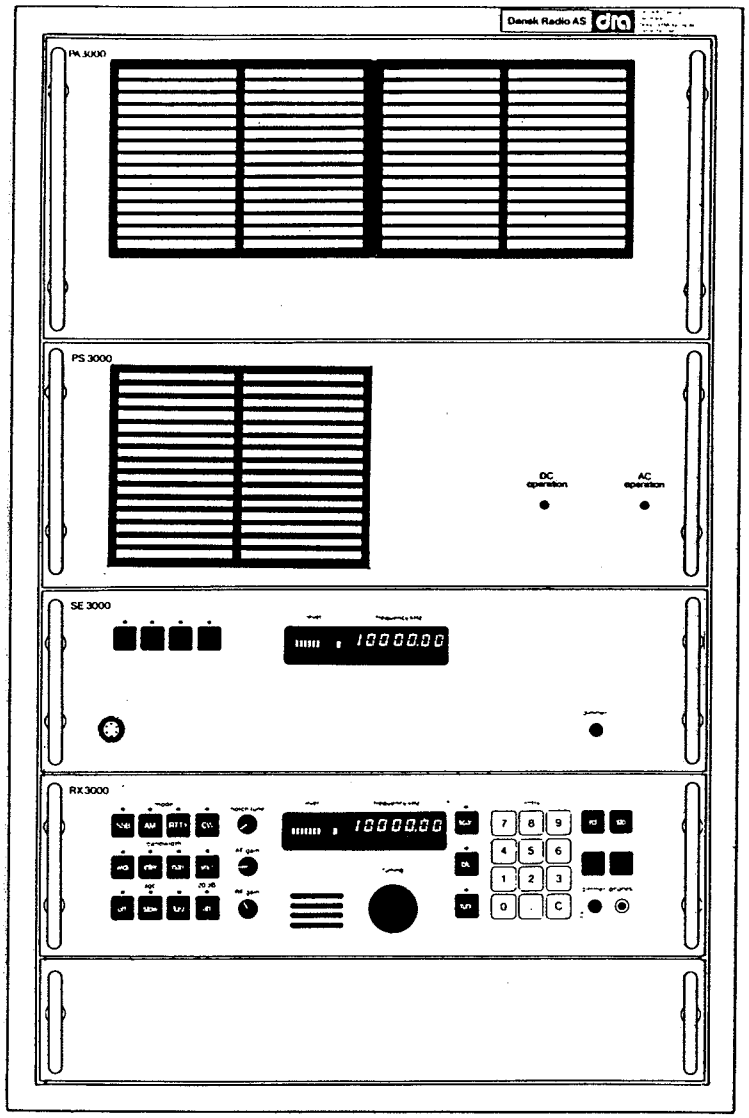
technical manual



HF-SSB Transceiver TR3000

WARNING

To prevent potential fire or shock hasard, do not expose the transceiver to rain or moisture.

DOCUMENT NO. 484121

ISSUE: 87-08

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 standard of design, manufacture and intended use of this equipment. Dansk Radio AS assumes no liability for the customer's failure to comply with these requirements.

GROUND THE EQUIPMENT.

To minimize shock hasard, 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 electric outlet or used with a three contact to two contact adapter with the grounding wire 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.

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.

TECHNICAL MANUAL VERSION 3.0 A

The technical manual is divided into two sections with continuing sections.

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GENERAL INFORMATION.

1.1 Introduction.

This Technical Manual contains information required to install, and operate and service the TR3000 HF-transceiver. A separate Operators Guide is supplied with the TR3000. The Operators Guide should be kept with the transceiver for use by the operator.

1.2 Specifications.

Transceiver specifications are listed in table 1.1. These are the certified specifications.

1.3 Transceivers covered by this manual.

All transceivers are cover by this manual. In case of any manual change, a special ammendments sheets is inserted in front of the manual.

1.4 Safety consideration.

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

1.5 TR3000 DESCRIPTION.

The TR3000 HF-SSB transceiver is especially designed for application where:

The operation of the transceiver should be logical in order to ease the operators work.
The installation should be simple with the possibility of easy removal to another site.
The station should operate also on 24 V DC.
Another station should have the possibility of starting up the unmanned TR3000 equipped with ARQ and collect or deliver messages in the ARQ memory.

The TR3000 is mainly operated from the receiver keyboard except for the transmitter power levels, which are selected from the exciter keyboard.
The frequency updating is made from the receiver keyboard or tuning knob. The split/nonsplit mode makes it possible to operate the receiver and transmitter at different frequencies, and change either the receiver or transmitter frequency without affecting the other.
When the TR3000 is operating unmanned, the receiver may monitor a number of frequencies if left scanning. When addressed by another station, the receiver stops the scanning, updates the transmitter at operation frequency, and the connection is estabished. The transmitter part covers the frequency range 1.6-26 MHz in 100 Hz steps, while the receiver covers 100 KHz to 30 MHz in 10 Hz steps.
The transceiver has the possibility of storing 75 user-programmed channels with their corresponding setting of mode, agc and bandwidth. The user-programmable channels also allow storing of separate frequencies for receiver

and transmitter.
The transceiver operating modes are USB ,AM , RTTY, CW.

The basic transceiver consists of 4 panels housed in a 19" rack. The four panels comprise a receiver RX3000, an exciter SE3000, a power supply PS3000 and the power amplifier PA3000. Furthermore the rack has room for one more panel, e.g. ARQ, Phonepatch.

1.6 Options.

The following options extend the features of the TR3000:

Option 001: With this option the TR3000 allows ARQ, FEC and selective FEC operation. When operating in ARQ mode, unmanned operation is possible.

Option 002: The receiver settings in the RX3000 non-volatile memory may be configurated in accordance with customer requirements. This will enable the customer to select 433 pre-programmed channels.

Option 003: With this option the TR3000 allows Radio Teletype operation (AFSK).

1.7 Accessories supplied.

The following accessories are supplied with the TR3000:

One handset	DRA part nr.	481017
One Operators Guide	DRA part nr.	484083
One antenna switch	DRA part nr.	482536
One set of running spares	DRA part nr.	484091

One set of installation kit
Containing 5 meters of mains cable and a N-connector for the antenna coax cable.

1.8 Accessories available.

The following items are available for use with the TR3000:

Depot spare parts kit	DRA part nr.	484113
Technical manual	DRA part nr.	484121
Special tools for RX3000	DRA part nr.	458902
Connector kit for RX3000	DRA part nr.	457914

TABLE 1.1 Specifications.

TRANSMITTER:

Frequency range.

1.6 MHz to 26 MHz in synthesized 100 Hz increments. The transmitter frequency is selected on the frontpanel of RX3000 by either the keyboard or the tuning knob and is displayed on a 7-digit LED display.

Frequency stability.

+/- 0.5 ppm from 0-50 °C

Frequency tune time.

Typical less than 1 sec.

Emission modes.

USB : J3E
AM : H3E
RTTY : F1B
CW : A1A

Output Power

1.6 to 26 MHz, 600 W +0/-1 dB in 50 ohm unbalanced PEP and average (continuous).

Output Power Reduction.

0-3-6-12 dB selected from keyboard.
Automatic 3 dB reduction with an antenna SWR worse than 2:1, DC supply voltage less than 26 V or transceiver error conditions.

Protection.

The transceiver is protected against all kind of antenna mismatch. A description of the different protections and the related error messages are given in section 3. ~~Operation.~~

Carrier suppression.

J3E : More than 50 dB
H3E : 6 dB.
F1B : More than 50 dB

Intermodulation.

Better than 34 dB relative to PEP at max. output.
Typical 40 dB relative to PEP.

Spurious Emission.

Better than 43 dB relative to PEP.
Typical 60 dB.

Wideband noise.

Better than 135 dBc/hz in 500 kHz offset.

Transmitter muting.

Better than 150 dB relative to PEP.
Typical 165 dB.

Suppression of unwanted sideband.

Better than 50 dB relative to PEP.

Audio input levels.

J3E/H3E
line : -15 dBm to +10 dBm into 600 ohm balanced
Mic. : 2.5-35 mV into 500 ohm.

F1B
Line : -15 dBm to +10 dBm into 600 ohm balanced

Audio frequency response.

J3E, H3E and F1B:
-3 dB 500-2600 Hz
-6 dB 350-2700 Hz

Keying input.

ON/OFF keying: OFF voltage 5 V
On current 1.5 mA.

Cooling system.

Forced air cooling with thermal sensor and timer function maintaining cooling approx. 5 min. after reaching the lower thermal limit of the amplifier.

RECEIVER:

Frequency Range.

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

Frequency stability.

1 ppm 0-40 C
2 ppm -15 C to +55 C

Frequency tune time.

Typically 10 msec.

Operating modes.

USB
AM
RTTY
CW

IF Selectivity.

SSB : -6 dB at 350 and 2700 Hz
AM,RTTY,CW:

Wide :	-6 dB at +/- 2.7 kHz
Inter:	-6 dB at +/- 1.2 kHz
Narrow:	-6 dB at +/- 0.5 kHz
Very narrow:	-6 dB at +/- 0.1 kHz

Antenna Impedance.

50 ohm, unbalanced.
SWR less than 1:2

Input Protection.

50 V EMF for up to 15 minutes.
35 V EMF continuously.

Input Selectivity.

Built-in sub-octave filters.

Sensitivity (100 kHz to 30 MHz).

Better than 0.7 uV EMF for 10 dB SINAD in SSB.
Better than 2.7 uV EMF for 10 dB SINAD in AM.

Intermodulation.

100 dBuV EMF per signal produces less than an equivalent input signal of 40 dBuV EMF.

Cross Modulation.

With a wanted signal of 60 dBuV EMF, an unwanted signal of 110 dBuV EMF/30% mod.400 Hz produces cross modulation output 30 dB below the wanted signal level.

Blocking.

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

Reciprocal mixing.

An unwanted signal removed 20 kHz or more from the tuned frequency must be more than 90 dB stronger than a signal 0.5uV EMF at the tuned frequency to give equal audio output.

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.

Automatic Gain Control.

Less than 4 dB change in output for an input signal variation from 1 dBuV to 100 dBuV.

RF Attenuator.

0 dB or 10 dB.

BFO.

Variable in 10 Hz step over +/- 7 kHz.

Notch Tune Filter.

30 dB variable from 300 to 2700 Hz.

IF Output.

1.4 MHz at -20 dBm.

Audio Output.

Speaker: 4W / 4 ohm.
Phones : 10 mW /500 ohm.
Line : 10 dBm/600 ohm.

General.

The transceiver contains a 75 channel memory with battery backup. Each channel contains all settings, exept power level.

Transceiver Power supply and environmental conditions.

Input Power.

220 V AC +/- 10% 47-63 Hz
24 V DC +30%/-10%

Power comsumption.

Operational.
AC : 2600 W max at full output power.
DC : 1800 W max at full output power.

Standby.
AC : 170 W.
DC : 140 W.

Environmental Conditions.

Full performance range : 0 to 40 C (2 to 26 MHz)
Operating range : -15 to 55°C
Storage : -40 to +75°C

Humidity.

95% relative humidity at 40°C.

Total Weight of transceiver.

114 kg.

Dimensions.

Height: 851 mm.
Width : 540 mm.
Depth : 625 mm.

INSTALLATION.

2.1 Introduction.

This section provides installation instructions for the TR3000 HF-transceiver. It also includes information about initial inspection and damage claims, preparation for use and information on repacking for shipment.

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 transceiver.

Inspect the shipping container for damage. If the shipping container or cushioning material are damaged, it should be kept until the contents of the shipment has been checked for completeness and the transceiver has been checked mechanically and electrically. Contents of the shipment should be as listed in sec.1.7. If the contents is incomplete, if there is mechanical damage or defect, or if the transceiver does not pass the performance test, please notify the nearest Dansk Radio agent. If the shipping container is damaged, or if the cushioning material shows sign of stress, please notify the carrier as well as the Dansk Radio agent.
A full report of the damage should be forwarded to Dansk Radio, including the following:

- Order number.
- Model and serial number.
- Name of transportation agency.

2.3 Storage.

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

2.4 Repacking for shipment.

The shipping container for the TR3000 has been carefully designed to protect the transceiver and its accessories during shipment. This container and its associated packing material should be used when repacking for shipment. If shipped to Dansk Radio for service, please attach a tag indicating the type of service required, return address, model number and full serial number. Please also mark the container **FRAGILE** to ensure careful handling.

If the original shipping container is not available, the following general instructions should be followed for re-packing with commercially available materials:

- Wrap heavy plastic or paper around the transceiver.

- Before wrapping the plastic around the transceiver place some bags with **SILICAGEL** in the transceiver to avoid condensation.

- Use a strong shipping container.

- 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** and **THIS SIDE UP** to ensure careful handling.

2.5 Mounting information.

The transceiver is mounted in a 19-inch-rack. For normal installation the transceiver should be placed on a sturdy table so that the operator has easy access to operate the transceiver. When choosing a table, the weight of the transceiver must be taken into consideration.
When operating the transceiver, provide at least 200 mm of clearance at the rear. Do not enclose the transceiver but allow for air circulation. If the transceiver does not get sufficient air circulation, excessive temperature rise may occur and the reliability of the transceiver will be influenced.

2.6 Power requirements.

220 V AC +/- 10 % 47-63 Hz
comsumption 2600 W max.

or

24 V DC -10%/+30%
comsumption 1800 W max.

Both the AC and DC power sources may be connected to the transceiver at the same time.
In case of a mains power failure the transceiver automatically switches to DC operation.

2.7 FUSES.

The power source fuses are listed in table 2.1

TABLE 2.1 FUSES.

RX3000	F1	1A timed	262706
RX3000	F2	6.3A timed	394629
SE3000	F1	4A timed	394637
PS3000	F1	.4A timed	262684
PS3000	F2	60A timed	482765
PA3000	F1-F5	16A timed	263176
PA3000	F6	2A timed	262714

2.8 Power cables.

The transceiver accepts both 220 Vac and 24 Vdc, and are therefore equipped with two supply inputs.

2.8.1 Mains input.

In accordance (with) the international safety standards this transceiver is equipped with a three terminal power connector J1 (refer to figure 2.8) for the mains input. If the power cable is terminated with a mains plug, this should only be inserted in a socket outlet provided with an earth contact. This protective action must not be neglected by the use of a power cable without a protective conductor (grounding).

2.8.2 DC input.

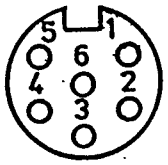
The DC input (TB1) is located on the rear of PS3000 on TB1. Refer to figure 2.9.
When using a DC supply the ground terminal located below TB1 should be grounded safely.

2.9 Audio inputs/outputs.

The audio inputs are dedicated to the different modes.

2.9.1 SSB/AM.

In the SSB/AM mode the audio input/output is terminated both on the handset connector on the front panel of the SE3000 (refer to figure 2.7) and on TB1 (refer to figure 2.8) on the rear of the rack.
The input levels accepted on the handset connector are between 2.5 mV and 35 mV into 500 ohms. The handset connection is shown in figure 2.1.
The input levels accepted on TB1 is between -15 dBm and +10 dBm into 600 ohm balanced. The connection is shown in figure 2.2.
The selection of either input is described in sec.3.6.5.2
The audio output is avaible all the time, no matter which input is selected by the operator. The output level is +10 dBm into 600 ohm balanced.



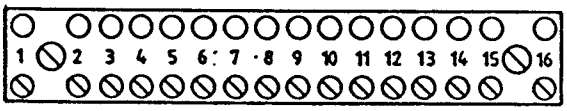
pin no.

1. Mic. GND.
2. Dyn. mic.
3. Loudspeaker GND.
4. Loudspeaker.
5. Key GND.
6. Handset key.

Figure 2.1
SE3000 Front Panel Handset connector.

2.9.2 FSK.

In the FSK mode the audio input is on the terminal block TB1 on the rear panel of the rack (refer to figure 2.8). The input levels accepted are between -15 dBm and +10 dBm into 600 ohm balanced. The connections for TB1 are shown in figure 2.2 and 2.8.
The audio line output is also located on TB1. The audio output level is +10 dBm balanced.



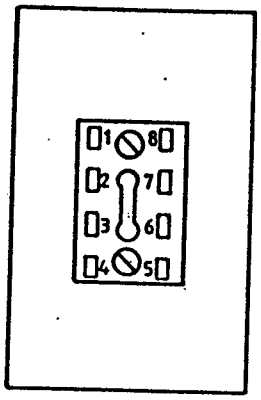
pin no.

1. Earth.
2. Line out.
3. Line out center.
4. Line out.
5. Key GND.
6. CW key.
7. LINE key.
8. Handset key.
9. Line 1 (FSK)
10. Line 1 center
11. Line 1 (FSK)
12. Line 2 (Voice)
13. Line 2 center.
14. Line 2 (Voice)
15. NC.
16. NC.

Figure 2.2
Rear panel input connector.

2.9.3 Optional telex connector.

The transceiver can optionally be prepared for installation of an ARQ modem, by placing two connectors J2 and J3 (refer to figure 2.8) on the rear of the rack. J3 is the connector for mains supply for a telex machine (or other kind of related equipment) while J2 is the telex connector. The connections are shown in figure 2.3.

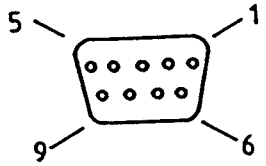


pin. no
1. TX.
2. TX.
3. RX.
4. RX.
5. not connected.
6. not connected.
7. Reader.
8. Reader.

Figure 2.3
Telex connector on the rear of the rack.

2.9.4 External loudspeaker.

Connections for an external loudspeaker (is brought out) on the rear of the receiver on the socket A10J3 (refer to figure 2.9). The connections are shown in figure 2.4.



pin no.		
4-8	Loudspeaker output	4W
5-9	Loudspeaker GND	4 ohms

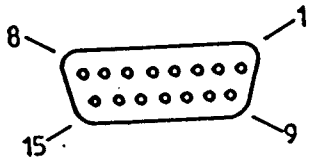
Figure 2.4
External loudspeaker connection on the rear of RX3000.

2.10 IF ouput.

The receiver is equipped with a 1.4 MHz IF output socket (BNC socket on the A7 modul) providing a -20 dBm/50 ohm 2nd IF signal for auxiliary equipment. The output is bandfiltered in accordance with the receiver bandwidth setting.

2.11 Control input/output.

The control input/output socket A8J1 on the RX3000 (refer to figure 2.9) provides all digital controls to and from the receiver. All controls are floating and exercised by 24Vdc/10mA positiv logic. Connections are shown in figure 2.6
The appropiate cable connector may be ordered from Dansk Radio as part of a connector kit, part no. 457914.



pin no.	
1	RS 232 input
2	RS 232 GND
3	Mute input (-)
4	Mute input (+)
7	Scan stop input (-)
8	Scan stop input (+)
9	RS 232 output
10	RS 232 GND

Figure 2.6
Control input/output on RX3000.

2.12 Key inputs

The key inputs are dedicated to the different modes in order to avoid illegal operation.
In SSB and AM mode the key indputs are available both at the front panel of SE3000 (refer to figure 2.7) and on the rear of the rack on TB1, handset key, (refer to figure 2.8) when the microphone input are selected. If the line input are selected the key input are located on TB1 as line key.
In the FSK mode the key input is available on the rear of the rack on TB1 as line key.
In the CW mode the key input is available on the rear of the rack on TB1 as CW key.
All key inputs are excercised by grounding. Connections are shown in figure 2.2 and in figure 2.8.

2.13 Antenna connection.

The antenna connection J4 (refer to figur 2.8) is made with an N-connector on the rear panel of the rack. The transceiver is designed for a 50 ohm unbalanced antenna load.

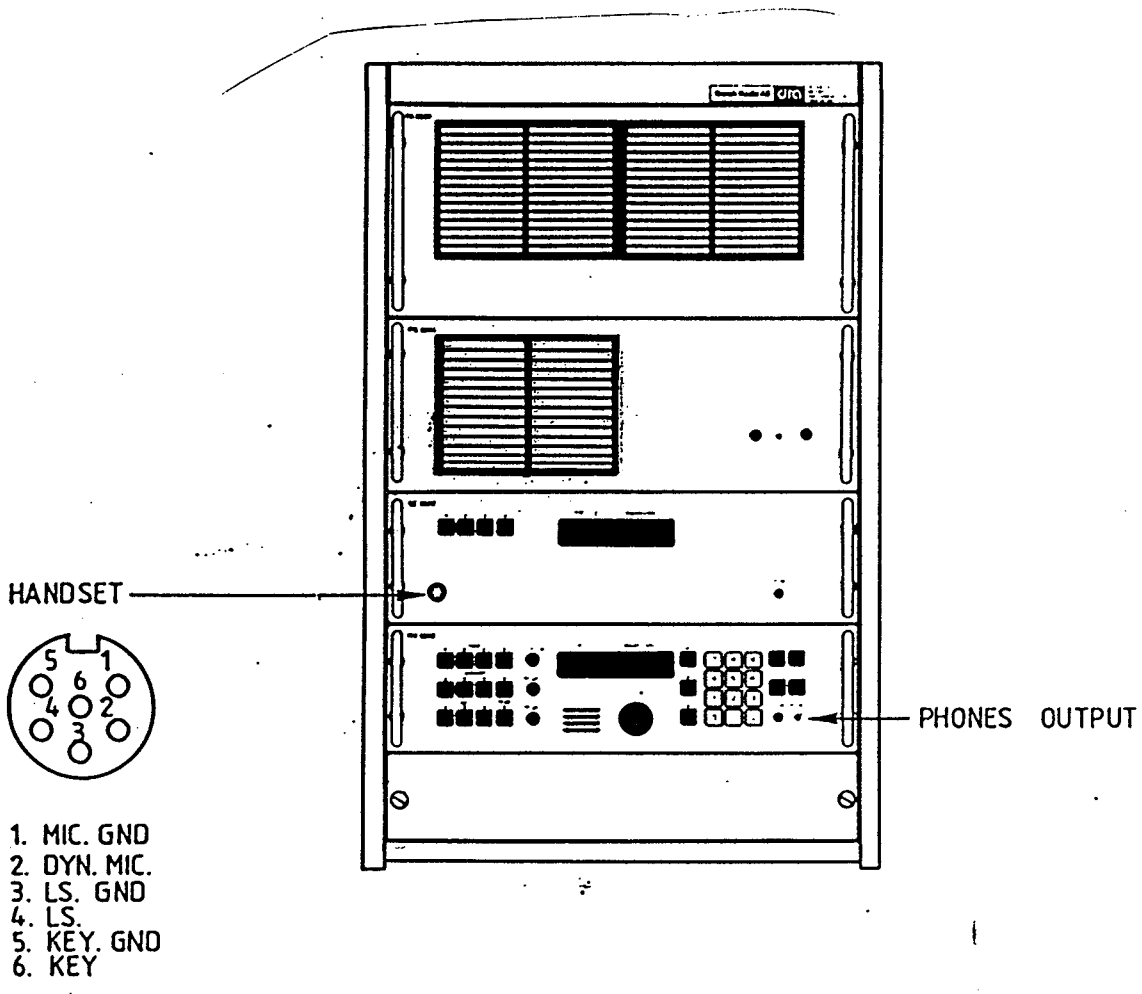
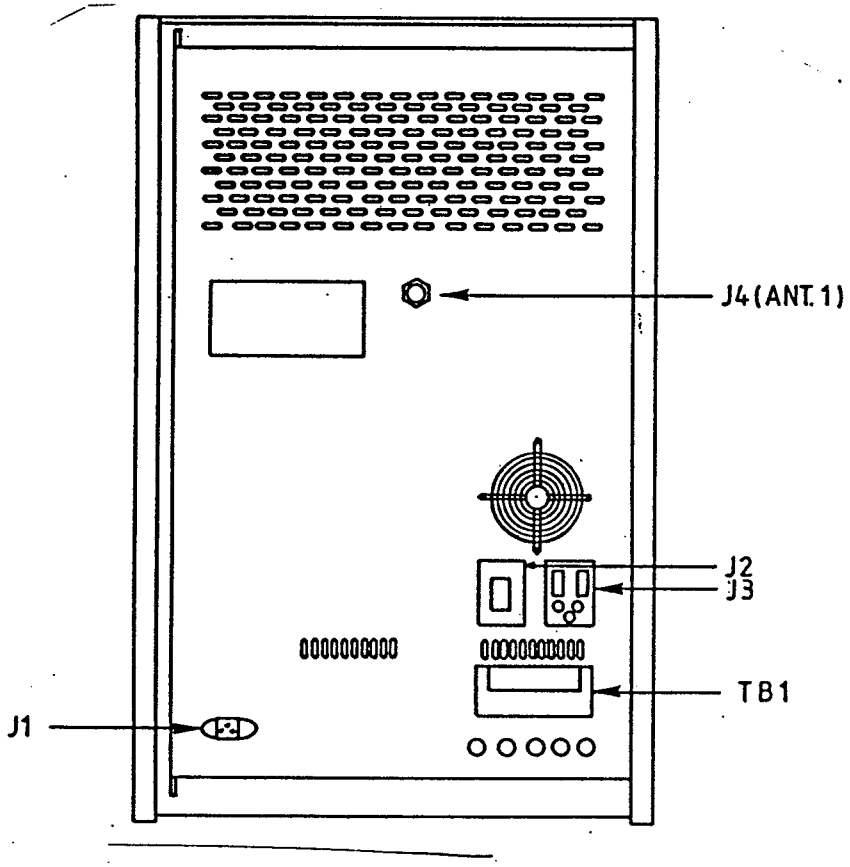


Figure 2.7

Front panel view



J1. MAINS
J2. TELEX CONNECTION (OPTIONAL)
1. TX
2. TX
3. RX
4. RX
7. READER
8. READER
J3. MAINS OUT (OPTIONAL)
J4. ANTENNA CONNECTION
TB1. 1. EARTH
2. LINE OUT
3. LINE OUT CENTER
4. LINE OUT
5. KEY GND
6. CW KEY
7. FSK KEY
8. HANDSET KEY
9. LINE 1 (FSK)
10. LINE 1 CENTER
11. LINE 1 (FSK)
12. LINE 2 (VOICE)
13. LINE 2 CENTER
14. LINE 2 (VOICE)
15. NC
16. NC

Figure 2.8

Rear panel view.

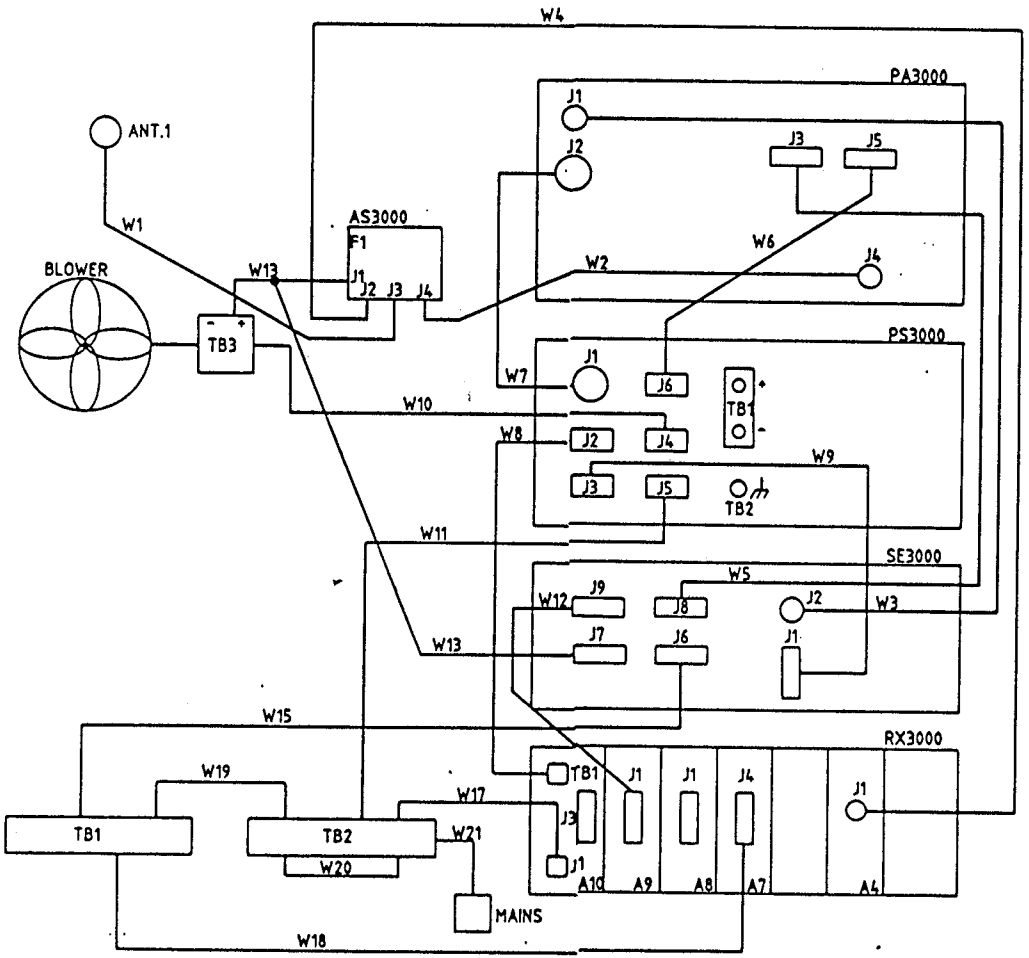
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	27.8.87	VH

REAR SIDE LOCATED
CONNECTORS USED FOR INSTALLATION.

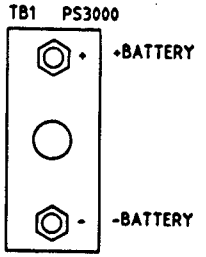
ANT. 1

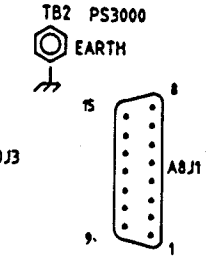
ANTENNA CONNECTOR

TRANSCEIVER INTERCONNECTIONS



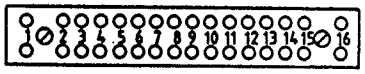
INSIDE LOCATED
CONNECTORS USED FOR INSTALLATION.





TB1:
pin no.

1. EARTH.
2. LINE OUT.
3. LINE OUT CENTER.
4. LINE OUT.
5. KEY GND.
6. CW KEY.
7. FSK KEY.
8. HANDSET KEY.
9. LINE 1 (FSK).
10. LINE 1 CENTER.
11. LINE 1 (FSK).
12. LINE 2 (VOICE).
13. LINE 2 CENTER.
14. LINE 2 (VOICE).
15. NC.
16. NC.



A10J3:
pin no.

4-8. LOUDSPEAKER OUTPUT.
5-9. LOUDSPEAKER GND.

A8J1:
pin no.

1. RS 232 INPUT.
2. RS 232 GND.
3. MUTE INPUT (-).
4. MUTE INPUT (+).
7. SCAN STOP INPUT (-).
8. SCAN STOP INPUT (+).
9. RS 232 OUTPUT.
10. RS 232 GND.

MAINS

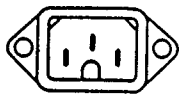


Fig 2.9

NEXT ASSY	TR3000	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	Dansk Radio AS
USED ON		ANGLES	DR. VH 5.3 1987
APPLICATION		LIN. DIM.	CH.
		MATERIAL	AP. 23.8.87
			AP.
		FIRST ANGLE PROJECTION	TITLE: RACK WIRING TR3000
			SIZE A2 / CODE IDENT / DRAWING NO. 48 53 81
			SCALE / SHEET 1 OF 1

OPERATION.

3.1 Introduction.

This section contains instructions for proper operation of the TR3000 HF-transceiver.
Basically all operation is made from the receiver keyboard. Only the selection of reduced output power level and display of the error log is made by operating the four push buttons on the SE3000.
Frequency, mode and levels for the receiver and transmitter are displayed on the respective displays on the RX3000 and SE3000.

3.2 Panel features.

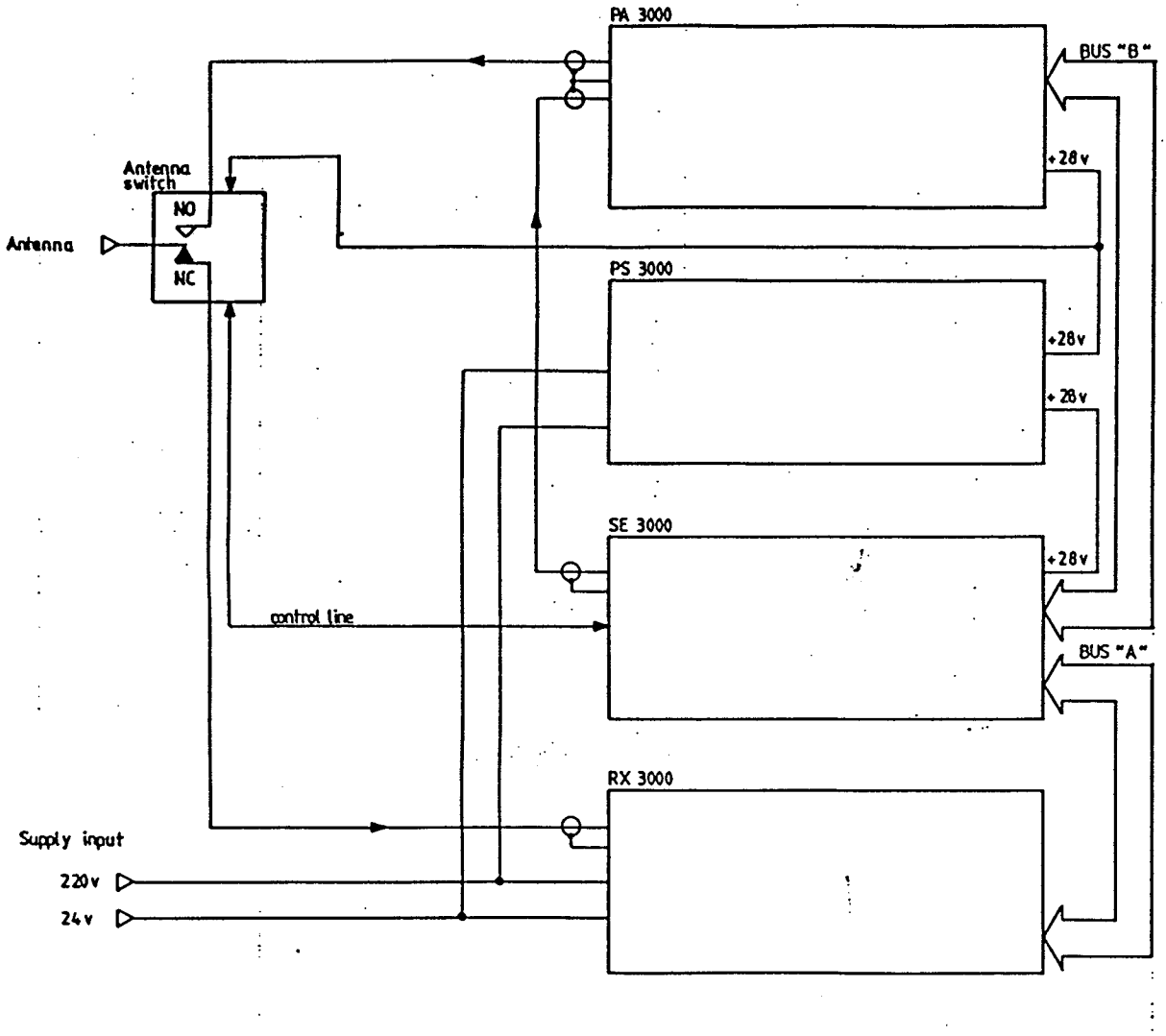
Figure 3.1 describes the build-up of the TR3000 while the function of the front panel controls, indicators and connectors of the different panels are described for the RX3000 in figure 3.2, for SE3000 in figure 3.3 and for PS3000 in figure 3.4

3.3 Power/warm-up.

The TR3000 requires a power source of 220 Vac, single phase, or 24 Vdc. Both sources may be applied at the same time.
Power-on of the transceiver is made in two steps, first the receiver RX3000, then the exciter SE3000.
The receiver and the exciter power switches have two positions, OFF and ON. Power is applied to some circuits at any time the transceiver is connected to the power source.

3.4 Initial conditions.

When the power has been switched on, the receiver will start up on the last set-up. An attempt to update the transmitter before turning on the exciter will result in an **error 10** being flashed on the receiver display indicating that only the receiver is activated.
When the exciter is turned on it will display **SE on** and then automatically request an update from the receiver.



BUS "A" : RS 232C and RX AUDIO

BUS "B": Low pass filter control
Driver ALC-preset
Error information
Supply lines

Figure 3.1

TR3000 build up.

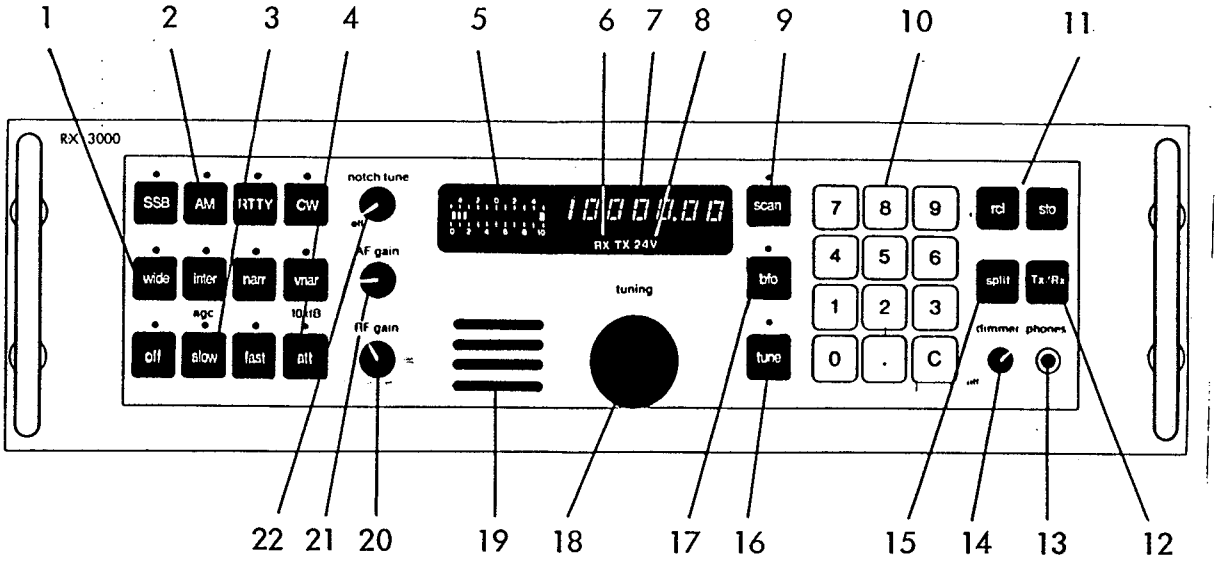


Figure 3.2

RX3000 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 and transmission. Pressing any mode key automatically selects default values for secondary keys on the receiver.
In SSB and AM are the mode keys also used for selection of either line or microphone input.

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, RFgain is manually controlled.

4. **Attenuator key.** Inserts a 10 dB attenuator in the receiver front end. Used to further improve the receivers large-signal response.

5. **S-meter.** Analog indication of the received signal strength.

6. **Split/nonsplit indicator.** When both the Rx and the Tx lightbar is on, the transceiver is in the non-split mode. When only one lightbar is active, the active lighbar indicates which unit is being updated.

7. **Alphanumeric display.** Displays the receiving frequency, the BFO-frequency, error codes and fault indications.

8. **Power source indicator.** Indicates that the receiver is powered from +24 Vdc.

9. **Scan key.** Selects the automatic and manual scanning mode.

10. **Entry keys.** This group includes the numeric data keys and the clear key.

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

12. **Rx/Tx.** This key is used to change between updating the receiver and the exciter when operating in split mode.

13. **Phones output.** Connection for headphones. Disconnects the local speaker.

14. **Dimmer/Power control.** Used for control of the light intensity in the front panel indicators. In the OFF position power is supplied to part of the power supply circuits.

15. **Split key.** This key is used to alter the transceiver between operating in split mode or non-split mode.

16. **Tune key.** Enables/disables free tuning by the tuning wheel.

17. **BFO key.** Enables/disables the BFO control mode.

18. **Tuning wheel.** Used for free tuning of the receiving frequency and BFO frequency.

19. **Loudspeaker.**

20. **RF-gain/threshold control.** Used during AGC "off" to manually adjust the intermediate frequency gain. Used in the threshold mode to control the threshold level.

21. **AF-gain.** Manual adjustment of the audio level in the loudspeaker.

22. **Notch tune control.** Manual adjustment of an audio frequency notch filter, tunable in the range 300 Hz to 3000 Hz. Used to attenuate undesired interfering signals in the audio output.

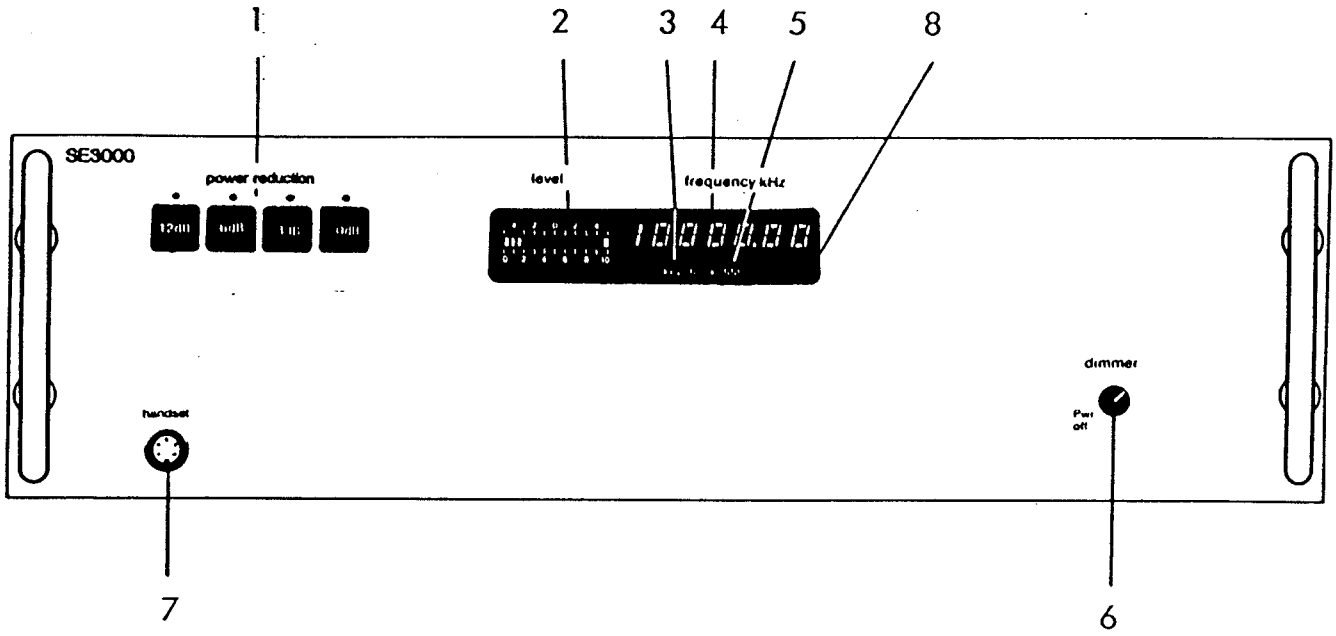


Figure 3.3

SE3000 front panel features.

1. Power reduction level keys. The four keys are used to control the reduction of the output power level, and the display of the error log.

2. Power level indicator.

3. Key and block indicator. The key-lightbar indicates whether the transceiver is keyed or not, if there is an error or an illegal situation in the transmitter, the block-lightbar will indicate that the transmitter has been blocked.

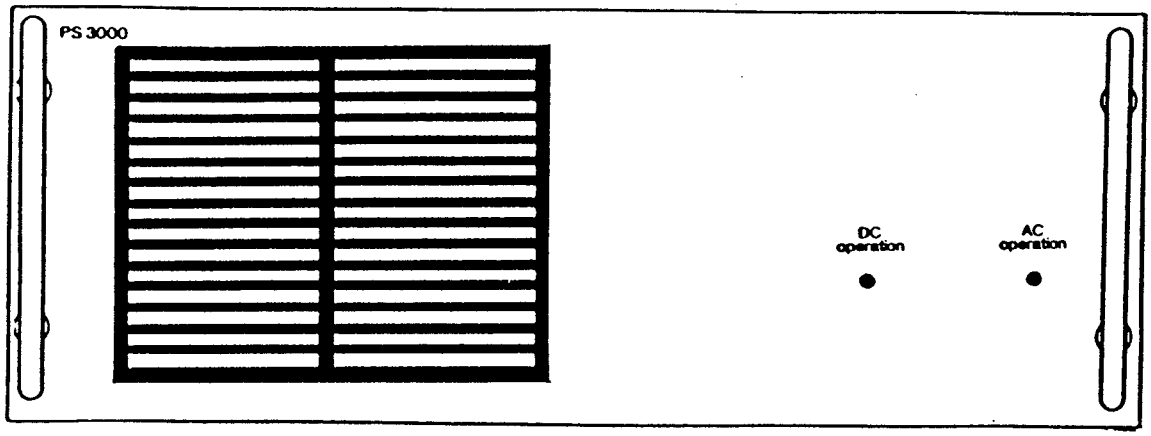
4. Alphanumeric display. Displays the transmitter frequency and the error codes.

5. Mode indicator. The transmitter mode is indicated by lightbars.

6. Dimmmer/Power control. Used to control the intensity of the frontpanel indicators, and to switch on the transmitter.

7. Handset connector.

8. Line input indicator. The line input indicator is used to display whether the line or microphone input are active in SSB/AM, or if in RTTY whether line 1 or line 2 are active.



Figuer 3.4

PS3000 front panel features

1. Power source indication. The light emitting diodes indicates which power source is active.

NOTE

1. If the display reads **OSC.FAIL**, the frequency synthesis circuits are not working properly.

2. If **Ann.FAIL** (nn is a two digit number) momentarily appears in the display after turn-on, some of the initial tests indicate a fault. Refer to section 8 Service in the RX3000 manual for fault description.

3. If either of the above situations occurs, refer the receiver to qualified service personnel for repair.

When

~~After the power~~ has been switched-on ~~to~~ the transmitter power supply PS3000 the blowers in PA3000 will start and maintain operation for approx. 5 min.

3.5 Self Test.

The transceiver self test is initiated by pressing first the "C" key, then the "TUNE" key.
The self-test first turns on all the indicators/displays of the front panels on RX3000 and SE3000 and gives an audio signal through the built-in loudspeaker. Press the "C" key again and the indicators/display will turn off and first show a letter and a number indicating the software version. By pressing any of the keys it is possible to check the keys for mechanical errors.
To leave the self test press the "C" key again and the transceiver will return to the set-up from before the test was initiated.

3.6 Manual operating instructions.

The following paragraphs describe the procedures for operating the TR3000 HF-transceiver from the front panels. It explains how to set the frequency, mode and special function controls.

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 Entry errors.

The word **error** will appear on the receiver display for approx. one second when an error in programming the receiver is made. The incorrect entry will not be accepted. Table 3.1 shows the relevant entry error-codes and their explanations.

Error code	Message
02	User register not defined
03	Invalid user register
04	Invalid international channel
05	Invalid scan sequence
06	Scan channel not defined
10	Transmitter power supply is not turned on or a failure on the RS 232 link between RX3000 and SE3000 has occured

Table 3.1
Entry errors

If the exciter SE3000 is updated with an illegal frequency the display will flash indicating the entry error.

3.6.3 Quick reference operating instructions.

3.6.3.1 AM operation.

- Key in the desired frequency.
- Press the "AM" key
- Adjust the AF-gain for a convenient volume.

3.6.3.2 SSB, CW and RTTY operation.

- Key in the desired frequency.
- Press the "SSB", "CW" or "RTTY" key.
- adjust the AF-gain for a convenient volume.

3.6.4 Frequency control.

3.6.4.1 Frequency resolution.

The frequency resolution of the receiver can be set by the operator to 1 KHz, 100 Hz or 10 Hz by pressing the "." key an appropriate number of times. The transmitter frequency resolution is fixed at 100 Hz.

3.6.4.2 Keyed tuning.

Key-in the desired frequency by pressing digits in sequence, just as they are written on a piece of paper. The display immediately shows the digit sequence in right

entry display format, i.e. the digits appear in the rightmost display character and are shifted left one character on each digit entry. The decimal point must be keyed if it is part of the desired frequency (unless the frequency chosen is in full KHz).
For example to key-in 7501.65 KHz, simply press the following keyes 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

3.6.4.3 Free tuning.

The receiver tuning control is activated by pressing "TUNE" key. A light above the key indicates the free tuning function. By rotating the tuning wheel the receiver frequency is varied in the selected steps. The exciter frequency does not following the receiver frequency during the free tuning. Pressing the "TUNE" key the second time disables the free tuning function and the exciter is updated at the new frequency if the transceiver is operating in the non-split mode.

3.6.5 Function Keys.

The RX3000 and the SE3000 have a number of function keys that allow the operator to select operating modes and power levels.

3.6.5.1 Reception/transmission mode.

The transceiver can operate in three modes:

SSB, AM , RTTY and CW.

The proper mode is selected by pressing one of the keys labeled "SSB", "AM", "CW" and "RTTY".
For the receiver part of the TR3000 the pressing of a mode key automatically selects a default key for secondary 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
AM	slow	WIDE	disabled
SSB	slow	FIXED	0 Hz
CW	slow	narr	800Hz
RTTY	slow	narr	1700Hz

3.6.5.2 Selection of audio input.

In SSB and AM it is possible to use a line input instead of the microphone input. As default selection the microphone input is activated when selecting SSB or AM.
To select the line input press once the desired mode key ones more after having selected the desired mode. This will select the line 2 input and will be indicated in the exciter display by the lightbar marked Line.
The display will show both Mode and Line.
In RTTY is it possible to select between the two line inputs in the same manner as with SSB/AM. Line 1 is default selected.

3.6.5.3 AGC control.

The AGC keys control the AGC time constants. Press any of the keys labeled "OFF", "SLOW" or "FAST" to select the desired setting.
In the AGC "OFF" mode the gain can be manually adjusted with 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 please refer to the receiver specifications.

3.6.5.4 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 constants.

- Press the active AGC key again to enter the threshold mode.

The threshold mode is indicated by a flashing AGC indicator. The AGC threshold is adjusted by the RF-GAIN knob.
To leave the threshold mode:

- Press the active AGC key.

The active AGC indicator will now light constantly. If the threshold mode is used during scanning the receiver will only dwell briefly, i.e. 100 mS, at channels with signal levels below the AGC threshold. If the signal level exceeds the threshold, the receiver will dwell at the channel for the time selected with the keys 0-9 (see 3.6.8.2) and then continue scanning.
A RS 232c compatible output at the rear of the receiver (A8J1) indicates in positive logic receive signals exceeding the AGC threshold. This output may be used for activation of external equipment, e.i. recording devices, selective calling devices, audio muting circuits or the output can be looped back to the scanstop input to hold the receiver frequency as long as the input signal level is above threshold.

3.6.5.5 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 and CW reception modes and will not respond to commands when the receiver is operating in SSB mode.
The exciter bandwidth is fixed.

3.6.5.6 Split - Tx/Rx keys.

The "SPLIT" and "Tx/Rx" keys are used to operate the transceiver in either non-split or split mode.
In the non-split mode the exciter ~~is~~ operating on the same frequency and mode as the receiver while in split mode it is possible to operate the exciter on a different frequency and in a different mode than the receiver.
The choice of mode is indicated by two lightbars Rx-Tx in the RX3000 display. When both lightbars are on, the transceiver ~~is~~ operating in the non-split mode, ~~and~~ When operating in split mode the active lightbar indicates which part of the transceiver is being updated.
To enter the split mode press the "SPLIT" key and update the receiver. Now press the "Rx/Tx" key and update the exciter.
Toggling the "Rx/Tx" key will shift between updating the receiver and the exciter. ~~If operating in split mode and~~ (pressing) the "SPLIT" key the exciter is updated by the receiver settings.
When in the non-split mode and free tuning, only the receive frequency will be altered, ~~and first when leaving the free tuning~~ the exciter will be updated ~~on~~ the receiver frequency.

3.6.5.7 Output power level reduction.

The output power level of the transceiver is controlled by the POWER REDUCTION keys on the SE3000. The keys are always enabled regardless of the split/non-split mode. A light above the selected key shows that it is active. Certain error situations will disable the 0 dB key as described in sec.3.6.11.

3.6.5.8 Error log.

Errors on the transmitter during operation are immediately displayed as described in sec.3.7.2. At the same time the last 10 errors are stored in the the memory of the microprocessor in SE3000.
This feature enables the operator to display the last 10 errors by operating the power reduction keys.
By pressing the "-3 dB" and "-6 dB" key simultaneous the exciter will display the errors stored in the error log one by one with half a seconds dwell time.
The error log is cleared by simultaneous pressing the "-12 dB" and "0 dB" keys.
If the error log is overrun only the last 10 errors will be in the log.

3.6.6 Storing and recalling of settings.

The receiver contains 75 addressable storage registers that allow the operator to manually store and recall complete transceiver settings except for the output power level, which always will be "0" dB after a recall. The split/non-split mode are included in the transceiver settings.
The storage registers are part of a CMOS memory in the microcomputer in the receiver and maintain their contents even though the receiver is turned off or disconnected from the power source.
When the receiver restarts after turn off or a power failure the settings will be the same as before the turn-off or power failure.
The user programmable storage registers have the numbers .01 through .75.

3.6.6.1 Storing of settings.

To store a complete transceiver setting:

- Press "STO"
- Press the decimal point "."
- Press the numeric keys of the applicable register address (01 through 75)

3.6.6.2 Recalling of settings.

Transceiver settings are recalled from the storage register in much the same way as they are stored. To recall a complete transceiver setting:

- Press "RCL"
- Press the decimal point "."
- Press the numeric keys of the applicable register address (01 through 75).

3.6.6.3 Using the R0 register.

The R0 register always contains the present transceiver settings except any free-tuned frequency off-set.
After a free-tuning sequence, simply press **RCL 00** (or **RCL.00**) to restore the original frequency setting. If, after a re-adjustment, the operator wants to update the transceiver setting to reflect the current receiving-/transmitter frequency, he should press **STO 00** (or **STO.00**).

3.6.7 Automatic channel selection.

The transceiver contains information on all CCIR recommended frequencies for

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

- Telex communication in the coaststation bands 4, 6, 8, 12, 16, 22 MHz.

3.6.7.1 Channel selection.

To select an international channel,

- Press "**SSB**" or "**RTTY**" to select desired mode.

- Press "**RCL**".

- Press the numeric keys of the applicable channel number.

The transceiver will automatically generate all settings for that particular channel.

3.6.7.2 International calling channels.

To select an international calling channel for SSB communication,

- Press "**SSB**".

- Press "**RCL**".

- Press the numeric key of the applicable maritime frequency band (4, 6, 8, 12, 16 or 22).

- Press the decimal point ".".

The automatic channel selection function does not occupy any space in the addressable storage register (this feature corresponds to 433 pre-programmed channels).
Selection of an invalid channel number will cause an "error" condition to be flagged on the display.

3.6.8 Scanning.

The receiver RX3000 is equipped with a scanning function that allows the operator to either manually or automatically scan a number of selected frequencies.
Scanning can be in any of the preset frequency bands or in the user programmable storage register.
During automatic scanning the exciter will be blocked and only updated and unblocked at scanstop.
During manual scanning the exciter is updated and unblocked when a dwell time of more than one second occurs.

3.6.8.1 Scanning international channels.

To initiate a scanning sequence in one of the coaststation bands,

- Press "SSB" or "RTTY"
- Press "scan"
- Press the numeric keys of the lowest applicable channels in the sequence
- Press the numeric keys of the highest applicable channel in the sequence

If all channels in a frequency band are to be scanned,

- Press "SSB" or "RTTY"
- Press "scan"
- Press the numeric keys of the applicable maritime frequency band (4, 6, 8, 12, 16 or 22)
- Press the decimal point "."

3.6.8.2 Scanning user defined frequencies.

To initiate a scanning sequence in the user programmable storage register,

- Press "scan"
- Press the decimal point "."
- Press the number key of the lowest applicable storage register
- Press the numeric of the highest applicale storage register

3.6.8.3 Scan stop/scan dwell time.

Once a scan is initiated the receiver will continue to scan from the lowest applicable channel. The display will show the settings corresponding to the current channel.

An external input signal connected to J1 on the microcomputer subassembly A8 can be used to interrupt the scanning sequence.
The default dwell time is 9 sec.
To enter another dwell time,

- Press any of the numeric keys "1" through "9" to select the dwell time in seconds

- Press key "0" to select 100 msec dwell time

3.6.8.4 Manual scanning.

To scan a programmed sequence manually, enter a scanning procedure as described.
Then

- Press "**scan**" again

The manual scanning mode is indicated by the scan indicator flashing.
Manual scanning is now carried out by rotating the tuning wheel, either forward or reverse. In the manual scanning the exciter is updated with the channel settings when rotating the knob with a dwell time of more than approx. 1 sec.
For example, to scan user programmed channel 1 through 10,

- Press "**scan**"

- Press "."

- Press "1"

- Press "10"

- Press "**scan**"

Now by rotating the tuning knob the channels from 1 through 10 are manually scanned. To leave the manual scanning ,

- Press "**scan**" to reenter automatic scanning

or

- Press "C" to leave the scanning mode

NOTE

Only the keys labelled "**scan**" and "C" may be operated during scanning.

3.6.9 BFO control.

The default setting of the BFO can be altered.
To enter the BFO setting,

- Press "bfo"

Now the BFO-frequency is displayed with 3-digit resolution. The frequency can be altered from the keyboard and-/or from the tuning wheel.
To alter the BFO-frequency from the keyboard,

- Press "0" to select the proper sign (+/-)

- Press the number keys of the applicable BFO-frequency, entering the decimal point in the proper place.

To adjust the BFO-frequency by the tuning wheel,

- Adjust the BFO-frequency by means of the tuning wheel.

Pressing "bfo" the second time disables the BFO control.

3.7 Error messages.

3.7.1 RX3000 error messages.

Table 3.7.1 lists the different error information and the related modules which may be faulty.

3.7.2 SE3000 error messages.

During operation and in the incident of errors several error messages can occur on the display of the exciter SE3000.

Table 3.7.2 lists the error messages covering the errors in the communication between the receiver RX3000 and the exciter SE3000.

Table 3.7.3 lists the error messages which can occur because of malfunction in the power amplifier PA3000, in the power supply PS3000 and the antenna and antenna switch used with the transceiver.
The errors listed in table 3.7.3 can be divided into two groups. One group ~~is used to give~~ as long operational time as possible by decreasing the output power by 3 dB while the other group ~~is used to keep~~ the transceiver from total break down ~~by making a transmitter~~ switches off the transmitter. and
If either one or more of the errors from the first group ~~causing output power reduction, should~~ occur the output power will not be reduced by more than 3 dB. Any attempt to rise the output to full will be ignored by the exciter as long as the error is present.

Table 3.7.4 lists the reset conditions for the errors.

By the use of the error log as described in sec.3.6.5.8 it is possible to display the last 10 errors.

Table 3.7.1 RX3000 errors.

SYMPTOM	POSSIBLE FAULTY MODULE
1. Receiver dead. Mains ok Fuse not blown. No LEDs lit.	A10 Power supply A11 Front panel
2. Receiver dead. Fuse blown and new fuse blown.	A10 Power supply
3. Front Panel dead. Noise heard in the loudspeaker during power up. No LEDs flashing on A8 back plane	A8 Microcomputer A10 Power supply
4. Front Panel dead. Some LEDs flashing on A8 back plate.	A11 Front Panel
5. Display very weak. Receiver else OK	A11 Front Panel A10 Power supply
6. Part of display extremely bright while the rest is not lit. Receiver stops operation	A8 Microcomputer
7. The same display segment is missing in all figures	A11 Front Panel
8. Display shows "FCS FAIL" and/or "FFFF.FF" steadily or periodically. Pressing a key can cause an "OSC 1 err" read out	A10 Power supply
9. The display shows "An FAIL" during power-up or during keyboard operation.	A8 Microcomputer
10. "OSC 1 err" during frequency or mode change	A1 Synthesizer
11. "OSC 2 err"	A2 Standard
12. "OSC 3 err"	A2 Standard
13. Receiving frequency incorrect	A1 Synthesizer A2 Standard
14. Sensitivity poor. Receiver runs test program without error readouts	Antenna cable A4 Suboctave filter
15. "An FAIL" during test program.	An module (n indicating the module)

SYMPTOM	POSSIBLE FAULTY MODULE
16."OSC 1 err" during test program. No errors during normal operation.	A1 synthesizer.
17."GAin Lo" 5 times followed by "SEnS Lo" one time during test program	A3 Frontend A7 IF/AF A1 Synthesizer A2 Standard.
18."GAin Lo" and "no Audio" 5 times followed by "SEnS Lo" one time during test program	Same as 17
19."GAin Lo" and "no AUdio" 5 times during test program	A1 Synthesizer
20."no AUdio" during test program.The loudspeaker is weak and distorted	A2 Standard A7 IF/AF
21."GAin Lo" in one of the bandwidths during test program.	A3 Front-end
22."SEnS Lo" during test program. Sensitivity poor	A4 Suboctave filter A3 Front-end
23."no Audio" during test program. Receiver operates normally.	A7 IF/AF
24.Audio distorted i AM	A7 IF/AF
25.Audio missing or weak No error read-outs during test program	A10 Powers supply A11 Front Panel
26.Receiver acts strangely when pressing certain keys	A8 Microcomputer
27.Receiver looses user-programmed channels	A8 Microcomputer
28."FCS FAIL" during power-up	A8 Microcomputer

Table 3.7.2 Communication errors.

Error nr.	Error	error description
error 20	No DSR	DSR not present on RS232
error 21	Parity error	Parity error on received character
error 22	Overrun error	Overrun error on received character
error 23	Framing error	Framing error on received character
error 24	Key value error	Not a legal value for power keys
error 25	Key FIFO	Buffer full
error 26	Key FIFO	Buffer underrun
error 27	Key FIFO	Buffer overrun
error 28	Mode error	Wrong mode character from RX
error 29	ASCII error	Not an ASCII character received

Table 3.7.3 Operational errors.

Error nr.	Description
error 40	The power amplifier is overheated and the transmitter has been switched off.
error 41	Transmitter is overheated, and in order to maintain operation as long as possible the output power has been reduced by 3 dB.
error 42	The voltage for the power amplifier has fallen below 26 V, and to keep the inter-modulation at a secure level the output power has been reduced by 3 dB.
error 43	The SWR between the antenna and the low pass filter is greater than 1:2 and the output power has been reduced by 3 dB in order to protect the transmitter.
error 44	The SWR between the power amplifier and the low pass filter is very bad and in order to protect the amplifier the transmitter is switched off. This error can be caused by very bad SWR, no antenna connected or fault in either the amplifier or the lowpass filter.
error 45	The control connection between the exciter and the power amplifier is missing, and in order to avoid illegal operation the transmitter has been switched off.
error 50	The 100 Hz loop in the exciter is out of lock. To avoid illegal operation and to protect the transmitter the transceiver is blocked.
error 51	The 10 kHz loop in the exciter is out of lock. To avoid illegal operation and to protect the transmitter the transceiver is blocked.
error 52	There is a fault present in the antenna switch, and to protect the transmitter the transceiver is blocked.

