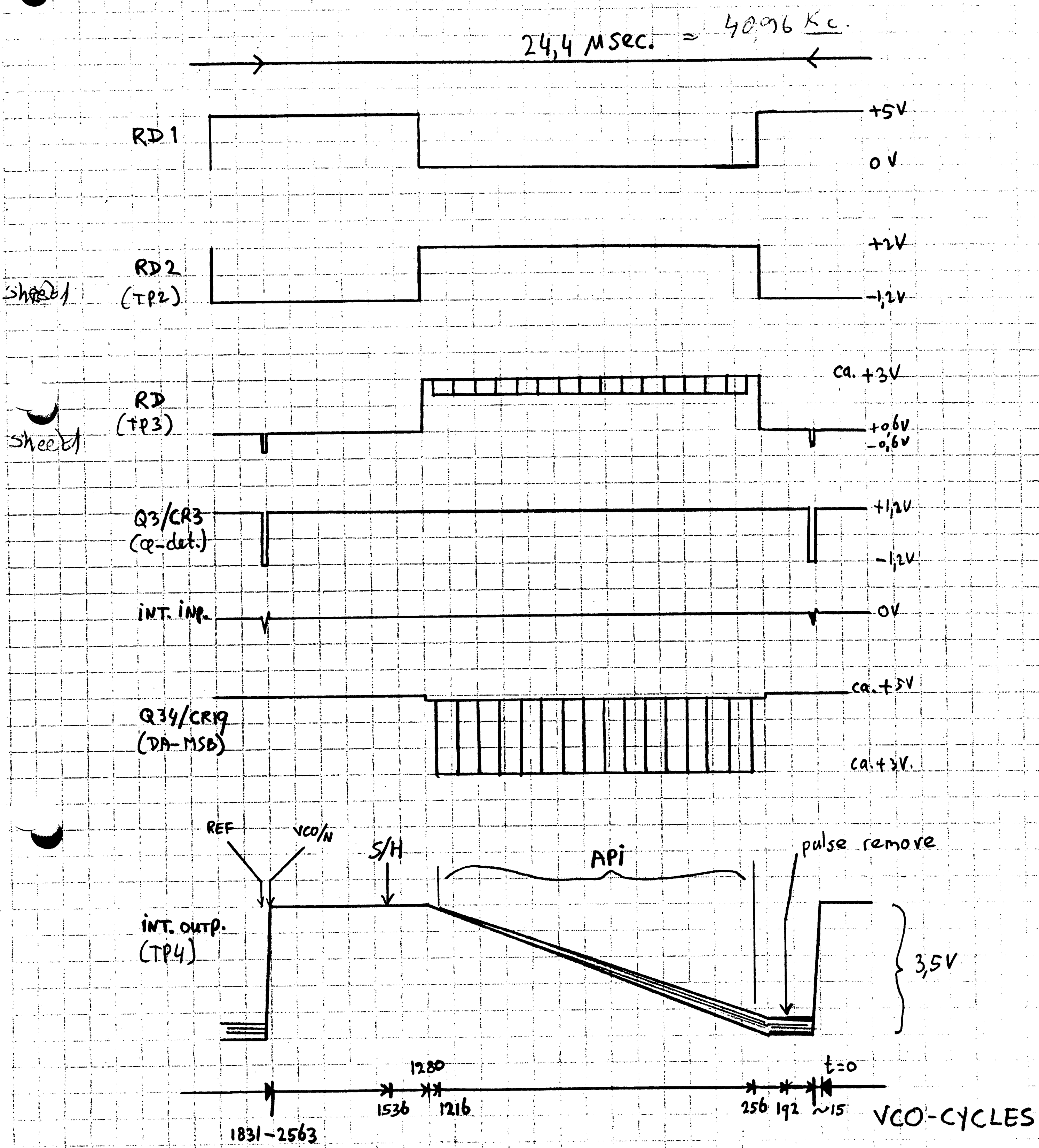
SYMPTOM	POSSIBLE CAUSE
20. "no Audio" during test program. The loudspeaker output is weak and distorted	A2 Standard. 1.4 MHz level or frequency. A7 IF/AF demodulator Interconnection cable
21. "GAin Lo" in one of the band-width during test program	A3 Front End crystal filter
22. "no Audio" during test program Receiver operates normally	Same as 21. + A7 IF/AF AGC detector not adjusted for -20 dBm IF output Audio detector
23. Audio distorted in AM	A7 IF/AF demodulator AGC detector not adjusted for -20 dBm IF output
24. Audio missing or weak No error read-outs during test program	A10 Power Supply Audio amplifier A11 Front Panel AF potentiometer Interconnection cable to mother-board
25. Receiver acts strange when pressing certain keys	A8 Microcomputer 8085 or EPROMs
26. Receiver looses user-programmed channels	A8 Microcomputer Battery run out CMOS RAM faulty
27. "bAt.FAIL" during power-up	As 26.



INTERCONNECTION DIAGRAM RX 4010

DWG. NO. 49 00 08

A1 RAMP TIMING



ASSY 448168, SYNTHESIZER ASSEMBLY

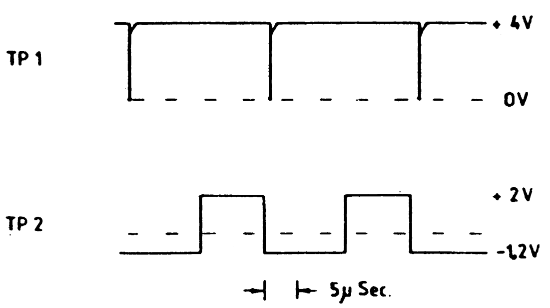
Service Sheet A1

(1) Phase Detector

The J-k flip-flop U31 forms a set-reset phasedetector, switching the differential transistor pair Q_1, Q_2. U-31 is clocked by the reference signal, 40.96 kHz negative going impulses, turning the diode switch CR4 "ON". CR4 is connected to a constant current generator, making the Ramp Generator ramp up. U31 is preset by the frequency divided signal from the VCO, terminating the ramp up period.

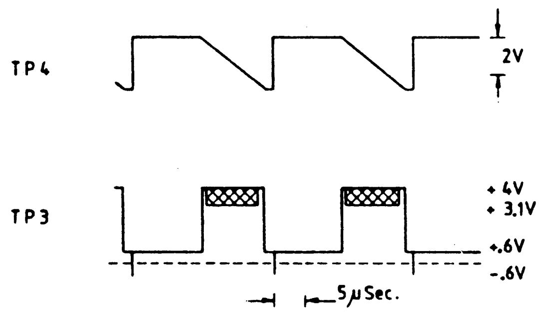
(2) Ramp Down Switch

The ramp down period is controlled by the diode switch and has the length of 832 VCO-cycles. The voltage at TP2 is 2.0 V in the ramp down period and -1.2 V in the remaining time.



(3) Ramp Generator

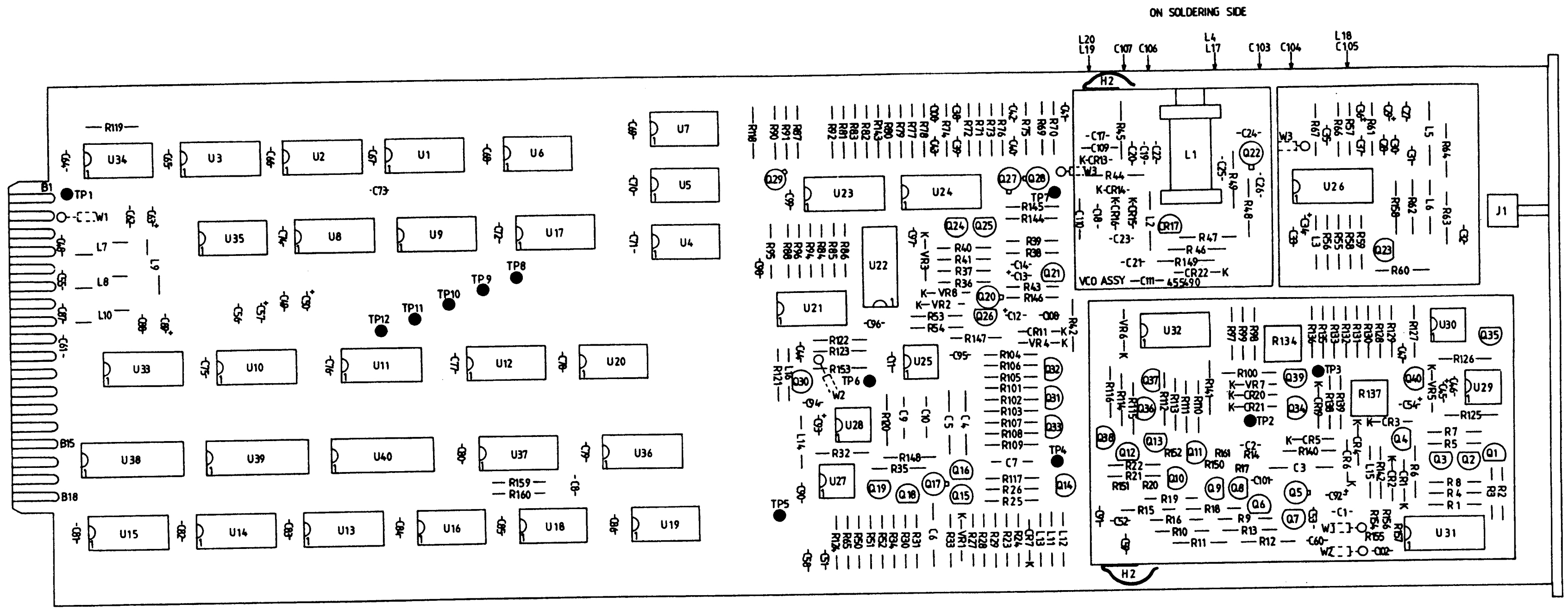
The ramp generator is an inverting current integrator built by discrete components ensuring fast response and low noise.



(4) Summing Amplifier

The current from the constant current genenerator U29, Q35 is added to the current from the resistance network R128-R139 by the summing Amplifier U30, Q40. The current from R128-R139 is controlled by the diode switches CR19-CR21.

(5) Supply Filtering



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	81.02.02	
	C	ÆM 84109	30.10.84	VH
	D	ÆM88009	3.3.88	VH

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		SCALE 2:1 · SHEET 1 OF 1

(6) Sample and Hold

The transistor pair Q_{15}, Q_{16} generates the gate voltage to the first sample switch Q_{14}. The voltage at C_4 is transferred to the sample capacitor C_5 by the second switch Q_{17}. The signal at TP5 is positive going impulses with a frequency of 40.96 kHz. At the output of the unity gain amplifier U28, the voltage is between - 9V and +10V

(7) Loop filter

Active second order Lowpass filter, $f_{cut} \simeq 3$ kHz.

(8) VCO - Supply

The voltage at TP7: −7.5 V.

(9) Voltage Controlled Oscillator. Assy 455490.

The 75 MHz - 105 MHz VCO is controlled by a voltage between -9V and+10V. R149 and CR22 is inserted for linearsation of the voltage-frequency function. The frequency range is divided into 4 subranges by switching the fixed capacitors C_{19} and C_{20}.

The VCO control voltage, TP6, may be adjusted by the coil L 1. With the receiver tuned to 29.99 MHz, the voltage shall be +10.0 V at $t_{amb.} = 25^{o}$C.

(10) Range Shift

The Range Shift shall be in accordance with the following table:

Frequence	R144 Voltage at ~~Q_{15}~~	R145 Voltage at ~~Q_{16}~~
15kHz-5999.99kHz	-8.2V	-8.2V
6000kHz-11999.99kHz	+15V	-8.2V
12000kHz-19999.99kHz	-8.2V	+15V
20000kHz-29999.99kHz	+15V	+15V

(11) Lock Detector

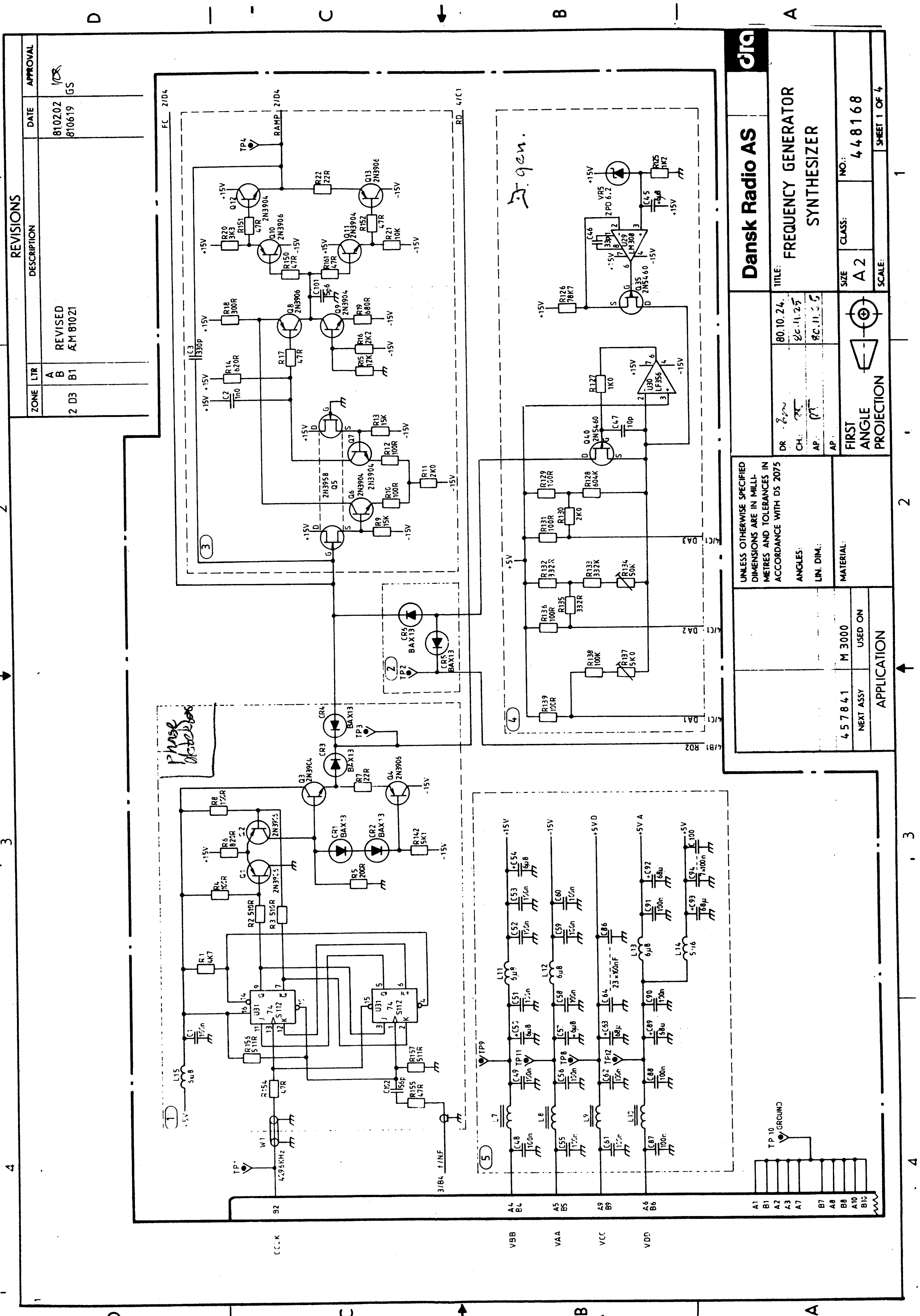
The output of the Lock Detector is high when the VCO control voltage is between -9.5V and 11.5V. Outside this range the output is turned low.

(12) Output Buffer

The necessary amplification and isolation is provided by the output Buffer U26. Unwanted spurious and harmonic outputs are attenuated by the band-pass filter L_5, L_6 and the attenuator R_{62}-R_{64} insures a low VSWR. The output is attenuated app. 60 dB by activating Q_{26}.

(13) Isolation Amplifier

The signal from the output Buffer is fed through the cascode configuration Q_{27}, Q_{28} to protect the VCO from noise generated by the Prescaler.



Service Sheet A1

1.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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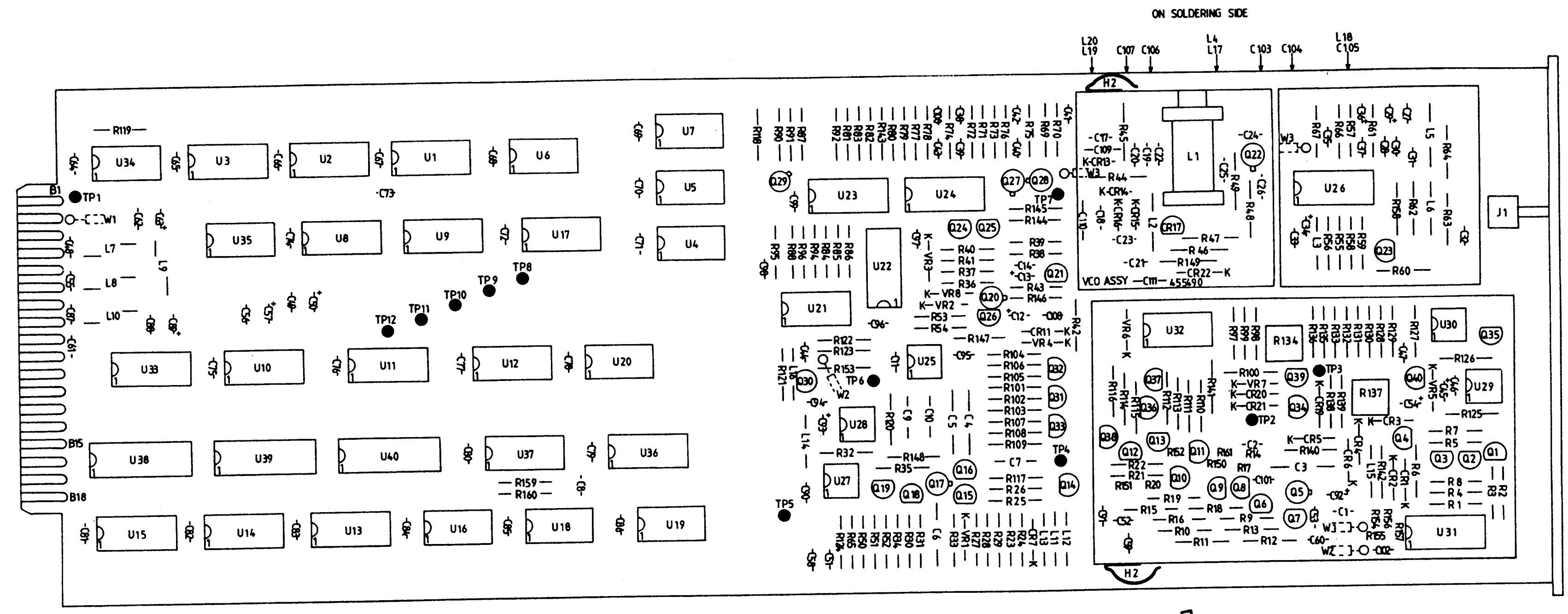
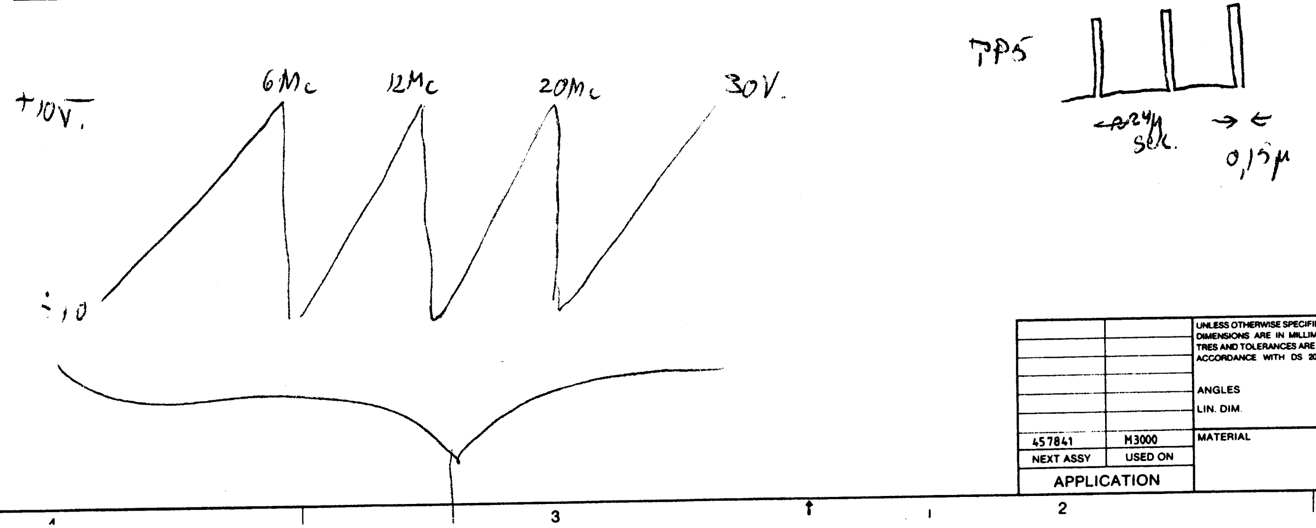
	B	REVISED		
	C	ÆM 84109	30.10.84	VH
	D	ÆM88009	3.3.88	VH





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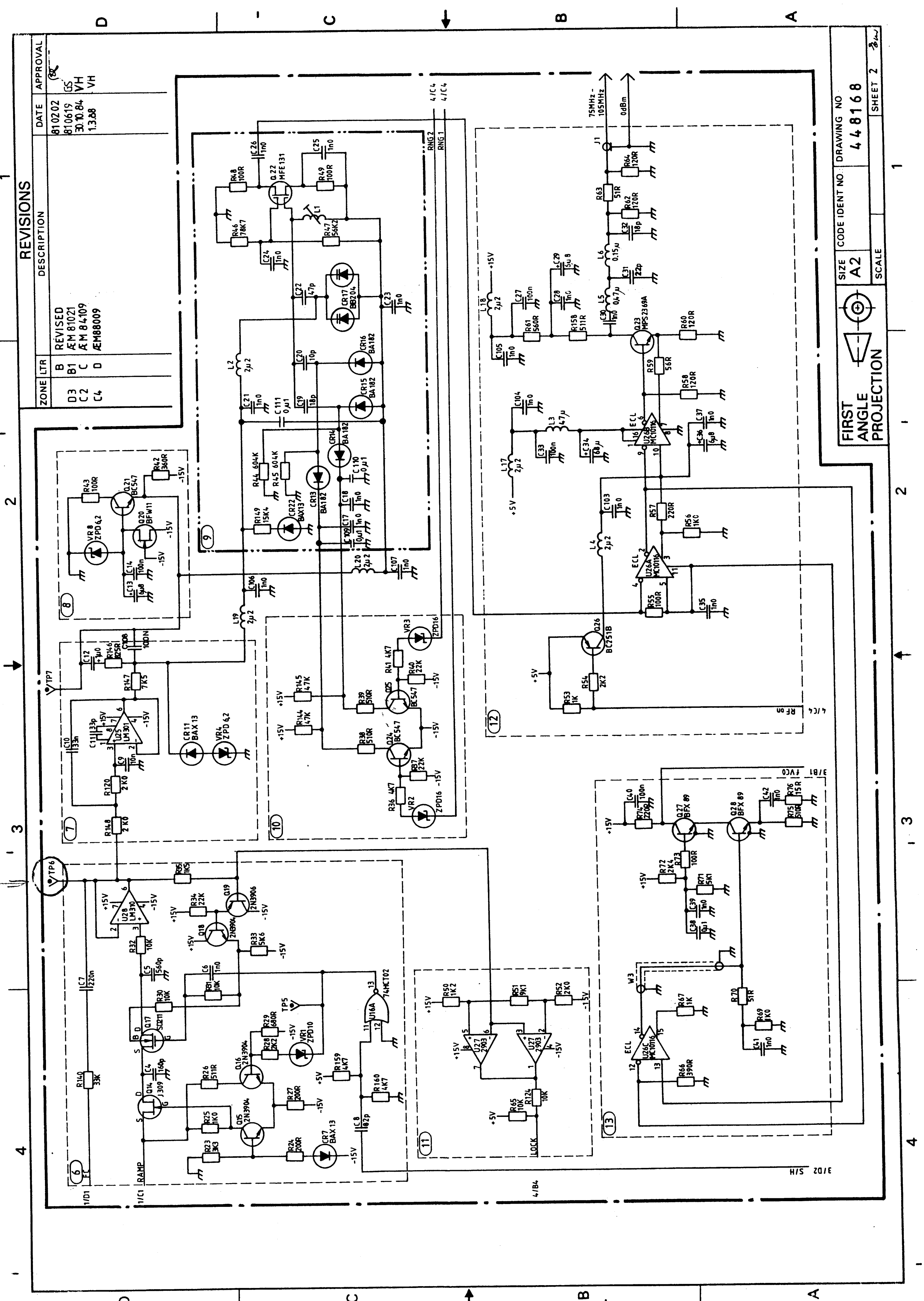
SIZE A1 | CODE IDENT | DRAWING NO. 448168

SCALE 2:1 | SHEET 1 OF 1

the 4-bit content of the latch. While the counters are active, the switches Q_{31} - Q_{33} are switched "ON".



Service Sheet A1

(14) Prescaler

The prescaler has a divide ratio of N= 16 or N=17 depending on the logical level of U16 pin 10. ECL to TTL conversion is provided by Q_{29}. Noise from the Prescaler is isolated from the Phase Detector by the inverter Q_{30}.

(15) Synchronizer

The synchronizer generates the timing signals for the sample and hold, ramp down, D/A conversion and pulse removal. One cycle of the Synchronizer is similar to one reference cycle. (24.4 μ-sec.). One reference cycle contains 1831-2563 VCO cycles, depending on the tune frequency. The reference cycle is defined at the negative transition of U21 pin 5. When 1536 VCO-cycles remains in the reference cycle, U18A is clocked and the sample and hold circuit is activated. When 1280 VCO-cycles remains, the decode counter U17 starts counting, defining the time for the ramp down period. The D/A conversion for the phase compensation is started when 1216 VCO-cycles remains (U19 pin 9). In case of an overflow from the adder U12, the pulse removal will take place when 192 VCO-cycles remains. The pulse remove signal is present at U20 pin 9.

(16) Pulse Swallowing Counter.

The counter is built by 3 4-bit counters and 1 flip-flop. When the down counter U15 reaches 0000, U15 is reset by U18B and the counter ratio for the Prescaler is changed from 17 to 16. The counter ratio N is loaded into the counters in binary code.

The linary code is split into a 4-bit code A and a 8-bit code P. Thus the wanted ratio is

$$N = P \times 16 + A.$$

At the start of the reference cycle all counters are loaded. The first A x 17 VCO-cycles the Prescaler ratio is 17. U15 is reset and U14, U13 go on counting the remaining (P-A) x 16 VCO-impuls. The result is

$$A \times 17 + (P-A) \times 16 = P \times 16 + A = N.$$

When all counters reaches the zero state, U13 pin 13 goes low. After 1 Prescaler cycle = 16 x VCO cycles, U21 pin 5 goes low, loading all 3 counters. After 2 Prescaler cycles, the load signal is inhibited and the count down period starts. As loading takes 32 VCO cycles, the counter must be programmed to the desired ratio minus 32.

(17) Rate Counters

For each reference cycle, the content of the latches U8, U9 is loaded into the linary counters U1-U3. In the ramp down period, U1-U3 are counted down with a frequency fVCO/64. When they reach the zero state, they are reset by an external flip-flop. Each counter correspond to 4 bit of the latches U8, U9 and the period of time in which the counters are active is proportional to

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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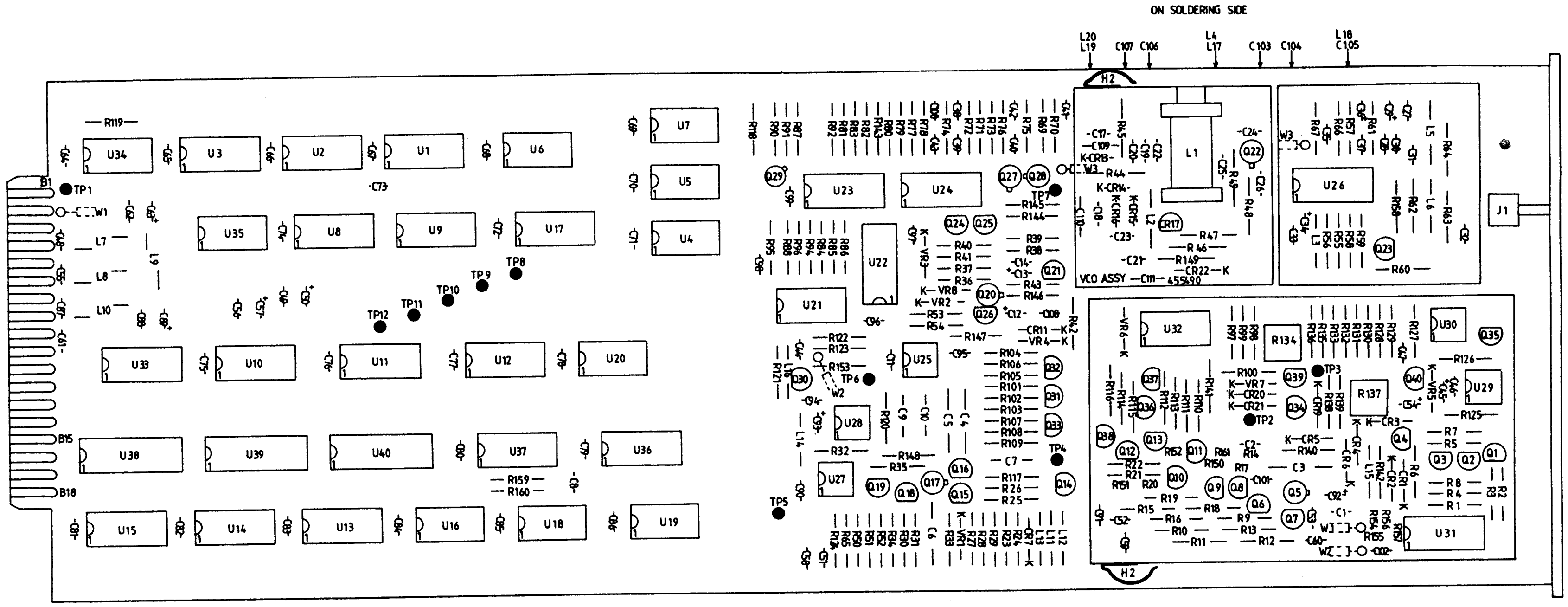

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(18) Current Generators.

3 current sources are used for the D/A-conversion and the ramp up. The FET Q_{39} is inserted to insure a high output impedance.

(19) Adder/Accumulator

For each reference cycle, the latches U8, U9 are clocked and the fraction part, present at the input af the adders U10-U12, is added to the content of the two latches. When the adders overflow, the Synchronizer is activated and one pulse is removed in the counting sequence.

(20) Current switches

The current switches Q_{31}-Q_{33} are operated from the Rate Counter, U4, U5, U7.

The current switched by Q_{33} is also used as ramp up current for the Ramp Generator.

Consequently, the ramp up current and the current for the D/A conversion of the most signifiant 4-bit is the same current.

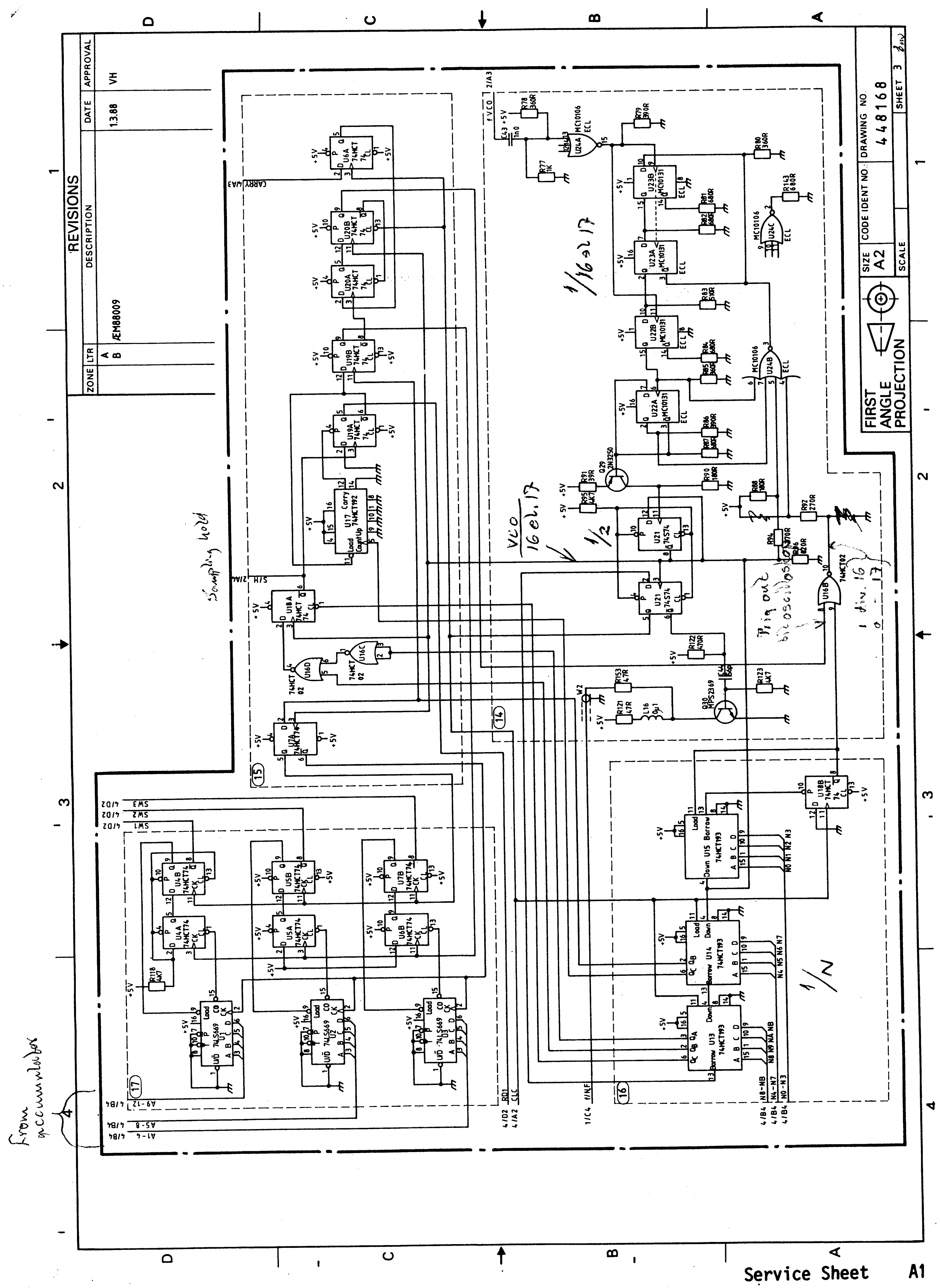
Q_{36}-Q_{38}generates the switch voltages for the ramp up D/A switch Q_{34}.

(21) Interface

The data selector U33 selects the wanted input or output latch.

The 24-bit frequency information is available at the output at U38-U40.

The input latch U36 sets the frequency range and the RF ON/OFF. At the output latch U37, the "out of lock" signal is checked, and the overflow indication from the adders U10-U12 is available at U37 pin 4.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM88009
1.3.88
VH
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT NO.
DRAWING NO.
448168
SHEET 3
SCALE
from accumulator
Sampling hold
VCO / 16 el. 17
1/2
1/16 el 17
1/N

3

RKW
880601

RX4010 'FRACTIONAL N'

reference-frekvens

$$f_{VCO} = 40{,}96\,\text{kHz} * N{,}P = 40{,}96\,\text{kHz} * \left(N + \frac{F}{A}\right)$$

N, F og A er hele tal.

A = AKKUMULATOR STØRRELSE = 4096 FOR 10 HZ OPLØSNING.

F = FRACTIONAL OFFSET = MELLEM 0 OG 4096 I STEPS AF 1.

DELTAL N,P LAVES VED AT SKIFTE OM MELLEM DELING MED (N) ELLER (N+1):

HVIS MAN DELER MED (N+1) I F GANGE OG MED (N) I (4096-F) GANGE, ER GENNEMSNITS DELTAL:

$$\frac{(4096-F)*N + F*(N+1)}{4096} = \frac{4096N - FN + FN + F}{4096} = N + \frac{F}{4096}$$

OMSKIFTNINGEN TIL (N+1) FORETAGES AF AKKUMULATOREN, HVER GANG DEN GIVER EN OVERFLOW.

VCO-FASEFEJLEN ER $\frac{F}{A} * 360^\circ$ PER REFERENCE-CYKLUS; ALTSÅ ER UDGANGEN AF AKKUMULATOREN EN DIREKTE MÅL FOR FASEFEJLEN OG KAN BRUGES TIL AT UDLIGNE SAVTAK-SPÆNDINGEN DER KOMMER UD AF FASEDETEKTOREN.

OSCILLATOR – FREKVENSOPSÆTNING (ISB-3400)

A1
1. LO

MODE	FREKV. DISPLAY	LO. – FREKVENS
ISB	10000.00 kHz	85000.00 KHz
USB.		85000.00
LSB		85000.00
CW VNAR		85001.70
TLX NAR		85001.70
AM INTER		85001.85
WIDE		85000.00

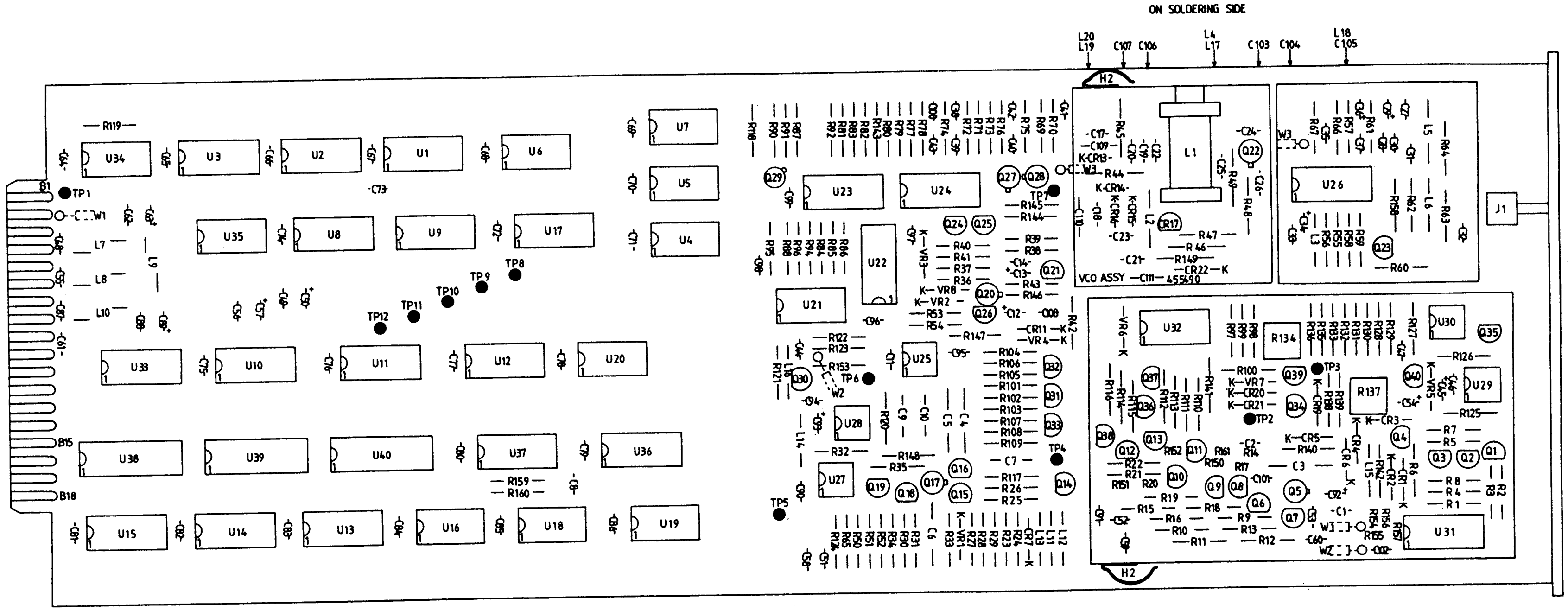
OPSÆTNING PÅ BUSSEN ER : N-32 OG F

A 2
BFO

MODE	BFO DISPLAY	BFO – FREKVENS
ISB	0.00 kHz	1400.00 kHz
USB		1400.00
LSB		1400.00
CW VNAR		1401.70
TLX NAR		1401.70
INTER		1401.85
WIDE		1400.00
AM	—	OFF

OPSÆTNING PÅ BUSSEN ER : F (N ER ALTID 34)

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A		81.02.02	
	B	REVISED	30.10.84	VH
	C	ÆM 84109	3.3.88	VH
	D	ÆM88009		



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

ANGLES

LIN. DIM.

MATERIAL

457841	M3000
NEXT ASSY	USED ON

APPLICATION

DR. Baduss 80.11.26

CH.

AP.

AP.

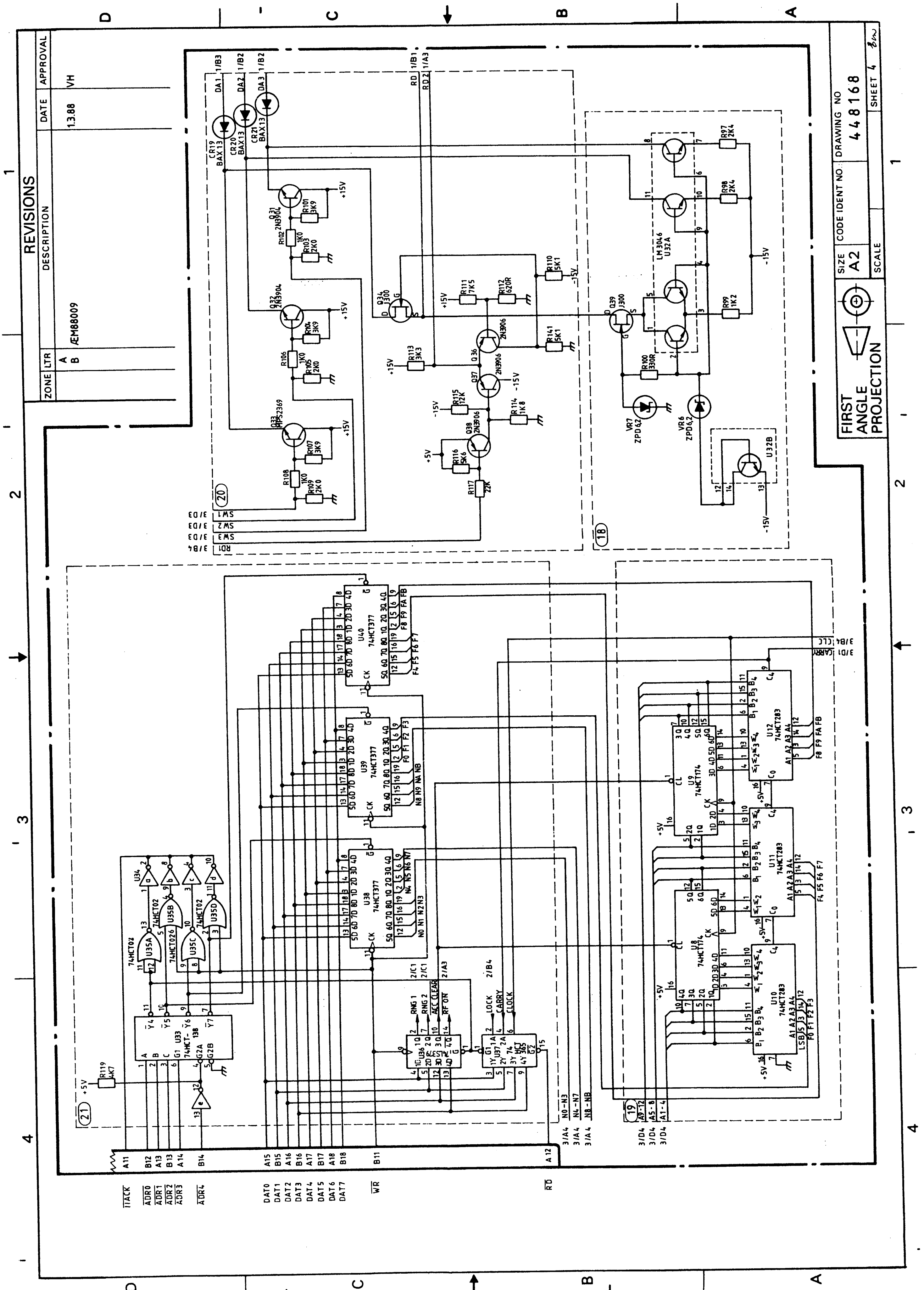
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE FREQUENCY GENERATOR SYNTHESIZER

SIZE A1 | CODE IDENT | DRAWING NO. 448168

SCALE 2:1 | SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM88009
1.3.88
VH
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT NO
DRAWING NO
448168
SCALE
SHEET 4

ASSY 460354, STANDARD ASSEMBLY

Service Sheet A2

ASSY 448184,459313, STANDARD ASSEMBLY Schematic 1

1 Phase-Frequency Detector

U23 generaters a matched set of currents. One for the current translator U19, Q8, two time this current to Q9, and a reference current to the D/A converter U22. The current from Q8 acts as a ramp up current for C29. R60, 61, 62 limiting this function. The ramp down current from Q9 is controlled by the switches CR5, CR6. The ramp down time is dependent on the count down VCO signal. This is performed by a set-reset function, U18a and Q7. The wave form in TP10 is an approx. triangle. This is feed to the loop integrator U20, C31, C32, R65 by R62. The loop bandwide is approx. 800 Hz. The diodes CR7, VR3 reduces saturation time in the loop. To reduce 40.96 kHz sidebands a second order low pass filter with a cut-of frequency at 2.5 kHz is added, U21, R66 - 67, C33 - 34.

2 1,4 MHz VCO

Q11, Q12 performs an oscillator with tuned circuit, L17-18, C39, C40 in the collector of Q11. The feedback path is performed between the emitters of Q11 - 12. A bufed output is taken from Q12 via a low Q tuned circuit L22, C42 - 43. The voltage controlled capacitance diodes CR8, CR9 allows a tuning range at approx. 6.8 kHz/V. The nominel DC voltage in TR11 is +3V at 1,400 MHz adjusted by L18 at 25°C room temperatur.

3 Output Amplifier

0dBm 50 Ω output is performed by Q13 with the tuned circuit L19, C48, L20. R87 - 88 - 89 is a 3dB attenuator which gives a more exact 50 ohm output impedance.

Q14 allows RF ON/OFF switching, with approx. 50dB attenuation.

4 Buffer-Translator.

Q15-16 is an emitter coupled amplifier, which gives excellent isolation between the counter and the VCO. The output level is a 0-5V square wave.

5 Lock Detector.

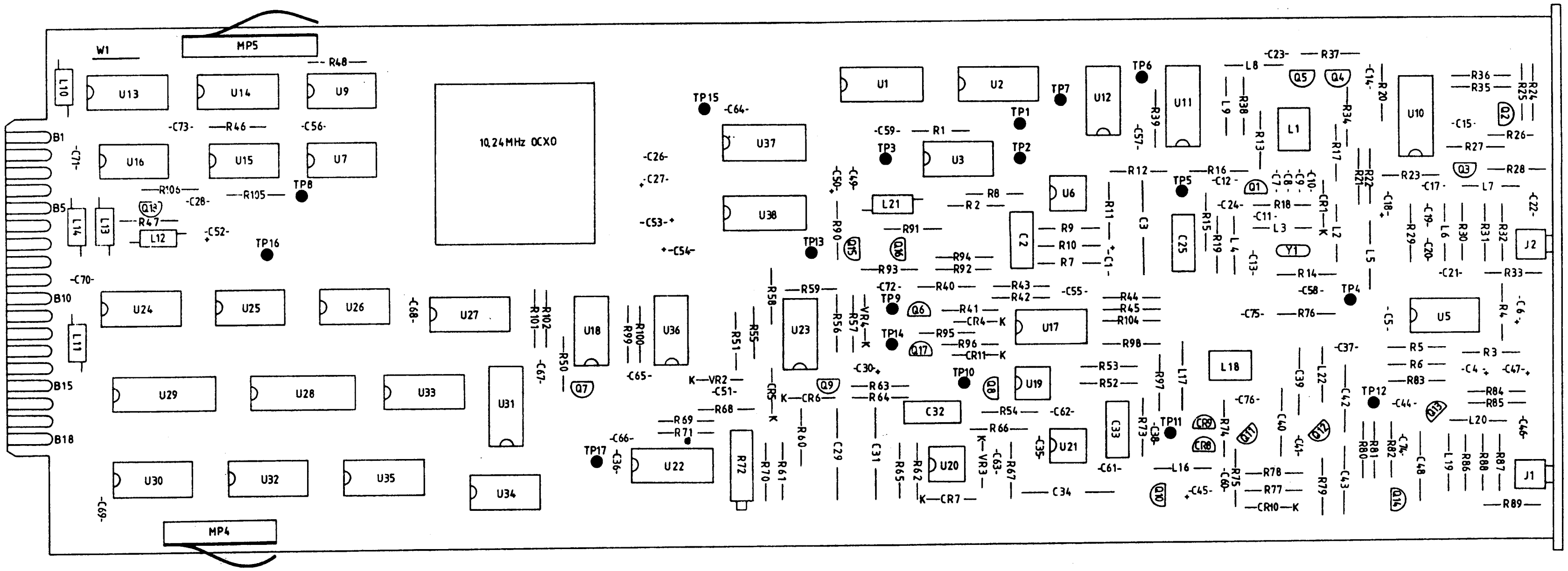
The control voltage to the VCO is feed to a window detector U17a-b. The loop is within proper conditions if the voltage in TP11 is 0V<TP11< +6V. Under this condition Q17 gives a HIGH, TP14.

6 API Generator

The D/A converter (U22), forms a part of the API system (analog phase interpolator). It converts a 8 bit phase information from the adder in 8 to a ramp current. This current is converted to a voltage by R61, and injected to the loop by R60. It is adjusted to eliminate the stepped ramp error signal arraising from the fractional system 8 .

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87039	18.12.87	VH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 207

ANGLES

LIN DIM

MATERIAL

NEXT ASSY	USED ON
471712	RX4000
490008	RX4010
488100	SC4010

APPLICATION

DR	Bew	80 09 26
CH	F. Walter	801009
AP		
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE: FREQUENCY GENERATOR STANDARD

SIZE: A1 | CODE IDENT: | DRAWING NO: 46 03 54

SCALE: | SHEET 1 OF 1

7 Loop Divider.

This divider works in to modes. Divid by 34 or 35. When the fractional part is zero (input to U32 - 33 - 35 equal 0), the counter continuous divides by 34. The output frequency is then 34 x 40,96 kHz= 1392,64 kHz. In general the average output frequency is set by;

$$Fo = (34 + \frac{F}{4096}) \ 40{,}96 \text{ kHz}$$

where F = 0-4095 (fractional part).

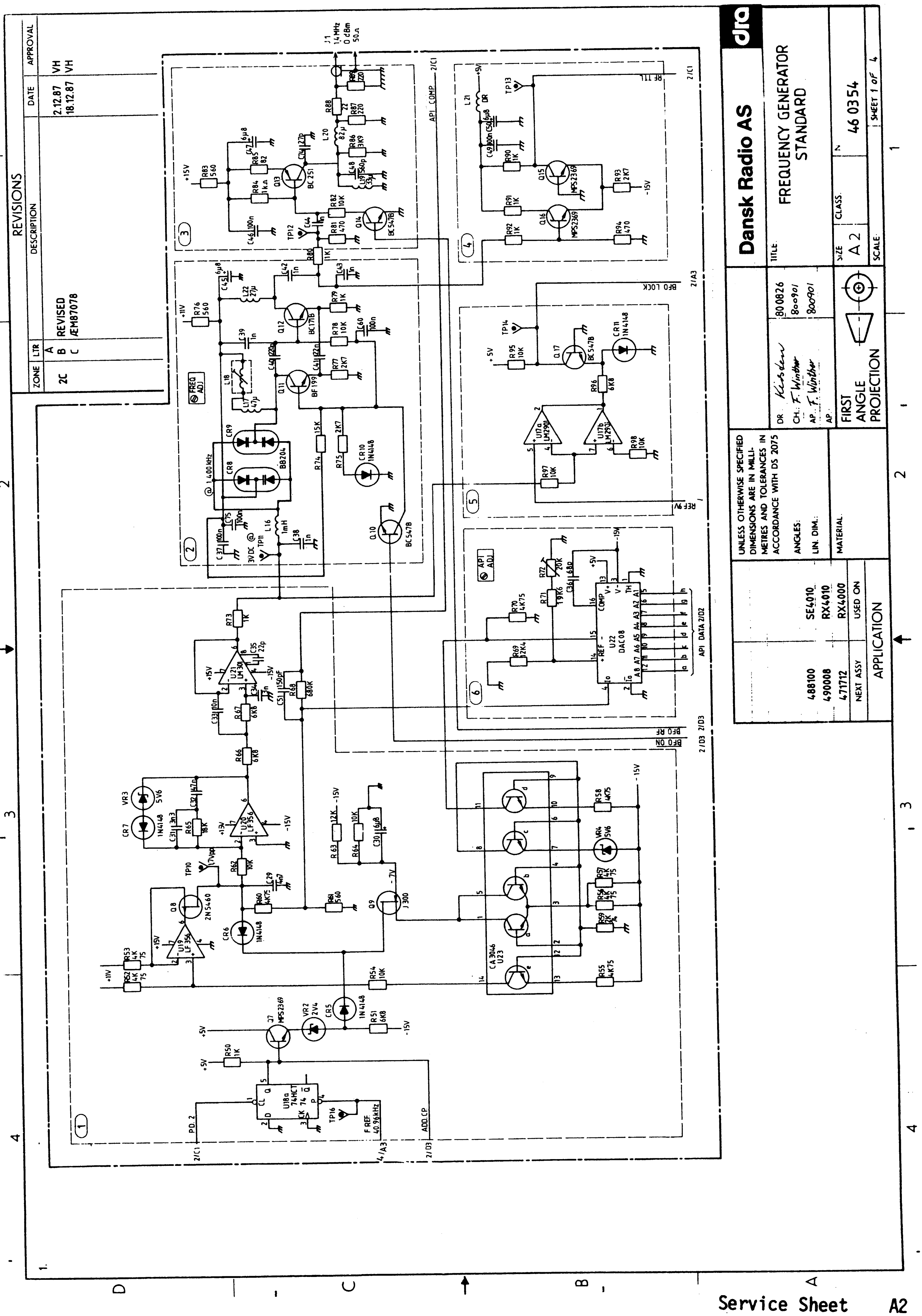
If F = 1, 4096 reference pulses will elapse before the counter receives one divide by 35 instruction. This means that the phase-detector will receive an instruction for raising the frequency each 4096 x $\frac{1}{40{,}96}$ kHz = 0,1 sek. The average frequency will raise 10 Hz. For F = 2, 20 Hz and so on. For Fo = 14000,0 kHz,F = 736.