Table 3.7.4 Reset conditions.

error nr.	-3 dB	Tx blocked	Reset auto/man.	Display flash/const
40		X	auto	const
41	X		auto	flash
42	X		man 0 dB key	flash
43	X		auto	flash
44		X	man switch off SE3000	const
45		X	auto*	const
50		X	auto	const
51		X	auto	const
52		X	auto	const

* Automatic reset after releasing of the key if the transmitter is keyed.

Basic Description.

4.1 TR3000 BLOCKDIAGRAM.

Ref. diagram 477842 page 6-1

The TR3000 consists of 4 panels, a receiver RX3000, an exciter SE3000, a power supply PS3000 and a power amplifier PA3000.
The master controller of TR3000 is the receiver RX3000 from which the exciter receives the frequency and mode information through a RS232 link BUS"A", also containing the AF-signal from the receiver to the handset, as well as the muting command from SE3000.
In case the transmitter part of the TR3000 has not been turned on the RX3000 will display **ERROR 10** telling the operator that it is not possible to update the transmitter before the power has been turned on.
SE3000 controls PA3000 through BUS"B" which is a parallel bus, containing the following information and commands:

- # ALC preset information from SE to PA.
- # Low pass filter control from SE to PA.
- # Supply to control circuit and blower relay
- # Output Power level information from the PA to SE3000
- # ALC level information from the PA to SE3000.
- # Error information from the PA to SE3000.

The ALC preset information is a 3 bit code in TTL-level.
The low pass filter control is a 3 bit code in TTL-level.
The supply lines contain +15V and GND.
The power level information is a DC level proportional to the output power. The power reading in the SE3000 display is relative and therefore not accurate.
The ALC information is a DC voltage proportional to the output of the Power Amplifier.
SE3000 monitors the error information from PA3000 and makes the necessary actions. ~~on the error situation. The error information include the following~~ information about the conditions in PA3000 ~~is~~ is as follows: Error

- # **THERMAL SHUT DOWN.** This error makes SE3000 switch off the system due to overheat of the power amplifiers. User information is given in the display of SE3000 by the error code **ERROR 40**

- # **HIGH TEMPERATURE.** This error makes SE3000 reduce the output power by 3 dB. After reduction of the output power the error code will be displayed as **ERROR 41** during (for about) 1 second. An attempt to increase the power to full output level will result in a flashing display of the error code.

- # **LOW VOLTAGE.** This error makes SE3000 reduce the output power by 3 dB. After reduction of the power the error code will be displayed as **ERROR 42** for about 1 second. An attempt to increase the power to full output will result in a flashing display of the error code.

BAD SWR. This error makes SE3000 reduce the output power by 3 dB. After reduction of the power the error code will be displayed as **ERROR 43** for about 1 second. An attempt to increase the power to full output will result in a flashing reading of the error code.

AT EITHER ONE OR MORE OF THE ERRORS 41-42-43 THE OUTPUT POWER WILL ONLY BE REDUCED 3 dB.

BAD SWR BETWEEN THE PA AND THE LOWPASS FILTER. This error makes SE3000 shut down the system, because a high SWR reading, can be caused by a fault in the lowpass filter, in the power amplifier or a missing antenna. The error information will be displayed constant in the SE3000 display as **ERROR 44.**

MISSING CONNECTION. This error bit informs SE3000 whether there is power for the control unit in PA3000 or not. If the power is missing the SE3000 makes a transmitter block, and informs about the situation by writing **ERROR 45** in the display.

The antenna switch in the transceiver is a vacuum relay. This type of antenna switch is used for continous operation. In case of ARQ operation a fast electronic switch is needed.
The antenna switch is controlled and supervised by SE3000.

ANTENNA SWITCH ERROR. If the temperature in the antenna switch rises, or the supply voltage is either to high or to low the antenna switch error interface informs SE3000 which then blocks the transmitter. This error is displayed as **ERROR 52.**

During operation SE3000 supervises the condition of the synthesizers. If any of the synthesizers are getting out of lock, SE3000 will display the synthesizer out of lock as **ERROR 50** for the 100 Hz loop and **ERROR 51** if the 10 kHz loop is out of lock.

The transceiver can operate on either AC or DC supply. The AC supply connection is located at the rear of the rack, while the DC connection is located at the rear of PS3000.
In case of a mains failure the transceiver automatically switches from AC to DC operation. If both an AC and a DC supply are connected, the transceiver will start up on AC and if the AC drops out the transceiver switches to DC operation. When the AC supply returns the transceiver continues to operate on DC until the transceiver is switched off and on again. This is done to prevent pendling from AC to DC if the AC supply is insufficient.

4.1.1 RX3000.

For description of RX3000 see sec.8 of this manual.

4.2.1 Tx SIGNALS GENERATION.

Ref. figure 4.2.1

The generation of the wanted signal is produced from the AF-input and the two synthesizers.
The AF signal is applied to the AF-circuit (A1) where it is amplified and limited. From here it is routed to the RF-circuit (A2) which contains a modulator and a signal combiner.
The 100 Hz loop supplies a 8.7 MHz carrier used for the modulator and for carrier reinsertion. The 100 Hz loop also supplies a variabel signal from 51.6901 to 51.7 MHz in 100 Hz steps. The resulting signal from the RF-circuit is from 42.9901 to 43 MHz in 100 Hz steps.
The signal from the RF-circuit is mixed in the Wide Band Mixer (A3) with the third LO, which comes from the 10 kHz loop.
The 10 kHz loop generates a signal ranging from 44.6 to 69 MHz in 10 KHz steps. The resulting signal from the Wide Band Mixer is 1.6 to 26 MHz in 100 Hz steps depending on the loops.

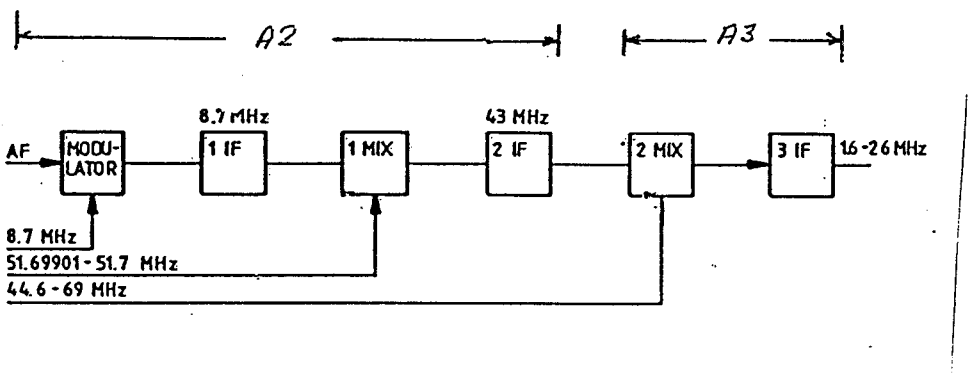


Figure 4.2.1

4.2.2 Tx KEYING SYSTEM.

Ref. figure 4.2.2

The keying of the transceiver is a differential keying system with a default circuit for key select.
The key input from the rear and the front of the transceiver are routed to the RF-circuit (A2) where a default circuit selects the appropriate key input and routes it to the AF-circuit (A1) where the key signal is shaped. From the key signal key info is derived for the microprocessor where it is converted to a mute signal for the receiver. Also the control signal for the antenna switch comes from the key signal.
After the shaping the signal is routed to both the RF-circuit and the Wide Band Mixer, where in both cases it keys the LO amplifiers and IF amplifiers. This ga-

ranties sufficient muting of the transmitter.

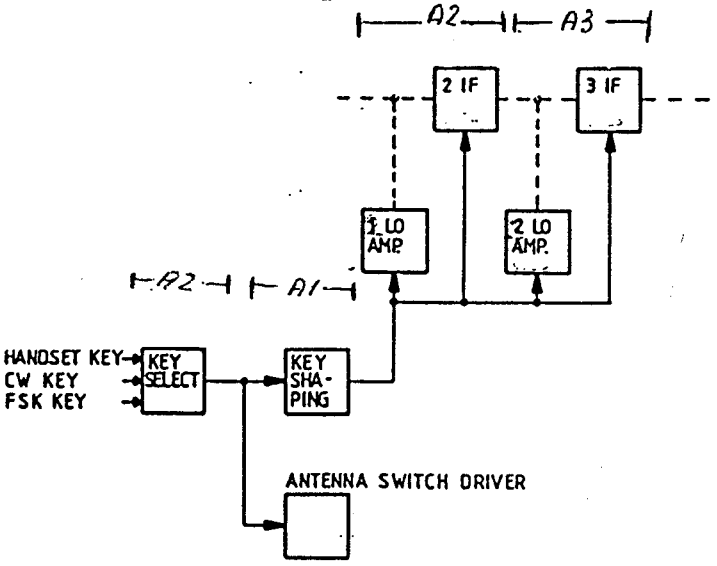


Figure 4.2.2

4.2.3 Tx ALC SYSTEM.

Ref. figure 4.2.3

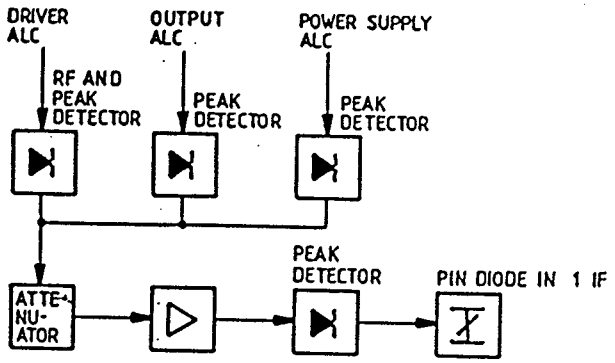


Figure 4.2.3

The transceiver operates with three types of ALC information, where normally only one type is active.
The main ALC information is derived from a directional coupler placed at the output of the Lowpass filter in PA3000. This ALC information is used to set the output power under normal conditions.
From the Power supply ALC information is derived from the current consumption in the transmitter. This ALC in-

formation is used to ensure that the maximum current consumption of the transmitter never exceeds 60 A.
The third type of ALC information is derived from the PA-driver and is only active if one of the Power Amplifiers fails.
The three types of ALC information are summed in the Control Unit (A1) in PA3000 and passed on to the Wide Band Mixer (A3) in SE3000. The Wide Band Mixer contains a preset attenuator and an ALC amplifier/ detector to shape the signal to present the wanted control signal for the pin-diode regulation on the RF-circuit (A2)

4.3 SE3000 BLOCKDIAGRAM.

Ref. diagram 477877 sheet 1-10. page 6-2 to 6-11

4.3.1 Modul konfiguration.

Ref. sheet 1 page 6-2

The SE3000 consists of 7 modules of which one module (A6) is divided into 3 submodules.
These 7 modules can be organized as 3 functional groups.

The first group is the control system of the exciter which includes the Microprocessor unit (A4) and the Front panel (A5). This group controls and provides status information for the exciter based on information from both RX3000 and PA3000 as well as the power reduction keys on the frontpanel. During upstart the microprocessor requests updating from the receiver RX3000.
The microprocessor controls the lowpass filters as well as the ALC-preset potentiometers in PA3000 based on the frequency information received from the RX3000. The synthesizers in SE3000 are controlled by the microprocessor in a BCD-code.
All signals to and from the microprocessor to the rest of the exciter are routed out by bus "C" which is a parallel bus allowing breaks for easy trouble shooting of the single circuit boards. The connection between the microprocessor and the frontpanel is made by bus "D" which is a flatcable mounted on the frontpanel and connected to the microprocessor with the aid of an edgeconnector allowing easy removal of the frontpanel. Also the connector for the handset is located on the frontpanel as well as the dimmer control for SE3000.

The second group is the Power Supply Unit (A6) which is divided into 3 submodules namely A6A1 which is the Power supply, A6A2 which is Filterboard 1 and A6A3 which is Filter board 2. The power supply is a free running power oscillator with a frequency of approx. 100 Hz which insulates SE3000 from the main DC supply in the transceiver and generates the voltages +45 V , +30 V , +15 V , +5 V and -12 V necessary for circuits in the exciter. The two filterboards provide RF-decoupling of the signal's between SE3000 and the other panels in TR3000, the antenna switch and the connections on the rear of the rack.

The third group are the modules for signal generating and signal conversion.
The signal line starts at the AF-Circuit (A1) which contains a microphone amplifier, two line amplifiers, a sidetone generator, an AF-compressor and the AF-signal shift for the handset. Furthermore the AF-circuit contains a key-shaping circuit, an antenna interface circuit with a breakin timer for CW and a foldback power supply for the control circuit in a electronic antenna switch. All the different circuits are controlled by the microprocessor by way of the Mode-bits.
The RF-Circuit (A2) receives the audio signal from the AF-Circuit in the SSB or FSK mode as well as keying signals. The RF-circuit receives two different LO-signals for the double-conversion taking place in the circuit. The circuit is generating the wanted signal by way of mode information from the microprocessor.
The power level is controlled by the RF-circuit with the aid of an attenuator which is also controlled by the microprocessor but via the A3 module. The different key input is default selected in the RF-circuit.
After the double conversion in the RF-Circuit the signal is routed to the Wide Band Mixer (A3) where it is converted to the final frequency by the third LO, and amplified. The A3 module also contains the ALC-amplifier, which input level attenuator is controlled by the microprocessor. The input level attenuator controls the power level attenuator on the RF-circuit.
The final module in the signal route is the wide band amplifier (A9), which delivers the necessary final drive level for PA3000.
The three LO's are generated by two synthesizers, namely the 100 Hz loop (A7) and the 10 kHz loop (A8), both being controlled by the microprocessor. The 100 Hz loop generates two signals, one being a fixed frequency 8.7 MHz and the other being a variable frequency ranging from 51.6901 to 51.7 MHz in 100 Hz steps. Both signals are routed to the RF-Circuit. The 10 kHz loop generates a variable frequency ranging from 44.6 to 69.0 MHz in 10 kHz steps which is routed to the Wide Band Mixer. Together these two synthesizers provide the frequency range from 1.6 to 26 MHz in 100 Hz steps.
The reference oscillator is a TCXO.

4.3.2 Module Description.

The following module description is based on the block diagrams of the different modules contained in the SE3000.

4.3.2.1 AF-circuit A1.

Ref diagram 477877 sheet. 2 page 6-3

The AF-CIRCUIT is divided into two parts, the AF-part and the key and antenna interface-part.
The AF part includes the input amplifier for the microphone input in SSB/AM (2), the line input in SSB/AM and FSK (4) and the sidetone generator for CW (1). The

line amplifier has two inputs, one used for FSK and one used for SSB/AM. With the aid of modebits the right input circuit is selected by the mode switch (5). From the mode switch the signal is routed to a compressor (3) which has a dynamic range of 25 dB. The compressed signal is led to both the RF-circuit and the audio select circuit (12) via a lowpass filter. The audio select circuit selects between the TX-AF and the RX-AF for the handset.
The key and antenna interface-part starts with the key input from the RF-circuit where the appropriate key has been selected. The key signal enters a key-shaping circuit (7), where the signal level is modified and shaped for an appropriate key form for the transmitter. From the key signal key info for the microprocessor is derived (6) to be used for muting of the receiver.
Blocking information from the antenna switch is also derived in block (6) as well as blocking information from the microprocessor.
The block and key situation derived in block (6) is displayed in the exciter display with the related error information.
From the key shaping circuit two different signals are derived. One is the exciter key line which is timed by the key timing circuit (7) before it is led to the rest of the exciter. The second signal is for the antenna switch. Depending on the mode, the key signal for the antenna switch is fed to a hangtime circuit (12) with adjustable delay.
In CW-mode the hangtime circuit is active while remaining inactive in SSB, AM and RTTY.
The antenna switch signals are led to two different antenna interface circuits. One circuit (13) is the interface for a mechanical antenna switch (vacuum relay) the other circuit (14) is the interface for an electronic antenna switch used with ARQ. For both types of antenna switches a +24 V for the control logic in the antenna switch is supplied (9).

4.3.2.2 RF-Circuit A2.

Ref. diagram 477877 sheet 3 page 6-4

The RF-circuit is divided into two parts, one part being the default key-select circuit, the other being the signal translator part.
Based on the modeinformation from the microprocessor the first part (12) selects which key input is to be active. After the selection the key is routed to the AF-circuit for shaping before entering the rest of the exciter.
Basically, the signal translator part is a doubleconversion circuit. The signal route starts with two inputs. One input is an LOinput of 8.7 MHz from the 100 Hz loop. This signal is fed to a buffer (2) and then to both a signal shaper (3) and the carrier level attenuator (5). The signal shaper changes the LO from a sinus to a squarewave-signal. The reason for this is better carrier rejection in the modulator (1).
The double balanced modulator (1) receives the AF-sig-

nal from the AF-circuit. The double side band output is fed to a crystal filter (4) in order to reject the lower sideband signal. The upper side band is led to a sideband level attenuator (5). The sideband level attenuator and the carrier level attenuator are controlled by modebits from the microprocessor. After the attenuators the two signals are summed in a summation amplifier (7), which also contains the ALC function (8), followed by a preset attenuator (9) used to set the open loop gain of the whole transceiver. Then follows an amplifier (10) and a crystal filter (11) used to remove part of the wideband noise. Before entering the mixer (13) the signal passes a fixed attenuator (13). The mixer performs the second conversion.
The LO signal for the mixer is driven by a buffer amplifier (15) which amplifies the LO signal (51.6901 to 51.7 MHz) from the 100 Hz loop. Between the mixer and the buffer amplifier is a diplexer (14) to ensure that only the right drive signal reaches the mixer. The output of the mixer is terminated in another diplexer (16) in order to suppress the unwanted output from the mixer and only allowing the wanted signal on 42.9901-43 MHz to the power level attenuator (17), which is controlled from the Wide Band Mixer (A3). The power level attenuator is terminated in a 50 ohms attenuator (18) to ensure correct operation. After the power level attenuator the signal is amplified (19) and filtered in a band pass filter (21) before led to the Wide Band mixer (the A3 modul). The buffer amplifier (15) is keyed through the keying circuit (15) while the amplifier (19) is keyed through another keying circuit (20) both being controlled by the exciter key line.

4.3.2.3 Wide Band Mixer A3.

Ref. diagram 477877 sheet 4. page 6-5

The Wide Band Mixer is divided into two parts, one being the ALC detection circuit, the other the signal translator circuit.
The ALC detection circuit receives two types of information. One is the power level information from the microprocessor which is used to control the power level reference atttenuator (1), to which also the second information the ALC level information from the PA3000 is fed. The attenuator controls the ALC information from PA3000 in order to keep a specific level on the output of the ALC detector (2). This ensures that the ALC system is able to maintain its dynamic range.
The signal translator part of the circuit is fed with the 43 MHz signal from the RF-circuit which passes through an attenuator (3) to ensure low SWR for the mixer. The LO signal (44.6 to 69 MHz) to the mixer, coming from the 10 KHz loop, is amplified (4) and fed to the mixer through an attenuator (3). The mixer is terminated in a diplexer made up by a low pass filter and a high pass filter. After the diplexer the signal is amplified (7) to the wanted level of max. 20 dBm. Both buffer amplifier (4) and the final amplifier (8) are controlled by the exciter key line.

4.3.2.4 MPU A4.

Ref. diagram 477877 sheet 5 page 6-6

The MPU (microprocessor unit) consists of a central processing unit (2), some addressing logic (4 and 3), read only memory (4) , random accessible memory (5), several parallel ports (5,6 and 8) and a serial port (10) for the RS232 connection to the RX3000. All control of the exciter and power amplifier lies in this unit which controls the transmitter through commands from the RX3000 and the power keys on the frontpanel. The MPU controls the status of the power amplifier with the aid of status signals giving information of thermal situation, SWR and supply voltage.
The MPU also watches the lock condition for the synthezisers and the antenna switch.

4.3.2.5 FRONT PANEL A5.

Ref. diagram 477877 sheet 6 page 6-7

The frontpanel consists of a special keyboard/display controller, an address decoder, a keyboard and a display with display driver.
The controller is controlled by the microprocesser which both reads and writes in the controller. Also on the frontpanel is the dimmer control for the display and the connections for the handset.

4.3.2.6 POWER SUPPLY A6.

Ref. diagram 477877 sheet 7 page 6-8

The power supply unit is divided into 3 submodules, the power supply A6A1, and two filterboards that connect SE3000 with the surrounding equipment.
A6A1 consists of a power oscillator driven by the main DC supply from PS3000. A transformer insulates the main DC supply from SE3000. The different outputs from the transformer are rectified and regulated to obtain the necessary supply voltages. The voltages are +45 V, +15 V, +5 V, -12 V and a special +15 V to the wide band amplifier A9. The latter has common ground with the main DC supply, which is not the case with the other supply voltages.
Filter Board 1 A6A2 contains the necessary decouplings for the connections to the antenna switch and the external connections on the rear of the transceiver rack.
Filter Board 2 A6A3 contains the connection for the RS232 (BUS "A")to RX3000 and the decoupled connections for the parallel bus (BUS "B") to PA3000.

4.3.2.7 100 Hz loop A7.

Ref. diagram 477877 sheet 8 page 6-9

The frequency reference in the exciter is a TCXO (3) with a frequency of 8.7 MHz. This 8.7 MHz signal is used in three different ways at the same time. First it is fed directly to the RF-circuit (A2) where it is used for carrier reinsertion and for driving the modulator. Secondly it is divided first by 870 (1) , giving a 10 KHz signal which is used as a reference for the 10 KHz loop, then divided by 100 (1) to give the 100 Hz reference for the 100 Hz loop. Thirdly it is used for mixing purposes in the 100 Hz loop.
The 8.7 MHz signal is tripled (2) and doubled (2) and then fed to a mixer (4) where it is mixed with the VCO (9) signal. The VCO has a frequency range from 51.6901 to 51.7 MHz. The output from the mixer is fed to the programmable divider (5), which is controlled by the microprocessor (in BCD-code). The output from the programmable divider is compared in a phase detector (6) with the 100 Hz reference signal and the error signal is fed to the VCO through a loop filter (7+8).
The phase detector has an out of lock detector incorporated which gives visual information on the PCB through a light emitting diode as well as giving the microprocessor information when the loop is out of lock.
The output from the VCO is fed to a buffer amplifier (9) to ensure that no loading problems occur.
To assure that the the loop is sufficiently fast a course tuning voltage controlled from the microprocessor is introduced in the VCO. This voltage is used to keep the loop voltage constant when shifting in full kHz steps, meening that only shift that differ from full kHz require a change in the loop voltage.

4.3.2.8 10 KHz loop A8.

Ref. diagram 477877 sheet 9 page 6-10

The phase comparator (1) receives its reference (10 kHz) from the 100 Hz loop. The output from the phase comparator passes through a loop filter (2+3) before reaching the VCO (4). The output from the VCO (44.6 to 69 MHz) is fed to a buffer amplifier (4) and to a programmable divider (5) which is controlled by the microprocessor (in BCD code with an offset of 4300). The output from the programable divider is fed to the phase comparator where it is compared with the reference signal. From the phase comparator out-of-lock information is fed to both the microprocessor and to a visual indicator in form of a light emitting diode on the PCB.

4.3.2.9 WIDE BAND AMPLIFIER A9.

Ref. diagram 477877 sheet 10 page 6-11

The wide band amplifier consists of a pushpull amplifier with broadband transformers (1). The supply for the amplifier has common ground with the main DC supply for the transmitter. The amplifier operates in class AB with a bias circuit (2).

4.4 PS3000 BLOCKDIAGRAM.

Ref. diagram 481459 page 6-12

The power supply PS3000 is designed for both AC and DC operation. When switching on the relay logic, which is always supplied either from the mains through the switchmode A2A1 or from the DC-supply, first activate the mains relay thus turning on the main switch mode power supply A1. If the main switchmode supply fails or the AC is missing the relay logic activates the DC relays and thus activates the transceiver on DC.
On the DC supply lines is the Current ALC circuit A3 ~~which~~ measures the DC comsumption connected. This measurement is used to assure that the DC comsumption never exceeds 60 A.

4.4.1 Module description.

4.4.1.1 Relay logic.

Ref. diagram 481335 page 6-13

The Relay logic consists of a start up circuit (1) connected to SE3000 dimmer control which is used as ON-/OFF switch. The start circuit activates the 220 V relay driver and a DC supply delay. The mains supply feedback circuit (2) detects whether the main switchmode supply is active or not. If the main switch mode starts properly the DC supply delay is neglected, but if the main switch mode fails the relay logic activates the 24 V relays and thereby starts the transceiver on DC.
The Supply for the module comes from either the DC input on PS3000 or from a switchmode power supply A2A1, both supplies being summed together in (3).

4.4.1.2 Support PSU.

Ref. diagram 481289 page 6-14

The switchmode consists of a RFI filter and a full wave rectifier (2). The rectified mains voltage is used for slow charging of a capacitor. When a specified voltage is reached the switchmode starts and thereby supplies voltage for the circuit by itself. This takes place in the Start-up Logic & control power supply (7). The switching element in the supply is controlled from a Pulse Width modulator made up from a 25 kHz oscillator which output is shortcircuited either from the feed back

(1) or from the current sensing (5).
The voltage from the transformer (6) is rectified and used to maintain a constant output voltage through the feed back.

4.4.1.3 Current ALC-Detector.

Ref. diagram 482595 page 6-15

The Current ALC-Detector senses the current to PA3000 and SE3000 in a shunt resistor. The voltage developed across the shunt is amplified (2) and used to frequency modulate an oscillator (3) which drives an optocoupler (4). The optocoupler is used as insulation. The output from the optocoupler is connected to a PLL system consisting of a multiplier (5), a loop filter (6) and a VCO (7).
The PLL tracks the frequency modulated oscillator and with the use of a filter (8) similar to the loop filter a DC voltage proportional to the current consumption is derived. This DC voltage is amplified (9) and filtered (10) before fed to PA3000 where ~~it is used in~~ the ALC system ~~to~~ controls the maximum current in the transceiver.

4.5 PA3000 BLOCKDIAGRAM.

Ref. diagram 484008 page 6-16

PA3000 consists of 5 modules: 1 control unit, 1 fuseboard, 1 amplifier modul (subdivided into 6 modules), 1 lowpass filter and a directional coupler.
The RF-signal passes from the exciter SE3000 to the driver, where it is amplified before arriving to the driver ALC detector.
The driver ALC-detector measures the RF-current, and with the aid of 8 preset potentiometers on the control unit controlled by the microprocessor in SE3000, the output level is frequency compensated.
This ALC is only used if one of the four amplifiers fails.
After the ALC-detector the RF-signal is fed to the 1:4 power splitter. Each output line goes to a power amplifier where it is amplified and then passed on to the 4:1 power combiner.
At the power combiner the 4 output signals from the amplifiers are combined and led through an onboard directional coupler before passing on to the low pass filter. This directional coupler is used for measuring the SWR between the power amplifier and the low pass filter. If the SWR between the power amplifier and the low pass filter ~~is~~ getting higher than 1:7.5 the control unit detects this as an error and passes the information on to SE3000, which then performs the appropriate error handling (blocking the transmitter displayed as error 44). At the output of the low pass filter the output directional coupler ~~is~~ measuring the forward and reflected power used by the control unit for SWR measurement, power output display information and ALC signal. If the SWR gets hig-

her than 1:2 this is detected by the control unit and the transmitter output power is decreased by 3 dB from SE3000.
The control unit receives ALC information from PS3000 and combines this information with the ALC information from the driver ALC and the output ALC. Under normal conditions the ALC reacts on the output ALC information. If the current consumption is getting higher than 60 A the ALC information from PS3000 takes over thus keeping the consumption at max 60 A DC.
If one of the power amplifiers fails the driver ALC takes over ensuring that the remaining amplifiers are not overdriven.
As long as one of the ALC's is intact the transceiver is able to operate.
The thermal conditions of the power amplifier are watched by the control unit with the use of 5 thermal switches, 4 located at the heat sink and 1 located at the power combiner. If any of the thermal switches opens, the control unit will detect this and pass on the information to SE3000, which will then take the appropriate actions. In case ~~of reaching~~ the first thermal limit of the amplifiers (90'C) or thermal limit of the power combiner (90'C), SE3000 will reduce the output power by 3 dB. When is reached the second thermal limit of the amplifiers is reached (125 'C) the SE3000 will make a total system blocking by blocking the keying of the transmitter.
The control unit also measures the temperature of the heatsink and with the aid of a resetable timer controlled by a circuit incorperating hysteres the blowers are controlled to start at a specified temperature (approx. 75 'C) and when the lower level of the hysteres (60 'C) is reached the timer is released and keeps the blowers running for aproximately 5 min.
The control unit passes on low voltage information from the fuse board to SE3000.
The fuseboard is used to distribute the supply voltage to the different amplifiers and to measure the supply voltage to ensure low intermodulation by decreasing the output power from the amplifiers in case of a low voltage situation.
The lowpass filter consists of 8 lowpassfilters controlled by the control unit. The output from the lowpass filters are routed through a directional coupler used for measuring the SWR and output power.

4.5.1 Module description.

4.5.1.1 Control unit.

Ref. diagram 484024 page 6-17

The control unit contains three detectors. The detector for the driver ALC (1) consists of an RF and peak detector which output is led to a preadjusted amplifier (2) . The next detector is a peak detector (4) receiving information from PS3000 about current consumption. The last detector is also a peak detector (3) receiving signal from the output directional coupler. The outputs

from the three detectors are gathered in the summation amplifier (5). The signal from the output directional coupler is also used for output SWR detection and indication of the output power level. The SWR detector reacts when the SWR gets higher than 2:1.
The signal from the summation amplifier is passed on to SE3000 for the ALC regulation.
The control unit also detects the SWR between the power amplifier and the lowpass filter in a second SWR detector (7). If the SWR gets higher than 1:7.5 the control unit detects this and passes on the information to SE3000 as error 44.
4 thermal switches are mounted on the heat sink of the power amplifiers and one on the power combiner. These thermal switches are used by the control unit (8) to supervise the thermal condition of the amplifier. If the the first thermal limit is reached (90'C) the control unit detects this and passes the information on to SE3000 as error 41. If the second thermal limit is reached (125'C) the control unit detects this as error 40.
On the heat sink of the amplifier module is also mounted a NTC resistor. This is used by the control unit for control of the blowers. When the temperature reaches the preset limit (approx.75 'C) the detector (9) starts the blower and when reaching the lower limit (approx.60 'C) the detector starts a timer (9) that keeps ping the blowers going for approx. 5 min in order to avoid pendling.
To As a control of supply power for PA3000 the +15 V used in the circuit is regulated to +5 V (10) and passed back to SE3000 as supervision for both connection and supply. If the +5 V for SE3000 is missing this is diplayed as error 45.
As the relays for the lowpass filter operate on the mains DC supply, the control of the relays is insulated by the use of optocouplers (11).
The information is decoded (13) into 9 lines used for the relays: 8 lines for the output relays, and one for switching between right and left output of the lowpass filter. The +28 V is regulated (12) to 10 V and serves as supply of the decoder.

4.5.1.2 Fuse board.

Ref. diagram 482854 page 6-18

The fuse board is used to distribute the power for the different amplifiers. Each supply line is fused (2).
On the fuse board the low voltage detect circuit (1) is located. This is used to supervise the supply voltage for the amplifiers in order to keep the intermodulation at a safe level.

4.5.1.3 Amplifier module.

Ref. diagram 484814/484830 page 6-19

All the amplifiers, both the driver and the final amplifiers have the same configuration.
They consist of two power transistors in push-pull (1)

and a bias regulation circuit (2) controlling the quiescent current in the transistors.

4.5.1.4 Driver ALC current sense and power splitter.

Ref. diagram 482196 page 6-20

The module consists of a current transformer (1) used to sense the output current from the driver.
The current is used in the control unit to determine the output power from the driver. This ALC information is only used during a amplifier failure to ensure that the remaining amplifiers are not overdriven.
From the current transformer the signal goes to a 4:1 impedance transformer and from here to a power splitter (2).

4.5.1.5 Power combiner.

Ref. diagram 484849 page 6-21

The Power Combiner consists of a 4 to 1 combiner and a 1 to 4 impedance transformer (1) followed by a diretional coupler (3). The directional coupler is used to supervise the SWR condition between the power amplifier and the lowpass filter.
On the Power Combiner is also located a thermal switch with a temperature limit of 90'C used to protect the Power Combiner by reducing the output power by 3 dB when activated.

4.5.1.6 Lowpass filter.

Ref. diagram 482358 page 6-22

The lowpass filter consists of eight filters selected from SE3000 through the control unit (A1). The filters are designed in order to keep the roll off frequencies up to an SWR of 1:2.
When not operational the filters in and output are grounded.
The relay drive lines come from the control unit (A1) through the output directional coupler (A5).

4.5.1.7 Directional coupler.

Ref. diagram 483257 page 6-23

The directional coupler consists of a directional coupler (1) and a relay (1) used to switch between the right and left output from the lowpass filter.
From the control unit (A1) the relay drive lines pass through the directional coupler (2) where they are routed to the input relays and the right and left output relayes on the lowpass filters.

4.6 AS3000 BLOCKDIAGRAM.

The antenna switch AS3000 consists of a vacuum relay controlled from the exciter. The antenna switch is protected against both over- and under voltage, as well as excessive temperature.

4.6.1 Module description.

4.6.1.1 Control unit.

Ref. diagram 479519 page 6-24

The relay driver (1) is controlled through an optocoupler located in the exciter. The antenna switch is protectet against both over and undervoltage. The overvoltage detector (2) measures the supply voltage divided by an attenuator (3) and compares this with a reference voltage. If the voltage comes higher than +33 V then the supply fuse is blown. The undervoltage detector (2) also measures the supply voltage and compares this with the reference and through an optocoupler used as insulation, the undervoltage detector controls the error circuit in the exciter. The limit is 21 V.
The temperature protection (4) is located in the line to the error circuit of exciter. The temperature limit is approx. 80 'C.

Circuit Description.

5.1 RX3000.

For a circuit description of the RX3000 please see the refer to sec. 8.

5.2 SE3000.

The circuit description of SE3000 is based on the diagrams belonging to the individual modules. The description follows the block numbers and not necessarily the functional route of the circuit.
A diagram reference is given at the beginning of each description.

5.2.1 Module location.

ref. drawing 477877 sheet 2-3 page 7-2

The drawings show the location of the different modules in SE3000. Sheet 2 shows the top and bottom view while sheet 3 shows the rear and front view. The connectors and key components on each module are shown.

5.2.2 SE3000 wiring diagram.

ref. diagram 477877 sheet 1 page 7-1

The wiring diagram shows all the internal connections in SE3000. The lines terminated in a circle is a coax cable while the lines terminated in a square is a multicable. A complete list of the connections in the multicables is found in sec. 5.2.12

5.2.3 AF-Circuit.

Ref. diagram 476714 sheet 1-4. page 7-4

Block (1). Sidetone generator.

The sidetone generator is based on U1, which is an astable multivibrator. The sidetone generator is supplied through switch Q2 controlled by the CW mode bit from the microprocessor via Q1, when SE3000 is in CW mode. The sidetone frequency can be varied from 750 to 1050 Hz by R7. The frequency is factory adjusted to 800 Hz. The output from the generator is fed to Q3 which is part of a signal summation system. The on/off control of the side tone is made by the exciter keyline through Q4 and Q5.

Block (2). Microphone amplifier.

The microphone amplifier is formed by U2. The sensitivity of the amplifier is adjusted by R13. The output is fed to Q7 which is part of a signal summation system. The microphone amplifier is supplied through switch Q6 when the Handset mode bit is present.

Block (3). Compressor.

The compressor is formed by U3a as the amplifying part and the diodes CR2-5 as the limiting element controlled by the circuit consisting of Q10-12. The compressor functions as follows:
The signal from U3a is fed to Q12 (CR7 and C24 forms a positive voltage detector) whose on/off condition is controlled by the reference voltage on C23. C23 receives a constant current controlled by Q11. When the positive voltage on the base of Q12 reaches a specific level Q12 starts to conduct and thereby controls Q10 which again controls CR2-5.
CR30-33 acts as a clipper to prevent overshoot.
The compressor has a dynamic range of 25 dB and is followed by a low pass filter with a roll-off frequency of 3 kHz.

Block (4) Line amplifier.

The line amplifier is equipped with two inputs. One for FSK input (T1), and one for line input in SSB/AM (T2). Both lines are balanced and have a 6 dB attenuator to improve return losses.
The sensitivity is adjusted by R30/R157. Through Q8 the line signal is summed up with the different audio signals before entering the compressor.
The line amplifier is switched by Q9 (in block 5) which is controlled by the mode bits from the microprocessor.
The switching between the two lines is carried out by U10 which is controlled from the line bit (the line bit is used in SSB/AM to select line input).

Block (5). Selection of function circuit.

The circuit receives the CW mode bit, the line bit and the handset bit from the microprocessor. Depending on which mode bits are active the circuit selects the related circuits. If none of the mode bits are active, the module is in the FSK mode.

Block (6). Blocking and muting circuit.

The blocking command from the microprocessor passes through Q15 where it is summed together with the blocking command from the antenna switch interface through Q16.
From the collector of Q16 blocking information is derived as well as the transmitter key blocking controlled by Q17. Through Q19 the key info for the microprocessor is converted to TTL level. Q19 gets the information from the key line.

Block (7). Key shaping circuit.

Q20 receives key commands from the key line through J1. From the collector of Q20 key information to the antenna switch interface and the keyshaping is derived. Q21 and Q22 make a level shift and R143-144 and C30 shape the positive slope, while Q44, 45, R145, R144 and C30 shape the negative slope of the exciter key line.

Block (9). Supply filter and antenna switch supply.

L1, C31 and C32 form a supply filter, while Q29-32 and the surrounding components form a +24 volt power supply used to supply both the key circuit and the error logic in the electronic antenna switch if installed. The power supply output current is limited to approximately 18 mA by foldback.

Block (10). Level translator.

U5 forms a level converter to translate the key line levels to control Q23.

Block (11). Antenna switch key signal summation.

At Q24 and Q25 the key signals are summed up. In CW mode a delay timer controls the antenna switch key. The undelayed key passes through Q24 while the delayed key passes through Q25. Q26 interfaces to the remaining circuit.

Block (12). Delay and AF-shift circuit.

The delay circuit consists of a timer U6. Q28 detects the positive going edge of the keying signal from Q23 (block 11) and goes low. If the CW mode bit is present the low state reaches pin 2 of U6 through U7 and starts the timer. Through VR3 connected to pin 4 of U6 the timer is reset each time the transmitter is keyed. If any other mode than CW is selected the delay is ignored.
The AF-shift is carried out by U7, which is an analog switch. U7 receives audio from the receiver through J11 and audio from the compressor. If the transmitter is unkeyed, a circuit consisting of Q35-36 selects the receiver audio (pin5 U7 = +15V) for the handset, and when the transmitter is keyed pin5 U7 goes low and pin13 goes high shifting the audio on J10 from receiver audio to transmitter audio.

Block (13). Mechanical antenna switch interface.

Q37 receives the key signal and through U8 the key signal is insulated from the exciter allowing the antenna switch to be supplied from a different source than the exciter.

Block (14). Electronic antenna switch interface.

U9 receives and detects the key signal and keys the antenna switch. The circuit consisting of Q39-40 checks for error on the antenna switch. In case of an error the key line is blocked (see block 6) and the LED CR26 is lit.

5.2.4 RF-circuit.

Ref. diagram 476730 sheet 1-5 page 7-8

Block (1). Double balanced modulator.

U1 is a double balanced modulator. It is double balanced in order to increase the carrier suppression. The AF for the modulator comes via J8 from the AF-circuit and the carrier (squarewave) at pin8 U1 from a special signal shaper circuit. The carrier suppression is adjusted by R8.

Block (2). Buffer amplifier.

The buffer amplifier aids impedance and level fitting as well as insulation between the LO and the subsequent circuits.

Block (3). Signal shaper.

The signal from the LO is a sinus signal and in order to increase the carrier suppression the sinus is converted to a square wave. Q2 serves as a limiting amplifier and U2 and Q3 shape the square wave before attenuation through R30-31 to a level of approx. 350 mVpp and fed to the modulator U1.

Block (4). Crystal filter.

The crystal filter FL1 suppresses the unwanted sideband. T3 and C10-11 give impedance transformation to match the subsequent circuit.

Block (5). Mode attenuator.

The mode attenuator selects the appropriate signal levels for the sideband and the carrier depending upon the mode bits present. The carrier level is adjusted by R38.

Block (6). Mode attenuator driver.

The mode attenuator is driven by Q4-5-6 which are controlled by the modebits from the microprocessor.

Block (7). Mode summation amplifier.

The mode summation amplifier adds up the sideband signal through Q7 and the carrier through Q8 in the collectors where also the ALC control is located.

Block (8). ALC cicuit.

CR17 is a pin diode acting like a variable resistor in parallel with the collector load of Q7 and Q8, controlled by a DC voltage. The ALC-circuit has a characteristic curve of 1dB/5 mV in the range 0 to -10 dB.

Block (9). Preset attenuator.

The preset attenuator is used to set the overall open loop gain of the exciter.

Block (10). Amplifier.

Q9 forms an amplifier raising the signal level before entering the subsequent filter.

Block (11). Crystal filter.

FL2 is a crystal filter with a bandwidth of 15 KHz used to attenuate the wideband noise and thereby adding suppression to unwanted sideband.

Block (12). Key selector.

Q10 to Q15 serve as an interface between the key inputs and the key line. Q16 to Q18 serve as a default key-select circuit controlled from the mode bits.

Block (13). Attenuator and mixer.

The fixed attenuator is used to assure that the subsequent high level mixer is fed with the right impedance.

Block (14). Diplexer.

The diplexer terminates the LO amplifier into 50 ohm independent of the frequency. It also assures that only the wanted signal reaches the mixer (through L14-C65-66), while the unwanted signal is terminated through L13-C67-68 into a dummy load R89.

Block (15). 2. LO amplifier.

Q20 is the LO amplifier with a gain of about 10 dB. The amplifier is keyed through Q19 which is controlled by the exciter key line.

Block (16). Diplexer.

The mixer U3 is terminated in a diplexer, matching the mixer output into 50 ohm, independent of the frequency. The diplexer allows the wanted signal to pass through L16 C58-59 and therby to enter the subsequent circuit. The unwanted signals are terminated through L15-17, C56-57 and C101, in a dummy load R81.

Block (17). Power level attenuator.

The power level attenuator consist of four diode switched T-attenuators. In case of no information about power levels, Q21 conducts and thereby switches the -12 dB T-pad (R98-99-100) into the circuit. In case of power level information, Q21 is switched off and the T-pad related to the chosen power level is switched on.

Block (18). Fixed attenuator.

The fixed attenuator is used to terminate the power level attenuator in a well-defined impedance of 50 ohm.

Block (19). Amplifier.

The amplifier is used to raise the signal level to the needed level from the RF-circuit of approximately +10 dBm (open loop).

Block (20). Amplifier keying.

The amplifier in block 19 is keyed through Q24 by the exciter key line.

Block (21). Output band pass filter.

The bandpass filter attenuates unwanted signal from the RF-circuit by more than 50 dB.

Block (22). Supply filter.

The dc-supply filter suppresses spurious signals to and from the RF-circuit on the supply line.

5.2.5 Wide Band Mixer.

Ref. diagram 476757 sheet 1-3 page 7-13

Block (1). Power level control.

The power level information from the microprocessor comes on J5. The power level bits control an attenuator consisting of R32 and either R16-17 or R18 depending on the chosen level. In case the -12 dB level has been chosen the signal from PA3000 through R32 passes directly to the ALC amplifier (2).
From the power level bits on the wide band mixer the control of the power level attenuator on the RF-circuit is derived and interfaced through Q3-Q6-Q9.

Block (2). ALC- amplifier.

The ALC signal is amplified by U1 and fed to a peakdetector U4 which is buffered by Q11 and Q12. Via R31 the ALC signal is led to the RF-circuit.

Block (3). Attenuators and mixer.

The attenuator (-2 dB) ensures that the high level mixer is terminated with 50 ohm on the input while the other attenuator together with the LO amplifier give 50 ohm's termination of the LO input of the mixer.

Block (4). LO. Amplifier.

Q14 and Q15 form an LO amplifier for the 3.LO and are keyed by the exciter key line through Q13.

Block (5). Low pass filter.

The low pass filter is part of a diplexer together with a high pass filter. The filter has a roll-off frequency of 27 MHz.

Block (6). High pass filter.

The high pass filter terminates the unwanted frequencies from the mixer in a dummy load R52. The start frequency of the filter is 37 MHz.

Block (7). Broad band amplifier.

Q18 driven by Q17 forms a broad band amplifier with a gain of 30 dB. The output level of the amplifier is approx. +16 dBm. The amplifier is keyed by the exciter key line through Q16.

Block (8). Supply filter.

C45-46-47 suppresses unwanted signals to and from the Wide Band Mixer's supply lines.

5.2.6 MPU.

Ref. diagram 476854 sheet 1-6 page 7-15

Block (1). Low voltage reset.

The purpose of the circuit is to reset the microprocessor when the +5V supply voltage is below a given value (+ 4.65V) preadjusted by R5. Even a small drop-out will give reset due to the hysteresis in the circuit.

Block (2). Microprocessor.

U2 is an 8085A microprocessor. The reference crystal Y1 of 6.144 MHz gives the overall system-timing-clock of 3.072 MHz (the 6.144 MHz is divided by two inside the 8085A).

Block (3). Address decoder.

This block performs the system-address-decoding for the MPU.

Block (4). Address latch and EPROM.

U4 is a latch used to hold the lower part of the address, and this is done to get the full use of the address range of the microprocessor. U5 is an EPROM (Erasable Programmable Read Only Memory) containing the system software. It is possible to use either a 2732 (4K*8) or a 2764 (8K*8) as U5.

Block (5). RAM, Timer and I/O-port.

U8 is an 8155 containing 256 bytes of RAM (Random Access Memory), a 14 bit timer and three input/output ports. In the system the timer is used as a real time clock interrupting the CPU every 1 msec. Port A in U8 as a software controlled timer for the receiver muting, while port B is used to read the error information from PA3000. Port C is used for control of the Lowpass Filter and the ALC preset.

Block (6). Frequency control port.

U9 is an 8255A which contains three input/output ports. In the system all three ports are defined as output ports used to hold the transmit frequency given to frequency synthesis.
Port A low holds the 100 Hz info.
Port A high holds the 1 KHz info.
Port C low holds the 10 KHz info.
Port C high holds the 100 KHz info.
Port B low holds the 1 MHZ info.
Port B high holds the 10 KHz info.
The information in port B is offset with 43 by the software.

Block (7). Pull up.

The frequency control port is pulled up to +5V through resistors R15, R16 and R17. This is necessary because the outputs are driving ECL (Emitter Coupled Logic).

Block (8). Mode, ALC and Power control.

U10 is an 8255A, equal to the one in block (6). Two of the ports are defined as output ports while the third (C) is an input port.
Port A is used for mode information and block command, while port B controls the attenuator in SE3000. Port C is used for error 50 and 51 which are synthesizers out of lock.

Block (9). Baud-rate generator.

The internal clock frequency of 3.072 MHz is fed to U11 and divided by 2 and used as clock for the serial transceiver U13.
The internal clock frequency is also divided by 5 in U11 before feed to U12 where it is divided by either 2, 4, 8 or 16 so that baud-rates of either 2400, 4800, 96000 or 19200 are selectable by a strap field. The frequency sent to U13 is 16 times the actual baud-rate because the remaining division-by-16 is done inside U13.

Block (10). Asynchronous serial transceiver.

U13, an 8251A containing a complete full duplex asynchronous channel, gives along with block (11) an RS232C interface-port. The controlling of the transmitter is done via this serial interface.

Block (11). RS232C drive.

U14 and U15 are special RS232C receive and drive circuits.

Block (12). Mute inverter.

The receiver Mute signal is inverted before it is sent to the receiver, in order to conform to active low when the receiver is to be muted.

Block (13). +15V to +12V voltage converter.

The incoming +15V is converted to +12V used in connection with the RS232C.

Block (14). TTL converter.

The incoming signals from PA3000 that are either open collector or +15V are converted to TTL levels before they are sent to port B on U8 (in block (5)).

block (15). Mute control.

The two NOR-gates are involved to control the mute signal for the receiver. The first gate combines the key info signal with a software controlled timer signal. The timer signal delays the mute release after the transmitter key has been released.
The second gate is used to bypass the mute signal if the transmitter has been blocked as a result of an error, no matter if the transmitter is keyed or not.

Block (16). Supply line filters.

Block (17). Loop Course tune voltage.

This circuit gives a DC-voltage between 0V and +30V which is used to course tune the 100Hz loop (A7). A

reference voltage (16.5V is generated by U16. The course tuning voltage is depending on the 1 KHz setting of the digital synthesis, so that a distinct value can be preadjusted by each of the ten potentiometers R44 to R53 for each of the ten 1 KHz values.

5.2.7 Front panel.

Ref. diagram 476838 sheet 1-2 page 7-21

Block (1). Keyboard/display controller.

U1 is an 8279, containing both keyboard and display controller and 16 byte of RAM. The contents shown in the display are stored in the RAM-cells inside the 8279. The display is multiplexed.

Block (2). 4 to 9 decoder.

In order to address more than 4 7-segments in a display it is necessary to decode the 4 select-lines from the 8279 in block (1). This is done by U2 working as 4 to 9 decoder where 7 of the decoded lines are used to select display segments while the last two are used to select the light bars and the LEDs for the power level push buttons.
U3 and U4 are working as the inverters for the select lines.

Block (3). Segment driver.

Q3-Q10 : Drivers for segment information.
R5-R12 : Current limiting resistors.

Block (4). Power keyboard.

Power reduction		corresponding switch.
12 dB	(38W)	S1
6 dB	(150W)	S2
3 dB	(300W)	S3
0 dB	(600W)	S4

Block (5). Multiplex drivers.

Drivers for multiplexing of LED's.

Block (6). LED indicators.

CR no.	corresponding switch.
1	-12 dB
2	- 6 dB
3	- 3 dB
4	0 dB

Block (7). Power level indicator info.

C8 is smoothing the DC-voltage for the power meter.

Block (8). Supply filters.

Block (9). Dimmer control.

This circuit controls the light intensity in the display, the LED's and the power meter. The RESD facility is not used. The dimmer control also contains the on-/off control of PS3000.

5.2.7.1 Display board.

Ref diagram 482110 sheet 1 page 7-23

Block (1). Display.

The displays U1 to U7 are driven by Q1 to Q7 and are multiplexed. The lightbars are also driven by the multiplexing system directly from the frontpanel.

Block (2). Power level meter.

The indication of the power level is given by the two lightbars U16 and 17, driven by U15. U15 receives its power level information from the front panel as a DC voltage.

5.2.8 Power supply.

The power supply is divided into three submodules, the power supply unit and the two filter boards.

5.2.8.1 Power supply unit.

Ref. diagram 477672 sheet 1 page 7-24

The power supply consists of the power oscillator Q1, Q2 and feedback winding of T1 having a frequency of approx. 100 Hz. The output from the transformer is rectified in CR5 to CR8 and regulated to supply the necessary voltages for the exciter.
The voltages from the power supply are: +58 V (varies from +45 to +58), +30V, +15V, and +15V for the wide band amplifier (the supply for the wide band amplifier is converted directly from the DC input on the power supply meaning that is has a ground different from the rest of the supplies), +5V and -12V.

5.2.8.2 Filter board 1.

Ref. diagram 477605 sheet 1 page 7-25

The filter board interconnects the exciter with the external signals (external keys and line inputs) and the antenna switch. Inductors and capacitors forming lowpass filters ensure that RF-noise from the connected sources does not reach the exciter.

5.2.8.3 Filter board 2

Ref. diagram 477621 sheet 1 page 7-26

The filter board interconnects the exciter with RX3000 and PA3000. Inductors and capacitor, forming lowpass filters, ensure that RF-noise from the connected equipment does not reach the exciter.

5.2.9 100 Hz loop.

Ref. diagram 478792 sheet 1-3 page 7-27

Block (1). Reference divider.

The reference signal from the TCXO (3) is divided by 870 via U1 to U4 to give a 10 KHz reference signal for the 10 KHz loop and then divided by 100 via U5 and U6 to give the 100 Hz reference signal for the 100 Hz loop.

Block (2). Tripler and doubler.

The reference signal from the TCXO is first tripled in Q2 to 26.1 MHz and then doubled in Q3 to 52.2 MHz.

Block (3). TCXO.

The TCXO is a Temperature Controlled Crystal Oscillator with a frequency of 8.7 MHz.

Block (4). Mixer.

In Q4 the multiplied by 6 signal from the TCXO (52.2 MHz) and the output signal from the loop (51.6901-51.7 MHz) are mixed. The output from the mixer is fed to a programmable divider (5). Q5 acts as buffer.

Block (5). Programmable divider.

Q6 converts to TTL-level and U8 to U11 forms a programmable divider, dividing with 5000 to 5099 controlled from the microprocessor. The microprocessor only controls the last two digits in the division in BCD kode. This is giving 99 steps of 100 Hz. The 100 Hz output passes to the phase comparator (6).

Block (6). Phase comparator

U7 is the phase comparator which is fed on pin 3 by the 100 Hz signal derived from the TCXO and the 100 Hz signal on pin 1 from the programmable divider (5). The output on pin 5 and 10 is fed to the loop filter (7). From the phase comparator information about lock condition on pin 4 and 13 is derived to the microprocessor as well as to give a visual indication through CR1, which is a LED mounted on the PCB for service purpose.

Block (7). Loop filter.

The loop filter amplifies and filters the output from the phase comparator. The output from the loop filter is used to fine-tune the 100 Hz loop since the coarse tuning is made by the microprocessor.

Block (9). VCXO.

The oscillator is a Voltage Controlled overtone Crystal Oscillator. The coarse tuning is made by the microprocessor through CR4-5-6 and the fine-tuning CR7 controlled by the phase comparator. The output frequency from the VCXO is from 51.6901 to 51.7 MHz. Q12 and Q13 act as buffer amplifiers.

5.2.10 10 KHz loop.

Ref. diagram 478806 sheet 1-3 page 7-30

Block (1). Phase comparator.

The phase comparator U1 compares the 10 KHz reference signal from the 100 Hz loop on pin 1 and the 10 kHz signal from the programmable divider in block (5) on pin 3. From the phase comparator information about lock condition is derived for the microprocessor and for visual indication through CR1, a LED on the PCB. The output from the phase comparator is fed to the loop filter (2).

Block (2). Loop filter.

The loop filter integrates the signal from the Phase comparator to a DC voltage before entering the tuning circuit. U12 forms a reference voltage controlling the off-set for the amplifier U2.

Block (3). Tuning circuit.

The output from the loop filter directly controls the capacity of CR5, while the output from the loop filter is amplified in Q4-5 and used as coarse tuning of CR4-6-7.

Block (4). Voltage controlled Oscillator.

The oscillator consists of Q6, T1 and the voltage controlled capacitors CR4-5-6-7. The output (44.6 to 69 MHz) from the oscillator is buffered by Q7 before being fed to the output and the programmable divider.

Block (5). Programmable divider.

The VCO signal is buffered and amplified by Q8 and U3b before entering the divider U4. The divider divides by 4300 to 6900 controlled by the microprocessor. The division rate is controlled in BCD code with an offset

of 4300. The output from the divider is fed to the phase comparator.

5.2.11 Wide band amplifier.

Ref. diagram 478814 page 7-33

Block (1). Amplifier.

The amplifier is a push-pull amplifier made by Q1-Q2 and the surrounding components. The components between T1 and the transistors are the gain and impedance transforming element.

Block (2). Bias.

Q3-Q4 forms a bias circuit controlling the quiescent current in the transistors Q1-Q2.

5.2.12 SE3000 INTERNAL MULTICABLE INTERCONNECTION LIST.

The following table lists the interconnection in SE3000 carried out by the cable assembly W13 (refer to diagram 477877).
The connections are made from pin 1 to pin1, pin 2 to pin 2, etc. except where notes are made. The notes describe the pin connections.
The connections are listed as A1P1 meaning that the connector is connected to the AF-circuit (A1) connector J1.
Figure 5.2.12 shows the orientation of the plug with respect to pin 1.

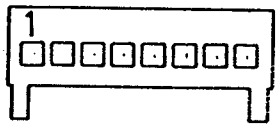


figure 5.2.12

Plug orientation.

BOTTOM VIEW.

INTERNAL WIRING ASSEMBLY W13.

A1P1 - A2P1	A2P1 - A1P1
A1P2 - A3P1	A2P2 - A3P2
A1P3 - A6A1P9	A2P3 - A6A1P8
A1P4 - A6A2P4	A2P5 - A6A2P2
A1P6 - A6A2P5	A2P7 - A4P4
A1P8 - A4P5	

A3P1 - A1P2
A3P2 - A2P2
A3P3 - A6A1P11
A3P4 - A6A3P2
A3P5 - A4P8

A4P1 - A7P1
pin 1. - pin 1.
2. - 4.
3. - 2.
4. - 3.
6. - 5.
7. - 8.
8. - 6.
9. - 7.

A4P2 - A8P2
pin 1. - pin 7.
2. - 8.
3. - 5.
4. - 6.
6. - 3.
7. - 4.
8. - 1.
9. - 2.

A4P3 - A8P1
pin 1. - pin 5.
2. - 6.
3. - 7.
4. - 8.
6. - 1.
7. - 2.
8. - 3.

A4P4 - A2P7
A4P5 - A1P8

A4P7 - A7P2
pin 1. - pin 5.
2. - 1.

A4P8 - A3P5
A4P11 - A6A3P6
A4P12 - A6A1P10
A4P14 - A6A3P5

A4P15 - A7P2
pin 1. - pin 8.
2. - 7.

A4P17 - A6A3P4
A4P18 - A6J1

A6A1P2 - A9P1

A6A1P2 - A9P2
pin 4. - pin 1.
5. - 2
6. - 3.

A6A1P6 - A7P4
pin 1. - pin 3.
2. - 6.
4. - 5.
5. - 2.
7. - 7.

A6A1P7 - A8P3
pin 1. - pin 2.
2. - 3.
3. - 2.
6. - 7.

A6A1P7 - A6A3P3
pin 7. - pin 1.

A6A1P7 - A8P3
pin 8. - pin 1.
9. - 4.

A6A1P8 - A2P3
A6A1P9 - A1P3
A6A1P10 - A4P12
A6A1P11 - A3P3

A6A2P2 - A2P5
A6A2P4 - A1P4
A6A2P5 - A1P6

A6A3P2 - A3P4
A6A3P4 - A4P17
A6A3P5 - A4P14
A6A3P6 - A4P11

A6A3P3 - A6A1P7
pin 1. - pin 7.
2. - 3.

A7P1 - A4P1
pin 1. - pin 1.
2. - 3.
3. - 4.
4. - 2.
5. - 6.
6. - 8.
7. - 9.
8. - 7.

A7P4 - A6A1P6
pin 2. - pin 5.
3. - 1.
5. - 4.
6. - 2.
7. - 7.

A7P2 - A4P7
pin 5. - pin 1.
7. - 2.

A7P2 - A4P15
pin 8. - pin 1.

A8P1 - A4P3
pin 1. - pin 6.
2. - 7.
3. - 8.
5. - 1.
6. - 2.
7. - 3.
8. - 4.

A8P2 - A4P2
pin 1. - pin 8.
2. - 9.
3. - 6.
4. - 7.
5. - 3.
6. - 4.
7. - 1.
8. - 2.

A8P3 - A6A1P7
pin 1. - pin 8.
2. - 1.
3. - 2.
4. - 9.
7. - 6.

A8P4 - A4P7
pin 1. - pin 2.

A9P1 - A6A1P2
pin 1. - pin 4.
2. - 5.
3. - 6.

A9P2 - A6A1P2
pin 1. - pin 1.
2. - 2.
3. - 3.

5.3 PS3000

The circuit description of PS3000 is based on the diagrams belonging to the individual modules. The description follows the block numbers and not necessarily the functional route of the circuit.
A diagram reference is given at the beginning of the description of each circuit.

5.3.1 Module location.

ref. drawing 481459 sheet 2-3 page 7-34

Sheet 2 shows the top wiew of the power supply while sheet 3A shows the modules mounted on the inside of the inner front plate. Sheet 3b shows the locations on the right inner side.

5.3.2 Rear panel location.

ref. drawing 481459 sheet 3c page 7-36

The drawing shows the rear panel layout of the power supply with the different connectors.

5.3.3 Wiring.

Ref. diagram 481459 sheet 1 page 7-35

The mains are connected to J5, from where they are routed to K3 which is the AC relay for the Main Switch Mode Power Supply (A1). From J5 the mains are also routed to the Relay Logic Board (A2), where they are used for the Support Power Supply (A2A1).
The DC inlets are led through a fuse F1 used for reverse protection of the power supply.
Both the DC inlets and the output from the Main Switch Mode Power Supply are led to K1 and K2 which are used for switching between AC and DC operation.
At the output of K1 and K2 the Current ALC Detector is placed. This unit measures the current flowing in the shunt resistor R1, and gives this information to the control unit in PA3000.
The start up of the power supply is carried out by the Relay Logic Board receiving turn on command from the dimmer control on SE3000 through J3.

5.3.4 Relay Circuit.

Ref. diagram 481335 page 7-37

Block (1). Start circuit.

The on/off function of PS3000 is performed with the dimmer control of SE3000 which activates an optocoupler U3 used as insulation.

Block (2). Main voltage feed back.

The feed back is used to check whether the main switchmode power supply is operational under starting up or not. The feed-back circuit consists of an opto-coupler U4 used for insulation and is acting as a short circuit when in operation.

Block (3). Voltage summation.

The supply for the relay logic comes normally from a support PSU A1 through CR3. When PS3000 is connected to a DC supply a second supply voltage comes to the driver circuit through CR1 and from CR1 through CR2 to the starting circuit.

Block (4). Delay timer.

When PS3000 is started Q4 is switched on through R13 which is shorted to ground through U3 (1). Q4 supply a current through R17 to C22. If the main switch mode supply is operational C22 is shortcircuited though U4 (2), but if the main switch mode supply is inoperational C22 is charged so that the voltage across C22 passes a reference level set by R6 and R9 (5). When this level is passed the output of the comparator U2 goes high and thereby switches on Q2 and Q3 in (5).

Block (5). Relay driver circuit.