8 Adder and Phase Accumulator.

The fractional part consists of 3 cascade coupled 4 bit adders connected with 3 x 4 bit latches. On reference clock, the data present on the data inputs of the latches will be transfered to the Q outputs. An addition will occur between these outputs and the data present on the frequency set inputs. After 4096/F additions U35 will give an overflow which is used to change the counter to divide by 35 (the same as removing 1 VCO clock cycle). The contents of the data latch U30-31-34 gives a phase information that converted in 6 will show a stepped ramp function similar to the error in the loop when the API is disconnected.

9 Microcomputer Interface.

U28 - U29 converts the 8 bit data bus to 14 bit data information. 11 bit for BFO frequency set, 1 for BFO RF ON/OFF, and 1 for 73,6 MHz RF ON/OFF switching. U27 reads BFO lock, 73,6 MHz lock, 10.24 MHz level and fractional control, and transmits them to the µP. U24, U25, U26 is an address key system.



Service Sheet A2

1.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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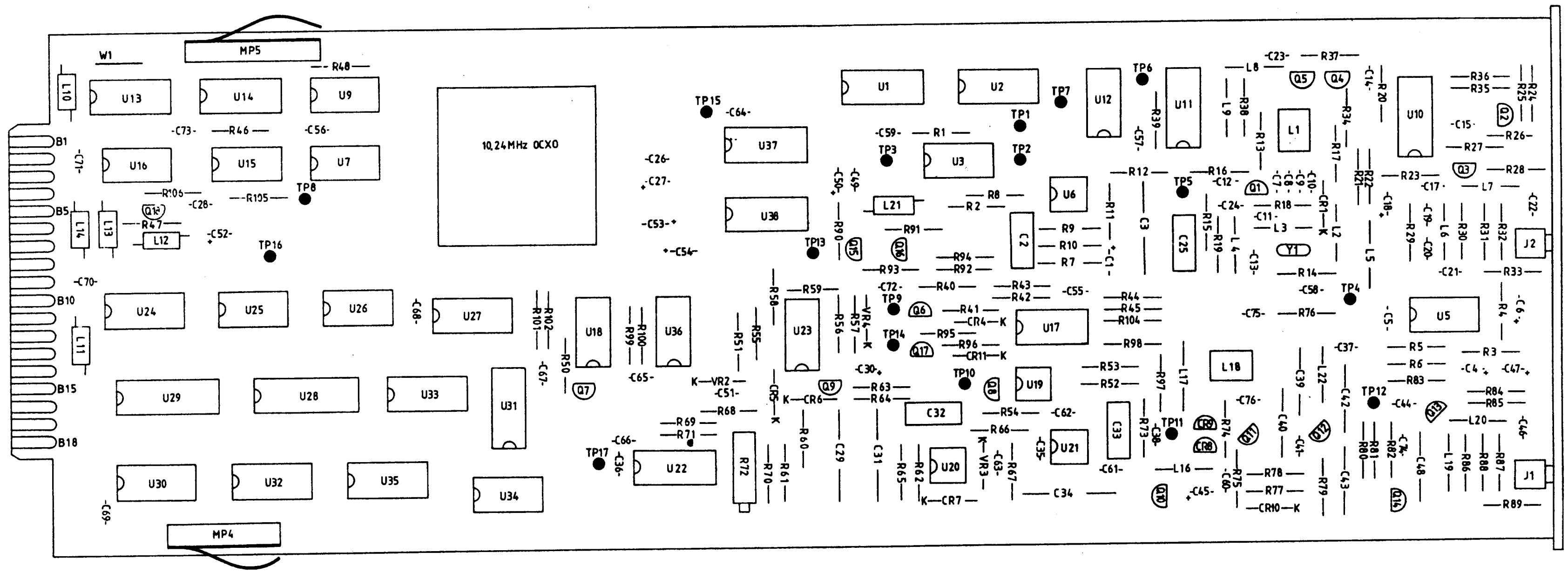
	B	ÆM87039	18.12.87	VH

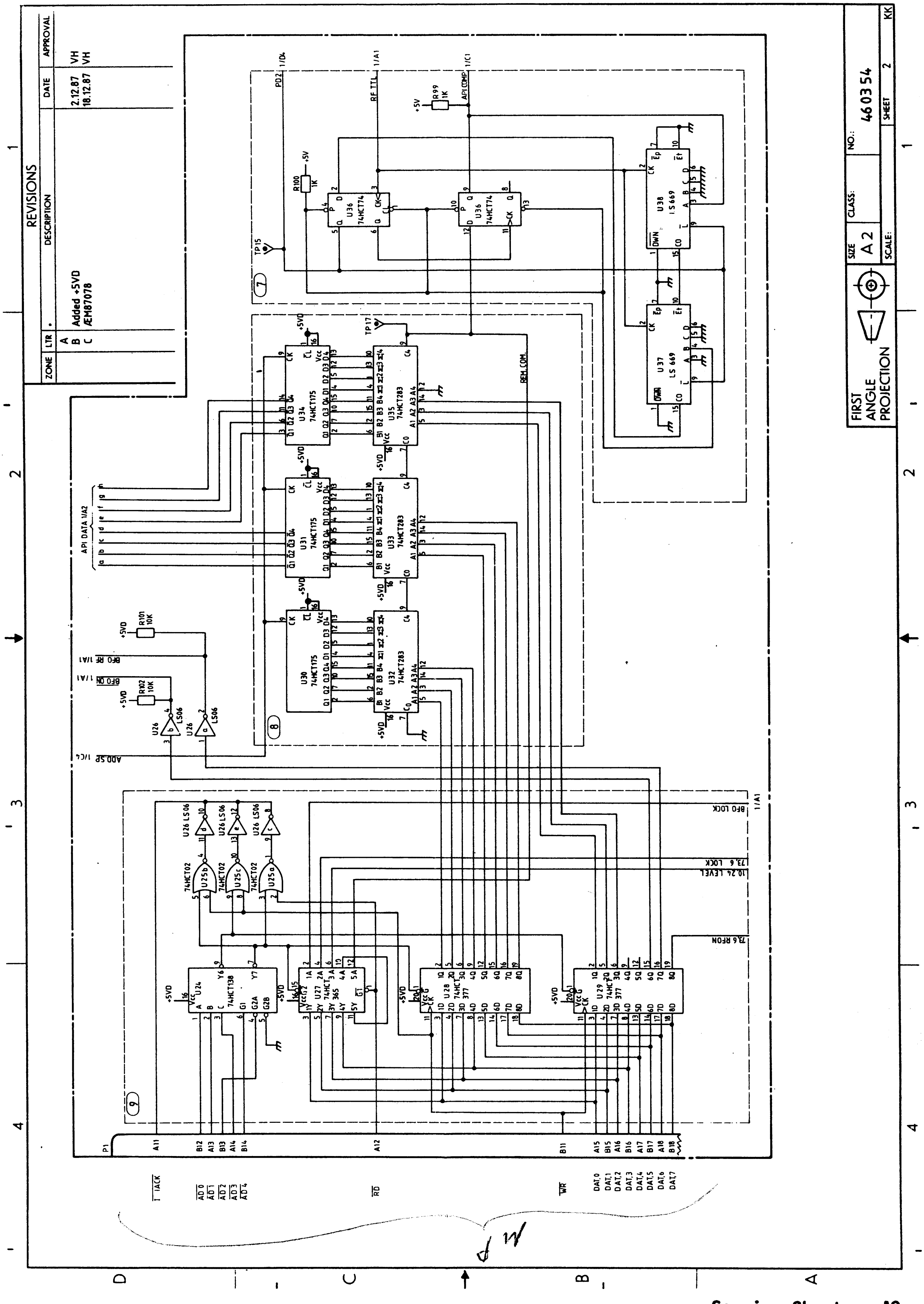


471712	RX4000	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 207	
490008	RX4010	ANGLES	
488100	SC4010	LIN. DIM	
NEXT ASSY	USED ON	MATERIAL	
APPLICATION			

DR Bau	80 09 26	Dansk Radio AS
CH F. Winther	801009	TITLE FREQUENCY GENERATOR STANDARD
AP		
AP		
FIRST ANGLE PROJECTION		SIZE A1 · CODE IDENT · DRAWING NO 46 03 54
		SCALE · SHEET 1 OF 1

(19) Divider.

U7 - 8 - 9 divides the input frequency on 5,12 MHz (TP8) with 160. The output TP3 is a negativ puls with a width of 150 nS. The signal is used as input to the phasedetector.



Service Sheet A2

2

(10) Divider.

U1 - 2 - 3 divides the input frequency of 3,68 MHz with 115 to 32 kHz (31,25 nS) TP1. This signal feeds the phase/freq. detector. The signal in TP1 is a negativ puls with a width of approx. 270 nS.

(11) Phase-Frequency Detector.

U3 performs a SET-RESET phase/freq. detector. It compares the 32 kHz from U1 - 2 - 3 (TP1) with a reference signal from U9b, TP3. The output TP2 is a duty cycle controlled square wave with a frequency of 32 kHz.

(12) Fine Regulator.

The +15V is stabilized to a +11V low noise reference for the 73,6 MHz VCXO and the 1,4 MHz VCO.

(13) 73,6 MHz VCXO.

The X-tal Y1 operates in serie-resonans mode with the voltage controlled circuit CR1, L2. It forms the feedback path in the oscillator performed by Q1 and the low Q tuned circuit L1, C8, C9. L3 eliminates the parallel capacitance in Y1. U10c ECL amplifier operates as buffer amplifier. The tune voltage in TR5 is nominel adjusted to +4V by L1, at 25^{O}C room temperature.

(14) Output Amplifier.

The 73,6 MHz +7 dBm output is performed by 1/3 ECL amplifier U10c and Q3 with the tuned circuit L2, L19, L7. R31-32-33 is at 3 dB attenuator which give a more exact 50 Ω output. An RF ON/OFF switch function is performed by U16 and Q2. The output is disabled by approx. 60 dB.

(15) ECL to TTL Translator.

U10b performs an isolation and driver amplifier for Q4, Q5 emitter coupled amplifier. L8, L9, R38 is a peaking circuit.

(16) Prescaler.

U11 divides by 4. The output is 18,4 MHz, TP6.

(17) Divider.

U12 divides the 18,4 MHz by 5. The output is 3,68 MHz, TP7.

(18) Loop Filter.

The square-wave from the phasedetector is integrated by R8, C2. U6 is an amplifier-filter removing the 32 kHz from the control voltage to the VCXO. The loop bandwide is approx. 10 Hz.

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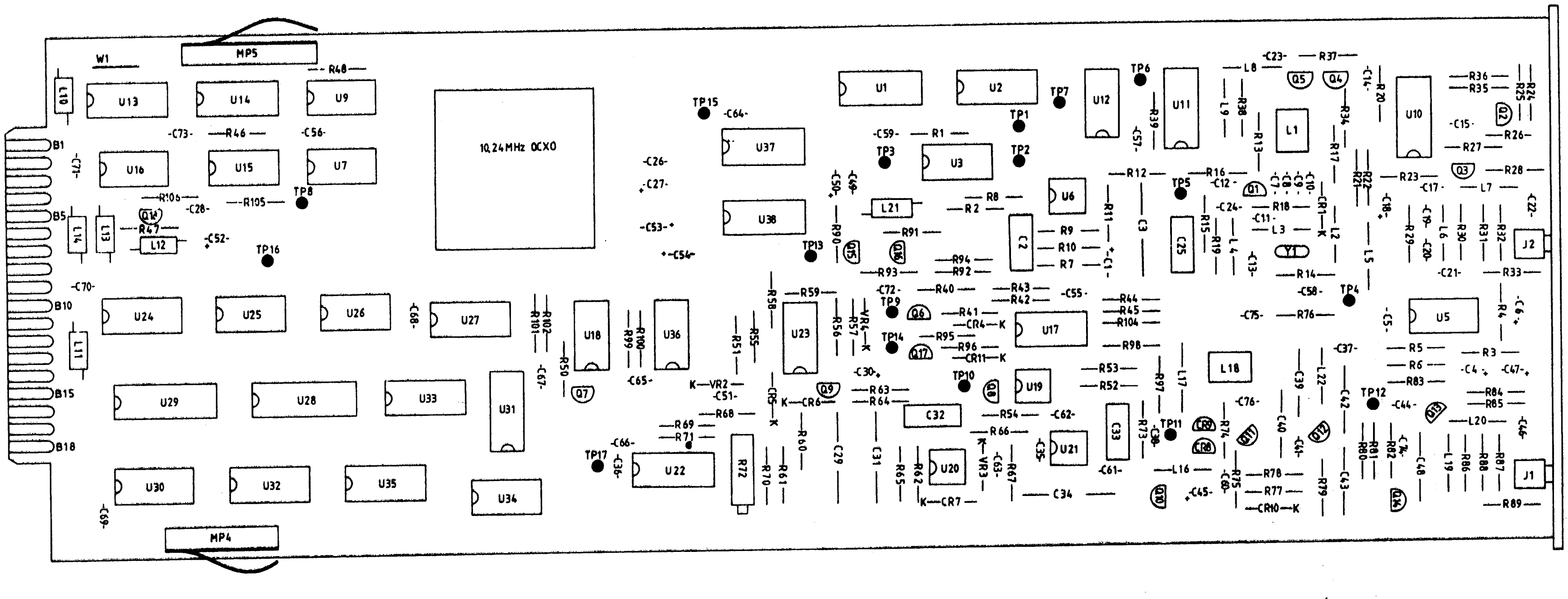
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87039	18.12.87	VH



471712	RX4000	
490008	RX4010	
488100	SC4010	
NEXT ASSY	USED ON	
APPLICATION		

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 207

ANGLES

LIN. DIM

MATERIAL

DR 800926

CH F. Walter 801009

AP

AP

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE FREQUENCY GENERATOR STANDARD

SIZE	CODE IDENT	DRAWING NO
A1		46 03 54
SCALE		SHEET 1 OF

(20) Reference Divider.

The buffed Main reference oscillator signal on 10,24 MHz is feed to a divide by 2 (U15a), a divide by 250 performed by U13-14-9d-15b,and a detector Q18, that indicates the presence of the 10,24 MHz. The output from U15b is used as a 40,96 kHz reference signal. The buffed signal from U16d is a negativ puls with a width of approx. 100 nS.

(21) Lockdetector.

The control voltage to the 73,6 MHz VCXO is feed to a window detector 1/2 U17. The loop is within proper conditions when this voltage is $-10V < V < +9V$. Under this condition Q6 gives a HIGH, TP9.

(22) Filter.

Power supply filter system.

(23) TCXO. Opt.000

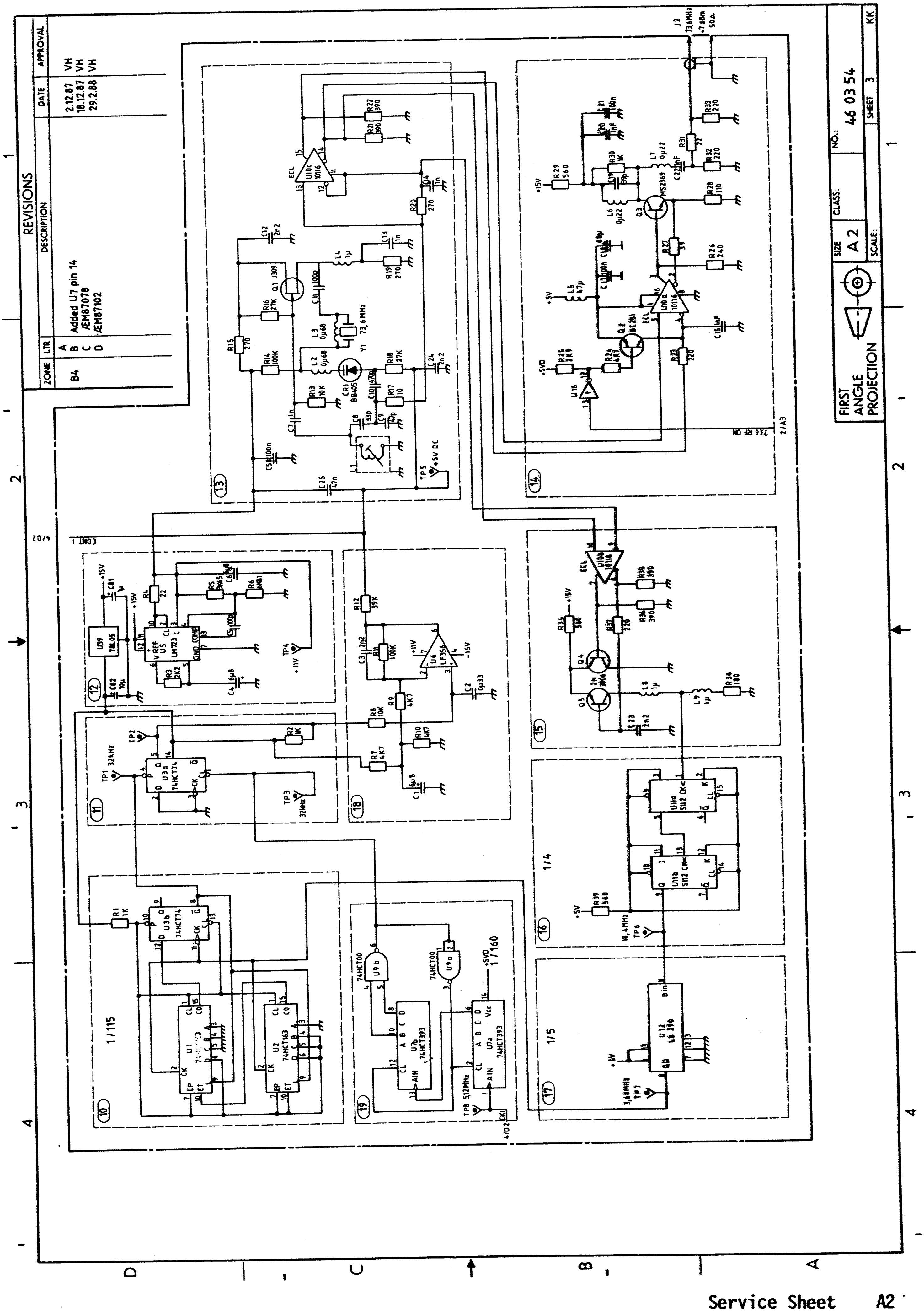
Master reference temperature compensated oscillator on 10,240 MHz.

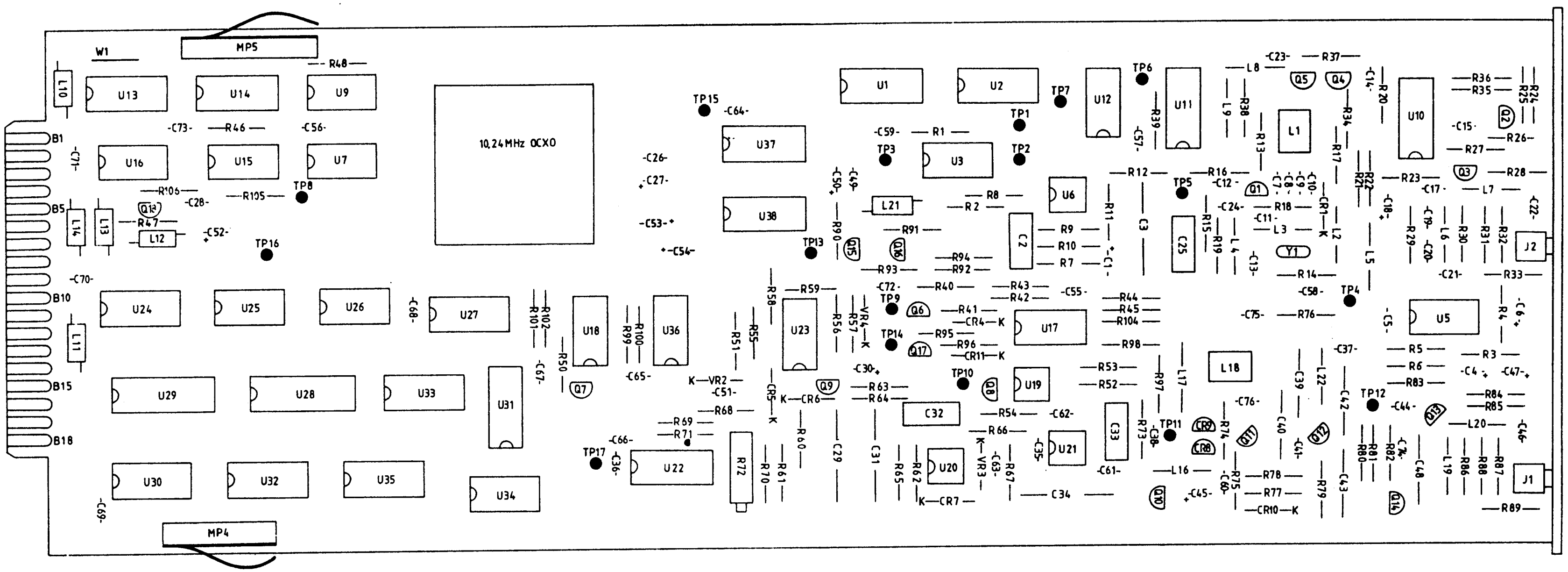
R49, frequency fine tuning adjustment.

(23) OCXO Opt.005

Master reference oven stabilized oscillator on 10,240 MHz

R49, frequency fine adjustment.


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
B4 A Added U7 pin 14 2.12.87 VH
B ÆM87078 18.12.87 VH
C ÆM87102 29.2.88 VH
D
FIRST ANGLE PROJECTION
SIZE A2
CLASS:
NO.: 46 03 54
SHEET 3
KK



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87039	18.12.87	VH

471712	RX4000
490008	RX4010
488100	SC4010
NEXT ASSY	USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 207

ANGLES

LIN. DIM

MATERIAL

DR 80 09 26

CH F. Winther 801009

AP

AP

FIRST ANGLE PROJECTION

Dansk Radio AS dra

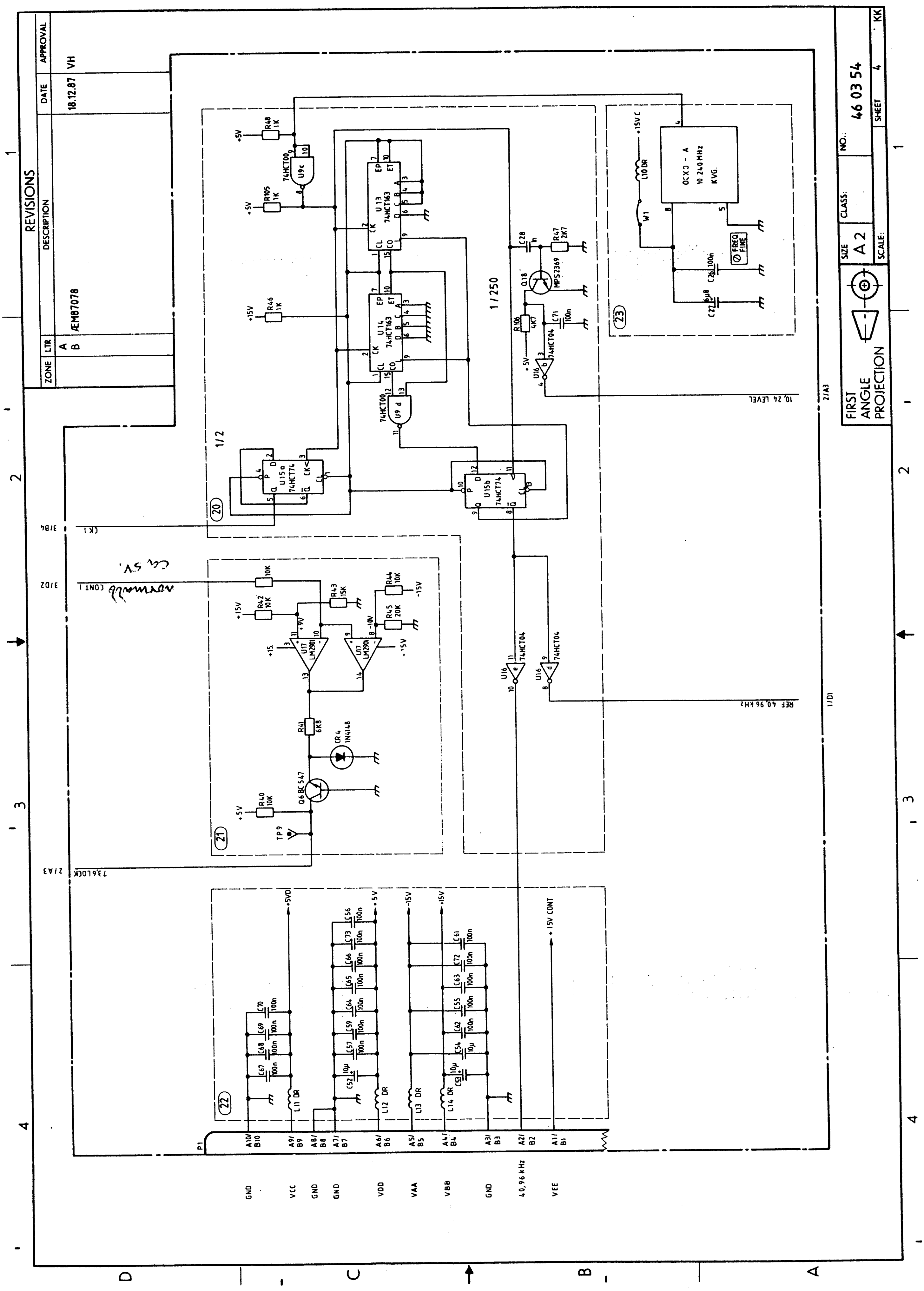
TITLE

FREQUENCY GENERATOR STANDARD

SIZE	CODE IDENT	DRAWING NO
A1		46 03 54

SCALE

SHEET 1 OF 1



Service Sheet A2

Assy 489638, FRONT-END ASSEMBLY

Service Sheet A3

Assy 489638, Front-End Assembly

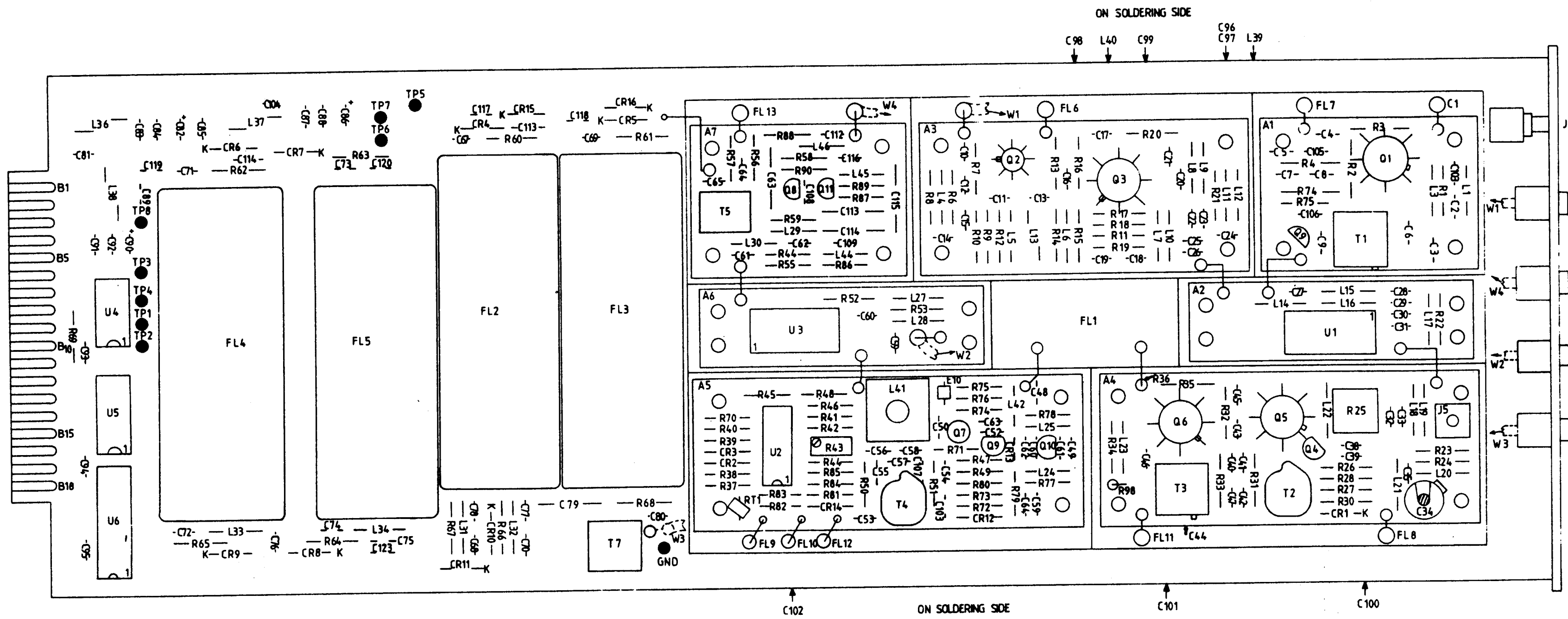
Schematic 1

1) RF Preamplifier.
Gain = +6 dB

2) First Mixer
Gain = -6 dB

3) 1.LO Amplifier
Gain = +17 dB

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87093-94-96 AND REVISED A7	19.1.88	VH



NOTE:
E1 - E3 MOUNTED ON W1
E4 - E6 — " — W2
E7 - E9 — " — W3
E11 - E12 — " — W5

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

ANGLES
LIN DIM
MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

DR VH 6.10 1987
CH
AP SN 6-10-87
AP

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
FRONT-END
RX4010

SIZE A1 | CODE IDENT | DRAWING NO 48 96 38
SCALE 2:1 | SHEET 1 OF 1

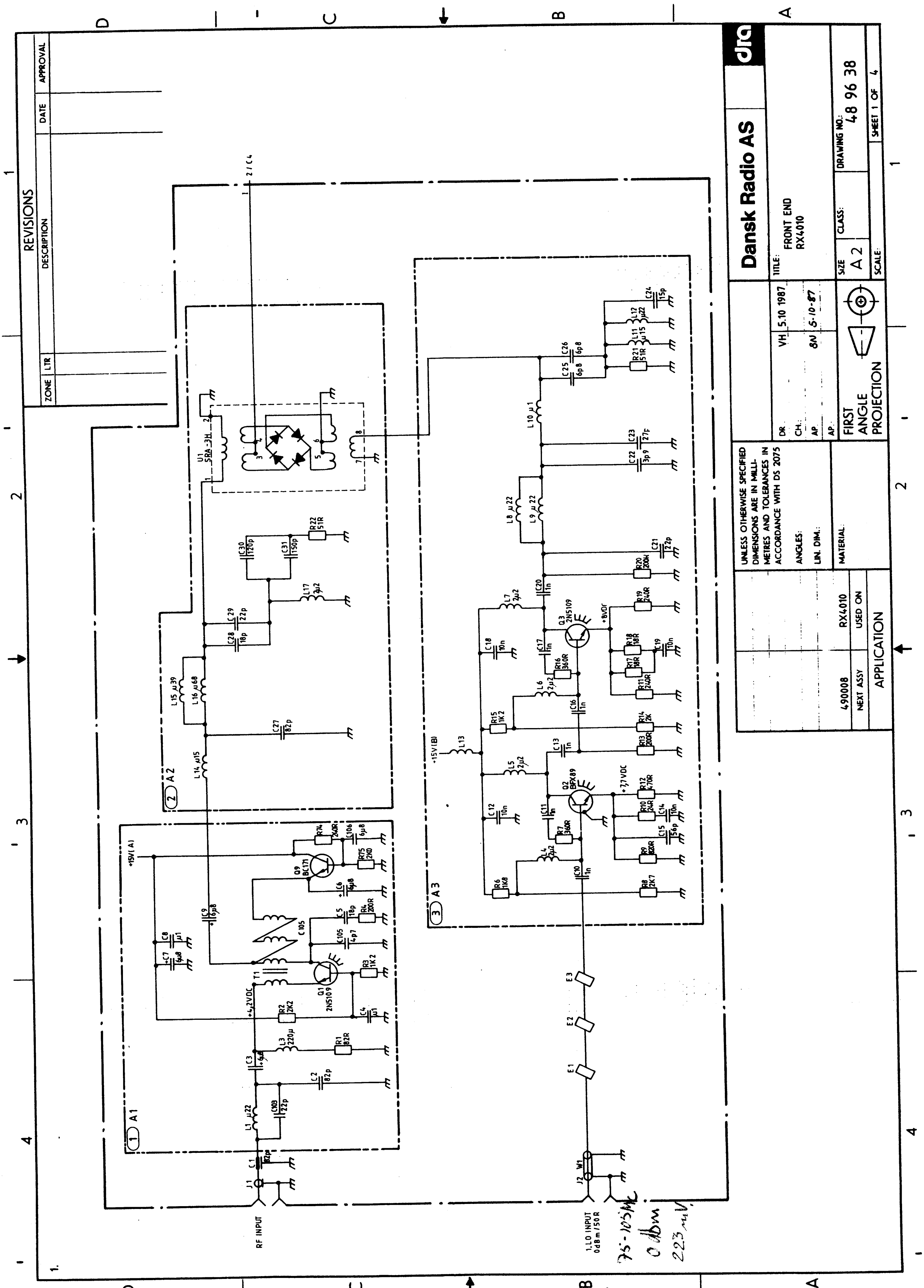
4) 75 MHz IF Amplifier
Voltage Gain = +14 dB
J5 is only used for factory adjustments.

5) 75 MHz X-tal filter
Gain = -4 dB

6) 75 MHz Voltage Controlled IF Amplifier
Voltage Gain = -41 dB to +9 dB approx. controlled by the dc-voltage applied to Gate 2 of Q7 and the current of CR13. C56 to C58 together with L41 form a 72.2 MHz rejection filter.

U2 with surrounding components form an AGC shaping circuit for the AGC voltage AGC1. Offset adjustment (R43): With AGC voltage AGC1 equal to 9V, the gain reduction of the IF amplifier is adjusted to 50 dB by means of R43 (T-amb. = +25°C). The voltage range of AGC voltage AGC1 is between 0V and +10V.

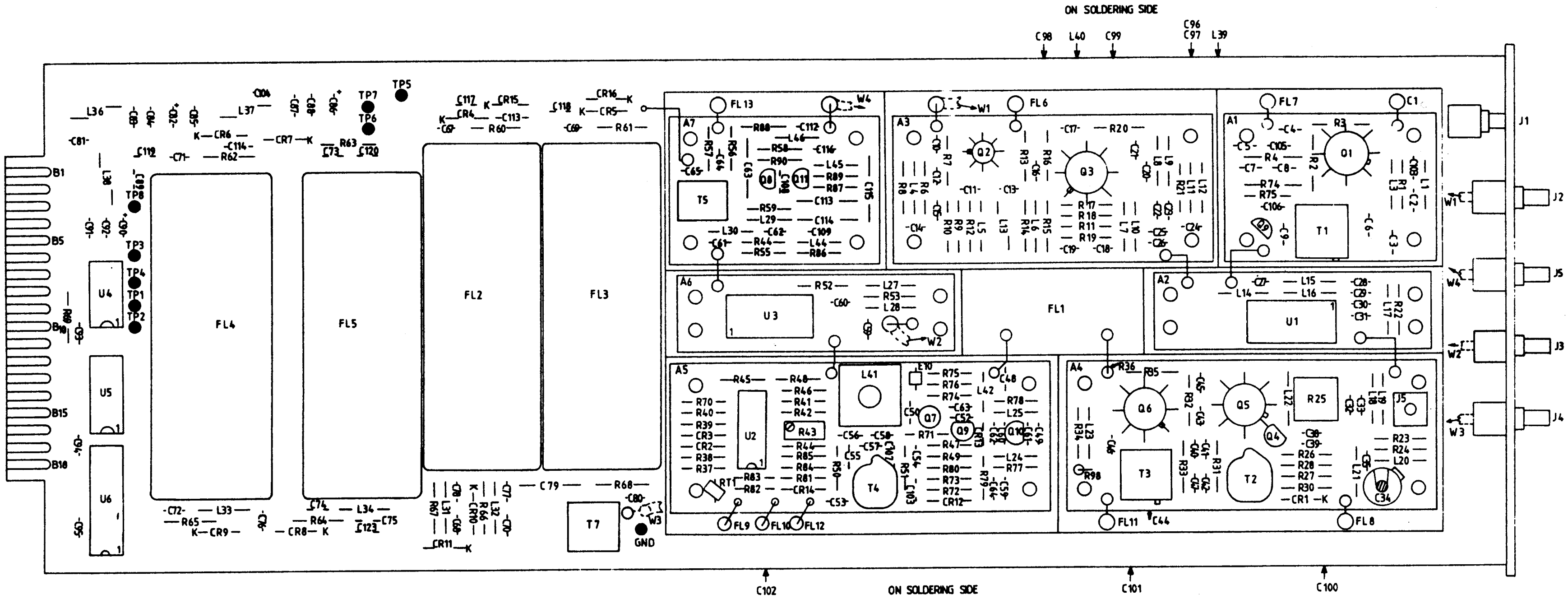
7) Feed-through Filter



Service Sheet A3

1.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87093-94-96 AND REVISED A7	19.1.88	VH



NOTE:
E1 - E3 MOUNTED ON W1
E4 - E6 — " — W2
E7 - E9 — " — W3
E11 - E12 — " — W5

49 00 08	RX4010
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	6.10 1987
CH		
AP	SN	6-10-87
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
FRONT-END
RX4010

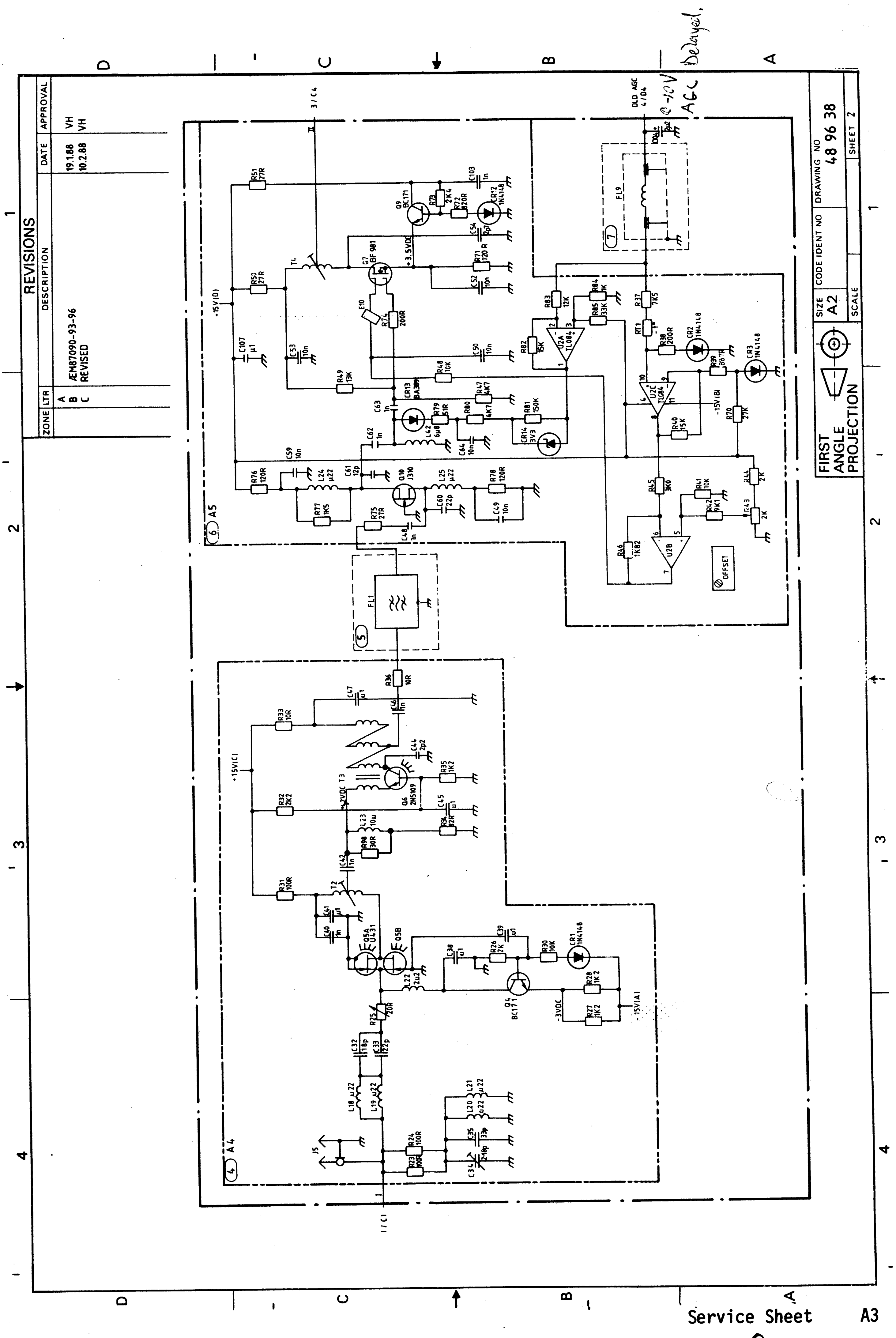
SIZE	CODE IDENT	DRAWING NO
A1		48 96 38

SCALE 2:1
SHEET 1 OF 1

8) Second Mixer
Translate the 75 MHz IF-signal to 1.4 MHz by mixing with 73.6 MHz.
Gain = -6 dB

9) 1.4 MHz Diplexer and Amplifier.
Voltage gain = +23 dB

10) Information Filterbank
The diodes at the input and at the output of the filters switch thecorresponding X-tal filter on, controlled by the logical level applied to U4. A logical 1 (+5V) switches the filter on.
Voltage gain = -18 dB



Service Sheet 2

A3

REVISIONS

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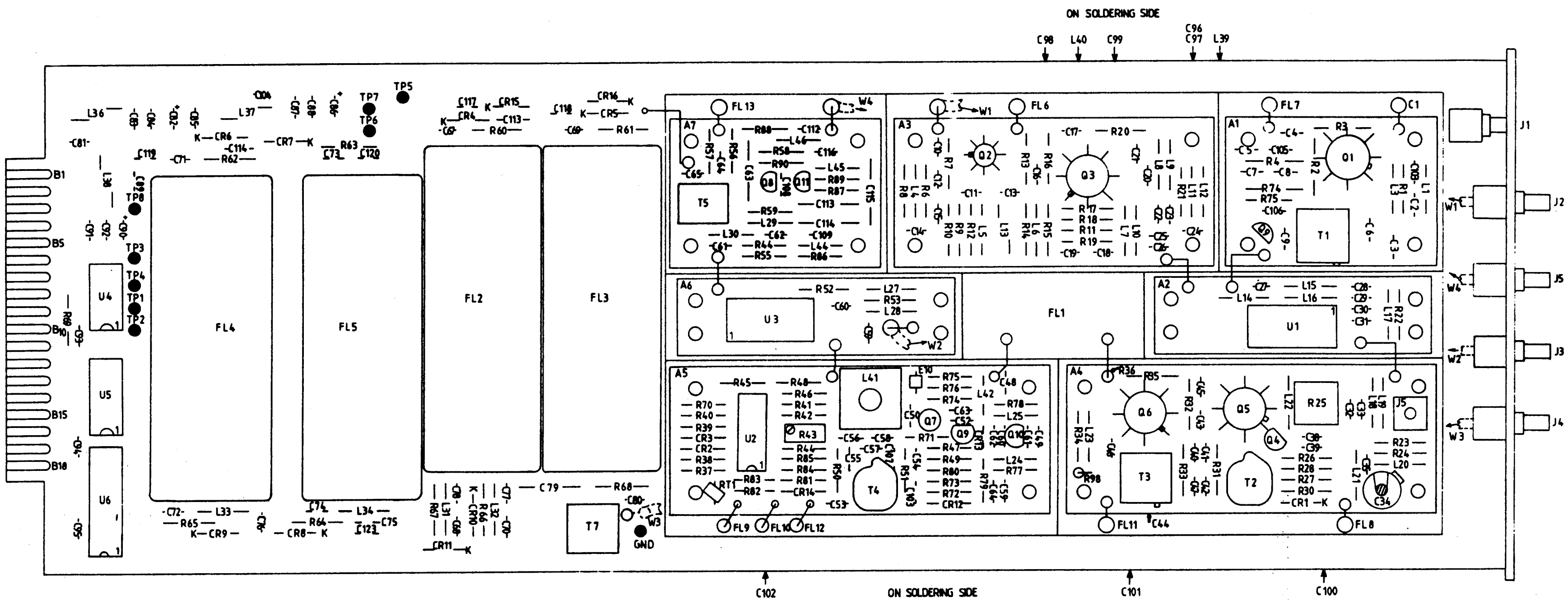
	B	ÆM87093-94-96 AND REVISED A7	19.1.88	VH



NOTE:

E1 - E3 MOUNTED ON W1
E4 - E6 — " — W2
E7 - E9 — " — W3
E11 - E12 — " — W5

49 00 08	RX4010
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	6.10 1987
CH		
AP	SH	6-10-87
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

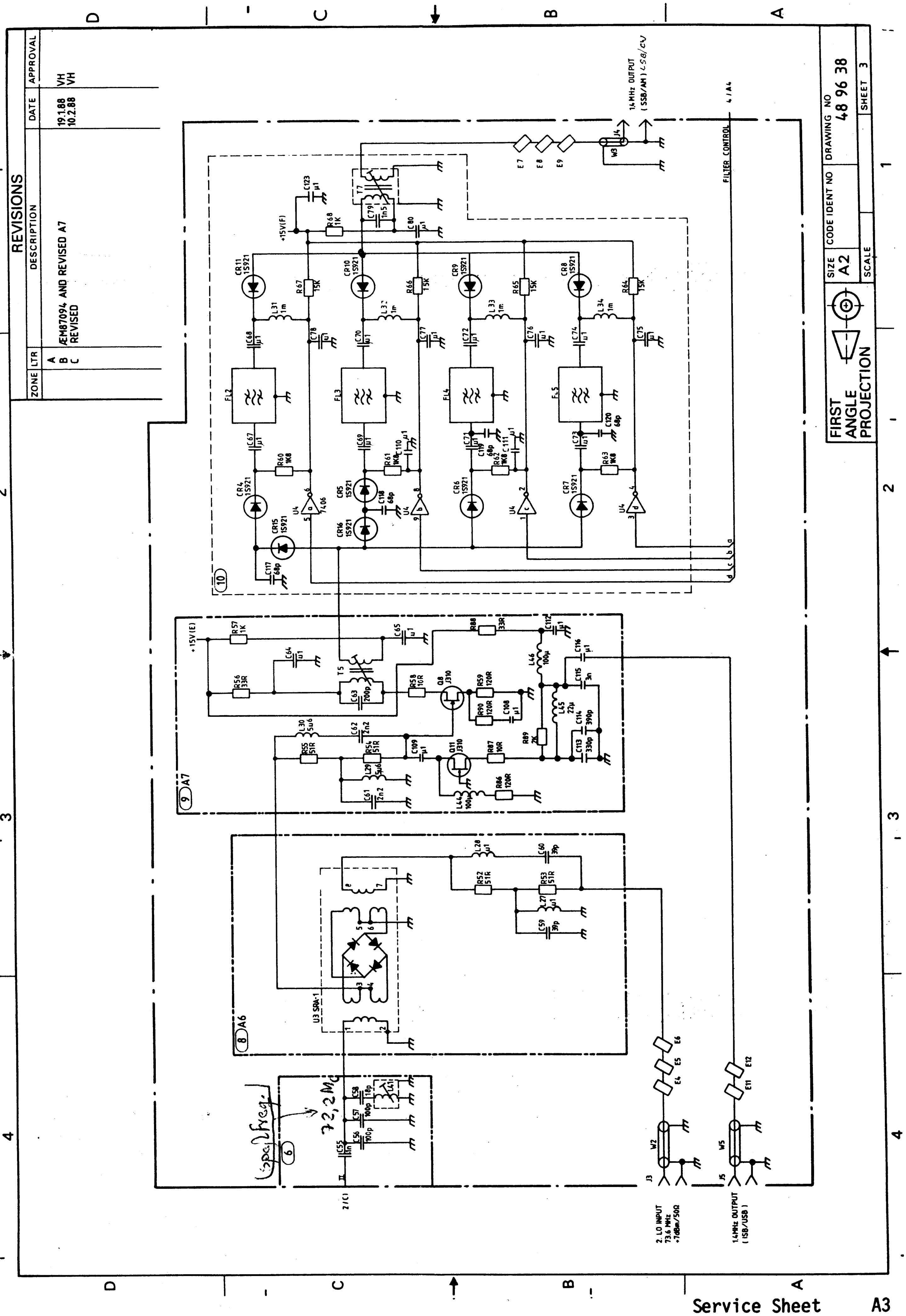
TITLE: COMPONENT LOCATION FRONT-END RX4010

SIZE	CODE IDENT	DRAWING NO
A1		48 96 38
SCALE 2:1		SHEET 1 OF 1

11) Filtering Circuit for Bias Voltages

12) Microcomputer Interface Circuit

The address of the module is FF26. When the five least significant address bits are applied to the assembly in inverting form, output U5-5 follows WR. On a positive transistion of WR, data is loaded into U6 and appears at the Q-outputs IIAck (A11) follows WR provided that the correct address is present.


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A ÆM87094 AND REVISED A7 19.1.88 VH
B REVISED 10.2.88 VH
C
1.4 MHz OUTPUT (SSB/AM) LSB/CW
FILTER CONTROL
2. LO INPUT 73.6 MHz +7dBm/50Ω
1.4MHz OUTPUT (ISB/USB)
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT NO
DRAWING NO 48 96 38
SHEET 3
SCALE

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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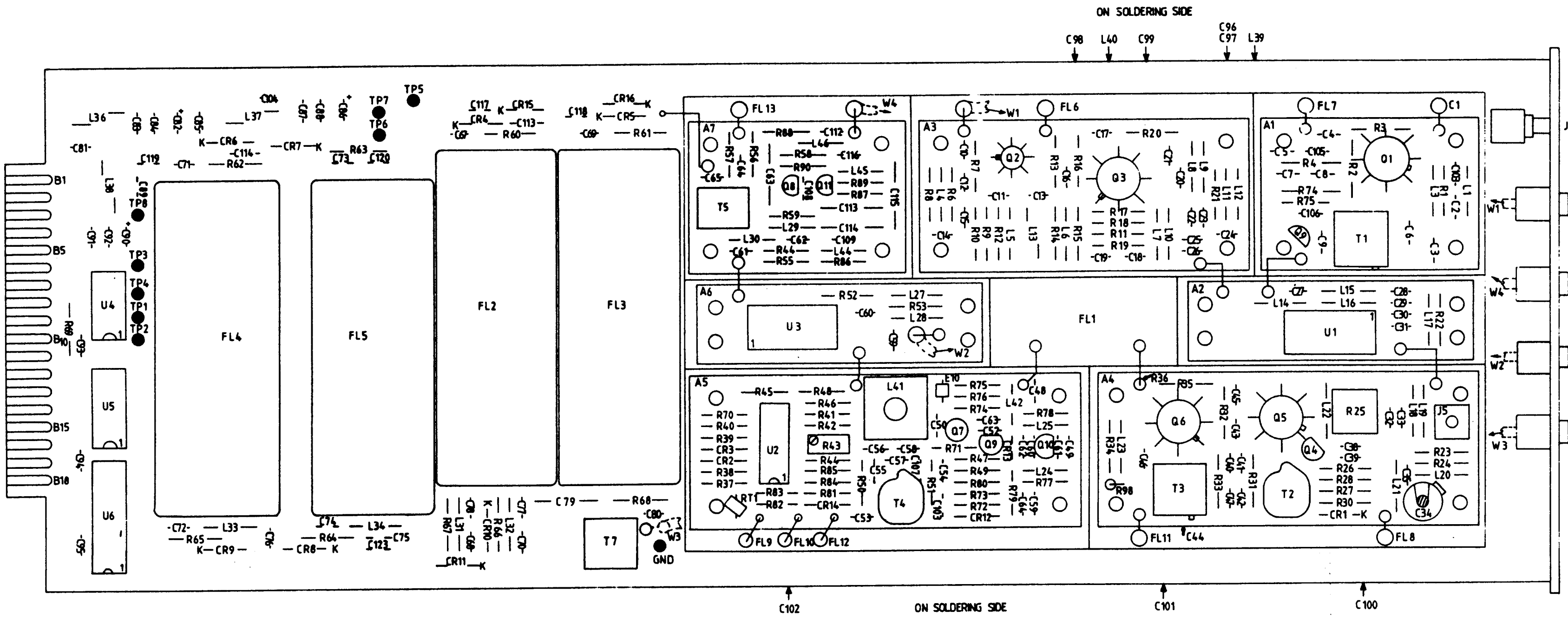
	B	ÆM87093-94-96 AND REVISED A7	19.1.88	VH



NOTE:
E1 - E3 MOUNTED ON W1
E4 - E6 — " — W2
E7 - E9 — " — W3
E11 - E12 — " — W5

49 00 08	RX4010
NEXT ASSY	USED ON
APPLICATION	

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

ANGLES
LIN DIM
MATERIAL

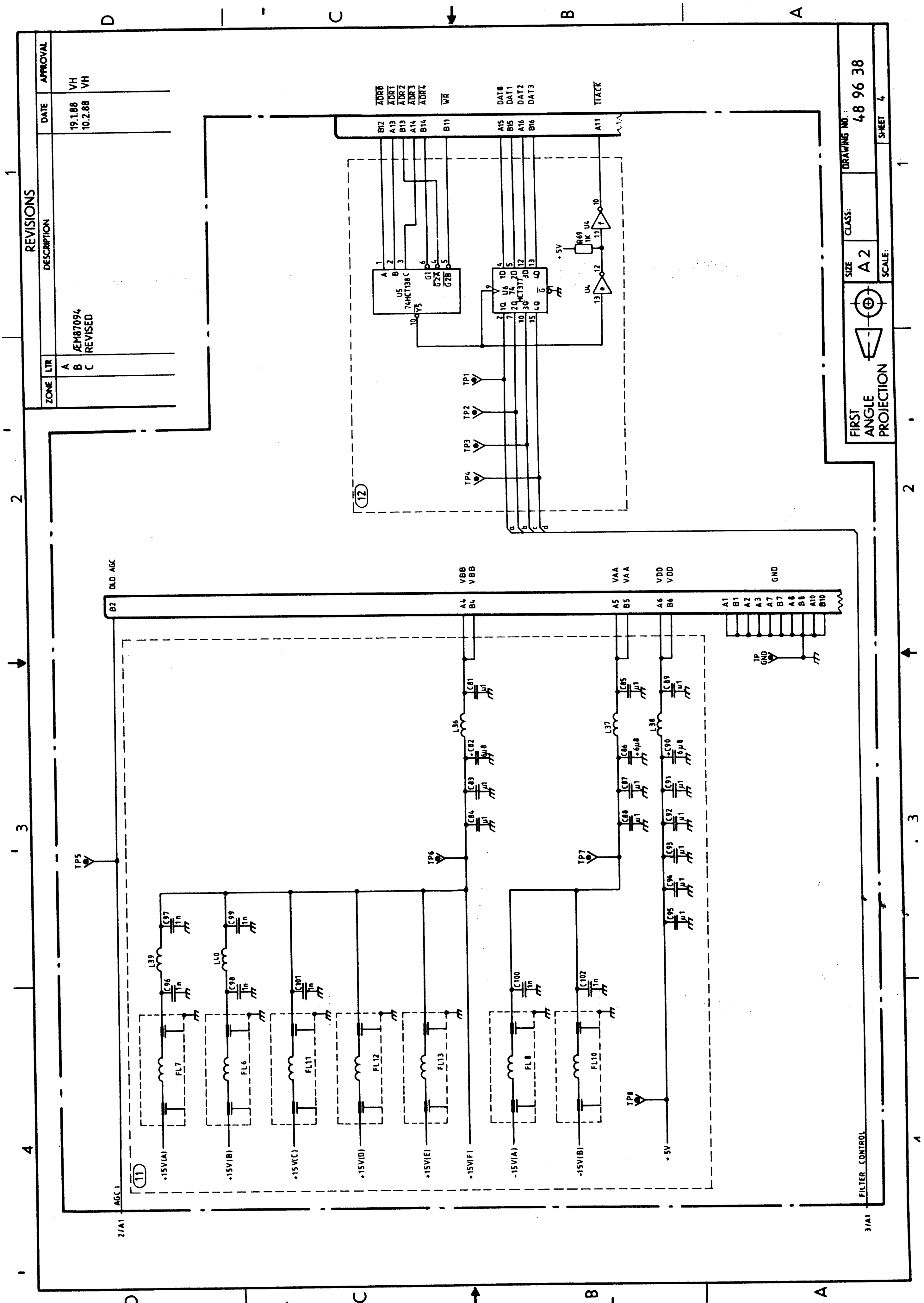
DR	VH	6.10 1987
CH		
AP	SH	6-10-87
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
FRONT-END
RX4010

SIZE	CODE IDENT	DRAWING NO
A1		48 96 38
SCALE 2:1		SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
ÆM87094
REVISED
19.1.88
10.2.88
VH
VH
FIRST
ANGLE
PROJECTION
SIZE
A2
CLASS:
SCALE:
DRAWING NO.:
48 96 38
SHEET 4
FILTER CONTROL

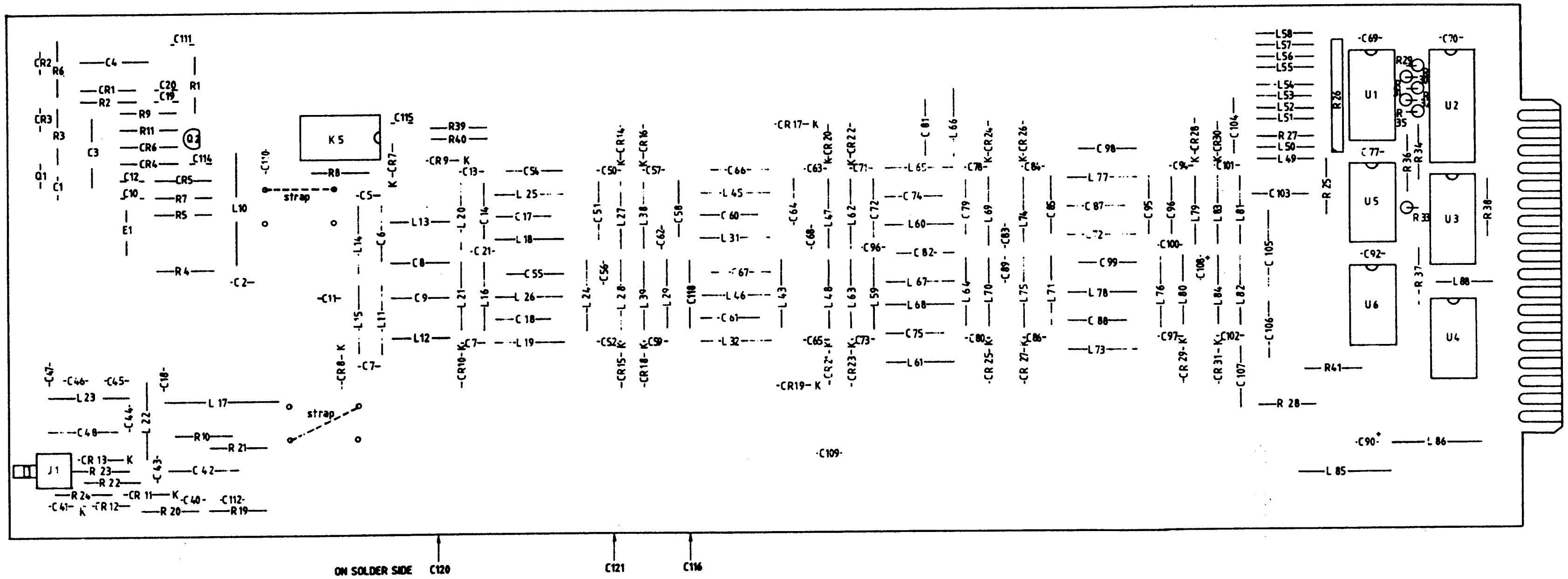
ASSY 490350, SUBOCTAVE FILTER

Service Sheet A4

Assy 490350, Sub-Octave Filters
Schematic 1

1) Input Protection Clipper
The output signal at C4 is limited to 10Vpp by CR2 and CR3.
At frequencies above 5 MHz Q1 will conduct when the RF voltage at C3 exceeds 10Vpp, thereby lowering the bias voltage at CR2 and CR3. This tends to make the clipping level frequency independent, as CR4 and CR5 are fast switching diodes.