When PS3000 is switched on the point R7 and R8 is shorted to ground through U3 (1), which makes the output of U1 going high whereby Q1 is switched on and thereby the relay that supplies the 220 V AC for the main switch mode power supply.
If the main switch mode power supply fails to start or the 220 V AC is missing the Delay timer in (4) switch on Q2 and Q3. Q3 drives the relays for the DC supply, while Q3 is used to switch off Q1. The reason for this is to avoid pendling between AC and DC operation.
The AC/DC operation is indicated through CR5 and CR7 located on the front panel of PS3000.

5.3.5 Support PSU.

Ref. diagram 481289 page 7-38

Block (1). Linear regulator and feed back.

The linear regulator U3 regulates the voltage from the switch mode to 24V. The feed-back is carried out by VR3 and U2, where VR3 acts as the limiting element and U2 as the insulated feed-back.

Block (2). Mains input.

FL1 is a mains filter before the rectifier consisting of CR14-17.

Block (3). Switch oscillator.

U1 a and b forms an oscillator with a frequency of 20-25 kHz. The oscillator is buffered through U1c-Q7 and puls width modulated through Q1. Q1 is controlled either by the drain current or from the feedback through U2.

Block (4). Driver and switch.

The puls width modulated signal is buffered by U1 e and d before fed to the driver transistors Q2-3 which drive the switch transistor Q4.

Block (5). Current limit.

The current flowing through the switch transistor Q4 is sensed by Q1 by R9. If the current is getting too high Q1 reduces the puls width and thereby the current.

Block (6). Switch transformer.

Energy is fed to the switch transformer through pin 1-3. From pin 6 voltage for the regulation circuit is taken while the output voltage is taken from pin 9 and 10.

Block (7). Start up circuit and regulation supply.

C15 is slowly charged through R19 to about 40 V, whereby Q6 is fired and C15 is now discharged through Q5. At the collector of Q5 the voltage is stabilized to aprox. 10 V. If the switch mode power supply starts correctly, the regulation supply is supplied from pin 6 of the switch transformer. If the start up procedure fails, the start up circuit is switched off when the output voltage has dropped to aprox. 5 V allowing C15 to recharge.

5.3.6 Current ALC detector.

Ref. diagram 482595 page 7-39

The Current ALC Detector is operating on two different grounds. One ground is the chassis ground. The other ground is the + 28 V. The + 28 V is marked with a Y. The Y indicates the + 28 V line from the relays to the system.

Block (1). Sensor and modulator PSU.

U2 converts the 28 V to minus 12V relative to +28 V, while U3 regulates to minus 6 V. U13 is an upconverter converting the 28V to 39 V relative the negative line on the 28 V supply. This 39 V is used to a supply voltage of +6 V relative to Y.

Block (2). Current sense amplifier.

U4 is a highgain amplifier used to amplify the voltage developed across the shunt resistor. A voltage of 1 mV across the shunt corresponds to 1 A and the amplifier has a gain of 100 giving an output of 100 mV/A. The amplifier is off-set adjusted by R8.

Block (3). Frequency modulator.

U5 is a voltage controlled squarewave oscillator. The modulating voltage is supplied from U4. The modulator has a characteristic of 1kHz/100 mV. The lower frequency of the oscillator is set by R13 to 30 kHz while R10 is used to set the upper frequency of 37 kHz, which corresponds to 70 A.

Block (4). Insulator.

U6 is an optocoupler used for insulation.

Block (5). Multiplier.

U7 is an multiplier which multiplies the signal from U6 and the signal from the VCO U8 (7). The output from the multiplier is routed through a loop filter and used to control the VCO U8.
If the two signals to the multiplier differ, the multiplier generates an error voltage used by the VCO U8.

Block (6). Loop Filter.

R20 and C19 form a loop filter.

Block (7). VCO.

U8 forms a VCO controlled by the error voltage from the multiplier U7. The center frequency for the PLL system is set by R23 to 33.5 kHz.

Block (8). Filter.

R29 and C23 form a filter similar to the loop filter, this time used to feed information about the current consumption to the ALC system.

Block (9). Amplifier with offset.

U9a is an amplifier used to amplify the signal from the PLL. As the signal from the PLL contains a DC component under no-signal conditions the amplifier is offset adjusted by R31.

Block (10). Filter.

U9b is an active filter used to remove any AC component above 3 kHz from the PLL system which is still present after the filtering in (8).

Block (11). Negative supply.

The supply for the Current ALC detector on chassis ground side is only a +15 V which is regulated to +12 V i U12. To be able to offset the PLL signal a negative voltage is necessary and this is generated from the +15 V through U10 and U11, U10 being a astable multivibrator with a frequency of 9 kHz folllowed by a rectifier CR1-2.

5.4 PA3000

The circuit description of PA3000 is based on the diagrams belonging to the individual modules. The description follows the block numbers and not necessarily the functional route of the circuit.
A diagram reference is given at the beginning of the description of each module.

5.4.1 Interconnection and location.

ref. drawing 484008 sheet 1-5 page 7-41
ref. drawing 483427 page 7-46

Sheet 1 of 484008 shows the multicable interconnection of PA3000 while sheet 2 shows the coax cable interconnection.
In section 5.4.11 a total list of the multicable interconnection is given.
Sheets 3 and 4 show the routing of the cables in PA3000. The sheets show both the cable routing and location of the different modules with the associated connnectors.
Sheet 5 shows the front view of the inner frontplate.
Drawing 483427 shows the cables and modules in the power amplifier module. The connectors are shown in this drawing to.

5.4.2 Rear panel location.

The position of the potentiometers used for aligment of the transmitters output are shown on the rear of PA3000 by silk screning.
The potentiometer R25 are used to set the output power under error-free conditions, while R12-19 are used to set the output power when a failure is present in the power amplifier.

5.4.3 Control Unit.

Ref. diagram 484024 sheet 1-3 page 7-47

Block (1). Driver ALC detector.

The current sensed in the Driver ALC current sensor on the power splitter is converted to a voltage in R1-2 and detected with CR1 which is temperature compensated by U1a and CR2. U1a is followed by a peak detector U2.

Block (2). Preset adjustment.

As the Driver ALC is taken before the output amplifiers it is necessary to linearise the output which is done by the 8 preset potentiomers R12-19 controlling the gain in U1b.
The control signal is a three line signal from SE3000 which is decoded in U3 to 8 lines.
The potentiometers are active according to the following list.

R12	1600-3999.9 kHz
R13	4000-7599.9 kHz
R14	8000-9399.9 kHz
R15	9400-11999.9 kHz
R16	12000-13400 kHz
R17	13401-17400 kHz
R18	17401-20000 kHz
R19	20001-26000 kHz

Block (3). Output ALC peak detector.

U4 forms a peak detector for the signal from the output directional coupler, while U1c is used as a high impedance buffer to ensure low loading of C12. R25 is used to set the output level of the transmitter.

Block (4). Current ALC peak detector.

U6a is a buffer driving U7 which is a peak detector for the Current ALC. U6b acts as a high impedance buffer ensuring low loading of C22.

Block (5). Summation amplifier.

The signals from the driver ALC, the Current ALC and the output ALC are summed together through diodes in U1d, an amplifier which is temperature compensated by CR6.

Block (6). Output SWR detector (error 43).

U5a is a comparator with hysteresis. The comparator compares the forward and reflected voltage from the output directional coupler and if the SWR gets higher than 1:2 Q1 stops conducting whereby SE3000 is informed about the condition, and will reduce the output power by 3 dB. If the SWR falls below 1:1.8 Q1 starts conducting whereby SE3000 will increase the output power to full.

Block (7). PA SWR detector (error 44).

U5d is a comparator comparing the forward and reflected voltage from the directional coupler located between the Power Amplifier and the lowpass filter. If the SWR becomes higher than 1:7.5 the output of U5d goes low whereby it informs SE3000 to perform a system shut down.

Block (8). Thermal Switch interface (error 40 and 41).

On the heat sink of the power amplifier 4 thermal switches are located plus one on the power combiner. Two of the thermal switches on the heat sink are rated for 90'C and are used together with the 90'C thermal switch located on the power combiner as error 41. The two error signals are summed together through CR7-8 and CR10 to control Q2, which gives the error signal for SE3000.
The other two thermal switches on the heat sink are rated for 125'C and routed through CR9 to Q3 giving the error signal error 40 to SE3000.
All three error situations are visualized on the rear of the amplifier as LEDs (CR7-8-9).

Block (9).Temperature measurement and blower timer

With the aid of a NTC resistor mounted on the heat sink of the Power Amplifier the temperature is meassured. U5c acts as a comparator with hysteresis. When the heat sink temperature reaches a temperature of aprox. 75'C the comperator resets the timer U5b through Q4 shortcircuiting C54. When the temperature of the heat sink has fallen sufficiently (approx. to 60'C) the comparator goes low again and the timer is released and maintains blower action for approx. 5 min.

Block (10). 5 V regulator (error 45).

U8 is a linear regulator serving two purposes.
One is to supply +5 V for the TTL logic on the control unit, the other purpose is as error information. If the +5 V is missing this is detected as an error 45 by SE3000. This error informs that either there is no connection between PA3000 and SE3000 or the +15 V,+5 are missing.

Block (11). Lowpass Filter control lines.

The lowpass filter control lines are insulated through U9-10-11 controlled by Q6-8-9. This is done because the relays on the lowpass filter are driven from the main DC supply. Q7 acts as a right/left shift drive to switch the relay in the output directional coupler between the left and right ouput line from the filter.
From the Fuse Board through J9 comes Low Voltage error information (error 42) +28 V for the blowers and the Lowpass Filter driver.

Block (12). 10 V Voltage Regulator.

U12 is a voltage regulator used to regulate the +28 V to +10V for the decoder U13.

Block (13). Decoder and Relay Driver.

U13 is a three to eight decoder used to decode the 3 control lines from SE3000 to the eight lines for the eight lowpass filters. The output from U13 is buffered by Q10-17.

5.4.4 Fuse Board.

Ref. diagram 482854 page 7-50

Block (1). Low Voltage Detector.

U1 is a comparator with hysteresis. The comparator compares the reference voltage at pin3 with the DC supply voltage. If the voltage goes below 26 V pin7 of U1 goes high whereby the output of U2 goes low informing SE3000 about the low voltage situation. If the voltage then goes above 26.5 V pin7 of U1 goes low whereby the output of U2 is reset.

Block (2). Supply distribution.

The 28 V from PS3000 is distributed to each of the four amplifiers and the driver. Each line is fused and protected against reverse voltage.

5.4.5 PA-Driver.

Ref. diagram 484814 sheet 1 page 7-51

Block (1). Amplifier.

The amplifier consists of two transistors Q1-2 in push-pull. The impedance transformation is carried out by wide band transformers and feedback.

Block (2). Bias.

The bias is supplied through Q3 controlled by U1 which is temperature compensated by Q4 located on the heat sink close to Q1-2.

5.4.6 Driver ALC Current Sense and Power splitter.

Ref. diagram 482196 page 7-52

Block (1). ALC current sense.

The current sense is carried out by a current transformer T1 with directivity of 20 dB.

Block (3). Power splitter.

The signal from the driver is first transformed to an impedance of 12.5R and then fed to the power splitter, from where it is led to the different amplifiers.

5.4.7 Output Amplifier.

Ref. diagram 484822 sheet 1 page 7-53

Block (1). Amplifier.

The amplifier consists of two transistors in pushpull. The impedance transformation is carried out by broad-band transformers and feed-back.

Block (2). Bias.

The bias to the amplifier comes through Q3 which is controlled bu U1 which is temperature compensated by Q4 which is located at the heat sink close to Q1-2.

5.4.8 Power Combiner.

Ref. diagram 484830 sheet 1 page 7-54

Block (1). Power Combiner.

The four lines from the amplifiers are combined in T1 and transformed to an impedance of 50R by T2.

Block (2). Thermal switch.

The thermal switch is located close to the balance resistors of the power splitter. The attack temperatu-re of the switch is 90'C where it gets open circui-ted.

Block (3). Directional coupler.

The directional coupler consist of an current trans-former T3 and a voltage divider C3-C1-C2. The informa-tion from the directional coupler is used by the cont-rol unit to determine the SWR between the amplifier and the lowpass filter.

5.4.9 Lowpass Filter.

Ref. diagram 482358 page 7-55

The Lowpass Filter consists of 8 similar filters de-signed to keep the roll off frequencies with an SWR up to 1:2.
The mechanical layout splits the filters in a left and a right side group. The input is common for all fil-ters but the output is divided into the left and right output which is fed to the Output Directional coupler where the left/right selection is made.

5.4.10 Output Directional Coupler.

Ref. diagram 483257 page 7-57

Block (1). Relay Lines.

The relay drive lines from the Control Unit comming in on J1 is routed through J2-3-4 to the different inputs on the Lowpass Filter.
The right/left signal is used by the relay K1 on the input of the Directional Coupler.

Block (2). Output Directional coupler.

The directional coupler consists of a current transformer T1 and a voltage divider L15-C7-C6. L15 is used for frequency compensation.
The signal from the directional coupler is used for output power regulation, output power indication and output SWR measurements.

5.4.11 Multicable interconnection list.

The list gives the interconnections for the multicables which are terminated in a plug in each end.
Figure 5.4.11.1 shows the orientattion of the plug with respect to pin 1.

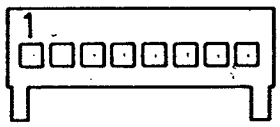


Figure 5.4.11.1

Plug orientation.

BOTTOM VIEW

The first letter and number indicates the assy number of the module to which the plug is applied.

MULTICABLE INTERCONNECTION LIST.

A1P2		A5P5
pin 1.	–	pin 3.
2.	–	2.
3.	–	1.

A1P10		A5P1
pin 1.	–	pin 1.
2.	–	2.
3.	–	3.
4.	–	4.
5.	–	5.
6.	–	6.
7.	–	7.
8.	–	8.
9.	–	9.
10.	–	10.

A2P1		A1P9
pin.1.	–	pin.7.
2.	–	6.
3.	–	5.
4.	–	4.
5.	–	3.
6.	–	2.
7.	–	1.

A1P9		A2P1
pin.1.	–	pin.7
2.	–	6.
3.	–	5.
4.	–	4.
5.	–	3.
6.	–	2.
7.	–	1.

A5P1		A1P10
pin.1.	–	pin.1.
2.	–	2.
3.	–	3.
4.	–	4.
5.	–	5.
6.	–	6.
7.	–	7.
8.	–	8.
9.	–	9.
10.	–	10.

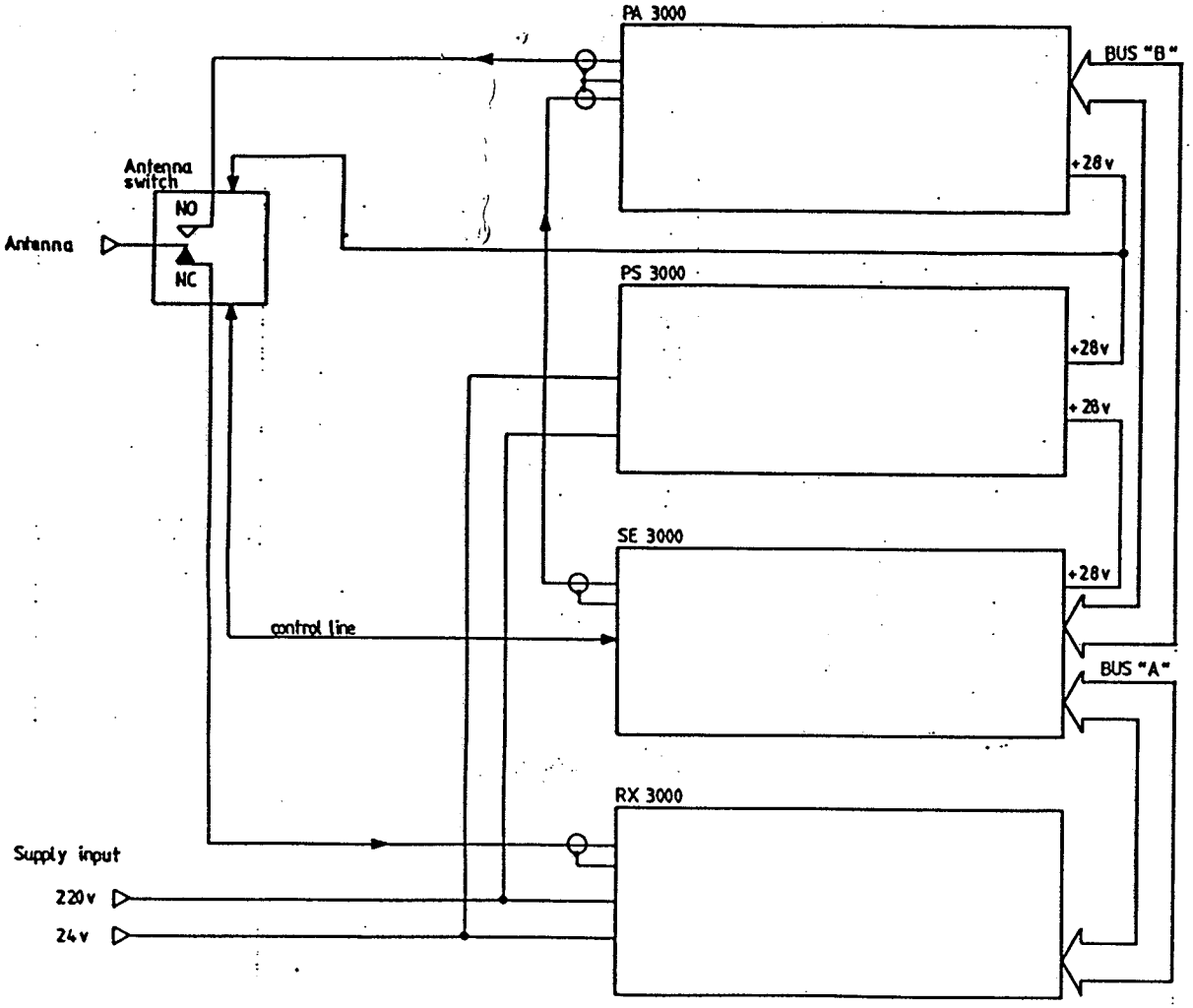
A5P5		A1P2
pin.1.	–	pin.3.
2.	–	2.
3.	–	1.

5.5 AS3000.

Ref. diagram 479519 page 7-58

The relay driving element is Q1 which is controlled from the exciter through an optocoupler. CR2 is located on the cabinet of the antenna switch as indication of operation.
The attenuator made up by R13-14-15 is used to give the necessary reference voltages for the error logic. The voltage across R13 sets the high voltage limit to approx. 33 V, while R13-14 sets the low voltage limit to approx. 21 V.

If the supply voltage comes above the upper voltage limit the fuse F1 is blown through the comparator U2b controlling Q2 used to shortcircuit the 28 V supply line.
If the supply voltage comes below the lower voltage limit, low voltage protection is carried out by U2a which compares the voltage from the attenuator with the reference voltage across CR4-5. As long as the supply voltage is above 21 V the output (pin 1) is low whereby there is a current running in U1, an optocoupler, used as an error logic interface to the exciter.
The lov voltage situation is displayed by CR6.
CR3 is used to indicate power supplied to the antenna switch.



BUS "A" : RS 232C and RX AUDIO

BUS "B": Low pass filter control
Driver ALC-preset
Error information
Supply lines

Dim. 477842.

~~Figure 3.1~~

TR3000 build up.

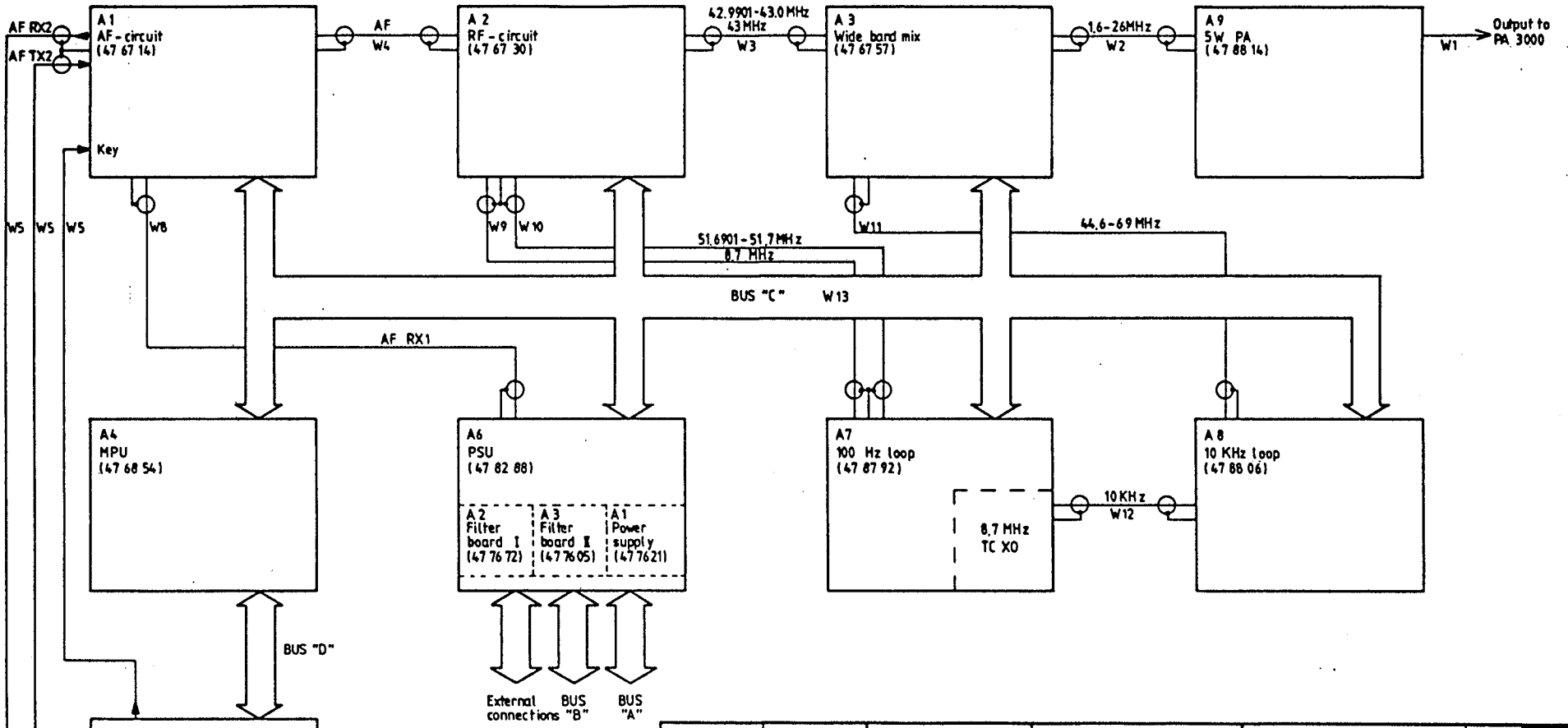
1. BUS "C"
Frequency information
Power level information
Key lines
Mode information
ALC-preset control
Low pass filter control
Error information
Supply lines

BUS "D"
Data lines
Address lines

BUS "A"
RS 232C and RX LF

BUS "B"
Low pass filter control
ALC-preset control
Error information
Supply lines
} to PA 3000

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	7.8.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075	
		ANGLES	
		LIN. DIM.	
	SE 3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

DR.	V.H.	18.9 1984
CH.		20/9-84
AP.		
AP.		

FIRST ANGLE PROJECTION

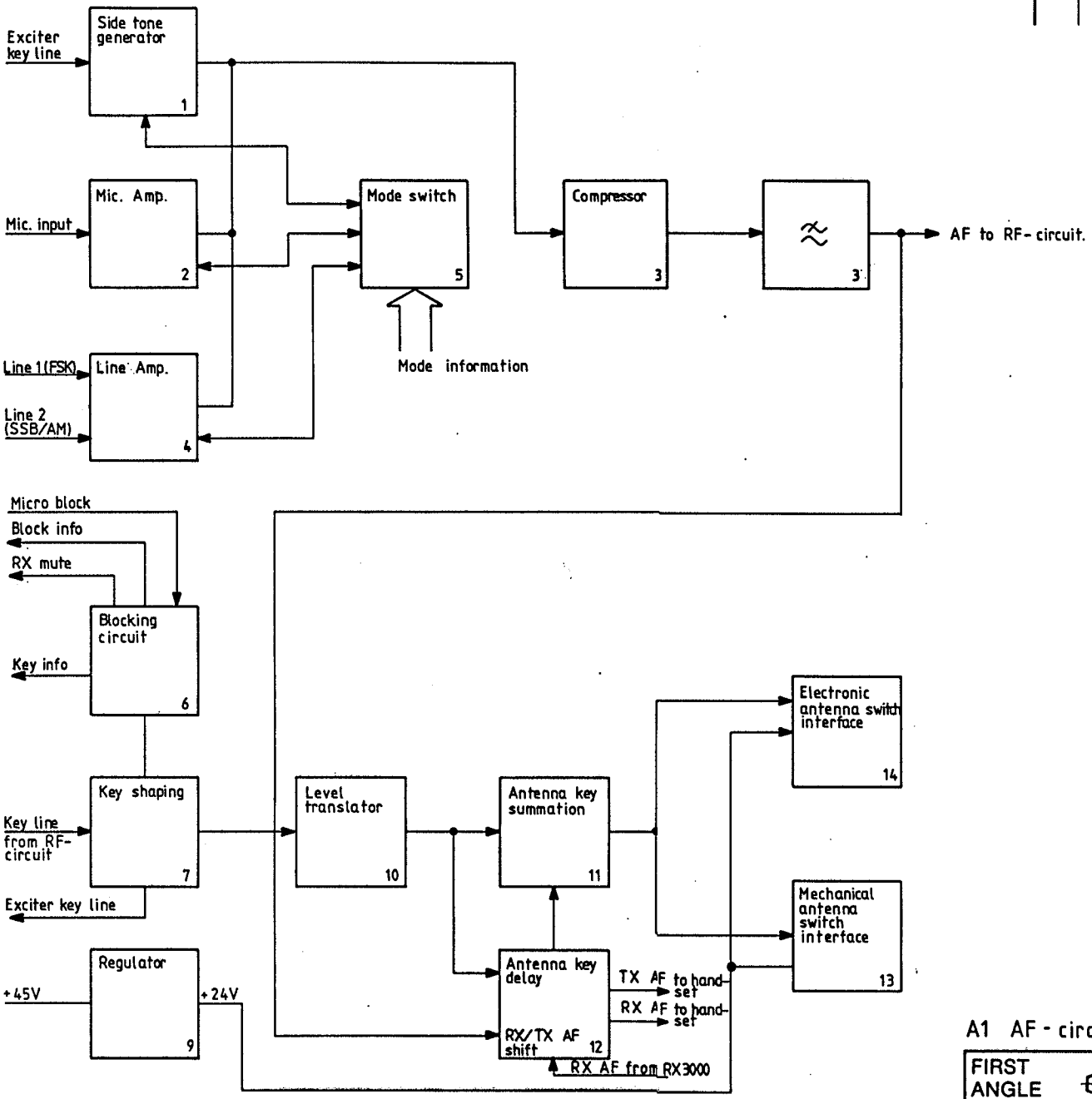
Dansk Radio AS

TITLE: MODUL CONFIGURATION

SIZE	CODE IDENT	DRAWING NO:
A2		47 78 77
SCALE		SHEET 1 OF 10

E9

REVISIONS				
ZONE	LTR	DESCRIPTION		APPROVAL
	A			
	B	REVISED	17.8.87	VH

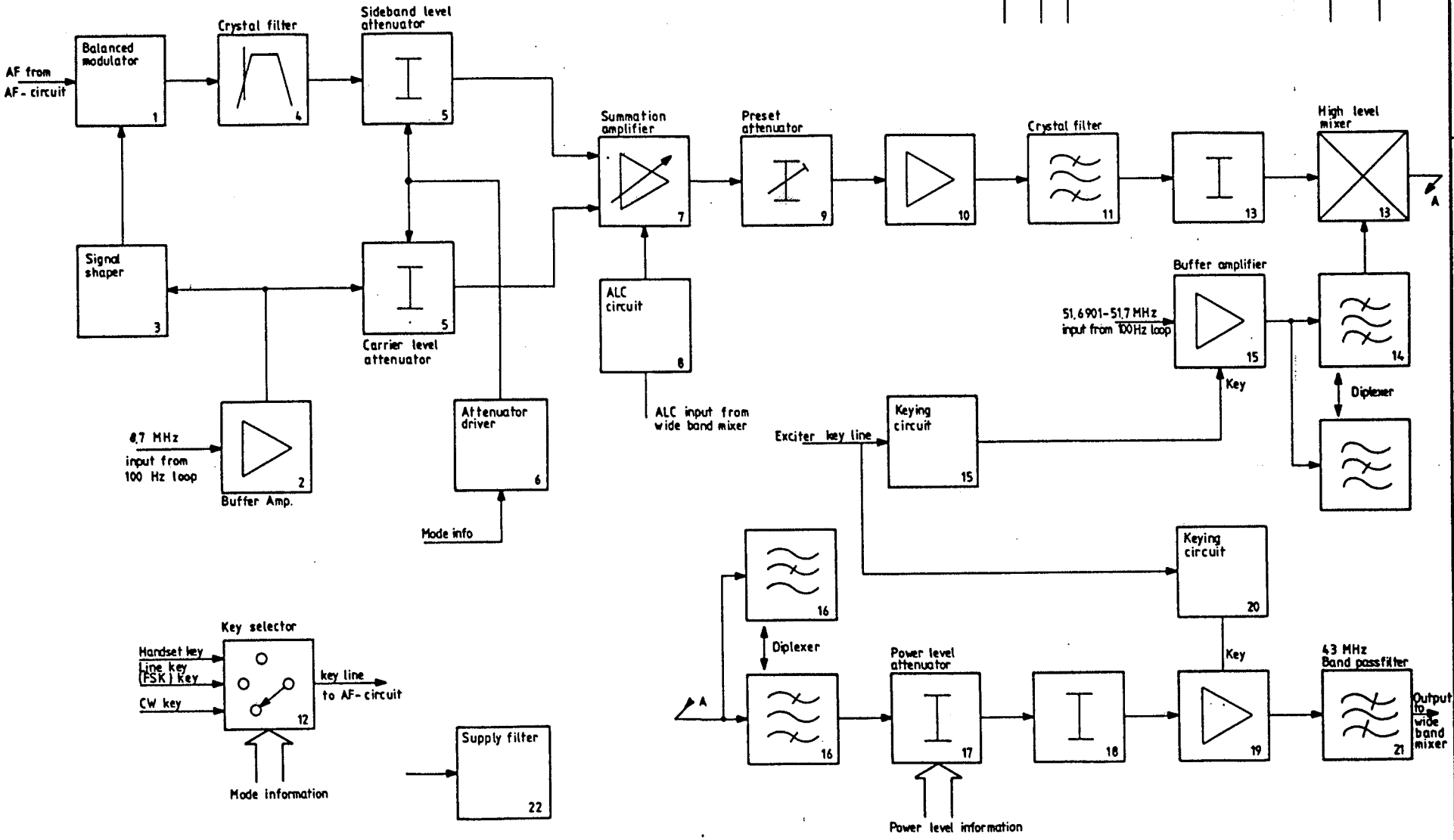


A1 AF - circuit (47 67 14)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 2

6-13

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	9.8.86	VH

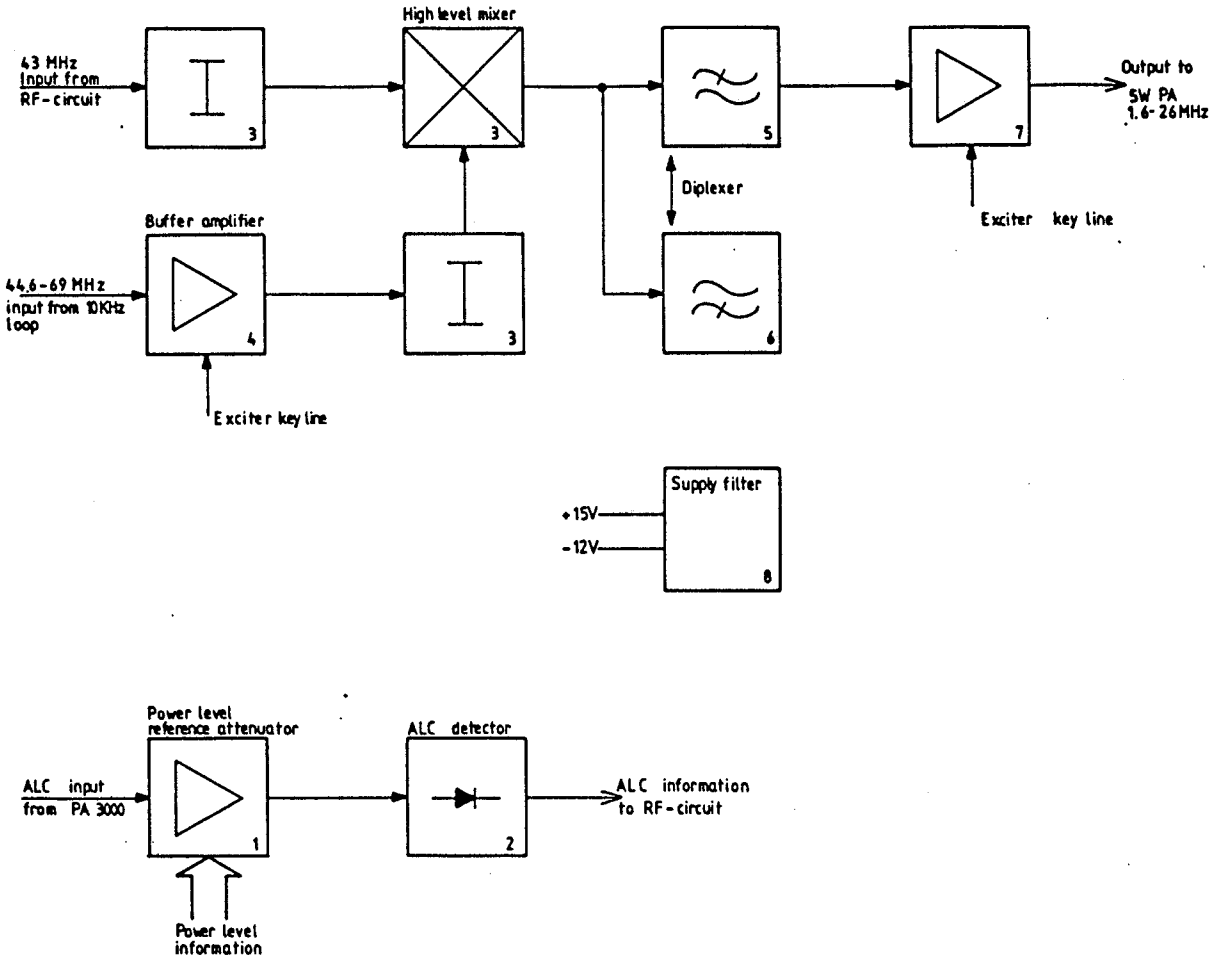


A2 RF-circuit (47 67 30)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 3

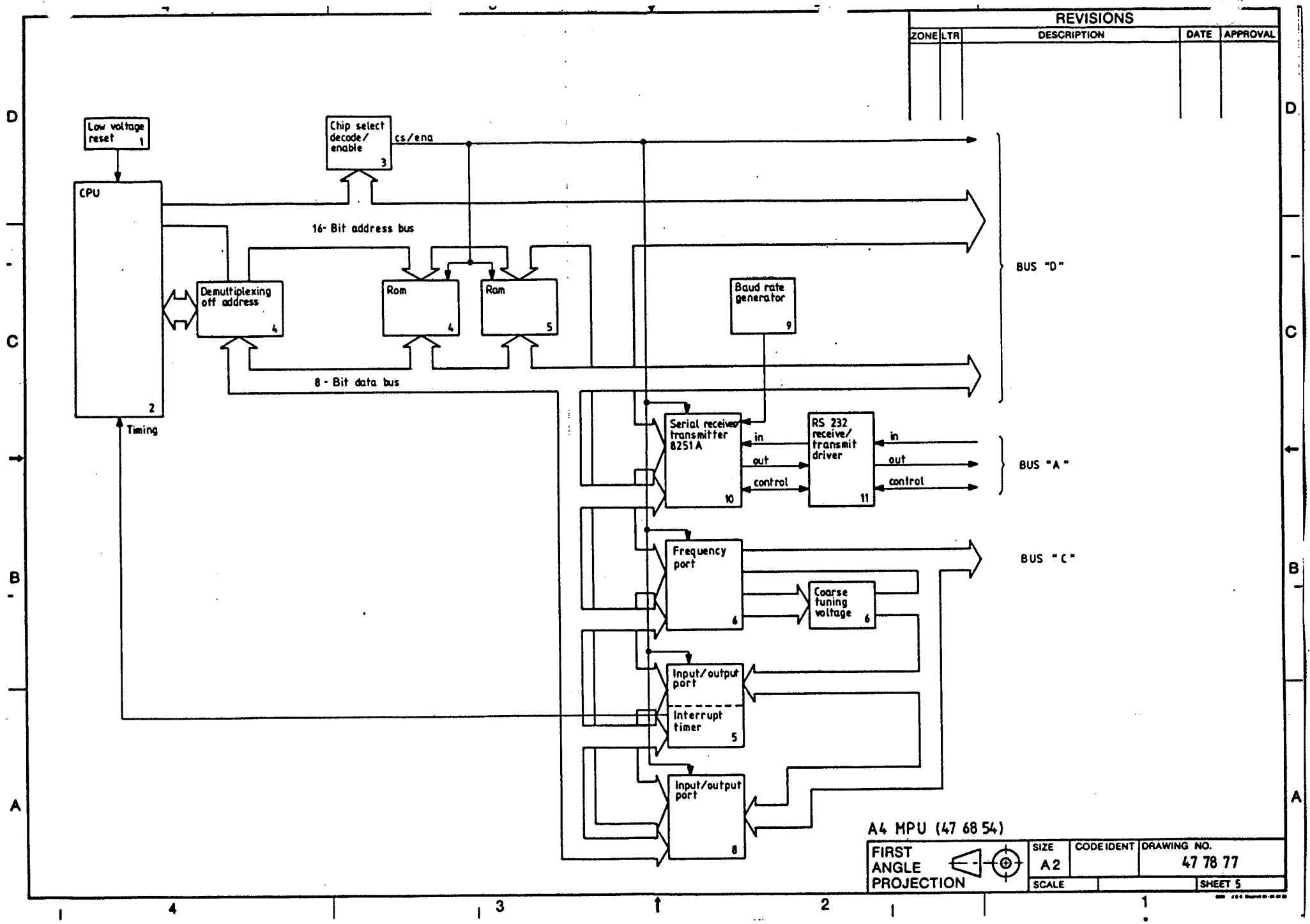
4-8-9

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	ROVAL

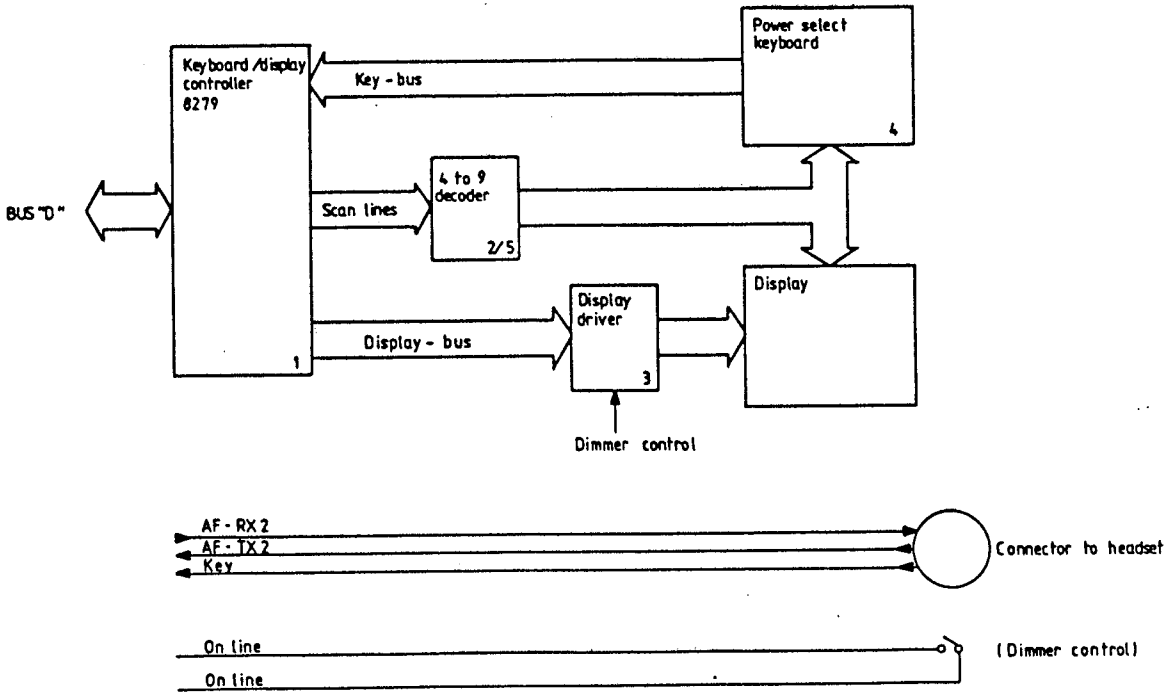


A3 Wide band mixer (47 67 57)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 4


REVISIONS
ZONE
LTR
DESCRIPTION
DATE
APPROVAL
Low voltage reset 1
Chip select decode/ enable 3
cs/ena
CPU
2
Timing
16- Bit address bus
Demultiplexing off address 4
Ram 4
Ram 5
Baud rate generator 9
8 - Bit data bus
BUS "D"
Serial receiver transmitter 8251A 10
in
out
control
RS 232 receive/ transmit driver 11
in
out
control
BUS "A"
Frequency port 6
Coarse tuning voltage 6
BUS "C"
Input/output port
Interrupt timer 5
Input/output port 8
A4 MPU (47 68 54)
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 78 77
SCALE
SHEET 5

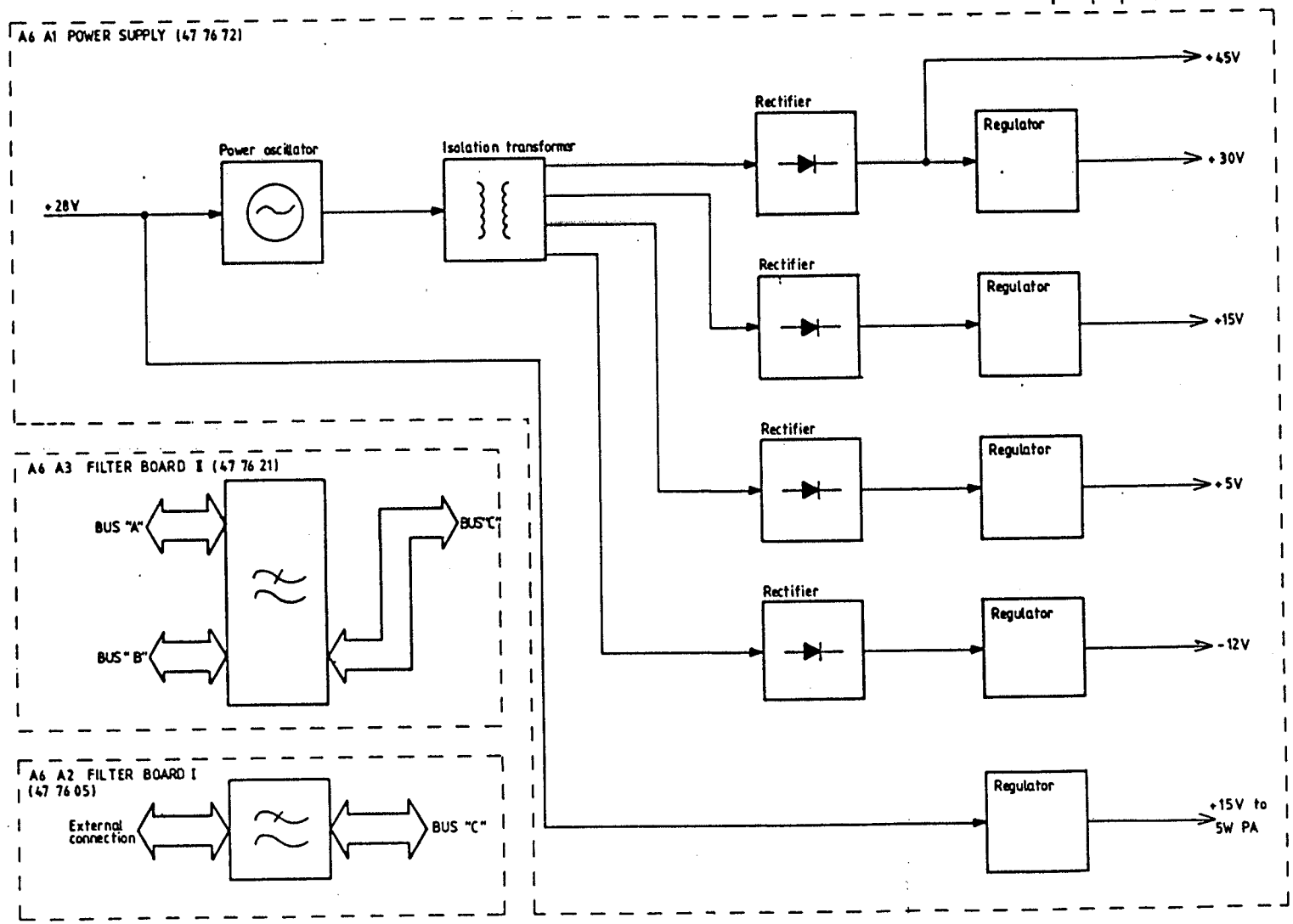
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	8.5.86	VH



A5 Front panel (47 68 38)

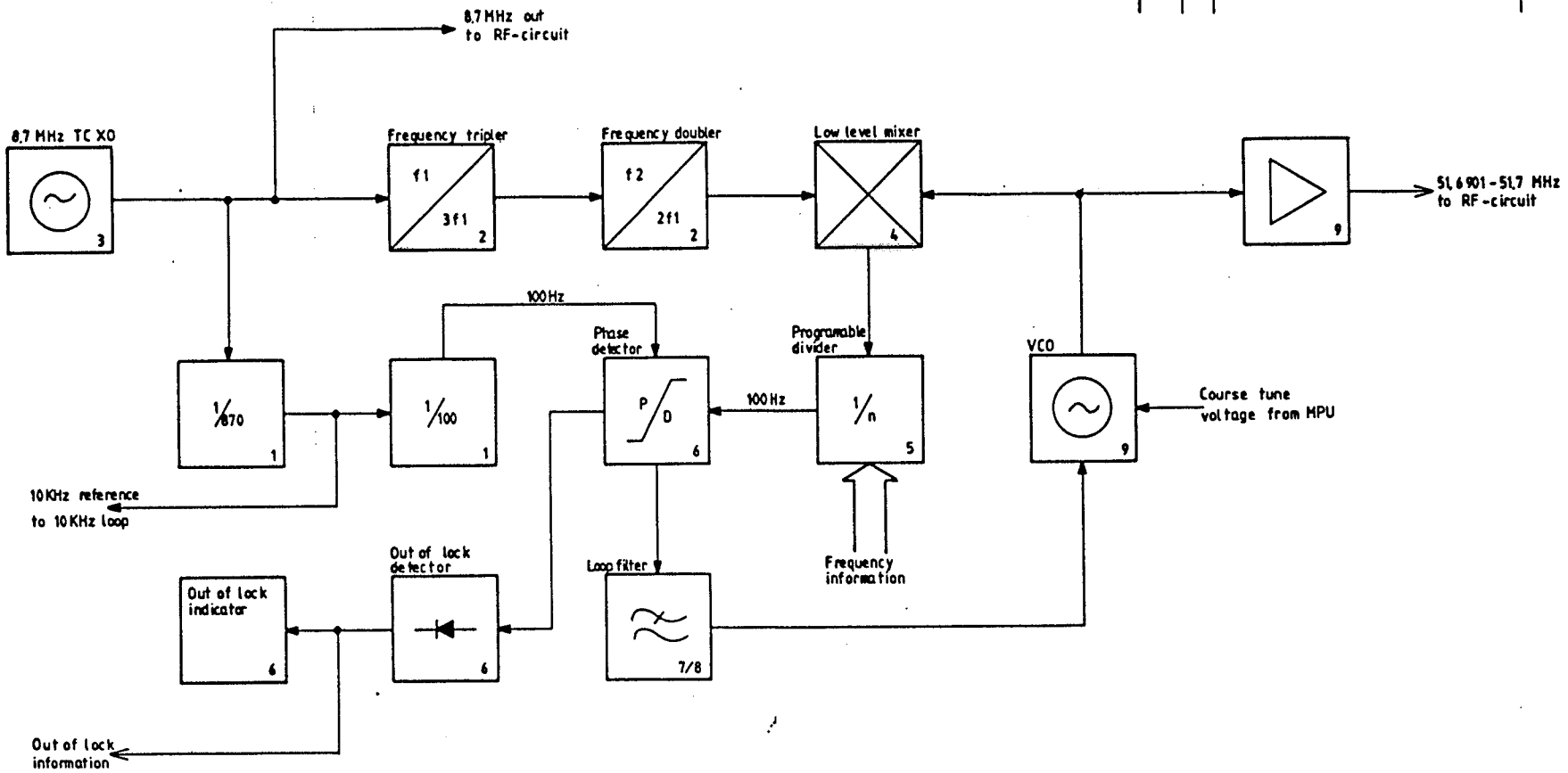
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 6

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	PROVAL



A6 PSU (47 82 88)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 7



REVISIONS

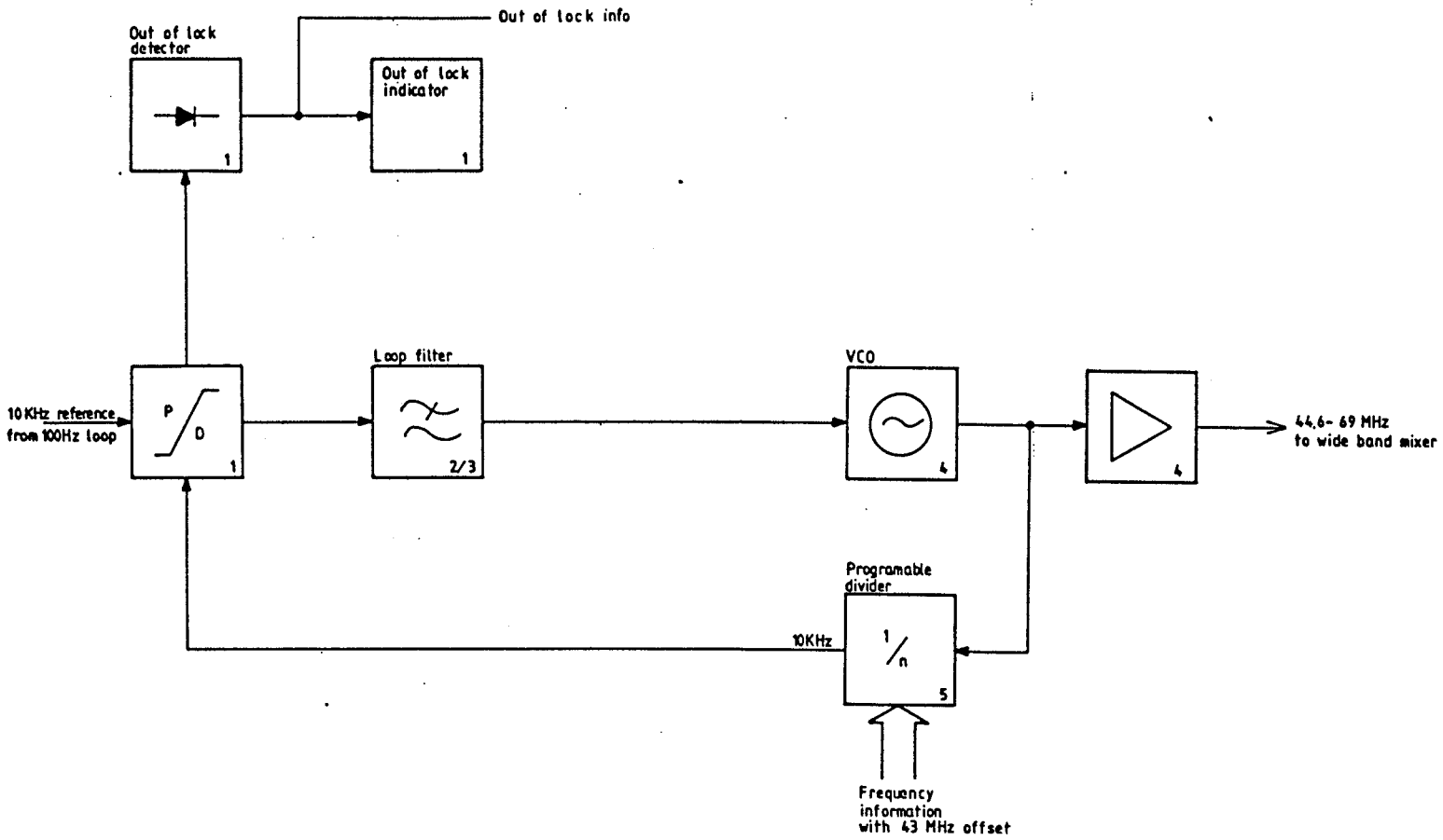
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

A7 100 Hz loop (47 87 92)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 8

LM-9

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

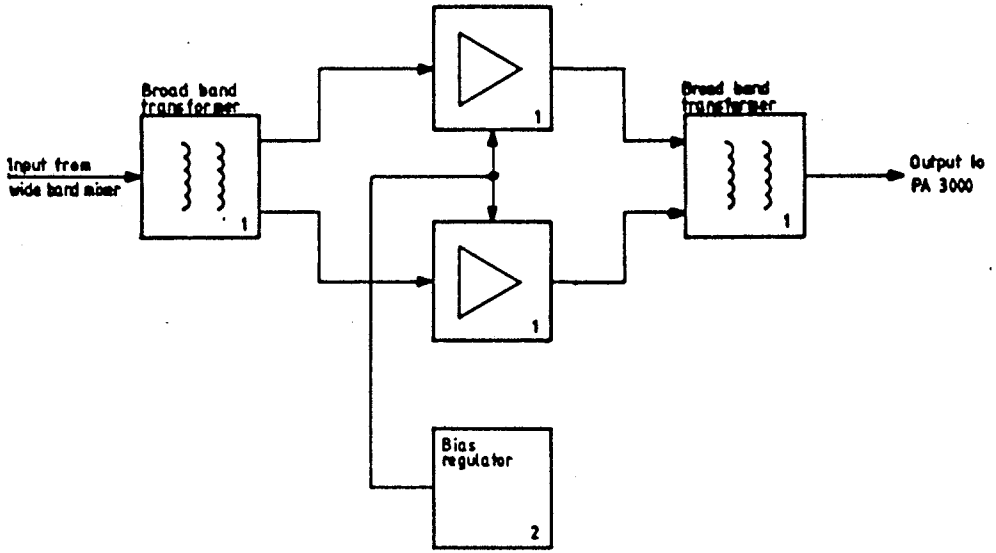


A8 10 KHz loop (47 88 06)

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE		SHEET 9

01 M-9

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



A9 SW PA (47 88 14)

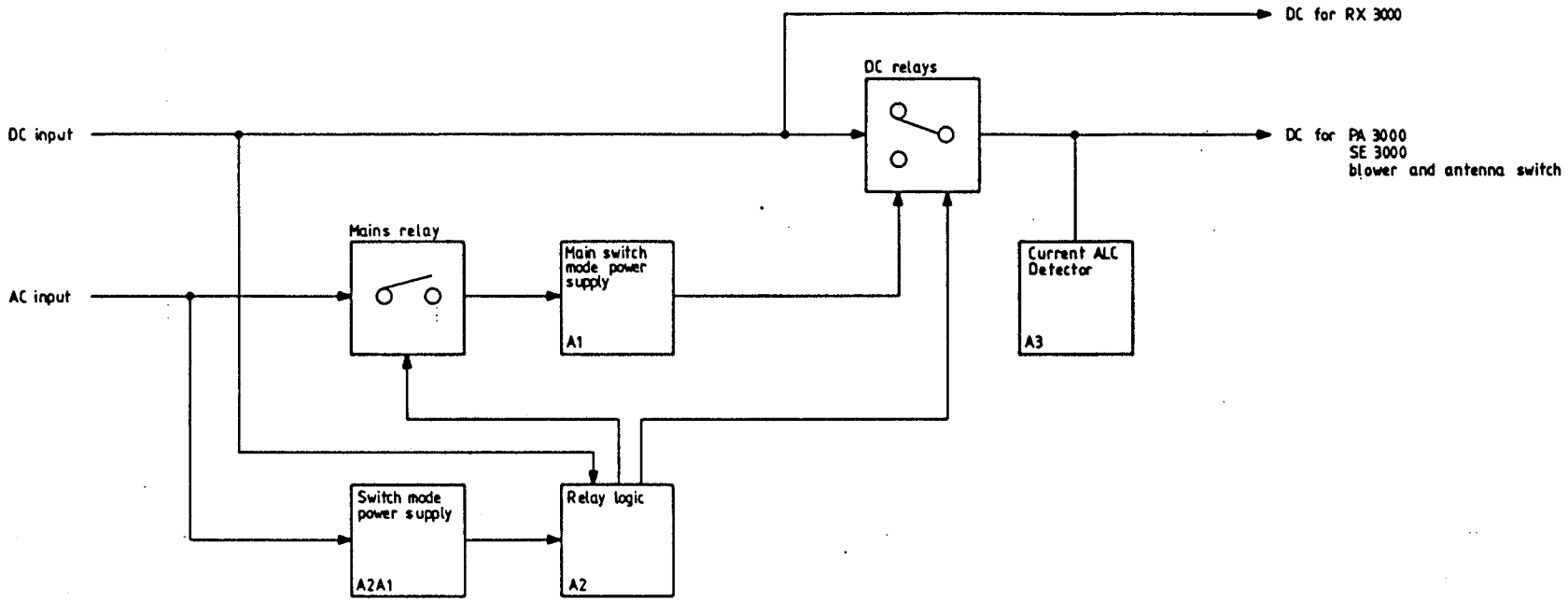
FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 78 77
	SCALE		SHEET

D C B A

4 3 2 1

11 78-9

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	11 6 86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075	
		ANGLES	DR. V.H. 18.3 1986
		LIN. DIM.	CH.
			AP.
	PS 3000	MATERIAL	AP.
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION
APPLICATION			

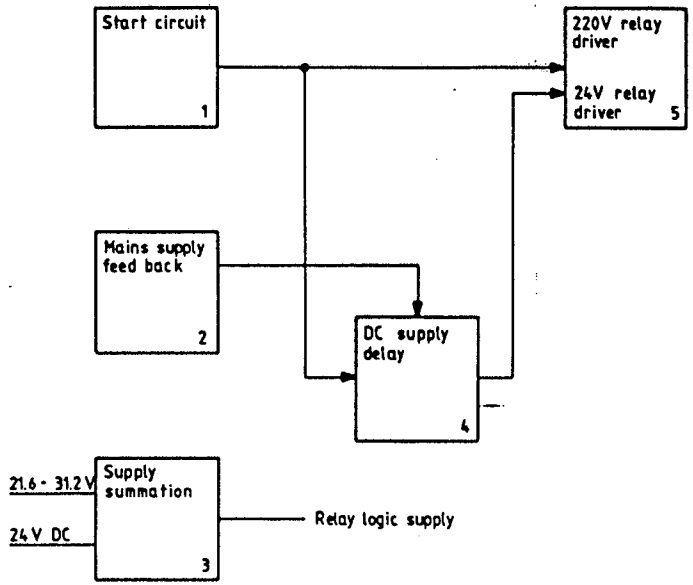
Dansk Radio AS

TITLE: SYSTEM CONFIGURATION PS 3000

SIZE	CODE IDENT	DRAWING NO.
A2		48 14 59
SCALE		SHEET 1 OF 1

6-86 12

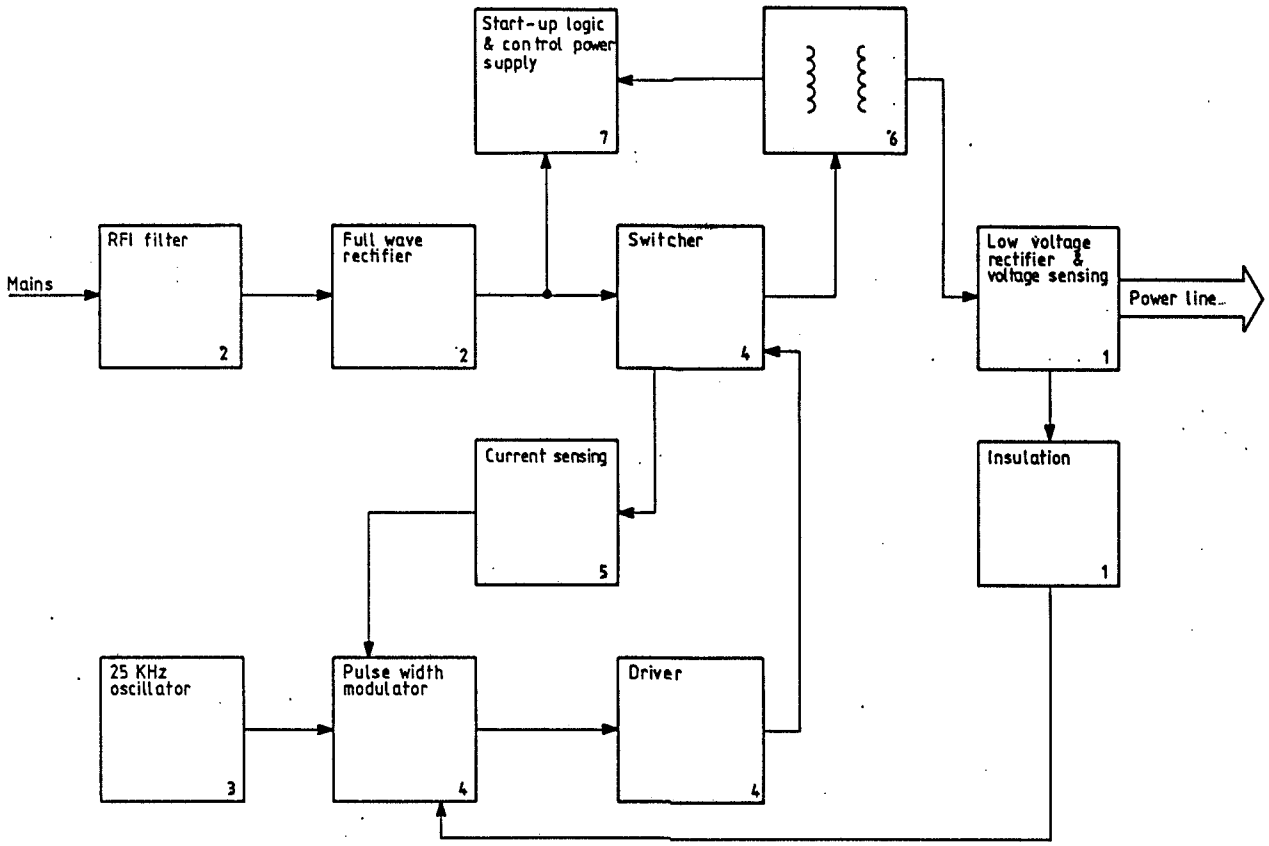
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	11 6 86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 18. 3 1986	TITLE CONFIGURATION RELAY LOGIC	
		LIN. DIM.	CH.		
			AP.		
	PS 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 13 35	
APPLICATION				SCALE / SHEET 1 OF 1	

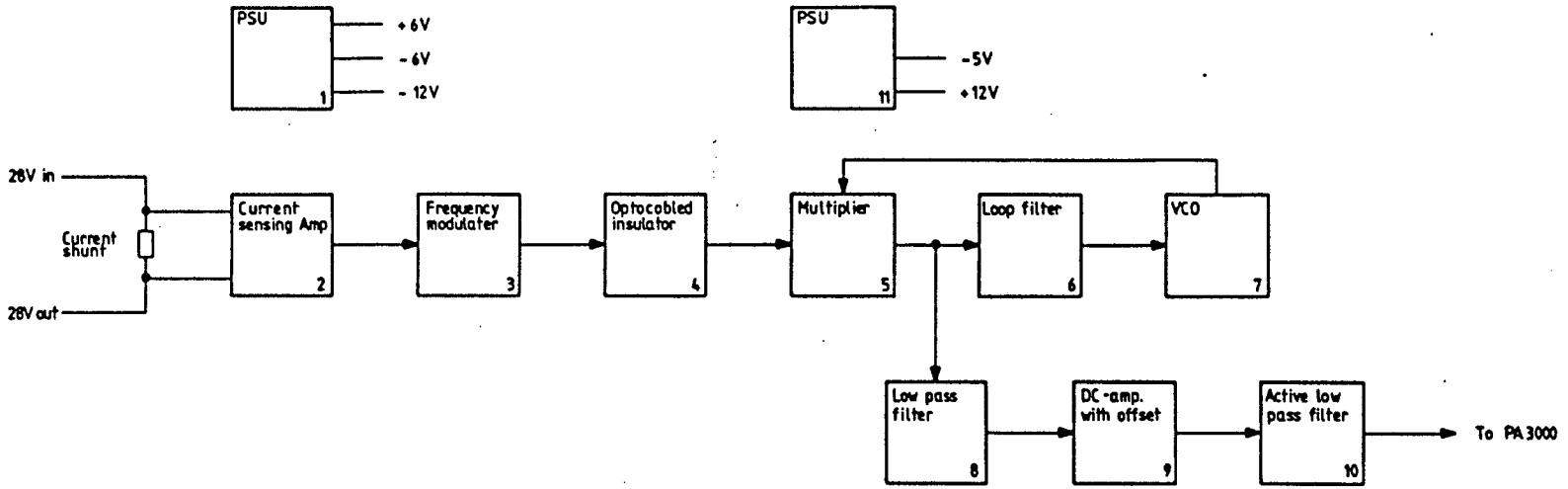
S1 #8-9

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
			DR. V.H. 18. 3 1986	TITLE CONFIGURATION SUPPORT PSU PS3000
		ANGLES	CH.	
		LIN. DIM.	AP.	
	PS 3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 12 89
APPLICATION				SCALE / SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

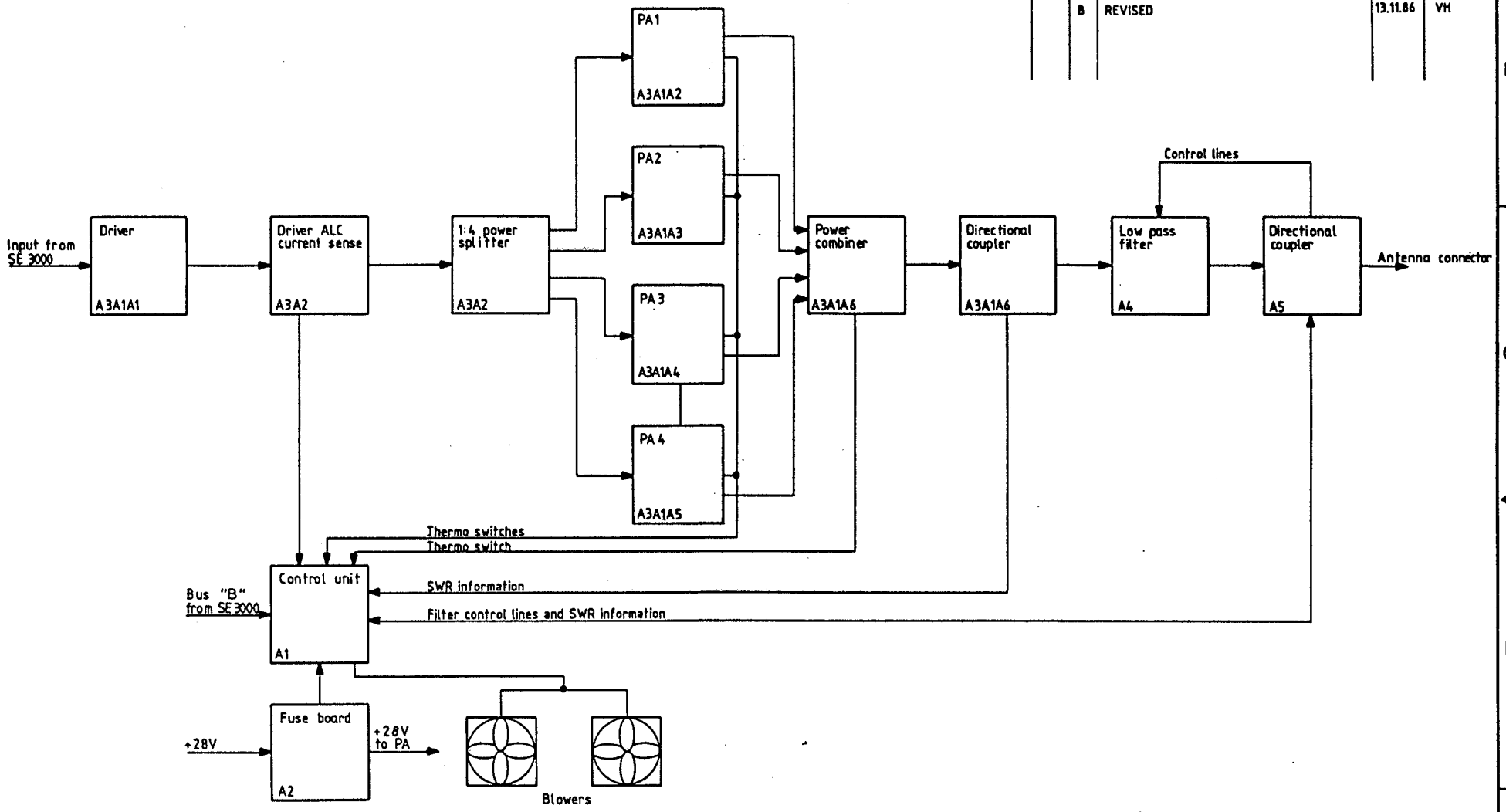


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
	PS 3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

		Dansk Radio AS
DR. V.H.	7.2 1986	TITLE
CH.		MODUL CONFIGURATION CURRENT ALC-DETECTOR
AP.	10.2.1986	
AP.		
FIRST ANGLE PROJECTION		SIZE A2 / CODE IDENT / DRAWING NO. 48 25 95
		SCALE / SHEET 1 OF 1

S1 94-9

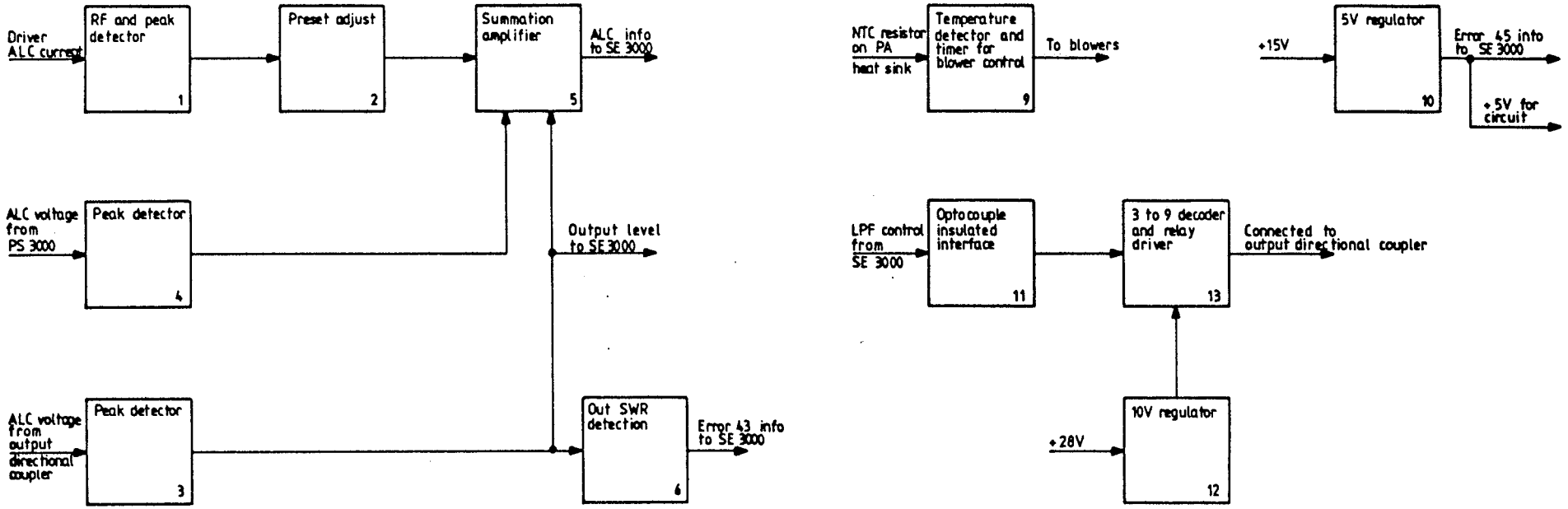
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	13.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
		ANGLES	DR. VH 19 3 1986	TITLE: SYSTEM CONFIGURATION PA 3000
		LIN. DIM.	CH.	
			AP. 13/11-86	
	PA 3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 40 08
APPLCATION				SCALE / SHEET 1 OF 1

91-6

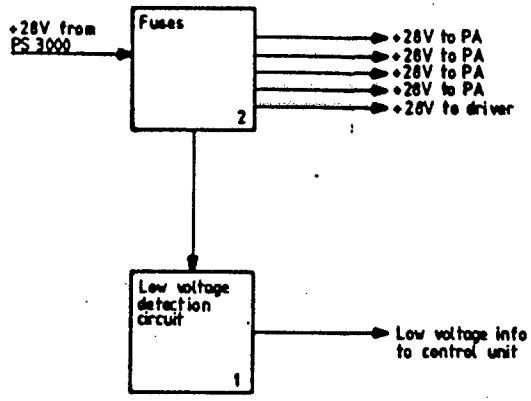
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	14.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
			DR. V.H. 21.3 1986	TITLE: CONFIGURATION CONTROL STAGE
		ANGLES	CH.	
		LIN. DIM.	AP.	
	PA 3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 40 24
APPLICATION				SCALE / SHEET 1 OF 1

41-9

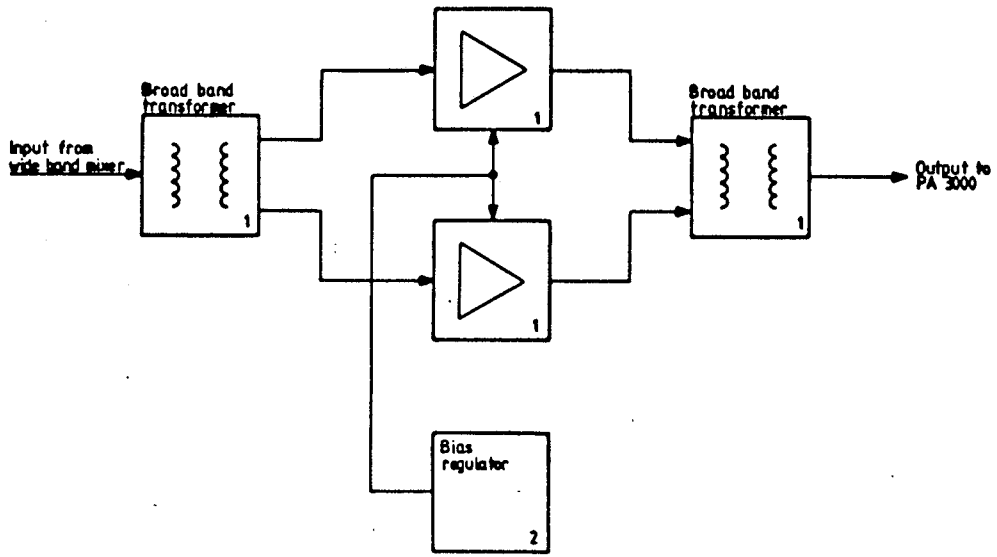
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 19.3.1986	TITLE CONFIGURATION FUSE BOARD	
		LIN. DIM.	CH.		
			AP.		
	PA 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 28 54	
APPLICATION				SCALE / SHEET 1 OF 1	

81 9

REVISIONS				
ZONE	LTR	DESCRIPTION	D...	APPROVAL



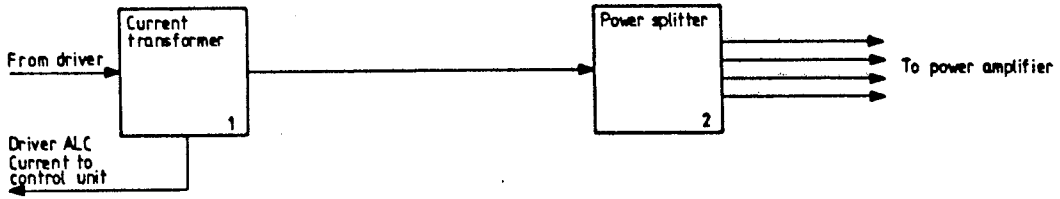
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 8075		Dansk Radio AS	dra
			DR. V.H. 2. 4 1986	TITLE	
		ANGLES	CH.	CONFIGURATION PA - DRIVER	
		LIN. DIM.	AP.		
			AP.		
48 34 35	PA 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 48 48 14
NEXT ASSY	USED ON			SCALE	SHEET 1 OF 1
APPLICATION					

4 3 2 1

D C B A

6-1 82-9

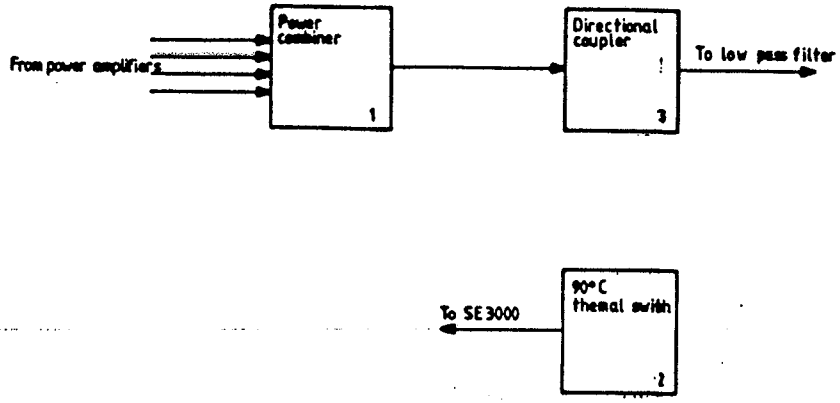
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	14.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
		ANGLES	DR. V.H. 1.4 1986	TITLE
		LIN. DIM.	CH.	CONFIGURATION DRIVER CURRENT SENSE AND POWER SPLITTER
			AP.	
	PA-3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 21 96
APPLICATION				SCALE / SHEET 1 OF 1

6-20

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	DR. V.H. 1.4 1986
		LIN. DIM.	CH.
			AP.
	PA3000	MATERIAL	AP.
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION
APPLICATION			

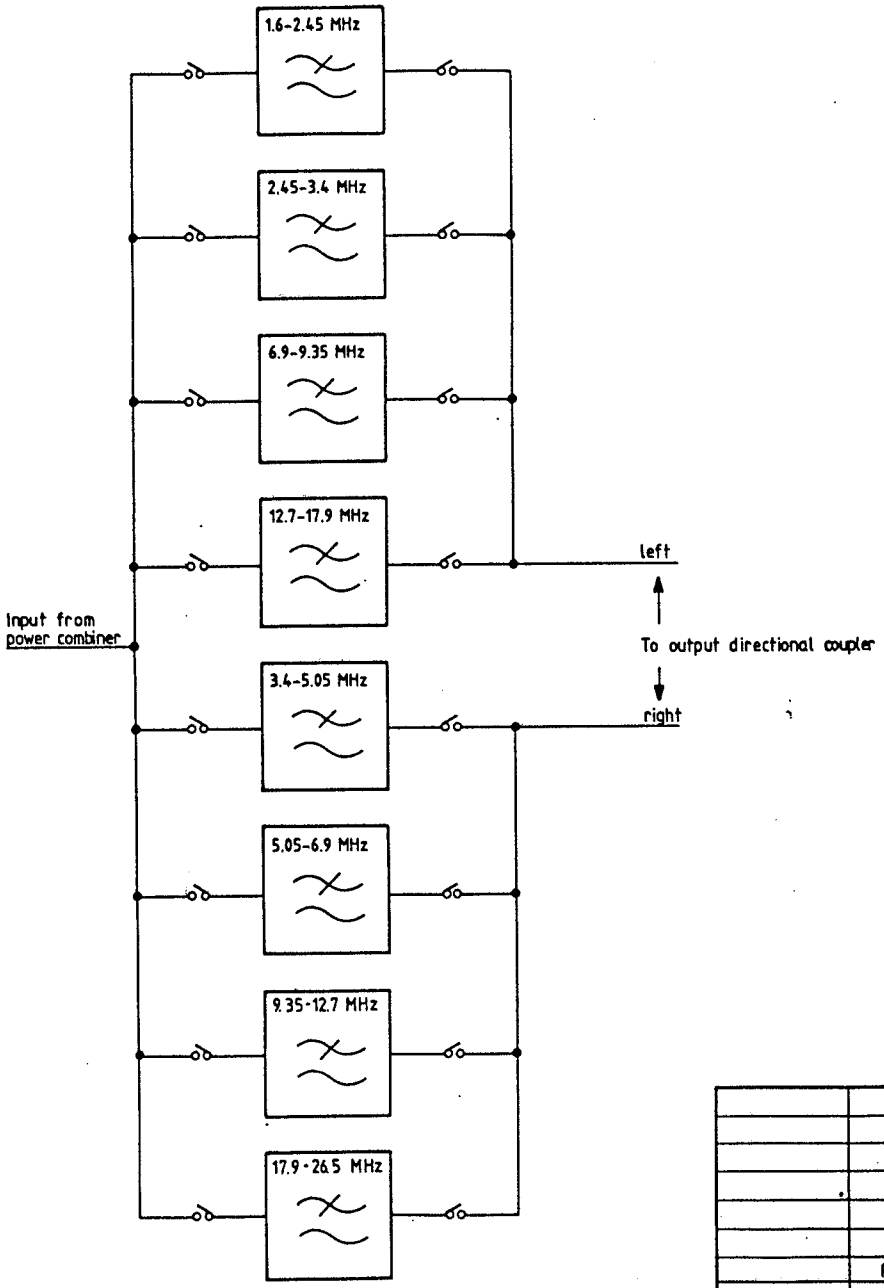
Dansk Radio AS dra

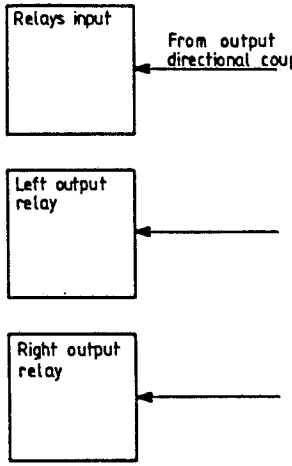
TITLE
CONFIGURATION
POWER COMBINER

SIZE	CODE IDENT	DRAWING NO.
A2		48 48 30
SCALE		SHEET 1 OF 1

6 22 21

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	18.11.86	VH

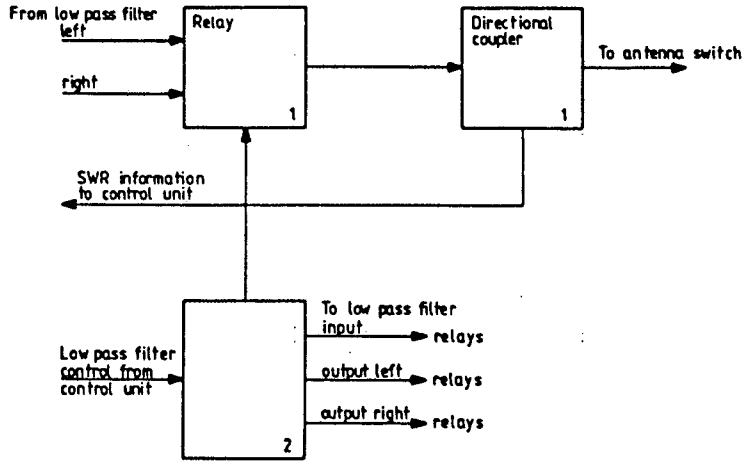




		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 1.4 1986	TITLE CONFIGURATION LOW PASS FILTER	
		LIN. DIM.	CH.		
			AP.		
	PA 3000	MATERIAL	AP.	SIZE A2	CODE IDENT
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	DRAWING NO. 48 23 58	
APPLICATION				SCALE	SHEET 1 OF 1

6-22

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	9.8.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	DR. V.H. 21.3.1986
		LIN. DIM.	CH.
			AP.
	PA 3000	MATERIAL	AP.
NEXT ASSY	USED ON		
APPLICATION			FIRST ANGLE PROJECTION

Dansk Radio AS

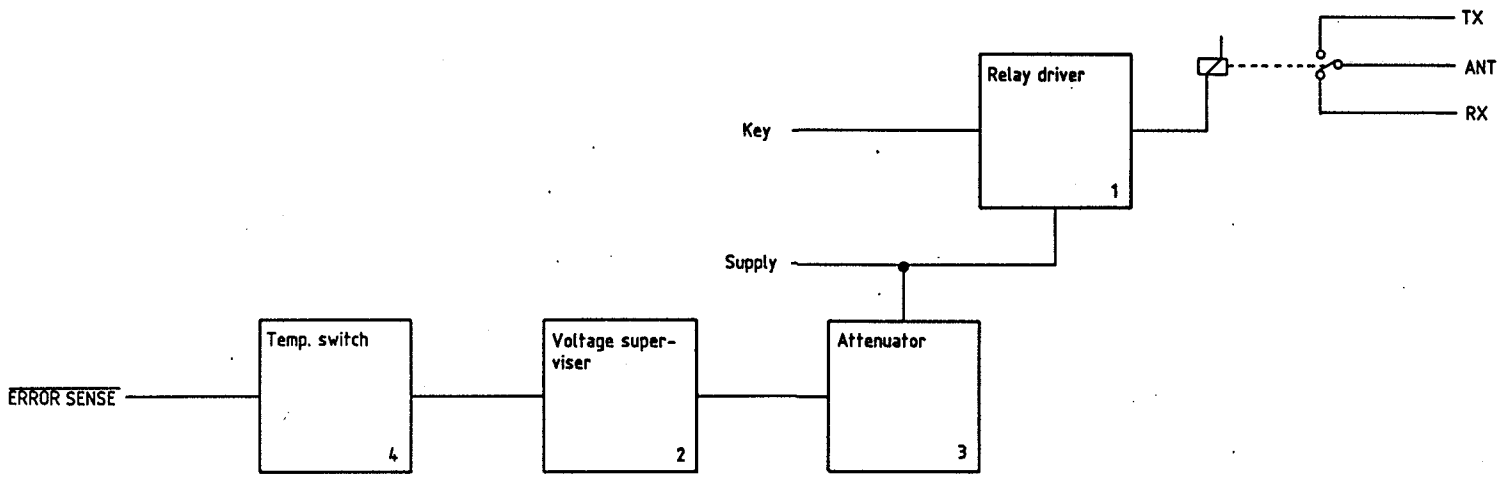
TITLE
CONFIGURATION
OUTPUT DIRECTIONAL COUPLER

SIZE	CODE IDENT	DRAWING NO.
A2		48 32 57
SCALE		SHEET 1 OF 1

6-88 23

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	ATE	APPROVAL
	A			



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
	TR3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

DR.	VH	11.2.87
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

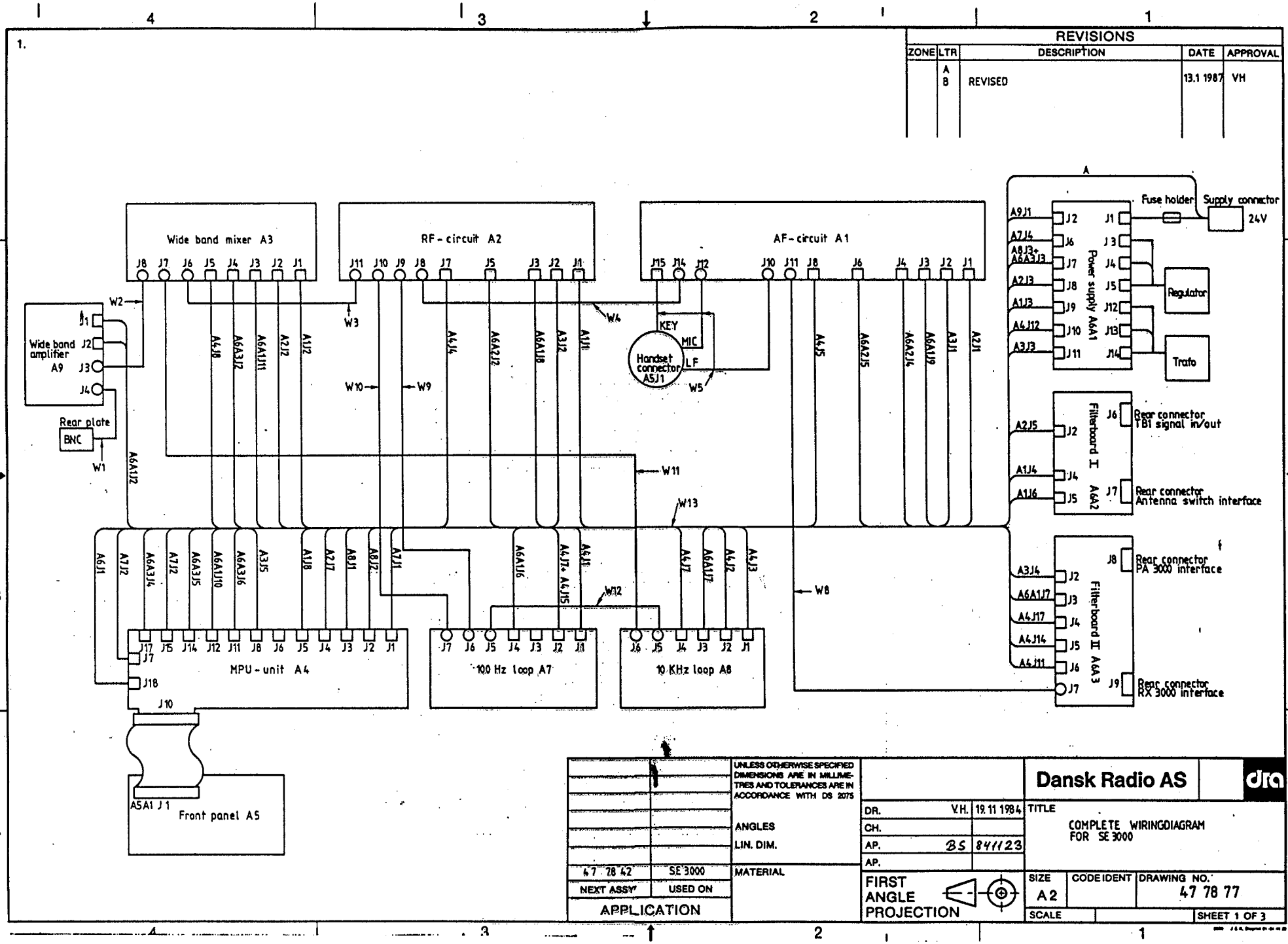
Dansk Radio AS

TITLE
CONFIGURATION
ANTENNA SWITCH
AS3000

SIZE	CODE IDENT	DRAWING NO.
A2		47 95 19

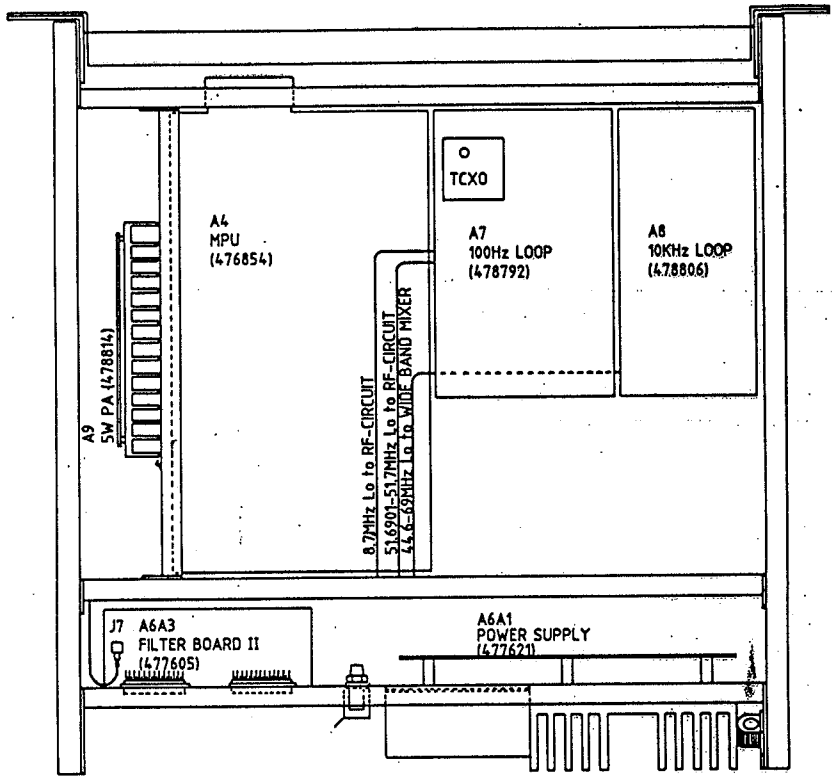
SCALE ~ SHEET 1 OF 1

6-27

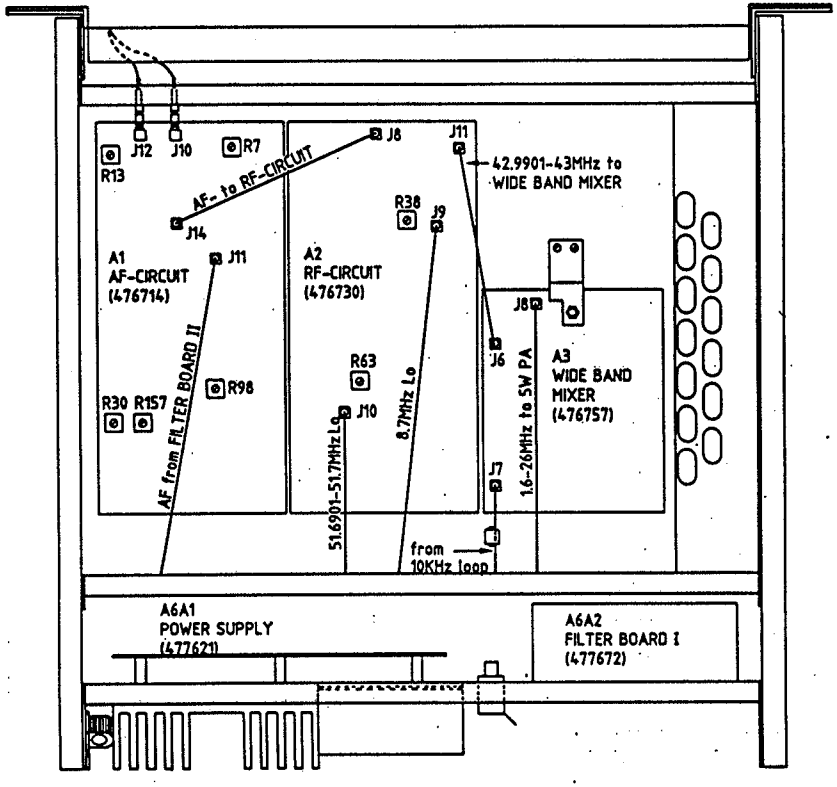

REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A REVISED 13.1 1987 VH
B
Wide band mixer A3
RF - circuit A2
AF - circuit A1
Wide band amplifier A9
Rear plate
BNC
W1
W2
W3
W4
W5
W8
W9
W10
W11
W12
W13
KEY
MIC
LF
Handset connector A5J1
MPU - unit A4
100 Hz loop A7
10 KHz loop A8
Front panel A5
A5A1 J1
Power supply A6A1
Fuse holder
Supply connector
24V
Regulator
Trafo
Filterboard I A6A2
Rear connector TB1 signal in/out
Rear connector Antenna switch interface
Filterboard II A6A3
Rear connector PA 3000 interface
Rear connector RX 3000 interface
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
47 78 42 SE 3000
NEXT ASSY USED ON
APPLICATION
DR. V.H. 19.11 1984
CH.
AP. BS 841123
AP.
FIRST ANGLE PROJECTION
Dansk Radio AS
TITLE
COMPLETE WIRINGDIAGRAM FOR SE 3000
SIZE A2
CODE IDENT
DRAWING NO. 47 78 77
SCALE
SHEET 1 OF 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

TOP VIEW



BOTTOM VIEW

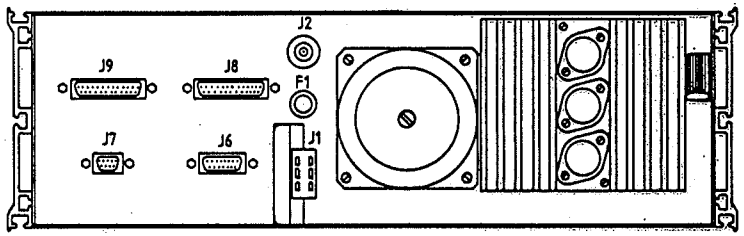


FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE 1:2		SHEET 2

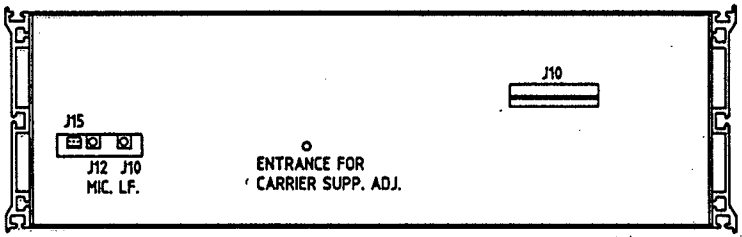
7-2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

REAR VIEW



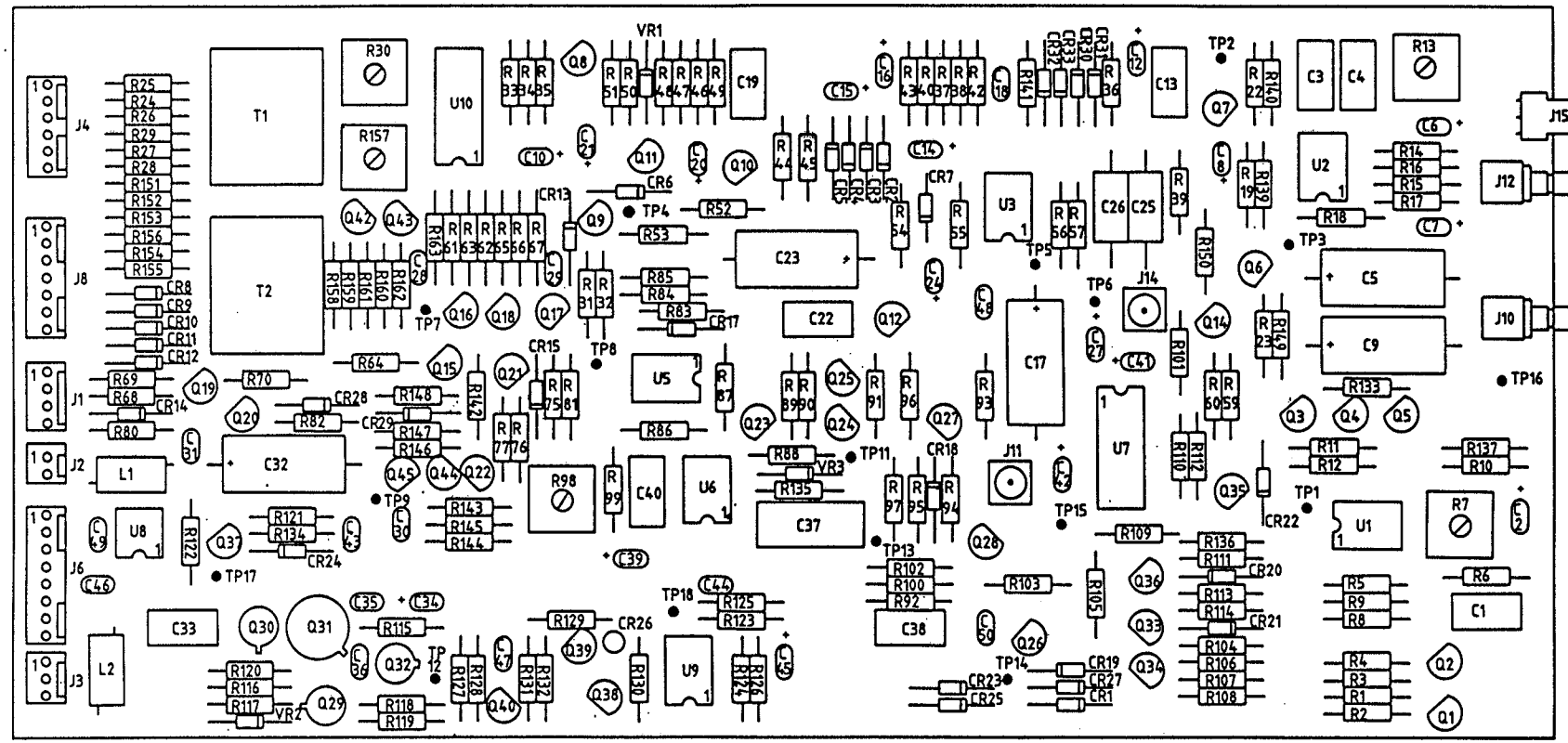
FRONT VIEW.



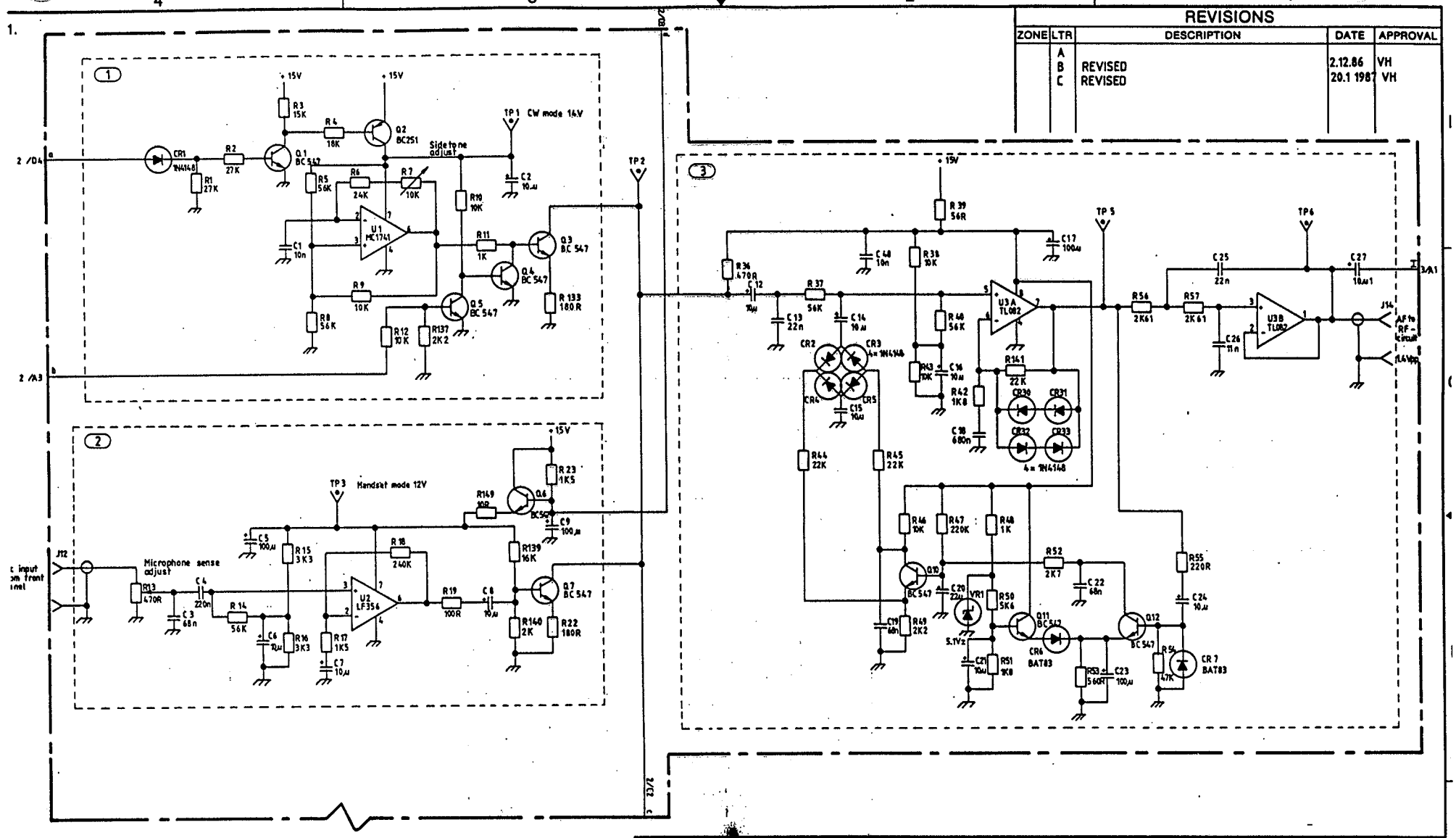
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 78 77
	SCALE 1:2		SHEET 3

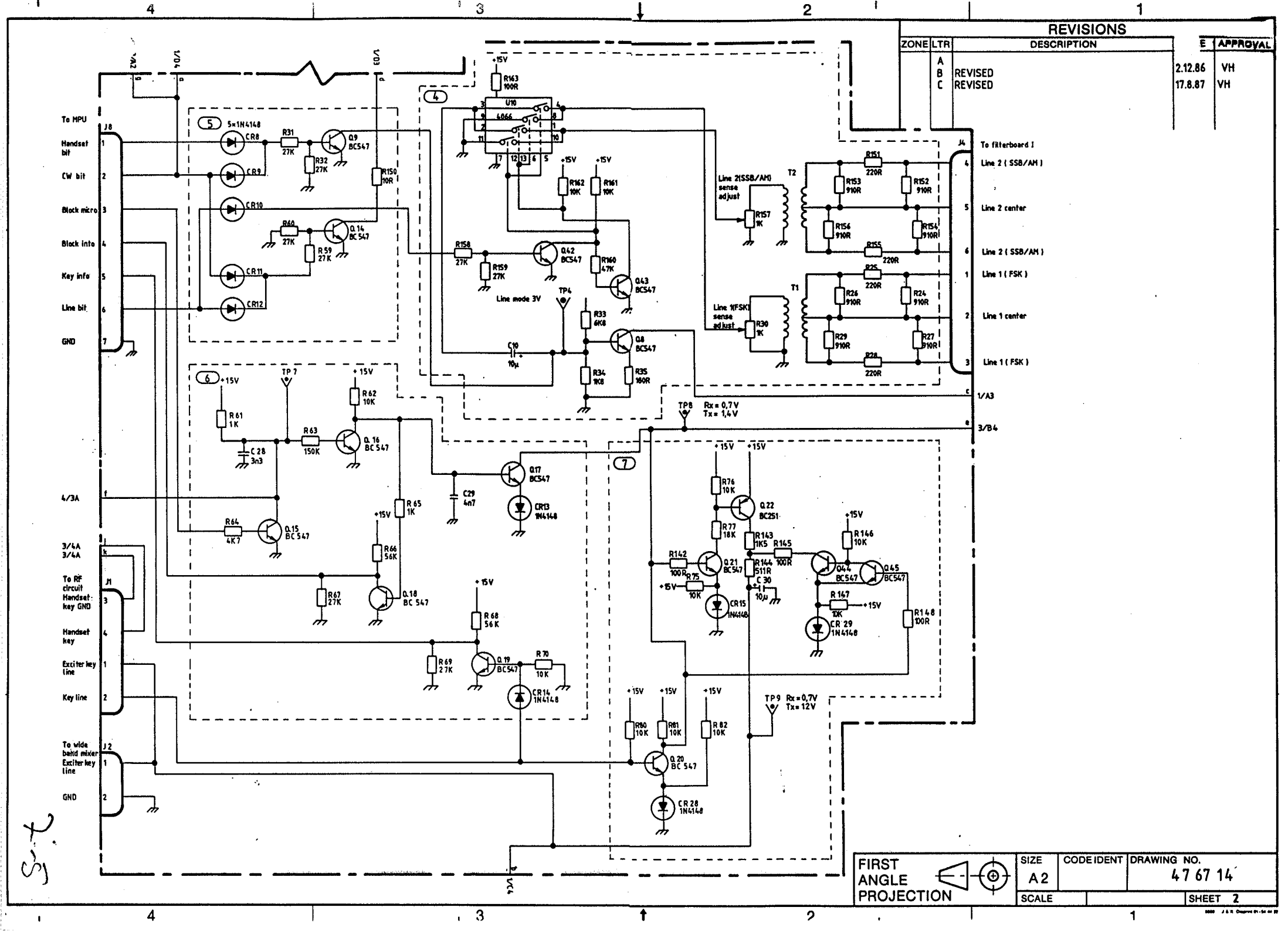
2-3

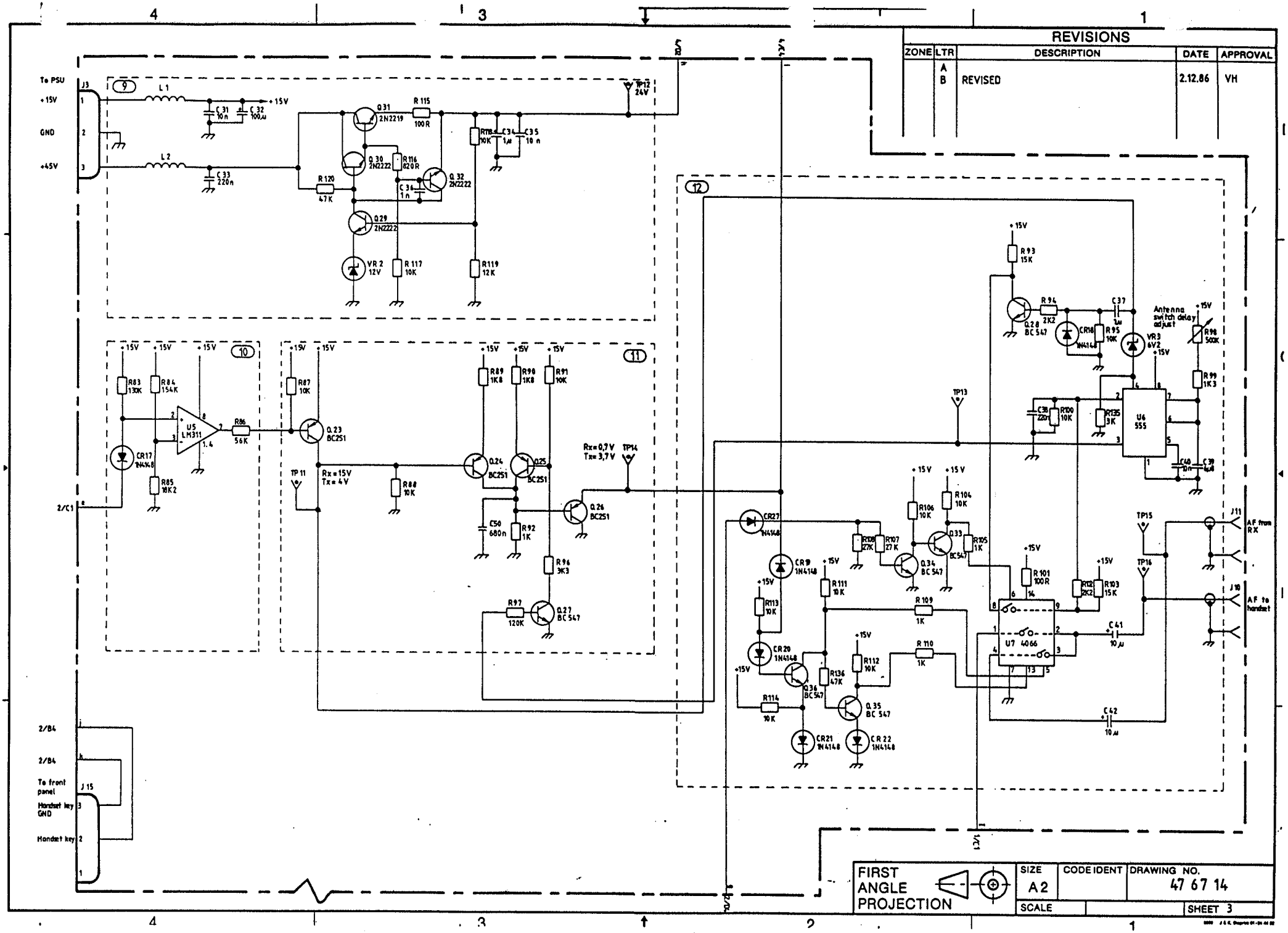
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. VH 1.12 1986	TITLE COMPONENT LOCATION AF CIRCUIT SE3000	
		ANGLES	CH.		
		LIN. DIM.	AP.		
			AP.		
47 78 77	SE3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 67 14
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						

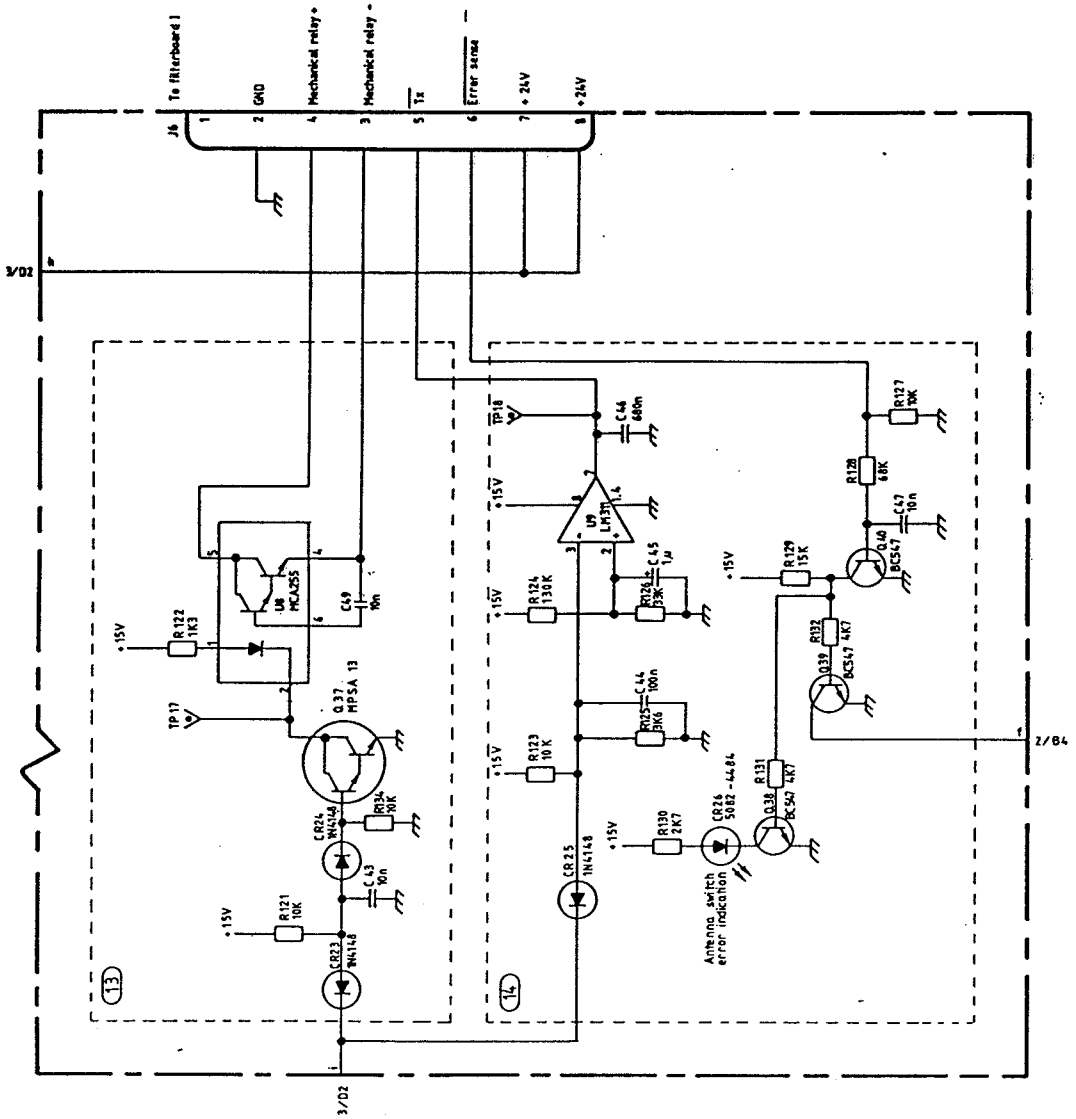

REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A 2.12.86 VH
B REVISED 20.1 1987 VH
C REVISED
1
2
3
TP1 CW mode 14V
TP2
TP3 Handset mode 12V
TP5
TP6
Side tone adjust
Microphone sense adjust
U1 MC1741
U2 LF356
U3A TL082
U3B TL082
Q1 BC 547
Q2 BC251
Q3 BC 547
Q4 BC 547
Q5 BC 547
Q6 BC 547
Q7 BC 547
Q10 BC 547
Q11 BC 547
Q12 BC 547
CR1 1N4148
CR2
CR3
CR4
CR5
4= 1N4148
CR6 BAT83
CR7 BAT83
CR30
CR31
CR32
CR33
4= 1N4148
VR1
5.1Vz
AF to RF-circuit
AF from RF-circuit
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
47 7877
SE 3000
NEXT ASSY
USED ON
APPLICATION
Dansk Radio AS
DR. VH 12.10 1984
CH.
AP.
AP.
TITLE
AF - CIRCUIT
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 67 14
SCALE
SHEET 1 OF 4


REVISIONS
ZONE LTR DESCRIPTION E APPROVAL
A
B REVISED 2.12.86 VH
C REVISED 17.8.87 VH
To MPU
J8
Handset bit
CW bit
Block micro
Block into
Key info
Line bit
GND
5x1N4148
CR8
CR9
CR10
CR11
CR12
R31 27K
R32 27K
R60 27K
R59 27K
Q9 BC547
Q14 BC547
R150 10R
+15V
R163 100R
U10
4066
R162 10K
R161 10K
R158 27K
R159 27K
Q42 BC547
R160 47K
Q43 BC547
Line mode 3V
TP4
R33 6K8
Q8 BC547
C10 10µ
R34 1K8
R35 160R
Line 2(SSB/AM) sense adjust
R157 1K
T2
R151 220R
R153 910R
R152 910R
R156 910R
R154 910R
R155 220R
Line 1(FSK) sense adjust
R30 1K
T1
R25 220R
R26 910R
R24 910R
R29 910R
R27 910R
R28 220R
J4
To filterboard I
Line 2 (SSB/AM)
Line 2 center
Line 2 (SSB/AM)
Line 1 (FSK)
Line 1 center
Line 1 (FSK)
1/A3
3/B4
TP8 Rx = 0,7 V Tx = 1,4 V
TP7
R61 1K
R62 10K
R63 150K
C28 3n3
Q16 BC547
Q17 BC547
CR13 1N4148
C29 4n7
4/3A
R64 4K7
Q15 BC547
R65 1K
R66 56K
R67 27K
Q18 BC547
3/4A
3/4A
To RF circuit Handset key GND
Handset key
Exciter key line
Key line
J1
R68 56K
R69 27K
Q19 BC547
R70 10K
CR14 1N4148
R76 10K
Q22 BC251
R77 18K
R143 1K5
R145 100R
R142 100R
Q21 BC547
R144 511R
C30 10µ
R75 10K
CR15 1N4148
R146 10K
Q44 BC547
Q45 BC547
R147 10K
CR29 1N4148
R148 100R
TP9 Rx = 0,7V Tx = 12V
R90 10K
R81 10K
R82 10K
Q20 BC547
CR28 1N4148
To wide band mixer Exciter key line
GND
J2
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 67 14
SCALE
SHEET 2

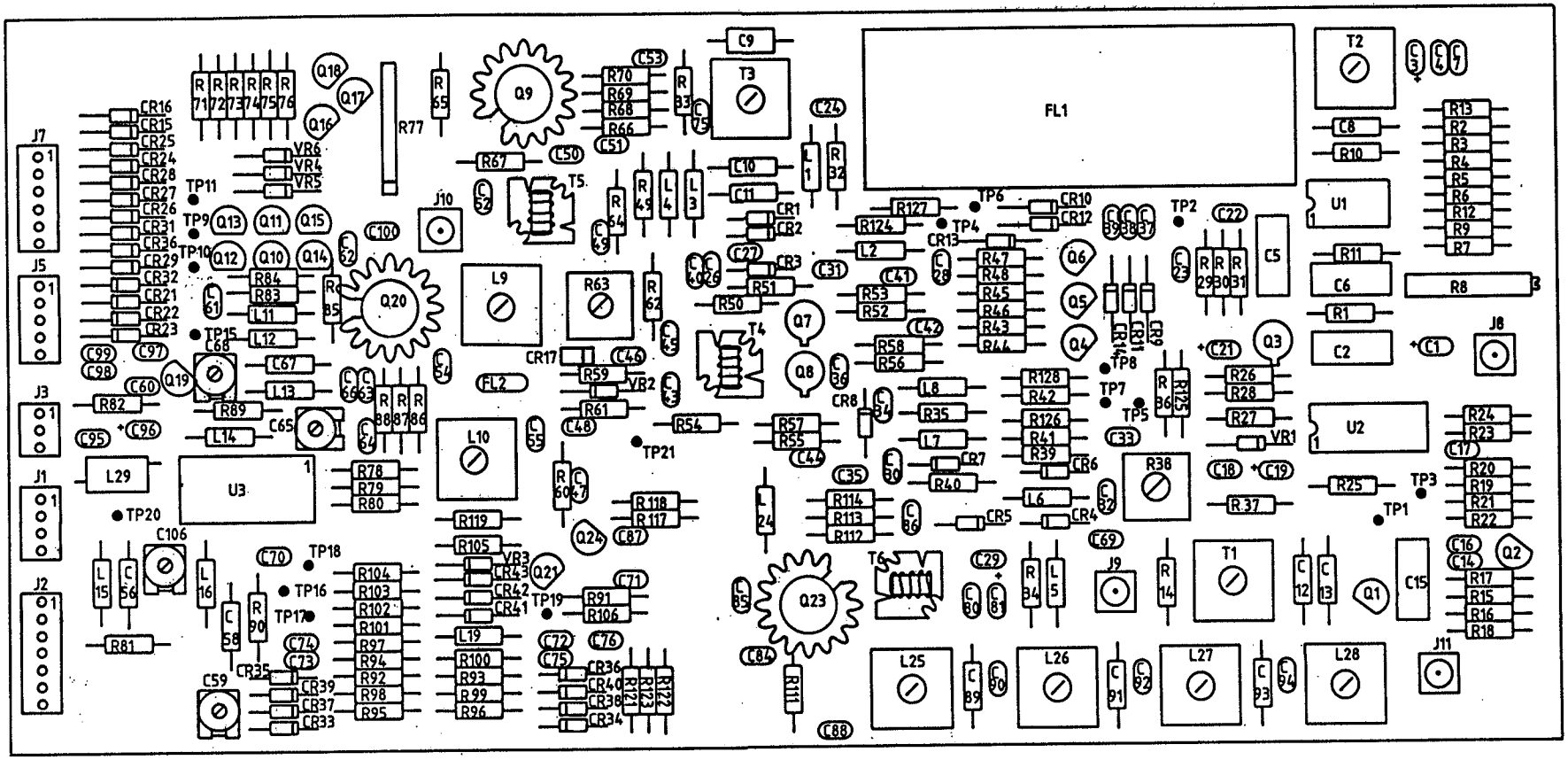

REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A
B REVISED 2.12.86 VH
To PSU
J3
+15V
GND
+45V
9
L1
L2
C31 10n
C32 100µ
C33 220n
Q31 2N2219
Q30 2N2222
Q32 2N2222
Q29 2N2222
R115 100R
R116 620R
R118 10K
C34 1µ
C35 10n
C36 1n
R120 47K
VR2 12V
R117 10K
R119 12K
TP12 24V
10
R83 130K
R84 154K
U5 LM311
R86 56K
CR17 1N4148
R85 18K2
2/C1
11
R87 10K
Q23 BC251
TP11
Rx=15V Tx=4V
R88 10K
R89 1K8
R90 1K8
R91 10K
Q24 BC251
Q25 BC251
Rx=0,7V Tx=3,7V
TP14
Q26 BC251
C50 680n
R92 1K
R96 3K3
R97 120K
Q27 BC547
12
R93 15K
R94 2K2
Q28 BC547
C37 1µ
CR18 1N4148
R95 10K
VR3 6V2
Antenna switch delay adjust
R98 500K
R99 1K3
TP13
C38 220n
R100 10K
R135 3K
U6 555
C40 10n
C39 4µ8
CR27 1N4148
R106 10K
R104 10K
R108 27K
R107 27K
Q33 BC547
Q34 BC547
R105 1K
CR19 1N4148
R111 10K
R113 10K
R109 1K
R101 100R
R102 2K2
R103 15K
TP15
TP16
J11 AF from RX
J10 AF to handset
U7 4066
C41 10µ
CR20 1N4148
Q36 BC547
R136 47K
R112 10K
R110 1K
R114 10K
Q35 BC547
C42 10µ
CR21 1N4148
CR22 1N4148
2/B4
2/B4
To front panel
J15
Handset key GND 3
Handset key 2
1
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 47 67 14
SCALE
SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	2.12.86	VH

FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 4767 14	SHEET 4
	SCALE			

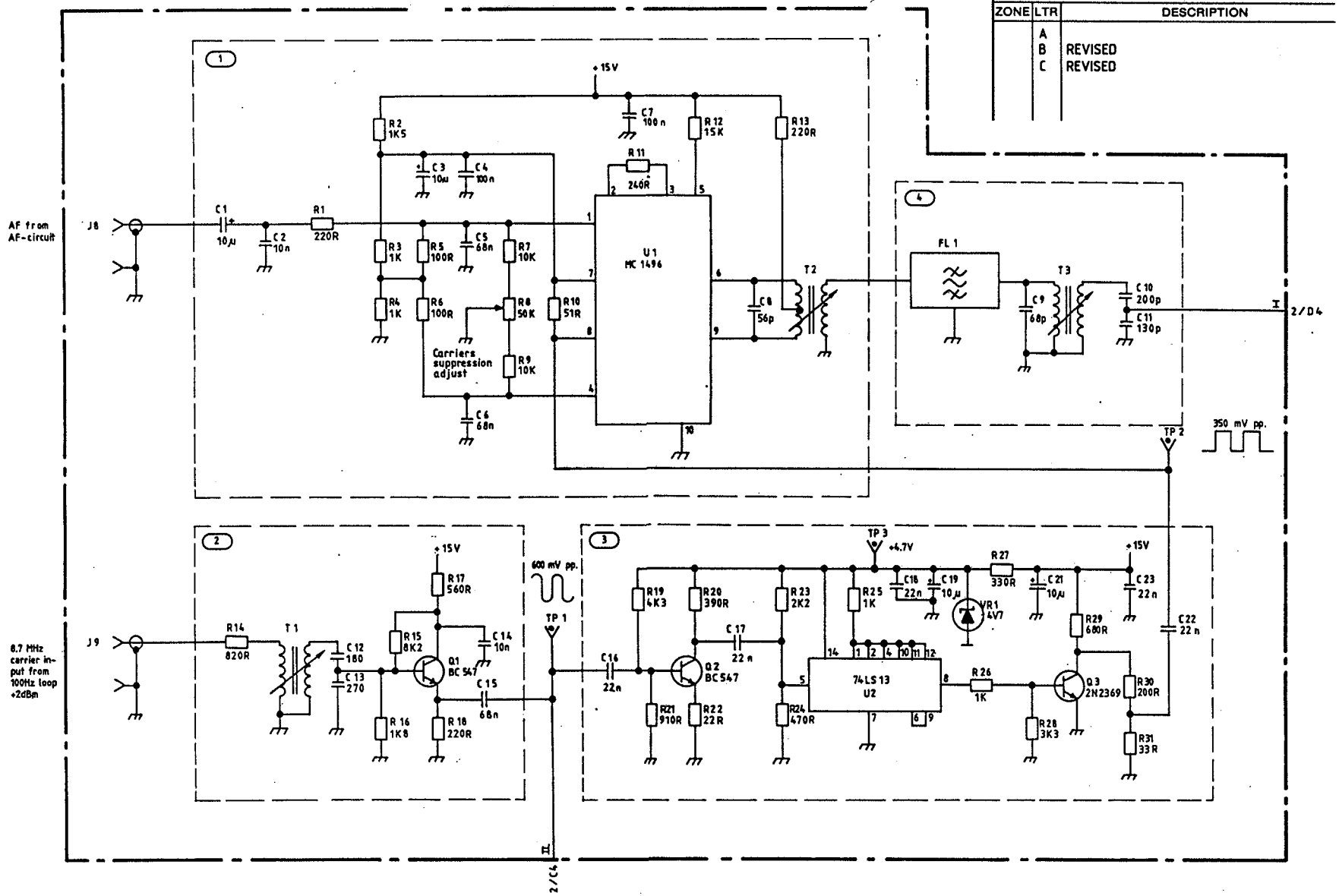


REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.8.87	VH



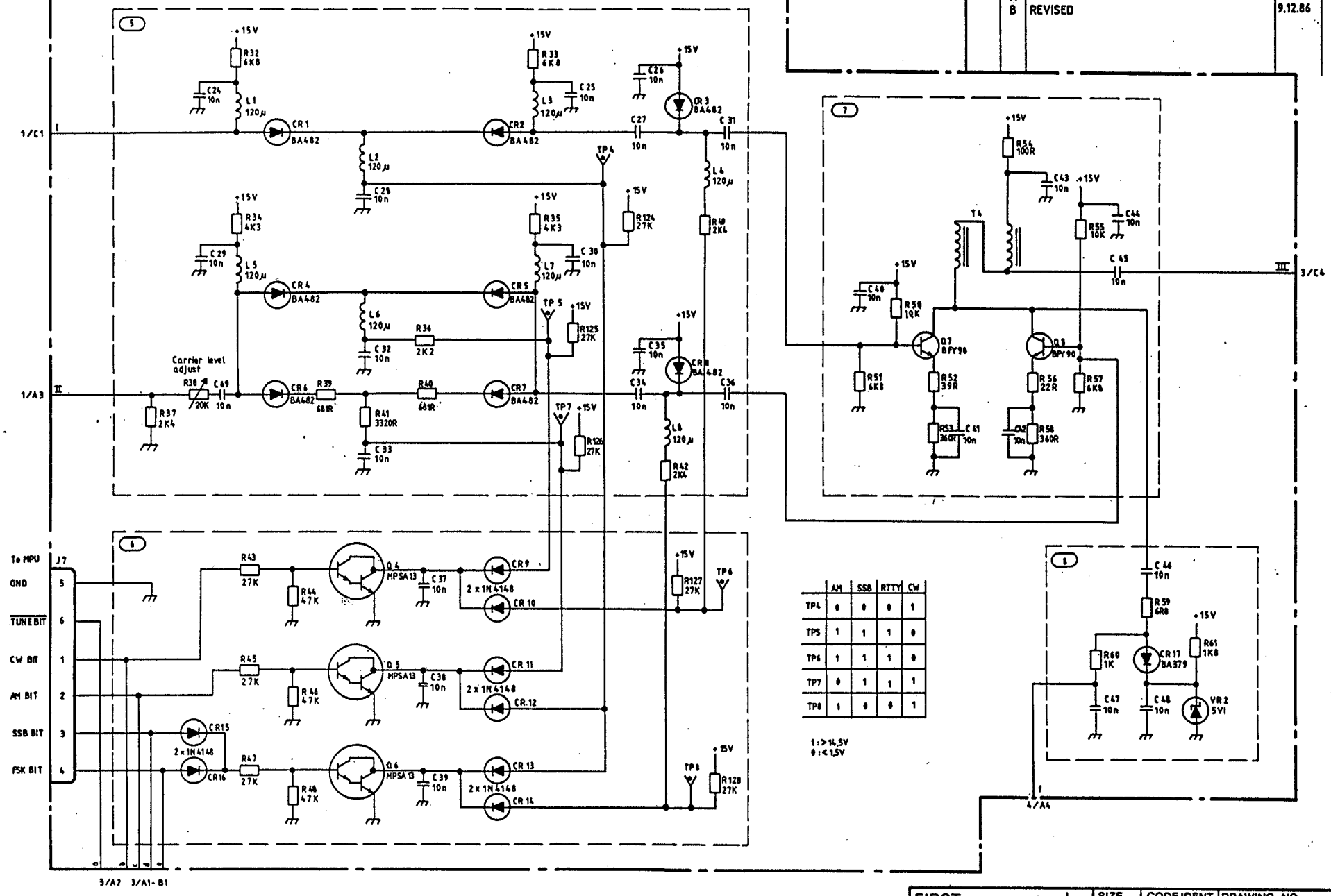
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
		ANGLES	DR. VH 5.12.86	TITLE COMPONENT LOCATION RF-CIRCUIT SE3000
		LIN. DIM.	CH.	
			AP.	
	SE3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 67 30
APPLICATION				SCALE 2:1 / SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	ATE	APPROVAL
	A			
	B	REVISED	9.12.86	VH
	C	REVISED	17.8.87	



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	Dansk Radio AS
		ANGLES	DR. V. H. 840703
		LIN. DIM.	CH.
			AP. 4/10-84
			AP.
47 78 77	SE 3000	MATERIAL	TITLE: RF - CIRCUIT SE3000
NEXT ASSY	USED ON		SIZE A2 | CODE IDENT | DRAWING NO. 47 67 30
APPLICATION		FIRST ANGLE PROJECTION	SCALE | SHEET 1 OF 5

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	9.12.86	VH

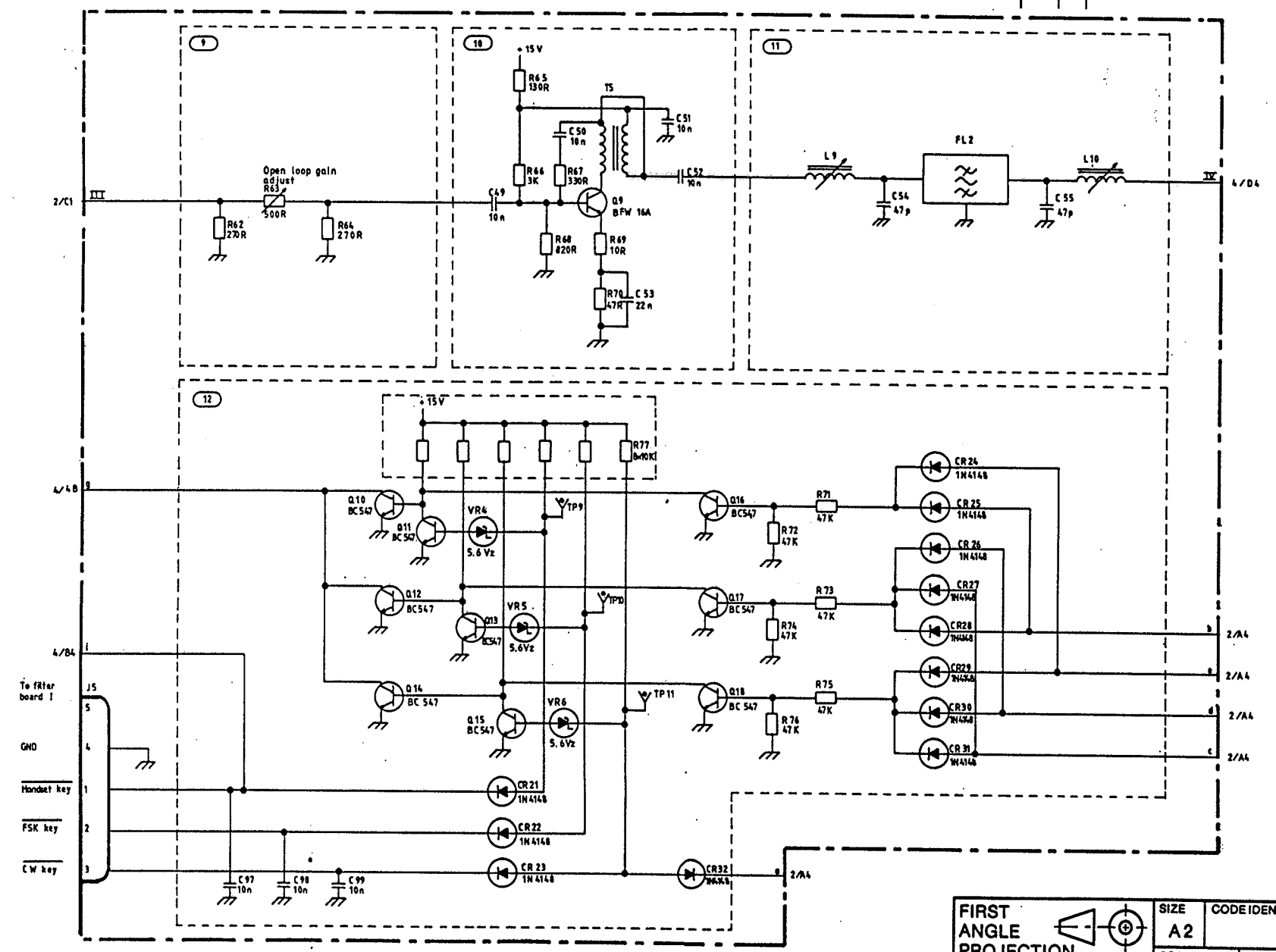


	AM	SSB	RTTY	CW
TP4	0	0	0	1
TP5	1	1	1	0
TP6	1	1	1	0
TP7	0	1	1	1
TP8	1	0	0	1

1 : > 14,5V
0 : < 1,5V

FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 67 30	
	SCALE			SHEET 2

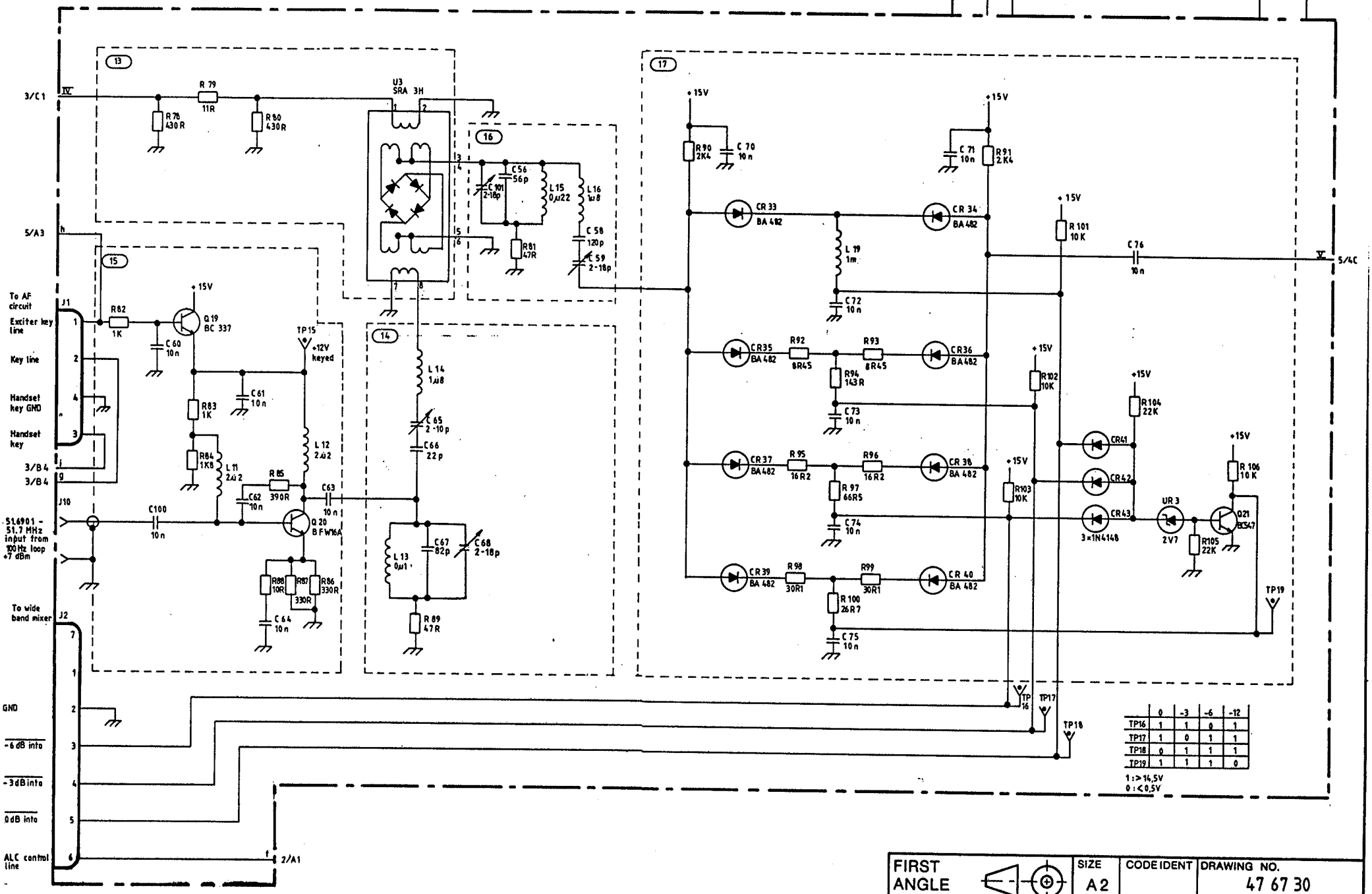
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	12.12.86	VH



TP9-TP10-TP11
KEYED 8,7V
UNKEYED 6,2V

FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 67 30
	SCALE		SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	12.12.86	VH
	C	REVISED	14.8.87	VH



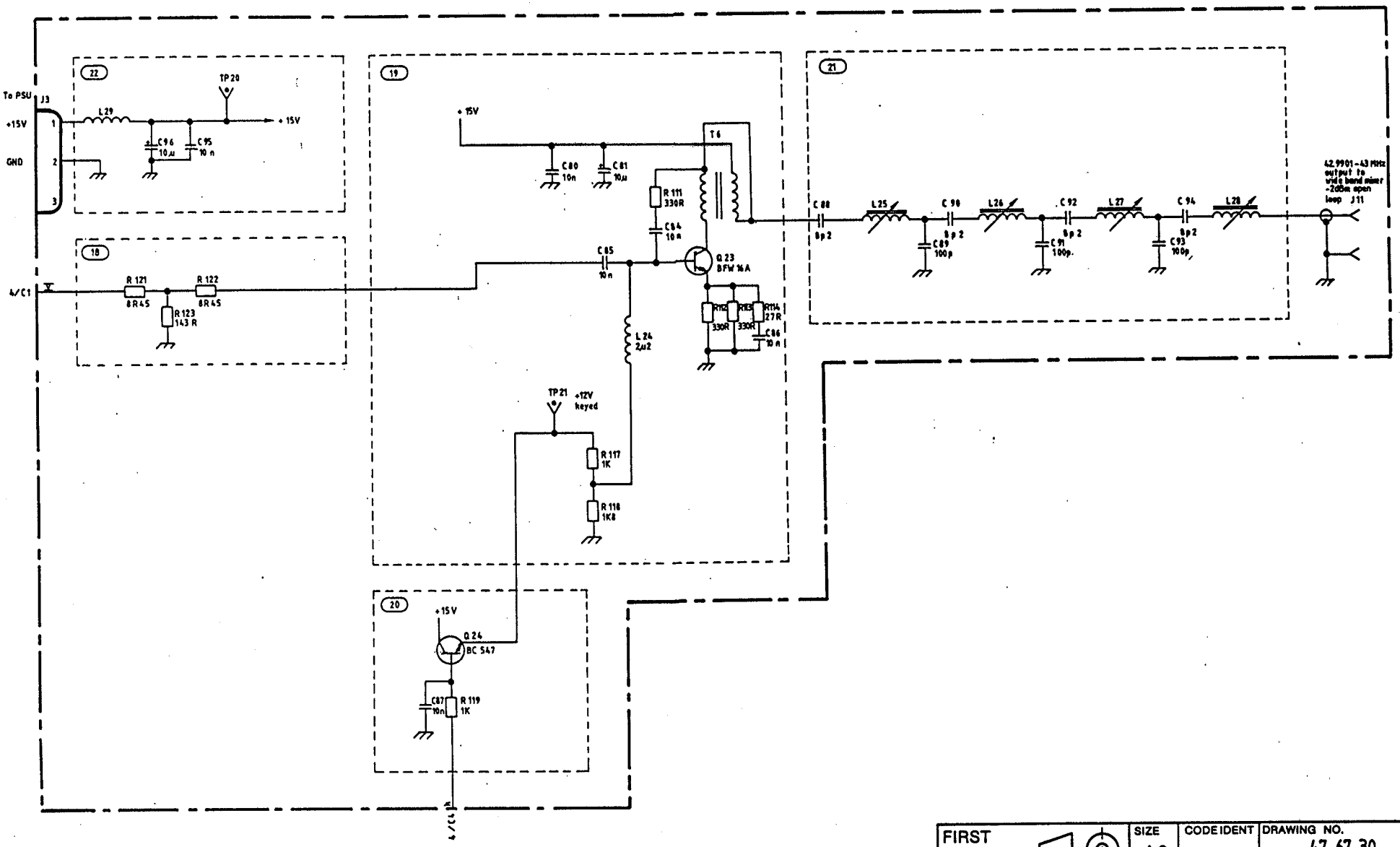
	0	-3	-6	-12
TP16	1	1	0	1
TP17	1	0	1	1
TP18	0	1	1	1
TP19	1	1	1	0

1 : > 14,5V
0 : < 0,5V

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 67 30
	SCALE		SHEET 4

11-6

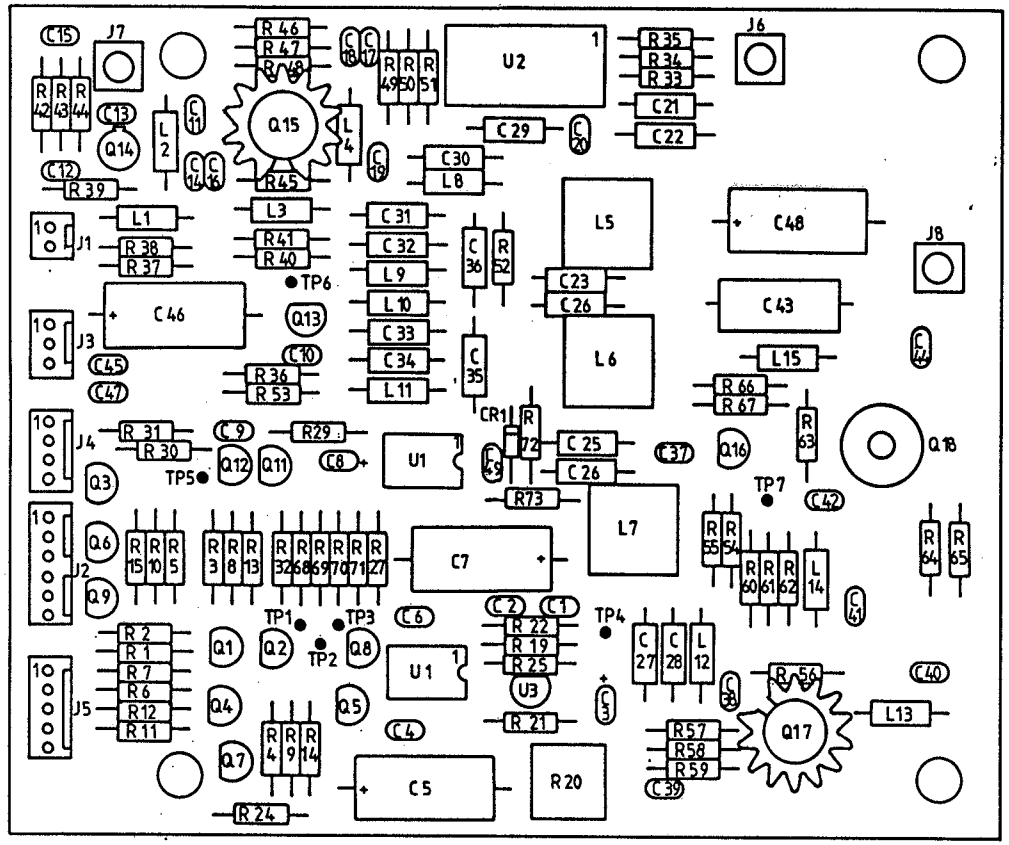
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	12.12.86	VH



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 67 30
	SCALE		SHEET 5

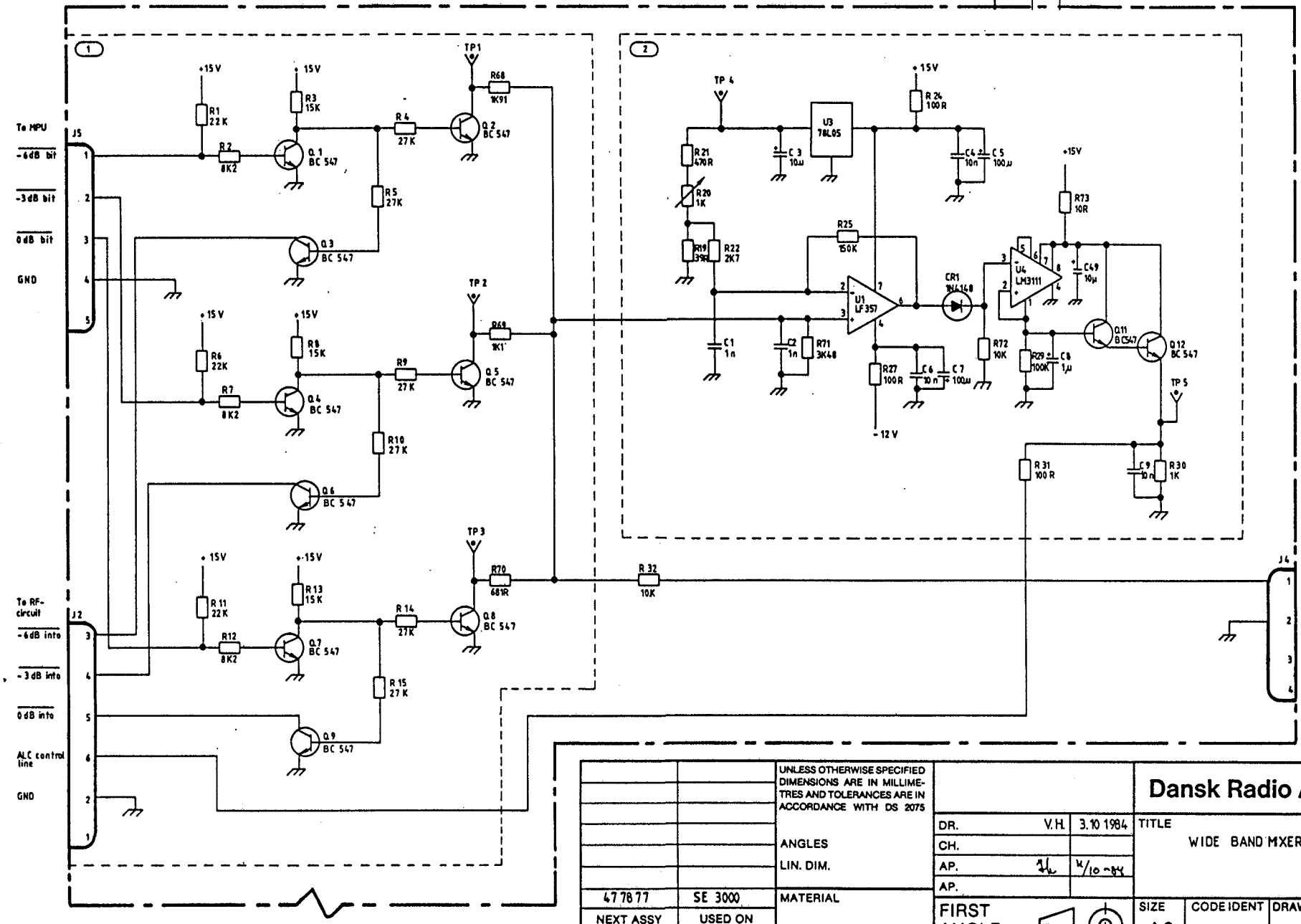
2-12

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH
	C	REVISED	7.7 1987	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 5.11 1984	TITLE COMPONENT LOCATION WIDE BAND MIXER	
		LIN. DIM.	CH.		
			AP. 5.11.1984		
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 67 57
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						

REVISIONS				
ZONE	LTR	DESCRIPTION		APPROVAL
	A			
	B	REVISED	15.12.86	VH



477877	SE 3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

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

ANGLES

LIN. DIM.

DR.	V.H.	3.10 1984
CH.		
AP.		4/10-84
AP.		

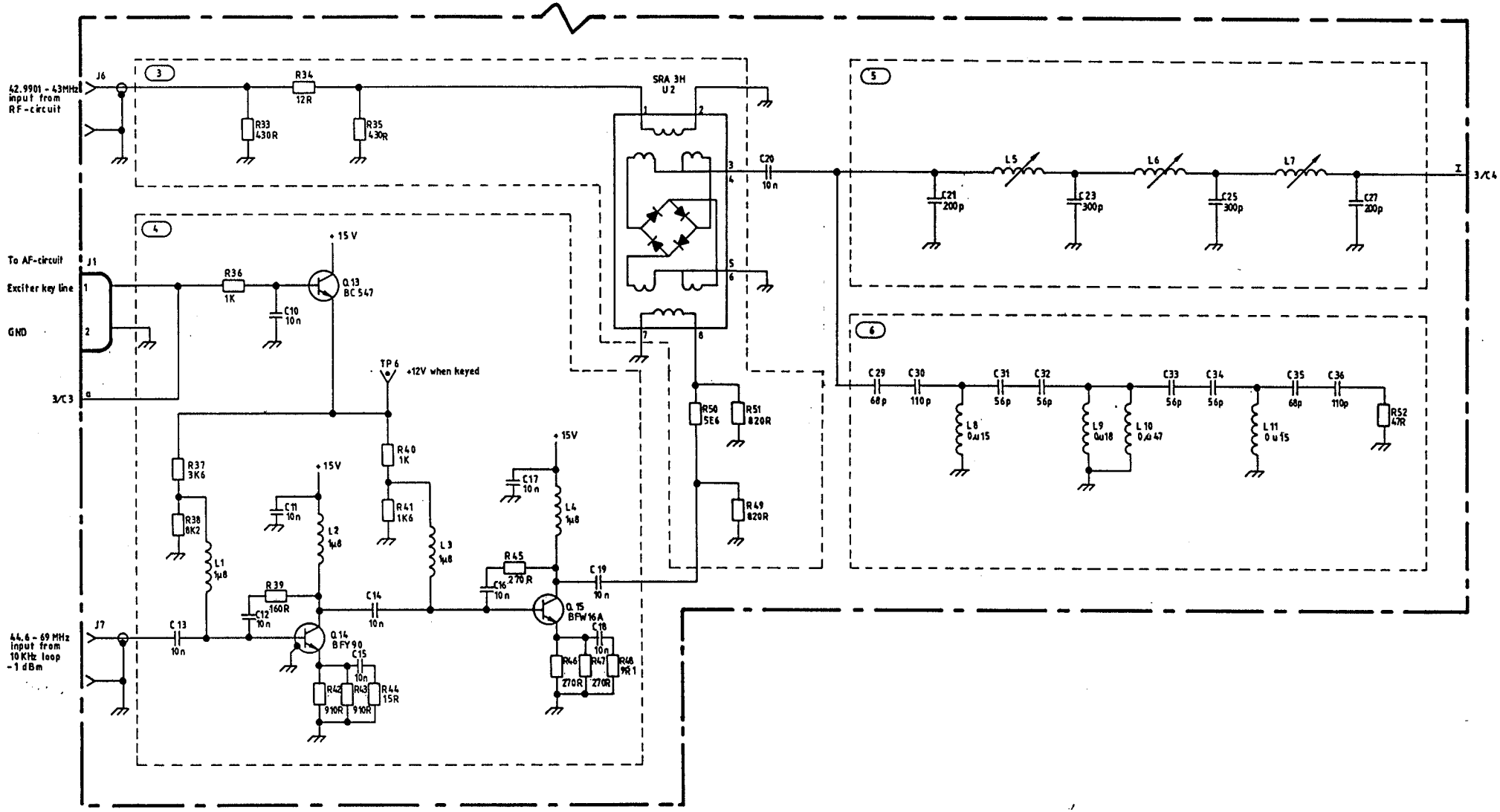
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE: WIDE BAND MXER

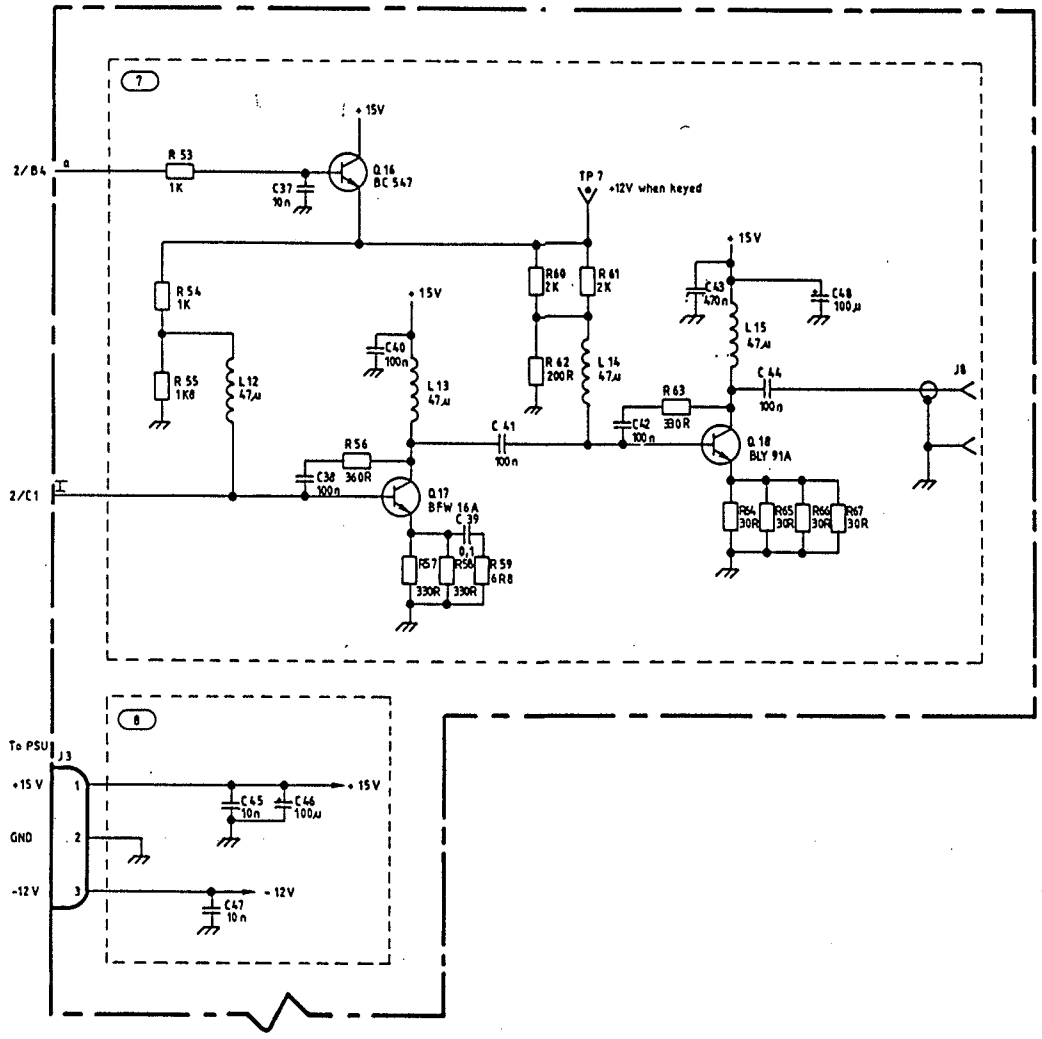
SIZE	CODE IDENT	DRAWING NO.
A2		47 67 57
SCALE		SHEET 1 OF 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH
	C	REVISED	14.8.87	VH



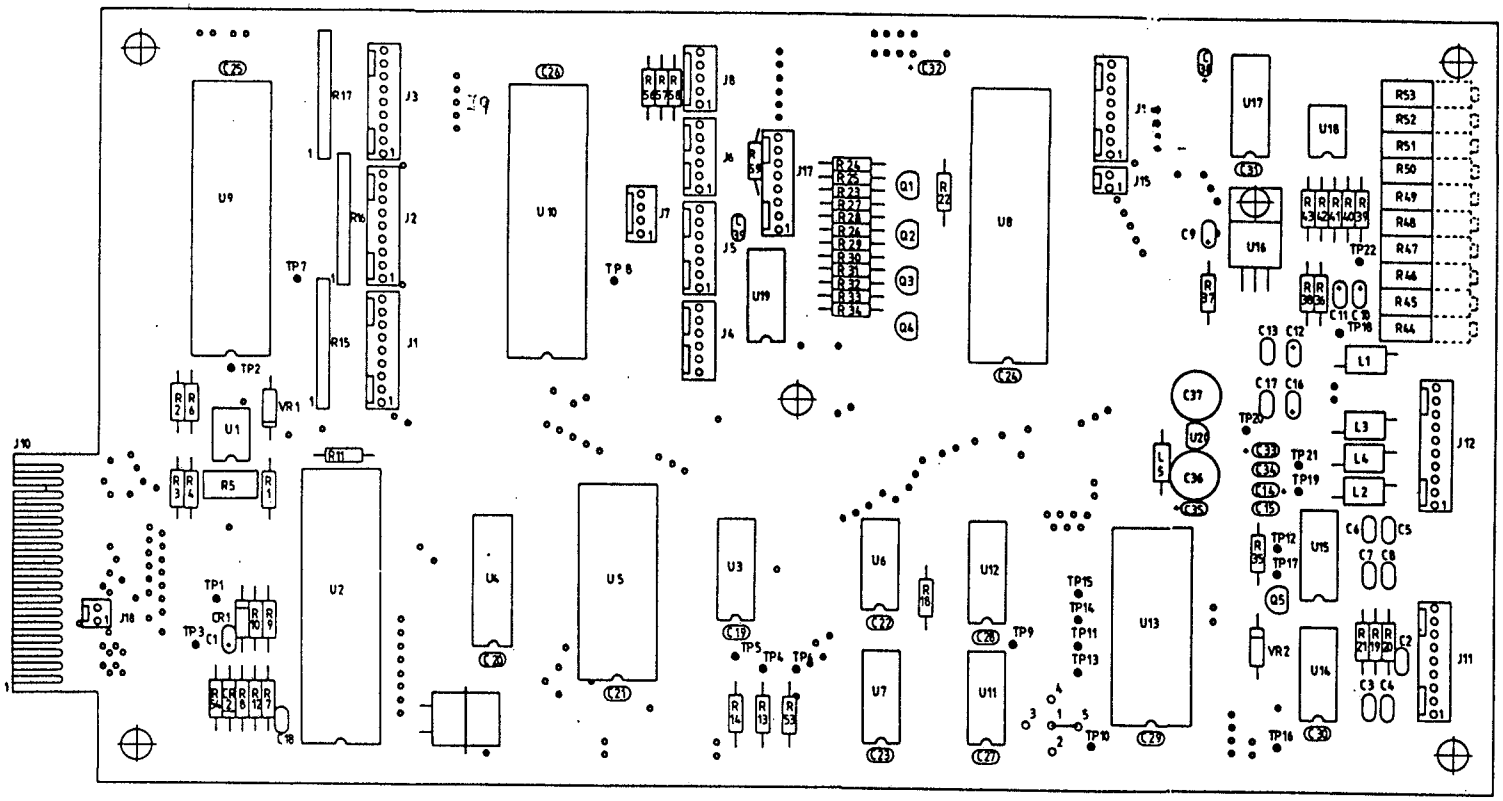
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		476757
	SCALE		SHEET 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH

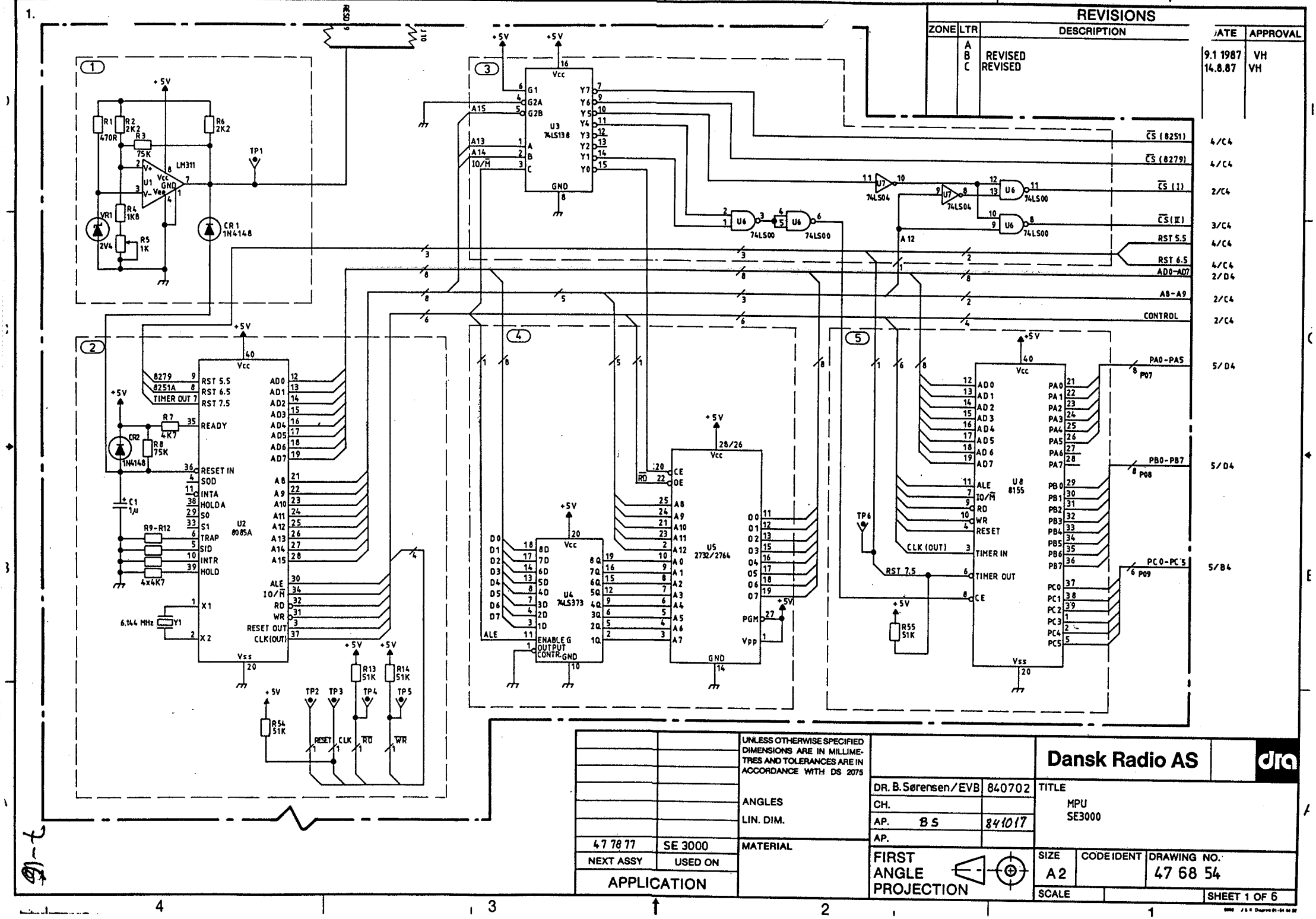


FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 67 57
	SCALE		SHEET 3

REVISIO				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised Revised	26 SEP 7.11.85	VH VH

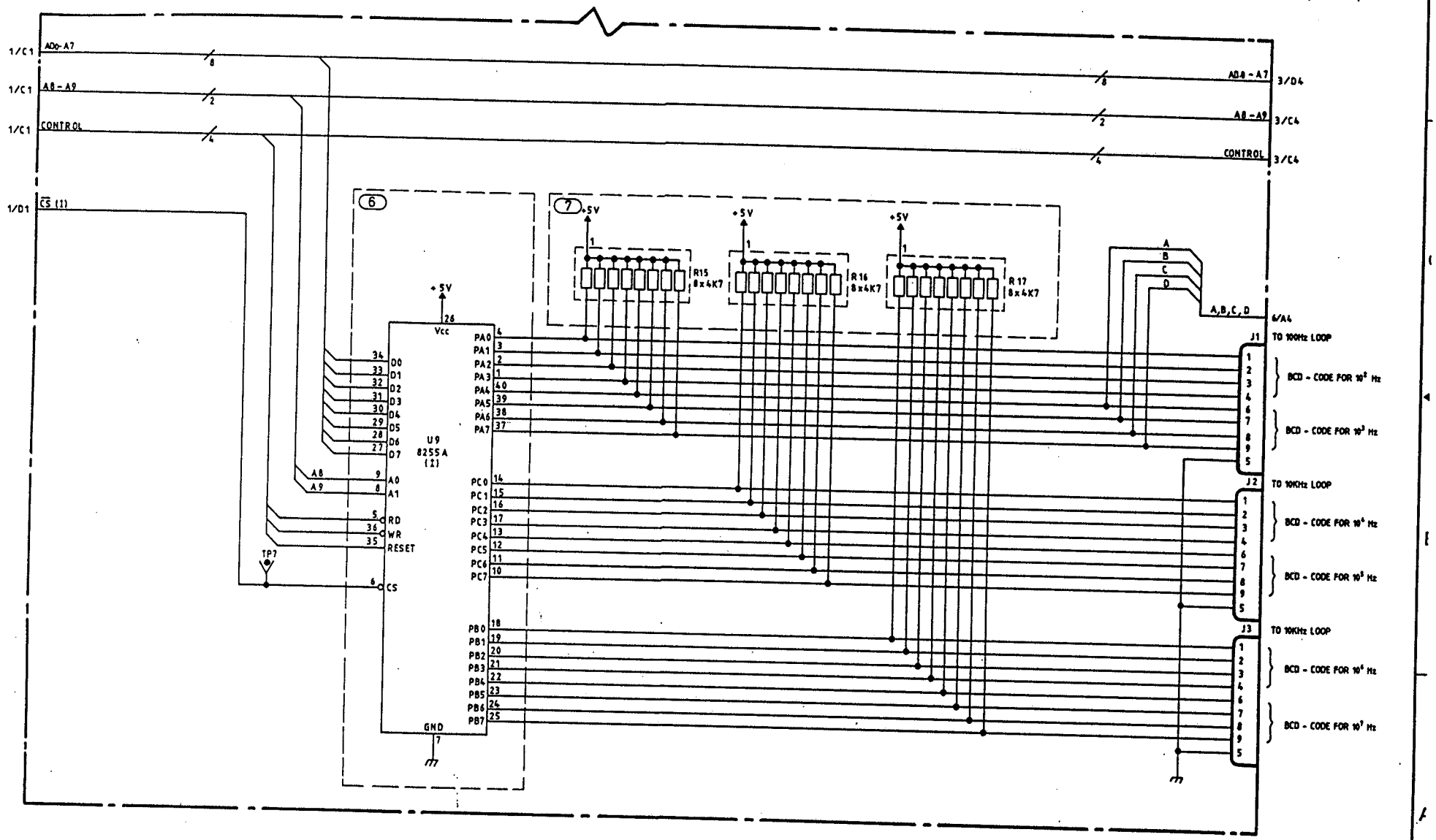


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3079		Dansk Radio AS	A
		ANGLES	DR. VH 25 10 1984	TITLE COMPONENT LOCATION MPU UNIT	
		LIN. DIM.	CH.		
			AP 85 841025		
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1	CODE IDENT	DRAWING NO. 47 68 54
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						



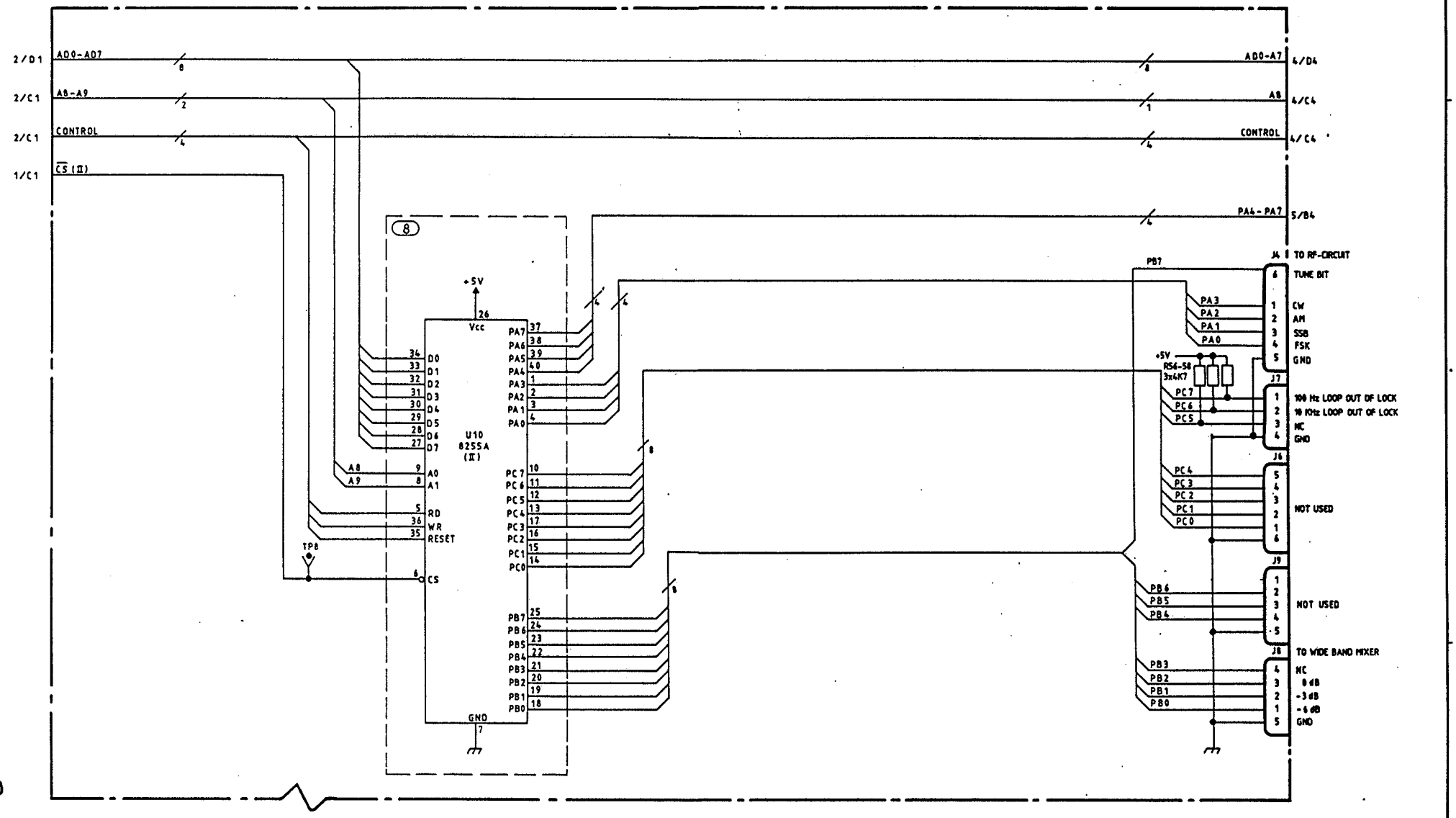
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	Dansk Radio AS
		ANGLES	DR. B. Sørensen/EVB 840702
		LIN. DIM.	CH.
			AP. BS 841017
			AP.
47 78 77	SE 3000	MATERIAL	TITLE: MPU SE3000
NEXT ASSY	USED ON		
APPLICATION		FIRST ANGLE PROJECTION	SIZE A2 · CODE IDENT · DRAWING NO. 47 68 54
			SCALE · SHEET 1 OF 6

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH



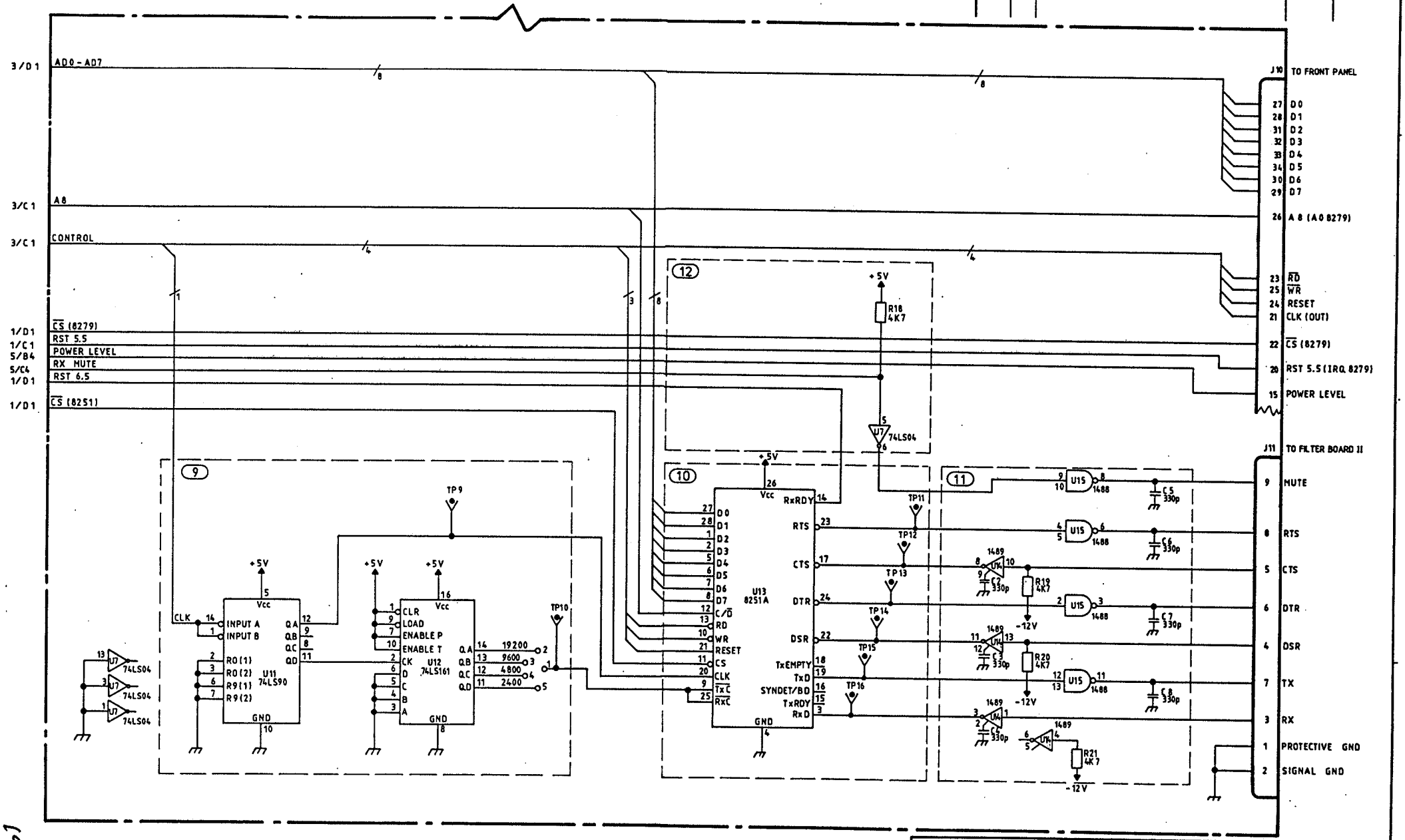
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 68 54
	SCALE		SHEET 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH



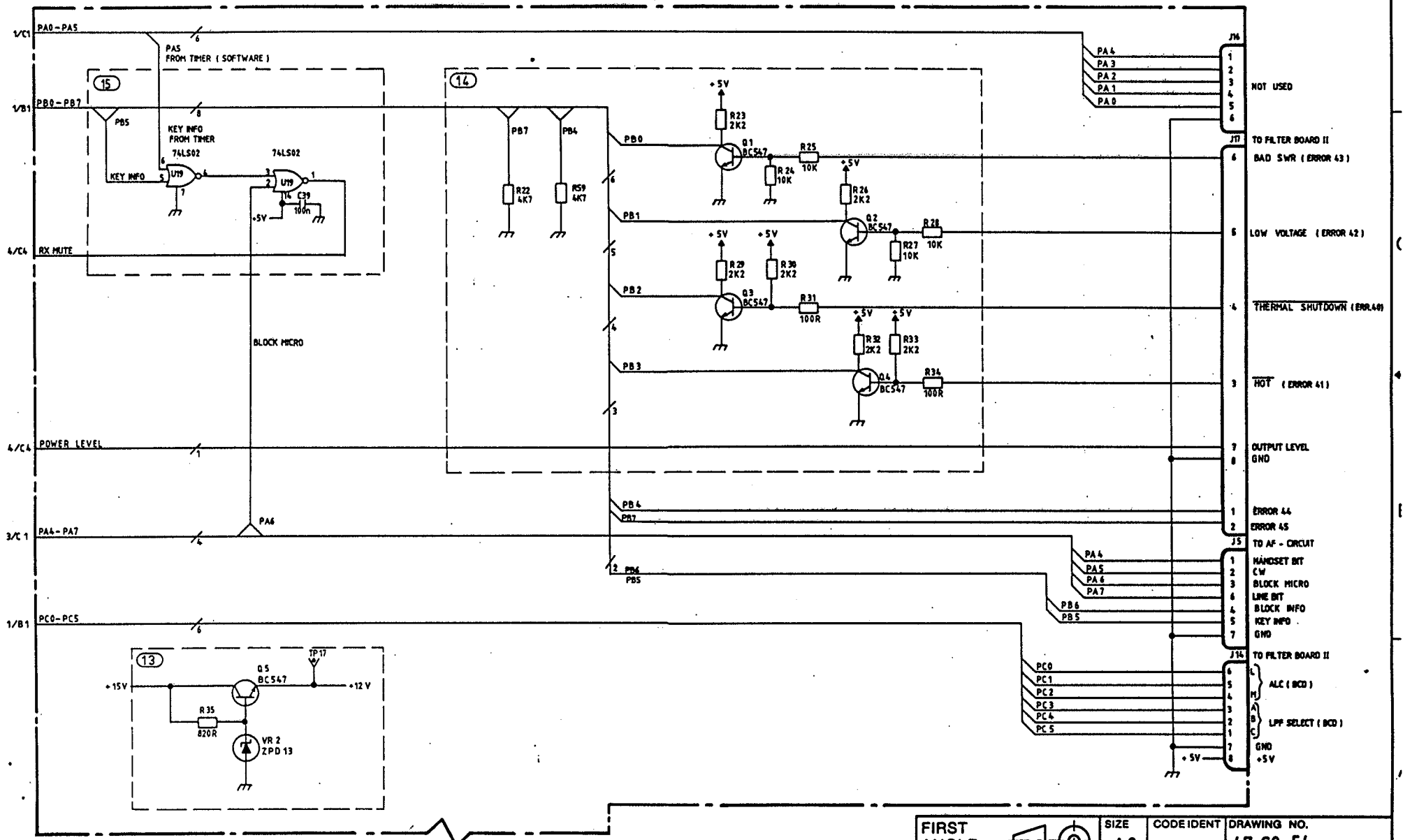
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 68 54
	SCALE		SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH
	C	REVISED	14.8.87	VH



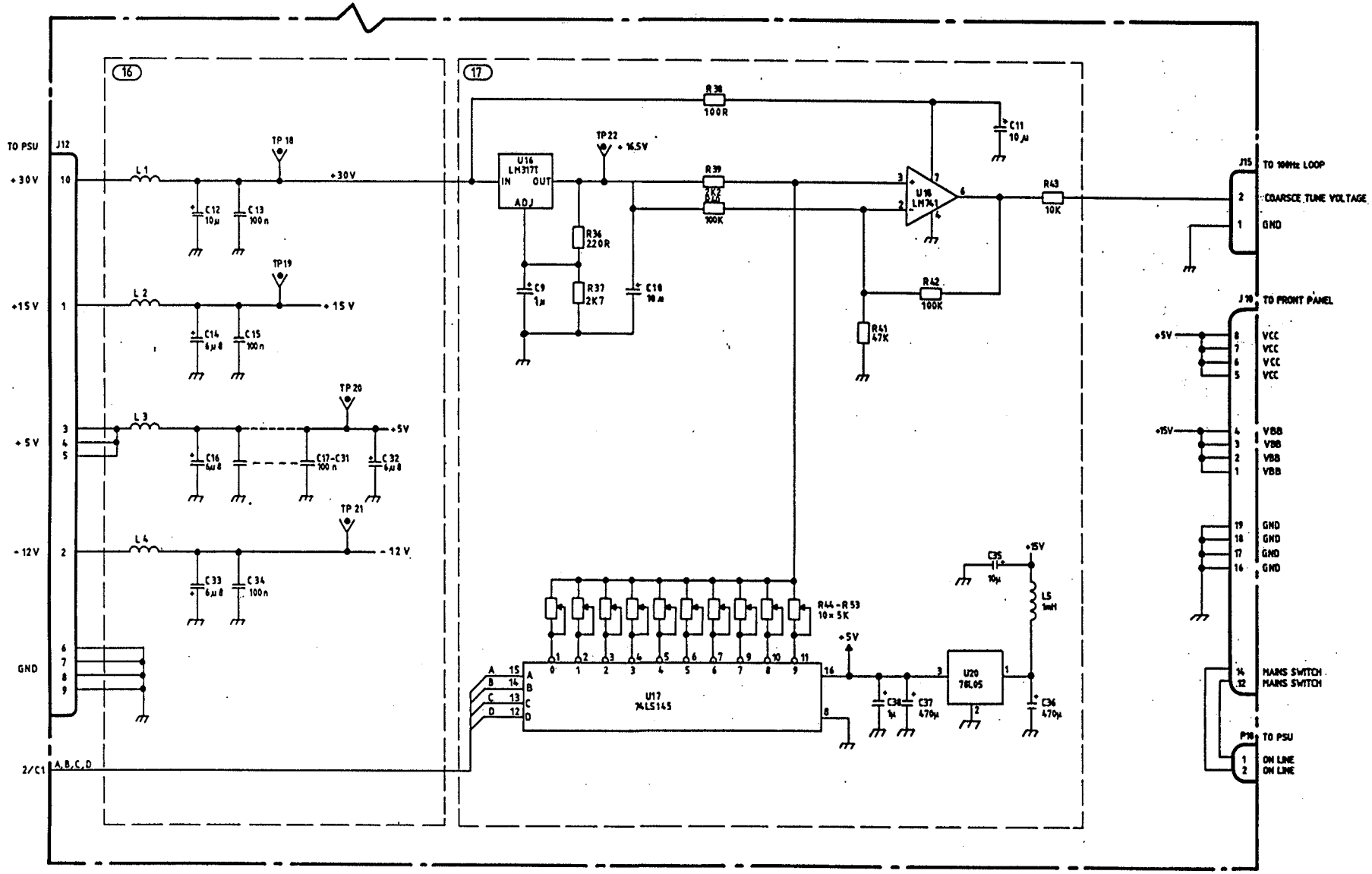
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 68 54
	SCALE		SHEET 4