3) Attenuator, Filters 13-20 MHz and 20-30 MHz
Relay K5 switches the 10 dB attenuator R8. Current to all range-switching diodes is supplied through resistors R4 (filter inputs) or R10 (filter outputs). A filter is switched in by a low level at the control line.



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.4.88	VH

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

ANGLES

LIN. DIM.

MATERIAL

49 00 08	RX4010
NEXT ASSY	USED ON

APPLICATION

DR. VH 22.10.1987

CH.

AP. SH 22.10.87

AP.

FIRST ANGLE PROJECTION

Dansk Radio AS dra

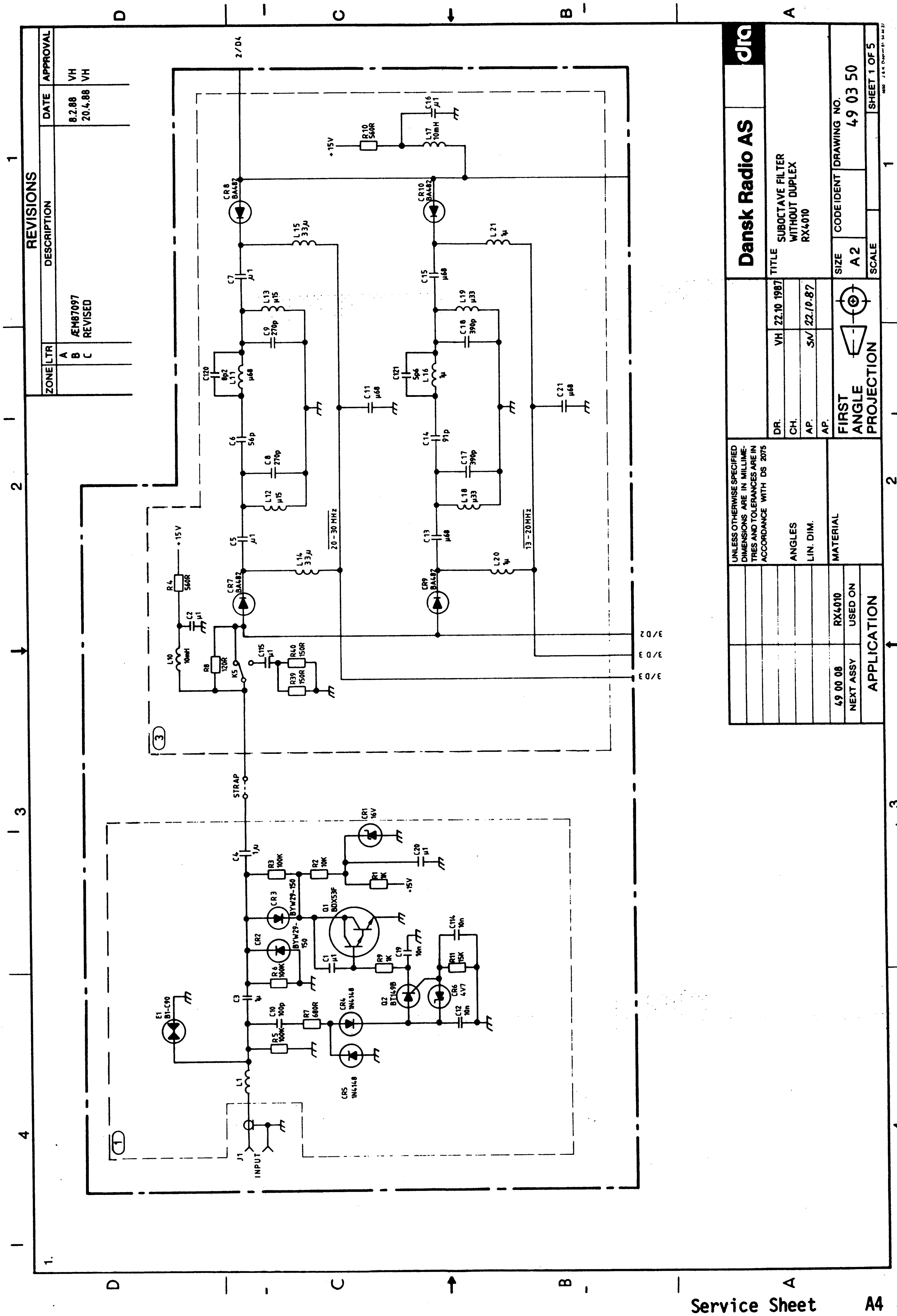
TITLE
COMPONENT LOCATION
SUBOCTAVE FILTER , WITHOUT DUPLEX
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		49 03 50

SCALE 2:1 | SHEET 1 OF 1

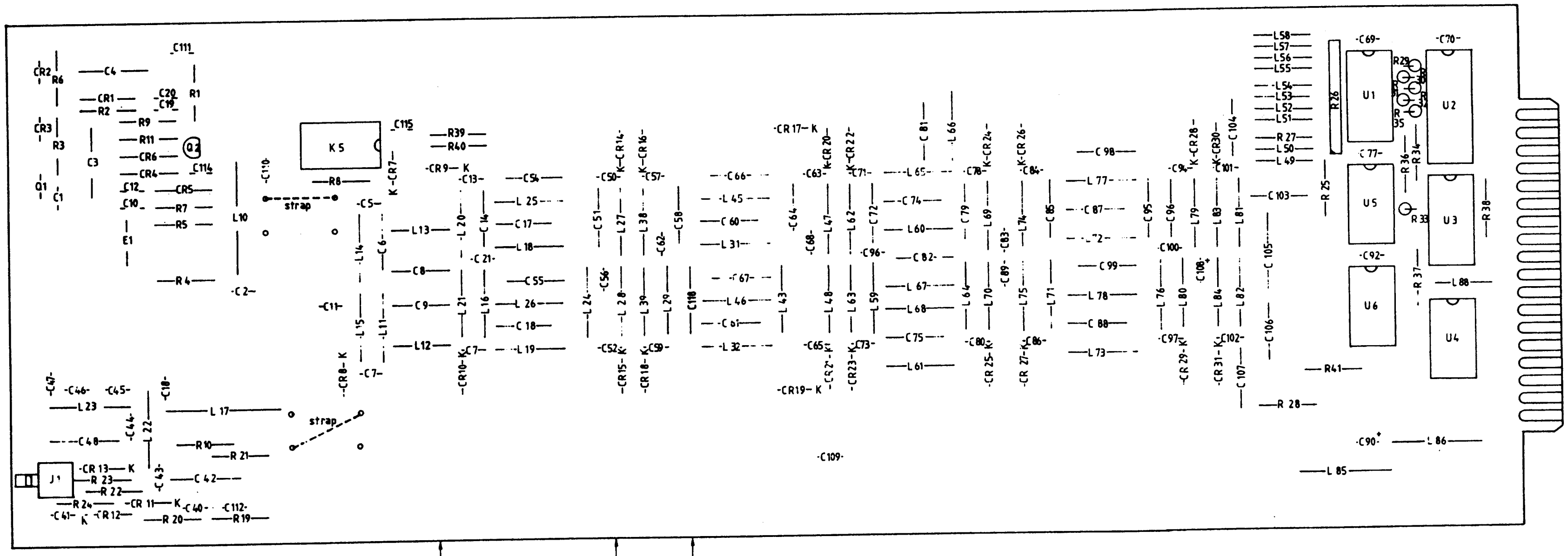
5) 30 MHz LP Filter

6) Output Protection Circuit
The output at C48 is limited to 6Vpp.


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A ÆM87097 8.2.88 VH
B REVISED 20.4.88 VH
Dansk Radio AS
TITLE SUBOCTAVE FILTER WITHOUT DUPLEX RX4010
DR. VH 22.10 1987
CH.
AP. SN 22.10.87
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 49 03 50
SCALE
SHEET 1 OF 5
49 00 08 RX4010
NEXT ASSY USED ON
APPLICATION
20-30 MHz
13-20 MHz
STRAP
INPUT

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.4.88	VH



49 00 08	RX4010	
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	22.10.1987
CH.		
AP.	SH	22.10.87
AP.		

FIRST ANGLE PROJECTION

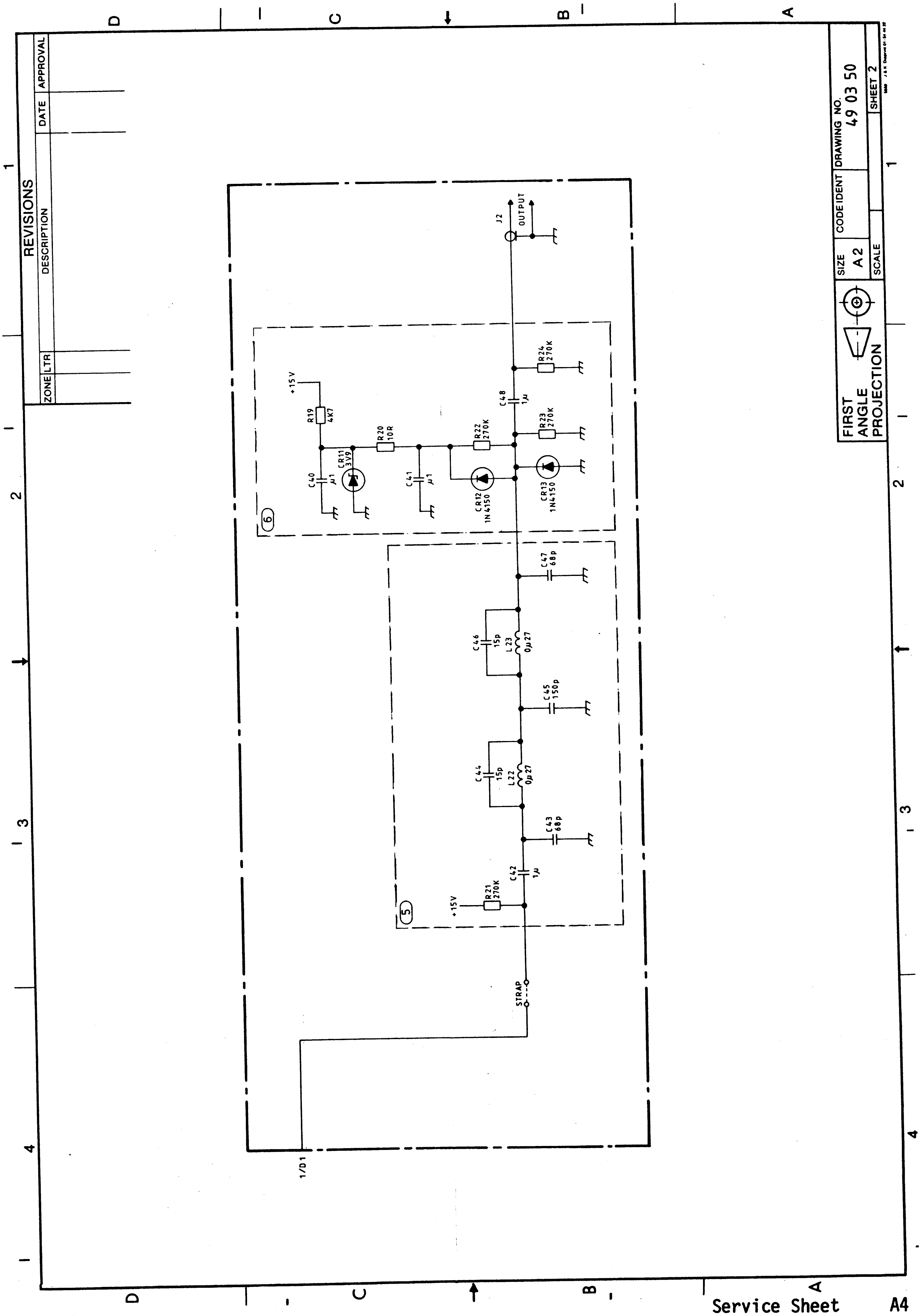
Dansk Radio AS

TITLE
COMPONENT LOCATION
SUBOCTAVE FILTER, WITHOUT DUPLEX
RX4010

SIZE	CODE IDENT	DRAWING NO
A1		49 03 50
SCALE 2:1		SHEET 1 OF 1

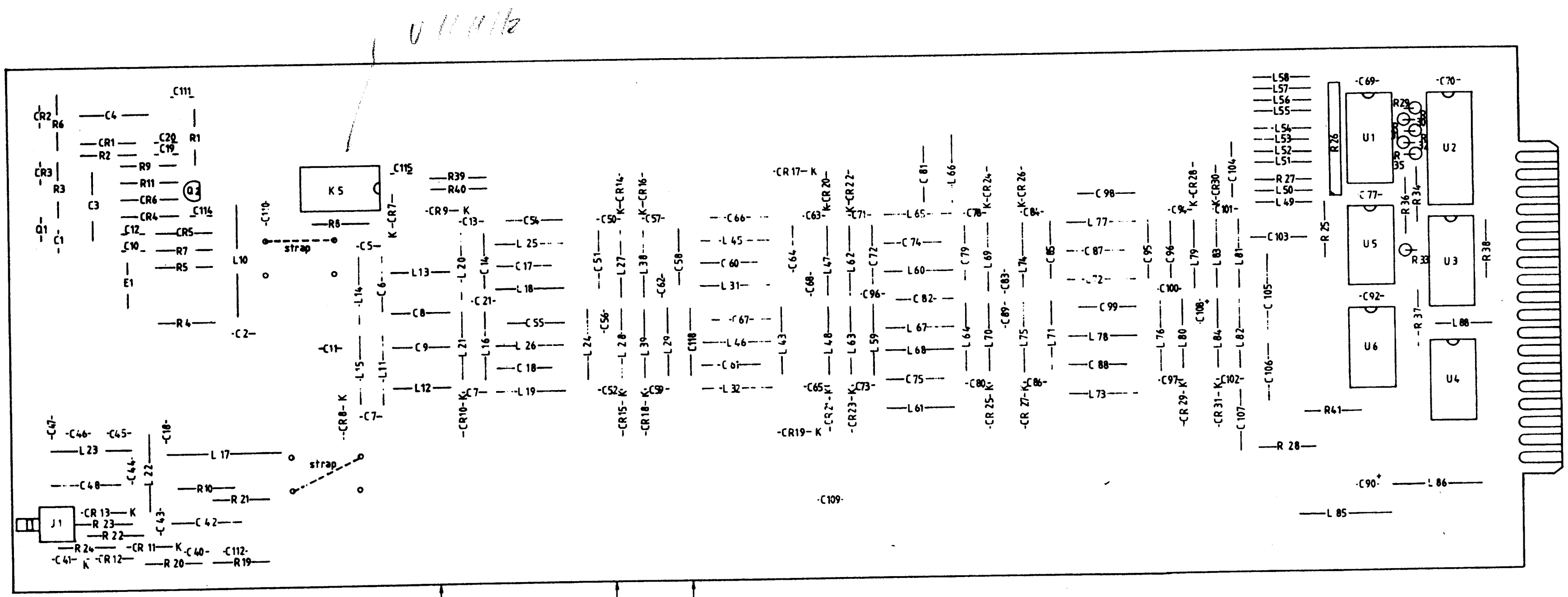
7) Range Decoder
U1 is a BCD to 1 of 10 decoders with open collector outputs.

8) Filters 3.6 - 5.5 MHz, 5.5 - 8.5 MHz and 8.5 - 13 MHz
A filter is switched in by a low level at the control line. Diodes CR17 and CR19 are conducting when a filter below 5.5 MHz is selected.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
J2
OUTPUT
R24 270K
C48 1µ
R23 270K
CR13 1N4150
R22 270K
CR12 1N4150
R20 10R
R19 4K7
+15V
CR11 3V9
C40 µ1
C41 µ1
6
C47 68p
C46 15p
L23 0µ27
C45 150p
C44 15p
L22 0µ27
C43 68p
C42 1µ
R21 270K
+15V
5
STRAP
1/D1
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
49 03 50
SHEET 2
SCALE

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.4.88	VH



ON SOLDER SIDE C120 C121 C116

49 00 08	RX4010
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	22.10.1987
CH.		
AP.	SH	22.10.87
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
SUBOCTAVE FILTER, WITHOUT DUPLEX
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		49 03 50
SCALE 2:1		SHEET 1 OF 1

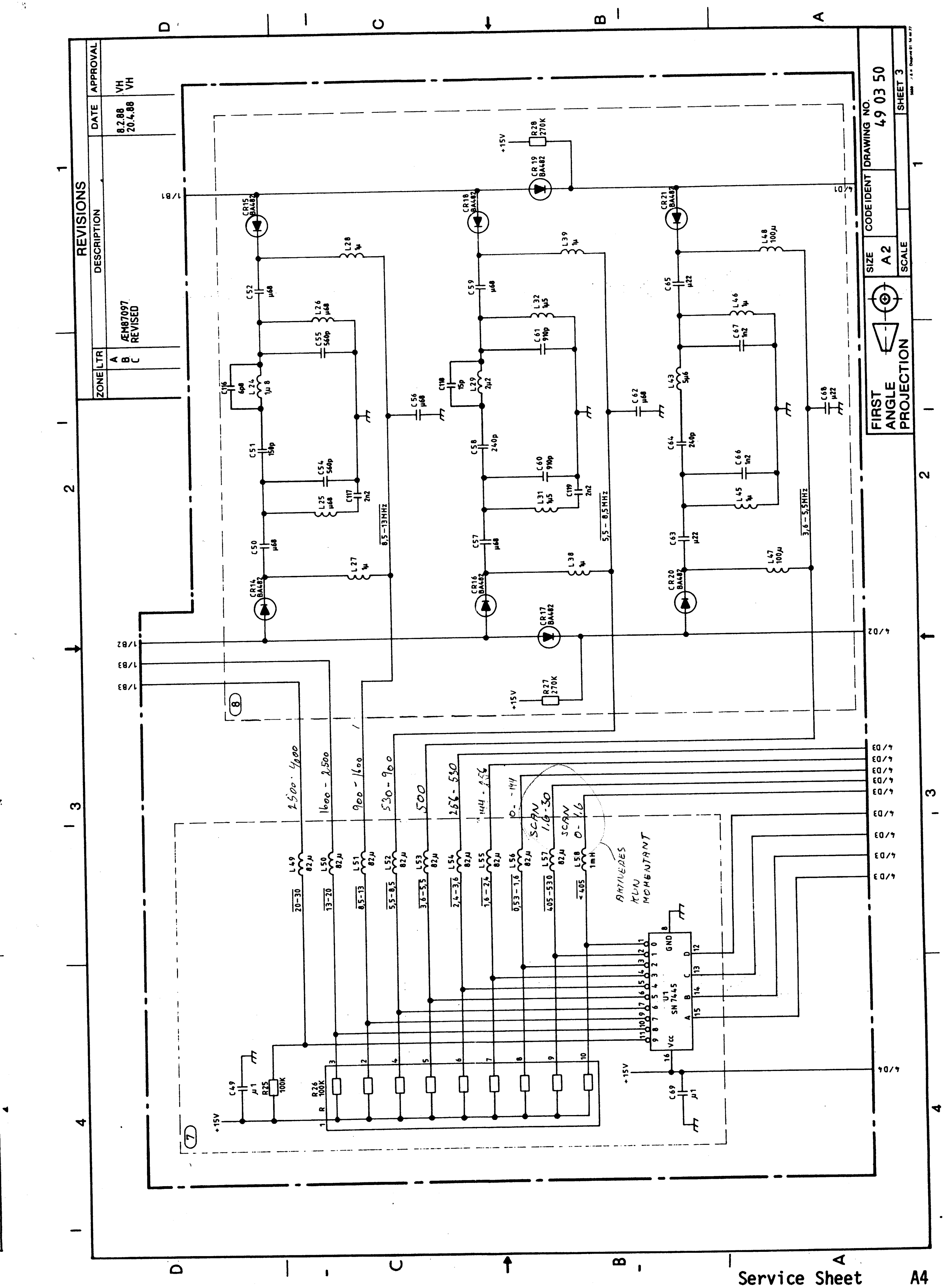
9) Data Latch

10) Address Decoder
When a correct address is present, output Y_o or Y_y go low.

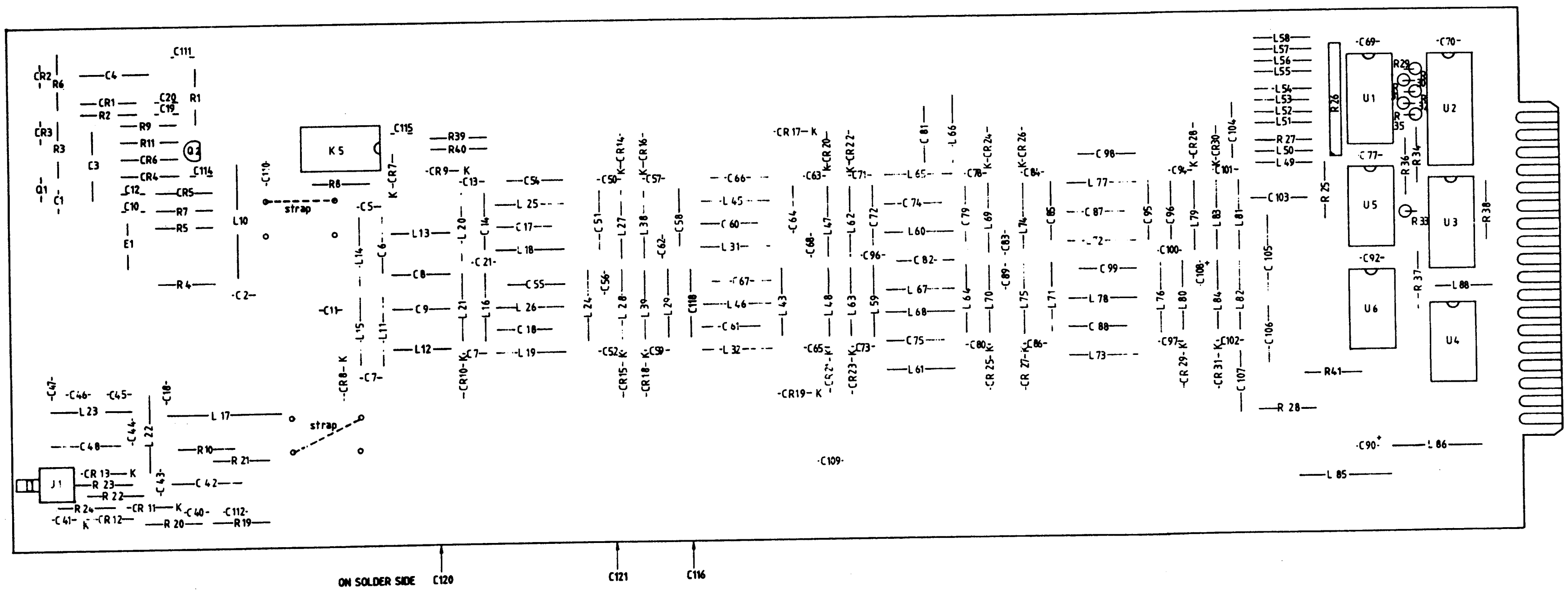
11) Acknowledge Driver
When a correct address is present, the acknowledge line (A11) is pulled low.

12) Gates

13) Filters 530 kHz - 3.6 MHz
A filter is switched in by a low level at the control line.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
SCALE
CODE IDENT
DRAWING NO.
49 03 50
SHEET 3

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.4.88	VH



49 00 08	RX4010
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 22.10.1987

CH.

AP. SH 22.10.87

AP.

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
SUBOCTAVE FILTER, WITHOUT DUPLEX
RX4010

SIZE A1 | CODE IDENT | DRAWING NO. 49 03 50

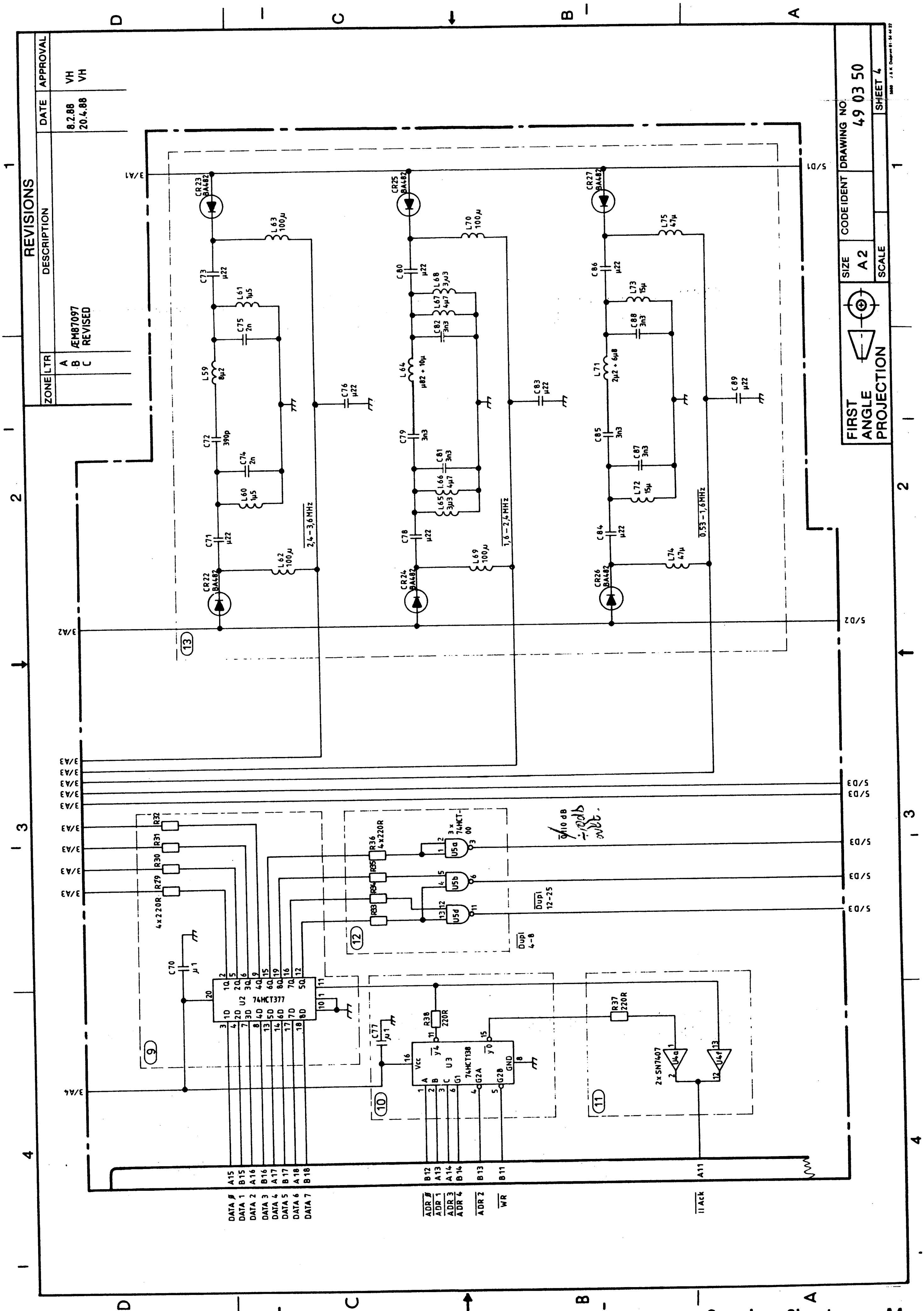
SCALE 2:1 | SHEET 1 OF 1

14) Supply Line Filters

15) Relay Drivers
The 10 dB attenuator is switched in when I5 is off.

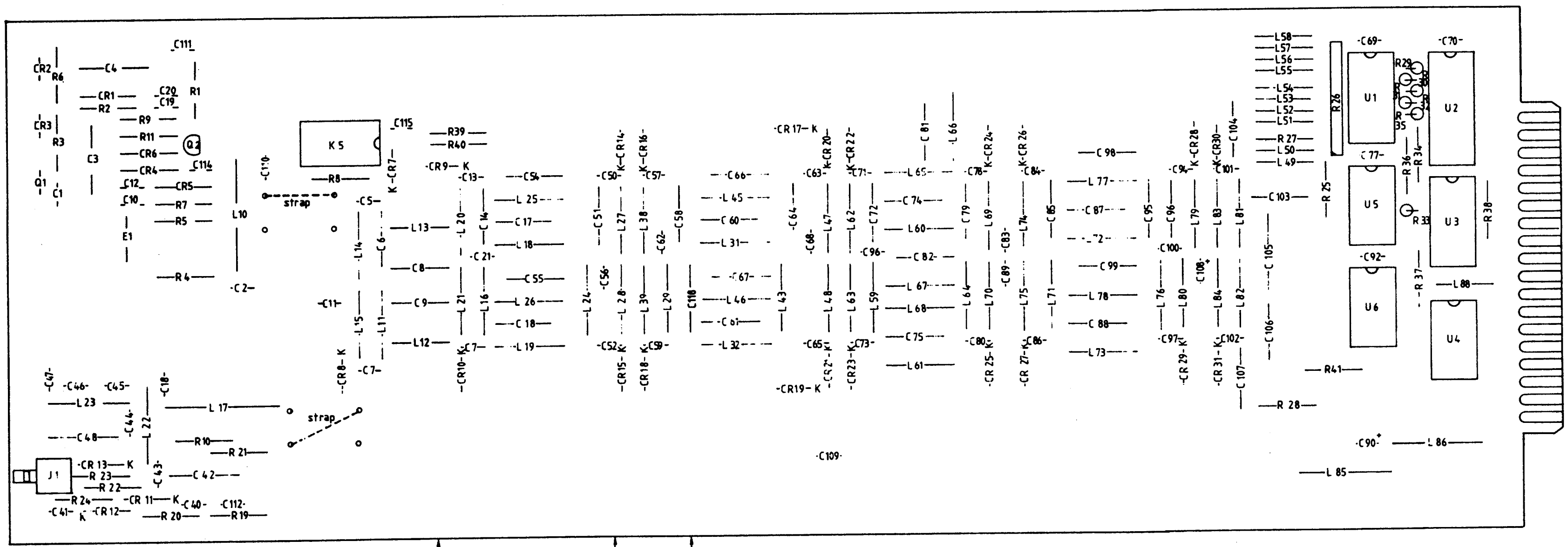
Duplex filters 4 - 6 - 8 MHz are switched in when K3, K4, K7 and K8 are on and K1 and K9 are off.

16) Filters 15 kHz - 530 kHz
A filter is switched in by a low level at the control line.



REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A ÆM87097 8.2.88 VH
B REVISED 20.4.88 VH
C
FIRST ANGLE PROJECTION
SIZE A2
SCALE
CODE IDENT
DRAWING NO. 49 03 50
SHEET 4
2,4-3,6MHz
1,6-2,4MHz
0,53-1,6MHz
74HCT377
74HCT138
2xSN7407
3x 74HCT-00
4x220R
DATA Ø
DATA 1
DATA 2
DATA 3
DATA 4
DATA 5
DATA 6
DATA 7
ADR Ø
ADR 1
ADR 3
ADR 4
ADR 2
WR
II Ack

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.4.88	VH



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

ANGLES
LIN. DIM.
MATERIAL

NEXT ASSY	USED ON
49 00 08	RX4010

APPLICATION

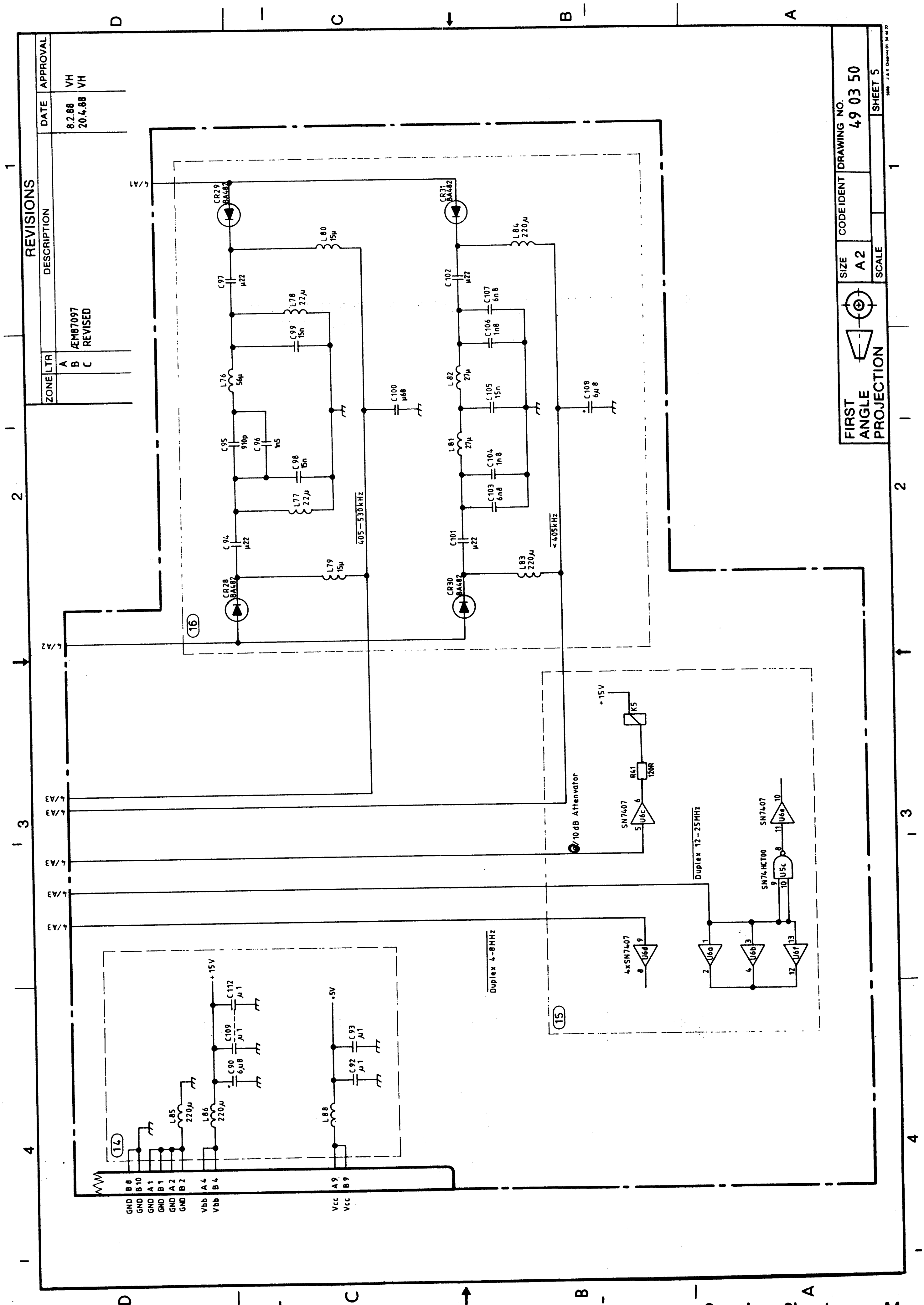
DR. VH 22.10.1987
CH.
AP. SH 22.10.87
AP.

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
SUBOCTAVE FILTER, WITHOUT DUPLEX
RX4010

SIZE A1 | CODE IDENT | DRAWING NO. 49 03 50
SCALE 2:1 | SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
C
ÆM87097
REVISED
8.2.88
20.4.88
VH
VH
FIRST
ANGLE
PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
49 03 50
SHEET 5
SCALE
CR29
BA482
CR28
BA482
CR31
BA482
CR30
BA482
L80 15µ
C97 µ22
L78 22µ
C99 15n
L76 56µ
C100 µ68
C95 910p
C96 1n5
C98 15n
L77 22µ
405-530kHz
C94 µ22
L79 15µ
C102 µ22
L84 220µ
C107 6n8
C106 1n8
L82 27µ
C105 15n
C108 6µ8
L81 27µ
C104 1n8
C103 6n8
<405kHz
C101 µ22
L83 220µ
16
4/A1
4/A2
4/A3
4/A4
+15V
K5
R41 120R
SN7407
U6c
10dB Attenvator
Duplex 12-25MHz
SN74HCT00
U5c
U6e
Duplex 4-8MHz
4xSN7407
U6d
U6a
U6b
U6f
15
14
+15V
C112 µ1
C109 µ1
C90 6µ8
L85 220µ
L86 220µ
+5V
C93 µ1
C92 µ1
L88
B8
B10
A1
B1
A2
B2
A4
B4
A9
B9
GND
Vbb
Vcc

ASSY 471577, RTTY Demodulator

Service Sheet A6

1 Address decoder.
When a correct address is present at the address bus, output U1-Y4 or U1-Y5 goes low to enable the relevant chip in block 2 or 3. U6 and U7 provide the acknowledged signal $\overline{\text{IIACK}}$ to the microprocessor.

2 A/D converter.
U2 is a selfcontained A/D converter. The input range to U2-6 is 0-5V. U24b supplies a 2.5V reference. U5 is an analogue multiplexer with 8 input channels. The multiplexer is controlled by the microprocessor via latch U3. Channels 0 and 1 are used during the selftest program to measure +15V and -15V supply voltages.

Channels 2 through 6 supervise the RTTY demodulator.

Channel 7 is used during the selftest program to monitor the function of the current loop generator. The current loop output at J2 shall be open-circuited during this test.

3 Bus interface and data selector.
U3 is an 8 bit latch which delivers control data to the demodulator.

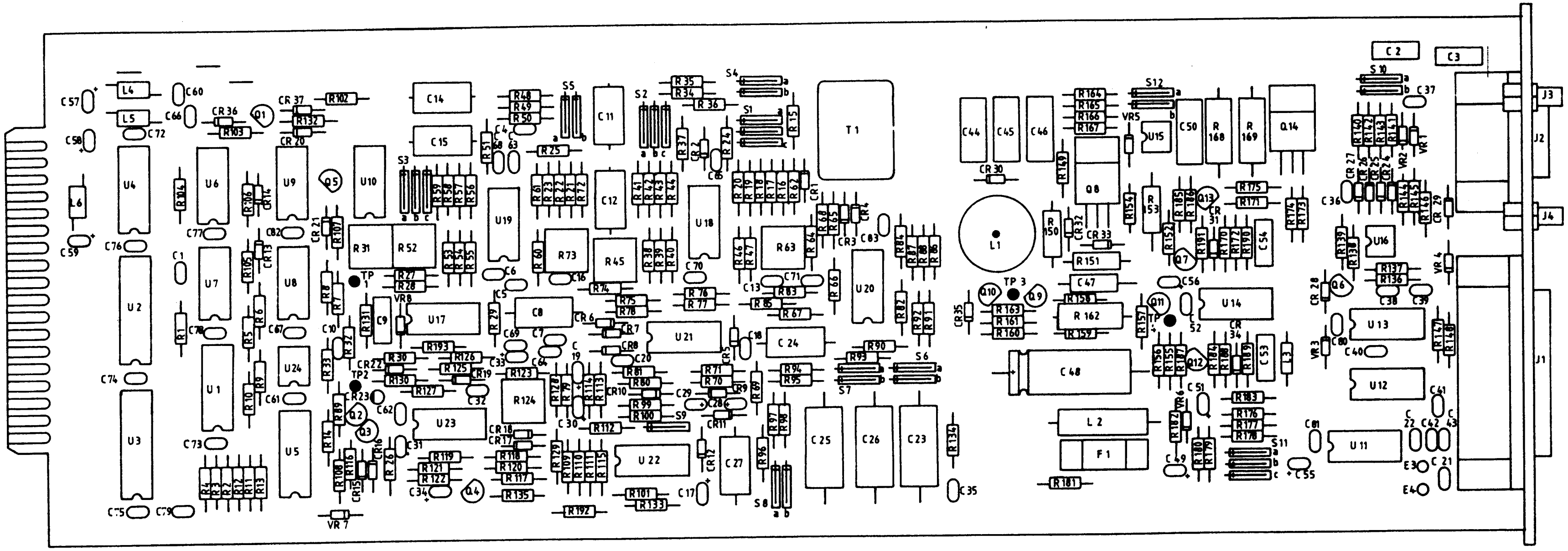
U4 is a 6 bit tri-state buffer which allows the microprocessor to read information- and control data from the demodulator.

The data selector U8 is controlled by U3-Q7, "SELECT EXT". When U3-Q7 is low, "DATAINT" is connected to "DATA 1" from the motherboard, provided "ANTISPACE" is low. This configuration allows optional dataprocessing equipment to communicate via the RS 232/current loop-port at the RTTY demodulator assy. It also allows the microprocessor to write out status messages to the teleprinter using the "ANTISPACE" line as a serial dataline.

1.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	REVISED C8 to C9 and C9 to C8	10.12.87	VH



471909	RC 4000	
471712	RX 4000	
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.	83-4-14	JL
CH. H. Aasten		22/4-83
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

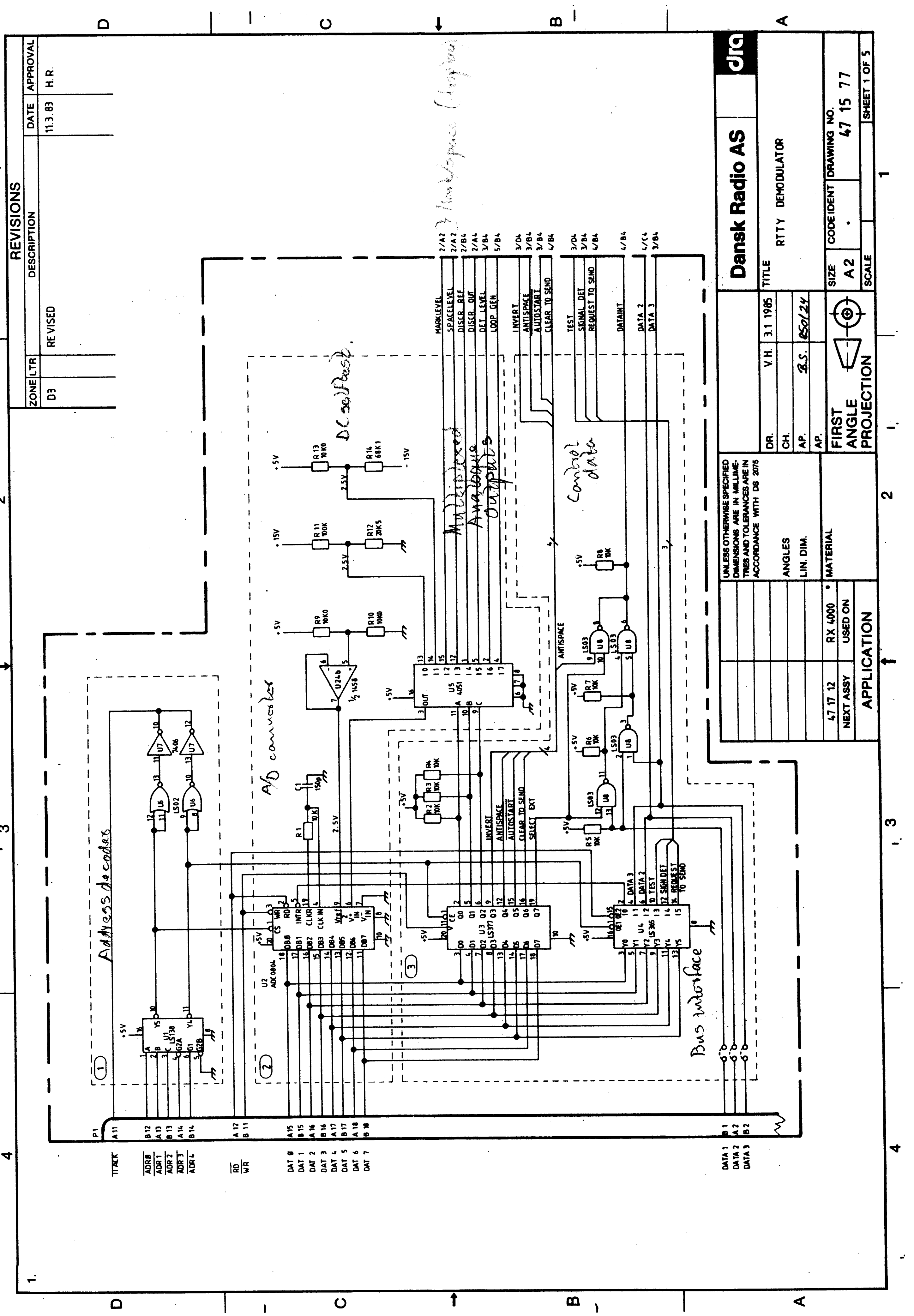
TITLE RTTY demodulator

SIZE	CODE IDENT	DRAWING NO.
A1		471577
SCALE		SHEET 1 OF 1

A diversity combining amplifier is placed between the subtractor and the filter.

With the output J4 from a second RTTY-demodulator, connected to the diversity-input J3 on the present RTTY-demodulator, the amplifier will average the 2 demodulated signals (post detection combining).

Output level from the LP-filter: 3Vpp.



Service Sheet A6

(4) AF-amplifier.
The AF-amplifier is divided into a 600 ohm balanced line input amplifier and an unbalanced AF-amplifier. The input level to the line input amplifier can be strapped (S1) to: 0dBm, -10dBm, -20dBm and -30dBm.

The unbalanced AF-amplifier receives input signal from the IF/AF-module (A7) via the motherboard. The input level is 280 mVpp. The mixed output from the 2 amplifiers is 590mVpp.

(5) Center frequency discriminator.
The discriminator is a PLL-type FM-discriminator. The center frequency is determined by R27, 28, 31 and C8, max. frequency deviation by R29 and loop damping by C9. The output from the discriminator is lowpass filtered through R30 and C10. The difference between DISCR. REF and DISCR. OUT is displayed on the front panel meter.

(6) Mark/Space filters.
Both of these filters are single pole bandpass filters of the gyrator type.

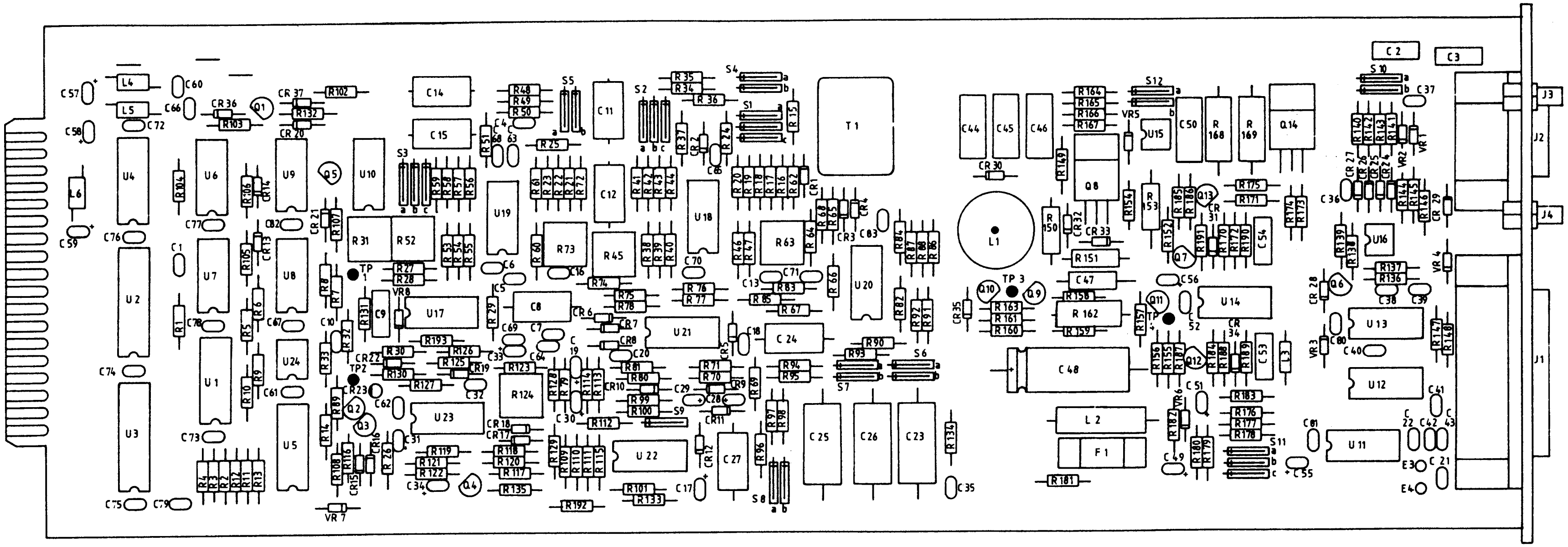
The center frequency is selected by the straps S2a-c and S3a-c, the bandwidth is selected by the straps S4a-b and S5a-b.
The center frequency is fine tuned with R45 and R52.
Both filters are buffered and the output level from the buffers is 1.8Vpp.

(7) Mark/Space level detectors.
The Mark/Space level detectors consist of a fullware rectifier, followed by a peak detector.
The output from the peak detector is led to the A/D-converter and shown at the front panel LED-display.
The input to the rectifier is adjusted to give full scale deflection on the meter with nominal input level.
To protect the multiplexer in front of the A/D-converter, the output from the peak detector is limited to 5V. Output from the peak detector: 4.5Vpp.

(8) Mark/Space subtractor and filter.
The rectified mark signal is subtracted from the rectified space signal. The resulting data signal is filtered in a 3 pole lowpass filter. The cut-off frequency is strapped by S6-8.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	REVISED C8 to C9 and C9 to C8	10 12 87	VH



471909	RC 4000	
471712	RX 4000	
NEXT ASSY	USED ON	
APPLICATION		

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

ANGLES

LIN. DIM.