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH
	C	REVISED	9.1 1987	VH



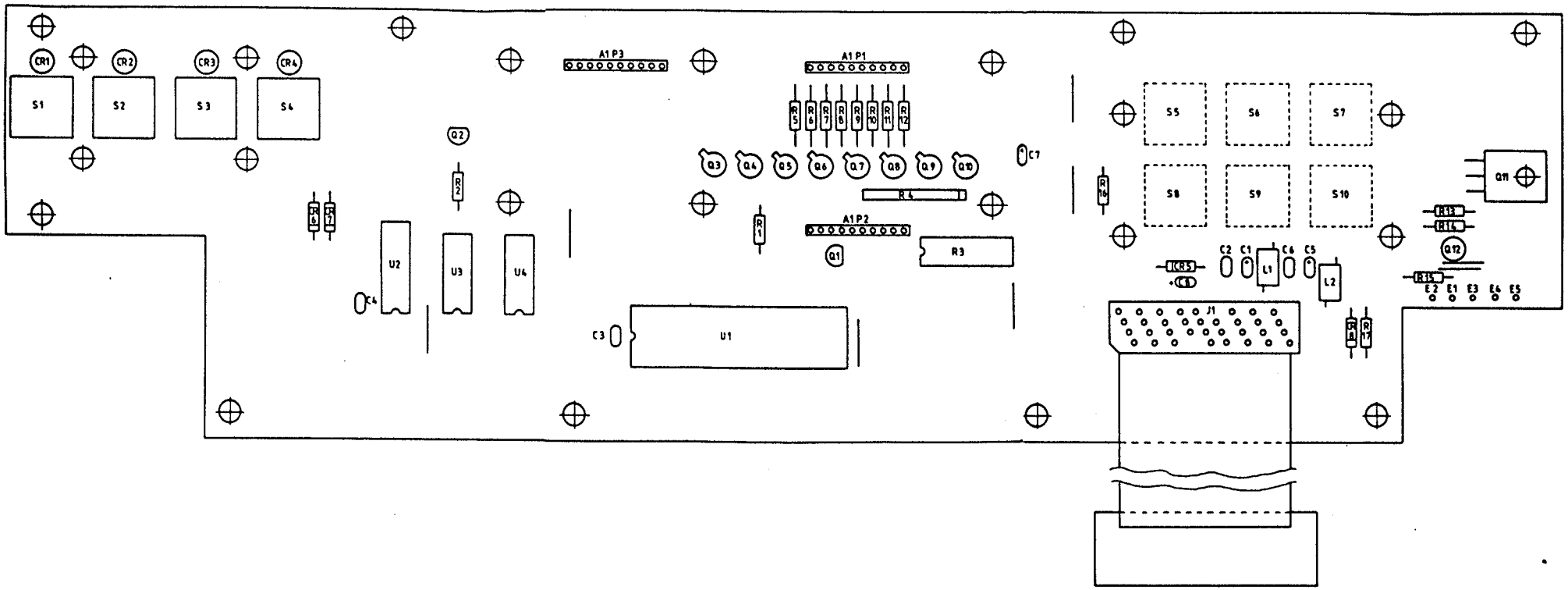
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 68 54
	SCALE		SHEET 5

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	15.12.86	VH
	C	REVISED	9.1 1987	VH

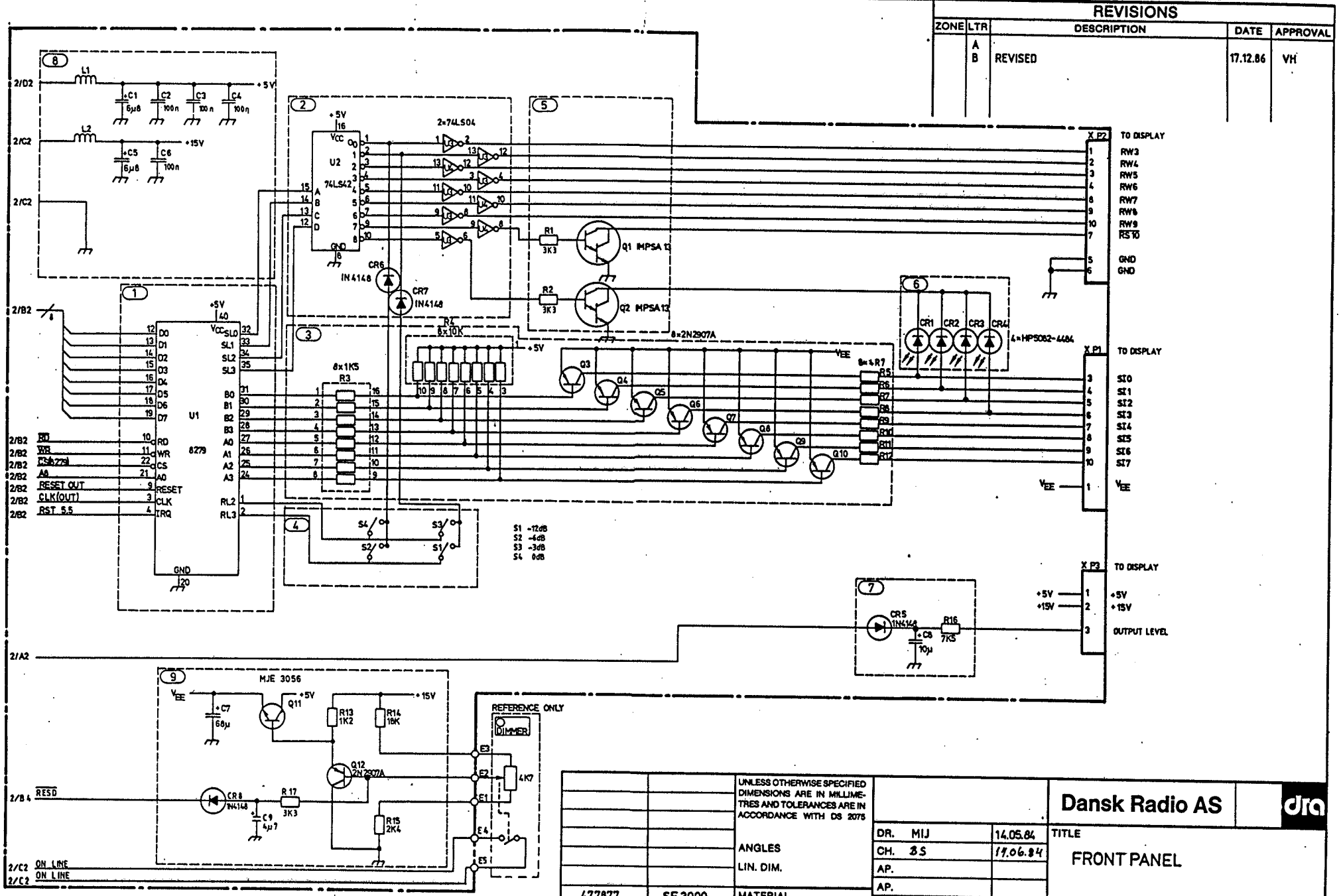


FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 68 54
	SCALE		SHEET 6

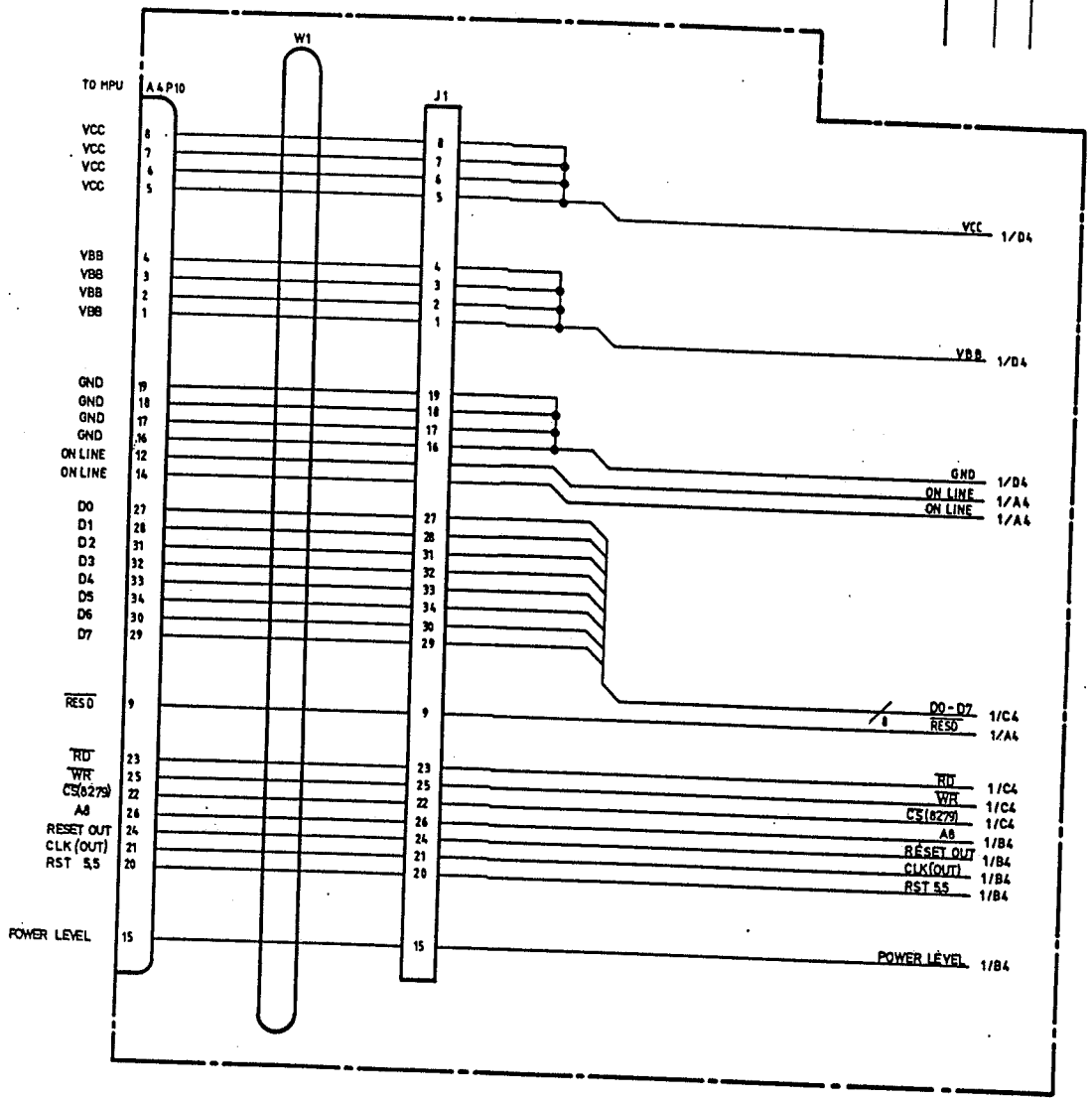
REVIS.				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3073		Dansk Radio AS	dra
		ANGLES	DR. V.H. 25.10.1984	TITLE COMPONENT LOCATION FRONTPANEL	
		LIN DIM.	CH		
			AP. BS 841026		
			AP.		
47 7877	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1	CODE IDENT DRAWING NO. 47 68 38
NEXT ASSY	USED ON			SCALE 2:1	SHEET 1 OF 1
APPLICATION					


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A
B REVISED 17.12.86 VH
TO DISPLAY
RW3
RW4
RW5
RW6
RW7
RW8
RW9
RST0
GND
GND
SI0
SI1
SI2
SI3
SI4
SI5
SI6
SI7
+5V
+15V
OUTPUT LEVEL
RESET OUT
CLK(OUT)
RST 5.5
ON LINE
ON LINE
REFERENCE ONLY
DIMMER
MJE 3056
2=74LS04
8=2N2907A
4=HP5082-4484
S1 -12dB
S2 -6dB
S3 -3dB
S4 0dB
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
477877 SE 3000
NEXT ASSY USED ON
APPLICATION
Dansk Radio AS
DR. MIJ 14.05.84
CH. BS 19.06.84
AP.
AP.
TITLE
FRONT PANEL
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 476838
SCALE
SHEET 1 OF 2

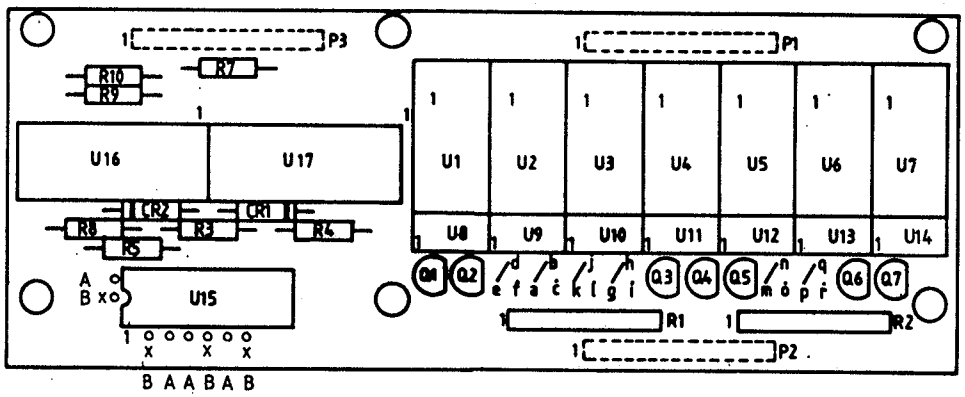
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.12.86	VH



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		476838
	SCALE		SHEET 2 of 2

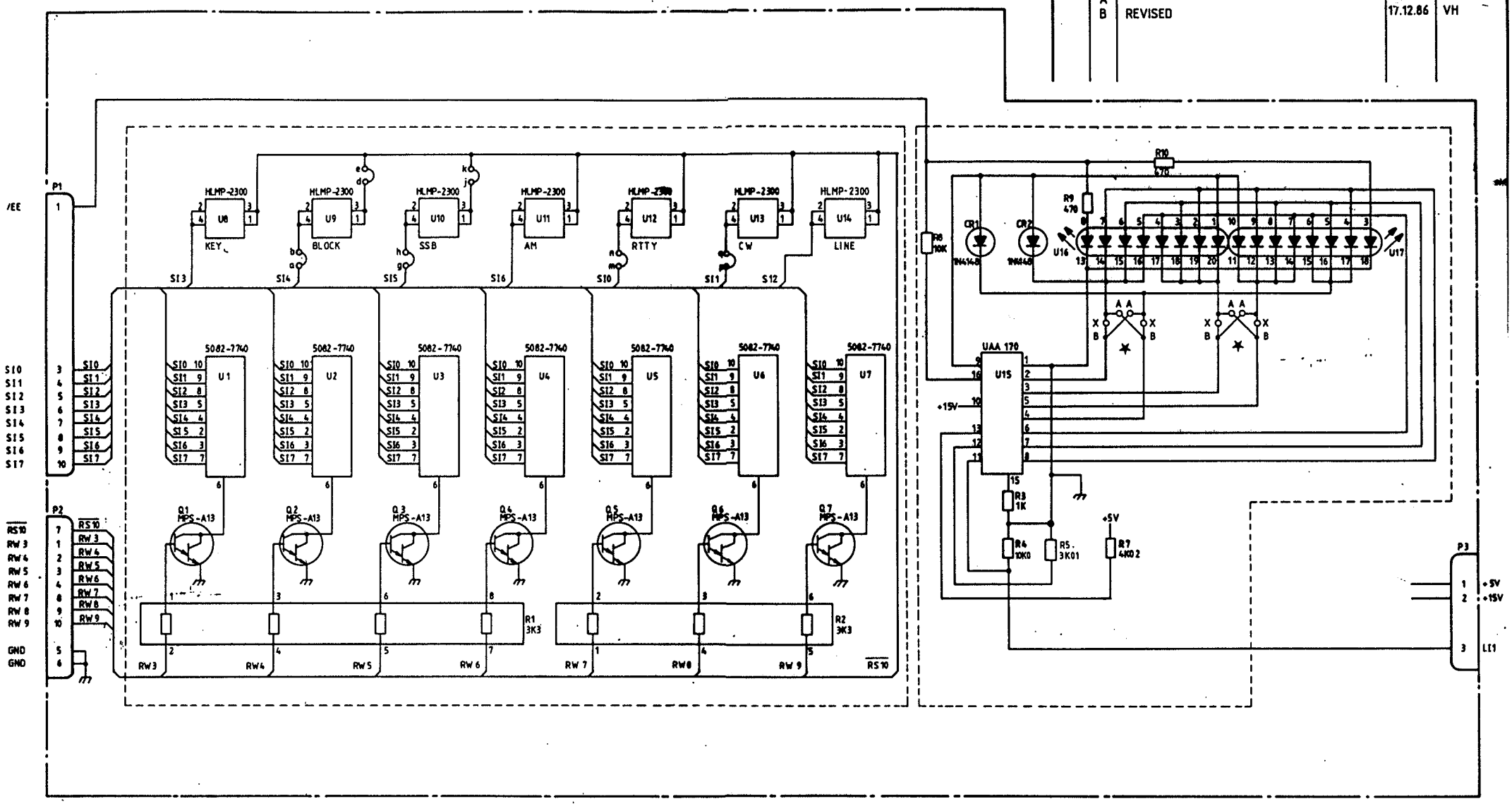
iennemplet q mærket med X udbores

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	12.6.86	V-H



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
		ANGLES	DR. V.H. 1.11 1984	TITLE
		LIN. DIM.	CH.	DISPLAY BOARD
			AP. 5/5-87	
47 68 38	SE 3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 82 29
APPLICATION				SCALE 2:1 / SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.12.86	VH



* : POINTS MARKED BY X , ARE BROKEN

47 68 38	SE 3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

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

ANGLES

LIN. DIM.

DR.	V.H.	1.11 1984
CH.		
AP.	BS	841102
AP.		

FIRST ANGLE PROJECTION

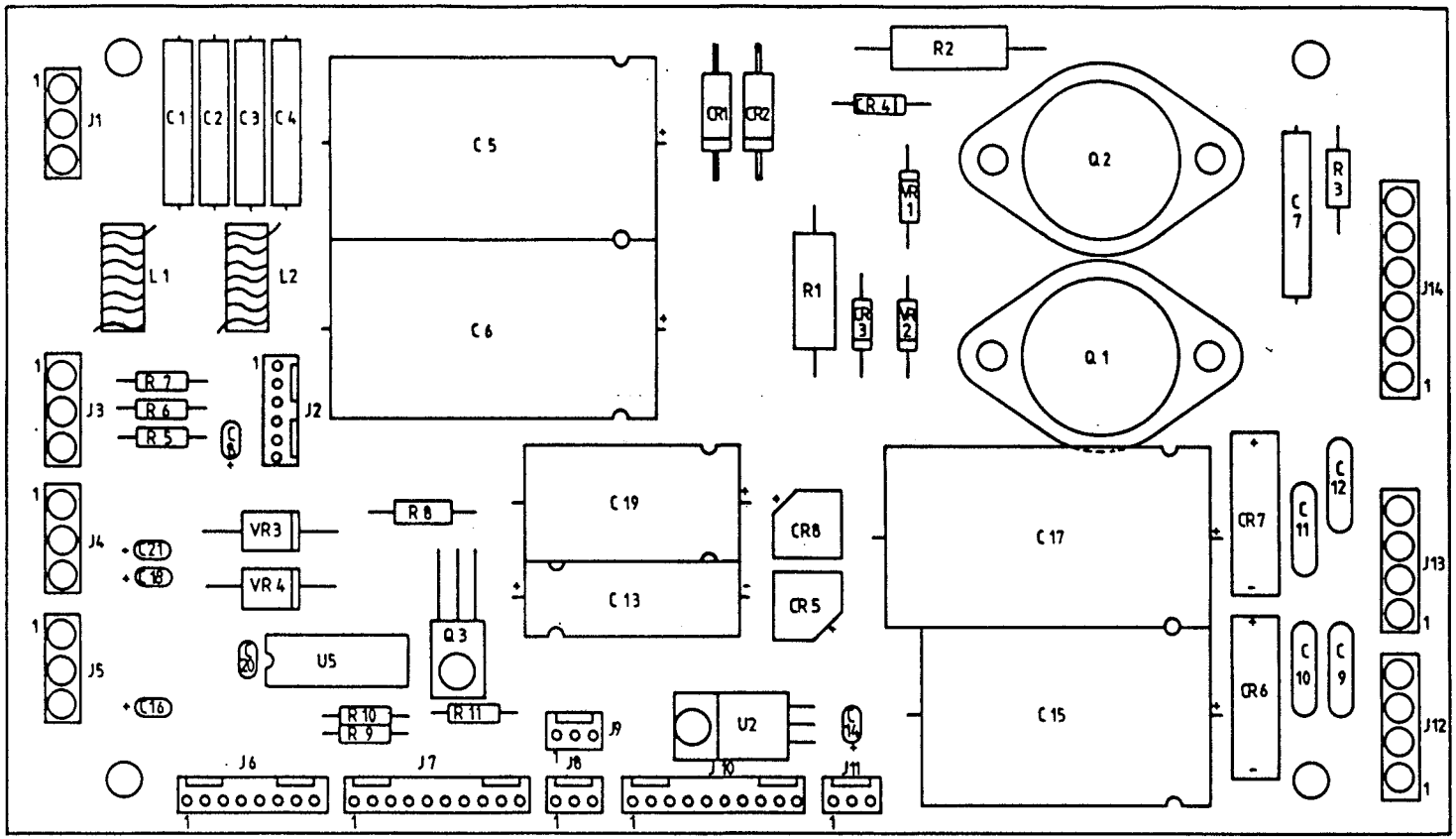
Dansk Radio AS

TITLE: DISPLAY BOARD

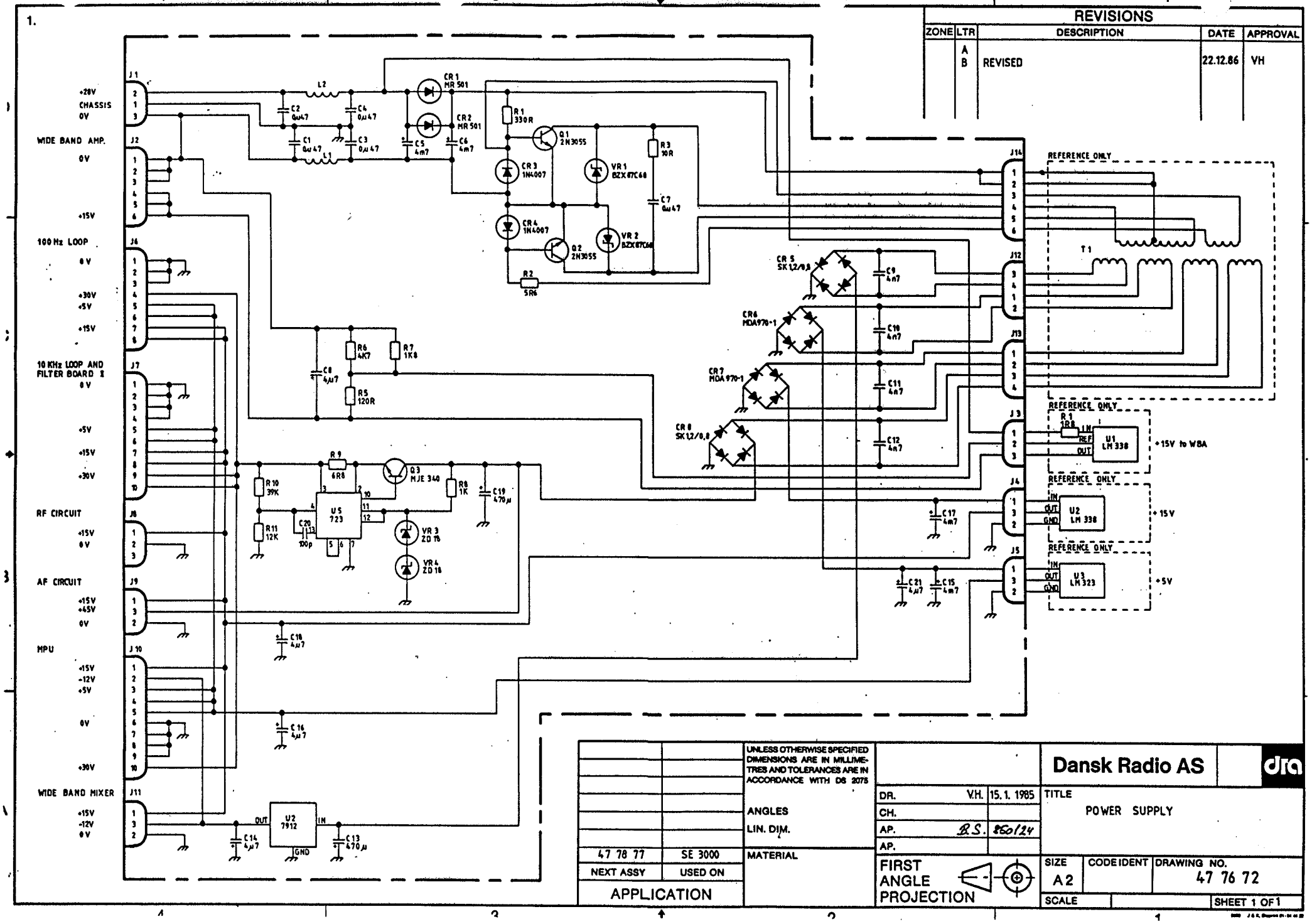
SIZE	CODE IDENT	DRAWING NO.
A2		47 82 29

SCALE | SHEET 1 OF 1

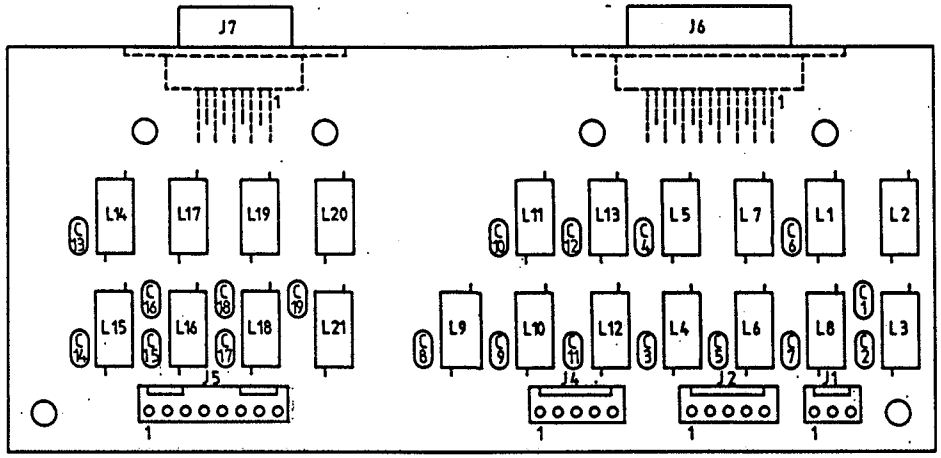
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		REVISED	10.6.86	V.H.



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			**Dansk Radio AS**	dra
		ANGLES	DR. V. H.	20.11 1984	TITLE	
		LIN. DIM.	CH.		POWER SUPPLY	
			AP. BS	841123		
			AP.			
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION		SIZE A2	CODE IDENT	DRAWING NO. 47 76 72
NEXT ASSY	USED ON				SCALE 2:1		SHEET 1 OF 1
APPLICATION							


REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A
B REVISED 22.12.86 VH
+28V
CHASSIS
0V
WIDE BAND AMP.
0V
+15V
100 Hz LOOP
0 V
+30V
+5V
+15V
10 KHz LOOP AND FILTER BOARD I
0 V
+5V
+15V
+30V
RF CIRCUIT
+15V
0 V
AF CIRCUIT
+15V
+45V
0V
MPU
+15V
-12V
+5V
0V
+30V
WIDE BAND MIXER
+15V
-12V
0 V
REFERENCE ONLY
+15V to WBA
+15V
+5V
T1
47 78 77
SE 3000
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. V.H. 15. 1. 1985
CH.
AP. B.S. 860124
AP.
FIRST ANGLE PROJECTION
Dansk Radio AS
TITLE
POWER SUPPLY
SIZE A2
CODE IDENT
DRAWING NO. 47 76 72
SCALE
SHEET 1 OF 1

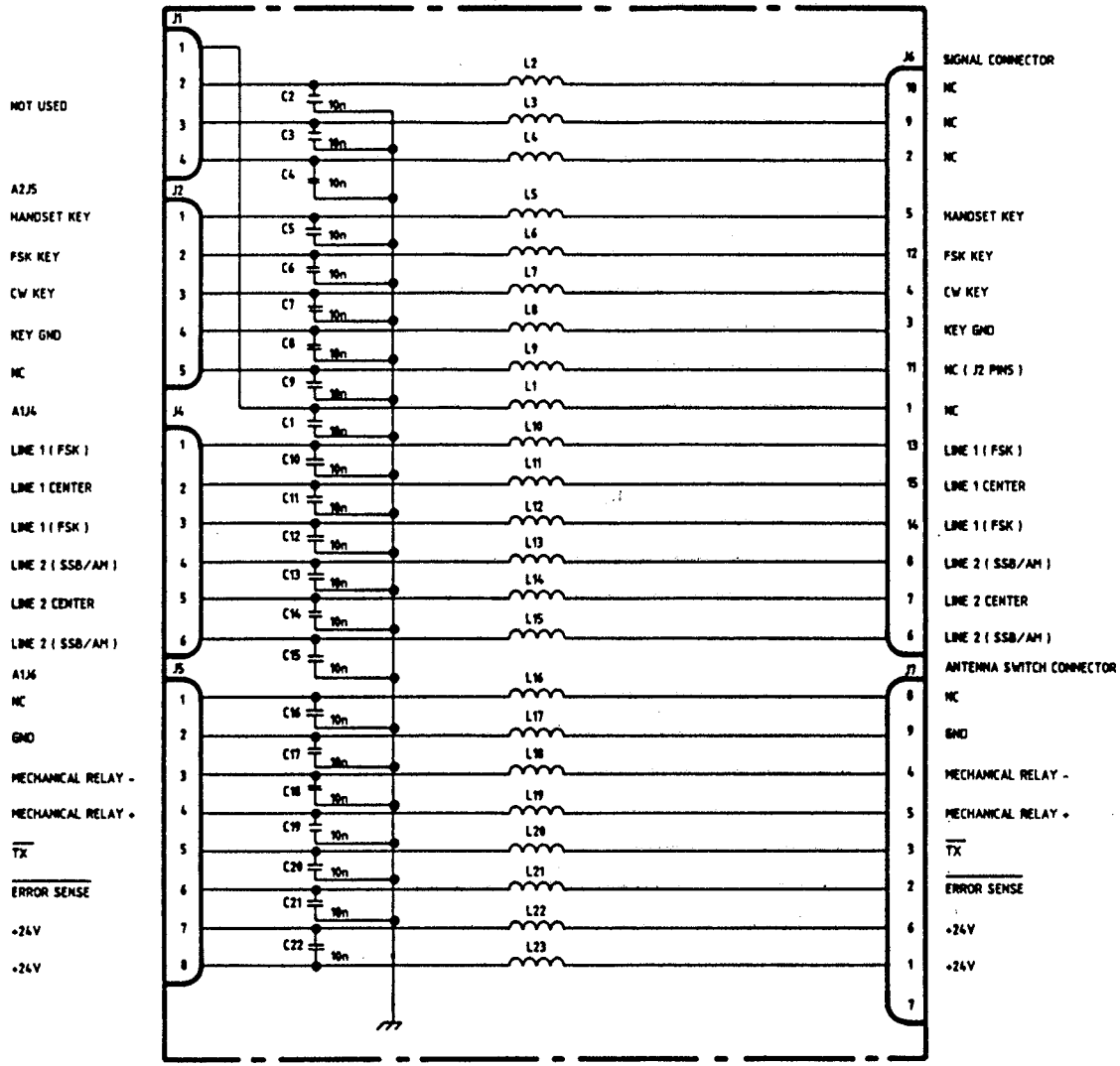
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. V.H. 21.11.1984	TITLE FILTERBOARD I	
		ANGLES	CH.		
		LIN. DIM.	AP. BS 841123		
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 76 05
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						

1.

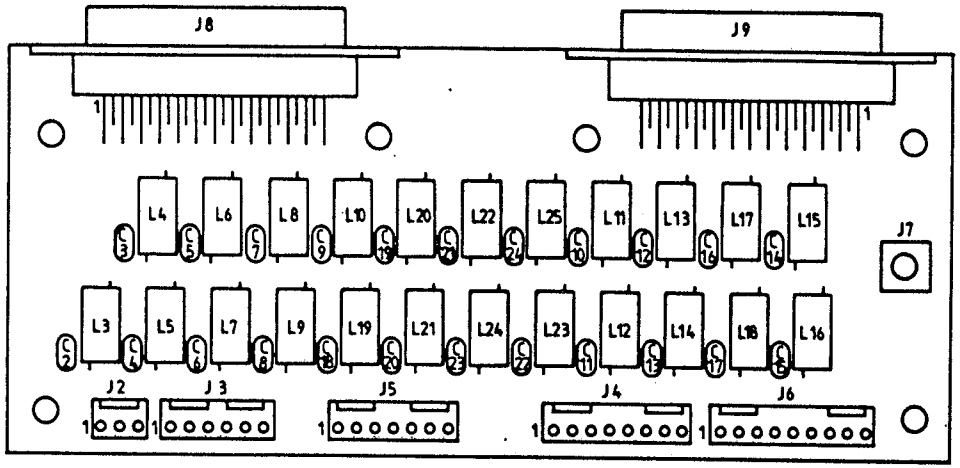
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
			DR. VH 30.6 1986	TITLE
		ANGLES	CH.	FILTER BOARD I
		LIN. DIM.	AP. 7.8.1986	
			AP.	
47 78 77	SE3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 76 05
NEXT ASSY	USED ON			SCALE / SHEET 1 OF 1
APPLICATION				

4 3 2 1

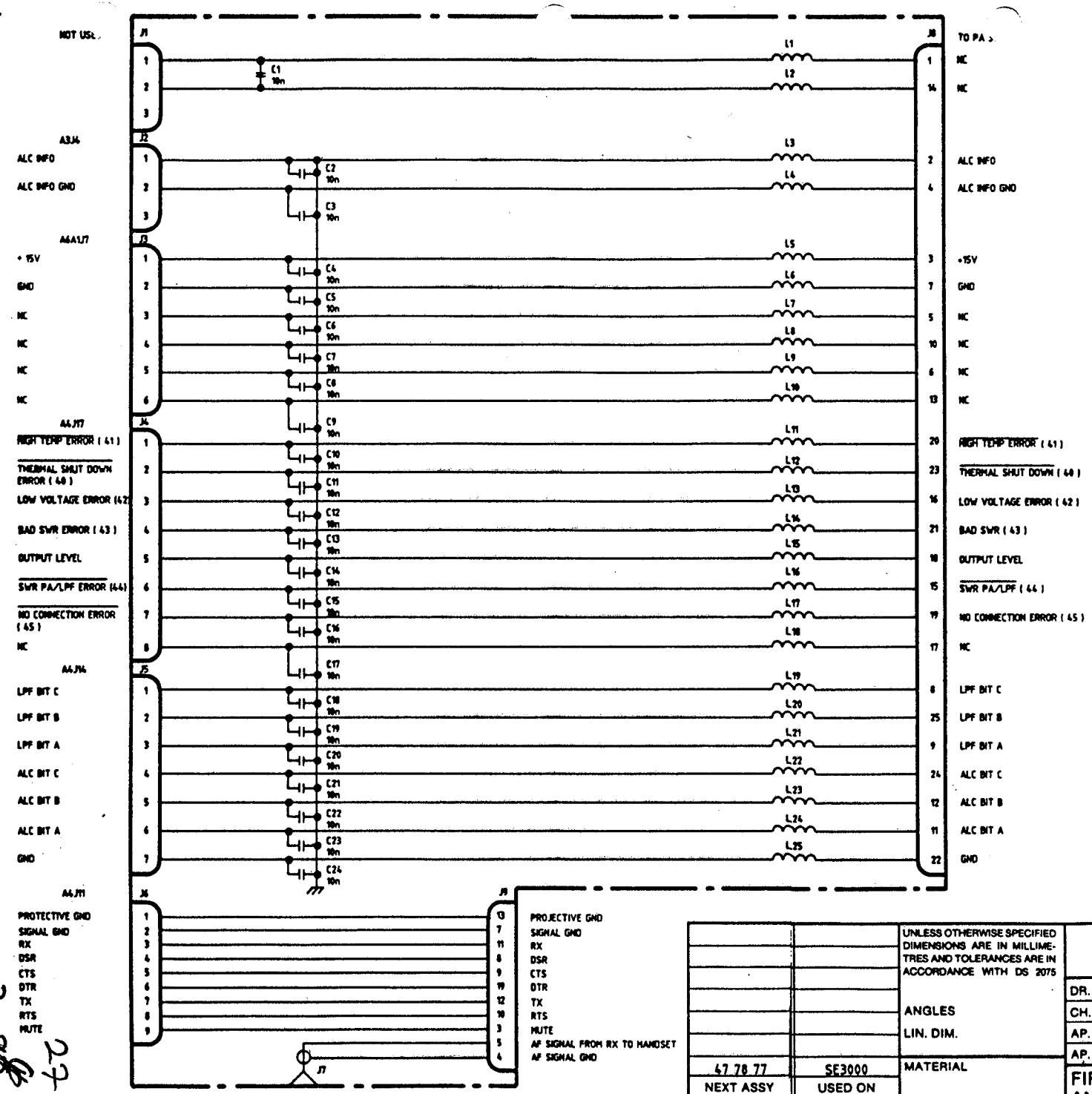
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		**Dansk Radio AS**	dra
		ANGLES	DR. V.H. 20.11 1984	TITLE FILTERBOARD II	
		LIN. DIM.	CH.		
			AP. BS 841123		
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 47 76 21
NEXT ASSY	USED ON			SCALE 2:1	SHEET 1 OF 1
APPLICATION					

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



47 78 77	SE3000
NEXT ASSY	USED ON
APPLICATION	

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

ANGLES

LIN. DIM.

MATERIAL

FIRST ANGLE PROJECTION

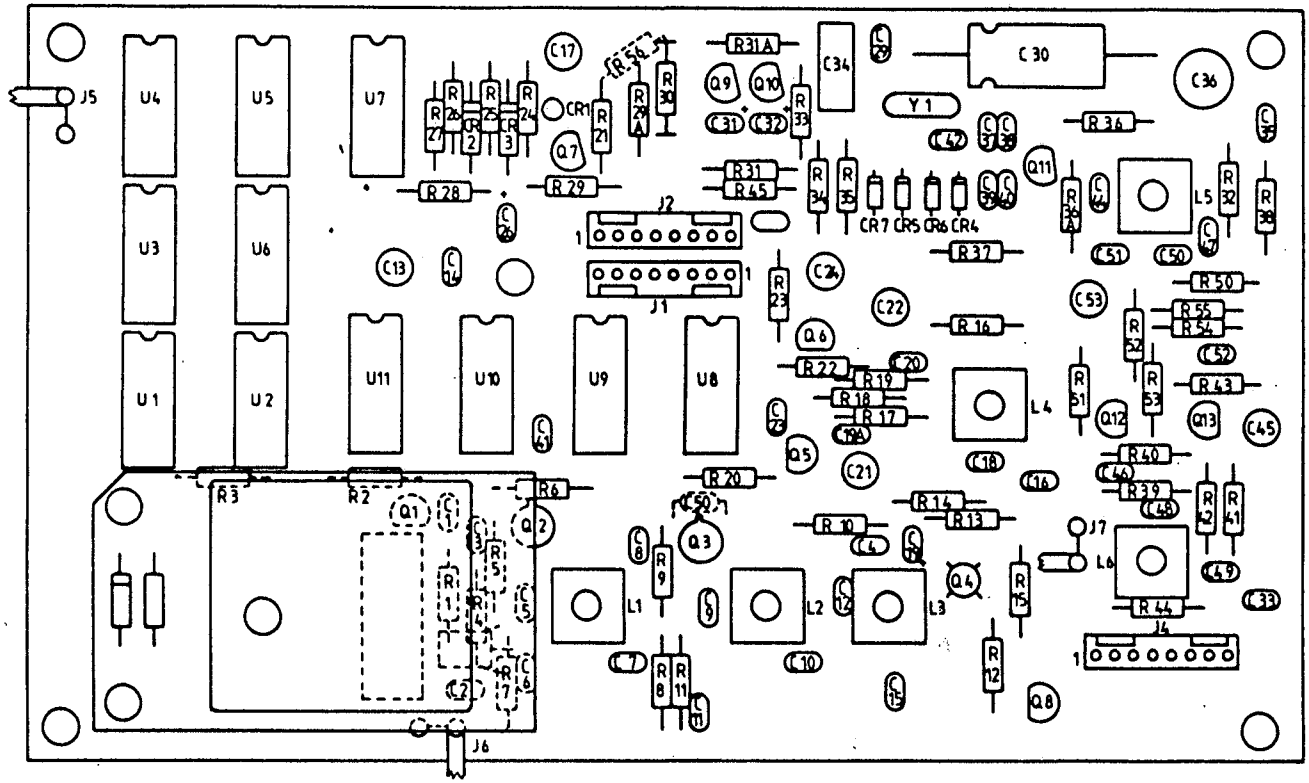
DR.	VH	7.8.1986
CH.		
AP.		7.8.1986
AP.		

Dansk Radio AS

TITLE: FILTER BOARD II

SIZE	CODE IDENT	DRAWING NO.
A2		47 76 21
SCALE		SHEET 1 OF 1

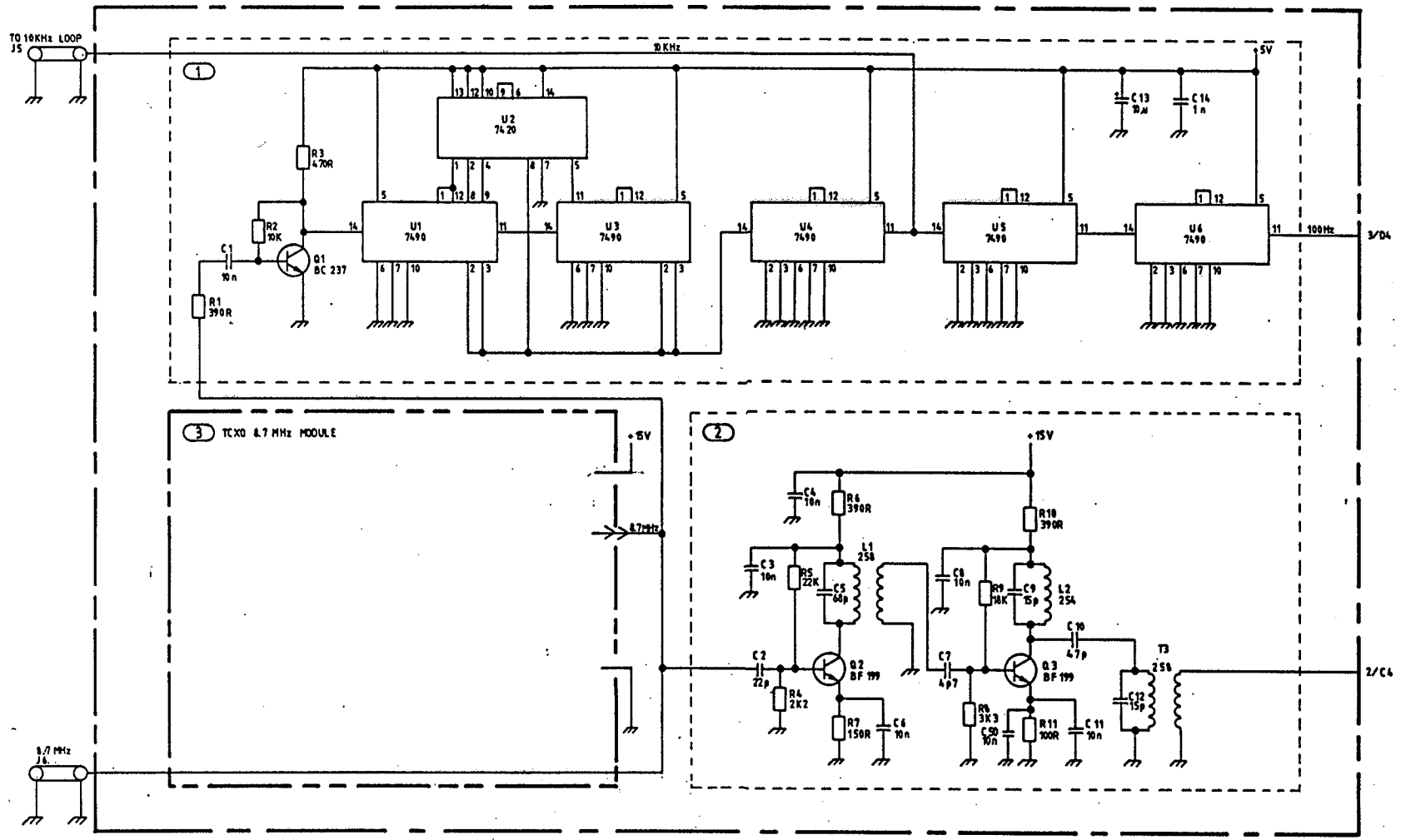
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 26 11 1984	TITLE COMPONENT LOCATION 100 Hz LOOP	
		LIN. DIM.	CH.		
			AP. 85 841126		
47 78 77	SE 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 87 92	
APPLICATION				SCALE 2:1	SHEET 1 OF 1

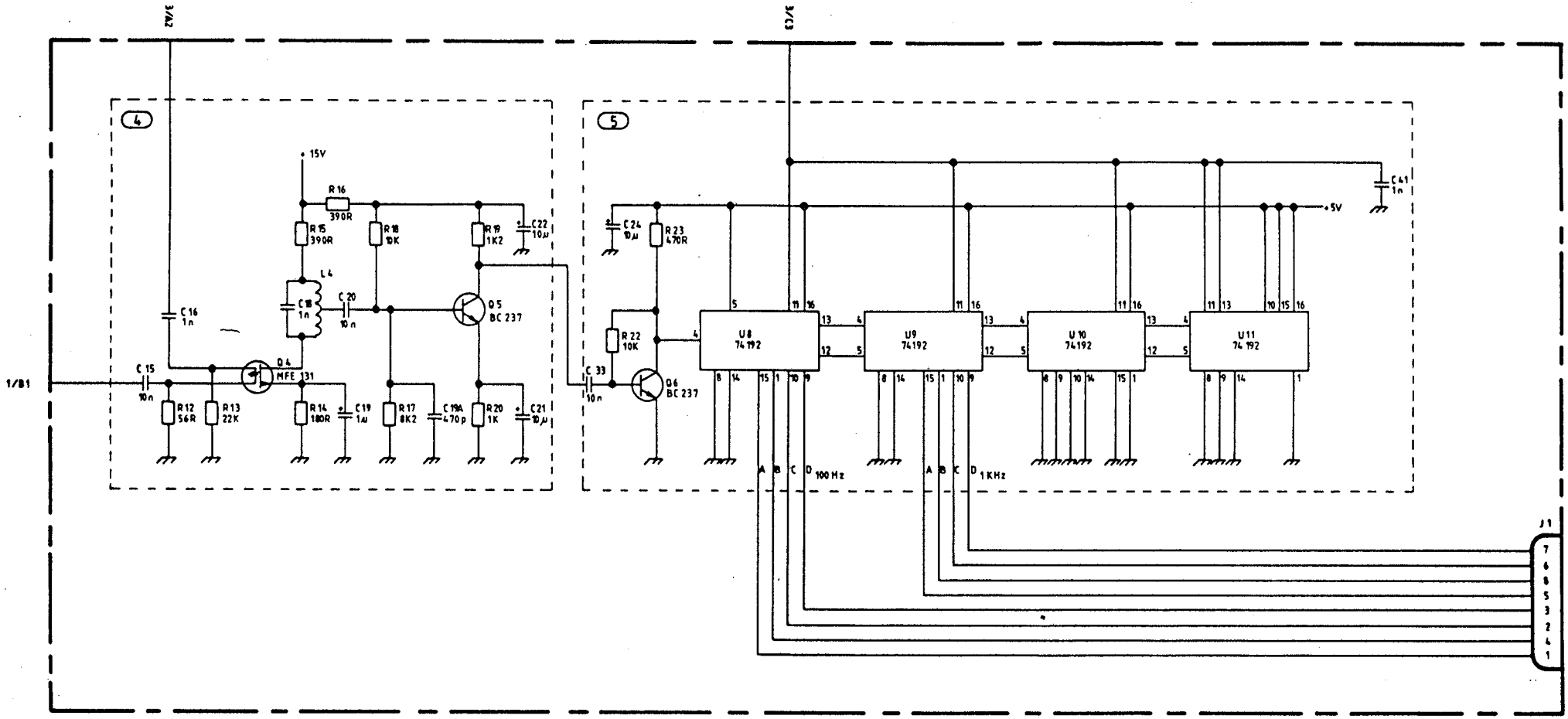
1. 4 3 2 1 D C B A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	9.1 1987	VH



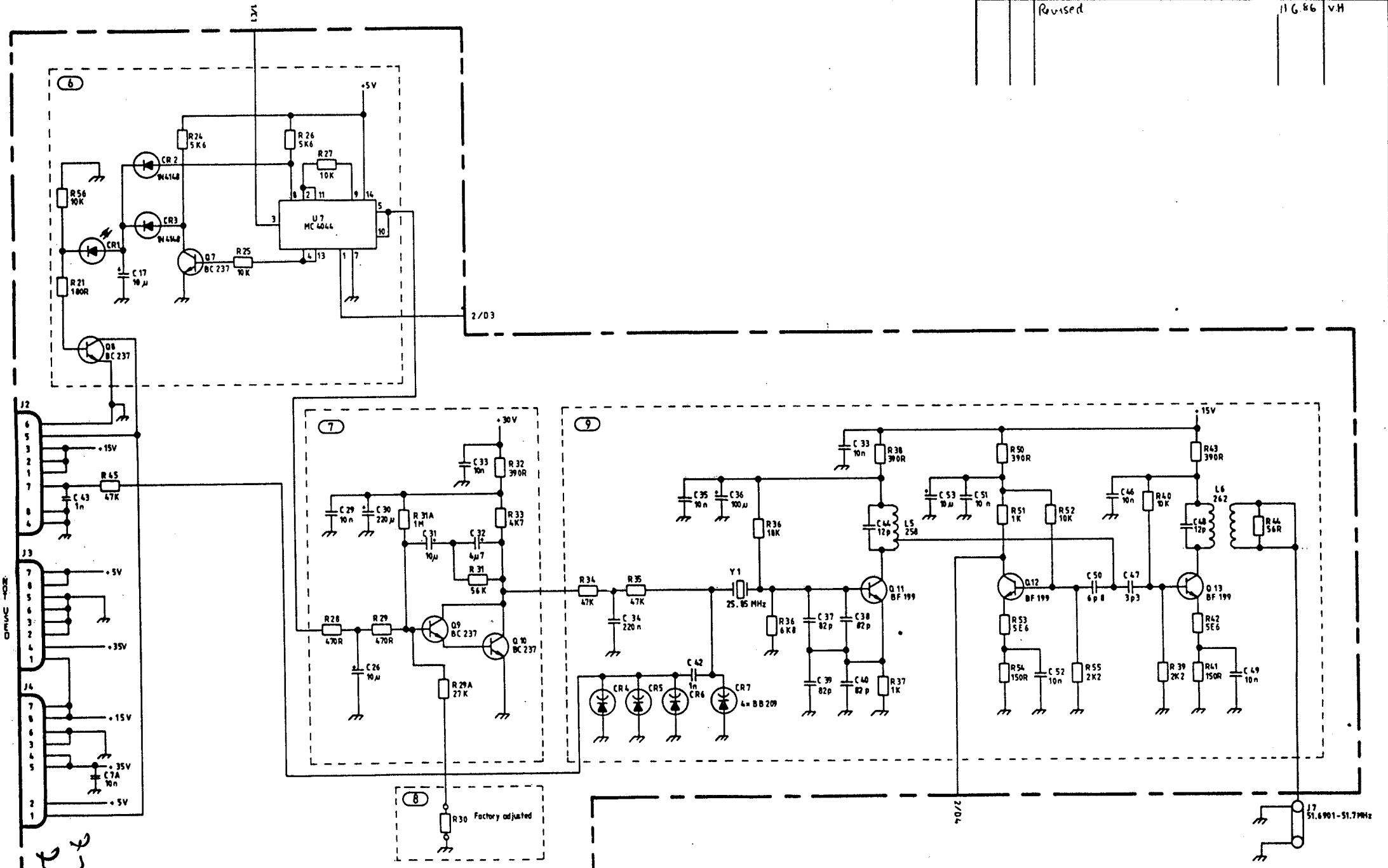
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			Dansk Radio AS
			DR. V.H.	14.11 1984	TITLE: TCXO/100 Hz LOOP
		ANGLES	CH.		
		LIN. DIM.	AP. BS	841116	
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION		SIZE A2 / CODE IDENT / DRAWING NO. 47 87 92
NEXT ASSY	USED ON				SCALE / SHEET 1 OF 3
APPLICATION					

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 87 92
	SCALE		SHEET 2

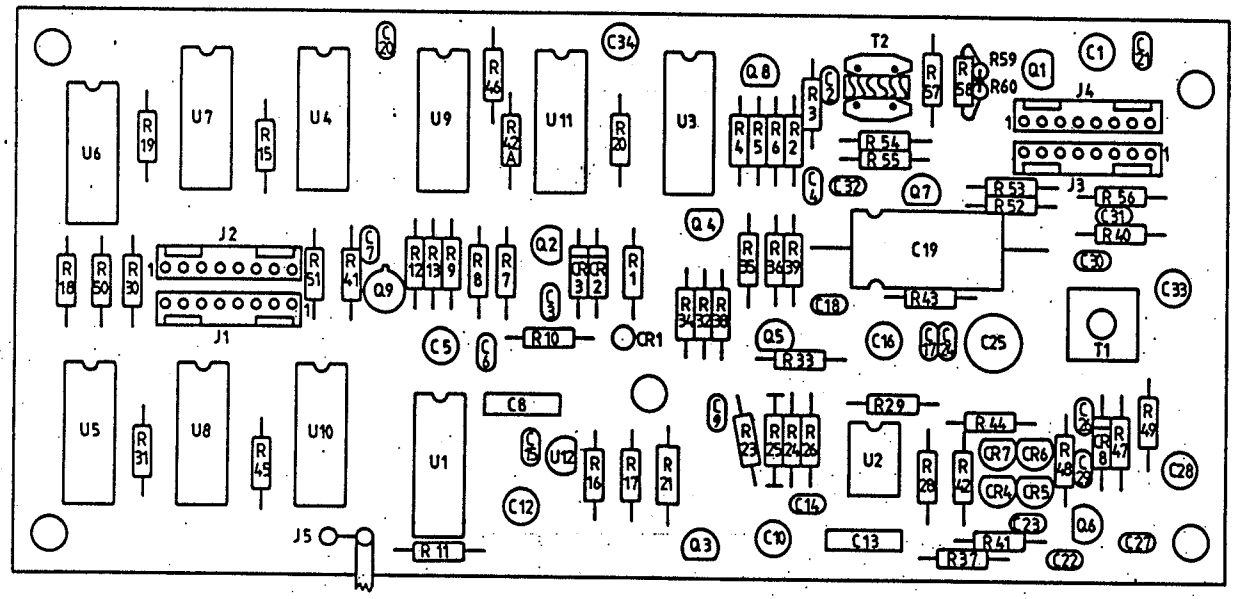
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
		Revised	11 6 86	V.H



FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 47 87 92	
	SCALE		SHEET 3	

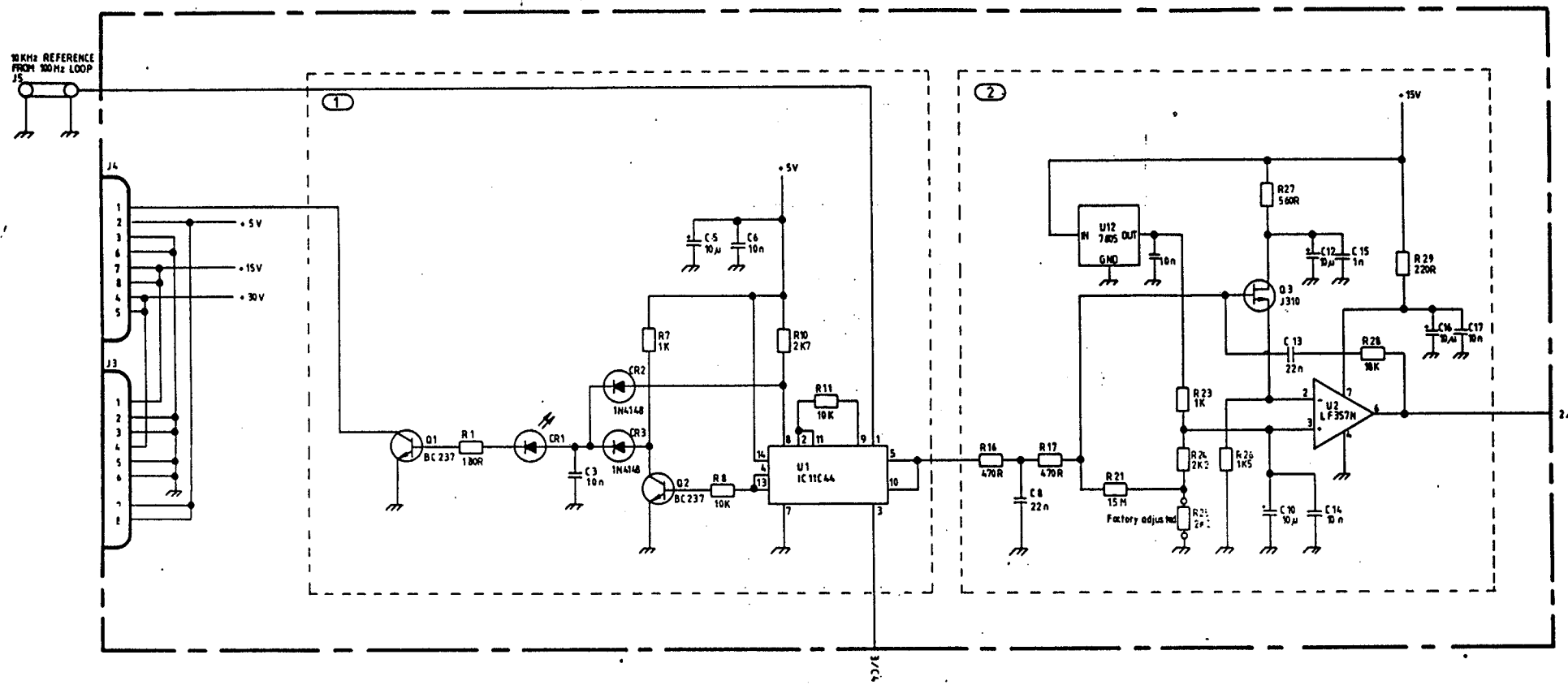
4 3 2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	9.1 1987	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 26.11 1984	TITLE COMPONENT LOCATION 10 KHz LOOP	
		LIN. DIM.	CH.		
			AP. BS 8411 26		
47 78 77	SE 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 88 06	
APPLICATION				SCALE 2:1	SHEET 1 OF 1

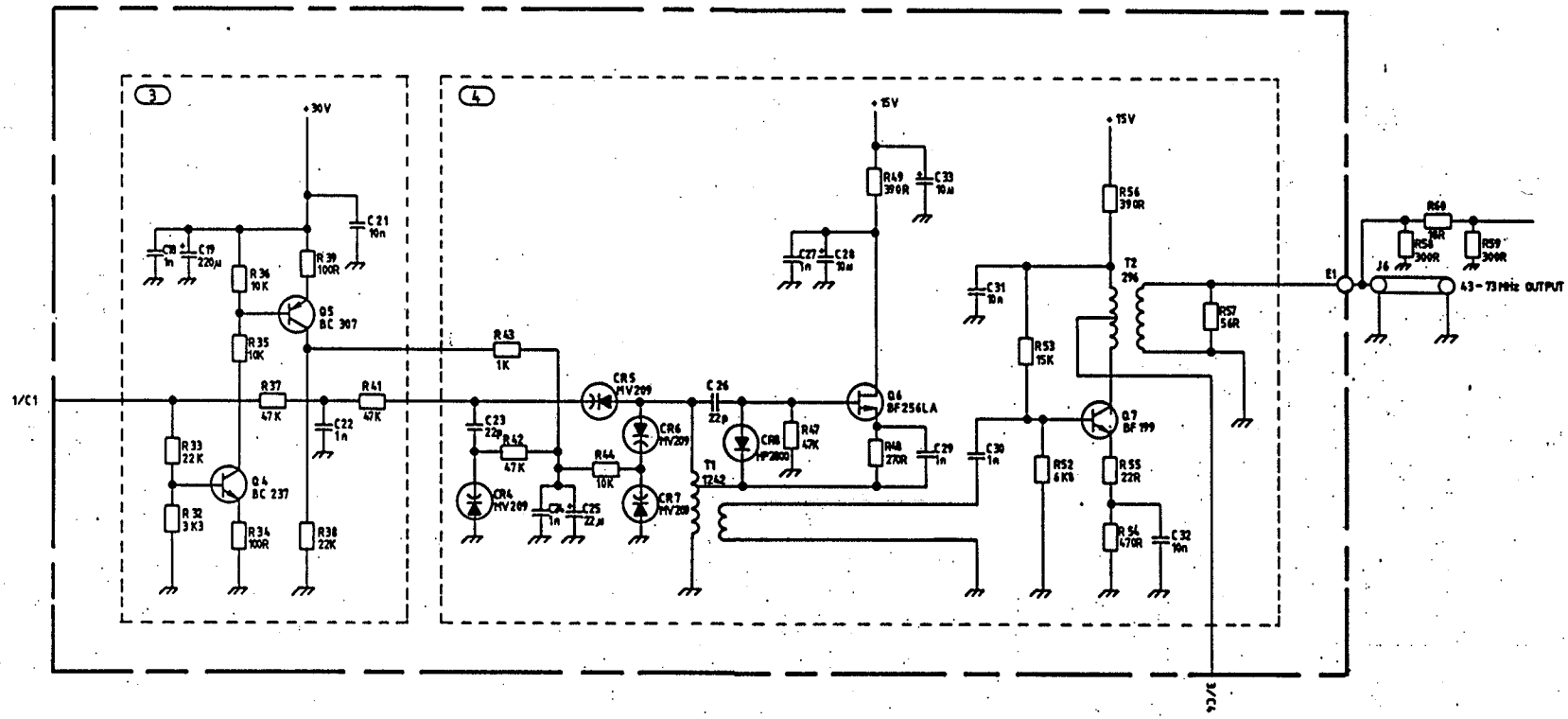
REVISIONS.				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. V.H. 12.11 1984	TITLE 10 KHz LOOP	
		ANGLES	CH.		
		LIN. DIM.	AP. BS 841116		
			AP.		
47 78 77	SE 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 47 88 06
NEXT ASSY	USED ON			SCALE	SHEET 1 OF 3
APPLICATION					