MATERIAL

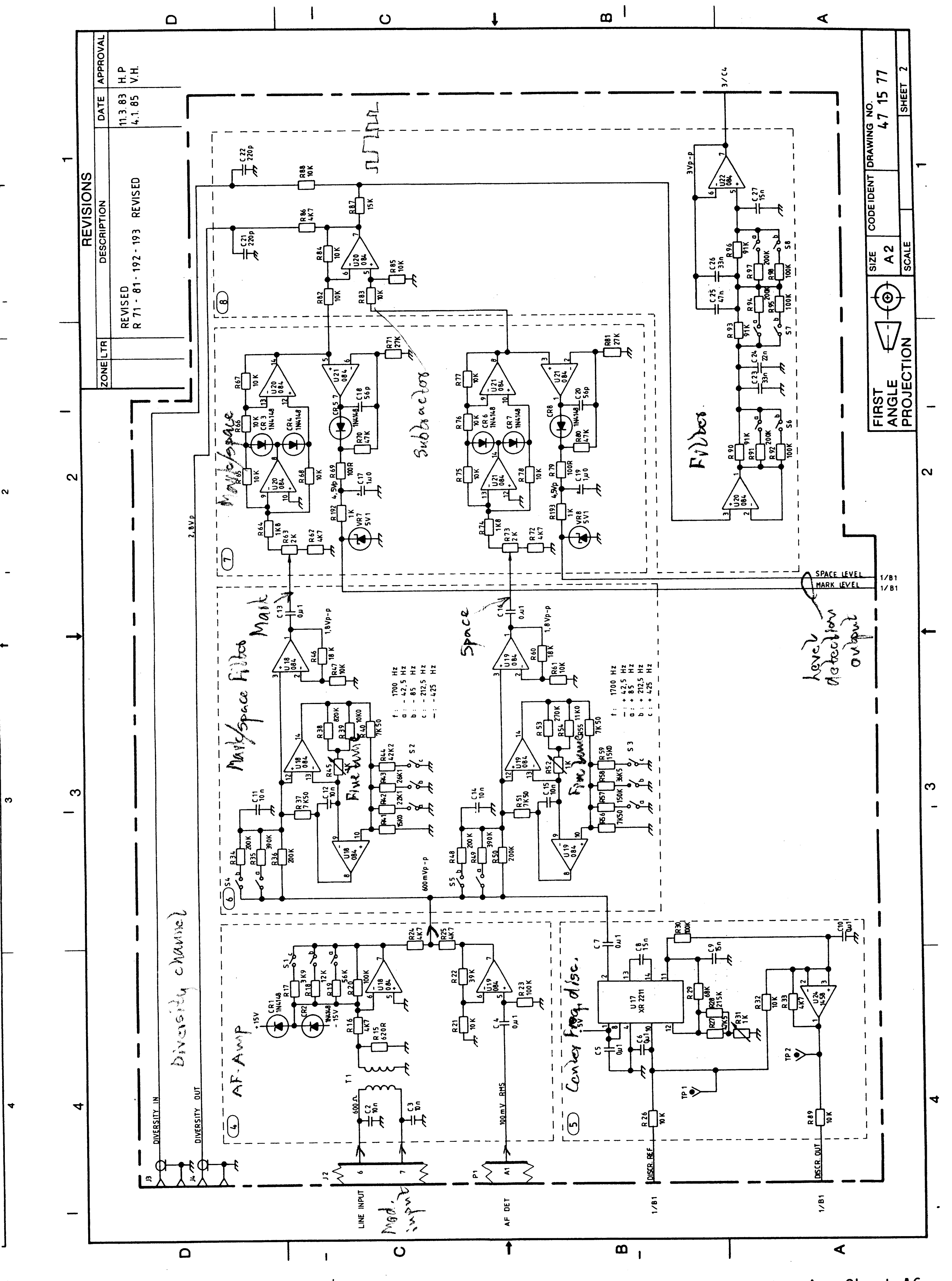
DR.	83 04 14	JL
CH. H. Andersen		22/4-83
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE RTTY demodulator

SIZE	CODE IDENT	DRAWING NO.
A1		471577
SCALE		SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
REVISED
R 71 - 81 - 192 - 193 REVISED
11.3.83
4.1.85
H.P
V.H.
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
47 15 77
SHEET 2
SCALE
AF-Amp
Center Freq. disc.
Mark/space Filter
Mark
Space
Mark/space
Subtractor
Filter
Fine tuning
Diversity channel
level detection output
Mod. input
DIVERSITY IN
DIVERSITY OUT
LINE INPUT
AF DET
DISCR. REF
DISCR. OUT
SPACE LEVEL
MARK LEVEL
1/B1
3/C4
600 mVp-p
100 mV RMS
1,8 Vp-p
3 Vp-p
2,8 Vp
U17
XR 2211
TP 1
TP 2
f : 1700 Hz
a : - 42,5 Hz
b : - 85 Hz
c : - 212,5 Hz
- : - 425 Hz
f : 1700 Hz
- : + 42,5 Hz
a : + 85 Hz
b : + 212,5 Hz
c : + 425 Hz

(9) Automatic threshold control.
The dc-component is removed and the signal is transferred into TTL-level. The ATC-function is ignored when S9 is closed.

(10) Invert Circuit.
When EX-INV and INVERT are low, the REC. DATA output at J1 is normal. If one or both inputs are high, the output is inverted.

(11) Anti space control.
If the signal is in Space more than 0.3 sec. the data output is switched to Mark.

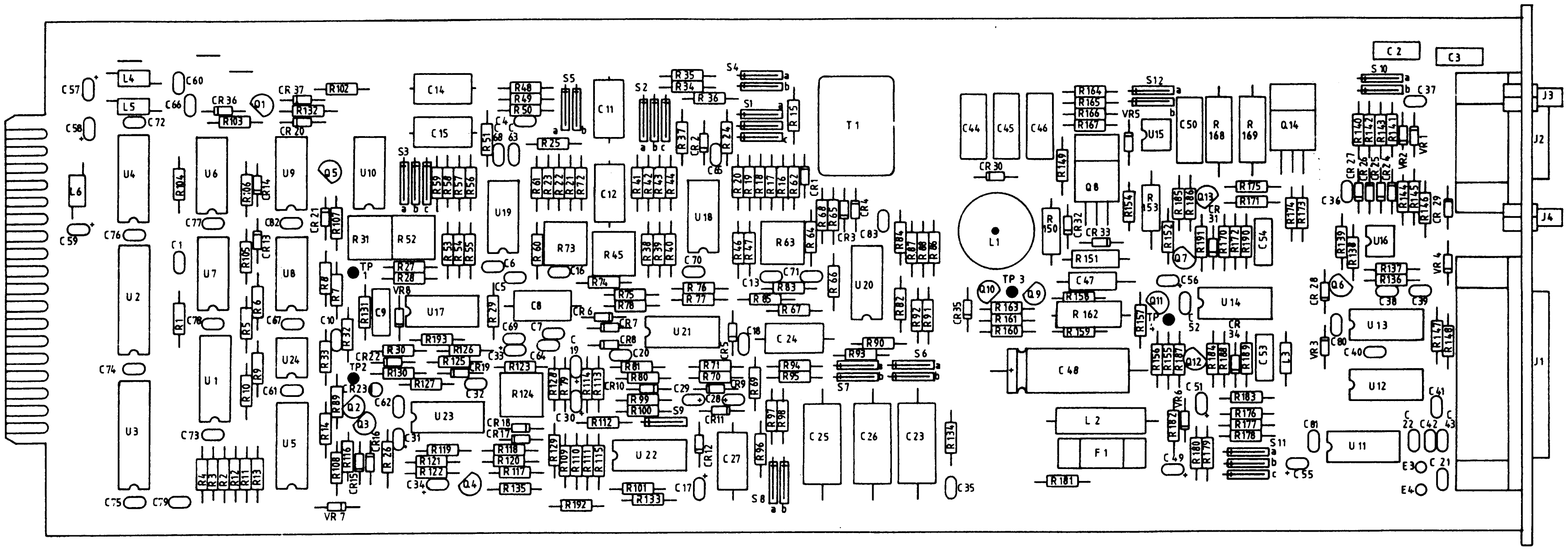
When receiving a normal RTTY-signal, C30 is discharged each time a Mark is present. When Mark is missing, the output from U22 will go high and U6-4 will go low.

(12) Data signal level detector.
The level detector is a full wave rectifier followed by a lowpass filter. The output from the detector, DET. LEVEL, can be read by the microprocessor.

(13) Auto start control.
The auto start control disables the data signal when it comes under a chosen level too often. The threshold level is set at R124. The capacitor C33 averages the time under threshold and when that value exceeds 3.3V, the output U23-14 goes negative and the U10 output goes high.

The LED on the PCB, CR23 lights when the signal level is sufficient. The disable of the data signal is delayed approximately 1 sec. and the enable approximately 3 sec. The auto start control can be blocked from the microprocessor (AUTOSTART) and by shortening J1-10 to ground (EXT. AUTO).

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	REVISED C8 to C9 and C9 to C8	10.12.87	VH



471909	RC 4000		
471712	RX 4000		
NEXT ASSY	USED ON		
APPLICATION			

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

ANGLES

LIN. DIM.

MATERIAL

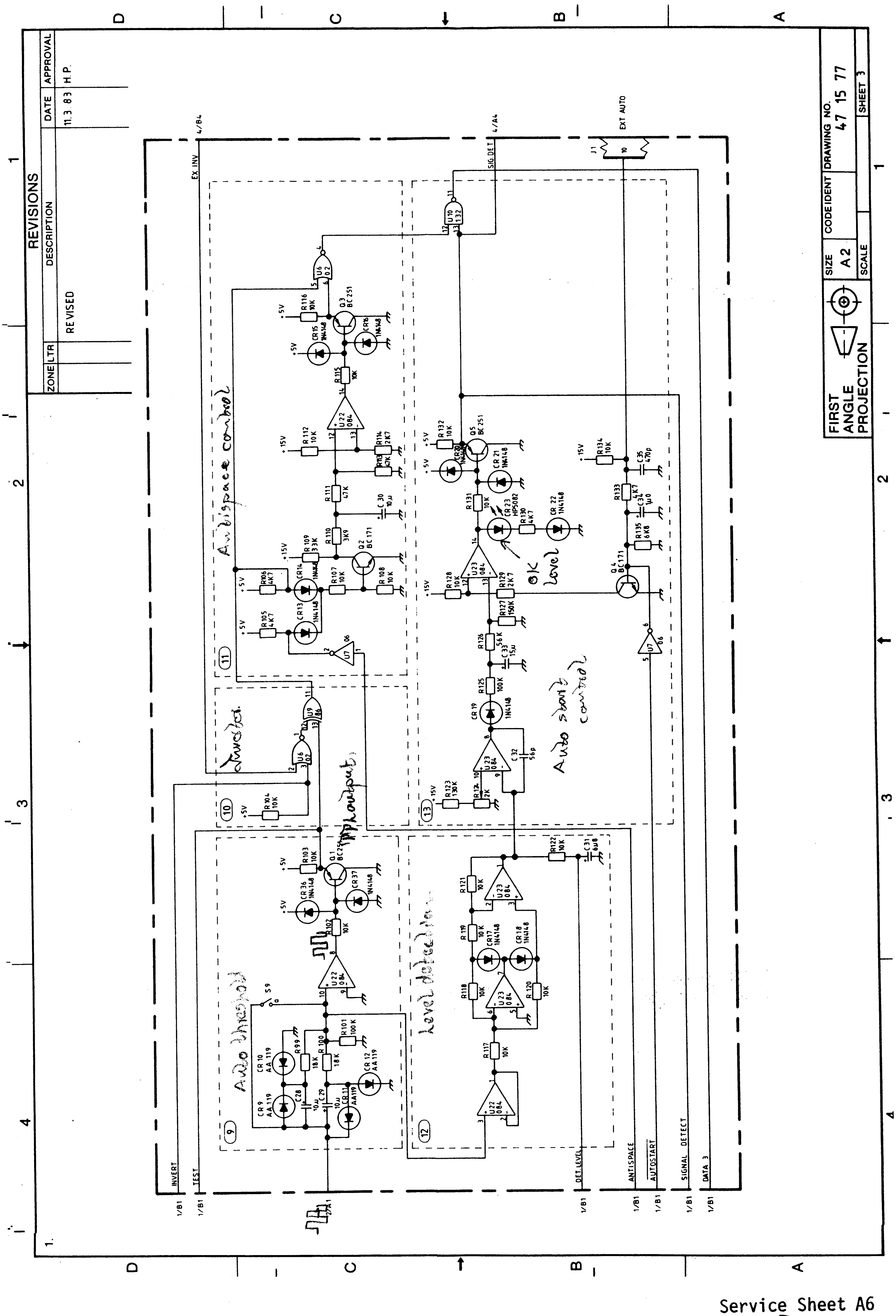
DR.	83-04-84	JL
CH. H. Andersen		22/4-83
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE RTTY demodulator

SIZE	CODE IDENT	DRAWING NO.
A1		471577
SCALE		SHEET 1 OF 1



REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
REVISED
11.3 83
H.P.
EX INV
SIG DET
EXT AUTO
J1
INVERT
TEST
DET LEVEL
ANTISPACE
AUTOSTART
SIGNAL DETECT
DATA 3
Antispace control
Auto start control
OK level
Auto threshold
level detector
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
47 15 77
SCALE
SHEET 3

14 TX Circuit.
A low voltage current loop for transmitting is present in J2. The shortcircuit current can be strapped to 20mA and 40mA and it can be used with both unbalanced 12V and balanced 24V output.

The TX-sense circuit is a floating loop made with an optocoupler (U16) and it can be placed in series with the TX- or the RX-current loop.
The TX-sense circuit is activated with a current greater than 4mA. The data output from the opto-coupler is led to the microprocessor.

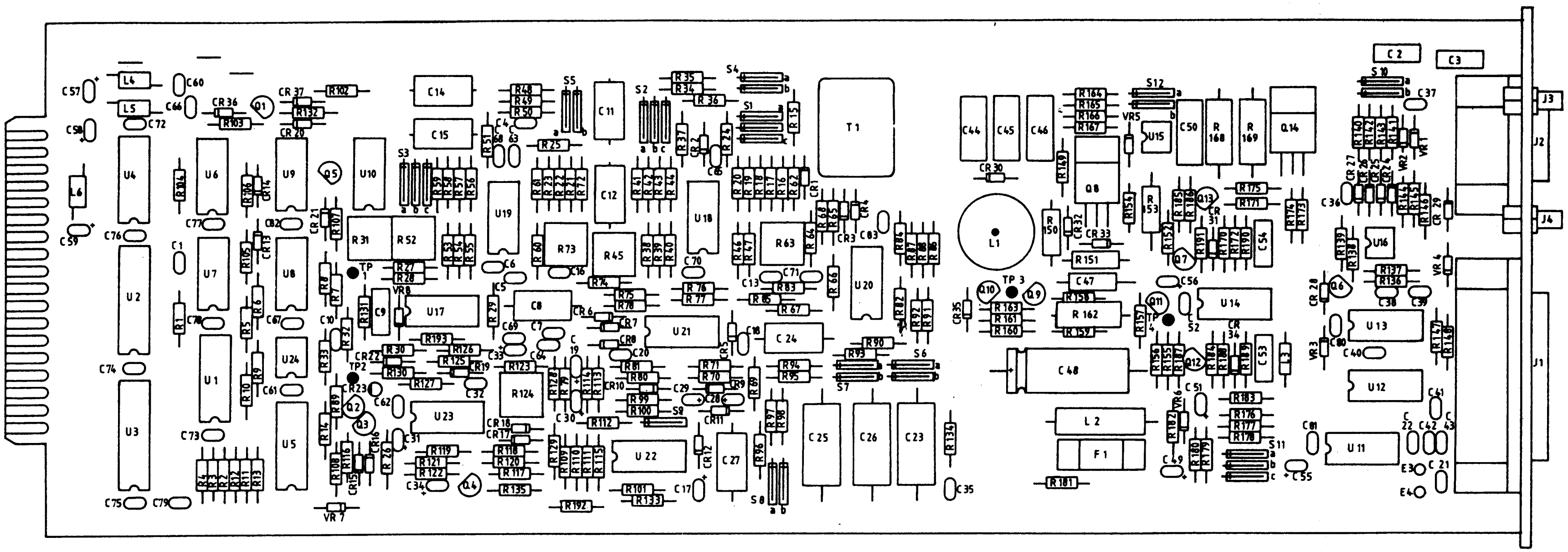
15 RS232C port.
U13: RS232C line receiver.
The TRANSMIT DATA input is gated together with the data signals from the TX-sense.

U12: RS232C line driver.
The RS232C socket has +/-12V and +5V to supply an external modem.

16 Oscillator and pulsewidth modulator.
R190 and C54 determine the operating frequency, approx. 20 kHz.
R188, 189 and C53 form a oneshot and the pulsewidth modulation is made by changing the discharge time of C53. The output is used to drive the converter output stage.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	REVISED C8 to C9 and C9 to C8	10.12.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
		ANGLES
		LIN. DIM.
471909	RC 4000	
471712	RX 4000	MATERIAL
NEXT ASSY	USED ON	

DR. 83-04-04 JL
CH. H. Aa[illegible] 22/4-83
AP.
AP.

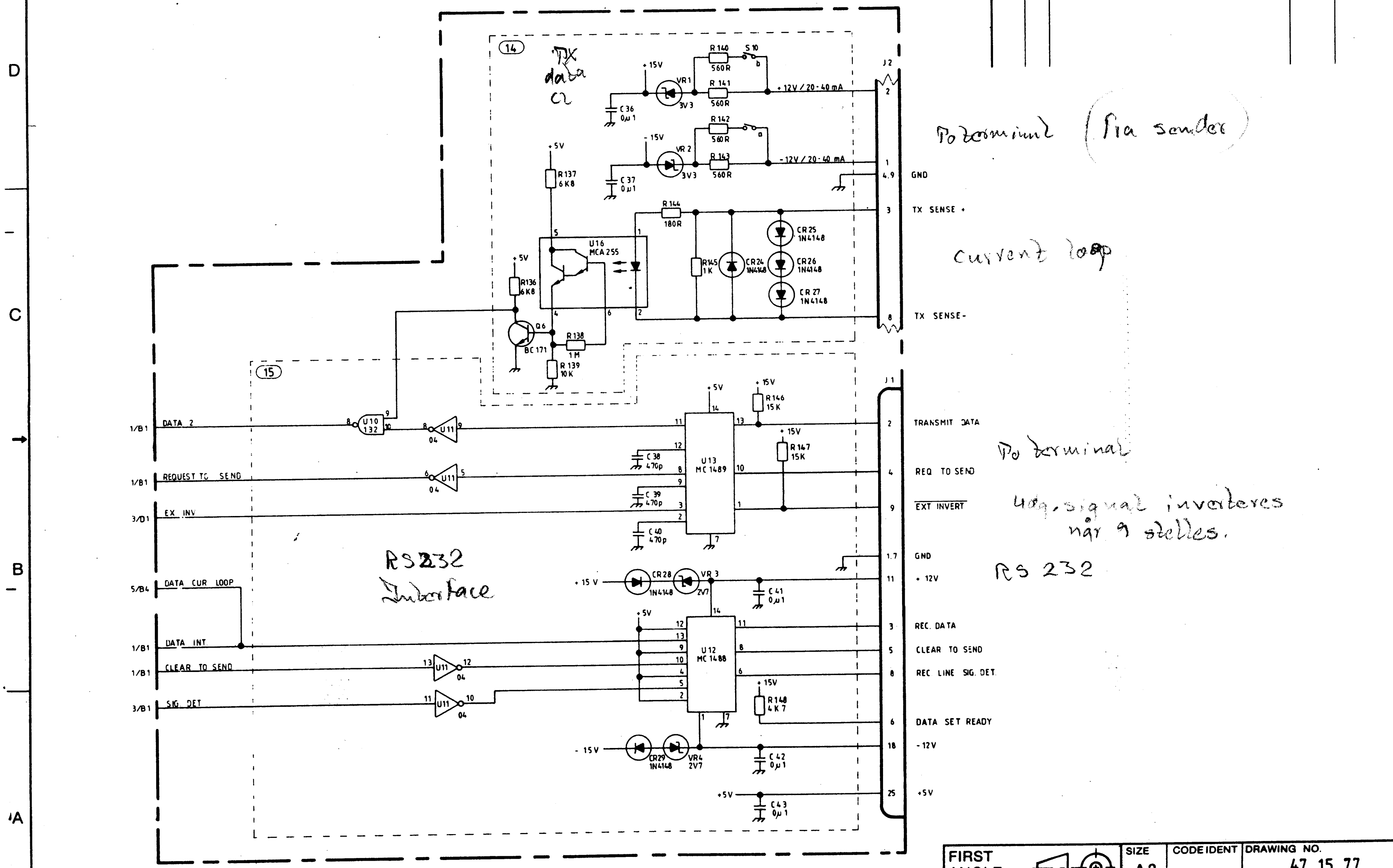
FIRST ANGLE

Dansk Radio AS dra

TITLE RTTY demodulator

SIZE	CODE IDENT	DRAWING NO.
A1		471577

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
REVISIONS				



FIRST ANGLE PROJECTION

SIZE	CODE IDENT	DRAWING NO.
A2		47 15 77
SCALE		SHEET 4

Service Sheet A6

17 Output stage.
The output signal from the pulse-width modulator is amplified in the driver stage (Q9-11) and then fed to the output transistor Q8. When Q8 is switched on, the current in L1 will raise linear. When the current has reached a sufficient value, Q8 is turned off and the voltage over L1 will raise to the level, where CR30 conducts. L1 will then deliver its energy to the storage capacitors C44-46. Q8 is shunted by a snubbernetwork in order to damp oscillations when L1 is without load.
R149 and C46 damp the high frequency ripple caused by the switching.
The function of Q7 is to stop the output pulse if the collector current raises further than approx. 1A. R154 and CR35 prevent Q8 to break down in case the drivernetwork fails. The collector current in Q8 will be limited to 1.5A and this will cause the -15V fuse F1 to blow off.

18 Voltage and current regulator.
The output voltage is set with the straps S11a-c and the voltage regulation is made with VR6 and Q12.

The output current limiter is set with the straps S12a-b and the current regulation is made with VR5 and U15.

Both the voltage- and current regulation change the discharge time of C53 in the oneshot.

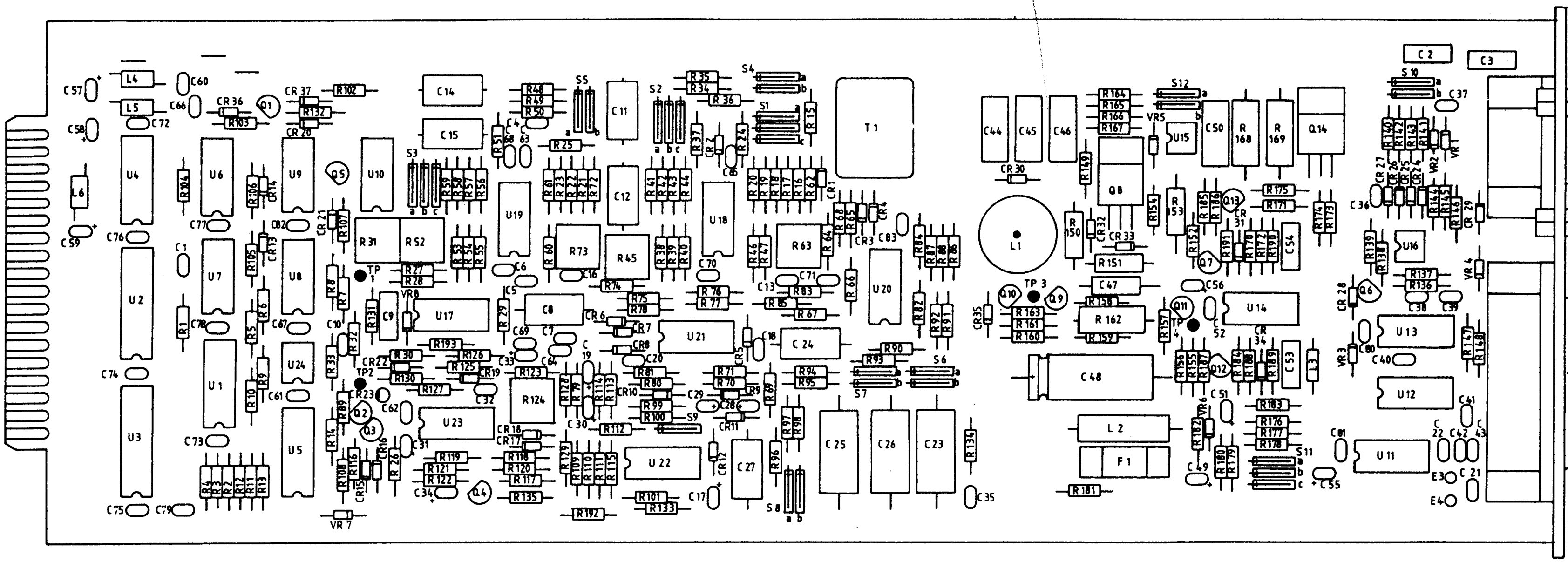
The output signal from the converter is modulated with Q13 and Q14. When a high is present on the DATA CUR. LOOP the RX+ output will be active.

19 Separate +5v line filter to the converter +5V, marked "(+5V)".

20 +15V, -15V and +5V line filters and decoupling capacitors.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	REVISED C8 to C9 and C9 to C8	10.12.87	VH

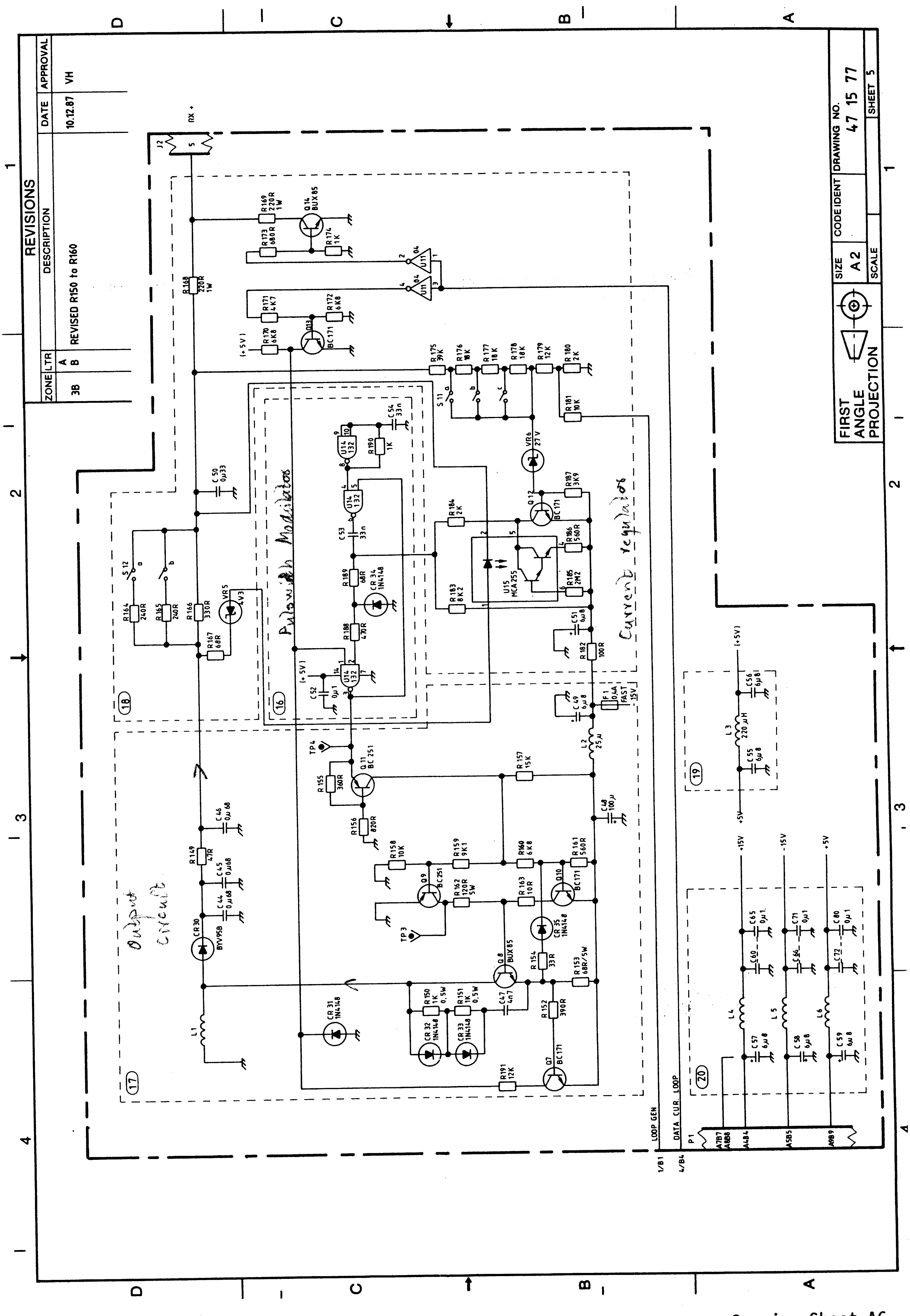


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	DR. 3L
		LIN. DIM.	CH. H. 22/4-83
471909	RC 4000		AP.
471712	RX 4000	MATERIAL	AP.
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION
APPLICATION			

Dansk Radio AS dra

TITLE RTTY demodulator

SIZE	CODE IDENT	DRAWING NO.
A1		471577
SCALE		SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
3B
A
B
REVISED R150 to R160
10.12.87
VH
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
47 15 77
SHEET 5
SCALE
Output circuit
Pulse width Modulator
Current regulator
LOOP GEN
DATA CUR. LOOP

ASSY 489913, IF/AS ASSEMBLY

Service Sheet A7

1) Summing Amplifier for IF-Output Level -20 dBm/50 ohm for each sideband.

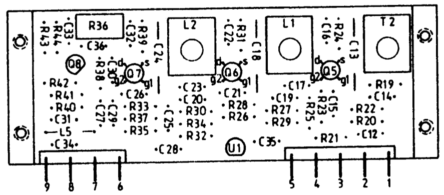
2) LSB Crystal Filter with impedance matching network

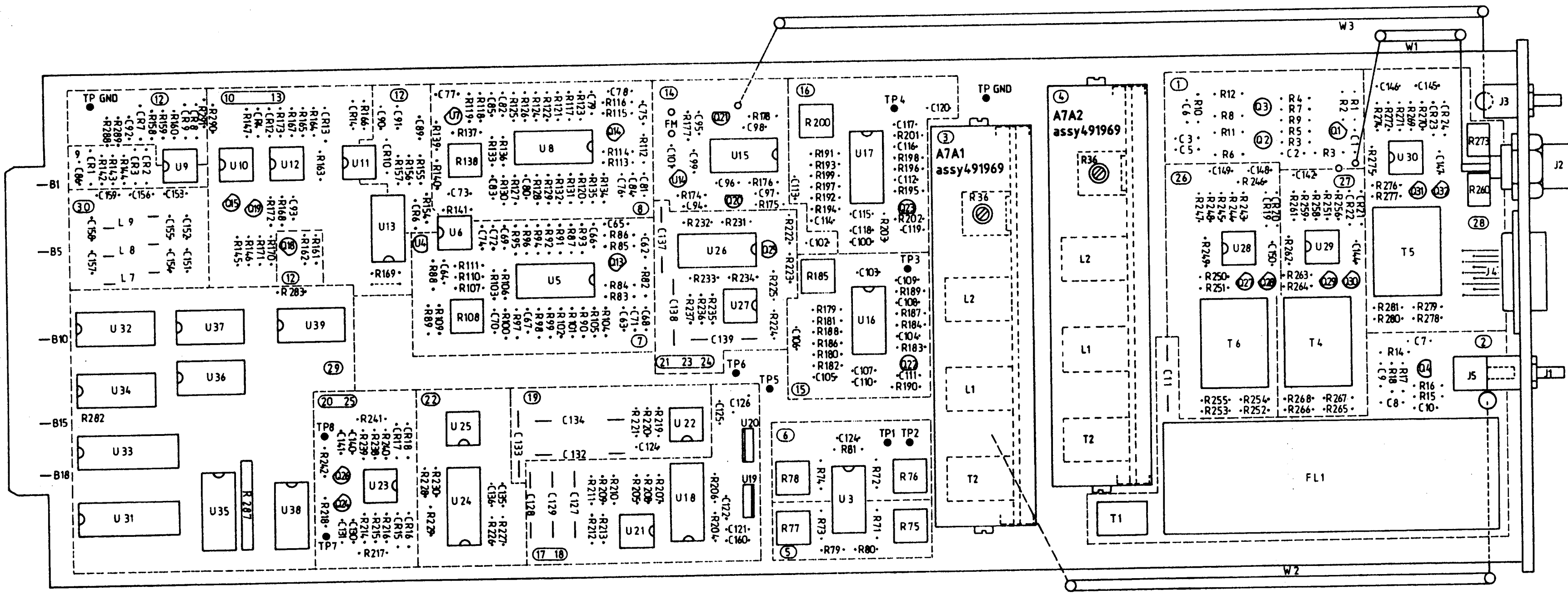
3.4) 1.4 MHz Gain Controlled Tuned Amplifier with 50 ohm input and output impedance.

Maximum gain from IF-input to IF-output is adjusted by means of R36 to 75 dB with IF-input equal to -100 dBm, AGC1/AGC2 equal to 0V and R75/R76 set to 1 dB signal attenuation. Minimum gain is adjusted by means of R77 and R78 to 0 dB with IF-input equal to -15 dBm and AGC1/AGC2 equal to 9V.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.3.88	VH

A7A1 - A7A2
assy 491969





490008	RX4010	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1
NEXT ASSY	USED ON			
APPLICATION				

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

ANGLES

LIN. DIM.

DR. 20.1.1988

CH.

AP. SN 20.1.88

AP.

Dansk Radio AS

TITLE: COMPONENT LOCATION SIGNAL PROCESSING ISB IF - 2ND, AUDIO RX4010

CODE IDENT

DRAWING NO. 48 99 13

SCALE

SHEET 1 OF 1

5.6) AGC Shapers with Offset and gain adjustment.

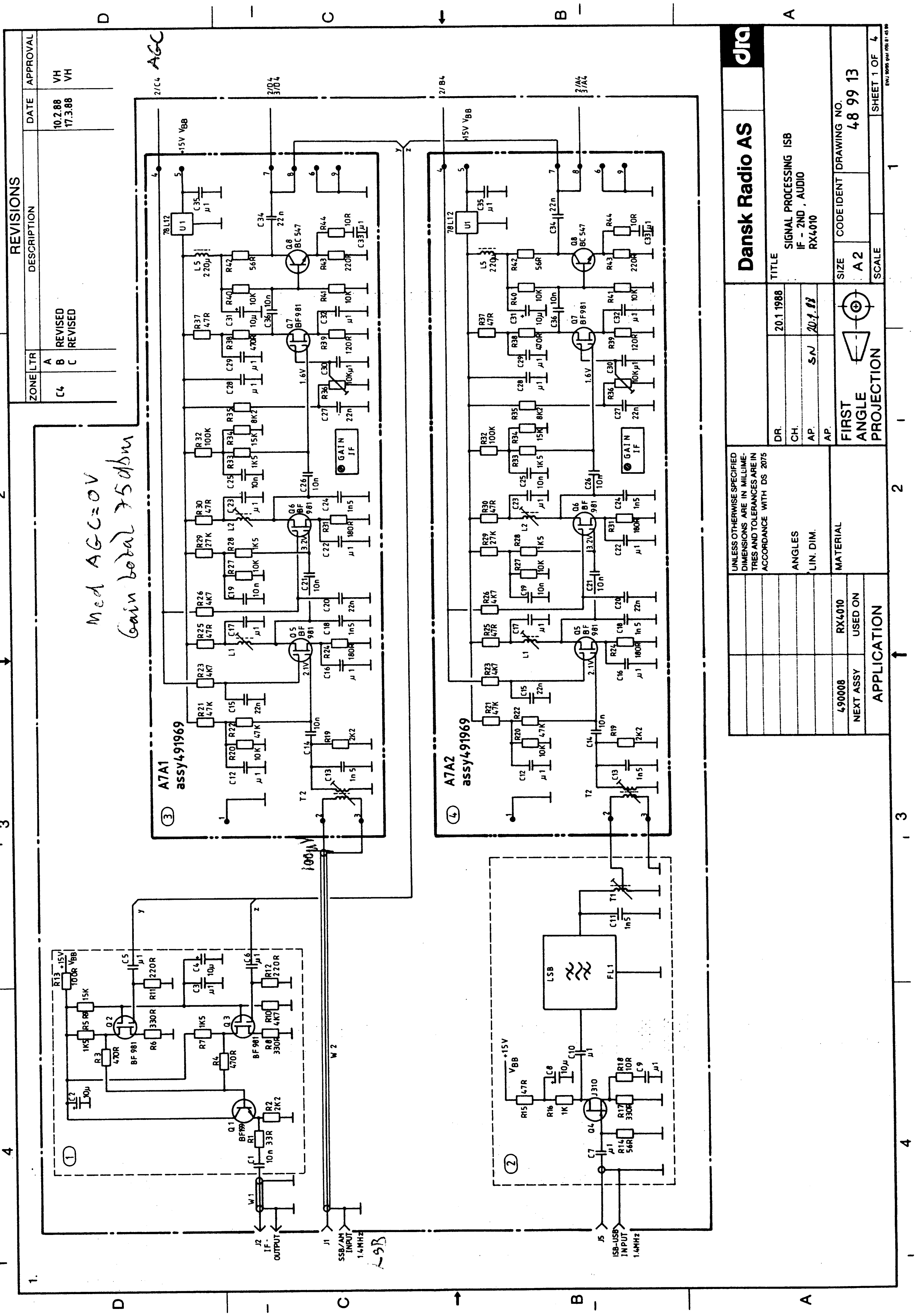
7.8) Logarithmic AGC Detector
AGC attack level is adjusted by means of R108/R138.
With IF-input equal to -90 dBm the IF-output is adjusted to -20 dBm. (AGC on).

9) Part of AGC Loop Filter

10) Buffer Amplifier and Mute Function

12) AGC Loop Filter, Buffer Amplifier and Mute Function

13) Circuit for Delayed AGC to Front-End module

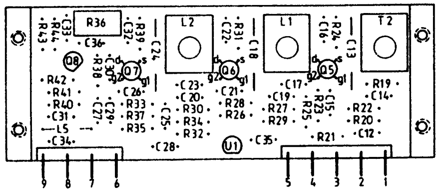


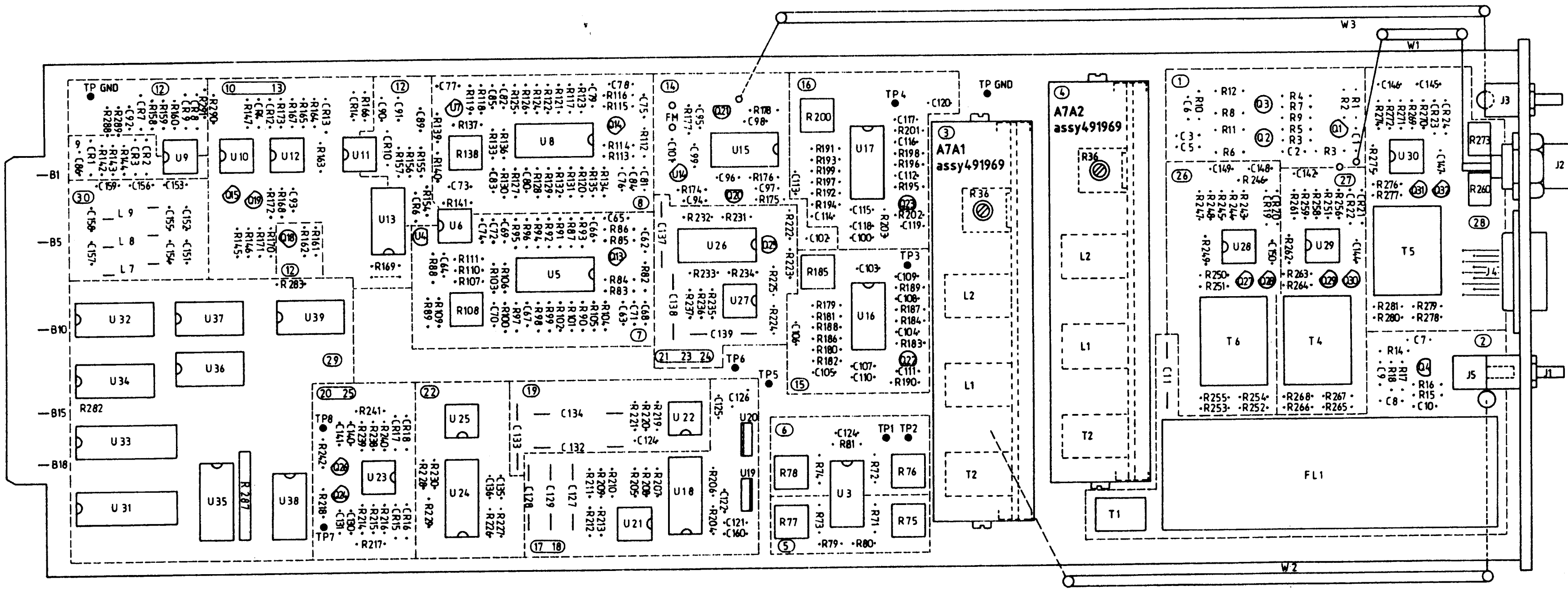
REVISIONS
REVISED
REVISED
10.2.88
17.3.88
VH
VH
Dansk Radio AS
SIGNAL PROCESSING ISB
IF - 2ND, AUDIO
RX4010
20.1.1988
48 99 13
SHEET 1 OF 4
A2
FIRST ANGLE PROJECTION
APPLICATION
490008
RX4010
NEXT ASSY
USED ON
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
A7A1
assy491969
A7A2
assy491969
LSB
FL1
SSB/AM INPUT 1.4MHz
ISB-USB INPUT 1.4MHz
IF-OUTPUT

1.

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.3.88	VH

A7A1 - A7A2
assy 491969





490008	RX4010	
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.		20.1 1988
CH.		
AP	SN	20.1. 88
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
SIGNAL PROCESSING ISB
IF - 2ND , AUDIO
RX4010

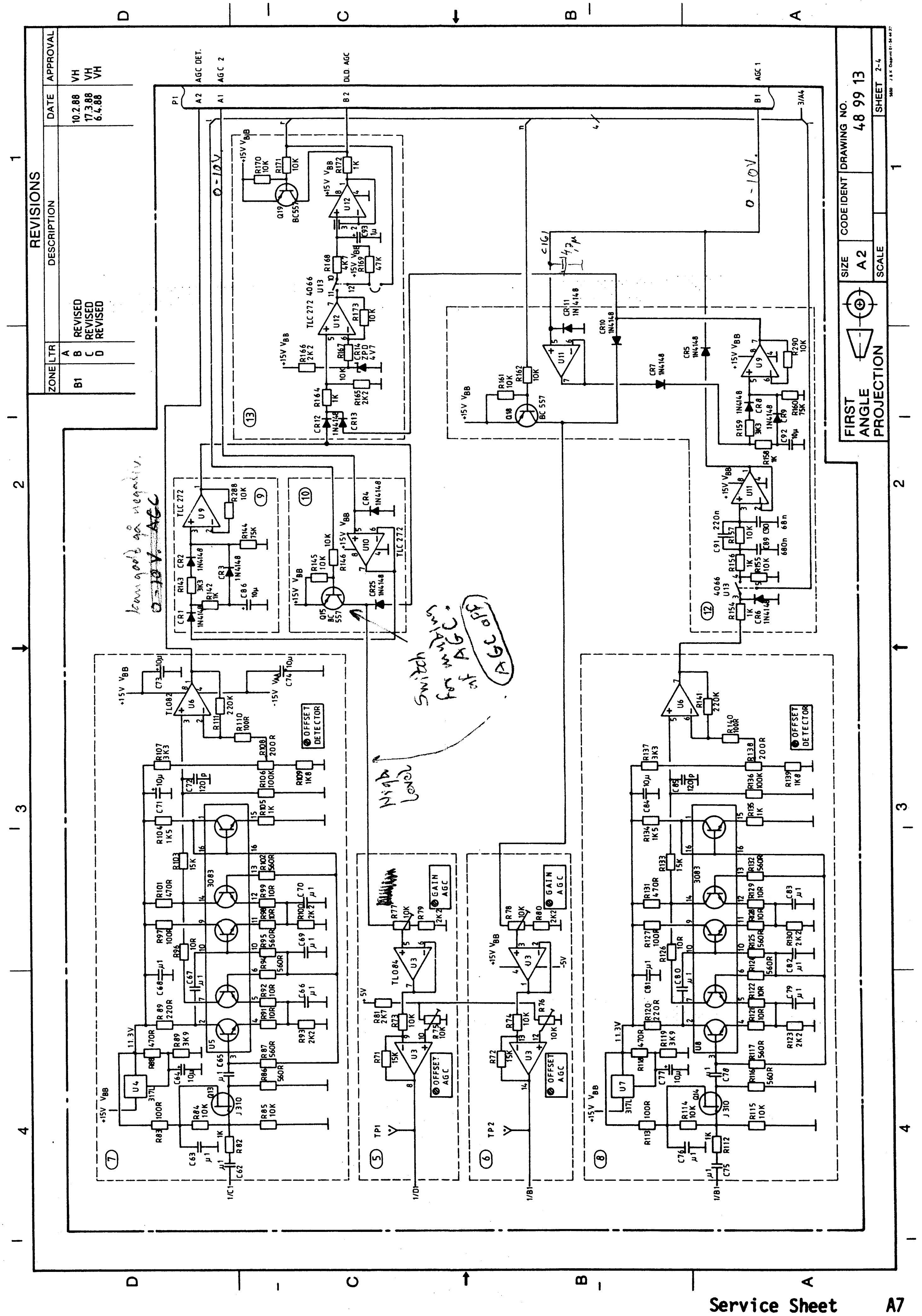
SIZE	CODE IDENT	DRAWING NO.
A1		48 99 13

SCALE
SHEET 1 OF 1

14) Amplifier for Local Oscillator Injection for Detectors

15/16) Balanced Demodulators
The gain is adjustable by means of R185/R200.

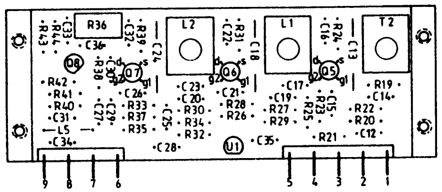
Nominal AF level at TP5 and TP6 is adjusted to 320 mVpp in SSB mode.

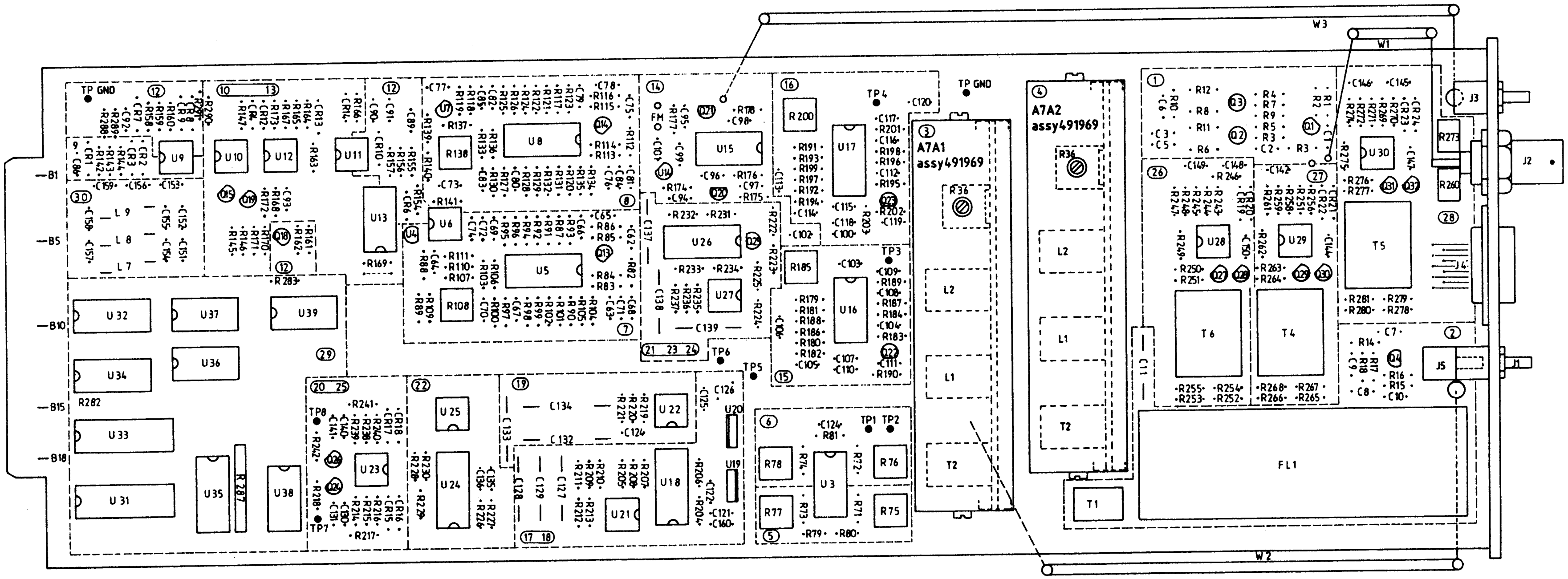


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
B1 A
B REVISED 10.2.88 VH
C REVISED 17.3.88 VH
D REVISED 6.4.88 VH
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 48 99 13
SHEET 2-4
SCALE
OFFSET DETECTOR
GAIN AGC
OFFSET AGC
AGC DET.
AGC 2
DLD. AGC
AGC 1
0-10V.
Switch for manual AGC. AGC off
High level

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.3.88	VH

A7A1 - A7A2
assy 491969





490008	RX4010
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.		20.1 1988
CH.		
AP.	SN	20.1.88
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
SIGNAL PROCESSING ISB
IF - 2ND , AUDIO
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		48 99 13
SCALE		SHEET 1 OF 1

17) Mode Selection Switch and AF Mute

18) 4 kHz LP-Filter

19) 1.4 kHz LP-Filter inserted in CW/narr and CW/vnar.

20) Signal Detector used in BITE program

21) Line Output Selector

22) TLX and Monitor Selector

23) AF Mute Circuit

24) 4 kHz LP-Filter

25) Signal Detector used in BITE program

26) Balanced 600 ohm TLX Output
Nominal level: 0 dBm

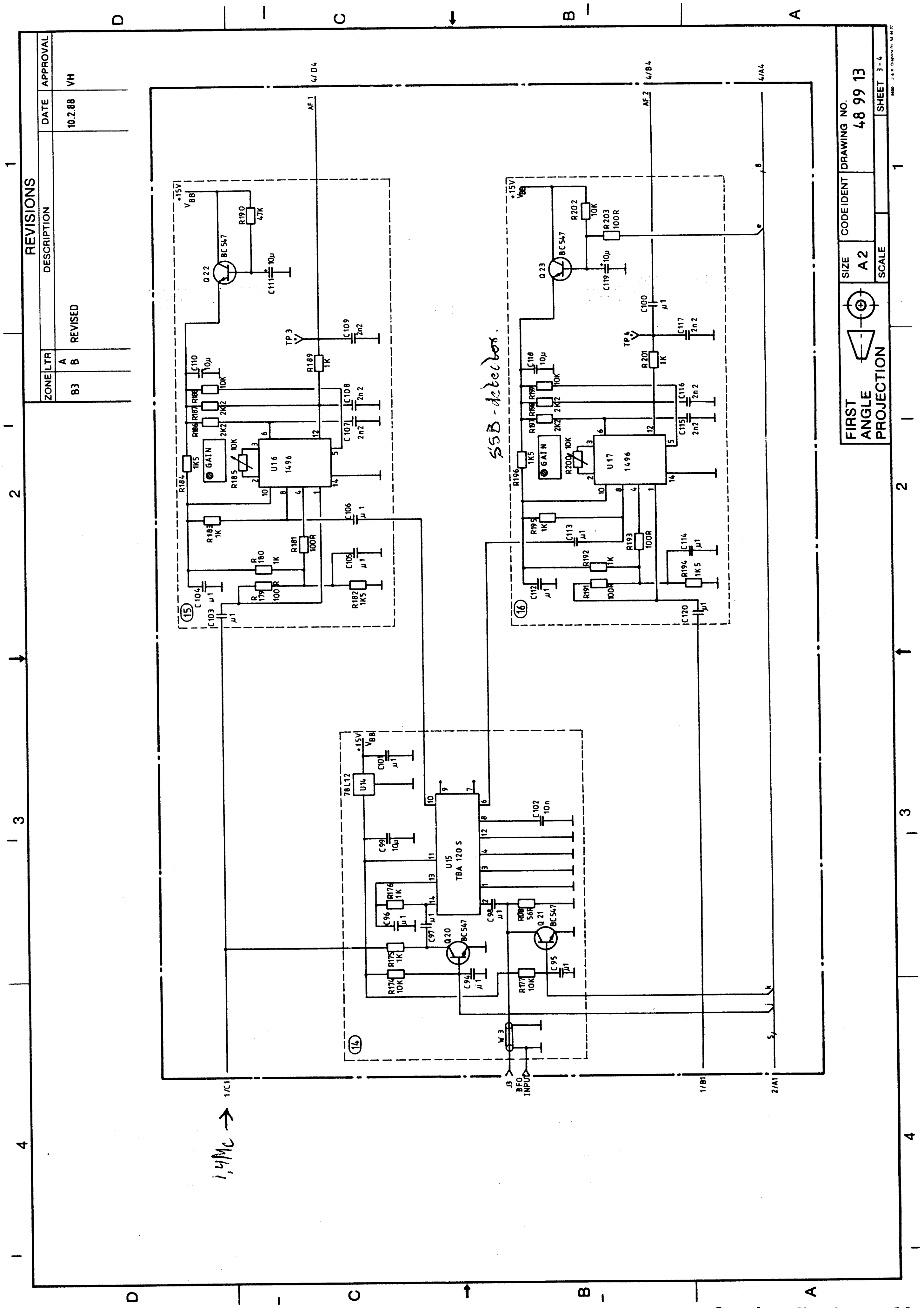
27) Balanced 600 ohm Line 1 Output Level adjustable up to +10 dBm

28) Balanced 600 ohm Line 2 Output Level adjustable up to +10 dBm

29) Microcomputer Interface Circuit
When the address matches the on board selected, data are loaded into U31 and U33 respectively on the positive transition of WR.
A logical 0 at RD enables the three state buffer U34 provided that the correct address is set up.
The ACK goes low synchronized with WR or RD when a correct address is present at the address bus.

The asynchronous MUTE controls the DLD.AGC mute directly and is wired-on to the two processor controlled sideband mute commands.
I.e. each sideband signal path can be selectively muted by the processor.

30) Filtering circuit for bias voltages.

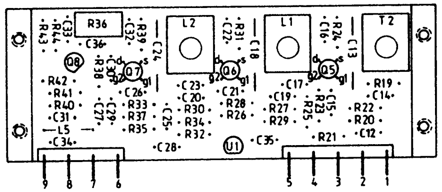


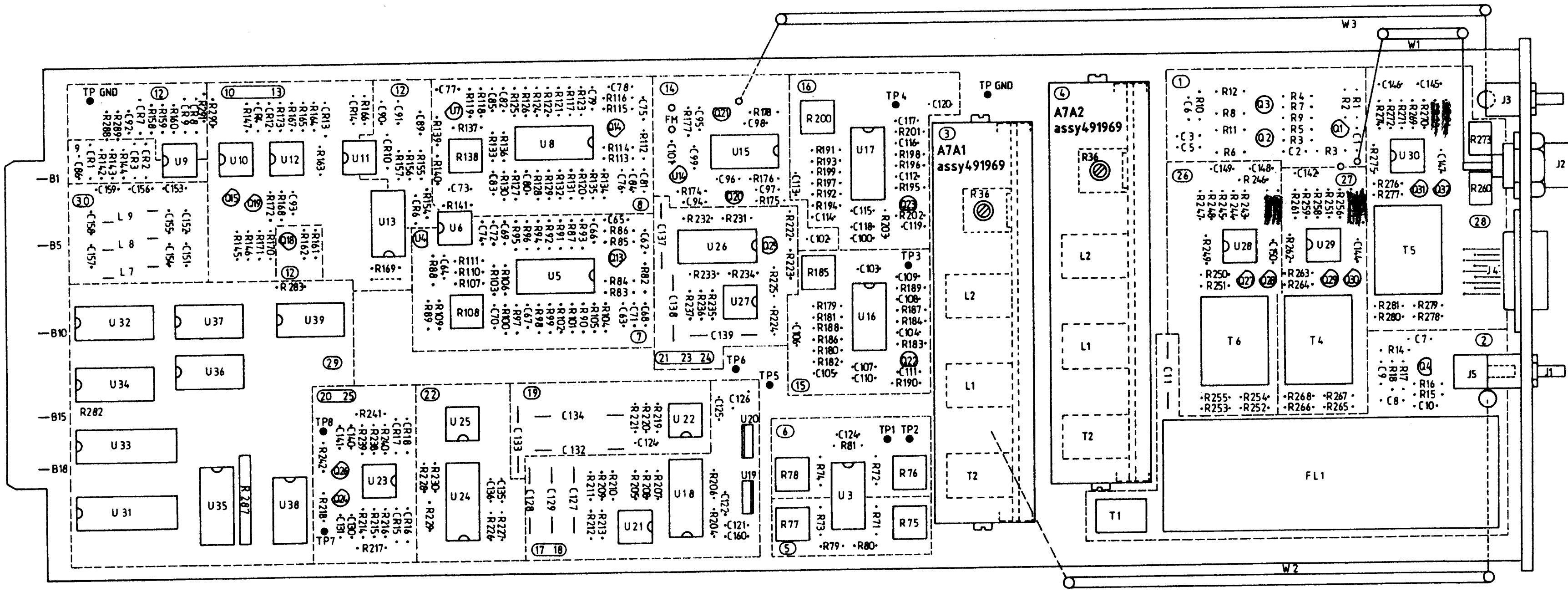
Service Sheet A/

3.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.3.88	VH

A7A1 - A7A2
assy 491969





UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		
ANGLES		
LIN. DIM		
MATERIAL		
490008	RX4010	
NEXT ASSY	USED ON	
APPLICATION		

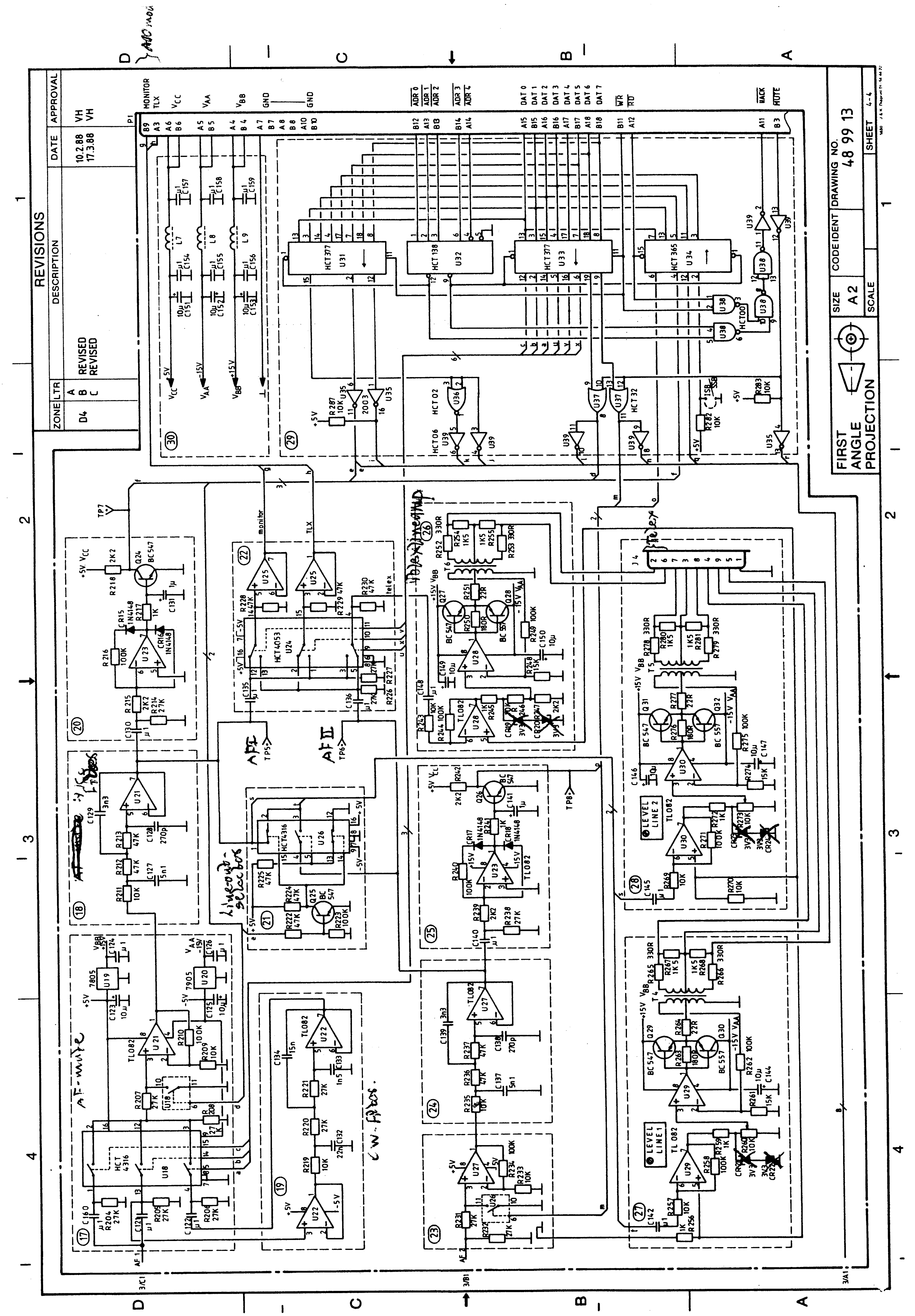
DR		20.1.1988
CH		
AP.	SN	20.1.88
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
COMPONENT LOCATION
SIGNAL PROCESSING ISB
IF - 2ND , AUDIO
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		48 99 13
SCALE		SHEET 1 OF 1


REVISIONS
REVISED
REVISED
FIRST ANGLE PROJECTION
SIZE A2
DRAWING NO. 48 99 13

ASSY 487740, MICROCOMPUTER ASSEMBLY

Service Sheet A8

(1) U1: 8085 microprocessor with associated 6.144 MHz crystal for internal clockstabilisation.

U12: Eight-bit latch for multiplexing address line DB0-DB7.

U13: Buffer for command signals etc.

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

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

U2: Retrigger astable multivibrator with a period of 1 s. Under normal operation, the software ensures 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) Timer that starts counting when $\overline{\text{OFF BD REQ}}$ goes low.

If the timer counts out, no acknowledge-signal has been received within the last 16 ms, and a Trap-interrupt is generated to the microprocessor.

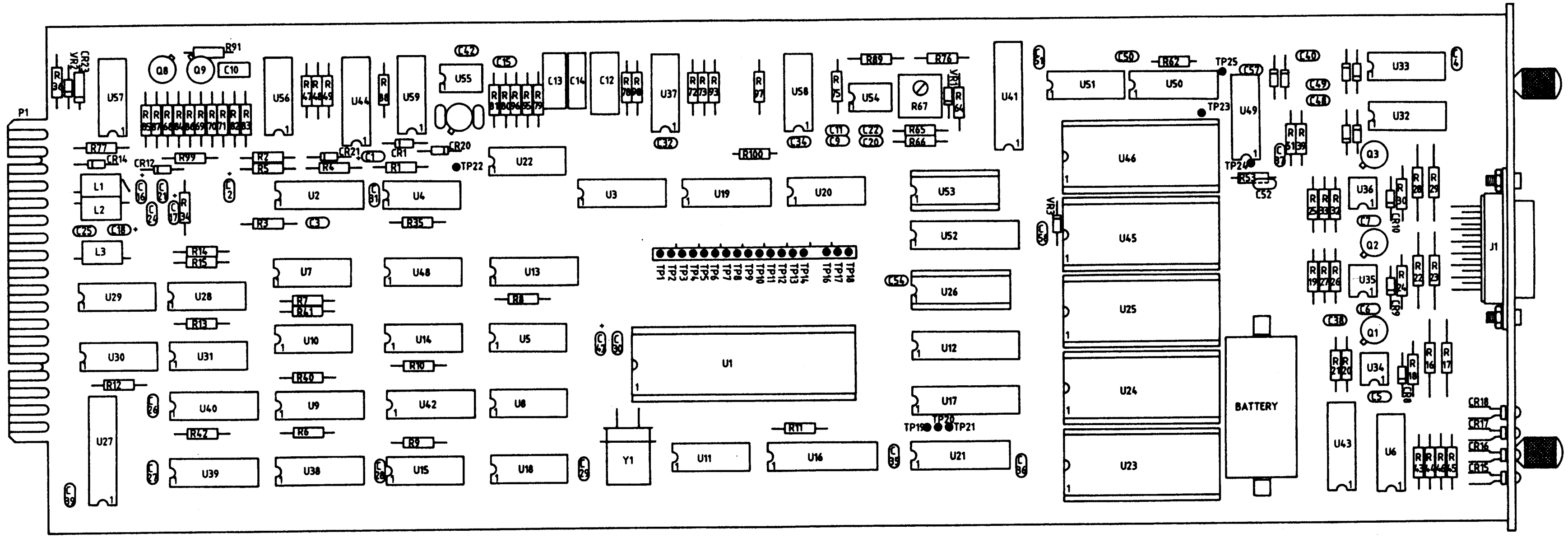
In normal operation, acknowledge-signals should be received within 16 ms.

(4) Network that converts an acknowledge-signal to a ready-signal to the microprocessor.

(5) The flip/flop U14 delays the start of $\overline{\text{WR}}$-signal one half of a CLK-period, which ensures that BUFEN-signal delays the enable of buffer U17 in accordance with the timing.
$\overline{\text{OFF BD REQ}}$ and $\overline{\text{OFF BD WR}}$ are only generated if no acknowledge-signal on board has been received before start of BUFEN.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	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	3.9 1987
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE COMPONENT LOCATION MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40

SCALE 2:1 SHEET 1 OF 1

(6) U16: Eight-bit buffer which is enabled during "free-running" i.e. when $\overline{TEST}$ is low. When "free-running" is selected U16 forces the microprocessor to read NOP-instructions,regardless of the microprocessor addressing.

(7) U17: Eight-bit bidirectional data bus buffer, which is enabled during on board operations.

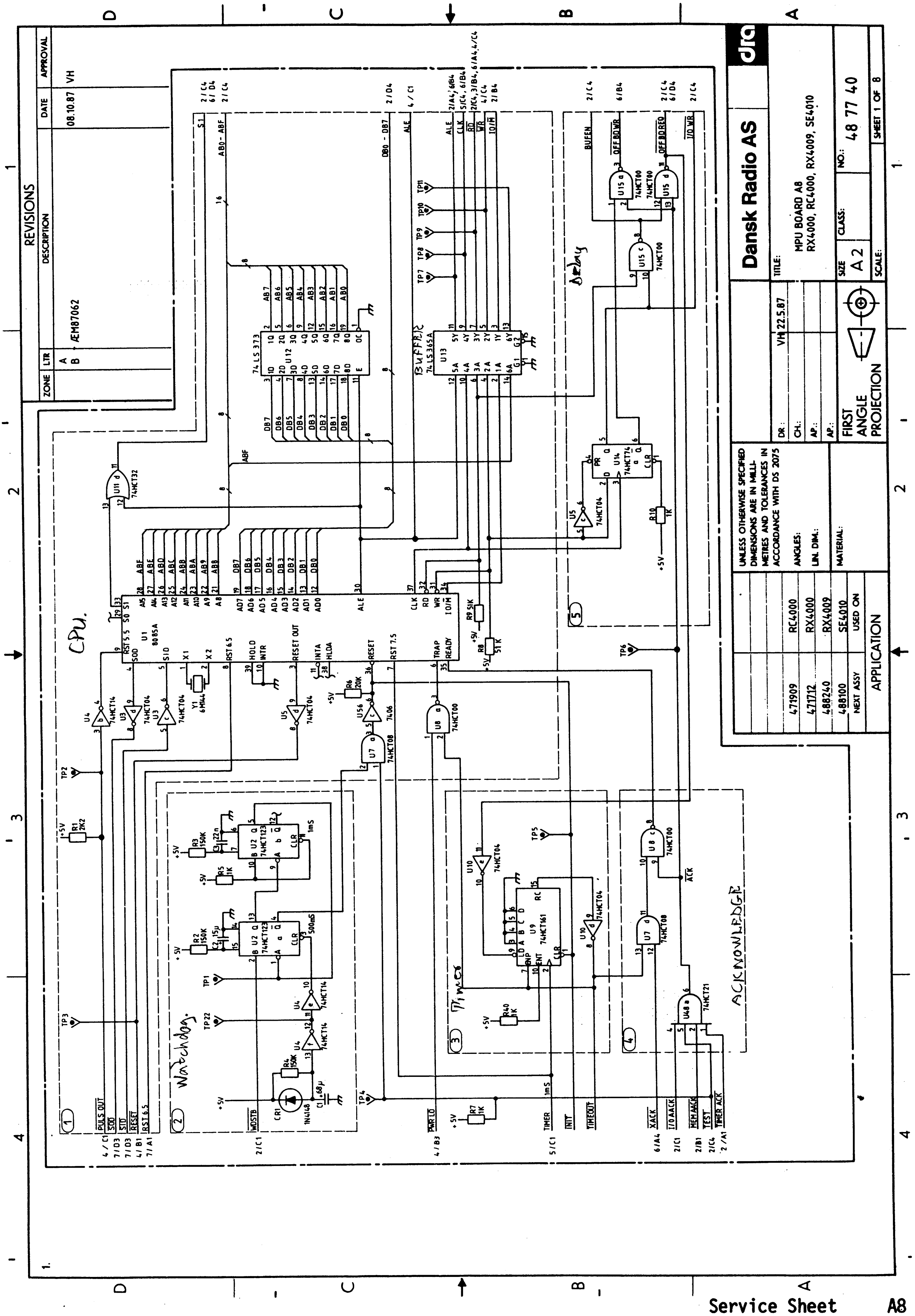
(8) Address decoding for generating on board chip selects for I/O operations. An acknowledge-signal $\overline{I/O\ AACK}$ is generated for every I/O-address, as handshaking signal to the microprocessor.

(9) Address decoding for generating on board chip selects for memory operations. An acknowledge-signal $\overline{MEM\text{-}AACK}$ is generated for every memory address; as handshaking signal to the microprocessor.

The S1, S2, S3 strap fields determine the address range of $\overline{CS1}$, $\overline{CS2}$, $\overline{CS3}$

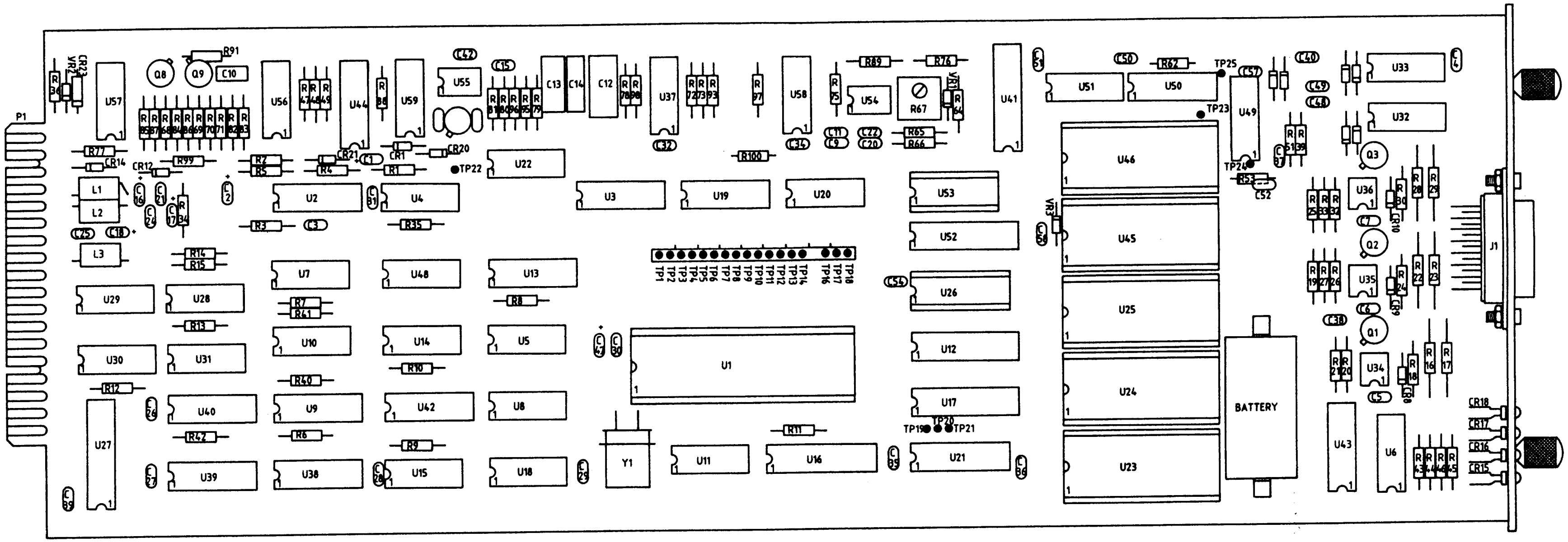
S1,S2,S3	32	64	128
CS1	0-FFFH	0-IFFFH	0-3FFFH
CS2	1000-IFFFH	2000-3FFFH	4000-7FFFH
CS3	2000-2FFFH	3000-4FFFH	8000-BFFFH

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


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM87062
08.10.87
VH
Dansk Radio AS
TITLE:
MPU BOARD A8
RX4000, RC4000, RX4009, SE4010
SIZE
A 2
CLASS:
NO.:
48 77 40
SCALE:
SHEET 1 OF 8
DR.:
VH 22.5.87
CH.:
AP.:
AP.:
FIRST ANGLE PROJECTION
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES IN ACCORDANCE WITH DS 2075
ANGLES:
LIN. DIM.:
MATERIAL:
471909
RC4000
471712
RX4000
488240
RX4009
488100
SE4010
NEXT ASSY
USED ON
APPLICATION
CPU.
Watchdog.
Timer
ACKNOWLEDGE
BUFFER
delay

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	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 3.9.1987
CH.	
AP.	
AP.	

FIRST ANGLE PROJECTION

Dansk Radio AS dra

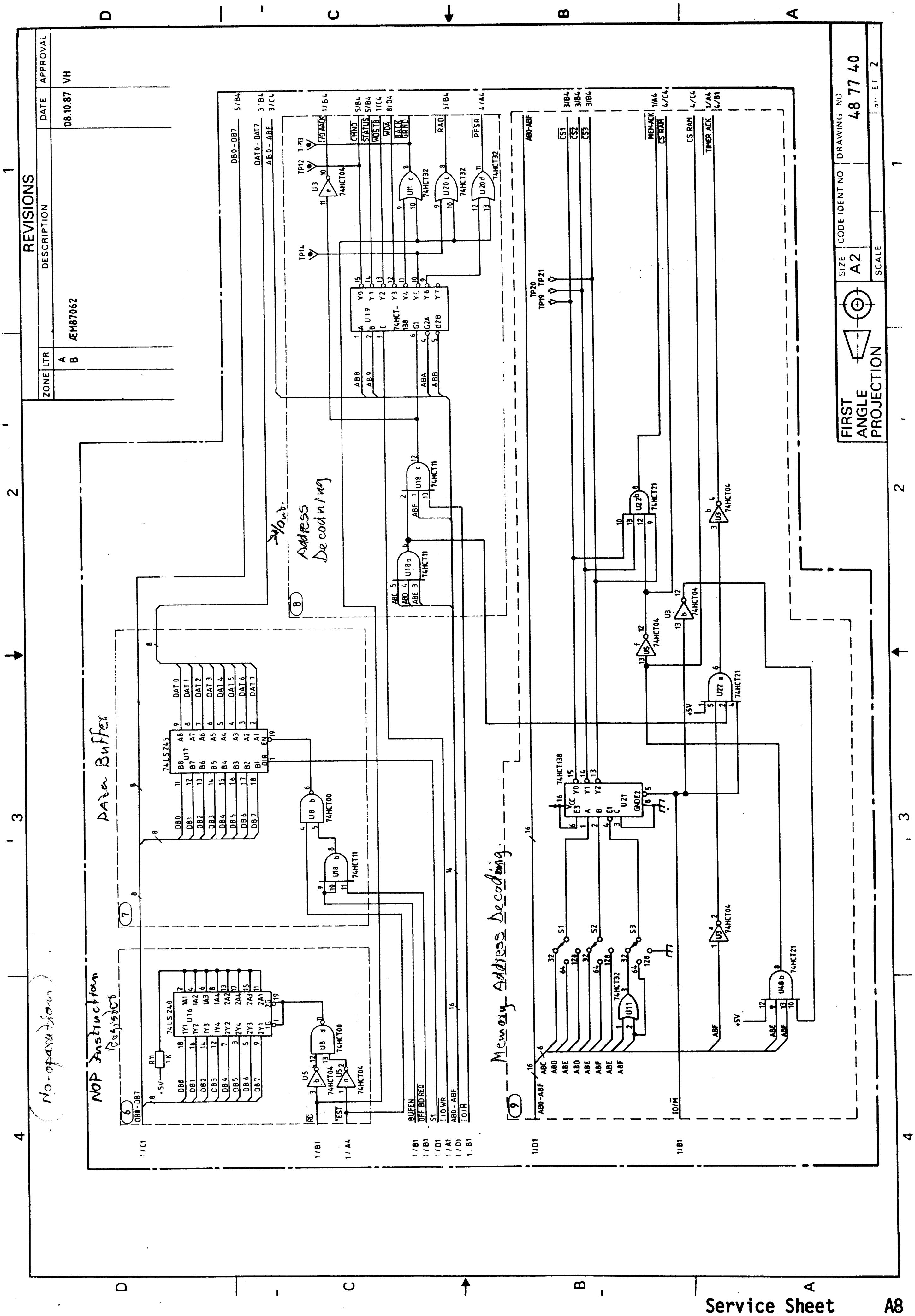
TITLE
COMPONENT LOCATION
MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40
SCALE 2:1		SHEET 1 OF 1

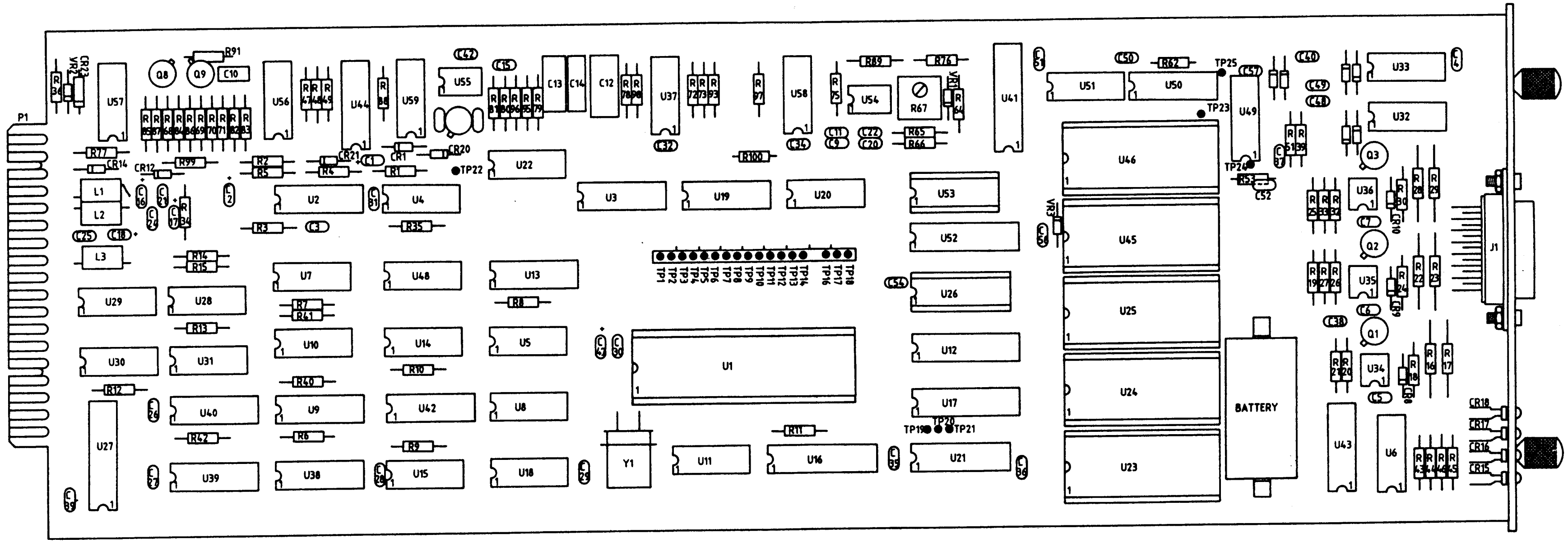
(10) EPROM AREA.

The content of 2732 is 4K x 8 bit.
The content of 2764 is 8K x 8 bit.
The content of 27128 is 16K x 8 bit.

S1,S2,S3	S4	S5	S6	U23	U24	U25
32	32	32	32	2732	2732	2732
64	-	32	-	2764	2732	not used
64	-	-	32	2764	2764	2732
64	-	-	-	2764	2764	2764
128	128	32	-	27128	32	not used
128	128	64	-	27128	64	not used
128	128	128	64	27128	27128	64
128	128	128	128	27128	27128	27128


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM87062
08.10.87
VH
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT NO
DRAWING NO
48 77 40
SHEET 2
SCALE
NOP Instruction Register
(No-operation)
Data Buffer
Memory Address Decoding
I/O & Address Decoding
74LS240
74LS245
74HCT138
74HCT00
74HCT04
74HCT11
74HCT21
74HCT32

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	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 3.9 1987

CH.

AP.

AP.

FIRST ANGLE PROJECTION

Dansk Radio AS

dra

TITLE COMPONENT LOCATION MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40
SCALE 2:1		SHEET 1 OF 1

(11) Circuit which ensures power to CMOS-gates U49,50,51 and CMOS-RAM U45 and U46 (if large RAM area is required).

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

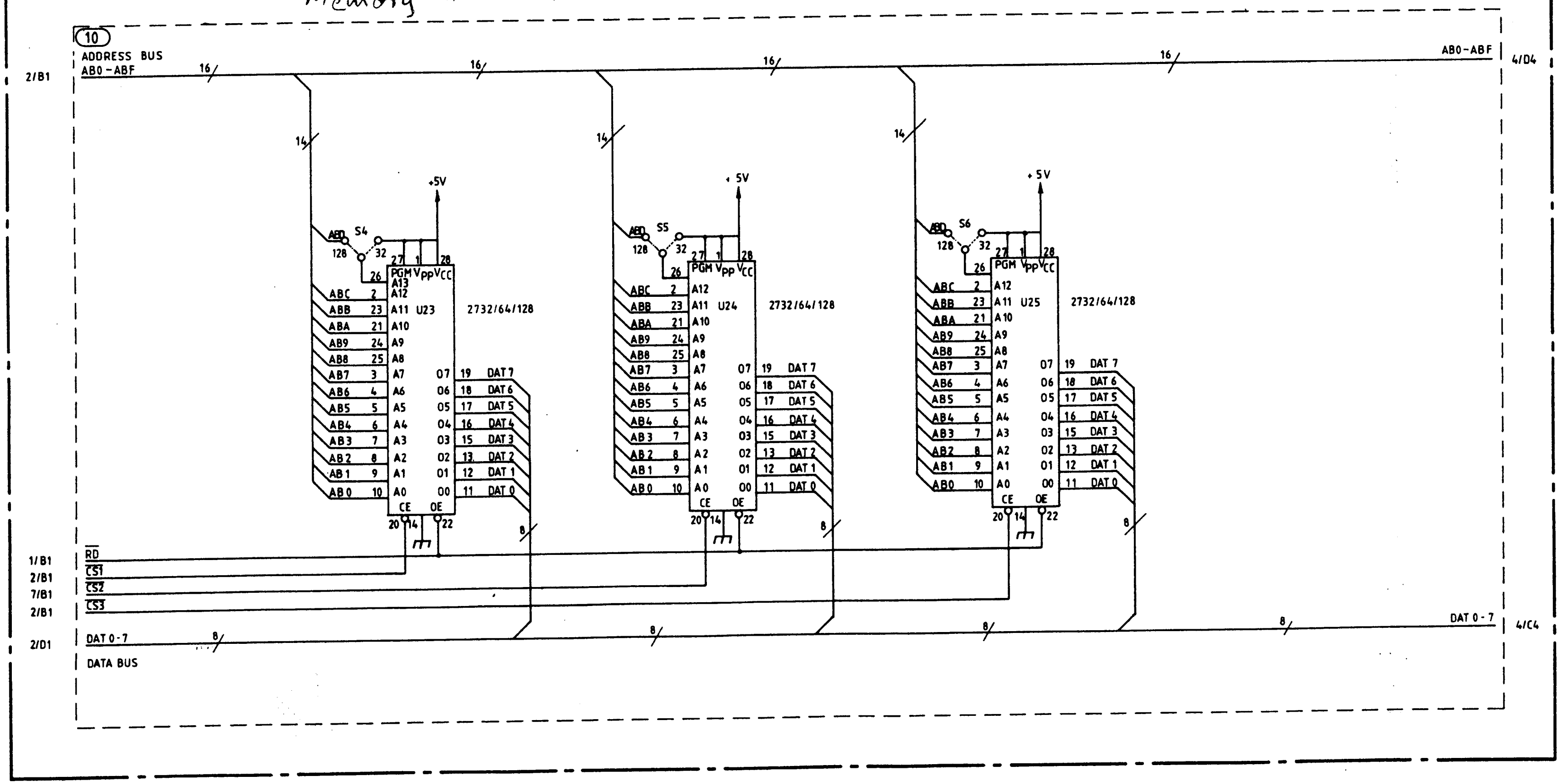
(12) RAM-area, consisting of one 8K x 8 bit. The Ram area can be extended to 16K x 8 bit by placing an additional 8K x 8 bit RAM circuit in socket U46

(13) When power is removed intentionally by PWR OFF on the front panel U50a is set. The 'PWRLO' will interrupt the microprocessor. This will read the status of U50a and store relevant information in the CMOS RAM (U47, 60,61) 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) U26: Real Time Clock integrated circuit (Battery back-uped).

ZONE	LTR	REVISIONS DESCRIPTION	DATE	APPROVAL

Memory EPROM Software

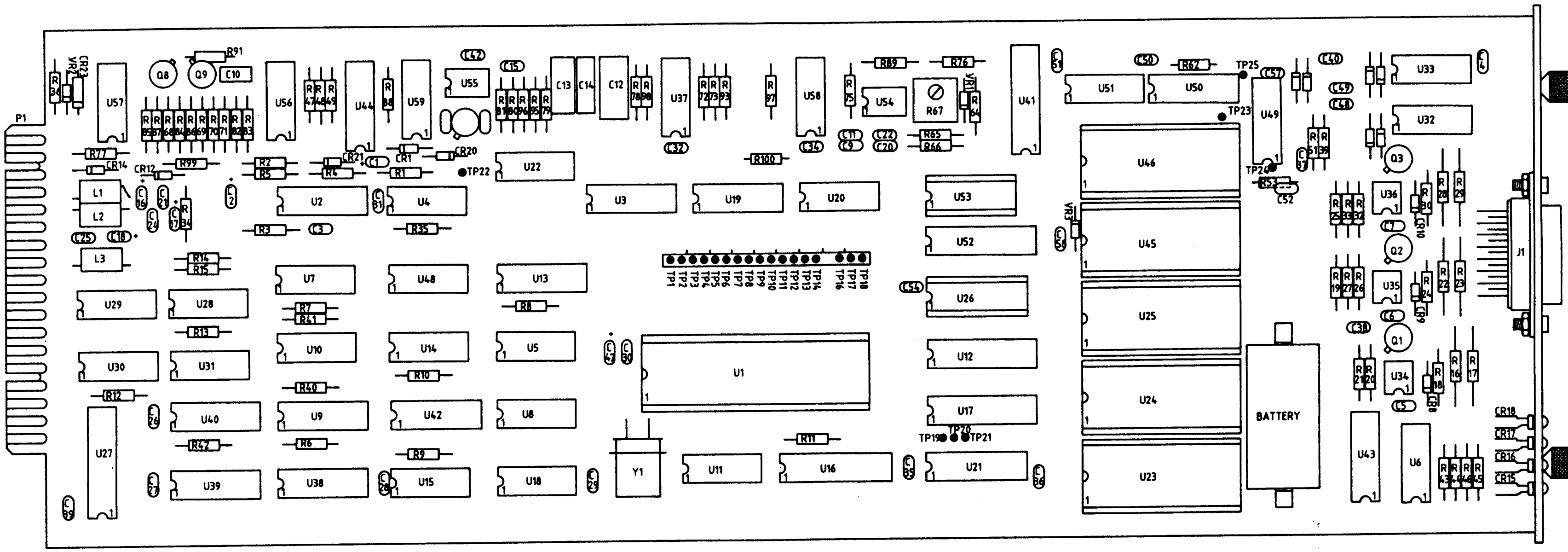


—·— 27128
········ 2732

FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 48 77 40
	SCALE		SHEET 3

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	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	3.9 1987
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

dra

TITLE
COMPONENT LOCATION
MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40

SCALE 2:1 | SHEET 1 OF1

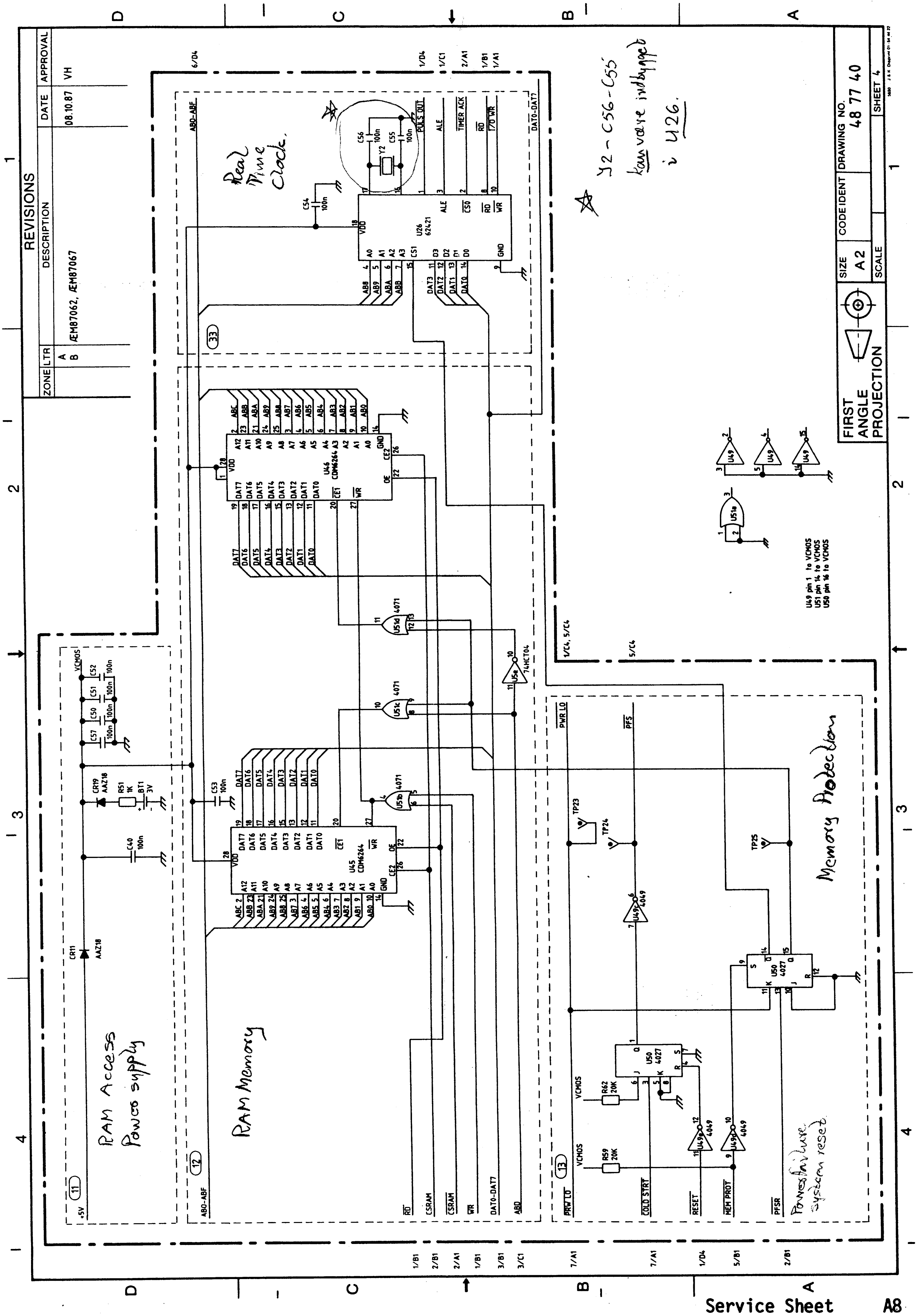
(14) Timer that counts on the CLK-signal from the microprocessor Output from the timer gives a RST 7.5 interrupt to the micro-processor for every 1ms, and a clock pulse to (3)

(15) Eight bit input port.

(16) U42:Eight addressable latches used for control signals.

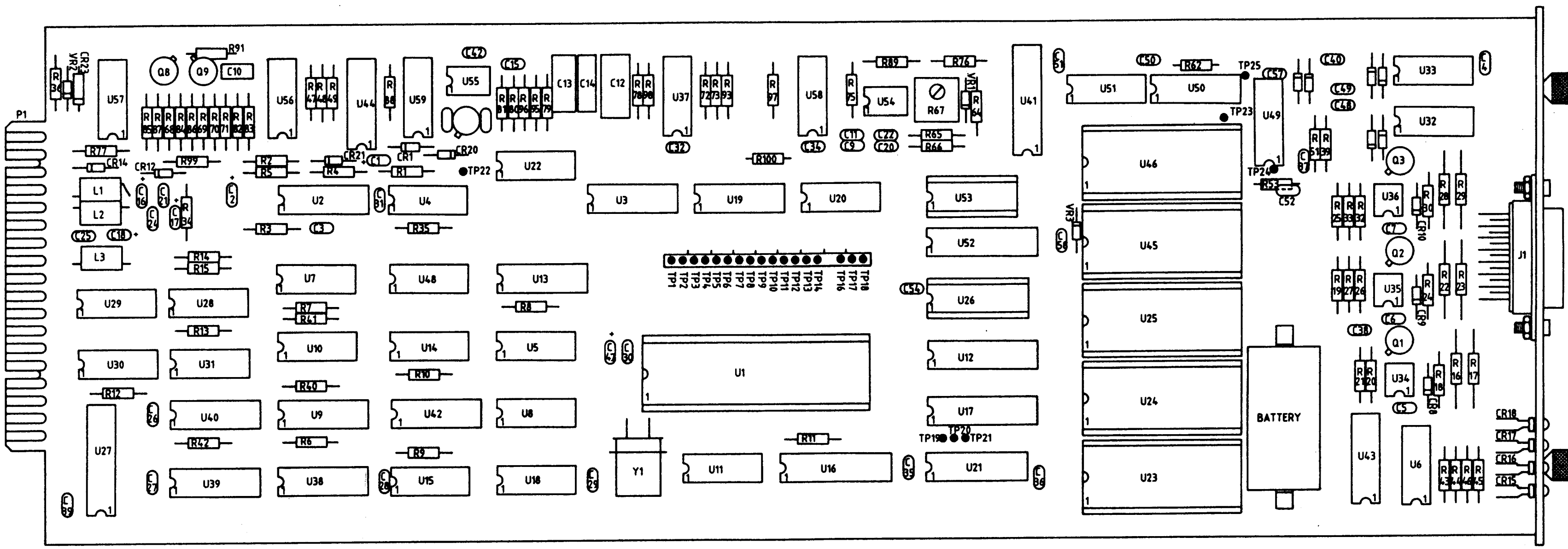
U44:One out-of-four decoder with associated pull-up resistors, used for control signals.

(17) Four bit latch with associated buffers and LED's.



Service Sheet A8

4



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	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 3.9 1987
CH.
AP.
AP.

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
MPU BOARD A8

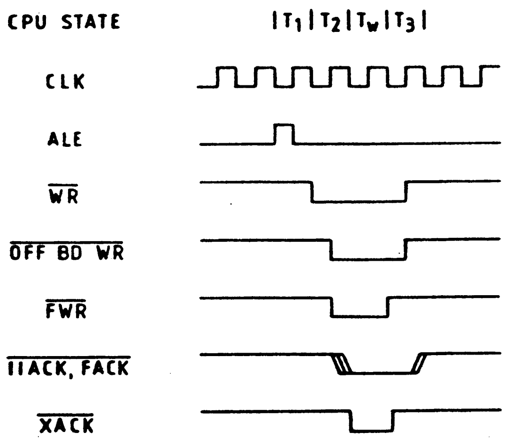
SIZE A1 | CODE IDENT | DRAWING NO. 48 77 40

SCALE 2:1 | SHEET 1 OF 1

(18) Supply filters.

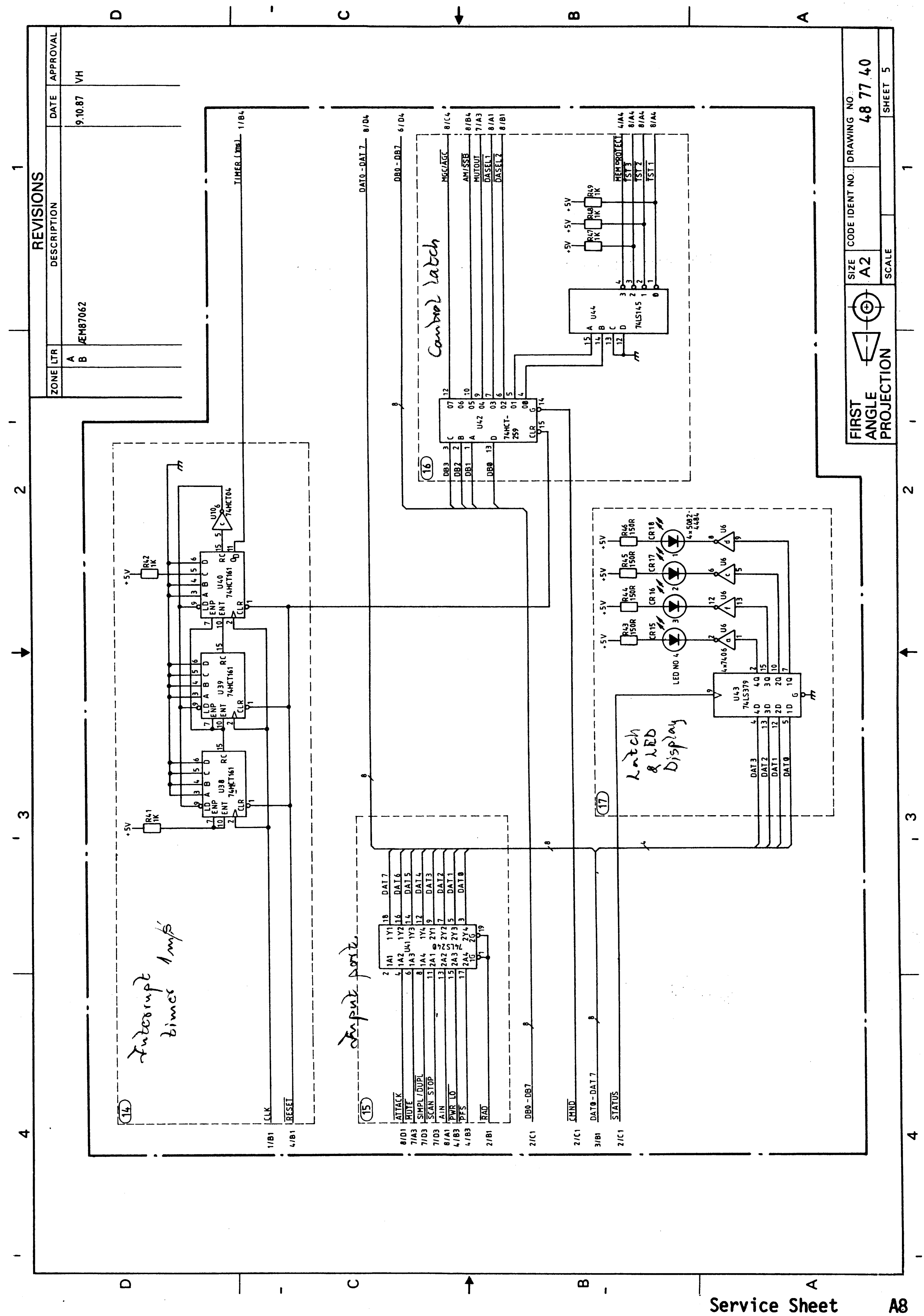
(19) U27:Eight bit bidirectional data bus buffer, which is enabled during off board operations.

(20) 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 $\overline{FWR}$.



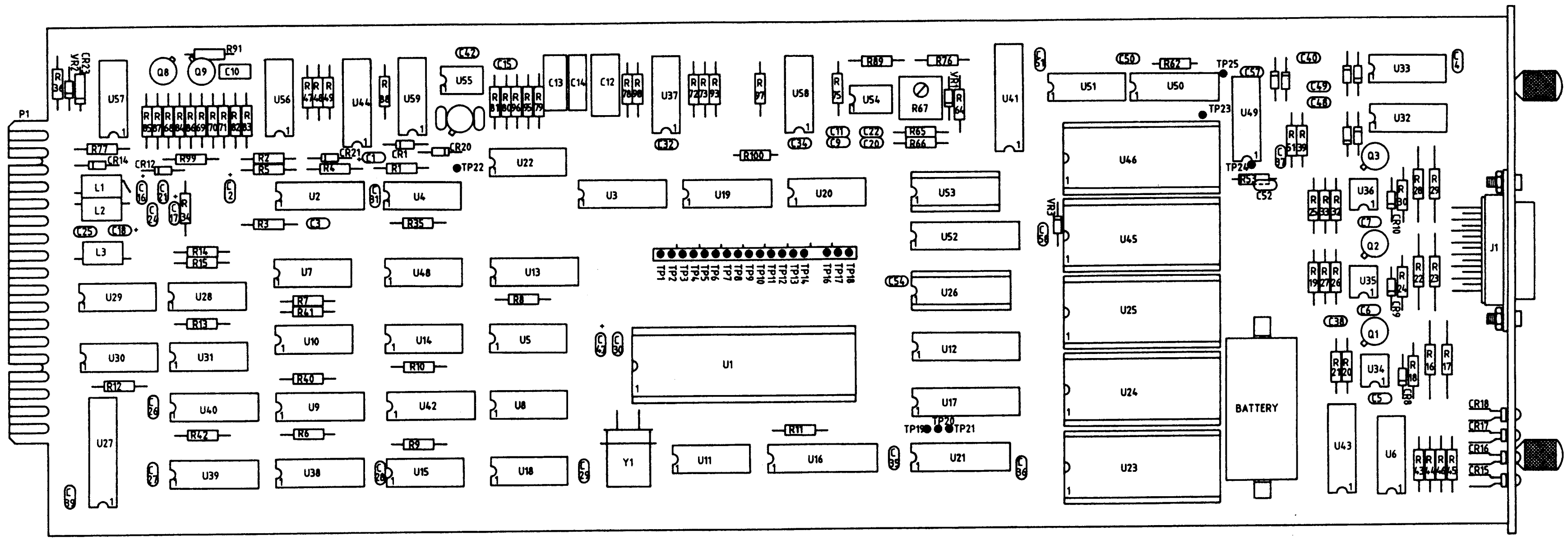
Timing diagram for generating of 1 wait-state,

(21) Buffers for off board address- and command-signals.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM87062
9.10.87
VH
Interrupt timer 1ms
Input port
Control latch
Latch & LED Display
U38 74HCT161
U39 74HCT161
U40 74HCT161
U41 74LS240
U42 74HCT-259
U43 74LS379
U44 74LS145
TIMER (1ms)
DAT0-DAT7
DB0-DB7
MGC/AGC
AM/SSB
MUTOUT
DASEL1
DASEL2
MEM PROTECT
TST3
TST2
TST1
CLK
RESET
ATTACK
MUTE
SIMPL/DUPL
SCAN STOP
AIN
PWR LO
PFS
RAD
CMND
STATUS
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT NO.
DRAWING NO. 48 77 40
SHEET 5
SCALE

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2 12 87	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 3.9 1987

CH.

AP.

AP.

FIRST ANGLE PROJECTION

Dansk Radio AS

dra

TITLE
COMPONENT LOCATION
MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40

SCALE 2:1

SHEET 1 OF 1

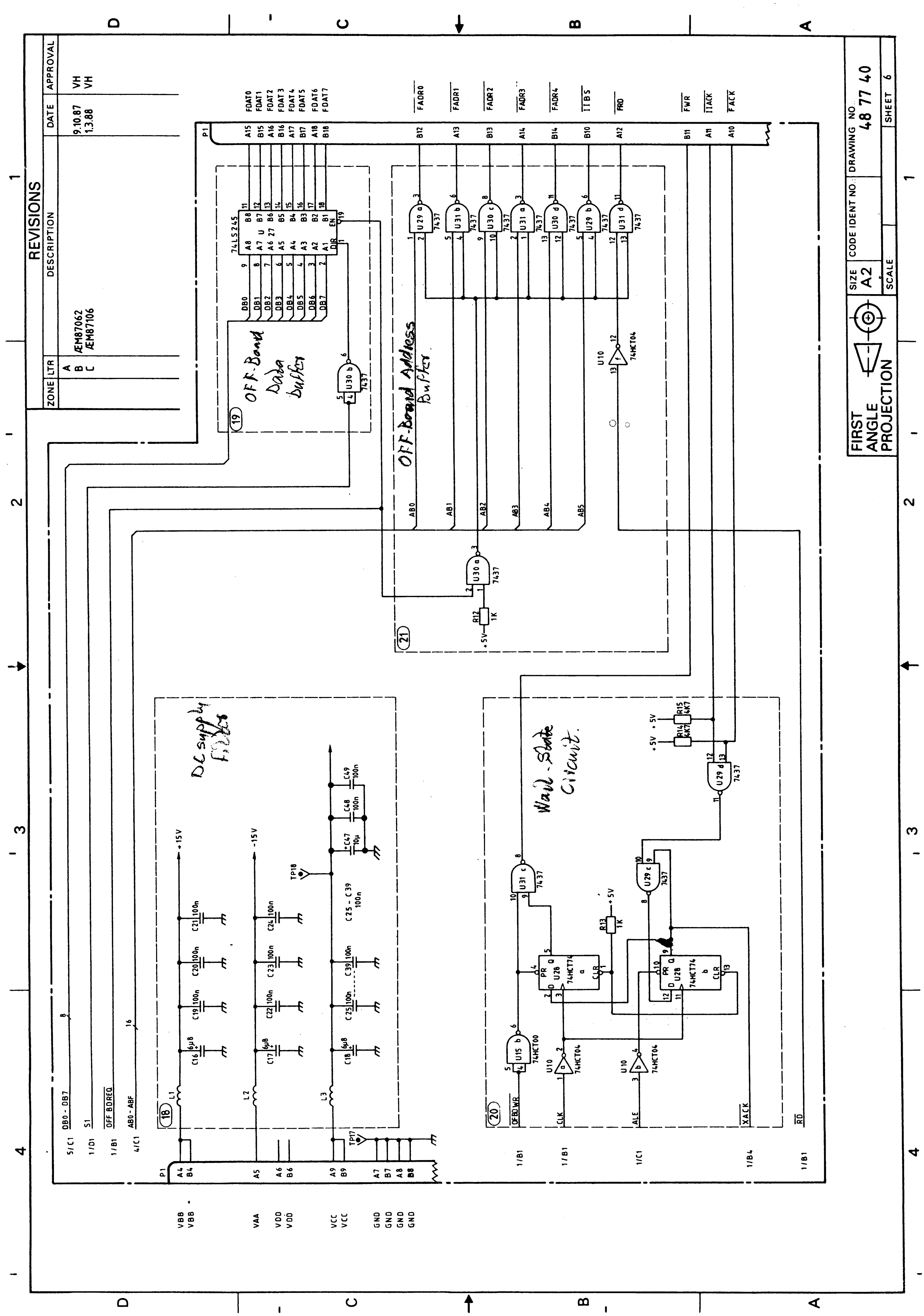
(22) RS232 interface for serial communication, optional.

(23) Optocoupler interface to ensure electrical seperation between incoming signals and on board signals.

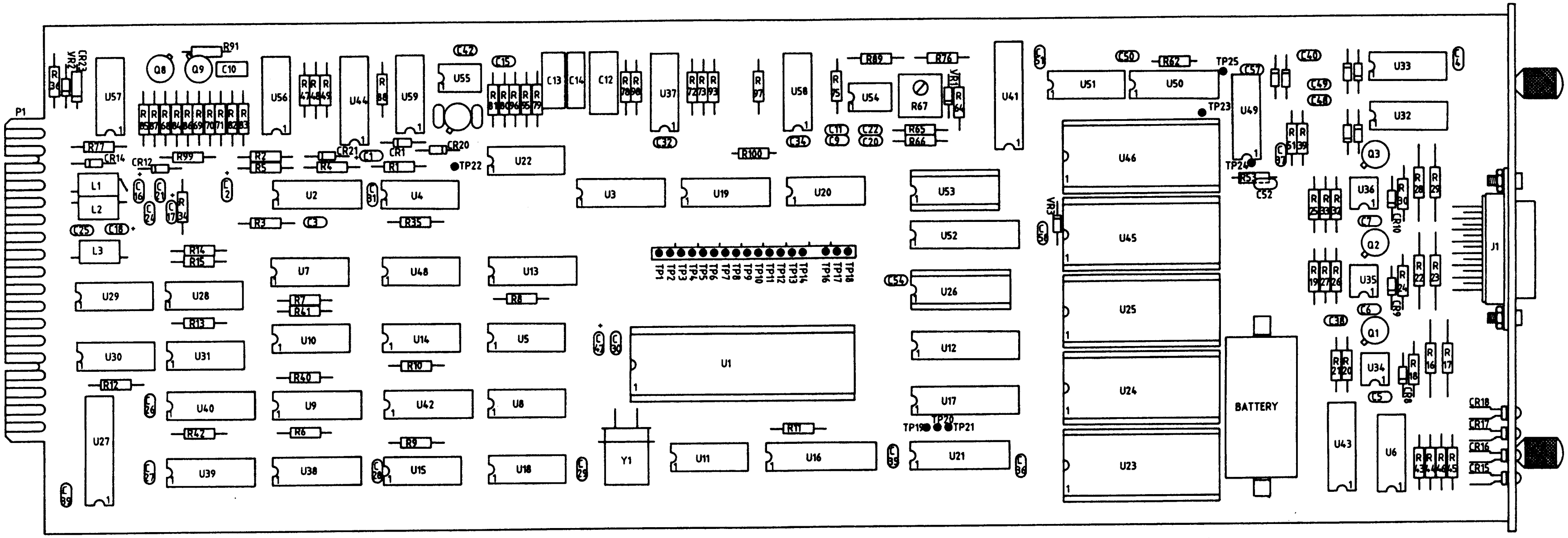
External signal generators shall be 24V, 10mA to provide a proper TTL-signal on Q1's, Q2's or Q3's collector.

(24) Diode network CR13 and CR14 are protection diodes. R34, CR12 ensures current through the connector when $\overline{PWRON}$ is low.