31

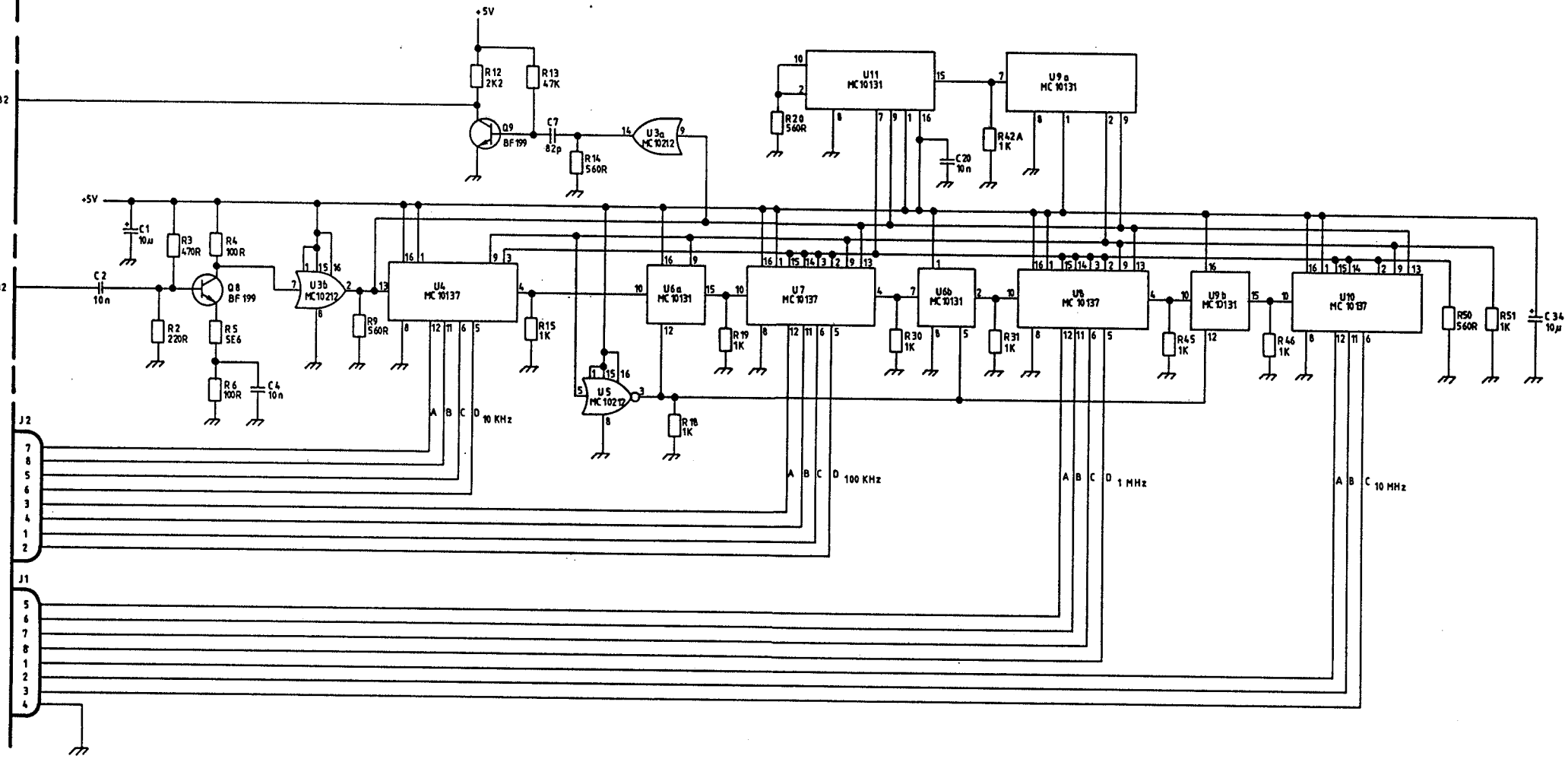
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	9.1 1987	VH



7-32

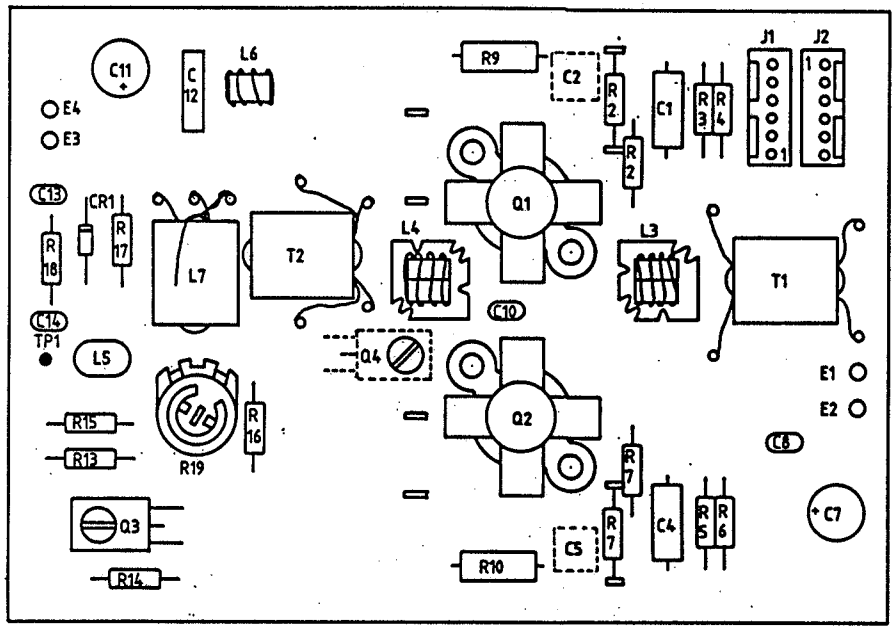
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 88 06
	SCALE		SHEET 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.8.87	VH



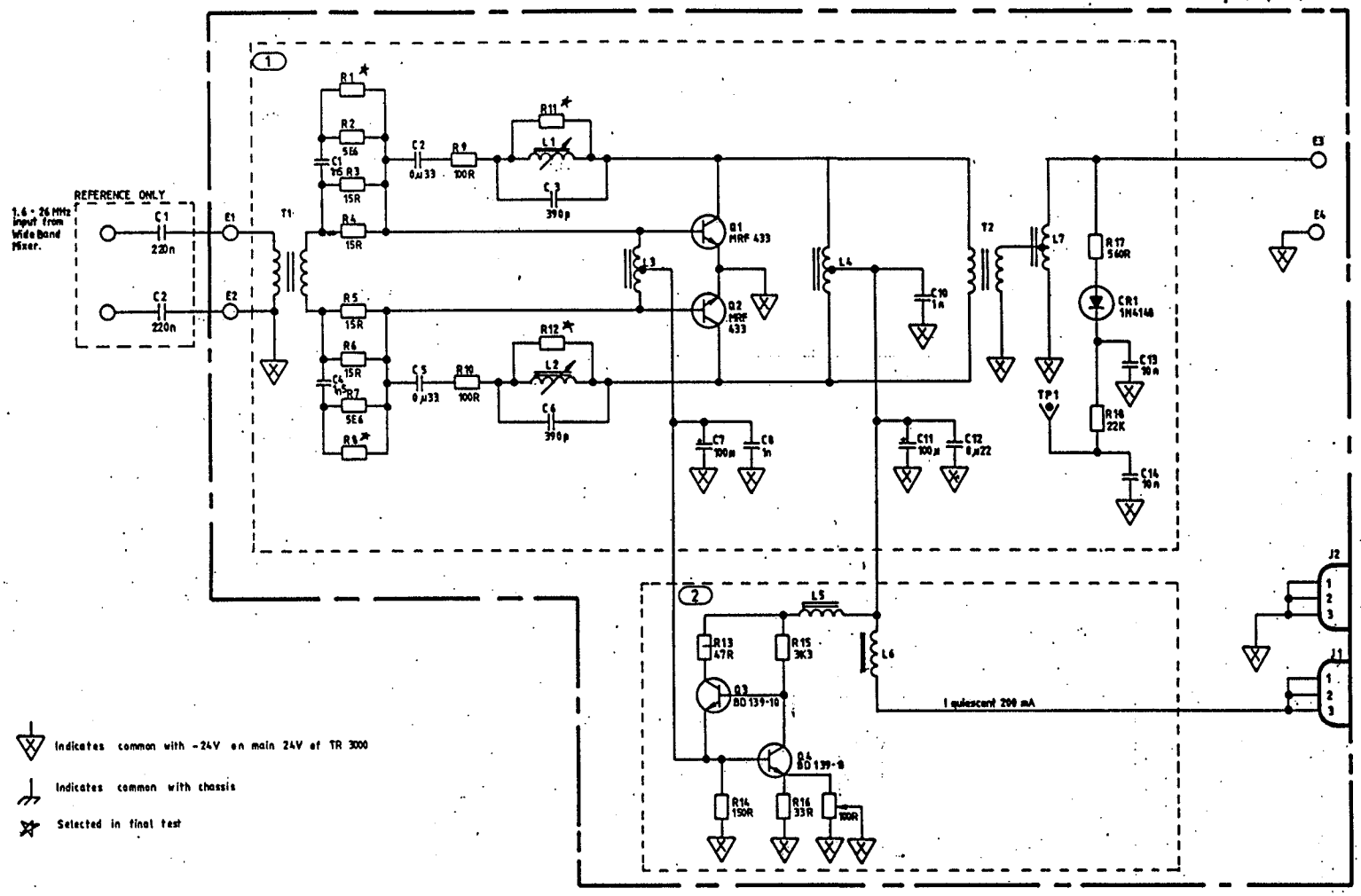
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		47 88 06
	SCALE		SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



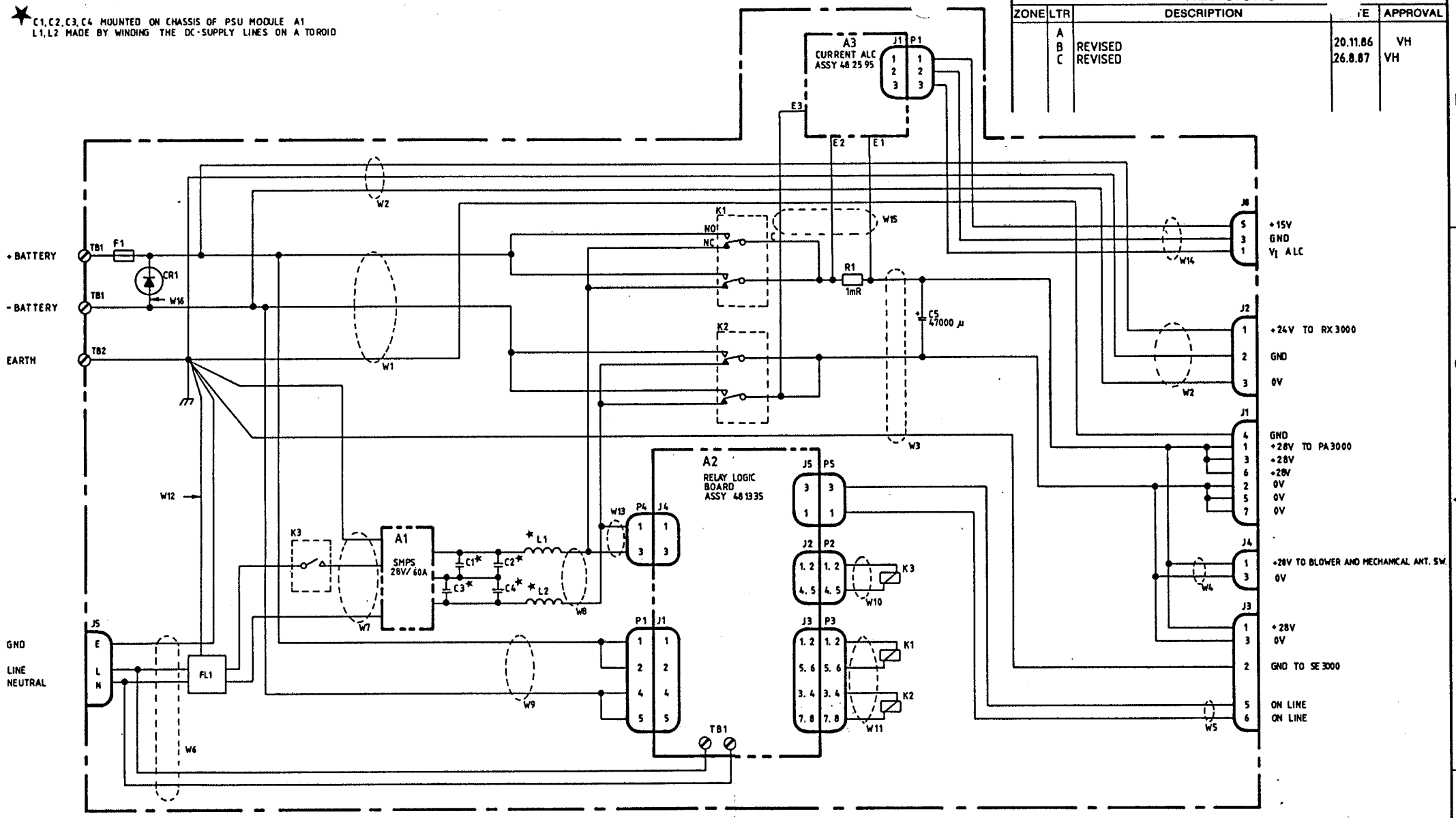
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. VH 13.1.1987	TITLE COMPONENT LOCATION WIDE BAND AMPLIFIER SE3000	
		ANGLES	CH.		
		LIN. DIM.	AP.		
477877	SE3000	MATERIAL	AP.		
NEXT ASSY'	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 88 14	
APPLICATION				SCALE 2:1	SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	13.1.87	VH



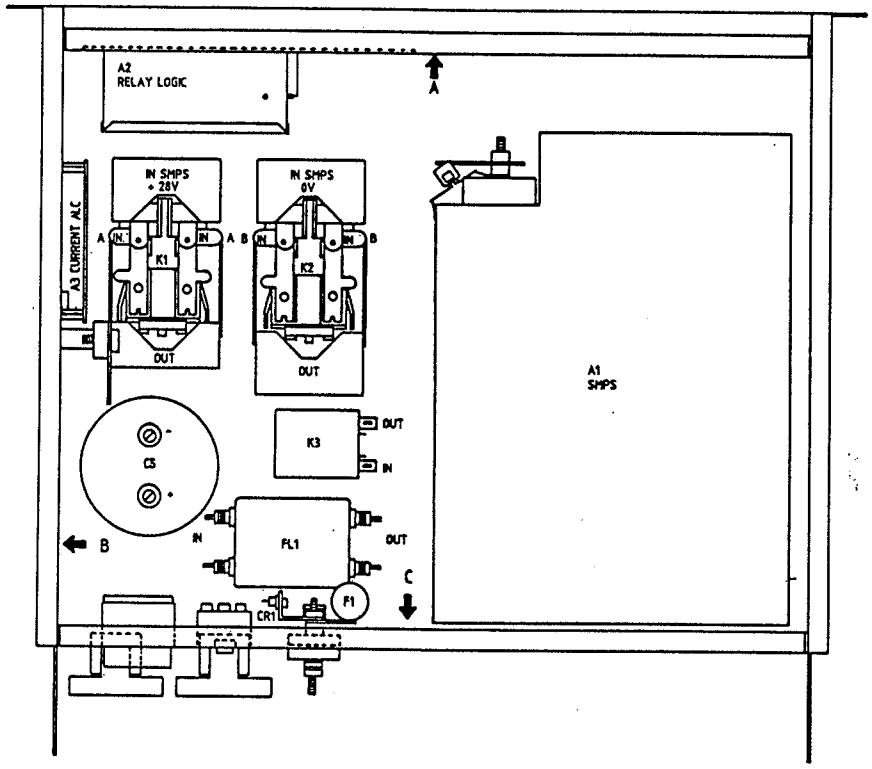
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. V.H. 3.12 1984	TITLE WIDE BAND AMPLIFIER SE3000	
		LIN. DIM.	CH.		
			AP.		
47 78 77	SE 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 47 88 14	
APPLICATION				SCALE / SHEET 1 OF 1	

1-38 34


C1, C2, C3, C4 MOUNTED ON CHASSIS OF PSU MODULE A1
L1, L2 MADE BY WINDING THE DC-SUPPLY LINES ON A TOROID
REVISIONS
ZONE LTR DESCRIPTION DATE APPROVAL
A
B REVISED 20.11.86 VH
C REVISED 26.8.87 VH
A3 CURRENT ALC ASSY 48 25 95
J1 P1
E3 E2 E1
+ BATTERY
- BATTERY
EARTH
TB1 F1
CR1
W16
TB1
TB2
W1
W2
K1
NO
NC
C
W15
R1
1mR
C5 47000 µ
K2
W3
W14
J8
5 +15V
3 GND
1 V1 ALC
J2
1 +24V TO RX3000
2 GND
3 0V
J1
4 GND
1 +28V TO PA3000
3 +28V
6 +28V
2 0V
5 0V
7 0V
J4
1 +28V TO BLOWER AND MECHANICAL ANT. SW.
3 0V
W4
J3
1 +28V
3 0V
2 GND TO SE 3000
5 ON LINE
6 ON LINE
W5
A2
RELAY LOGIC BOARD ASSY 48 13 35
J5 P5
J2 P2
J3 P3
K3
K1
K2
W10
W11
W12
W13
P4 J4
P1 J1
TB1
K3
A1
SMPS 28V/ 60A
C1* C2* C3* C4*
L1 L2
W7
W8
W9
J5
E
L
N
GND
LINE
NEUTRAL
FL1
W6
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
TR 3000
NEXT ASSY
USED ON
APPLICATION
DR. V.H. 20.9 1985
CH.
AP. 20.9 1985
AP.
FIRST ANGLE PROJECTION
Dansk Radio AS
dra
TITLE
INTERCONNECTION DIAGRAM
POWER SUPPLY
PS3000
SIZE A2
CODE IDENT
DRAWING NO. 48 14 59
SCALE
SHEET 1 OF 3
4-35

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

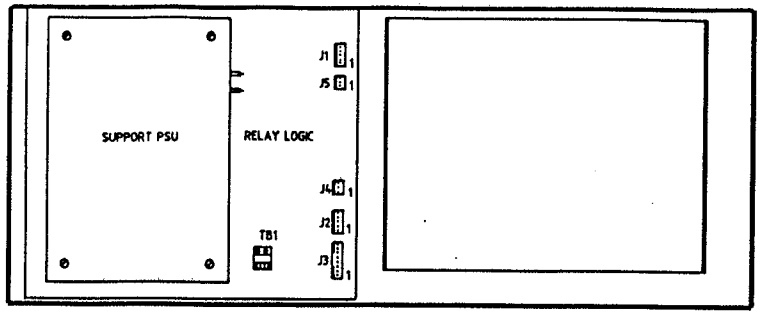
LOCATION DRAWING



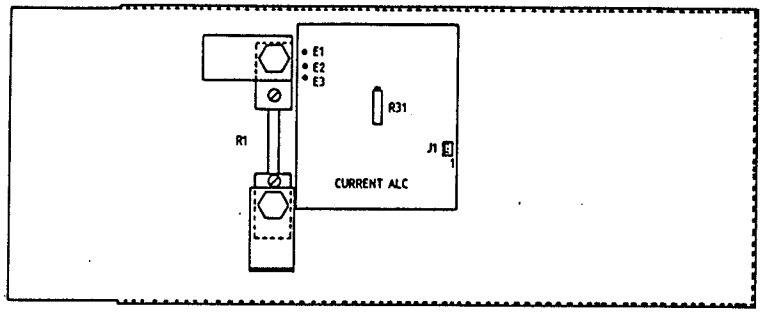
IN A: + INPUT FROM BATTERI
IN B: 0V INPUT FROM BATTERI

FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 14 59
	SCALE 1:2		SHEET 2

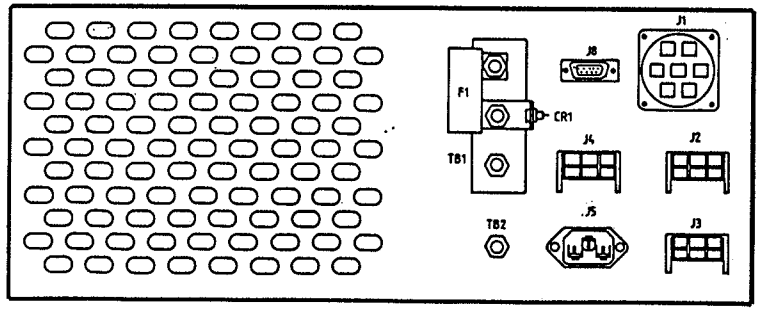
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



A FRONT CHASSIS



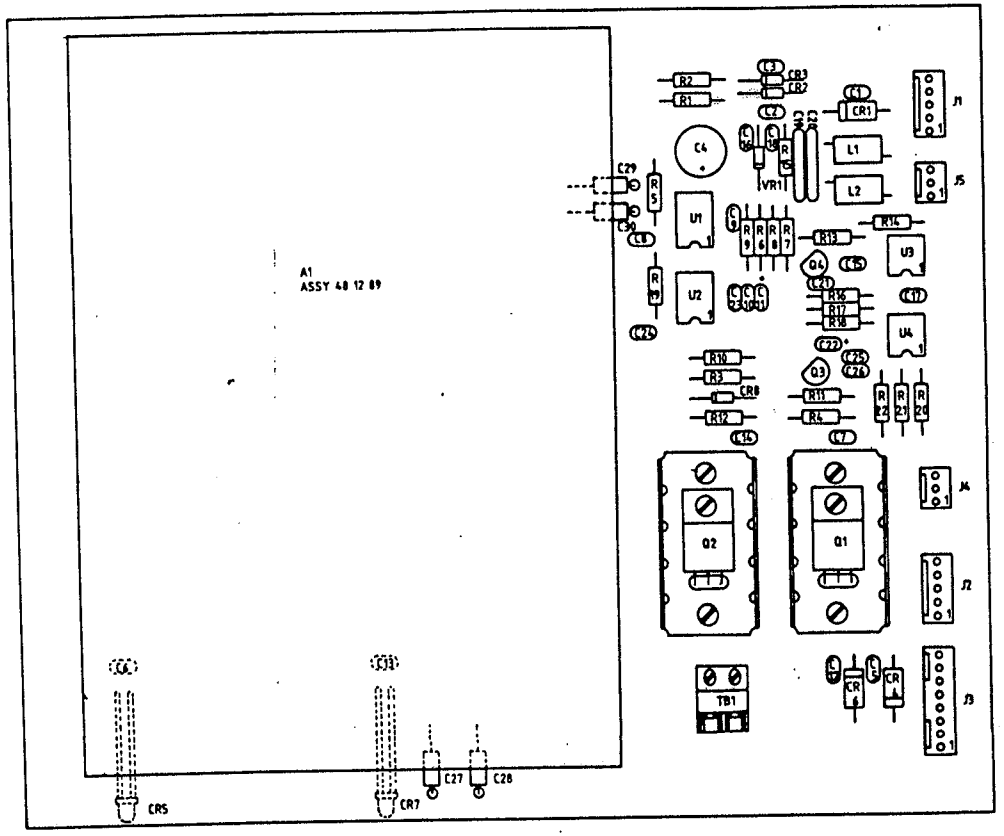
B SIDE PLATE LEFT



C REAR PLATE

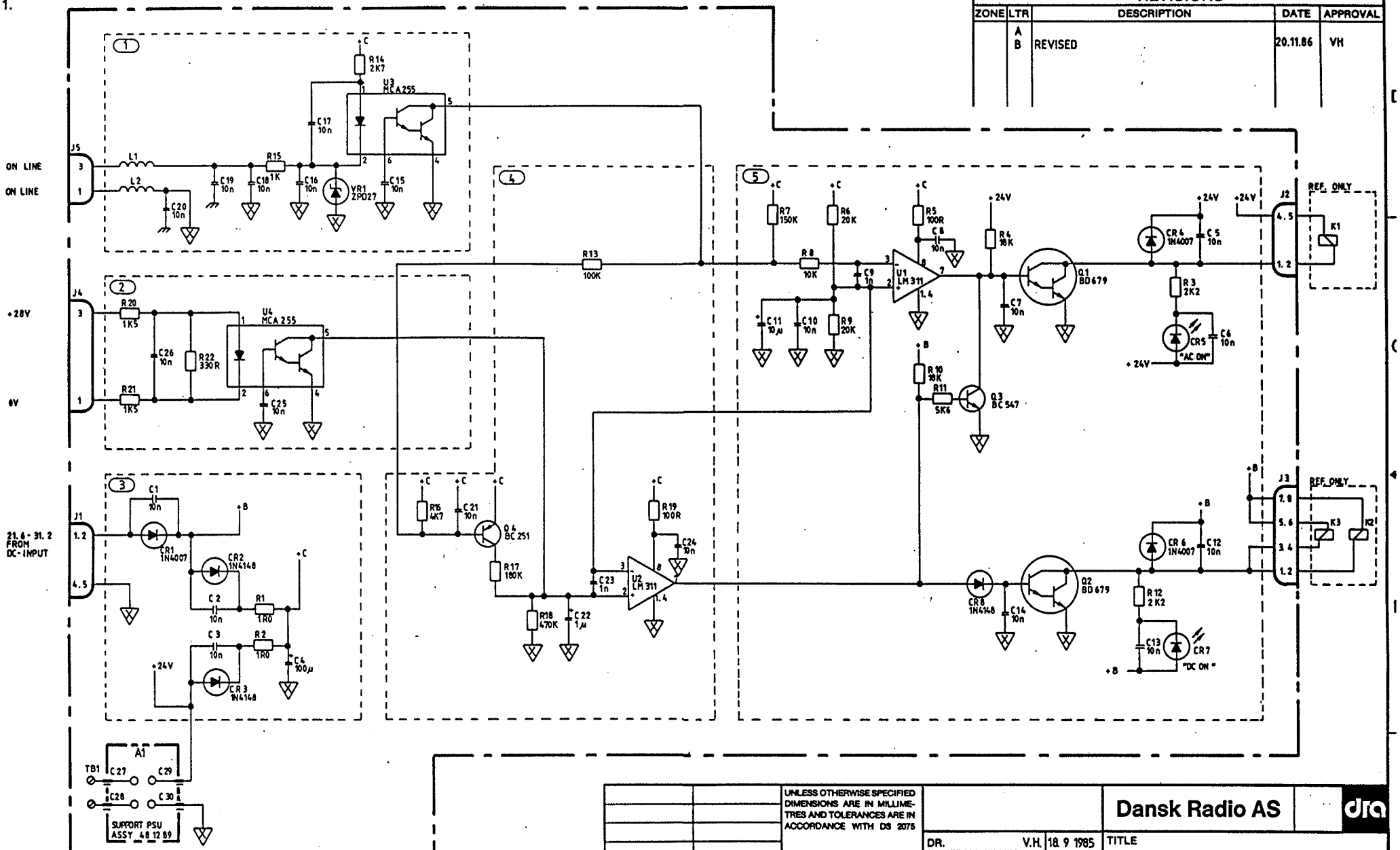
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 14 59
	SCALE 1:2		SHEET 3

REVISION				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075		Dansk Radio AS	dra
			DR VH 12.9 1986	TITLE COMPONENT LOCATION RELAY LOGIC	
		ANGLES	CH		
		LIN DIM	AP 12.9.1986		
			AP		
48 14 59	PS 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A1	CODE IDENT	DRAWING NO. 48 13 35
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						

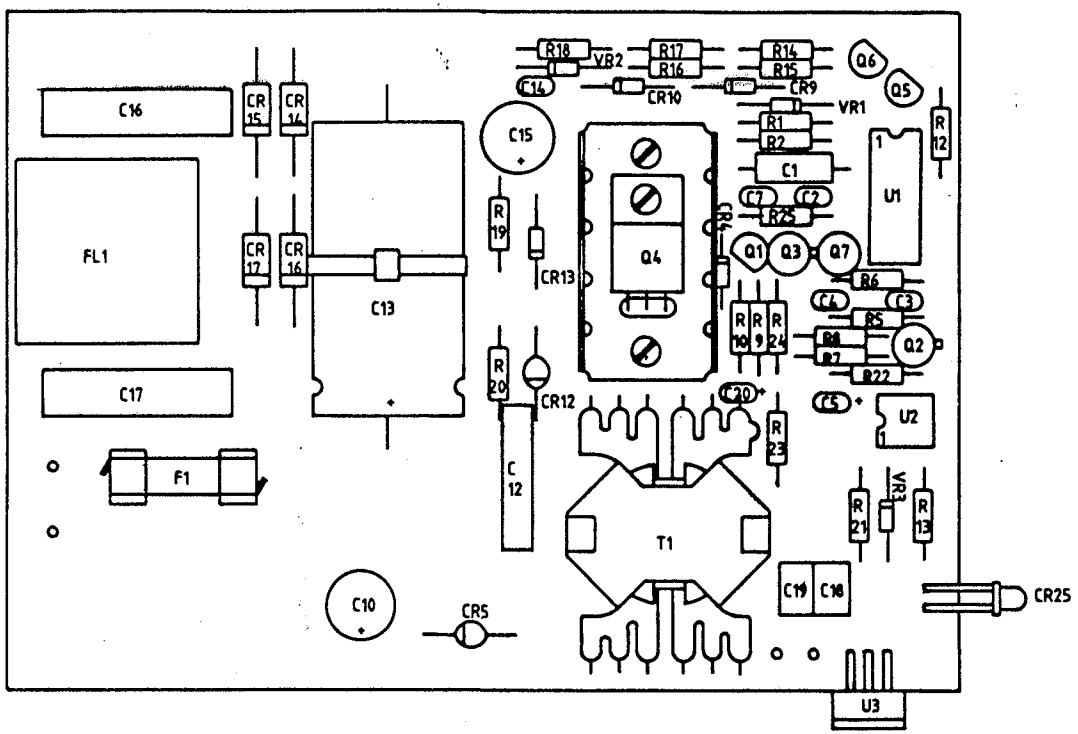
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. V.H. 18 9 1985	TITLE RELAY LOGIC	
		ANGLES	CH.		
		LIN. DIM.	AP. 19.9.1985		
			AP.		
48 14 59	PS 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 48 13 35
NEXT ASSY	USED ON			SCALE		SHEET 1 OF 1
APPLICATION						

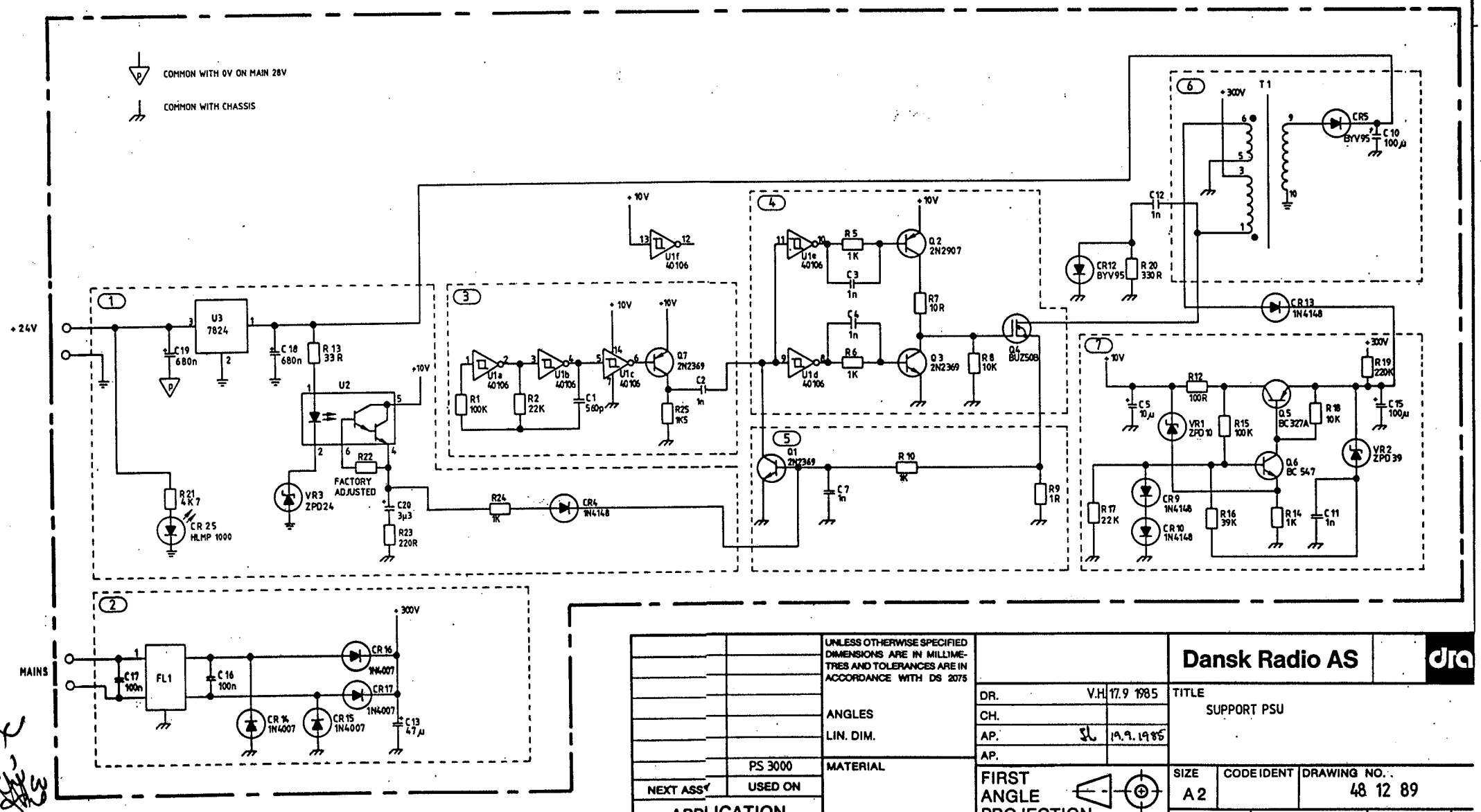
38

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



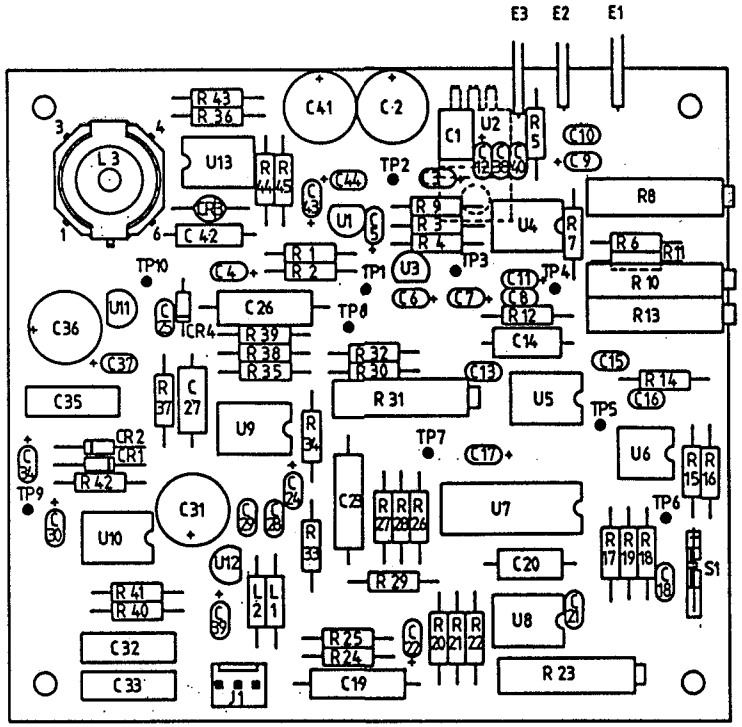
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			**Dansk Radio AS**
		ANGLES	DR. VH 11.9 1986	TITLE	COMPONENT LOCATION POWER SUPPLY
		LIN. DIM.	CH.		
			AP. 11.9.1986		
	PS 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 48 12 89
APPLICATION				SCALE 2:1	SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	ATE	APPROVAL
	A			
	B	REVISED	20.11.86	VH
	C	REVISED	14.8.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. V.H. 17.9 1985	TITLE SUPPORT PSU	
		ANGLES	CH.		
		LIN. DIM.	AP. 19.9.1985		
			AP.		
	PS 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT DRAWING NO. 48 12 89
NEXT ASS'Y	USED ON			SCALE	SHEET 1 OF 1
APPLICATION					

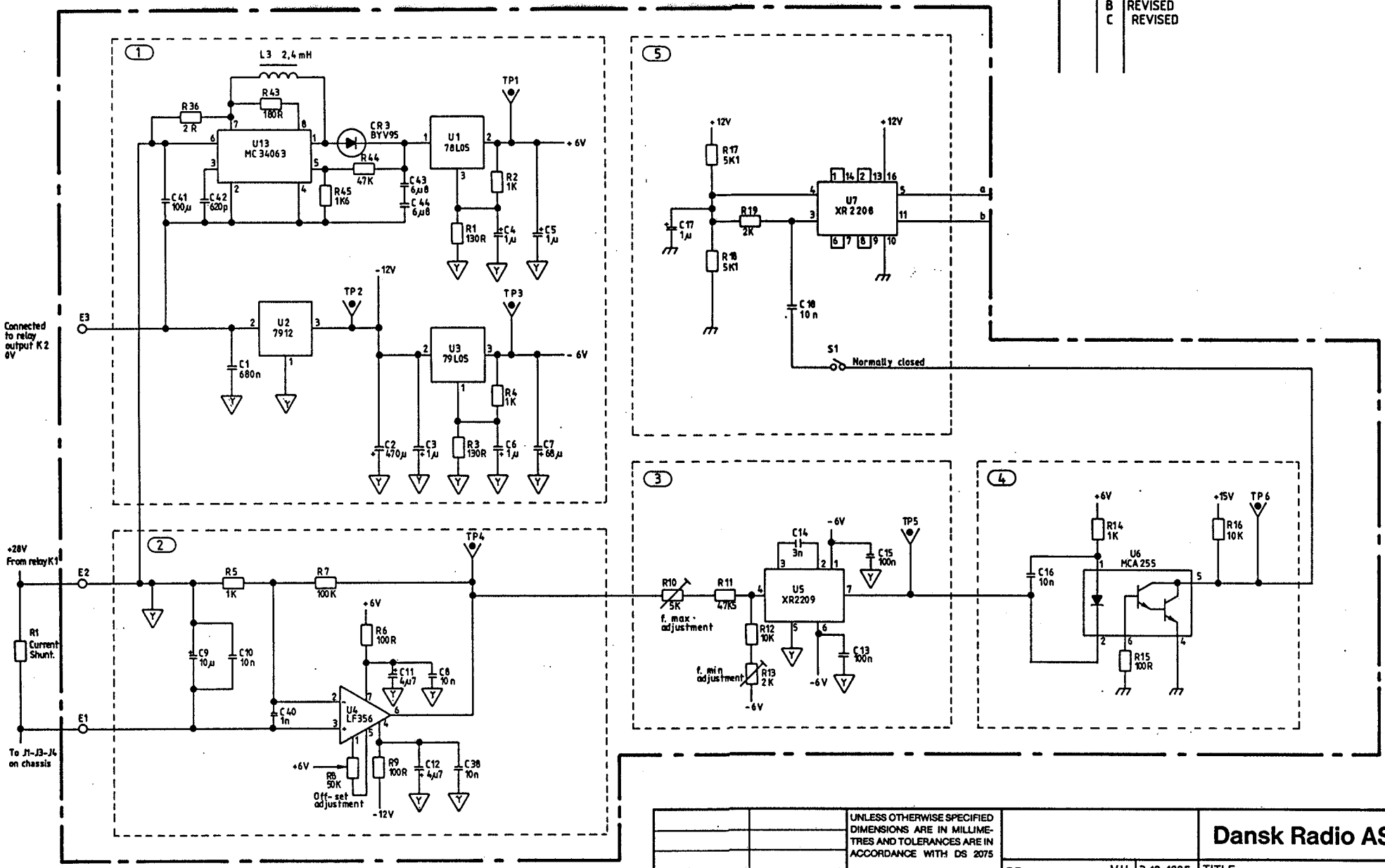
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.11.86	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. VH 4.12 1985	TITLE COMPONENT LOCATION ALC DETECTOR	
		LIN. DIM.	CH.		
			AP. 4/1-86		
			AP.		
	PS 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 48 25 95
NEXT ASSY	USED ON			SCALE 2:1		SHEET 1 OF 1
APPLICATION						

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	.TE	APPROVAL
	A			
	B	REVISED	20.11.86	VH
	C	REVISED	17.8.87	VH

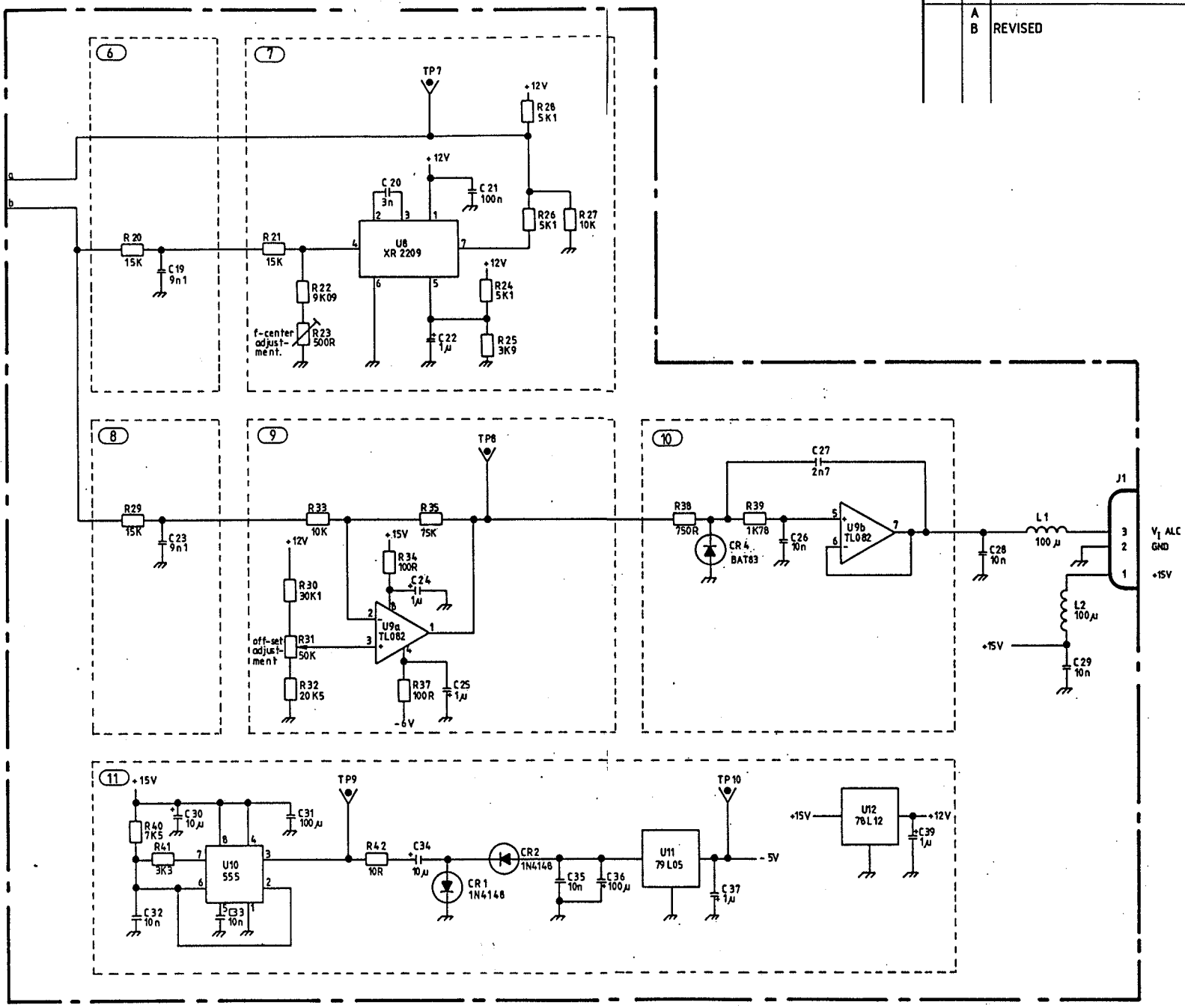


▽ = INDICATED COMMON WITH +28V ON MAIN

▽ = INDICATED COMMON WITH CHASSIS

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
		ANGLES	DR. VH. 3.12 1985	TITLE ALC DETECTOR
		LIN. DIM.	CH.	
			AP. 6/12-86	
	PS 3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 25 95
APPLICATION				SCALE / SHEET 1 OF 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	20.11.86	VH

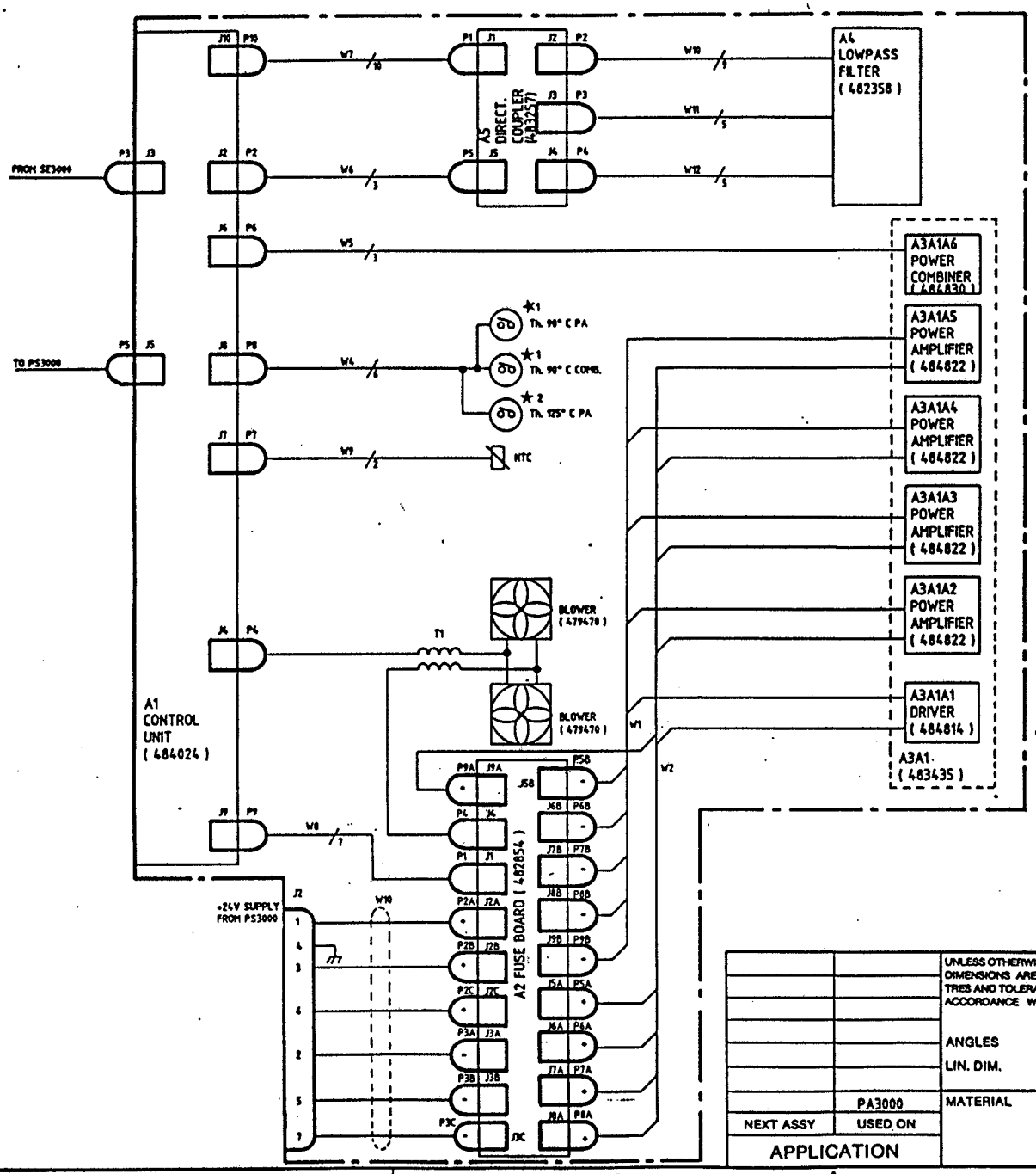


FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 25 95
	SCALE		SHEET 2

D C B A

4 3 2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	13.11.86	VH



*1 THREE THERMO SWITCHES ON 90° C IN SERIES. TWO MOUNTED ON THE PA HEATSINK.

*2 TWO THERMO SWITCHES ON 125° C IN SERIES. MOUNTED ON THE PA HEATSINK.

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
	PA3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

Dansk Radio AS

DR.	VH	9.10 1986
CH.		
AP.		13.10.1986
AP.		

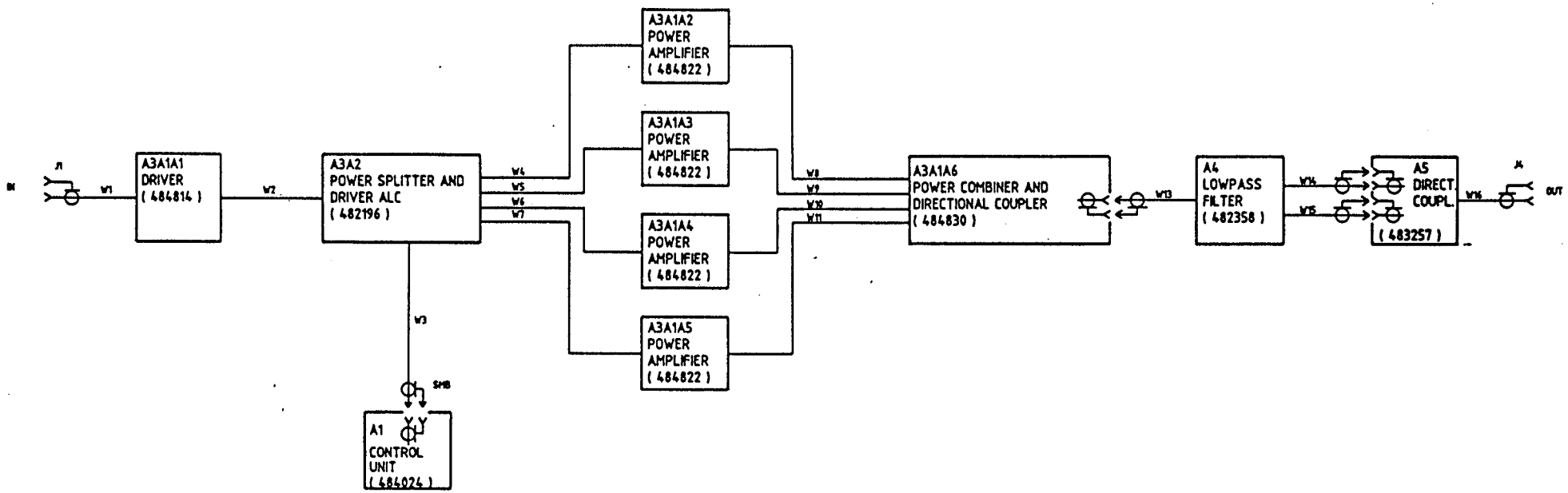
TITLE: INTERCONNECTION DIAGRAM PA3000

FIRST ANGLE PROJECTION

SIZE	CODE IDENT	DRAWING NO.
A2		48 40 08

SCALE ~ SHEET 1 OF 5

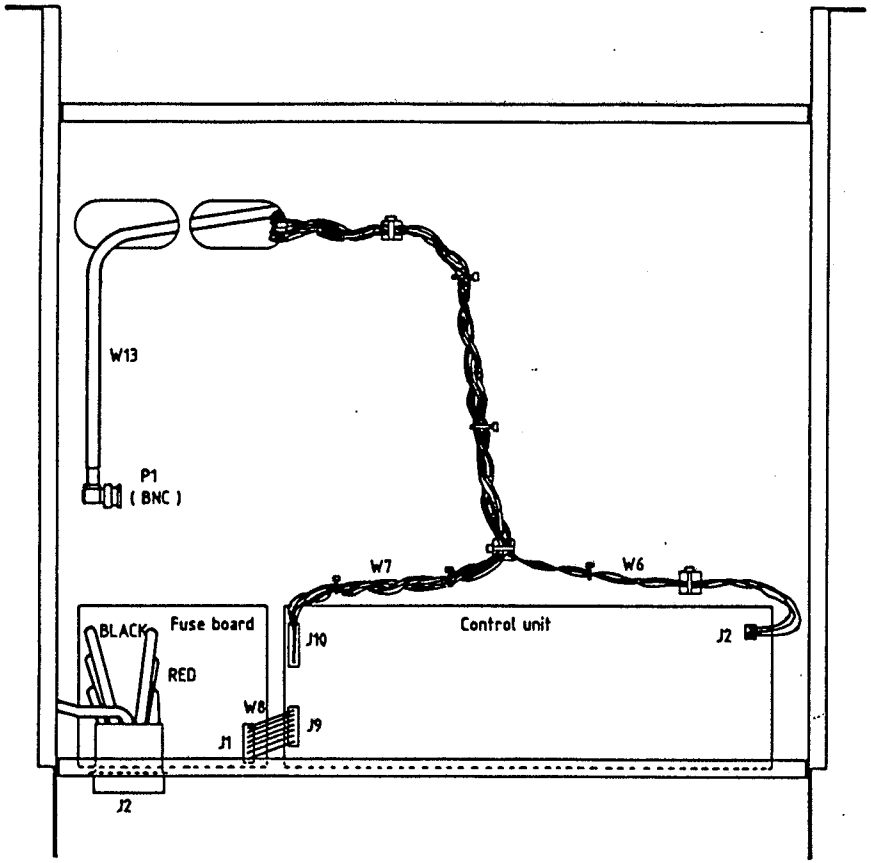
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	13.11.86	VH



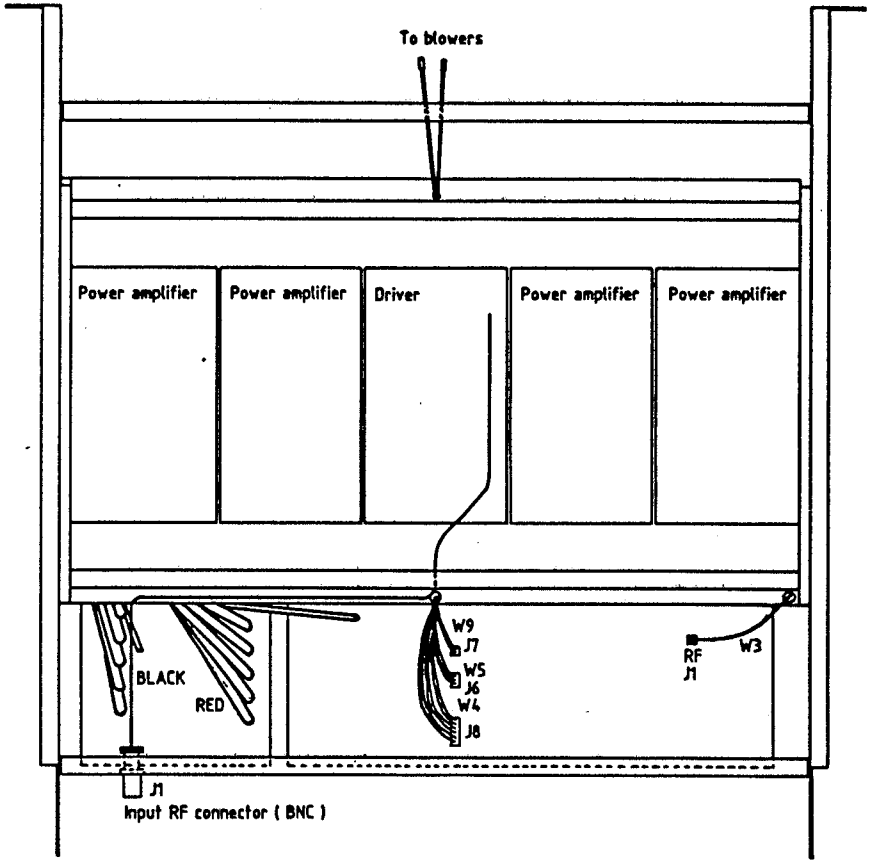
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 40 08
	SCALE		SHEET 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	13.11.86	VH

CABLE LAY OUT
BEFORE PA UNIT
IS MOUNTED



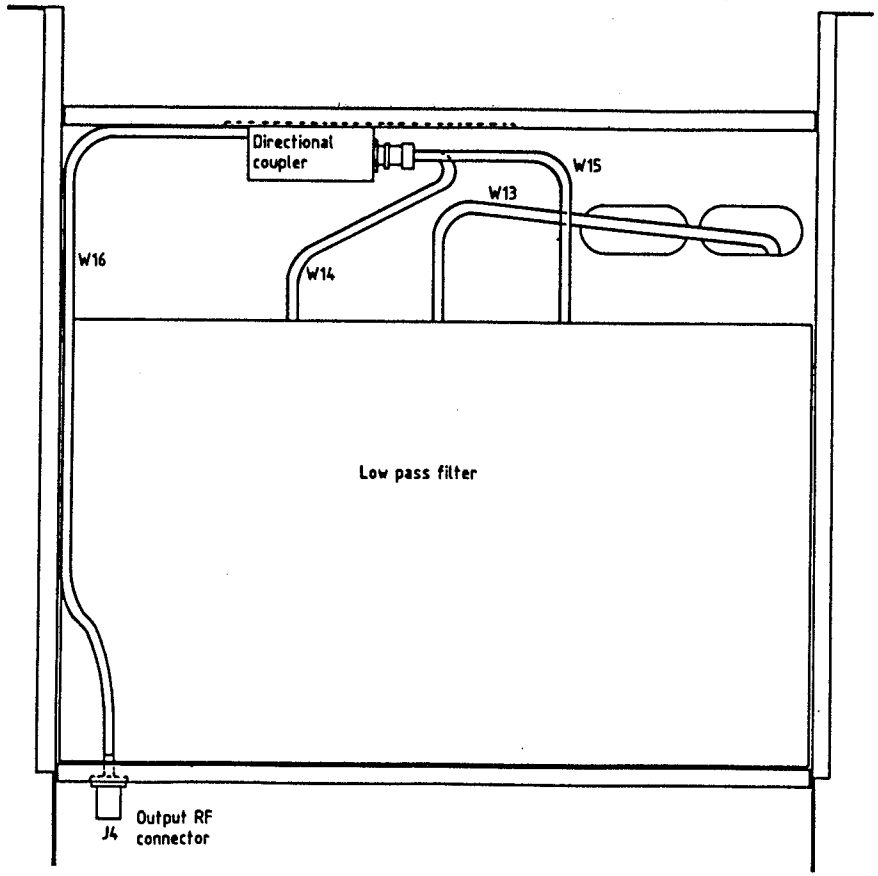
CABLE LAY OUT
AFTER PA UNIT
IS MOUNTED



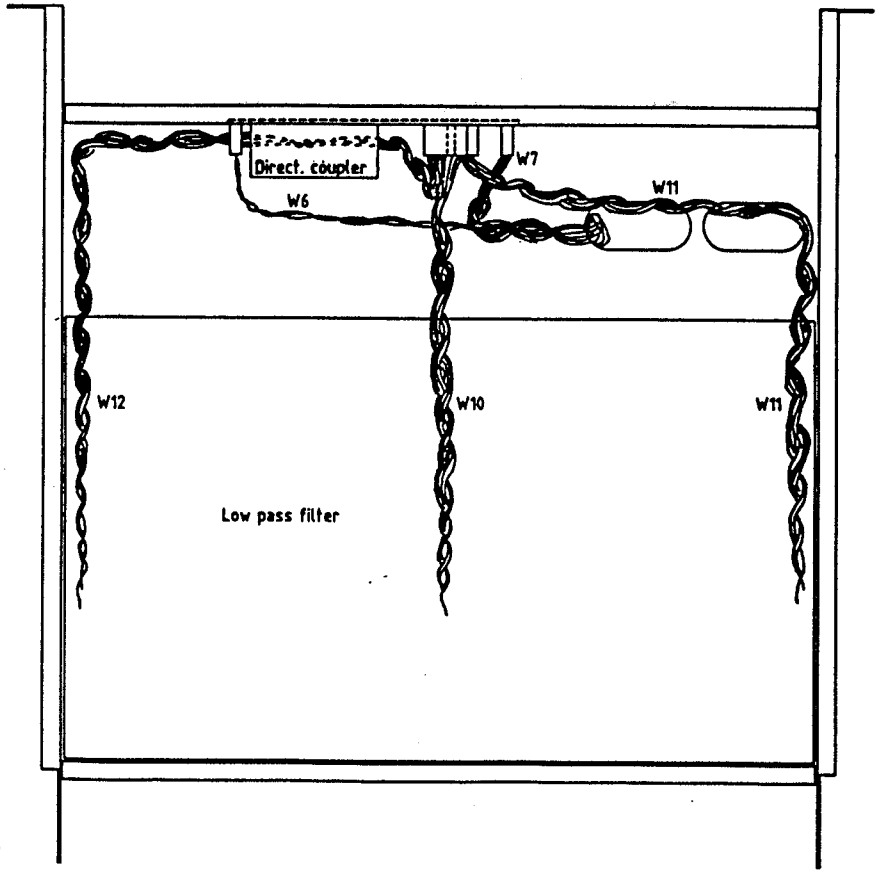
FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 40 08
	SCALE 1:2		SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	13.11.86	VH

COAX CABLE LAY OUT
ON FILTER (LPF)



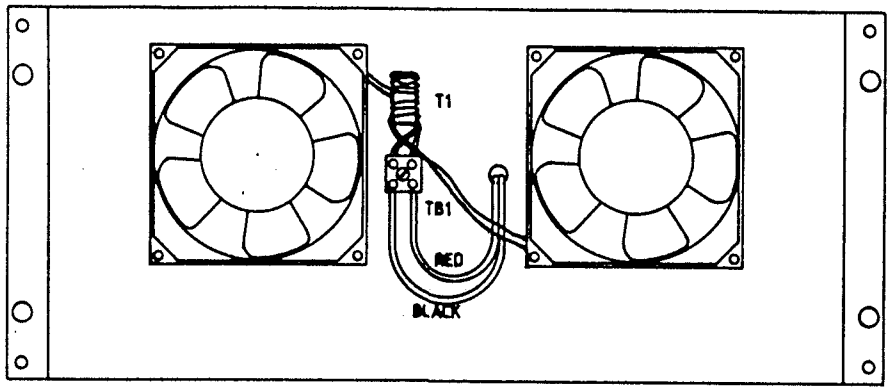
WIRE LAY OUT
ON FILTER (LPF)