If power is removed by turning "Pwr off" on the front panel, $\overline{PWRON}$ goes high, and provides U50a in 13 to be cleared, by means of $\overline{COLD\ STRT}$.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
C
ÆM87062
ÆM87106
9.10.87
1.3.88
VH
VH
OFF-Board Data buffer
OFF-Board Address Buffer
Wait-State Circuit.
74LS245
74HCT74
74HCT04
74HCT00
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT NO.
DRAWING NO.
48 77 40
SCALE
SHEET 6

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
3C	B	Added CR1	2.12.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			Dansk Radio AS	dra
			DR.	VH 3.9 1987	TITLE COMPONENT LOCATION MPU BOARD A8	
471909	RC4000	ANGLES	CH.			
471712	RX4000	LIN. DIM.	AP.			
488240	RX4009		AP.			
488100	SE4010	MATERIAL	FIRST ANGLE PROJECTION		SIZE A1	CODE IDENT / DRAWING NO. 48 77 40
NEXT ASSY	USED ON				SCALE 2:1	SHEET 1 OF1
APPLICATION						

(25) U52: Eight bit latch.

U53: Eight-bit Digital to Analog converter with associated resistor network.

U54: Operational amplifier with an output to be range set by R67.

The maximum output may be adjusted to 10V.

(26) Circuit to provide an $\overline{\text{ATTACK}}$ as long as Q9 is open. To avoid spikes to cause an $\overline{\text{ATTACK}}$ R91, C10 determines the minimum time Q9 has to be open. R70, R71, C10 holds the $\overline{\text{ATTACK}}$ to ensure the microprocessor to read the $\overline{\text{ATTACK}}$.

(27) A $\overline{\text{MUTE}}$ - Signal will force the AGC2 to +15V DC (maximum damping).

(28) U57: Analog switch. If closed then Automatic Gain Control is selected.

CR23 protects U57 against negative levels.

(29) Gain Control filter. When U58 (analog switch) is closed, the filter is set up for Single Side Band mode.

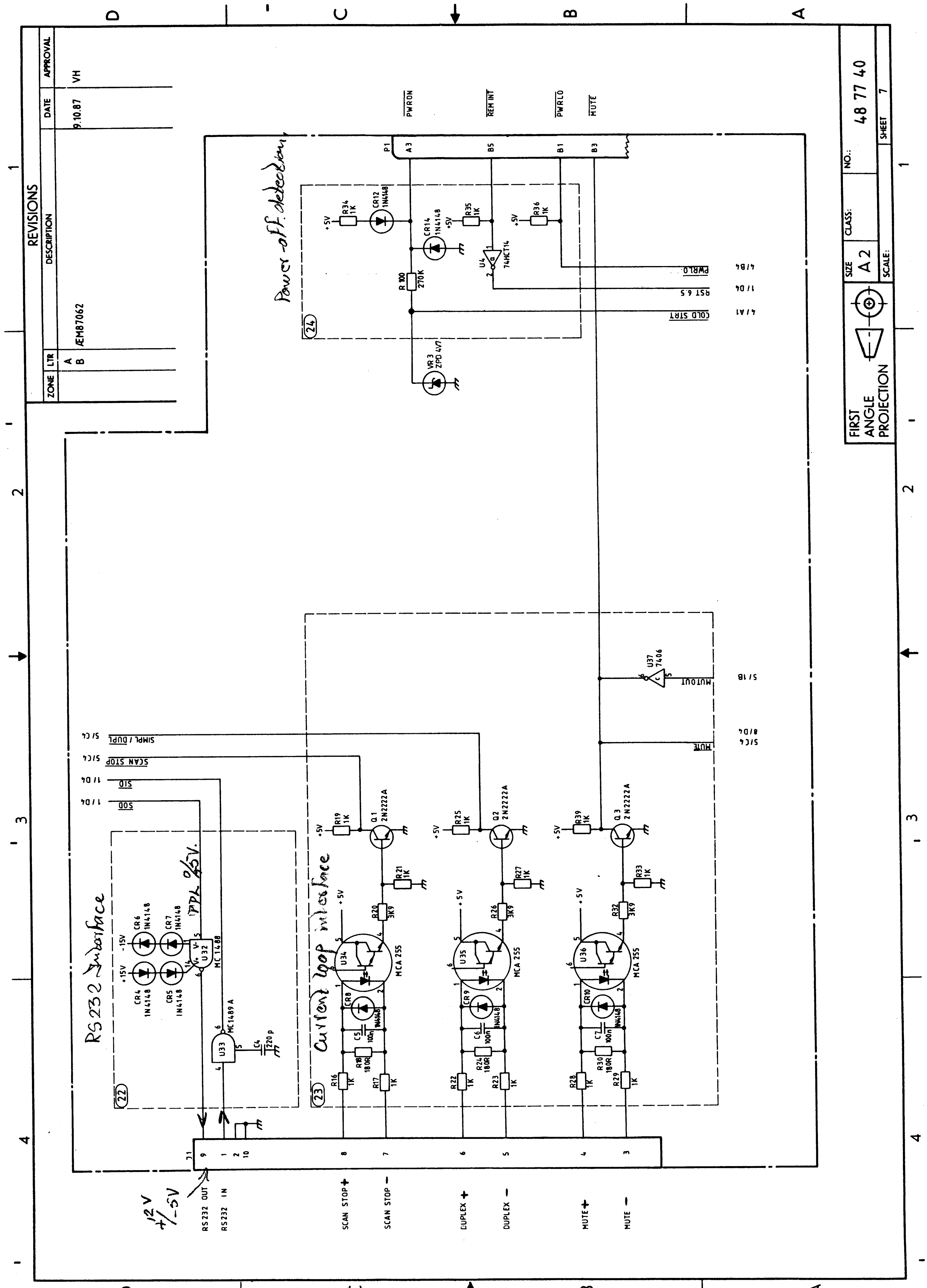
U55 is an operational amplifier used as a buffer.

R82 protects U55 when muting.

(30) Sample hold circuit used to give a digital AGC-level to AGC 2. The microprocessor controls the hold and decay-level of the AGC2.

(31) By means of the comparator U59 and the D/A-converter in (25) an A/D-conversion of either AGC1, AGC2 or a test level can be performed.

(32) Sample hold circuit used to give a digital AGC-level to AGC1.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
ÆM87062
9.10.87
VH
Power-off detection
RS232 Interface
Current loop interface
PWRON
REM INT
PWRLO
MUTE
COLD STRT
RST 6.5
MUTOUT
SIMPL / DUPL
SCAN STOP
SID
SOD
RS232 OUT
RS232 IN
SCAN STOP +
SCAN STOP −
DUPLEX +
DUPLEX −
MUTE +
MUTE −
MC1488
MC1489A
MCA 255
2N2222A
74HCT14
7406
FIRST ANGLE PROJECTION
SIZE A2
NO.: 48 77 40
SHEET 7

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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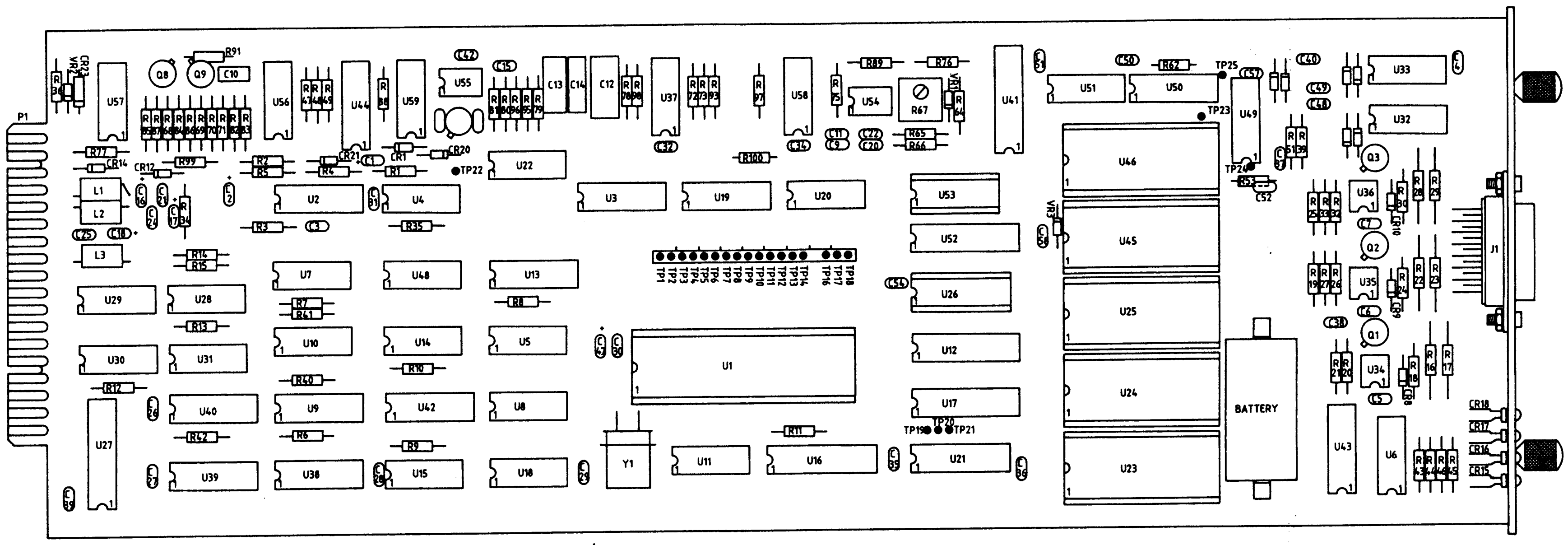
3C	B	Added CR1	2.12.87	VH



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	3.9 1987
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

dra

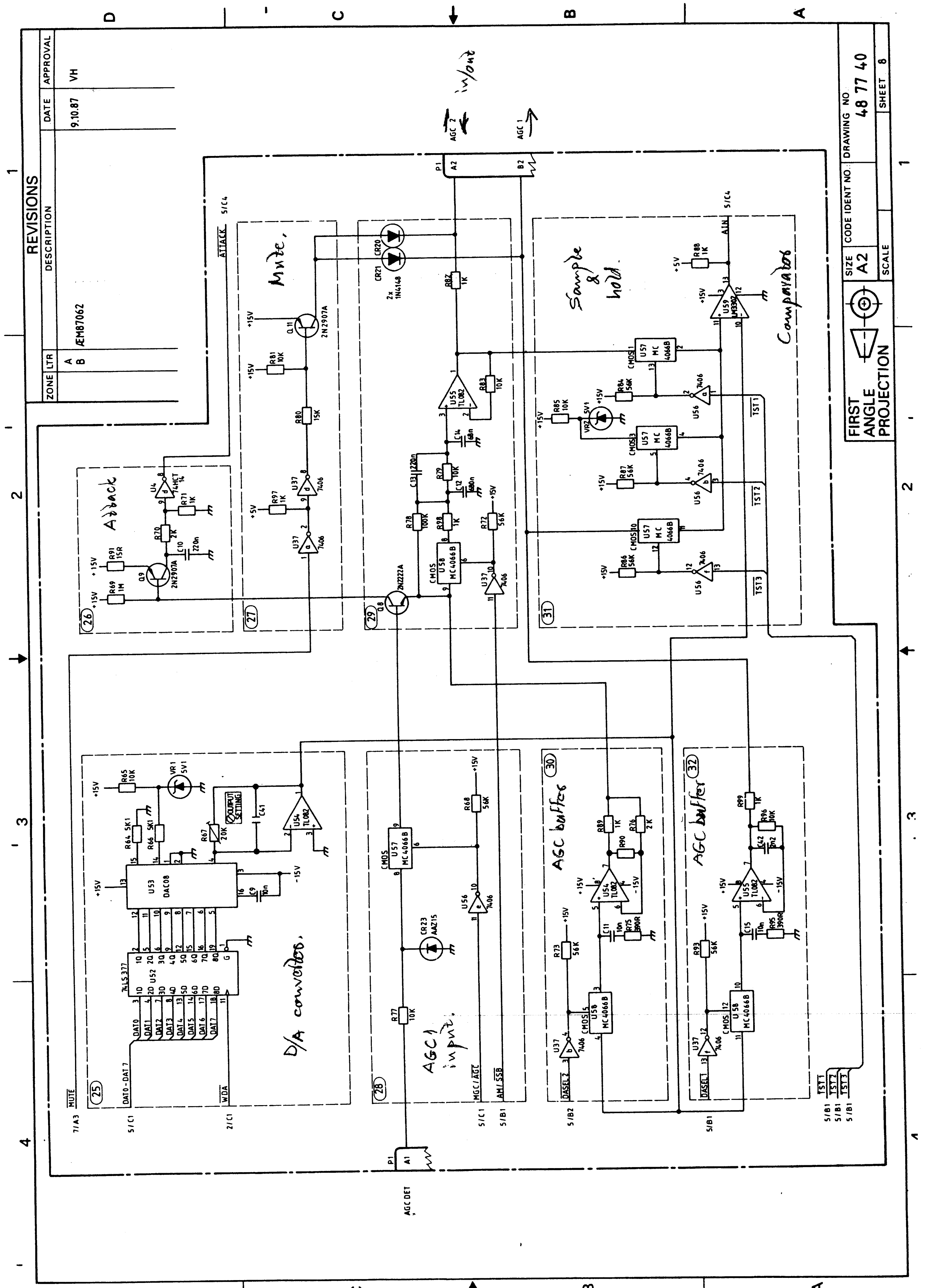
TITLE

COMPONENT LOCATION
MPU BOARD A8

SIZE	CODE IDENT	DRAWING NO.
A1		48 77 40

SCALE 2:1

SHEET 1 OF 1


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A ÆM87062 9.10.87 VH
B
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT NO.
DRAWING NO. 48 77 40
SCALE
SHEET 8
Attack
Mute.
Sample & hold.
Comparator
D/A convertor.
AGC 1 input.
AGC buffer
AGC buffer
in/out
AGC 2
AGC 1
AGC DET
U53 DAC08
U52 74LS377
U54 TL082
U55 TL082
U59 LM393
U57 MC 4066B
U58 MC4066B
Q8 2N2222A
Q9 2N2907A
Q11 2N2907A
CR20
CR21 2x 1N4148
CR23 AAZ15
OUTPUT SETTING
ATTACK
MUTE
DAT0-DAT7
WDA
MGC/AGC
AM/SSB
DASEL 2
DASEL 1
TST1
TST2
TST3
AIN

ASSY 471631, DIGITAL MODEM ASSEMBLY

Service Sheet A9

(1) Supply filtering.

The +15V, -15V and +5V supplies are filtered to reduce noise by distributed capacitances around the board.

(2) Line input - output A.

The line I/O provides a balanced impedance for bidirectional data and audio, bidirectional data or only transmitted data.

(3) Line A buffer.

The buffer, U1, is protected against high levels by D3-D6 and provides a low impedance output to the attenuator. Data to be transmitted is applied to the line primary via R89.

(4) Line A attenuator.

The attenuator is used to set the line sensitivity. Attenuation of 10dB, 20dB or 30dB is obtained with S7 c,b and a respectively.

(5) Buffer.

The buffer is used to provide a low impedance source for the filter inputs and prevents loading of the attenuator.

(6) Line input B.

The line input can act as data receiver, audio receiver or both data and audio receiver. R98 defines the line impedance.

(7) Line B attenuator.

The attenuator is used to set the line sensitivity. Attenuation of 10dB, 20dB or 30dB is obtained with S10 c,b and a respectively.

(8) Line B buffer.

The buffer U1 is protected against high levels by D7 and D23 and provides a low impedance source to the filters.

(9) Notch filter.

As a 2990Hz tone is used to provide a mute contact for the receiver it is desirable to filter this out of the audio and data line. This filter provides > 20dB attenuation with a bandwidth of 300 Hz. The center frequency of the notch is adjustable with R208.

(10) 200 Hz HPF.

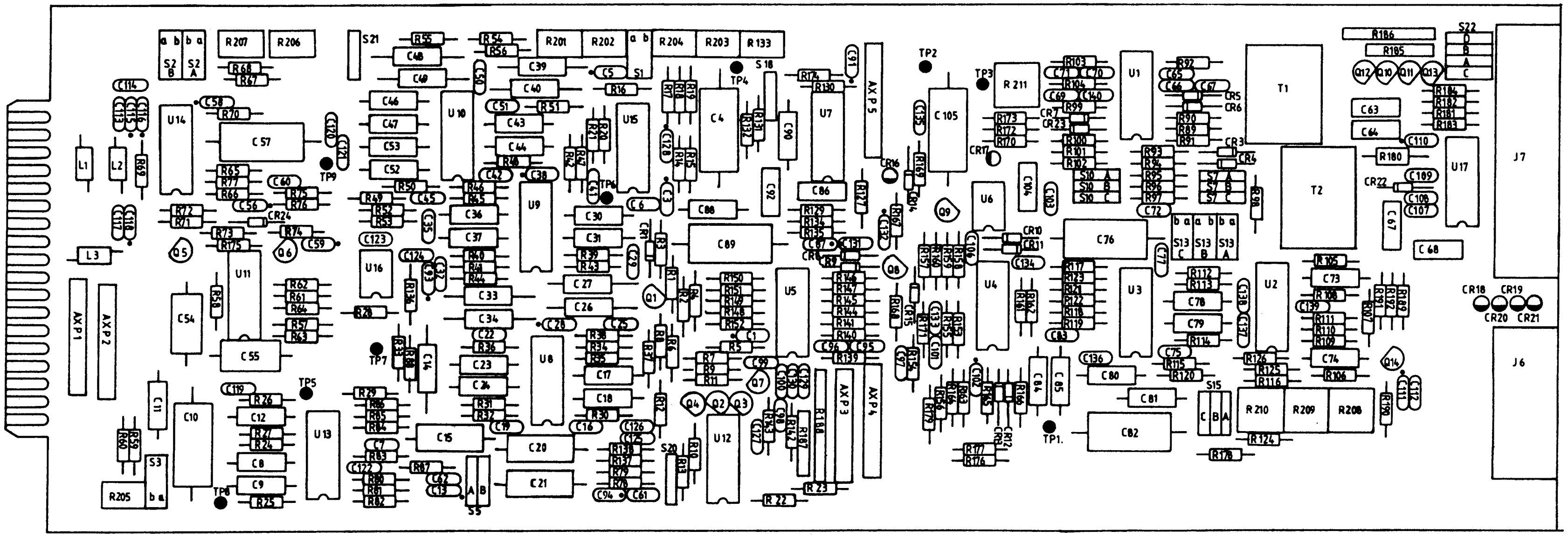
The low end frequency response as used by the FSK demodulator is defined by this third order filter.

(11) FSK demodulator.

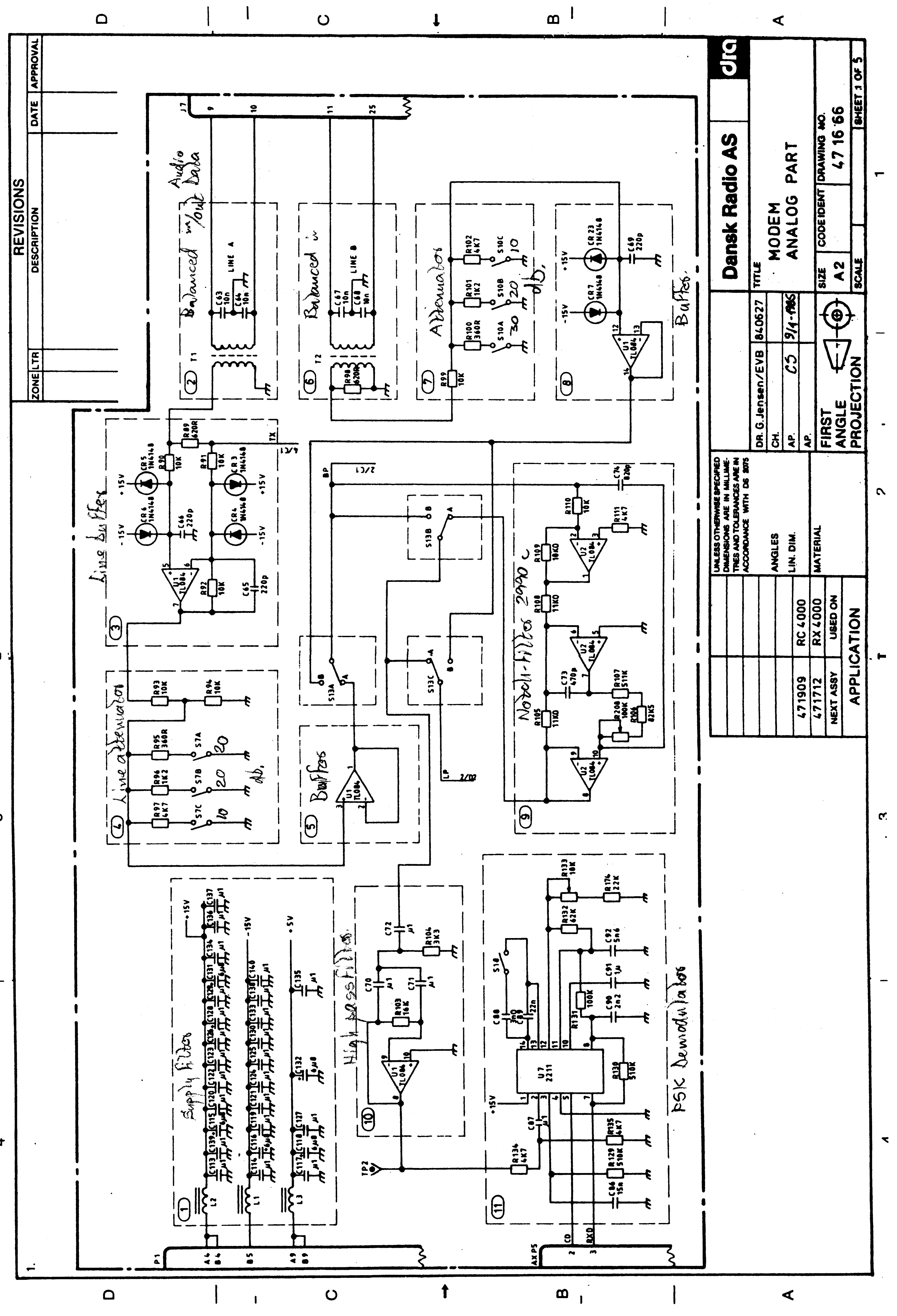
This is a PLL type demodulator and can be set to receive either 600 baud, 1300Hz mark and 1700Hz space or 1200 baud, 1300Hz mark and 2100Hz space by setting S18 either on or off. The received data and carrier detect signals are sent to the digital board via AXP5.

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87079	21.12.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			Dansk Radio AS
		ANGLES	DR GERT JENSEN	830505	TITLE MODEM
		LIN DIM.	CH.		
			AP		
			AP.		
		MATERIAL	FIRST ANGLE PROJECTION		SIZE A1 · CODE IDENT · DRAWING NO. 47 16 66
NEXT ASSY	USED ON				SCALE · SHEET 1 OF 1
APPLICATION					


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
Dansk Radio AS
TITLE
MODEM
ANALOG PART
DR. G.Jensen/EVB 840627
CH.
AP. CS 9/4-1986
AP.
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 16 66
SCALE
SHEET 1 OF 5
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
471909 RC 4000
471712 RX 4000
NEXT ASSY
USED ON
APPLICATION
Balanced in/out
Audio Data
Balanced in
Attenuator
Buffer
Line buffer
Line attenuator
Notch-filter 2990 c
High pass filter
Supply filter
FSK Demodulator

(12) Bandpass filter.

This filter is tuned to a center frequency of 2990Hz with R209 and R210. U3 is used as a "gyrator" to simulate inductance. The bandwidth of the filter is 100Hz with S15 a,b,c open and 200Hz with S15 a,b,c closed.

(13) Amplifier.

A +3dB amplifier acts also as a buffer following the filter and operates in the non-inverting mode.

(14) Level detector.

The level detector is preceded by a limiting stage U4a, D12-D13. The output of this also goes to the frequency detector. The limited signal is then rectified with U4, D10, D11 and filtered by U4 and C101. The resulting signal will then be used to indicate the presence of a 2990Hz tone above a required level.

(15) Frequency detector.

The limited signal from (14) is applied to the input of U6, a PLL tone decoder. The free running frequency is adjusted to 2990Hz with R211. If the loop locks on to a signal of 2990Hz then the output will go low, lighting CR17.

This is also "anded" with the output from the level detector, so when both level and frequency criteria are filled then CR16 lights. At the RX 4000 this is used to determine if a mute tone is present.

(16) 200Hz HPF.

This 3rd order filter is used to define the low end audio response before further amplification in the RC 4000.

(17) Audio switch.

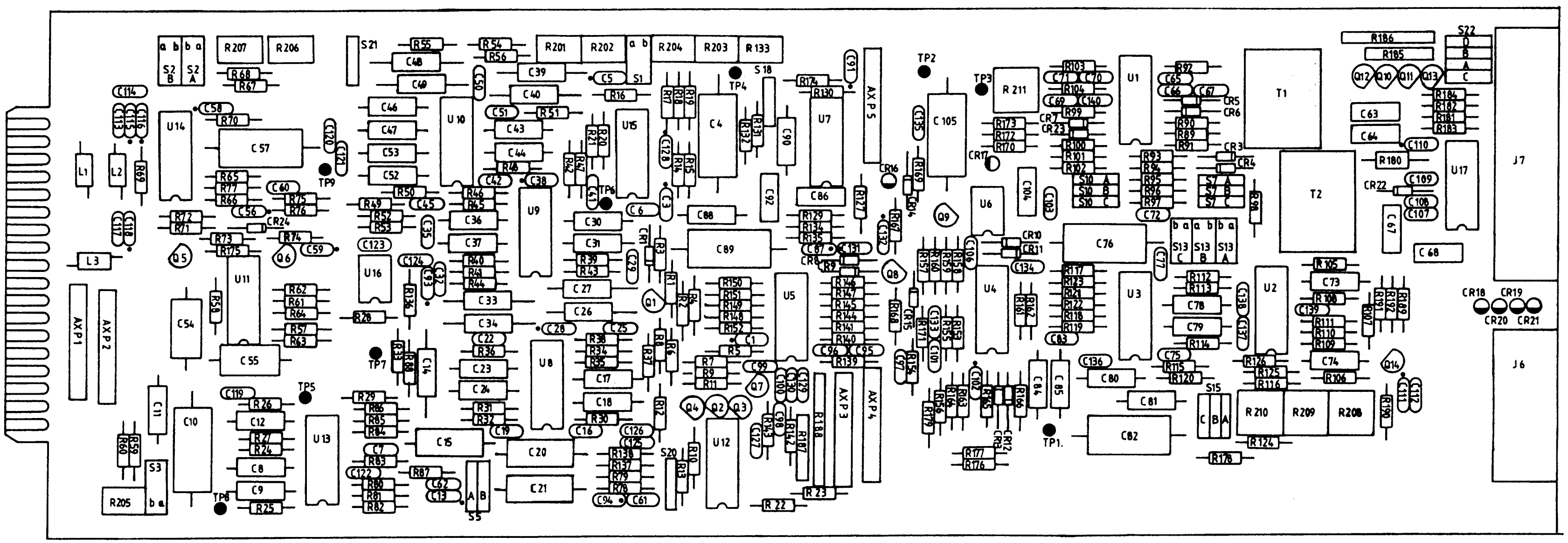
The analogue switch, biased for linear operation, is used to cut the audio at the RC 4000 when a mute tone or data is sent. It can be bypassed with S20 which would allow a continuous monitoring of the line.

(18) Unity gain buffer.

The buffer is used for the audio signal before it passes to the power amplifiers at the RC 4000.

(19) Log AF detector.

The detector gives an output proportional to the log of the audio level. The detector and buffer are made up of U5, D8, D9 and the feedback is applied to the transistor Q7 which reduces the input signal level.



REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87079	21.12.87	VH

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

ANGLES
LIN. DIM.
MATERIAL

NEXT ASSY	USED ON

APPLICATION

DR. GERT JENSEN 830505
CH.
AP.
AP.

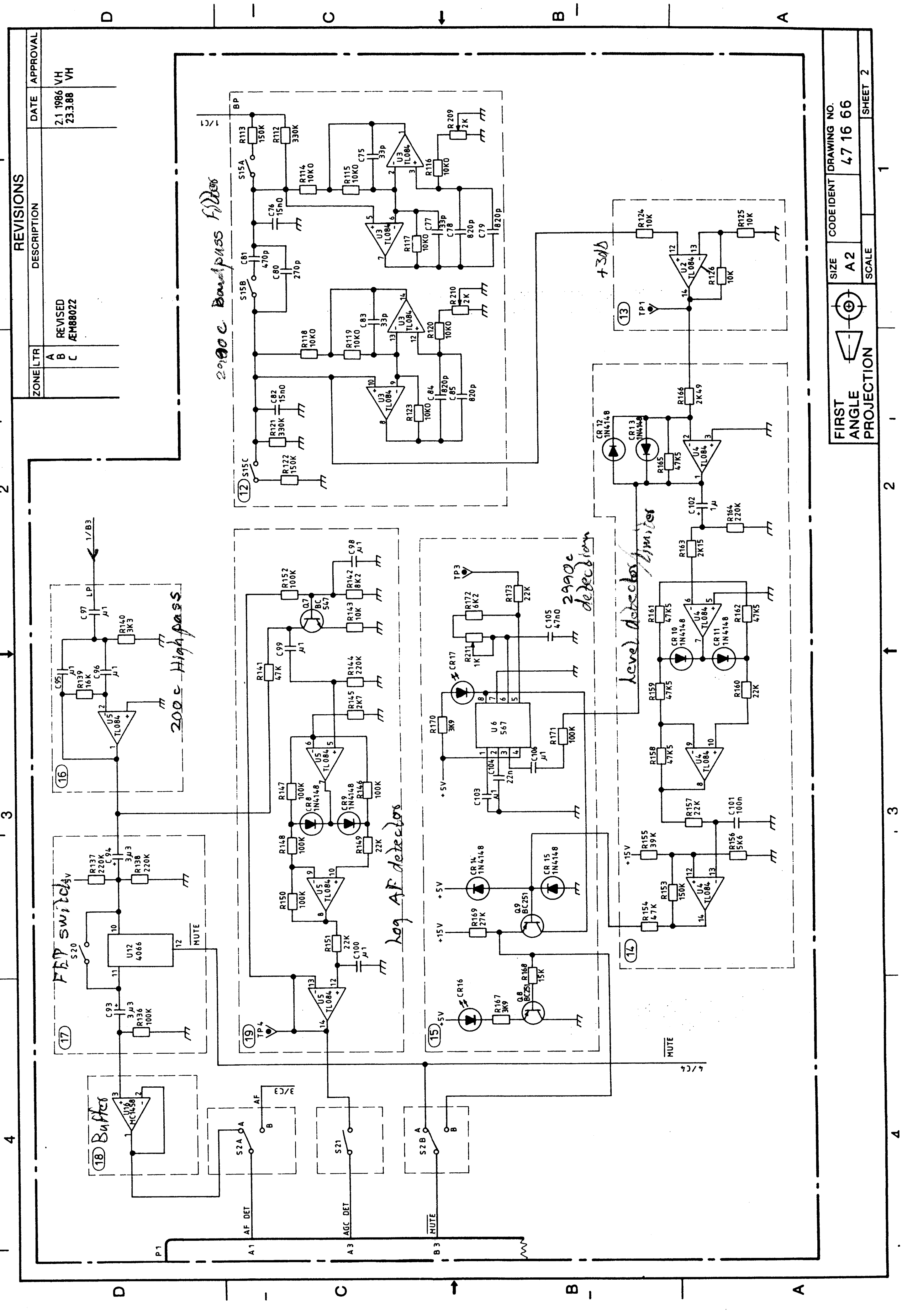
FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
MODEM

SIZE	CODE IDENT	DRAWING NO.
A1		47 16 66

SCALE
SHEET 1 OF /


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A B C REVISED ÆM88022 2.1.1986 VH 23.3.88 VH
BP
LP
TP1
TP3
TP4
20990c Bandpass filter
200c Highpass
+3dB
level detector/limiter
2990c detection
Log AF detector
FET switch
Buffer
MUTE
AF DET
AGC DET
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 16 66
SHEET 2
SCALE

(20) 60mS delay.

A delay of 60mS is produced between $\overline{RTS}$ going low and $\overline{CTS}$ going low due to R3,R4 and C1. The switching speed of the network is increased with Q2 so that a sharp falling edge is produced. Q4 is used as an inverter to drive the analogue switch 22 .

(21) FSK generator.

The serial data to be transmitted is used to control two tones. A mark tone of 1300Hz is adjusted by R202. The space frequency can be either 1700Hz or 2100Hz as selected by S1. K203 adjusts the 2100 $\pm$5Hz tone and R204 adjusts the 1700 $\pm$5Hz tone. R201 adjusts the output level at TP6 to be 77mVrms.

(22) Analogue switch.

The switch, biased for linear operation by R22 and R23, selects either audio from the receiver's detector or the tones from the FSK generator. It is controlled by the 60mS delay (20) so that only one source is selected at any one time.

(23) Buffer.

A buffer is provided so that the following filter sees a low source impedance.

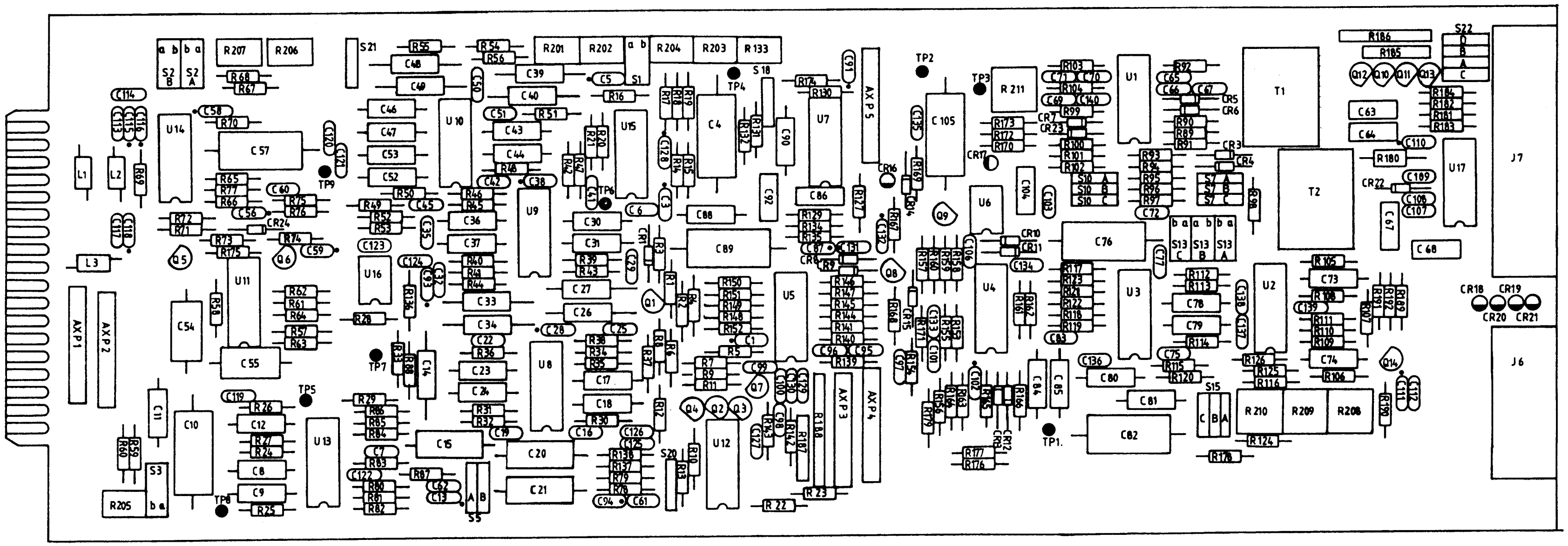
(24) 3kHz lowpass filter.

This 3rd order LPF is used to provide a band limited signal for the line transmitter.

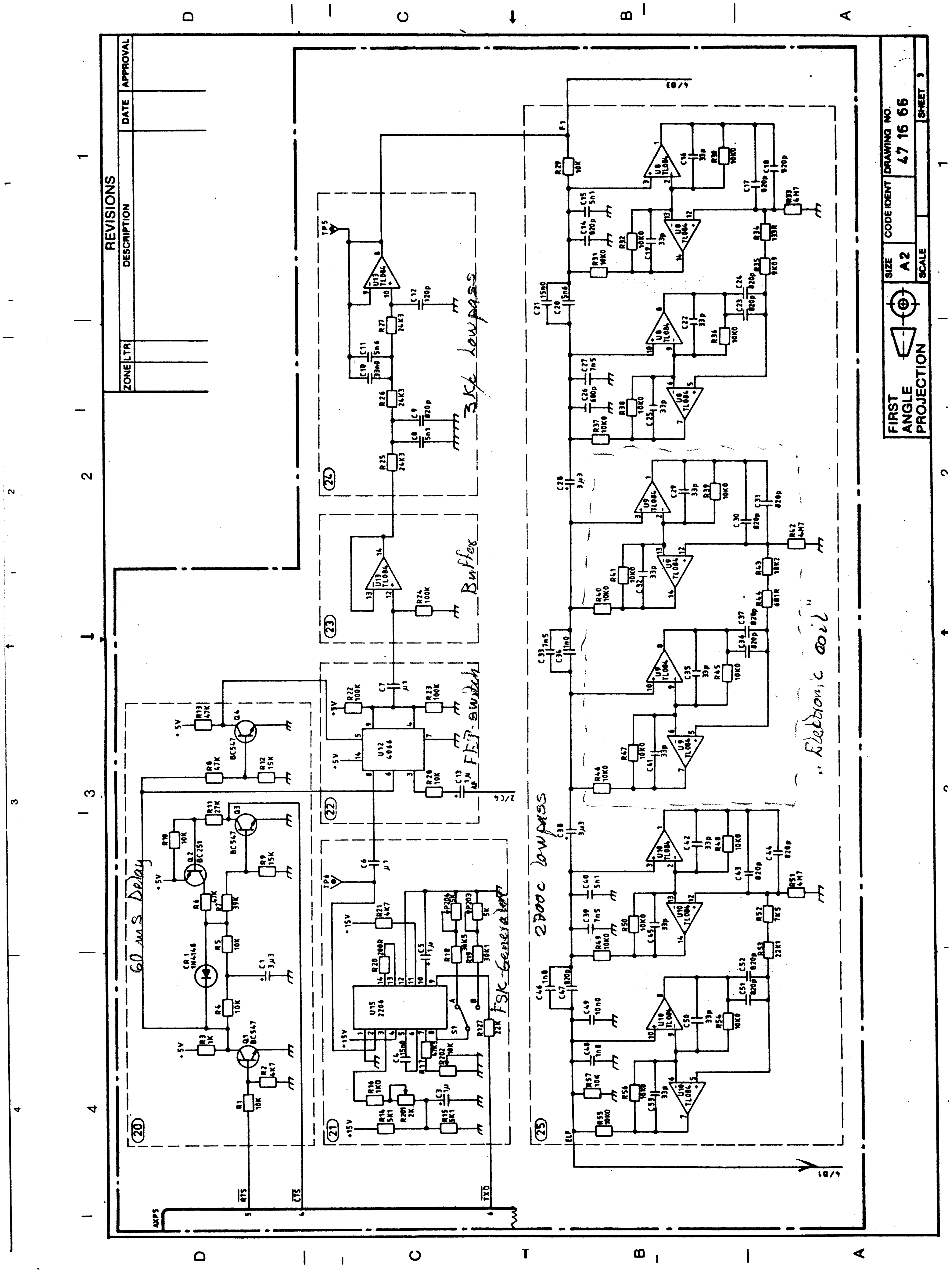
(25) 2700Hz lowpass filter.

This filter, of an elliptic configuration, provides very high attenuation of frequencies above 2.7kHz, typically 45dB at 2870Hz. It is formed with floating gyrators providing the inductance. R33, 42 and 51 are only to provide a ground reference point. This high order of attenuation is used to prevent the audio tones from activating the mute. The three stages are coupled by C28 and C38.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87079	21.12.87	VH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	DR. GERT JENSEN 830505	Dansk Radio AS dra
ANGLES	CH	TITLE MODEM
LIN. DIM.	AP.	
MATERIAL	AP.	
NEXT ASSY / USED ON	FIRST ANGLE PROJECTION	SIZE A1 / CODE IDENT / DRAWING NO. 47 16 66
APPLICATION		SCALE / SHEET 1 OF 7


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 16 66
SHEET 3
SCALE
60 ms Delay
FSK-Generator
FSK switch
Buffer
3Kc lowpass
2700c lowpass
" Electronic coil "

(26) Buffer.

The buffer is used to provide isolation between filters (25) and (27) .

(27) Notch filter.

This provides further attenuation of any further 2990Hz frequencies. During alignment it is normally necessary to connect TP7 and TP5, so that R205 can be adjusted for a minimum. Typically $>$ 20dB of attenuation is provided with a 3dB bandwidth of $<$ 300Hz.

(28) Tone generator.

The mute tone of 2990 $\pm$5Hz is generated by U14 with the frequency of the tone adjusted by R207. The output level at TP9 is nominally 206mVrms and is set by R206.

(29) +10dB switch.

When the controller requires the receiver to be muted, the mute line goes low. This turns on Q5 and turns off Q6, leaving the mute tone only attenuated by R76. After a time delay set by C54, R76 Q6 again turns on and the mute tone is attenuated by R75 in parallel to R76, reducing the level by 10dB.

(30) Switch.

The analogue switch is controlled by the inverted $\overline{\text{MUTE}}$ and isolates the tone from the combiner if no mute is selected.

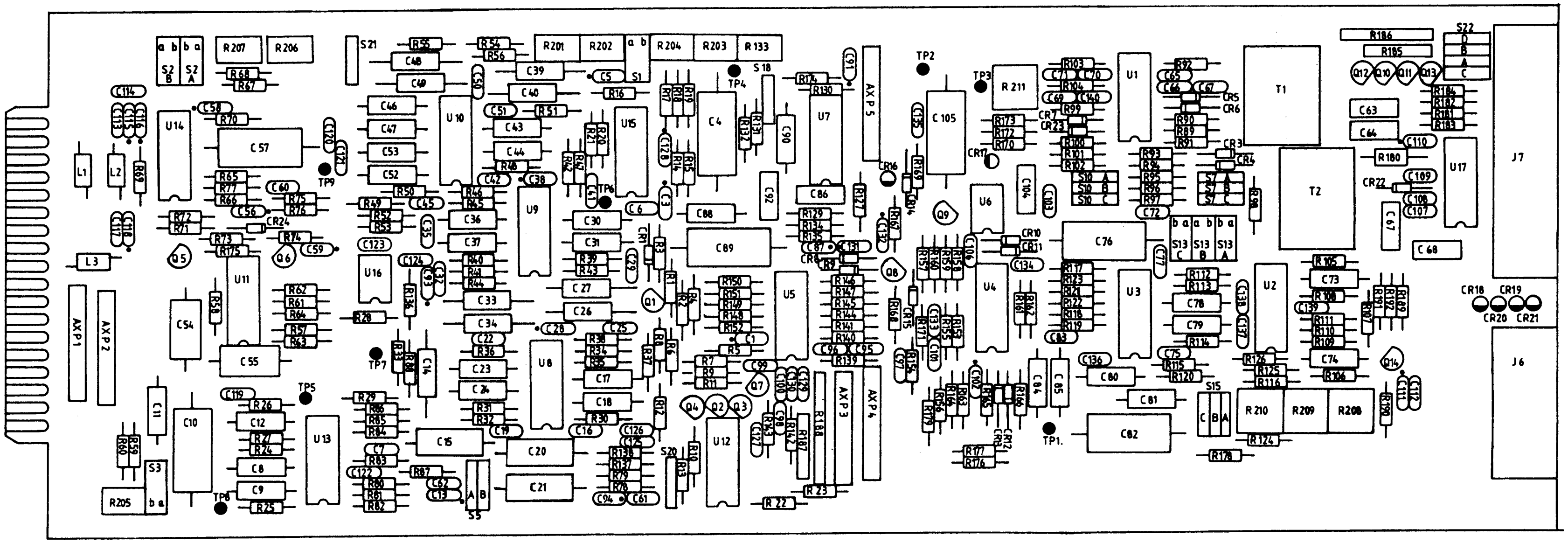
(31) Combiner.

U13 is used to combine the audio or FSK and mute tones when present.

(32) Output amplifier.

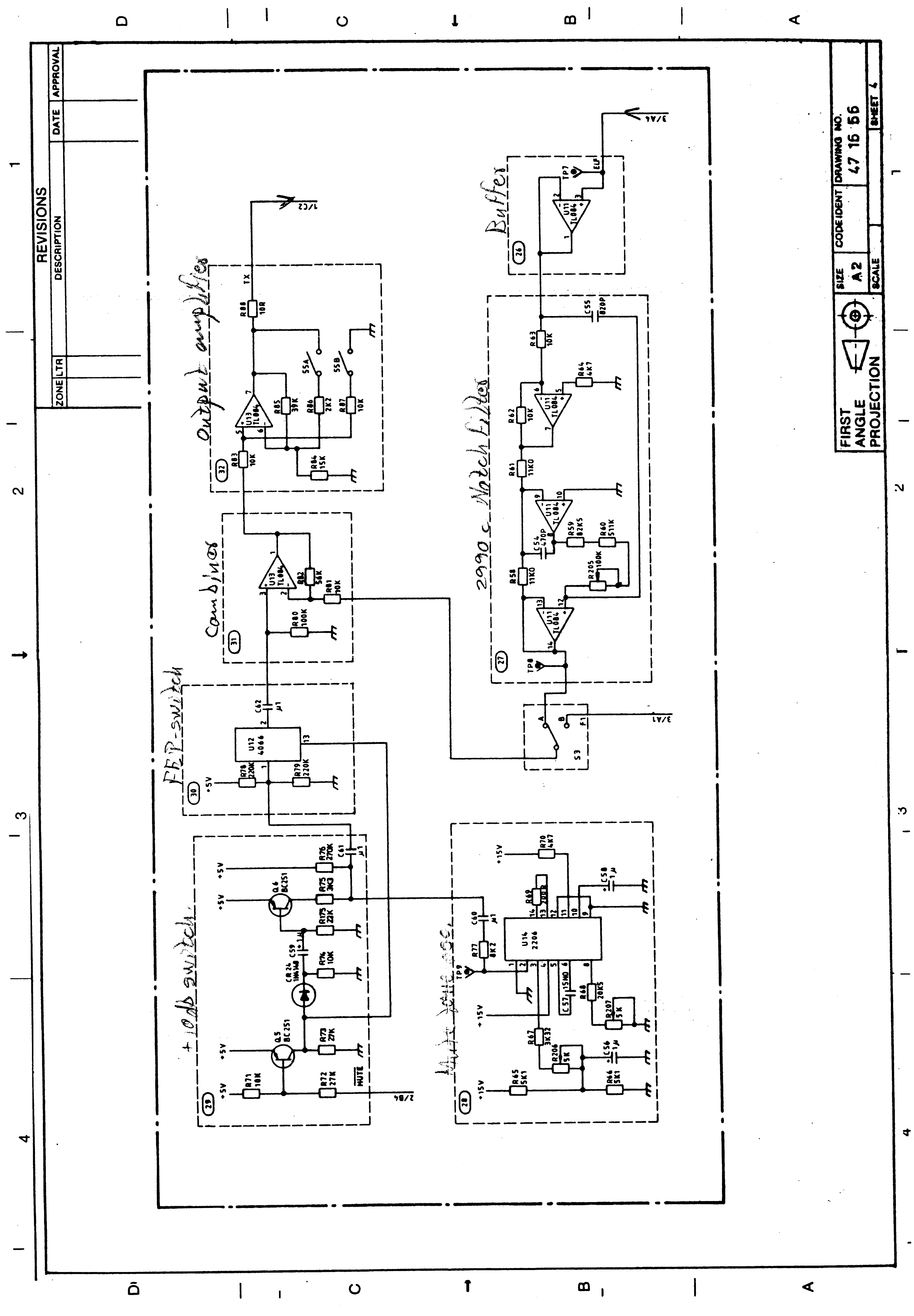
The line A output amplifier has three possible gain reductions, six dB with S5a closed and ten dB with S5b closed or sixteen dB with S5a and S5b both closed.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87079	21.12.87	VH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
ANGLES	
LIN. DIM.	
MATERIAL	
NEXT ASSY	USED ON
APPLICATION	

DR. GERT JENSEN	830505	Dansk Radio AS
CH.		TITLE: MODEM
AP.		
AP.		
FIRST ANGLE PROJECTION		SIZE: A1
CODE IDENT	DRAWING NO. 47 16 66	
SCALE	SHEET 1 OF 7	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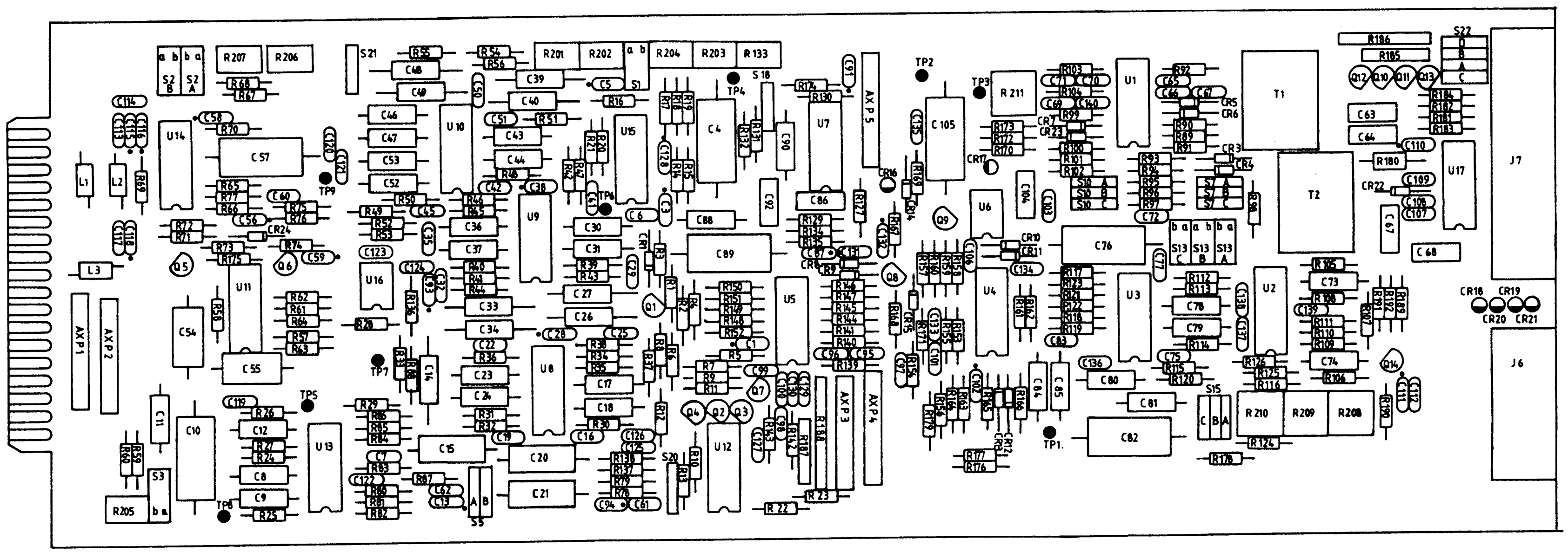
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
47 16 56
SHEET 4
SCALE
Buffer
Output amplifier
Combiner
2990 c Notch Filter
+10dB switch

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87079	21.12.87	VH



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

ANGLES
LIN. DIM.
MATERIAL

NEXT ASSY | USED ON
APPLICATION

DR. GERT JENSEN 880505
CH.
AP.
AP.

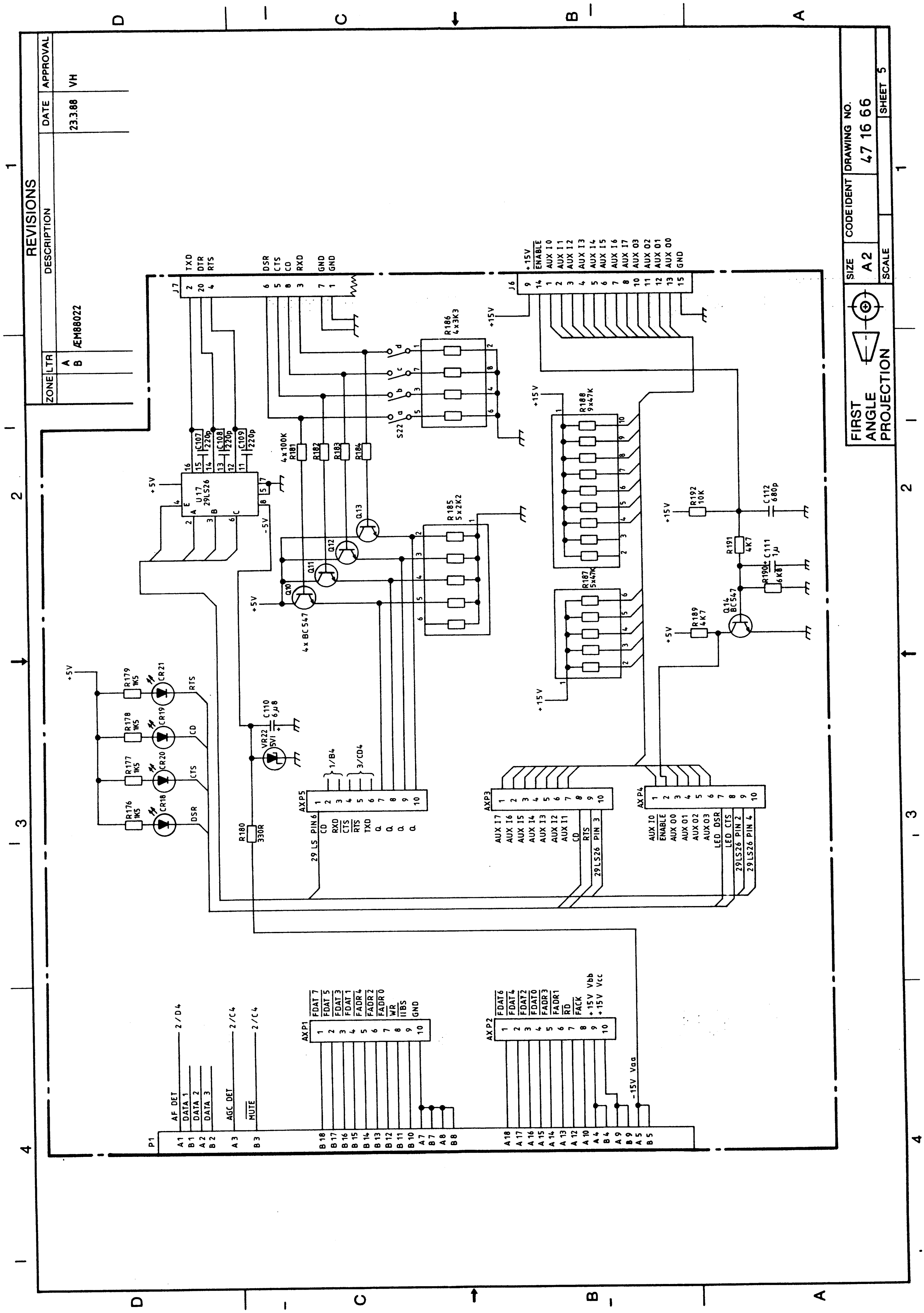
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE: MODEM

SIZE: A1 | CODE IDENT | DRAWING NO. 47 16 66

SCALE | SHEET 1 OF 7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APPROVAL
A
B
ÆM88022
23.3.88
VH
SIZE
A2
CODE IDENT
DRAWING NO.
47 16 66
SCALE
SHEET 5
FIRST ANGLE PROJECTION

ASSY 471631, DIGITAL MODEM ASSEMBLY Schematic 1

(1) Control/data interface.

This circuit controls the data transmission between the CPU card (A8) and the modem card (A9).
The modem is controlled through 6 ports, each having an address decoded by U11.

Address:	Function:
02H	UART command port
03H	UART data port
04H	AUX out port (from card)
06H	AUX in port (to card)
0AH	STATUS in port
0CH	STRAP in port

A handshake signal is generated to A8, when a port is addressed.

(2) Strap field.

Switch S2 and U8 form a strap circuit.

Switch	a	remote	address	0
"	b	"	"	1
"	c	"	"	2
"	d	"	"	3
"	e	"	"	4
"	f	"	"	5

Switch a through f select the address of the actual remote unit (binaer form).

Switch g selects either external or internal modem.

Switch h selects whether data and AF are transmitted on the same modem line or not.

(3) AUX circuit.

This circuit is used to control the data transfer between the I/O ports and the data bus.

The AUX port has 8 inputs and 8 outputs, which are split up in 4 separate input lines and 4 separate output lines, and 4 common I/O lines. The common lines can only be used as either input or output at a time.

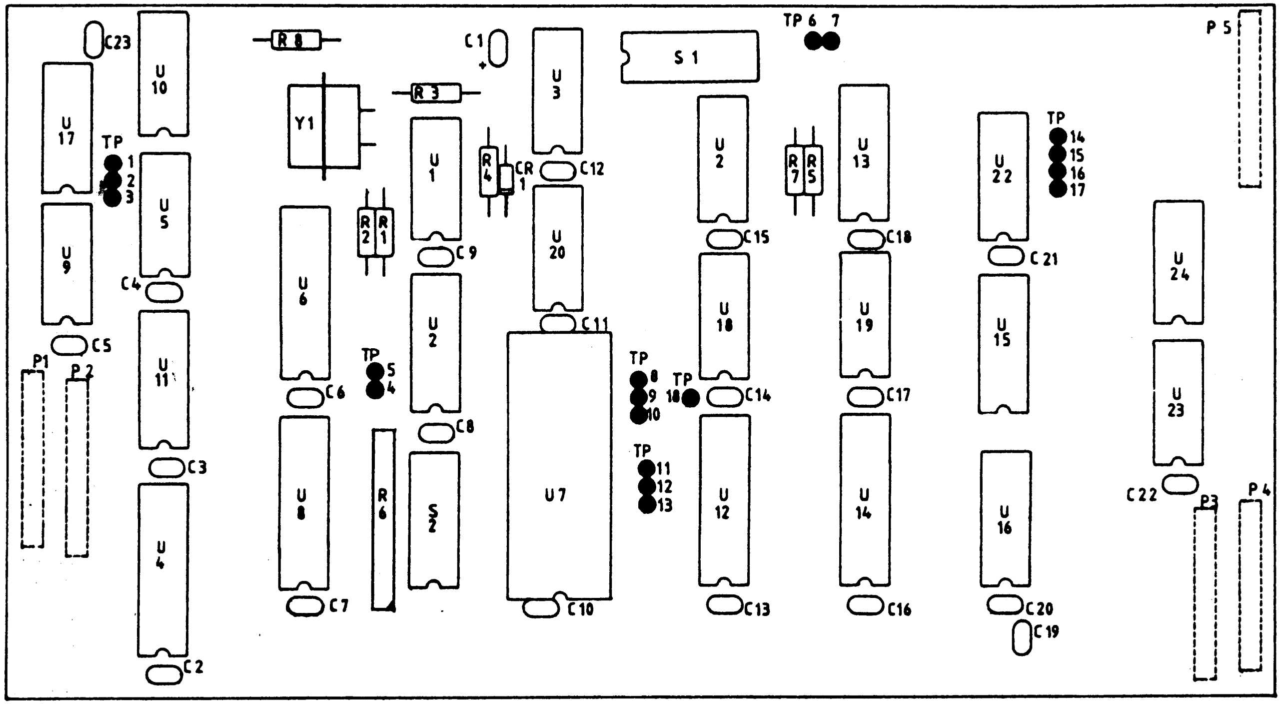
The signal on the input lines is latched by putting 'Enable' to 0V. Input level is RS232 compatible. Output level is open collector circuit max. 15V and max. source current is 100mA per line.

(4) Status port.

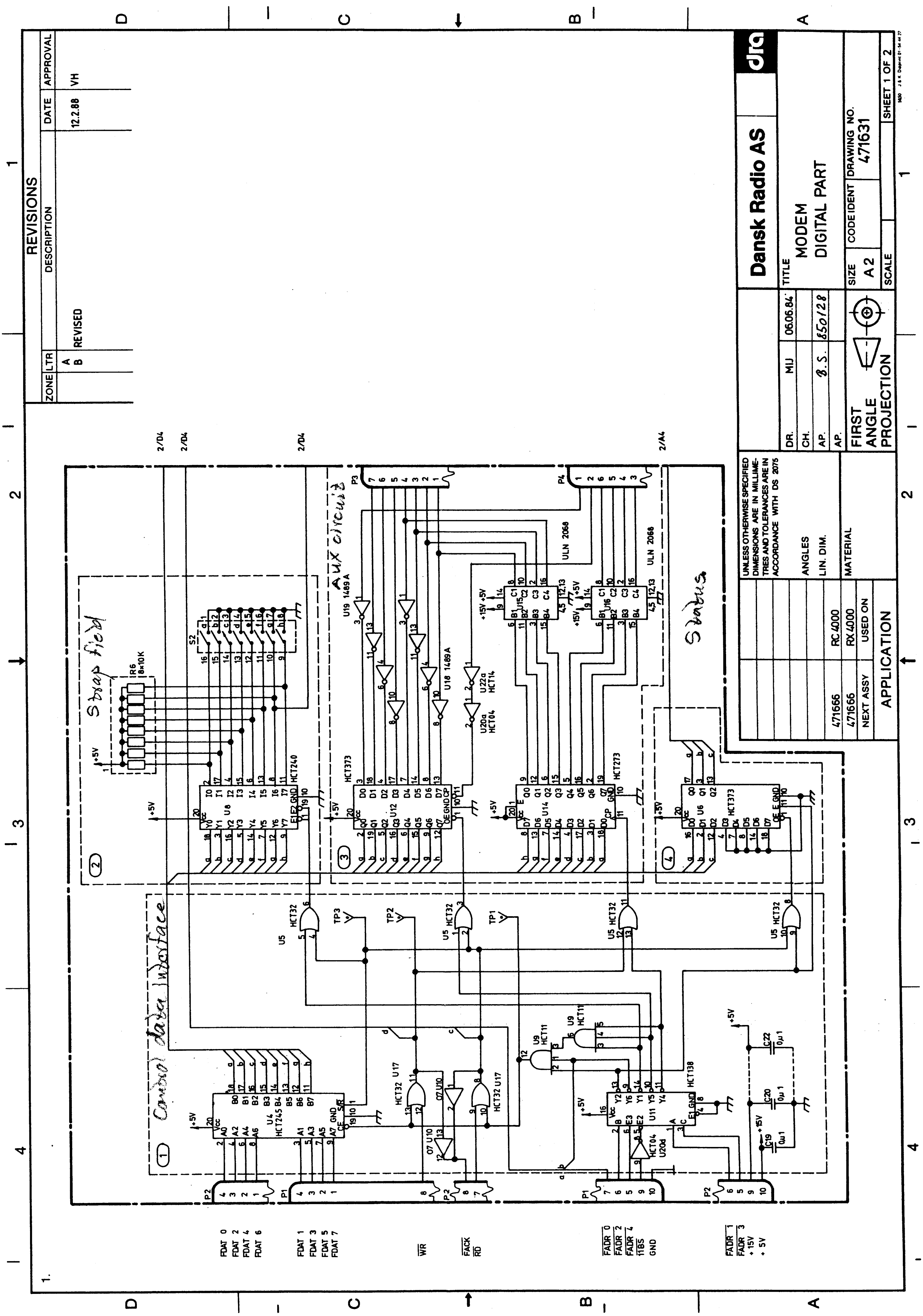
U6 is used as status port of the modem.

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. MIJ 06.06.84	TITLE	
		LIN. DIM.	CH.	MODEM	
471666	RC 4000		AP. B.S. 850128	DIGITAL PART	
471666	RX 4000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A 2	CODE IDENT / DRAWING NO. 471631
APPLICATION				SCALE	SHEET 1 OF 2



Service Sheet A9

ASSY 471631, DIGITAL MODEM ASSEMBLY Schematic 2

5 Modem Controller.

U7 is a USART and the heart of the modem. It controls the serial data transmission and sets associated control signals.

6 Clock circuit.

U1 e,d,f and crystal Y1 form a clock generator running at 6,4122 MHz. U2 divides this by 5 to obtain a 1,2824 MHz clock to the UART. This clock is further divided by U3 to get the receive/transmit clock rate at 16 times the baud rate.
The baud rate is selected at switch S1. b selects 600 baud transmission. c selects 1200 baud rate.
U1c together with R4 and C1 generate a power on reset pulse to the USART.

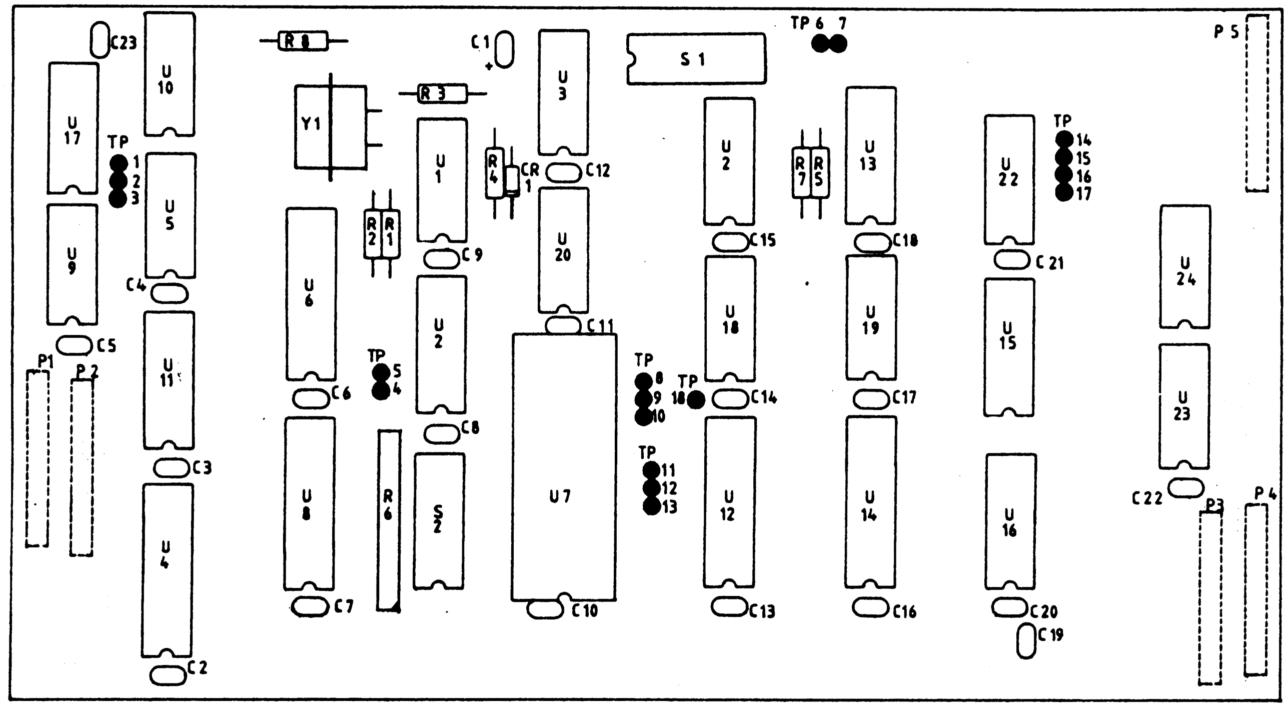
7 Modem control logic.

U21 and U13 control the data transfer between the ext./int. modem and the USART.

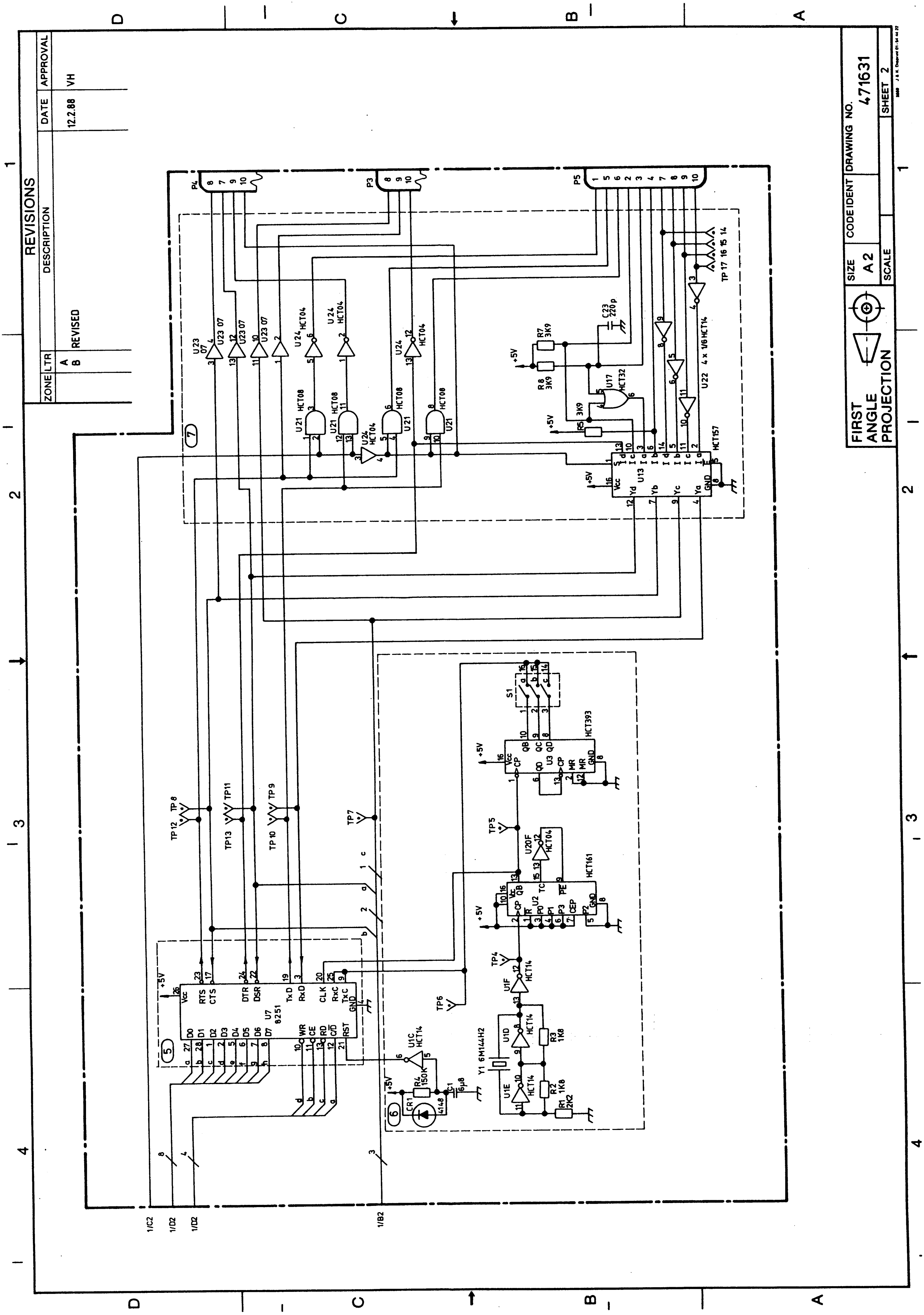
1.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075				Dansk Radio AS
		ANGLES	DR.	MIJ	06.06.84	TITLE MODEM DIGITAL PART
		LIN. DIM.	CH.			
471666	RC 4000		AP.	B.S.	850128	
471666	RX 4000	MATERIAL	AP.			
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION			SIZE A 2 — CODE IDENT — DRAWING NO. 471631
APPLICATION						SCALE — SHEET 1 OF 2


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
REVISED
12.2.88
VH
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT
DRAWING NO.
471631
SCALE
SHEET 2
P4
P3
P5
U7
8251
U13
HCT157
U3
HCT393
U2
HCT161
U17
HCT32
U22
4 x 1/6 HCT14
U21
HCT08
U24
HCT04
U23
07
S1
Y1 6M144H2
CR1
4148
R4
150K
C1
6µ8
R1
2K2
R2
1K8
R3
1K8
R5
3K9
R7
3K9
R8
3K9
C23
220p
TP 17 16 15 14
RTS
CTS
DTR
DSR
TxD
RxD
CLK
RxC
TxC
GND
Vcc
+5V
1/C2
1/D2
1/D2
1/B2

ASSY 448532, 448559, 448575, POWER SUPPLY

Service Sheet A10

(1) VEE supply filter

(2) -15V reference voltage regulator. The reference voltage is adjusted to -15, 3V at 25^0 by means of R2.

(3) Standby/On switch circuit. When P1-A3 is grounded, Q1 is switched on supplying +15V to 4.

(4) U2 forms part of the PWRLO detector. R6 and R7 generate a reference ripple from the unregulated 8V. The reference ripple is compared with a threshold level (R8, R9), holding Q2 in the off-state when the reference ripple exceeds the threshold level. Q3 and Q4 ensure a PWRLO signal during start-up until VBB reaches VEE.

(5) +15V - VBB regulator. U4 compares VBB/3 with the 5V reference voltage and supplies the regulating current for the driving transistor Q6.

U3 forms the current limiting circuit. When the R26-27 voltage drop exceeds the R132 voltage drop, U3 shunts the regulating current for Q6 tracking a fold-back characteristic.

Q5, VR2 and R33 form a crow-bar protection on the regulator output voltage. The trigger point for Q5 is approx. +17V.

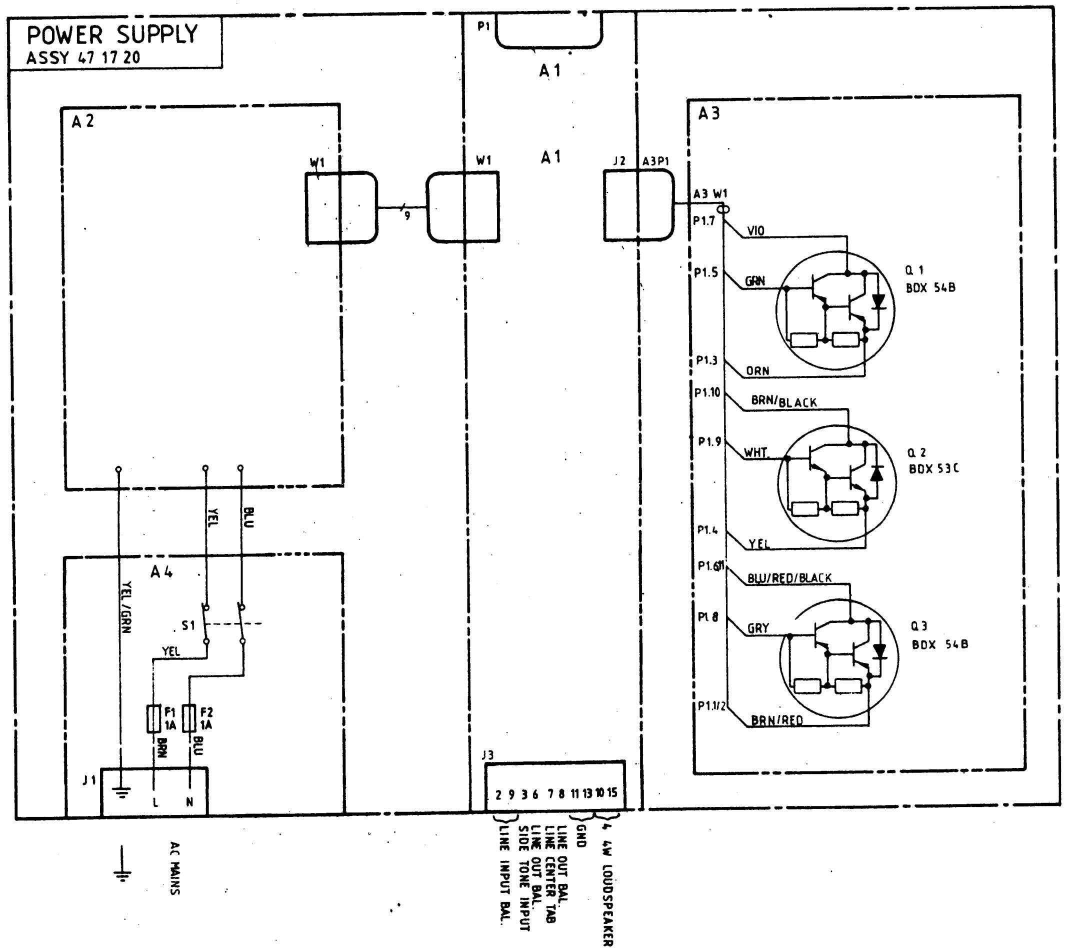
(6) -15V - VAA regulator. U5B compares VAA with three times the 5V reference voltage and supplies the regulating current for the driving transistor Q8.

U4B forms the current limiting circuit similar in operation to 5. Q7, VR3, R49, R50 and Q9 form a crow-bar protection on the regulator output voltage. The trigger point for Q7 is approx. -17V.

(7) +5V - VCC/VDD regulator. U5d compares VDD from a mother board sense point (P1-B6) or through R61, with the 5V reference voltage and supplies the regulating current for the driving transistor Q11.

U5a forms the current limiting circuit similar in operation to 5. Q10, VR4 and R62 form a crow-bar protection on the regulated output voltage. The trigger point for Q10 is approx. +6.2V.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
REVISIONS				



47 19 09	RC4000	
47 17 12	RX4000	
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.	FP	8 - 11 - 83
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

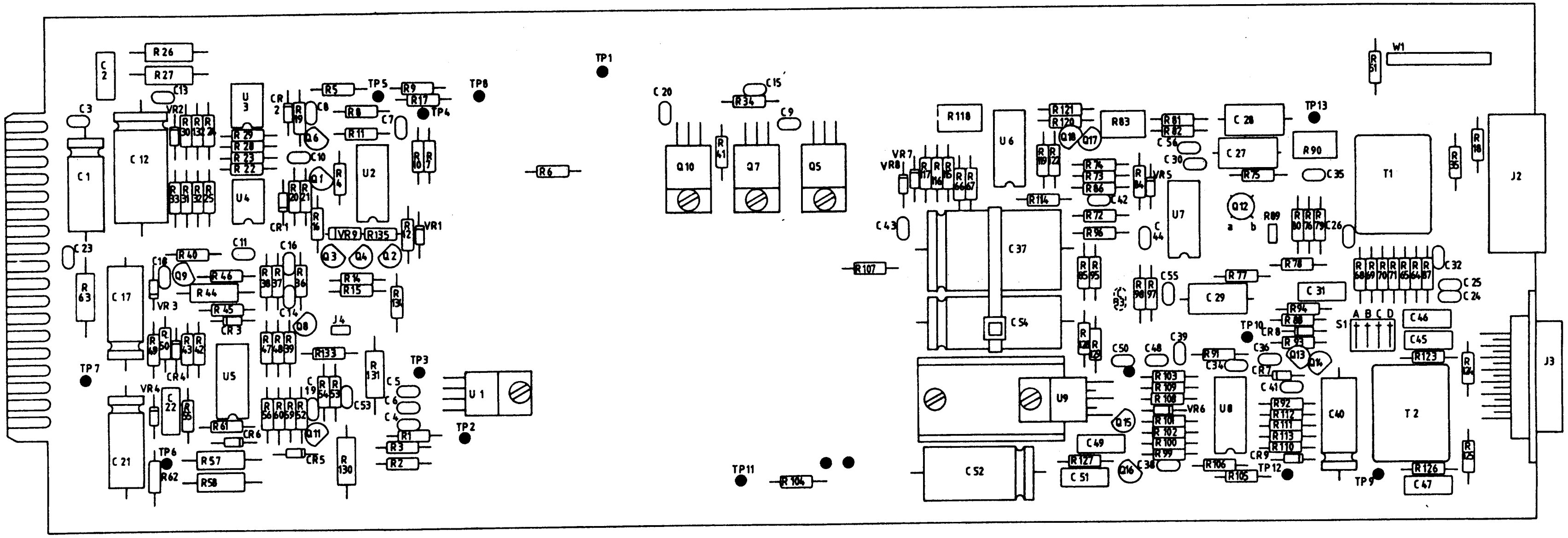
Dansk Radio AS dra

TITLE
POWER SUPPLY

SIZE	CODE IDENT	DRAWING NO.
A2		47 17 20
SCALE		SHEET 1 OF 1

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	C	[illegible]	8.9.86	VH
	D	Revised (S1)	7.1.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		**Dansk Radio AS** dra
		ANGLES	DR. CH. AP. AP.	TITLE Regulator and AF assy
		LIN. DIM.		
471909	RC 4000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1 · CODE IDENT · DRAWING NO. 4715 34
471712	RX 4000			
NEXT ASSY	USED ON			SCALE · SHEET 1 OF 1
APPLICATION				

(8) AFDET and line input.
The appropriate input is selected with S1. U6d makes it possible to drive the AFDET line with the 600 ohm line input.

(9) Notch-filter.
U7a, U7b and U7c form an inverting voltage controlled bandpass filter with unity gain. The notch characteristic is obtained by adding the non-inverted input signal to the inverted output signal. Q12 acts as voltage controlled resistor in the filter. The filter is adjusted by means of R83 to 1 kHz notch tune when TP9 is set to -11.5V.

(10) Notch Control.
R88, R89 and C35 filter and temperature stabilize the filter control voltage.

By means of Q13 and Q14 the notch filter may be bypassed. When TP9 reaches -15V, Q13 is switched on whereby the bandpass filter output is grounded.

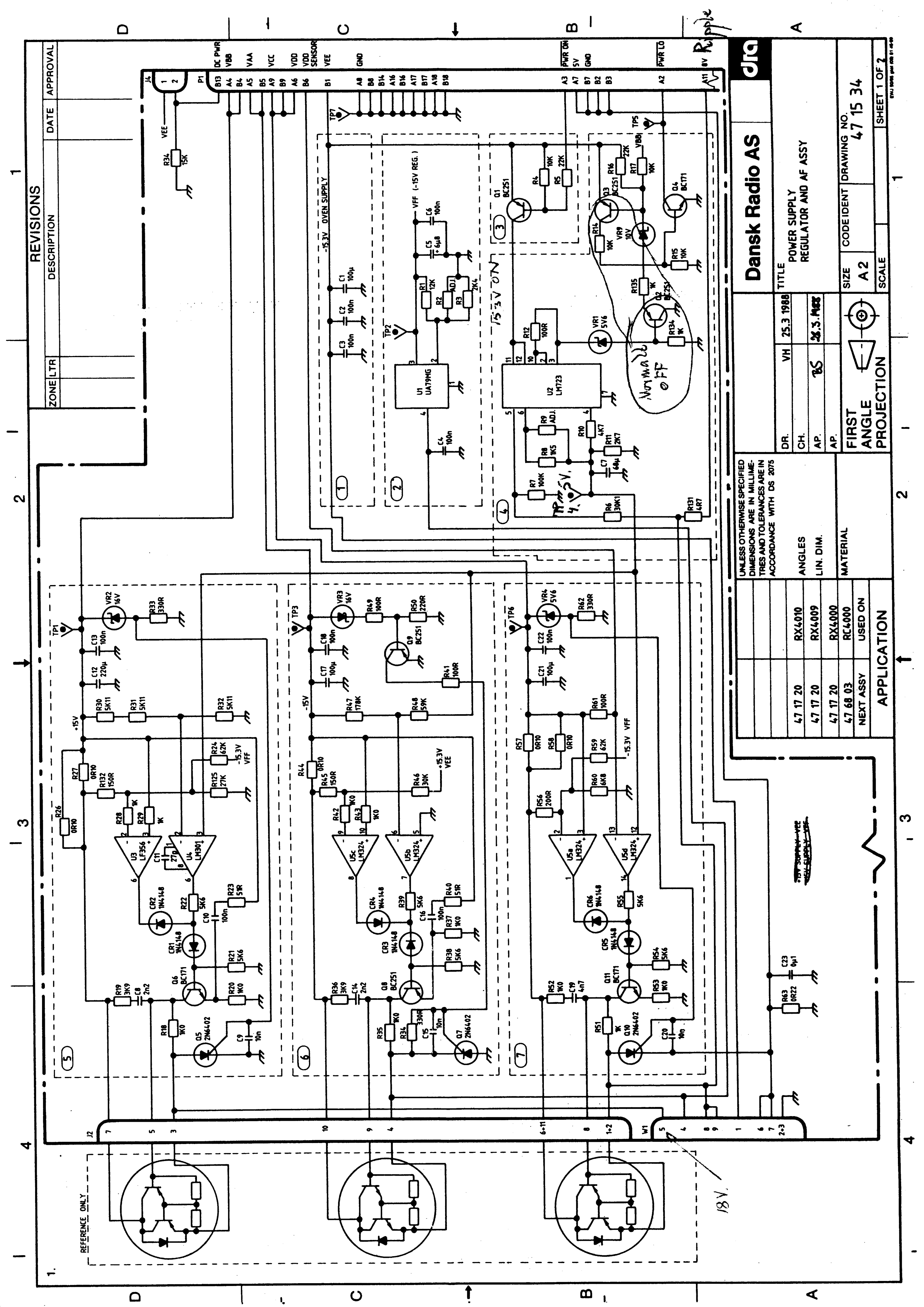
U7d forms a summing amplifier for AFDET, bandpass filter output and "Side-Tone" input.

(11) AF-gain Control.
The AF signal from (9) is routed to U8-11. The control voltage between U8-6 and U8-9 adjusts the AF signal level at R106 by means of the emitter coupled amplifier within U8. The control voltage is derived from the AF gain control adjustment. The overall gain of the stage may be controlled from -60dB to approx. 0dB.

(12) Line output amplifier.
U6c, VR7 and VR8 form an amplifier with the output limited to ± 3.5V peak.

U6b, Q17 and Q18 drive the transformer T2 and the feedback loop includes the transformer.
R123 and R126 give the 600 ohm output impedance independent of the transformer.

(13) AF-Output amplifier.
U9 forms the AF output amplifier. The stage has a voltage gain of approx. 38 dB and is capable of delivering up to 4W in a 4 ohm load.



Dansk Radio AS
POWER SUPPLY
REGULATOR AND AF ASSY
A2
47 15 34
SHEET 1 OF 2
FIRST ANGLE PROJECTION
APPLICATION
REVISIONS
REFERENCE ONLY

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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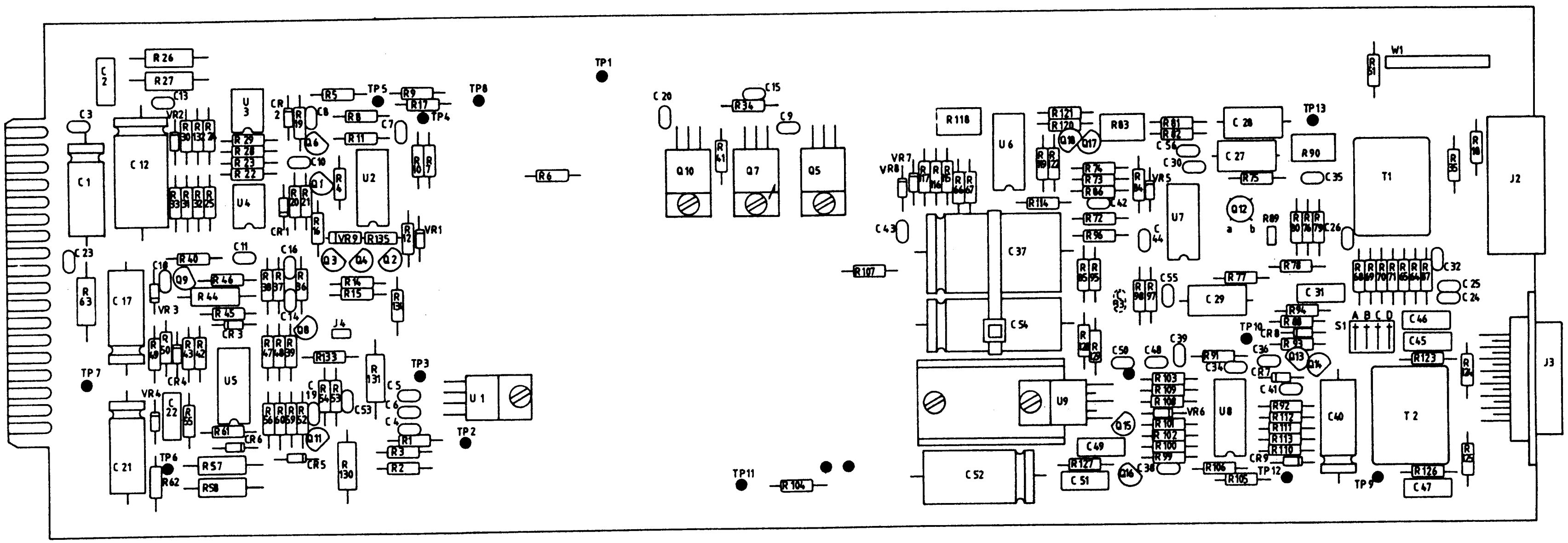
	D	Revised (S1)	7.1.87	VH



471909	RC 4000	
471712	RX 4000	
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. [illegible] 840427

CH.

AP.

AP.

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE: Regulator and AF assy

SIZE	CODE IDENT	DRAWING NO.
A1		4715 34

SCALE

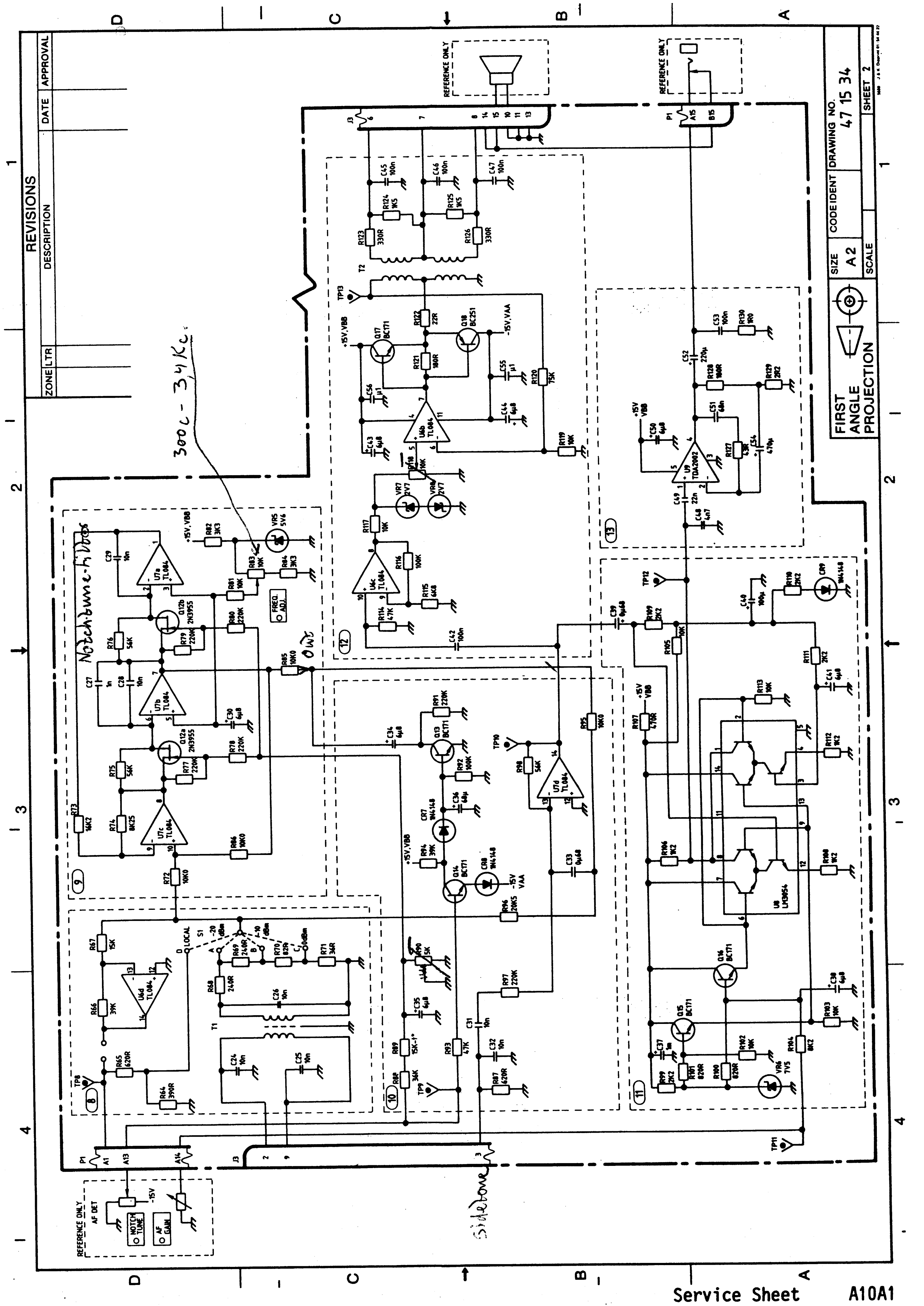
SHEET 1 OF 1

(1) EMI filter for AC-mains supply.

(2) Mains transformer with 110V to 125V and 220V to 250V in 5V steps.

(3) Rectifiers and filters.

(4) +15V regulator for standby supply. By means of R3 the voltage is adjusted to +15, 3V at 25°C.



Service Sheet A10A1

2.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
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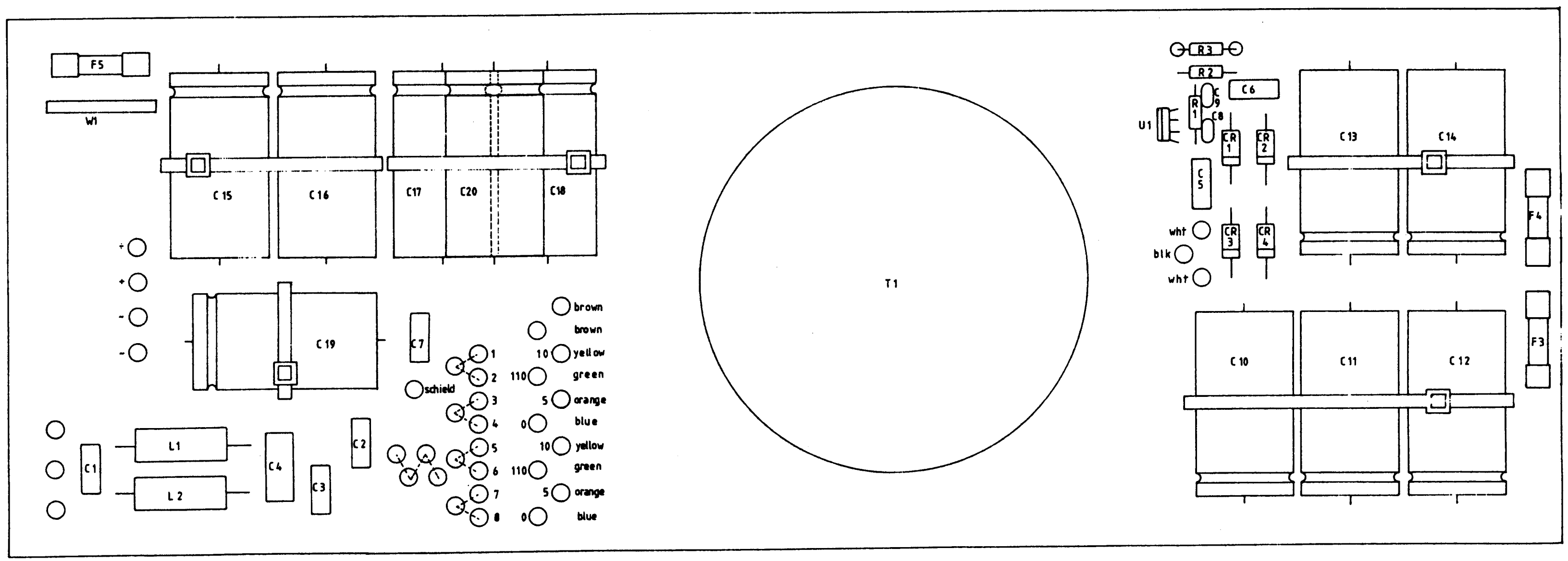
C3	B	ÆM87101	29.2.88	VH



----- strap

47 17 20	RX4010	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
47 17 20	RX4009	ANGLES	
47 17 20	RX4000	LIN. DIM.	
NEXT ASSY	USED ON	MATERIAL	
APPLICATION			

DR. | CH. | AP. | AP.

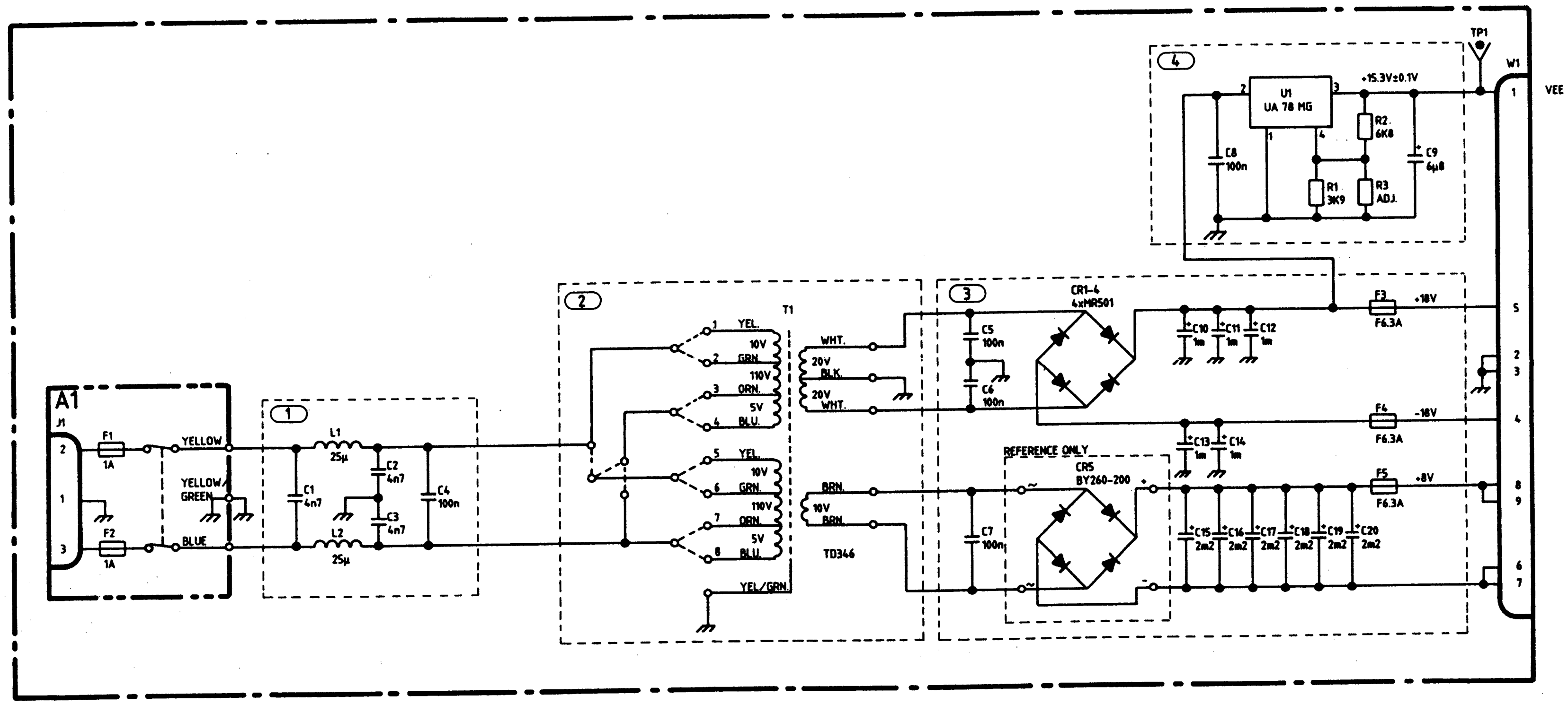
FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
POWER SUPPLY , 220V
TRAFO ASSY

SIZE	CODE IDENT	DRAWING NO.
A1		47 15 50
SCALE 2:1		SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



471720	RX4010
471720	RX4009
471720	RX4000
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	21.3 1988
CH.		
AP.	[illegible]	21.3.88
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
POWER SUPPLY , 220V
TRAFO ASSY

SIZE	CODE IDENT	DRAWING NO.
A2		47 15 50
SCALE		SHEET 1 OF 1

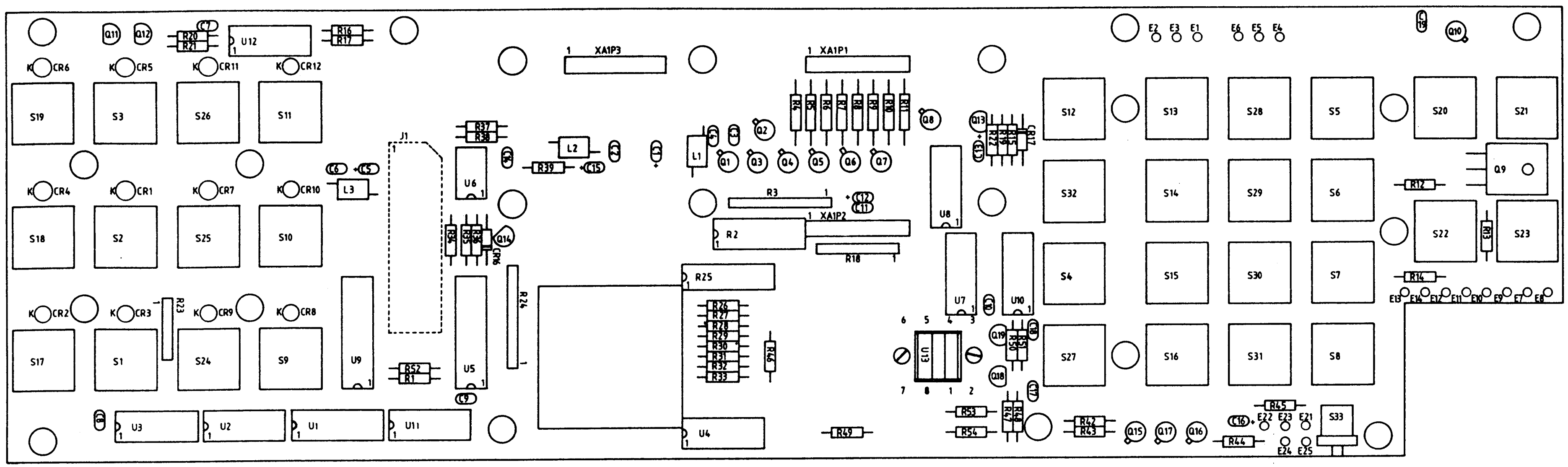
ASSY 489891, 489883 FRONT PANEL CIRCUIT
Service Sheet A11

Assy 489891, Front Panel Schematic 1
Circuit

1) Address decoding with associated gates for generation of acknowledge FACK, as handshaking signal for the microcomputer

2) Supply Filters

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87077	17.12.87	VH



489905	RX4010
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	23.10 1987
CH	-	
AP	SN	23.10.87
AP		

FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
FRONT PANEL CIRCUIT
RX4010

SIZE	CODE IDENT	DRAWING NO.
A1		48 98 91
SCALE 2:1		SHEET 1 OF 1

3) Eight-bit Latch

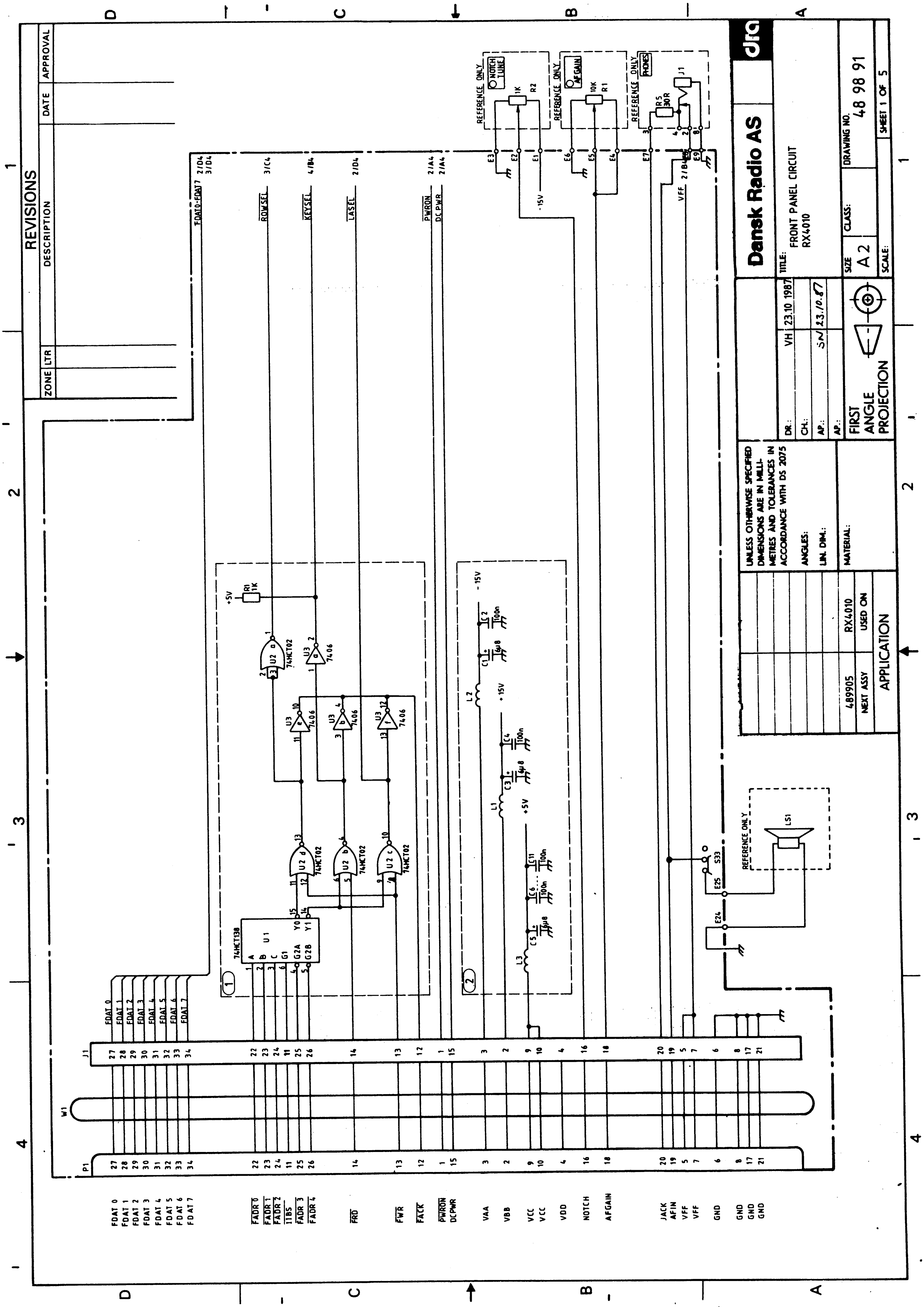
used for segment information to displays and LEDs, and data to D/A-converter (11).

4) Q1-Q8: Drivers for Segment Information
R4-R11: Current limiting resistors.

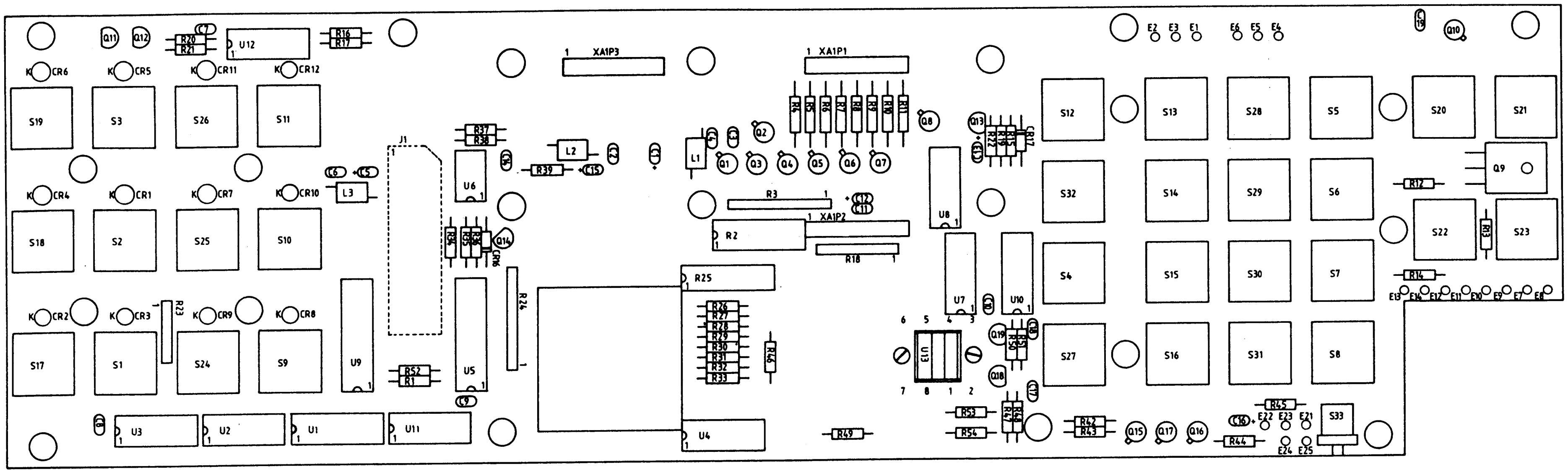
5) LED Indicators

Cr.no.	Corresponding Switch
1	inter
2	off
3	slow
4	WIDE
5	AM
6	SSB
7	narr
8	att
9	fast
10	vnar
11	RTTY
12	CW
13	tune
14	bfo
15	scan

6) Dimmer Circuit,
controls the light in displays, LEDs and S-meter.


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
Dansk Radio AS
TITLE:
FRONT PANEL CIRCUIT
RX4010
DR.: VH 23.10 1987
CH.:
AP.:
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES IN ACCORDANCE WITH DS 2075
ANGLES:
LIN. DIM.:
MATERIAL:
FIRST ANGLE PROJECTION
SIZE A 2
CLASS:
SCALE:
DRAWING NO. 48 98 91
SHEET 1 OF 5
489905
RX4010
NEXT ASSY
USED ON
APPLICATION
FDAT 0
FDAT 1
FDAT 2
FDAT 3
FDAT 4
FDAT 5
FDAT 6
FDAT 7
FADR 0
FADR 1
FADR 2
IIBS
FADR 3
FADR 4
FRD
FWR
FACK
PWRON
DCPWR
VAA
VBB
VCC
VCC
VDD
NOTCH
AFGAIN
JACK
AFIN
VFF
VFF
GND
GND
GND
GND
ROWSEL
KEYSEL
LASEL
74HCT138
74HCT02
7406
REFERENCE ONLY
NOTCH TUNE
AFGAIN
PHONES
LS1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87077	17.12.87	VH



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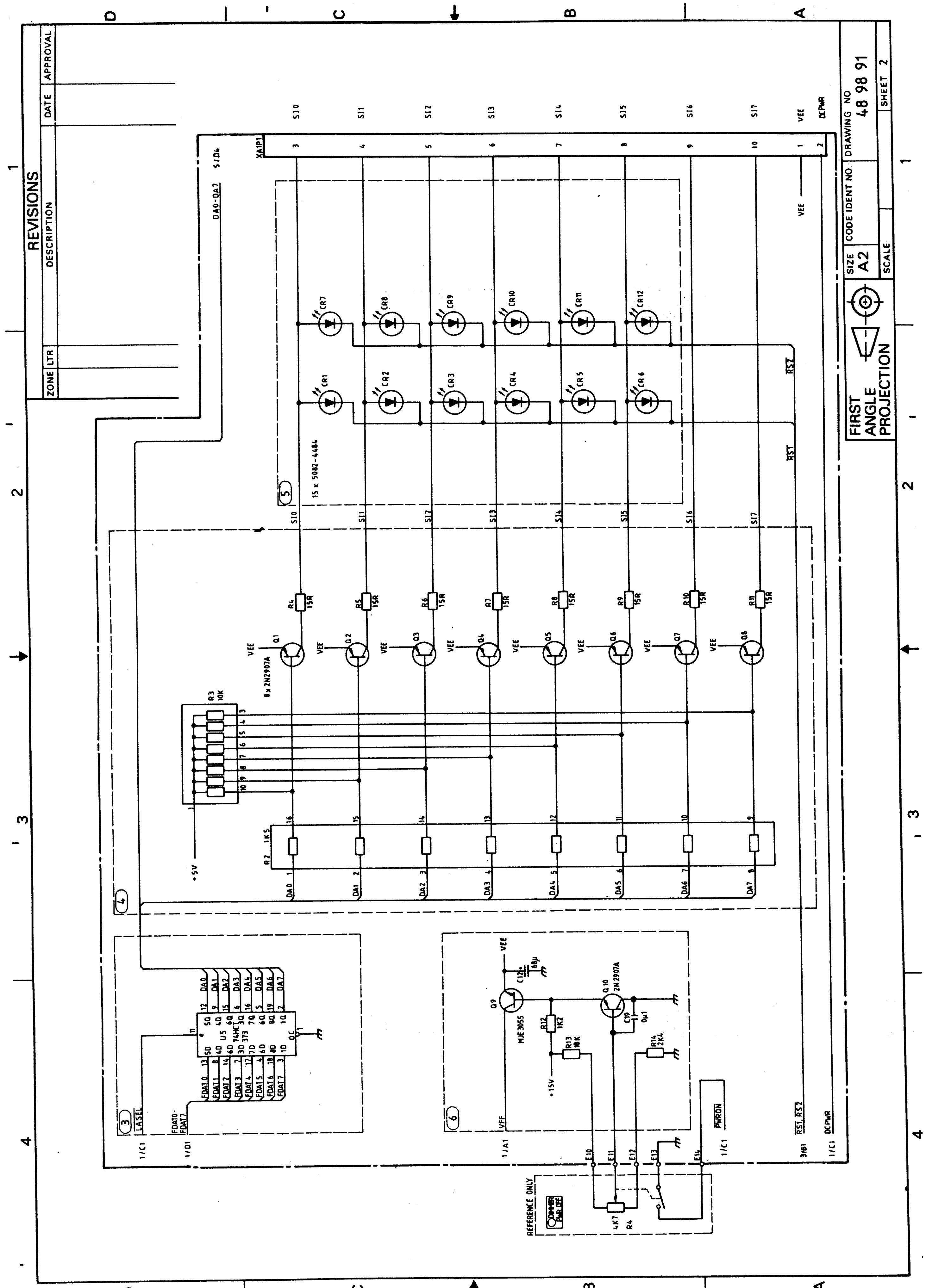
		ANGLES	CH -	TITLE COMPONENT LOCATION FRONT PANEL CIRCUIT RX4010
		LIN DIM	AP SN 23.10.87	
			AP	
489905	RX4010	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1 / CODE IDENT / DRAWING NO 48 98 91
NEXT ASSY	USED ON			SCALE 2:1 / SHEET 1 OF 1
APPLICATION				

7) U7,U8: Shift registers with associated pull-up network, used for multiplexing displays LEDs and switches. It also selects the sample hold circuit (13),and clears tune F/F(12). R15, C13 clear U7-U8 during start-up.

8) Drivers for Multiplexing of LEDs



Service Sheet A11A1

REVISIONS				
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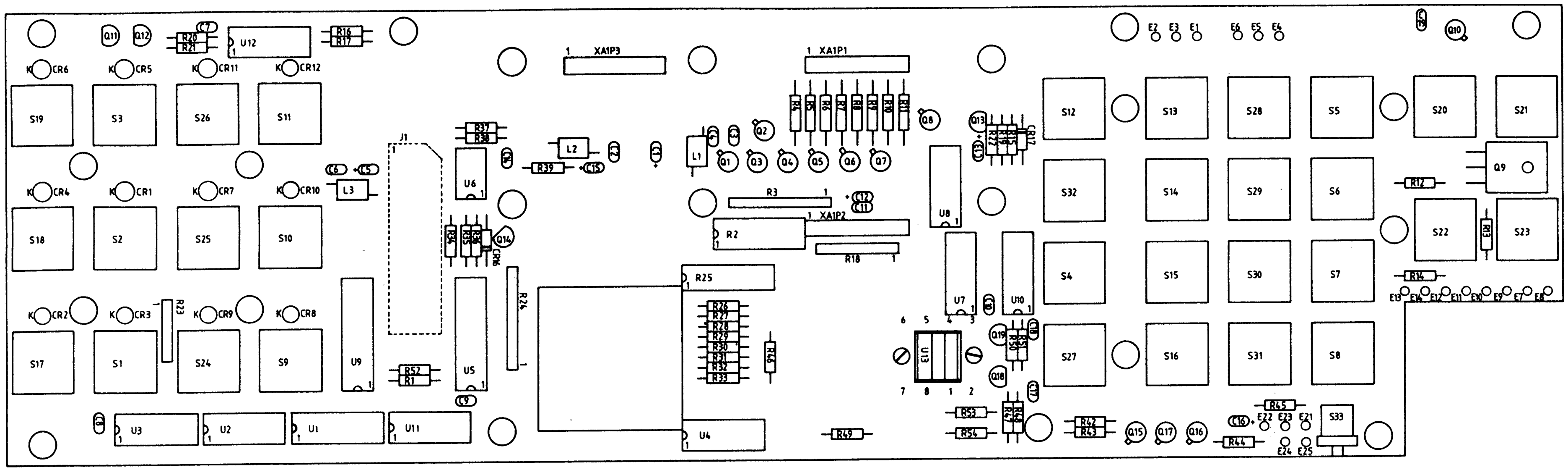
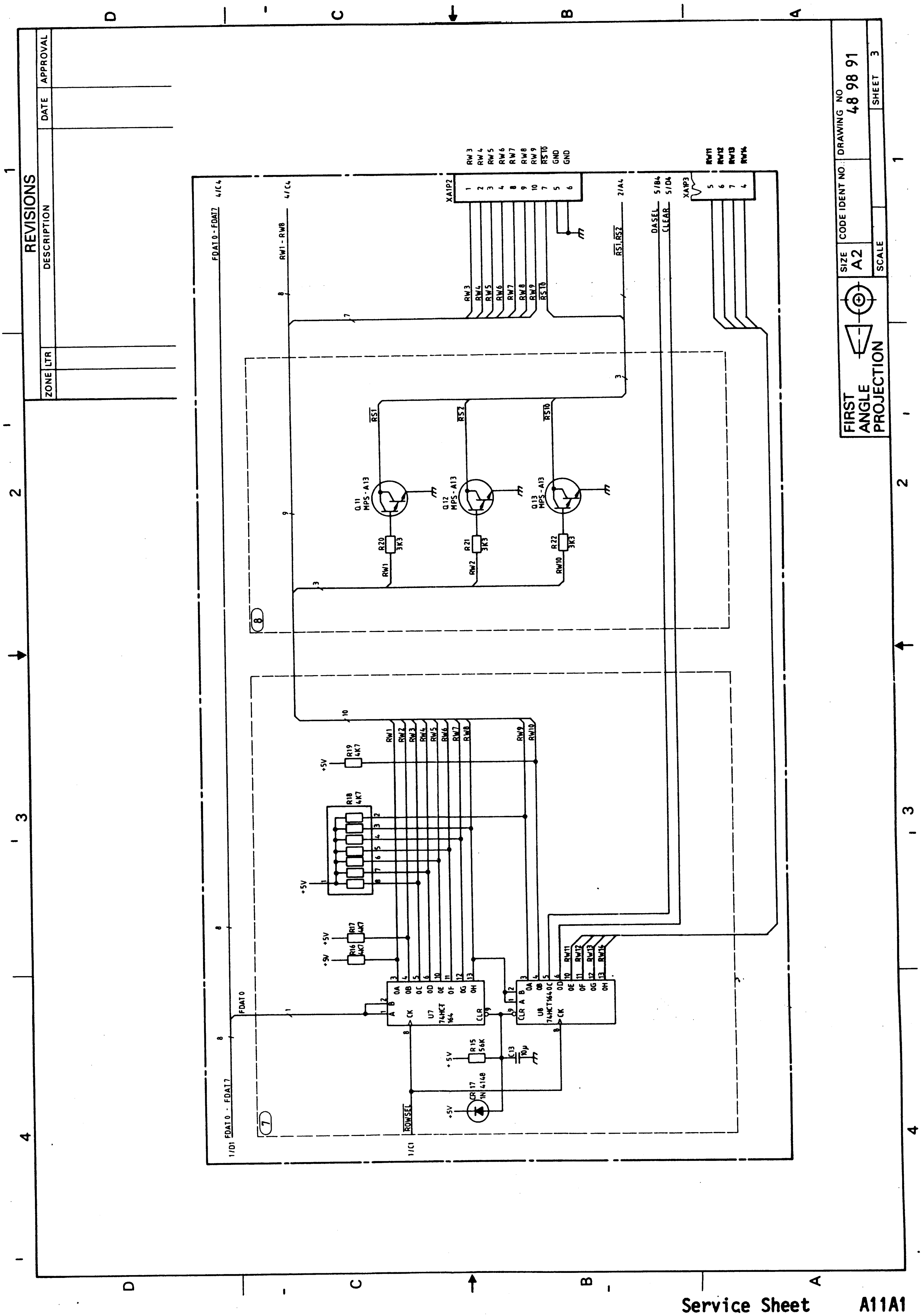
	B	ÆM87077	17.12.87	VH



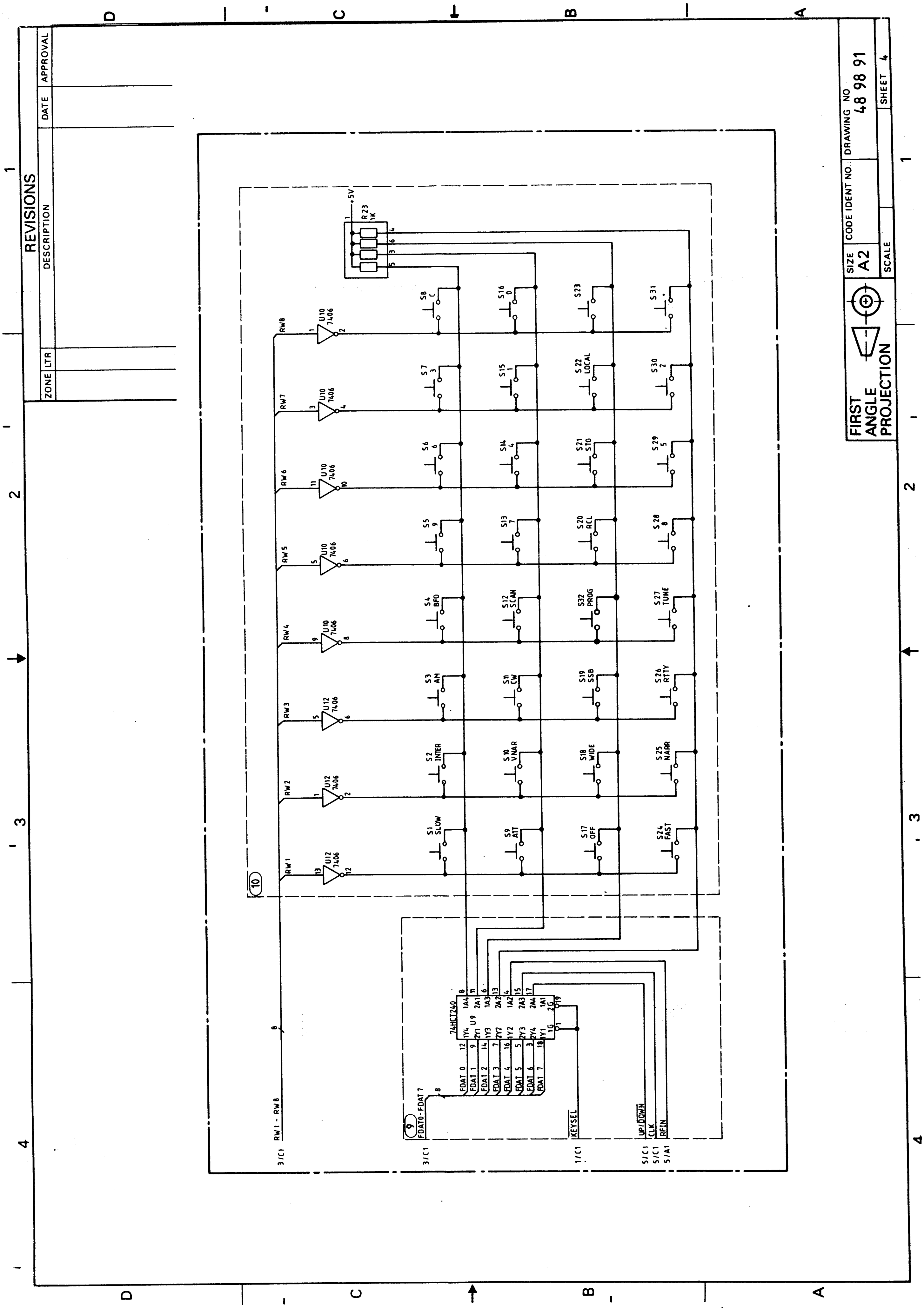
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 20??			**Dansk Radio AS**	dra
		ANGLES	DR	VH 23.10 1987	TITLE COMPONENT LOCATION FRONT PANEL CIRCUIT RX4010	
		LIN DIM	CH	-		
			AP	SJ 23.10.87		
			AP			
489905	RX4010	MATERIAL	FIRST ANGLE PROJECTION		SIZE A1 / CODE IDENT / DRAWING NO. 48 98 91	
NEXT ASSY	USED ON				SCALE 2:1	SHEET 1 OF 1
APPLICATION						

9) Eight-bit Output Buffer read by the microcomputer

10) S1-S31, Switches SPSTNO (Single pole single throw normally open) with associated pull-up network and open-collector buffers.

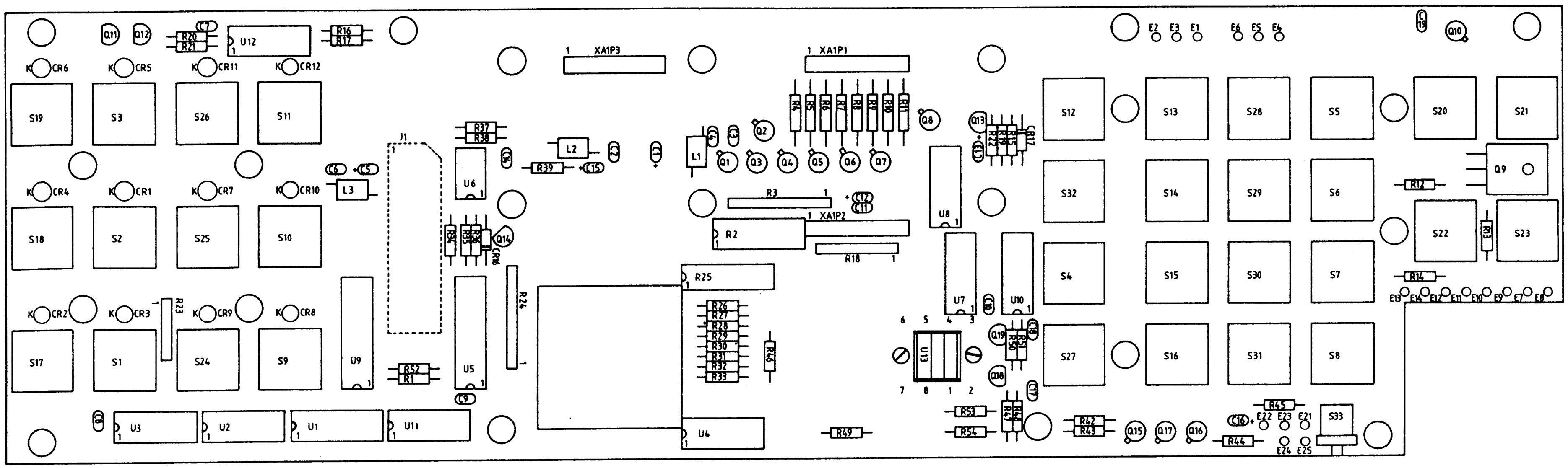


Service Sheet A11A1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT NO.
DRAWING NO
48 98 91
SCALE
SHEET 4
R23 1K
+5V
U10 7406
U12 7406
74HCT240
U9
S1 SLOW
S2 INTER
S3 AM
S4 BFO
S5 9
S6 6
S7 3
S8 C
S9 ATT
S10 VNAR
S11 CW
S12 SCAN
S13 7
S14 4
S15 1
S16 0
S17 OFF
S18 WIDE
S19 SSB
S20 RCL
S21 STO
S22 LOCAL
S23
S24 FAST
S25 NARR
S26 RTTY
S27 TUNE
S28 8
S29 5
S30 2
S31 .
S32 PROG
RW1
RW2
RW3
RW4
RW5
RW6
RW7
RW8
RW1 - RW8
FDAT0 - FDAT7
FDAT 0
FDAT 1
FDAT 2
FDAT 3
FDAT 4
FDAT 5
FDAT 6
FDAT 7
KEYSEL
UP/DOWN
CLK
RFIN
3/C1
3/C1
1/C1
5/C1
5/C1
5/A1

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87077	17.12.87	VH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	DR VH 23.10 1987	Dansk Radio AS	dra
ANGLES	CH -	TITLE COMPONENT LOCATION FRONT PANEL CIRCUIT RX4010	
LIN DIM	AP SAJ 23.10.87		
MATERIAL	AP		
	FIRST ANGLE PROJECTION	SIZE A1	CODE IDENT
		DRAWING NO 48 98 91	
		SCALE 2:1	SHEET 1 OF 1

489905	RX4010
NEXT ASSY	USED ON
APPLICATION	

Assy 484991, Front Panel Circuit

11) Eight-bit Digital to Analogue Converter
R24 : Pull-up network
R25-R33: R-2R network
U6b : Operational amplifier with an output range from 5V to 10V.

12) Input Circuit for Inreading of Tune Adjustment
U11a: is set when tuning
U11b: is set when tuning up

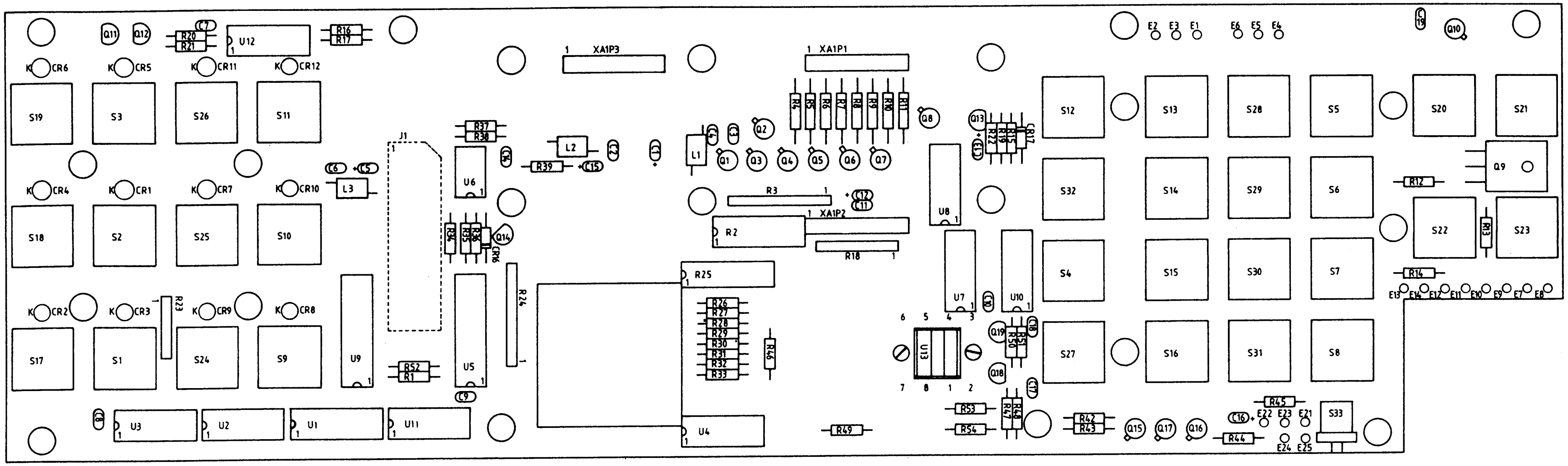
When U11 has been read by the microcomputer, the program will clear U11a.

13) Sample Hold Circuit
used as a source generator to the S-meter (14) and for A/D-conversion (15).

14)

15) Voltage Comparator
By means of the D/A-converter (11) and the comparator circuit an A/D-conversion of the RF-level is performed.

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	ÆM87077	17.12.87	VH



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
ANGLES	
LIN. DIM	
MATERIAL	

DR	VH	23.10 1987
CH	-	
AP	SN	23.10.87
AP		

NEXT ASSY	USED ON
489905	RX4010

APPLICATION

FIRST ANGLE PROJECTION

Dansk Radio AS dra

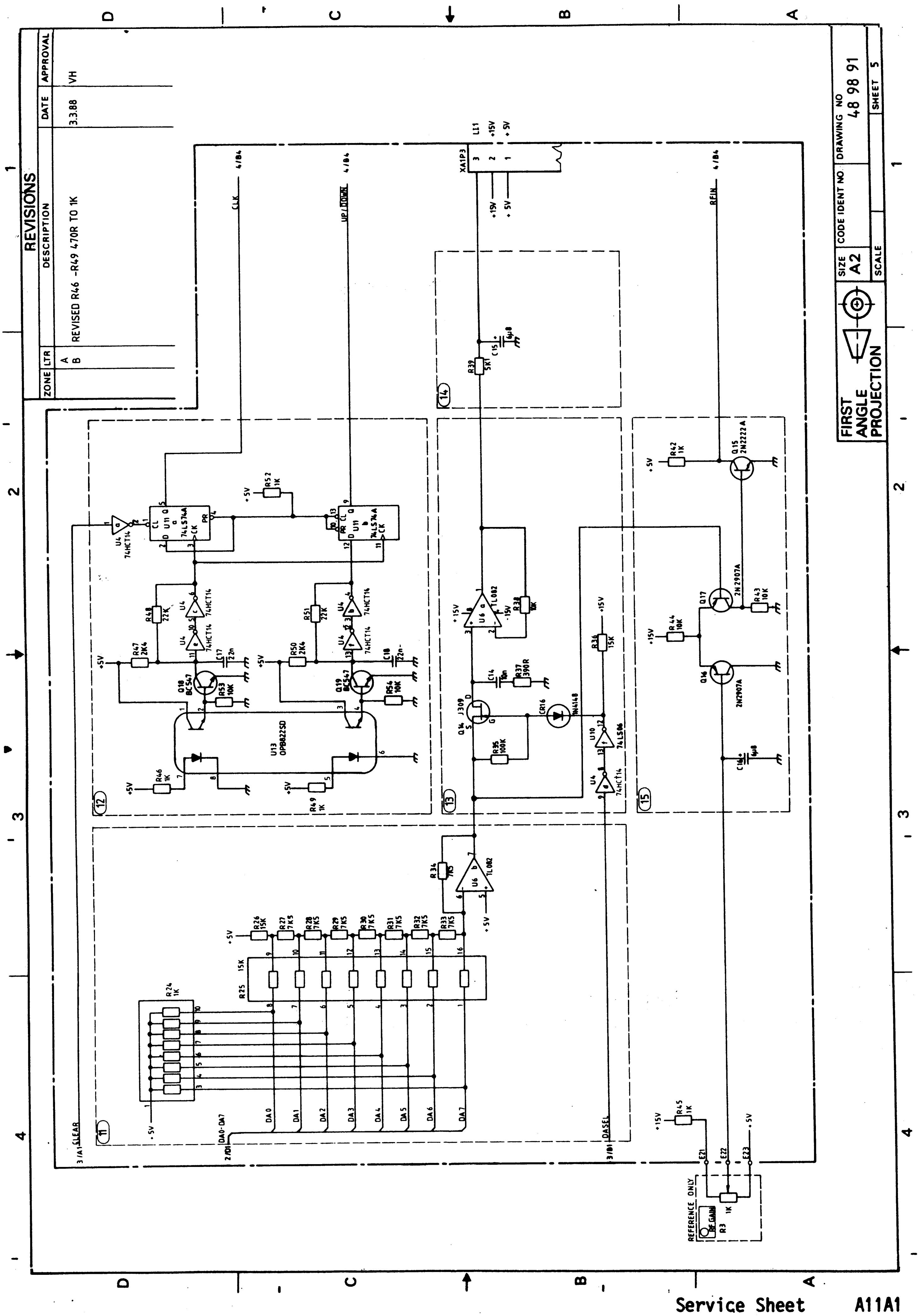
TITLE
COMPONENT LOCATION
FRONT PANEL CIRCUIT
RX4010

SIZE	CODE IDENT	DRAWING NO
A1		48 98 91

SCALE 2:1 SHEET 1 OF 1

Assy 489883 Display Board Schematic 1
Assembly A11A1A1

U1-U7 : 7-segment display
Most significant
digit,U1
U8-U14: Light bars
Q1-Q8 : Drivers for
multiplexing
U15 : Driver for light bars
for meter
U16-U17:Light bars for meter


REVISIONS
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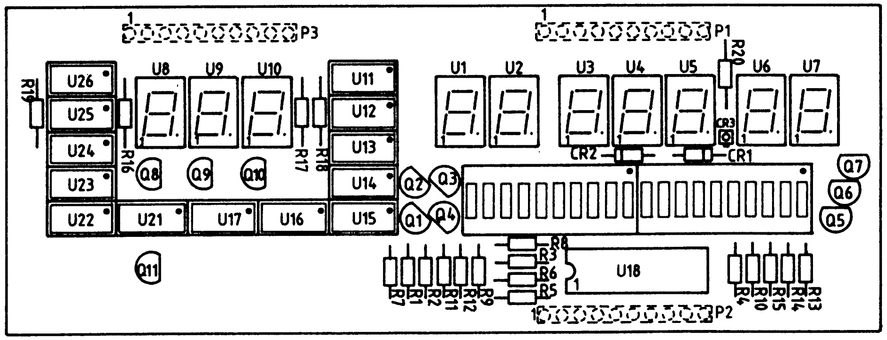
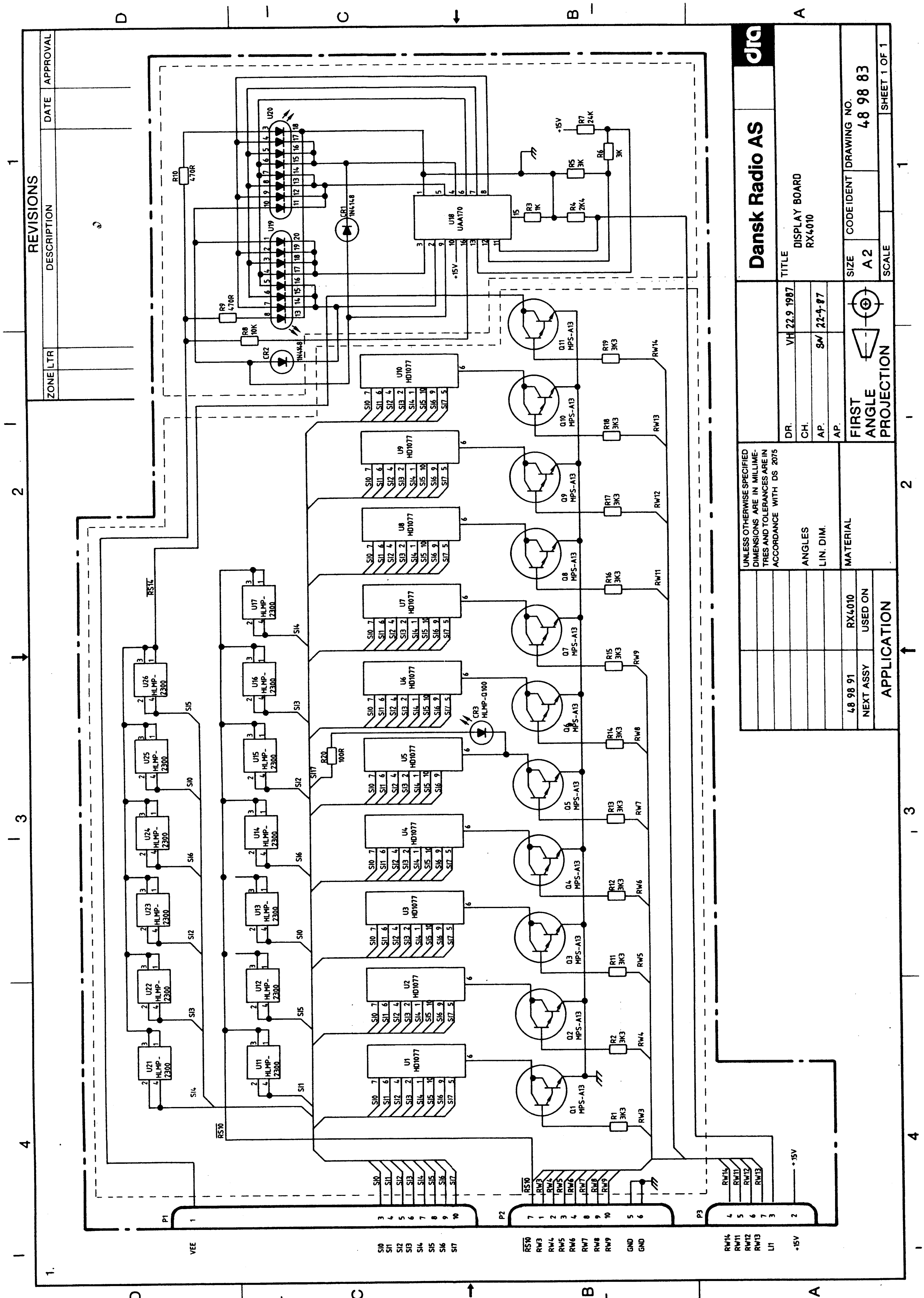
LTR
DESCRIPTION
DATE
APPROVAL
A
B
REVISED R46 -R49 470R TO 1K
3.3.88
VH
FIRST ANGLE PROJECTION
SIZE
A2
CODE IDENT NO
DRAWING NO
48 98 91
SCALE
SHEET 5
CLK
UP/DOWN
RFIN
XA1P3
U13 OPB822SD
DA0-DA7
CLEAR
DASEL
REFERENCE ONLY

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	22.3.88	VH



489891	RX4010	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	DR. VH 22.9 1987	Dansk Radio AS
NEXT ASSY	USED ON	ANGLES	CH.	TITLE COMPONENT LOCATION DISPLAY BOARD RX4010
APPLICATION		LIN. DIM.	AP. BN 22-9-87	SIZE A2
		MATERIAL	AP.	CODE IDENT
			FIRST ANGLE PROJECTION	DRAWING NO. 48 98 83
				SCALE 2:1
				SHEET 1 OF 1



Service Sheet .A11A1A1

ASSY 489174, MOTHERBOARD ASSEMBLY

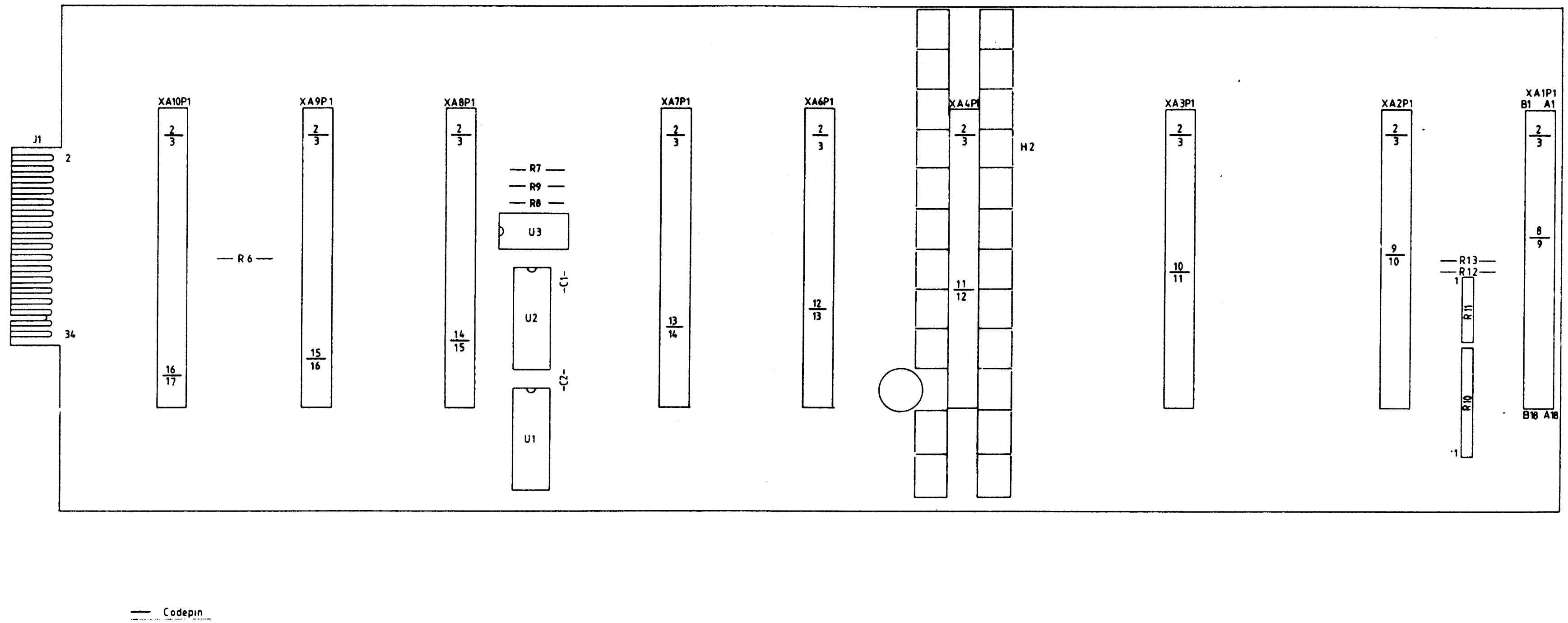
Service Sheet A12

ASSY 489174, MOTHERBOARD ASSEMBLY

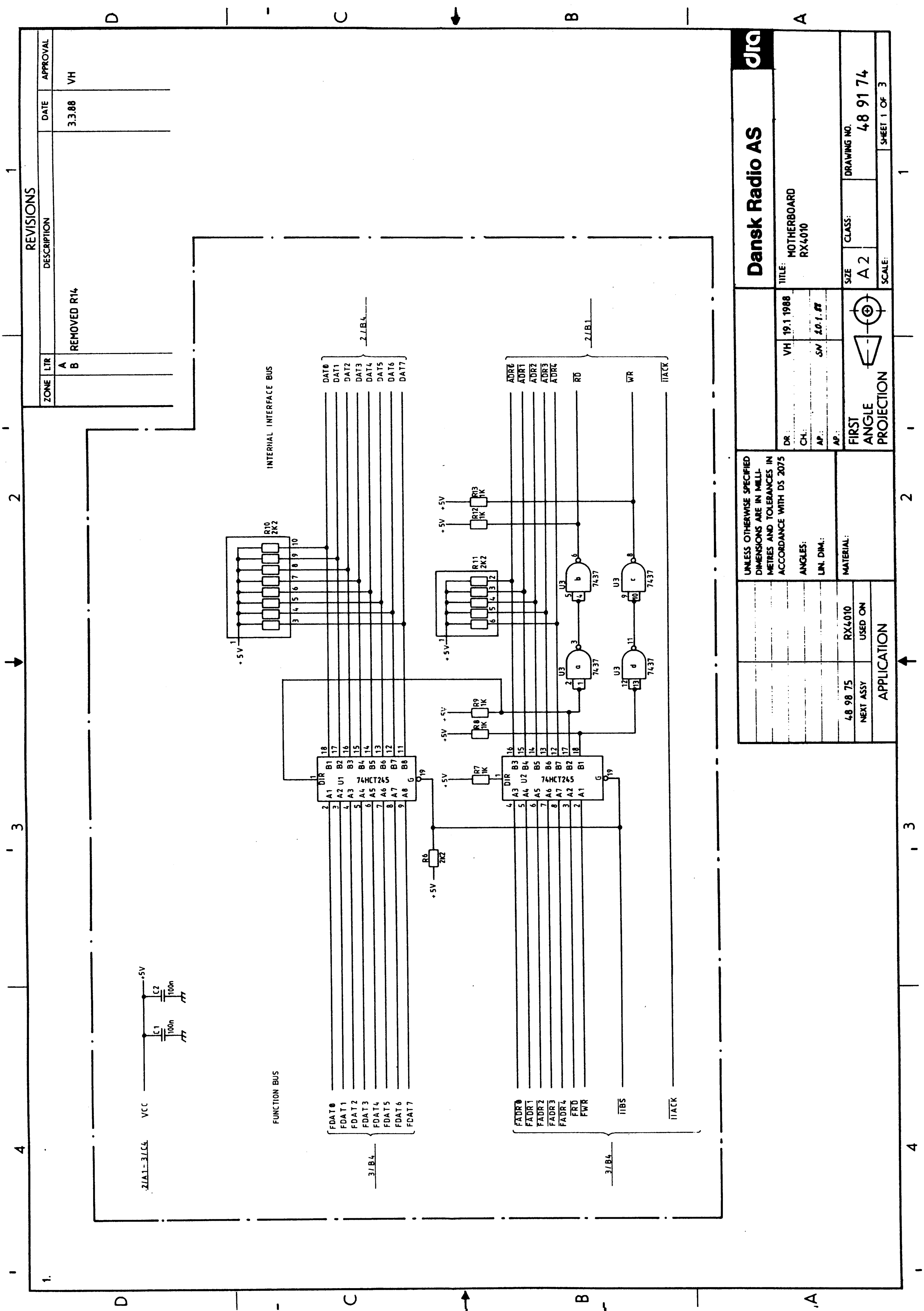
To avoid noise in the more sensitive parts of the receiver, two buffers U1 and U2 seperates the internal interface bus from the function bus. The internal interface bus is only activated when necessary.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REMOVED R14	3.3.88	VH
	C	REVISED	28.3.88	VH

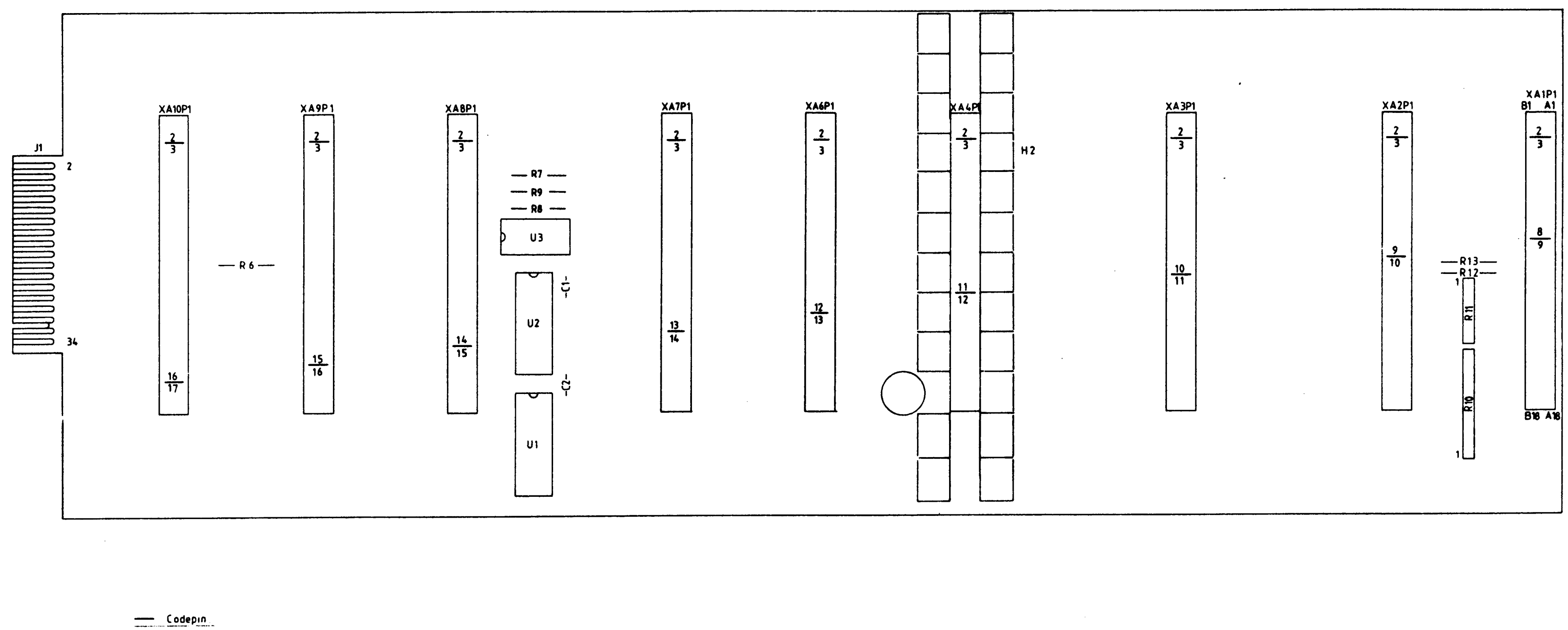


48 98 75	RX4010	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	DR VH 19.1 1988	Dansk Radio AS
NEXT ASSY	USED ON	ANGLES	CH	TITLE: COMPONENT LOCATION MOTHER BOARD RX4010
APPLICATION		LIN DIM	AP SN 28.1.88	
		MATERIAL	AP	SIZE A1 / CODE IDENT / DRAWING NO. 48 91 74
			FIRST ANGLE PROJECTION	SCALE 2:1 / SHEET 1 OF 1


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A
B REMOVED R14 3.3.88 VH
Dansk Radio AS
TITLE: MOTHERBOARD RX4010
DR.: VH 19.1 1988
AP.: SN 20.1.88
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES IN ACCORDANCE WITH DS 2075
ANGLES:
LIN. DIM.:
MATERIAL:
FIRST ANGLE PROJECTION
SIZE A2
CLASS:
SCALE:
DRAWING NO. 48 91 74
SHEET 1 OF 3
48 98 75 NEXT ASSY
RX4010 USED ON
APPLICATION
INTERNAL INTERFACE BUS
FUNCTION BUS
74HCT245
7437
VCC

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REMOVED R14	3.3.88	VH
	C	REVISED	28.3.88	VH



48 98 75	RX4010	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
NEXT ASSY	USED ON	ANGLES
APPLICATION		LIN DIM
		MATERIAL

DR VH 19.1 1988
CH
AP SN 30.1.88
AP

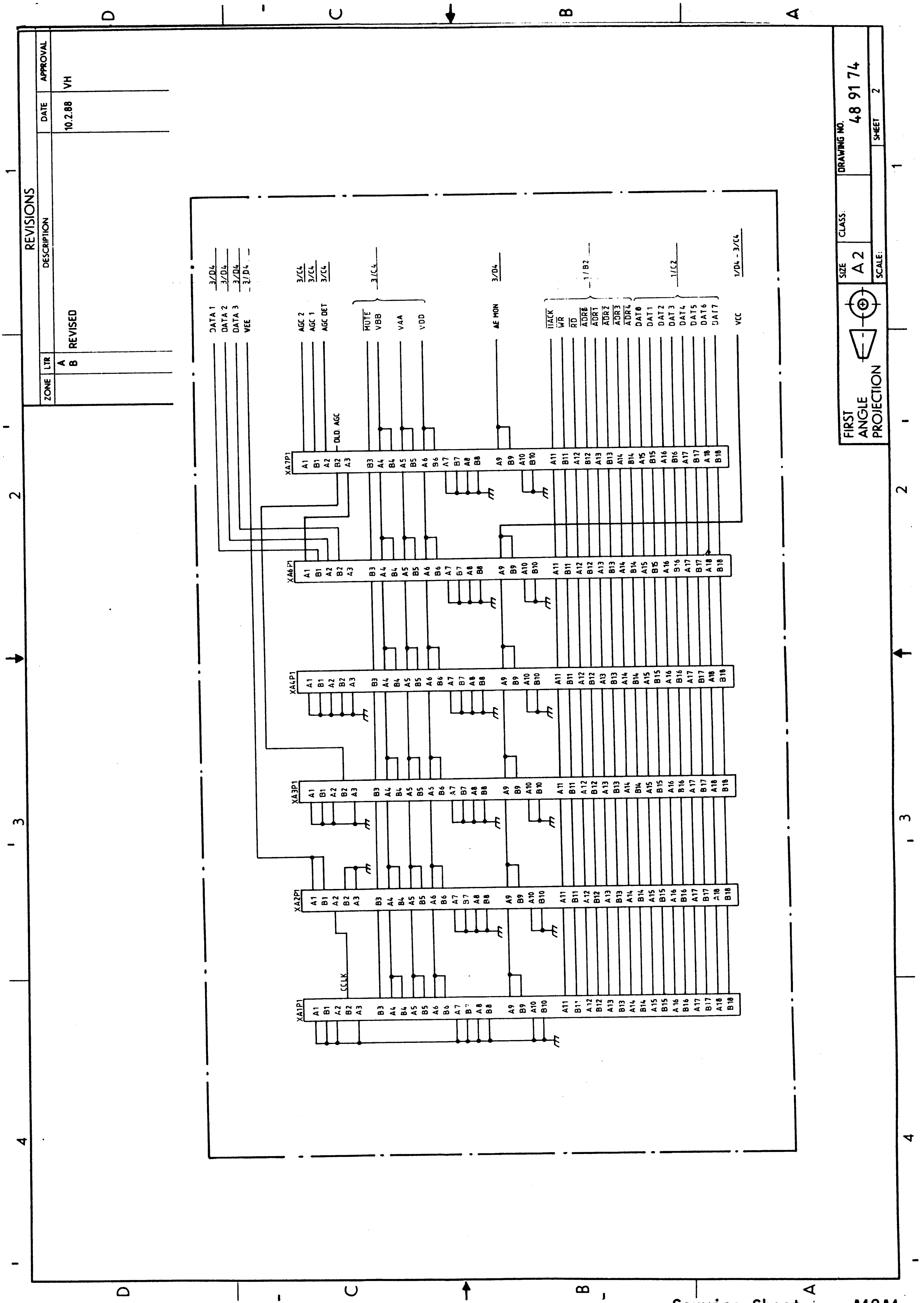
FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE: COMPONENT LOCATION MOTHER BOARD RX4010

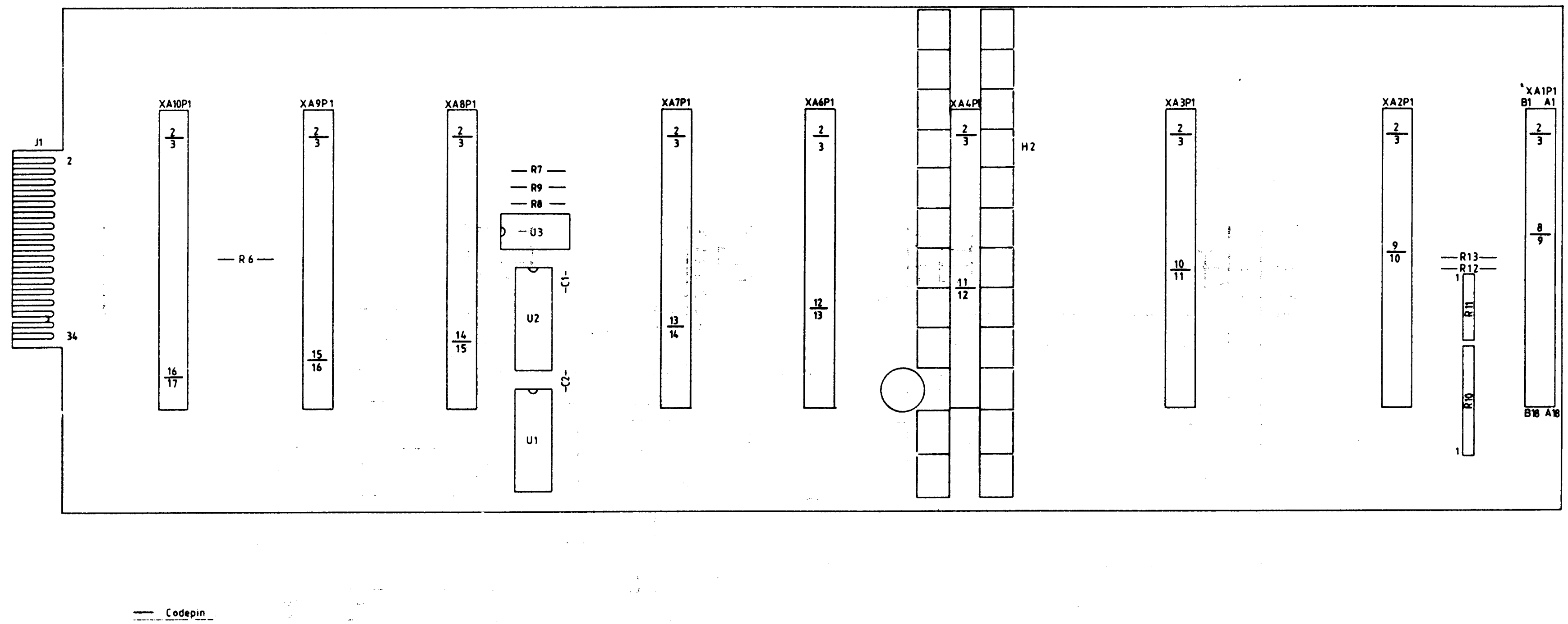
SIZE: A1 | CODE IDENT | DRAWING NO. 48 91 74

SCALE 2:1 | SHEET 1 OF 1


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
A
B
REVISED
10.2.88
VH
FIRST ANGLE PROJECTION
SIZE
A2
CLASS.
DRAWING NO.
48 91 74
SHEET 2
SCALE:
DATA 1
DATA 2
DATA 3
VEE
AGC 2
AGC 1
AGC DET
MUTE
VBB
VAA
VDD
AE MON
VCC
DLD. AGC
CCLK
XA7P1
XA6P1
XA4P1
XA3P1
XA2P1
XA1P1

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REMOVED R14	3.3.88	VH
	C	REVISED	28.3.88	VH



48 98 75	RX4010
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 19.1 1988
CH	
AP	SN 28.1.88
AP	

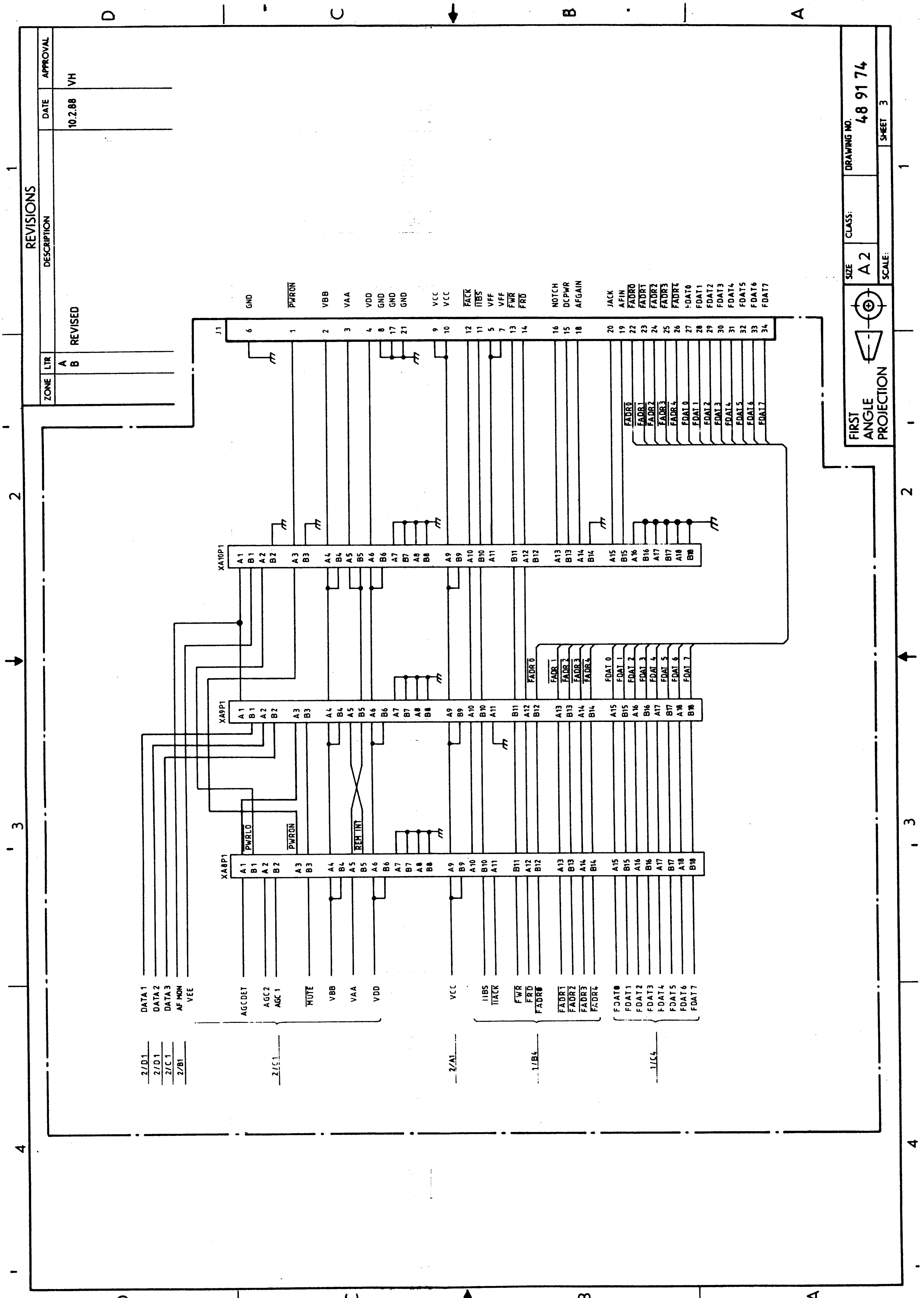
FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
MOTHER BOARD
RX4010

SIZE A1 | CODE IDENT | DRAWING NO 48 91 74

SCALE 2:1 | SHEET 1 OF 1



Service Sheet A12A1

3.