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 40 08
	SCALE 1:2		SHEET 4

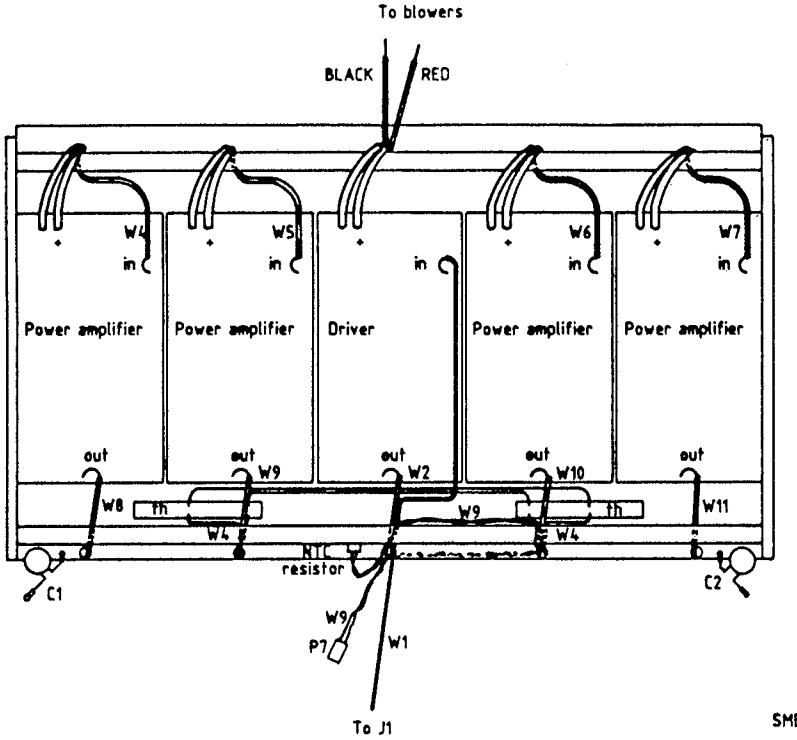
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL

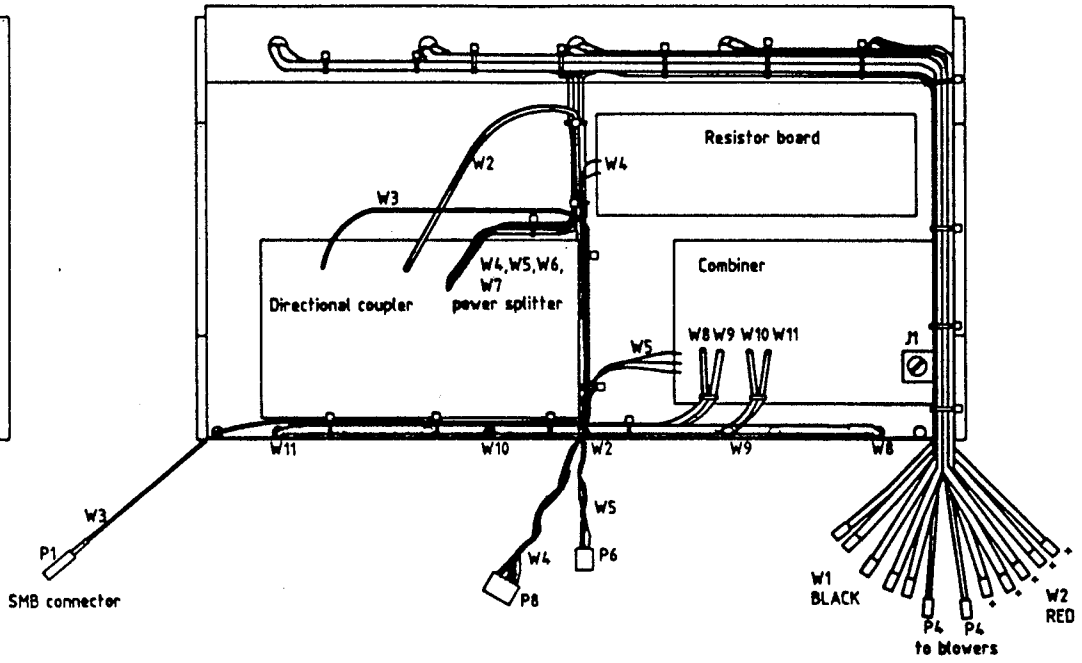
FRONT VIEW OF INNER
FRONTPLATE IN PA3000



FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT	DRAWING NO. 48 40 08
	SCALE		SHEET 5

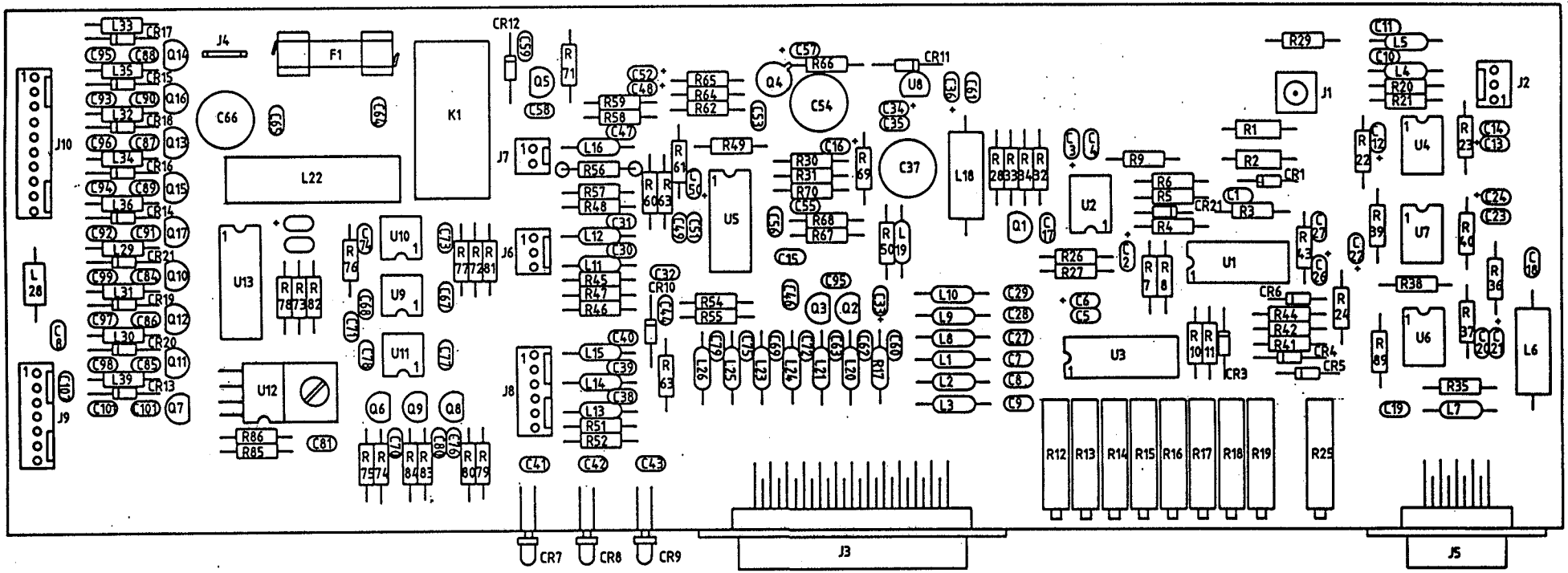
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	14.11.86	VH



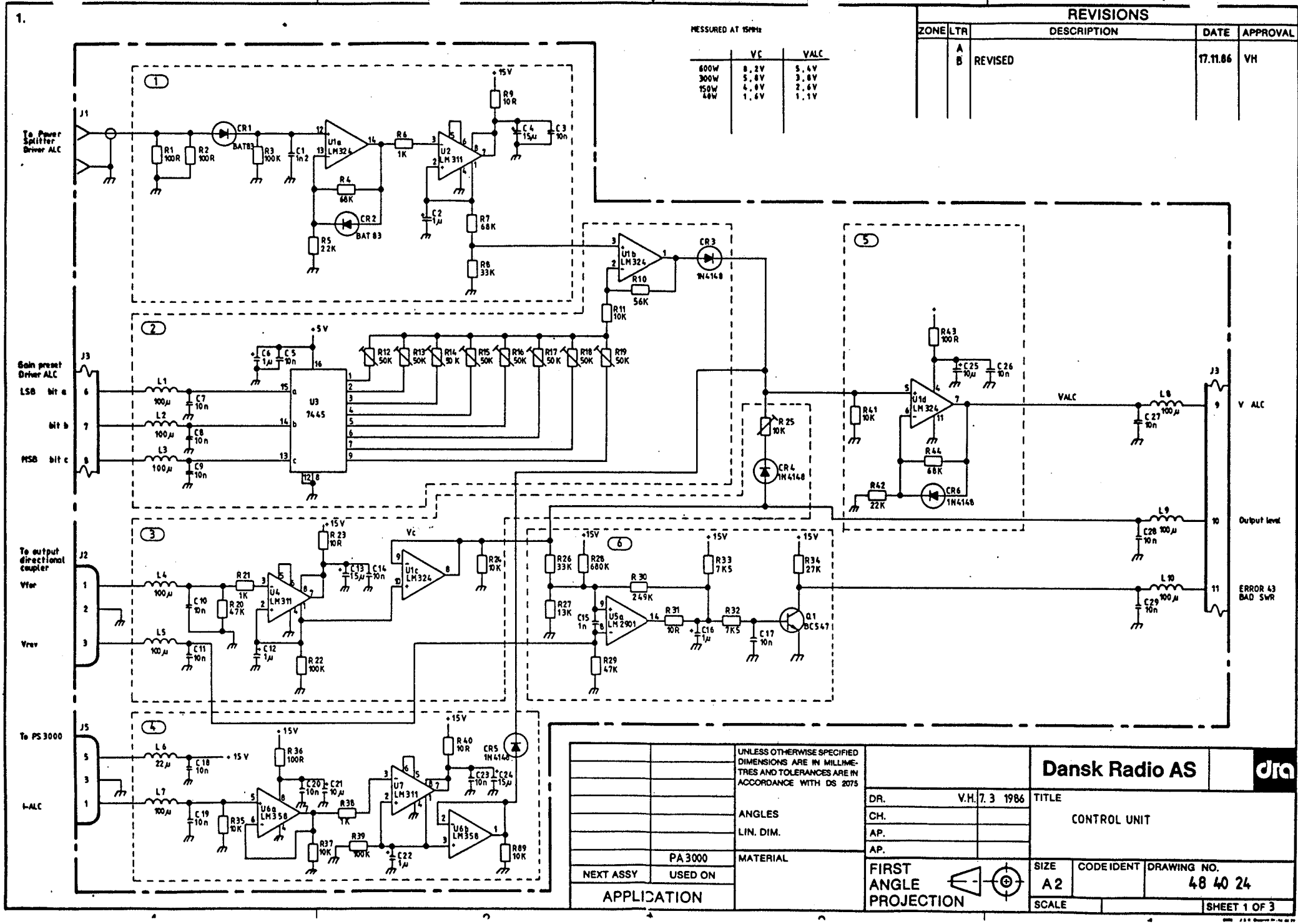


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		**Dansk Radio AS**
			DR. VH 16.10.1986	TITLE WIRING LAY OUT IN PA-UNIT
		ANGLES	CH.	
		LIN. DIM.	AP.	
	PA3000	MATERIAL	AP.	
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 34 27
APPLICATION				SCALE 1:2 / SHEET 1 OF 1

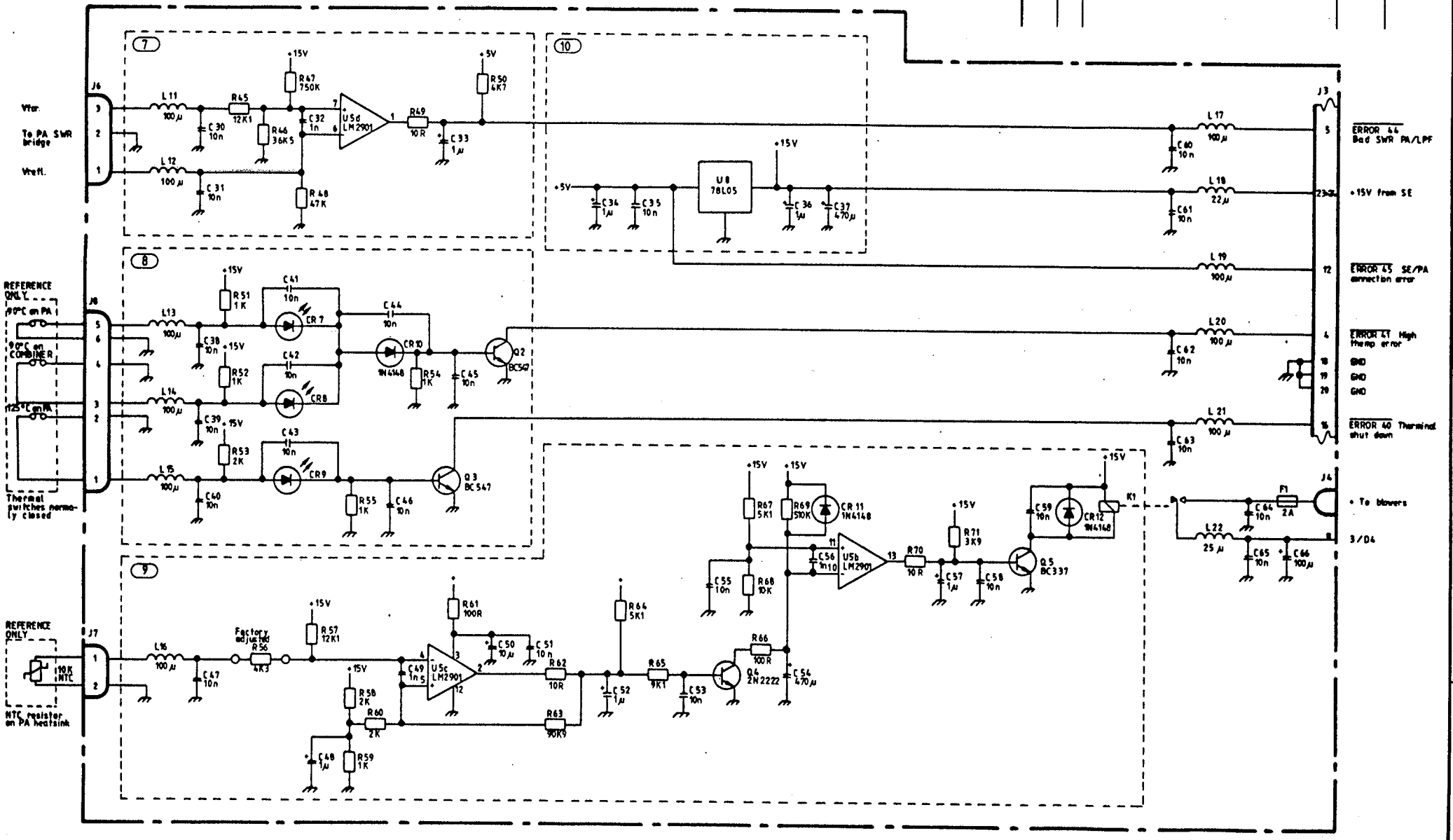
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A B	REVISED	17.11.86	VH



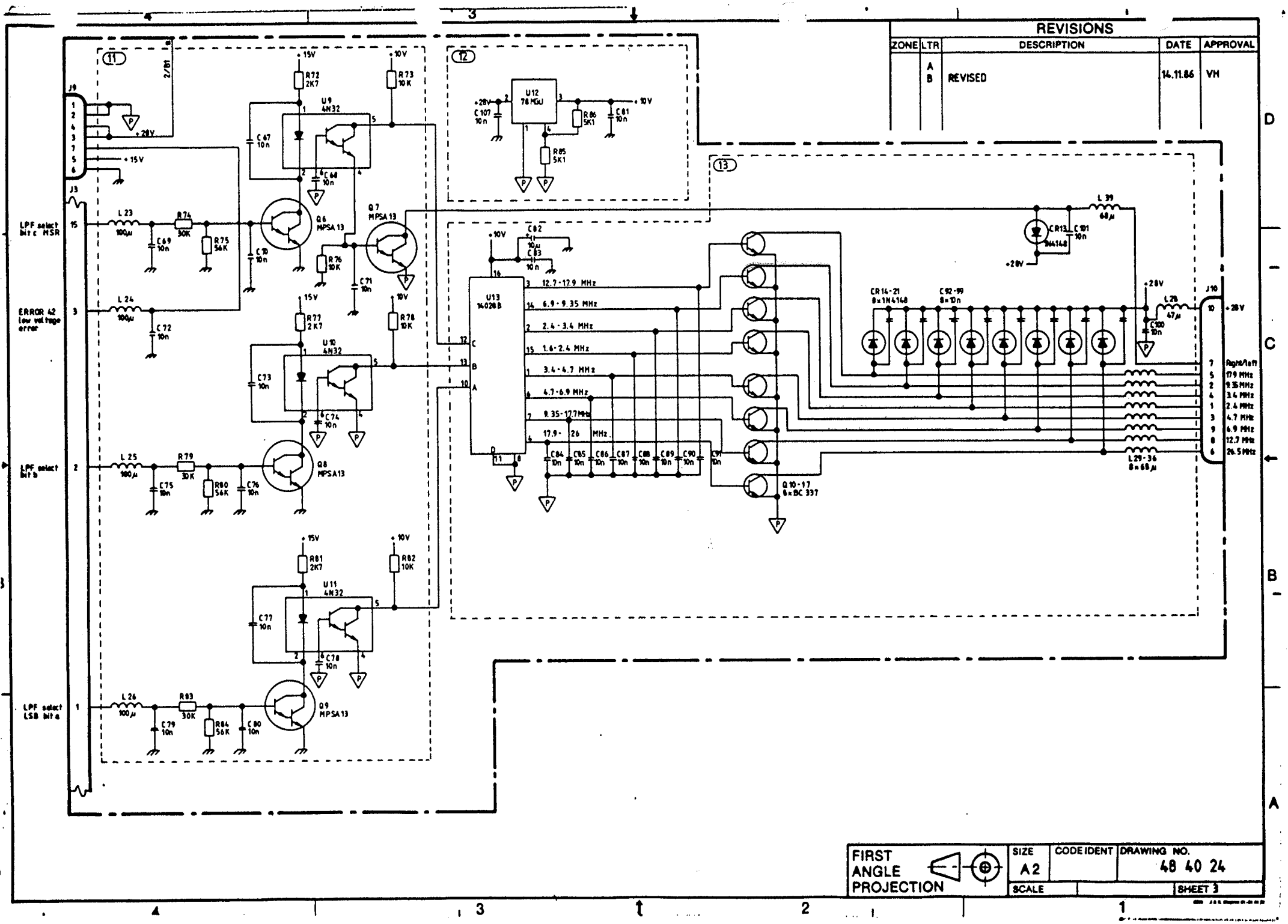
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. VH 10.9 1986	TITLE CONTROL UNIT	
		ANGLES	CH.		
		LIN. DIM.	AP.		
	PA 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 40 24	
APPLICATION				SCALE 2:1	SHEET 1 OF 1


REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVAL
A
B | REVISED | 17.11.86 | VH
MESSURED AT 15MHz
VC | VALC
600W | 8,2V | 5,4V
300W | 5,8V | 3,8V
150W | 4,0V | 2,6V
40W | 1,6V | 1,1V
To Power Splitter Driver ALC
Gain preset Driver ALC
LSB bit a
bit b
MSB bit c
To output directional coupler
Vfor
Vrev
To PS 3000
I-ALC
VALC
V ALC
Output level
ERROR 43 BAD SWR
Dansk Radio AS
CONTROL UNIT
DR. V.H. 7. 3 1986
CH.
AP.
AP.
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
ANGLES
LIN. DIM.
MATERIAL
PA3000
NEXT ASSY | USED ON
APPLICATION
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 48 40 24
SCALE
SHEET 1 OF 3

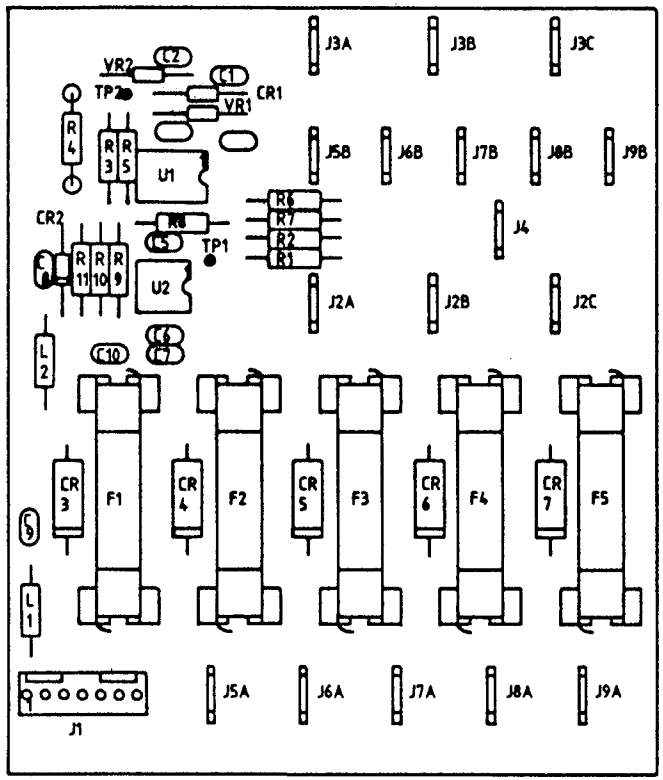
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.11.86	VH



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 40 24
	SCALE		SHEET 2

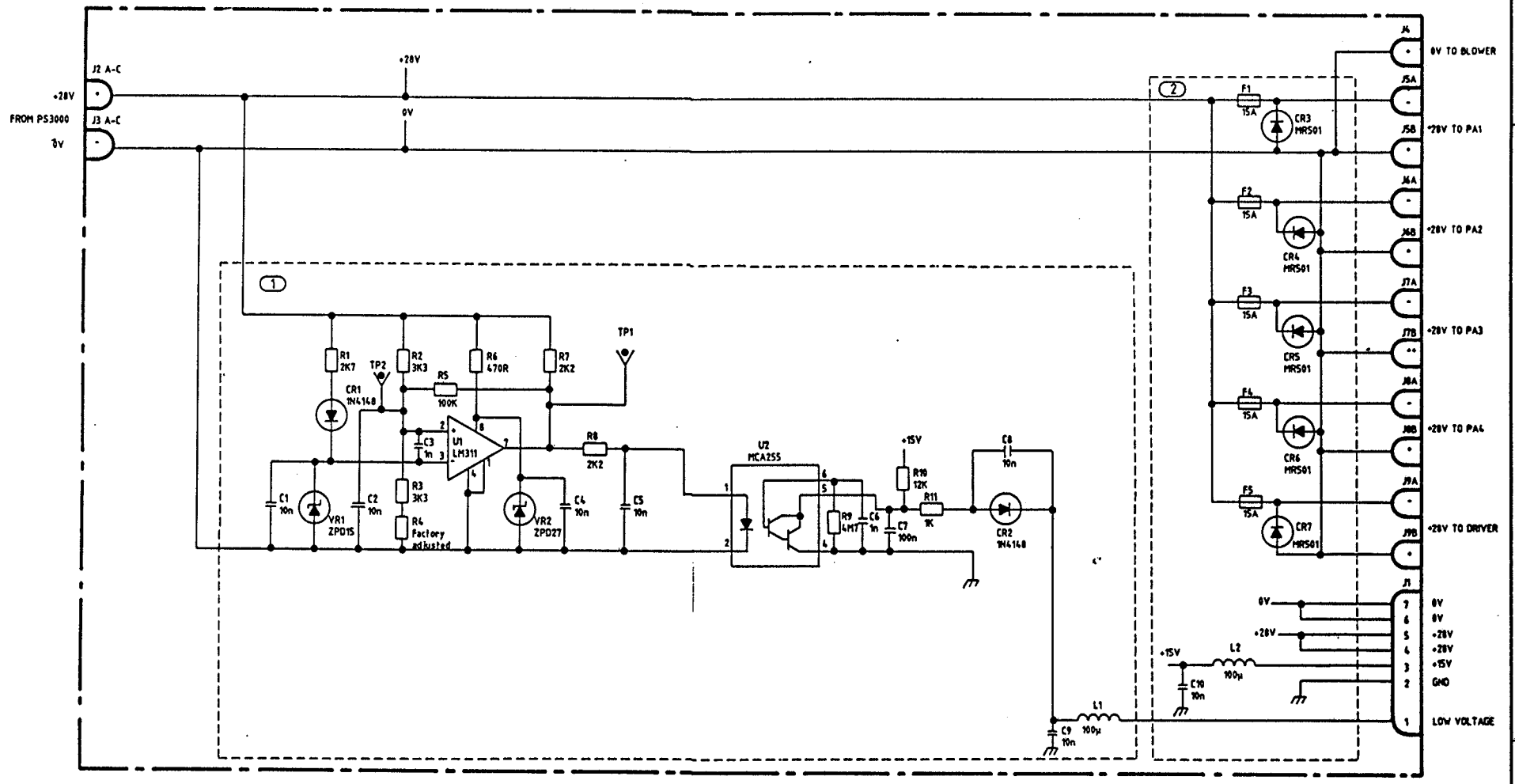

REVISIONS
ZONE | LTR | DESCRIPTION | DATE | APPROVAL
A
B | REVISED | 14.11.86 | VH
LPF select bit c MSB
ERROR A2 low voltage error
LPF select bit b
LPF select LSB bit a
U9 4N32
U10 4N32
U11 4N32
U12 78M10
U13 14028B
Q6 MPSA13
Q7 MPSA13
Q8 MPSA13
Q9 MPSA13
Q10-17 8x BC 337
CR14-21 8x1N4148
CR13 1N4148
L29-36 8x68µ
12.7-17.9 MHz
6.9-9.35 MHz
2.4-3.4 MHz
1.6-2.4 MHz
3.4-4.7 MHz
4.7-6.9 MHz
9.35-12.7MHz
17.9-26 MHz
Right/left
17.9 MHz
9.35MHz
3.4 MHz
2.4 MHz
4.7 MHz
6.9 MHz
12.7 MHz
26.5MHz
FIRST ANGLE PROJECTION
SIZE A2
CODE IDENT
DRAWING NO. 48 40 24
SCALE
SHEET 3

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



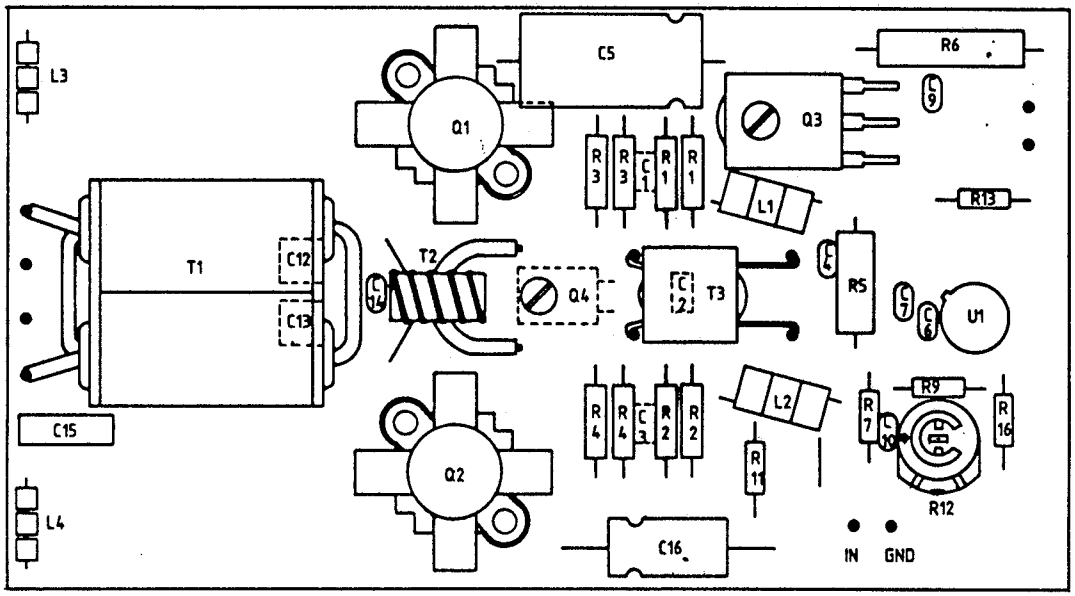
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. VH 28.10 1986	TITLE	
		LIN. DIM.	CH.	COMPONENT LOCATION FUSE BOARD PA3000	
			AP.		
	PA3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 28 54	
APPLICATION				SCALE 2:1	SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	E	APPROVAL
	A			
	B	REVISED	27.8.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS
			DR. VH 28.10 1986	TITLE FUSE BOARD PA3000 ALC 5R
		ANGLES	CH.	
		LIN. DIM.	AP. 6/5-1987	
			AP.	
	PA3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 28 54
NEXT ASSY	USED ON			SCALE / SHEET 1 OF 1
APPLICATION				

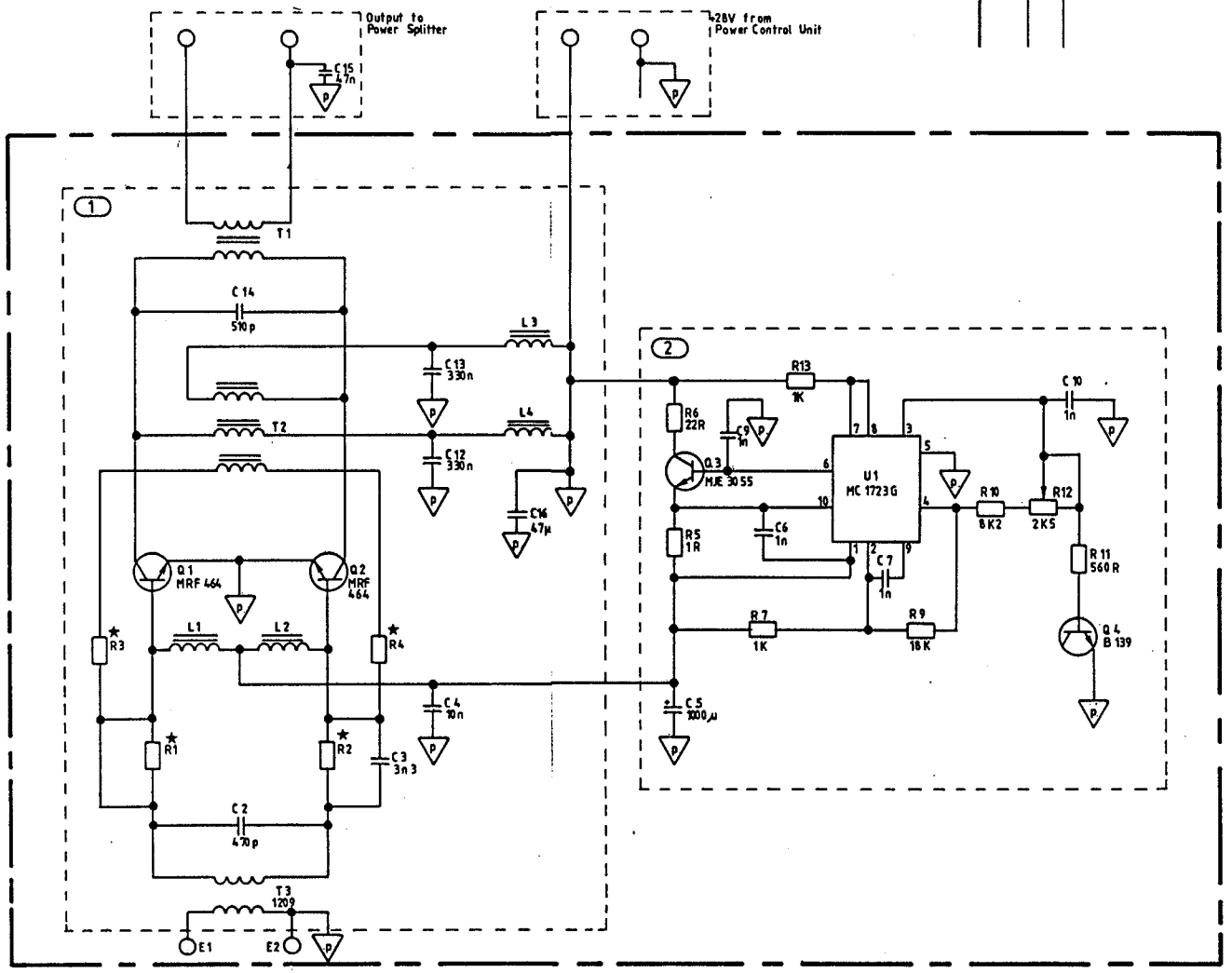
REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
			DR. VH 4.9 1986	TITLE	
		ANGLES	CH.	COMPONENT LOCATION	
		LIN. DIM.	AP. 4.9.1986	PA - DRIVER	
			AP.		
48 34 35	PA 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 48 48 14
NEXT ASSY	USED ON			SCALE 2 : 1	SHEET 1 OF 1
APPLICATION					

1.

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.8.87	VH



Indicates common with 0V on main 28V of TR 3000

Indicates common with chassis

R1 = R2 = 2 × 4E7 parallel, R3 = R4 = 2 × 6E8 parallel

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
48 34 35	PA 3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

DR.	V.H.	3.12 1984
CH.		
AP.		4/12-84
AP.		

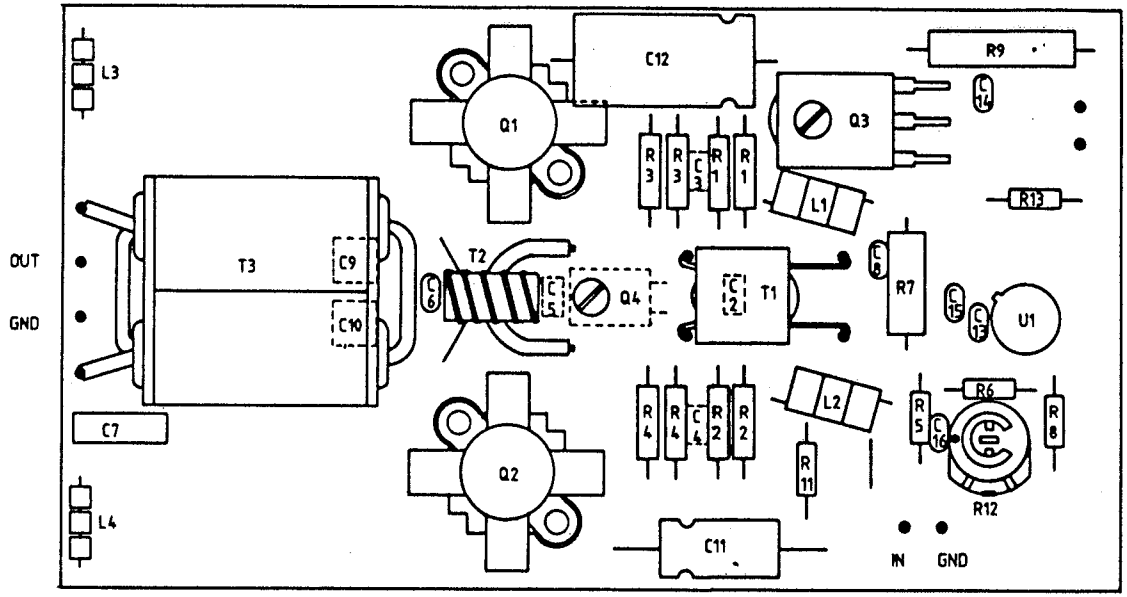
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE: PA - DRIVER

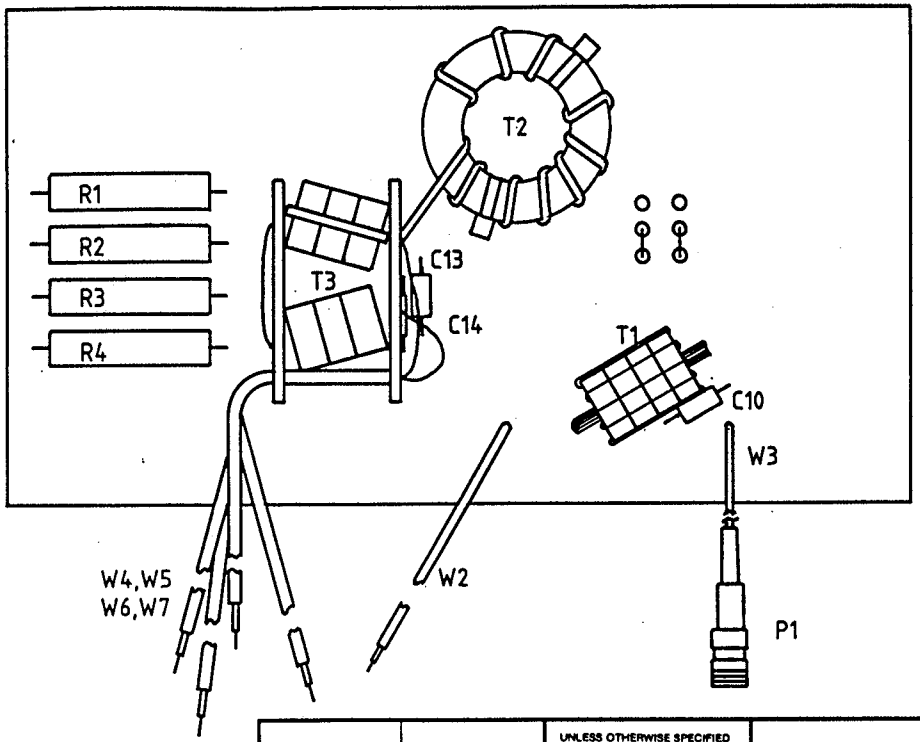
SIZE	CODE IDENT	DRAWING NO.
A2		48 48 14
SCALE		SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075			Dansk Radio AS
			DR. VH 4.9 1986	TITLE	COMPONENT LOCATION POWER AMPLIFIER
		ANGLES	CH.		
		LIN. DIM.	AP. 4.9.1986		
			AP.		
48 34 35	PA 3000	MATERIAL	FIRST ANGLE PROJECTION	SIZE A2	CODE IDENT / DRAWING NO. 48 48 22
NEXT ASSY	USED ON			SCALE 2 : 1	SHEET 1 OF 1
APPLICATION					

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVAL
A B	REVISED	17.11.86	VH



	PA3000
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	30.10.86
CH.		
AP.		
AP.		

FIRST ANGLE PROJECTION

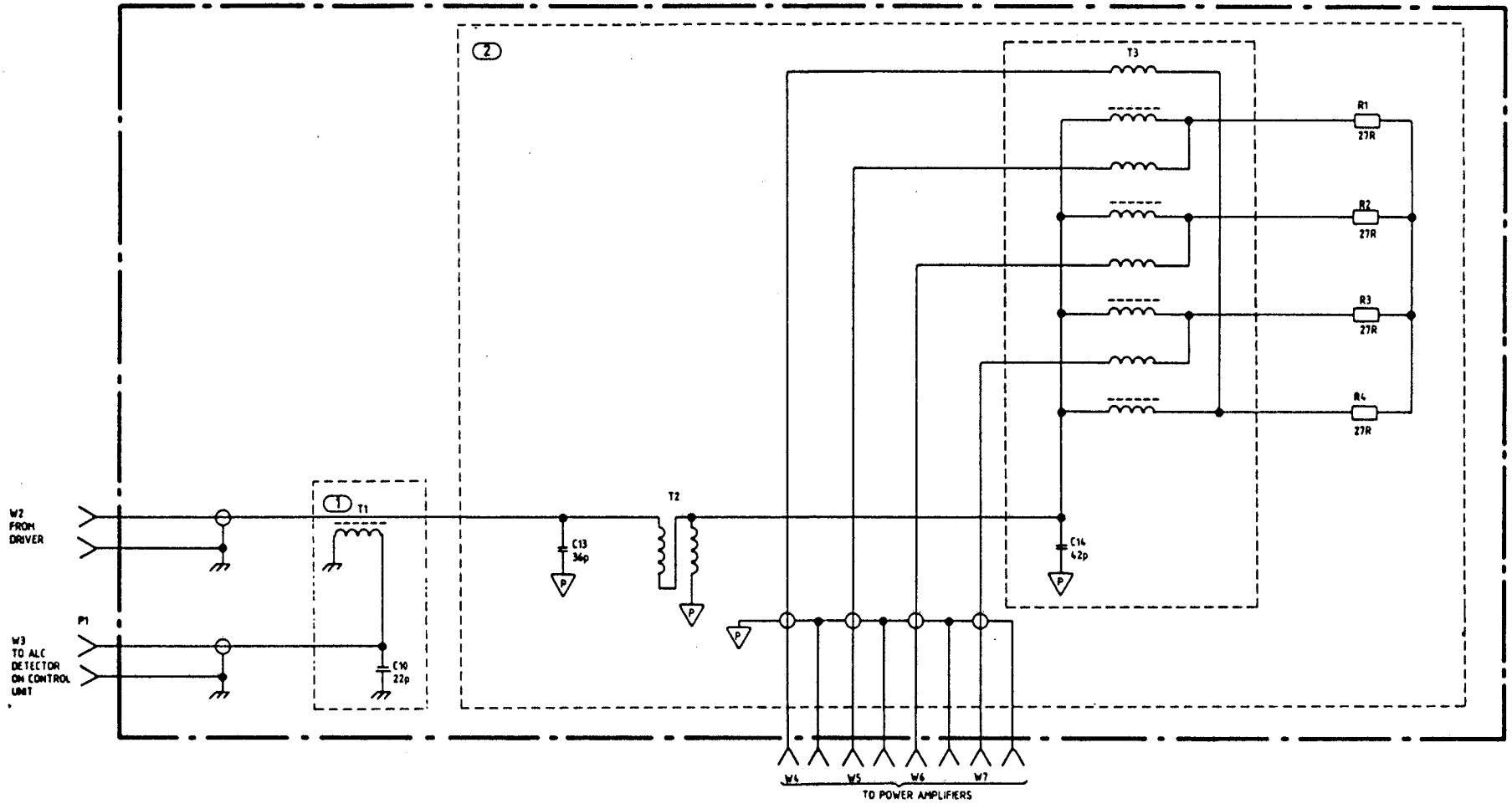
Dansk Radio AS

TITLE
COMPONENT LOCATION
CURRENT TRANSFORMER-ALC- AND
1:4 POWER SPLITTER
PA3000

SIZE	CODE IDENT NO.	DRAWING NO.
A 3		48 21 96
SCALE 1:1		SHEET 1 OF 1

5800 J & K, Diaprint 01-54 44 22

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	17.11.86	VH



P COMMON WITH 0V ON MAIN 28V

COMMON WITH CHASSIS

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075
		ANGLES
		LIN. DIM.
	PA3000	MATERIAL
NEXT ASSY	USED ON	
APPLICATION		

DR.	VH	29.10 1986
CH.		
AP.		19/11-86
AP.		

FIRST ANGLE PROJECTION

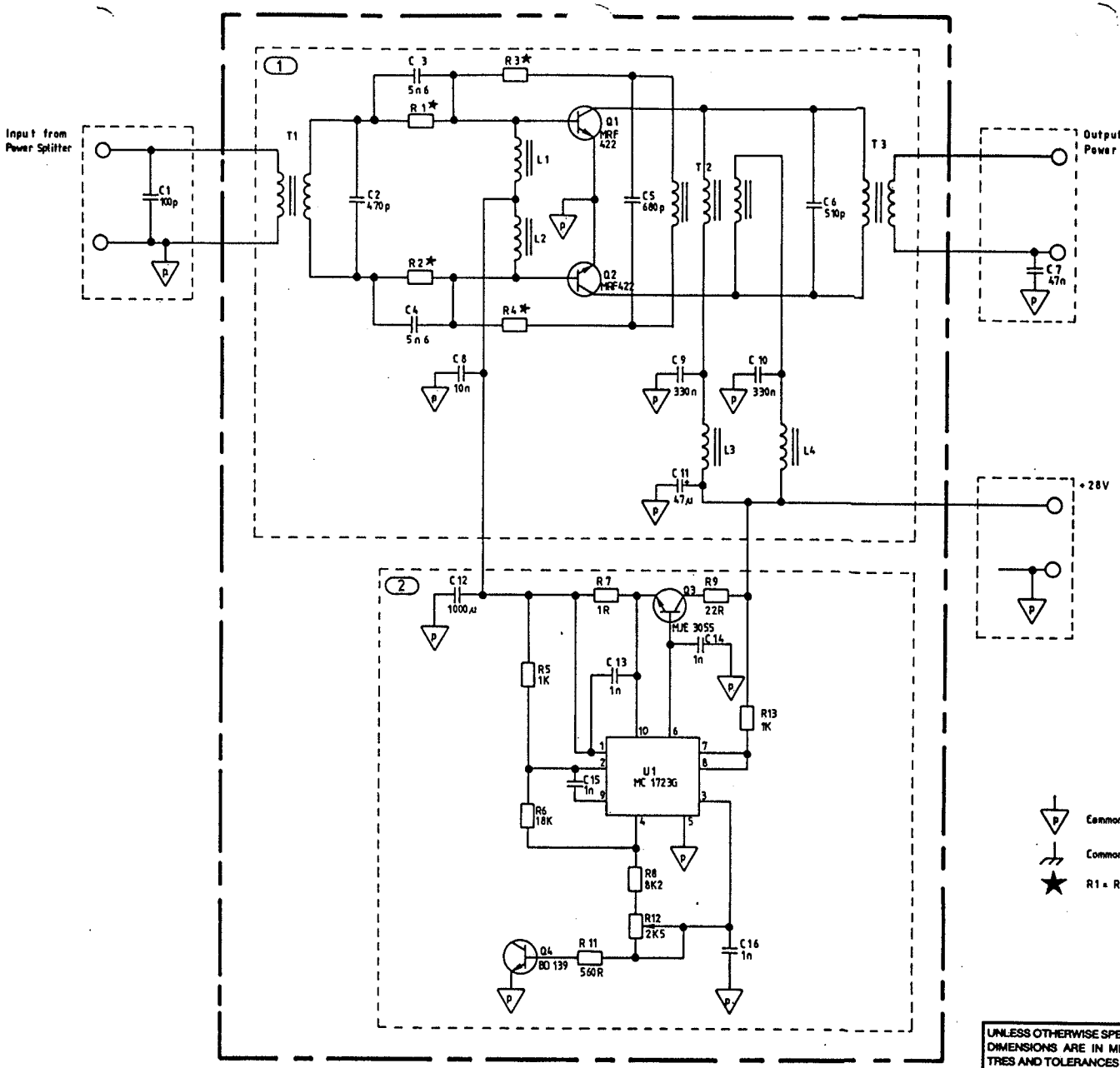
Dansk Radio AS

TITLE
CURRENT TRANSFORMER-ALC- AND
1:4 POWER SPLITTER
PA3000

SIZE	CODE IDENT	DRAWING NO.
A2		48 21 96
SCALE		SHEET 1 OF 1

53

1.



P Common with 0V on main 28V

Common with chassis

★ R1 = R2 = 2 × 6E8 parallel , R3 = R4 = 2 × 8E2 parallel

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.8.87	VH

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

ANGLES

LIN. DIM.

MATERIAL

48 3435	PA3000
NEXT ASSY	USED ON
APPLICATION	

DR.	V.H.	2. 4 1986
CH.		
AP.		5/5-1987
AP.		

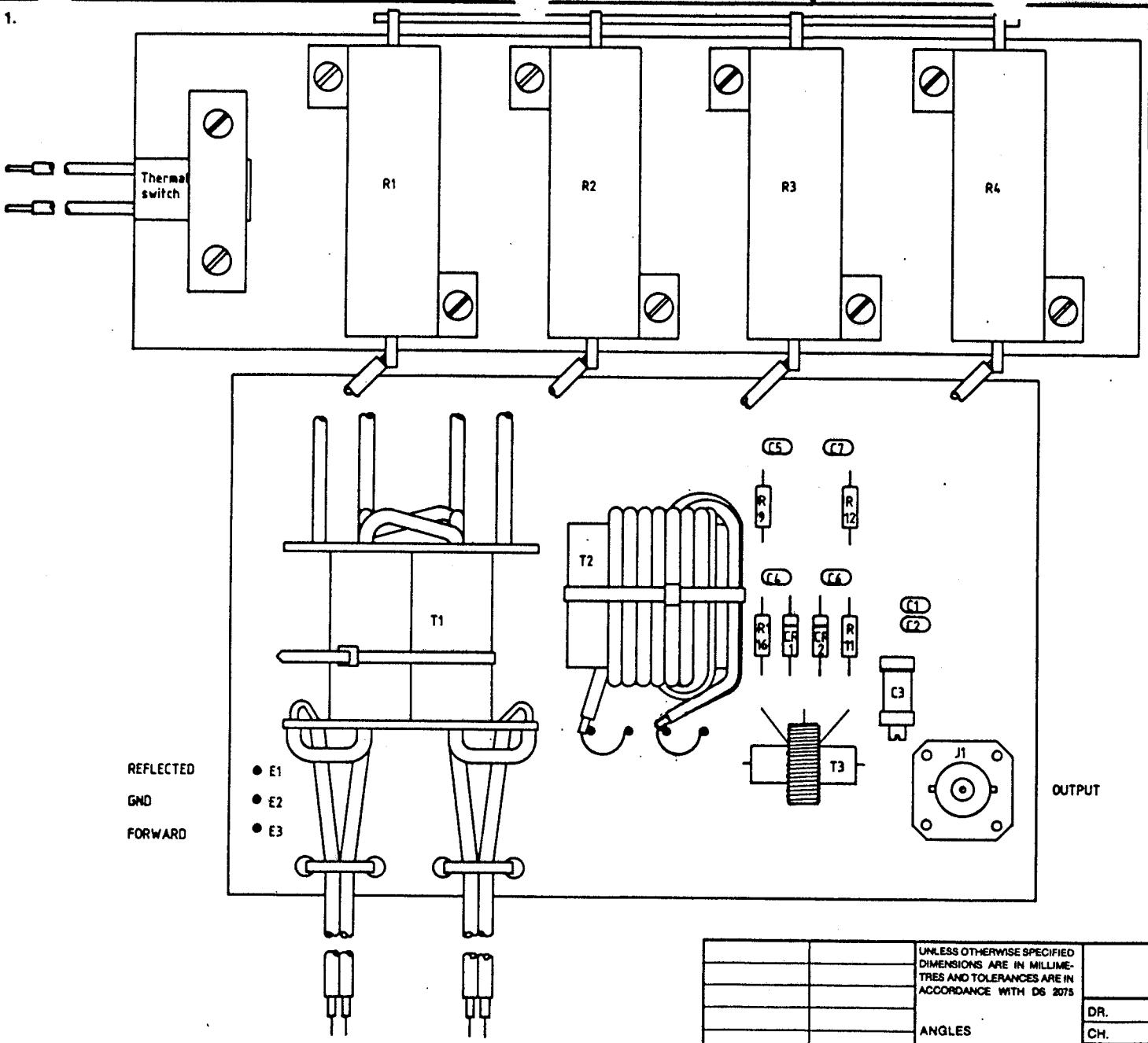
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE: POWER AMPLIFIER

SIZE	CODE IDENT	DRAWING NO.
A2		48 48 22
SCALE		SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.11.86	VH



48 34 35	PA 3000
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. 1986
CH.		
AP.		8.9.1986
AP.		

FIRST ANGLE PROJECTION

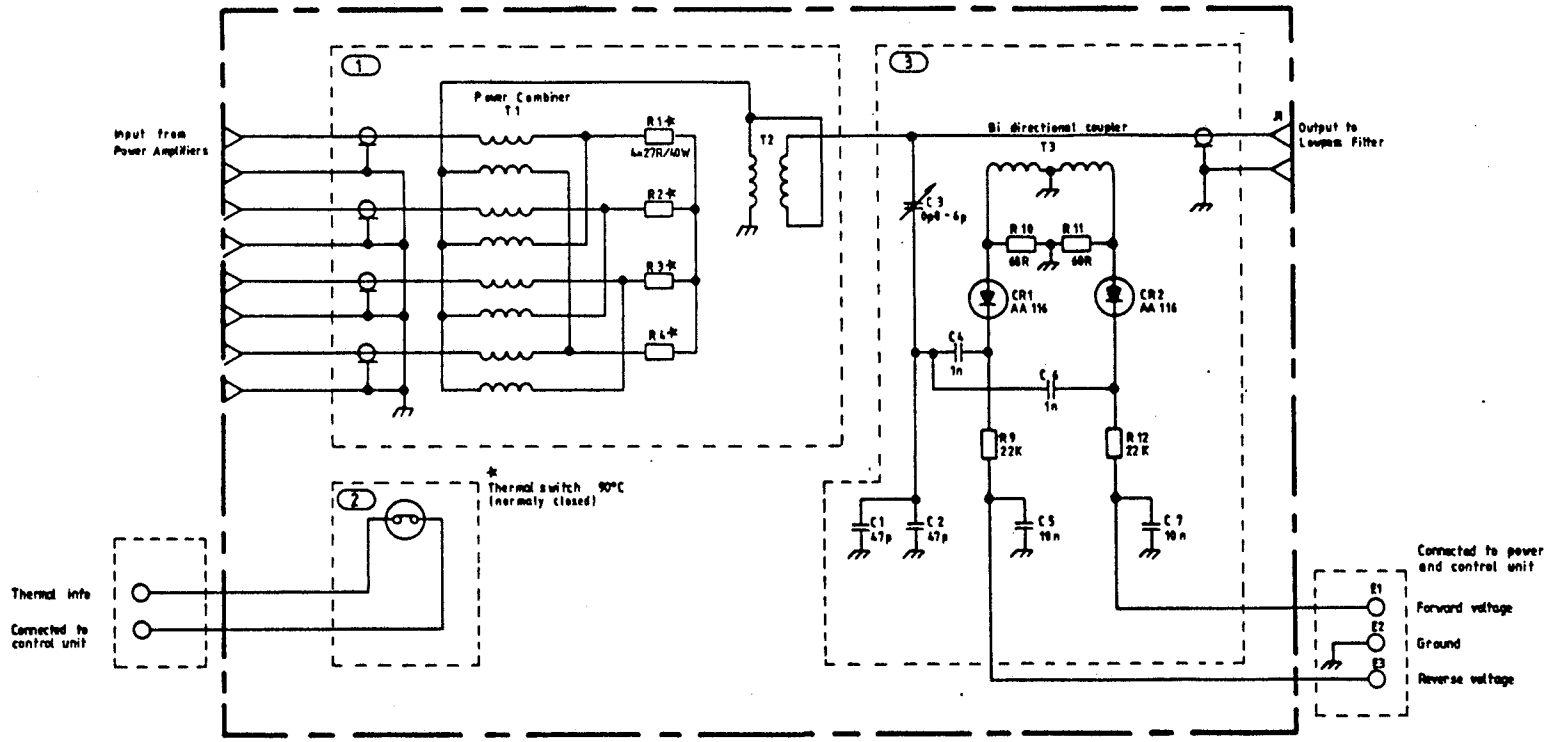
Dansk Radio AS

TITLE
COMPONENT LOCATION
POWER COMBINER / SWR

SIZE	CODE IDENT	DRAWING NO.
A2		48 48 30

SCALE 2 : 1 | SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	14.11.86	VH



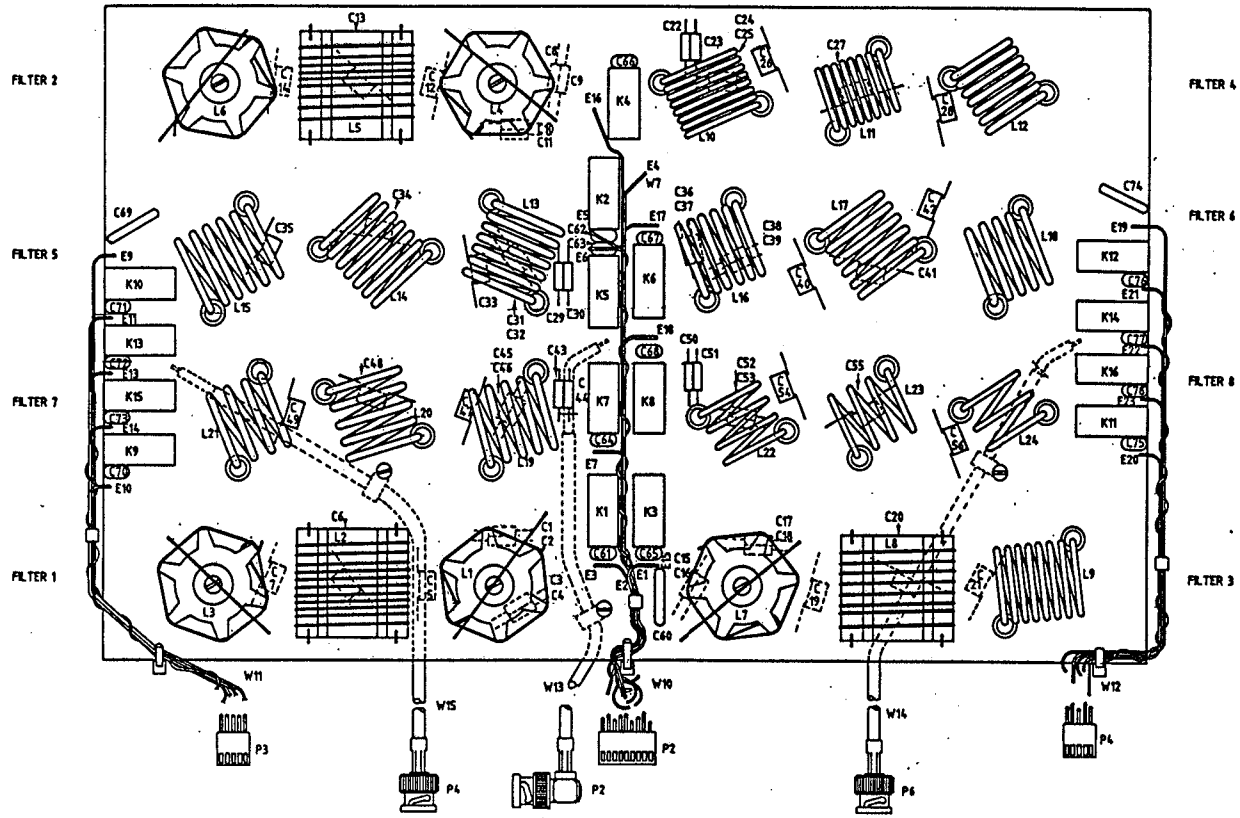
Indicates common with chassis

Components mounted on heat sink

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075		Dansk Radio AS	dra
		ANGLES	DR. VH 2.4 1986	TITLE POWER COMBINER / SWR	
		LIN. DIM.	CH.		
			AP.		
48 3435	PA 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A2 / CODE IDENT / DRAWING NO. 48 48 30	
APPLICATION				SCALE / SHEET 1 OF 1	

48-4
SS

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	18.11.86	VH

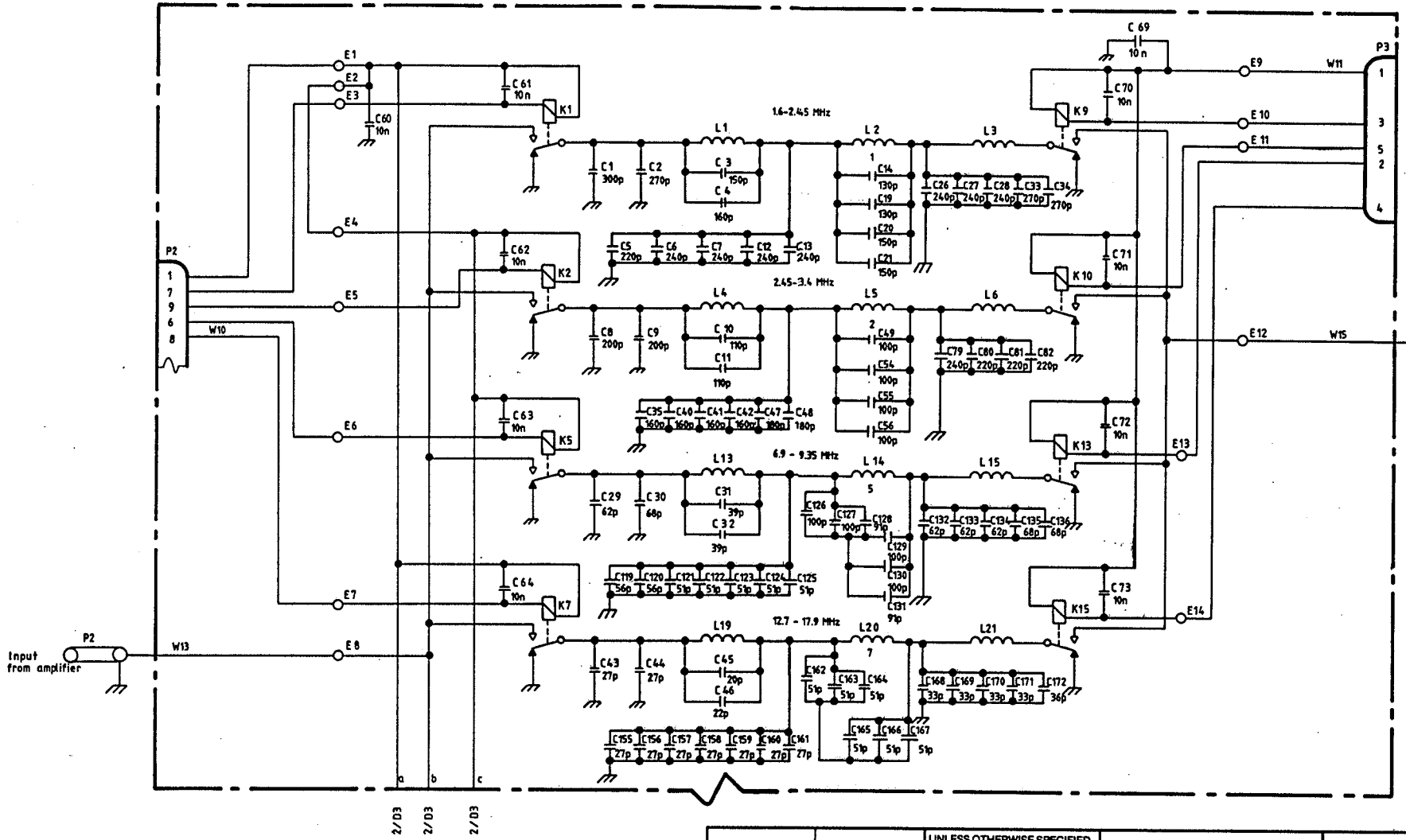


		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 3075		Dansk Radio AS	dra
		ANGLES	DR. VH 29.8.1986	TITLE COMPONENT LOCATION OUTPUT FILTER PA3000	
		LIN. DIM.	CH. RKV 860829		
			AP.		
	PA 3000	MATERIAL	AP.		
NEXT ASSY	USED ON		FIRST ANGLE PROJECTION	SIZE A1 / CODE IDENT / DRAWING NO. 48 23 58	
APPLICATION				SCALE 1:1	SHEET 1 OF 1

1.

REVISIONS

ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	18.11.86	VH
	C	REVISED	1.4.87	VH
	D	REVISED	14.8.87	VH



		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
	PA3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

DR.	V.H.	3.4 1986
CH.		
AP.		2.9.1986
AP.		

Dansk Radio AS

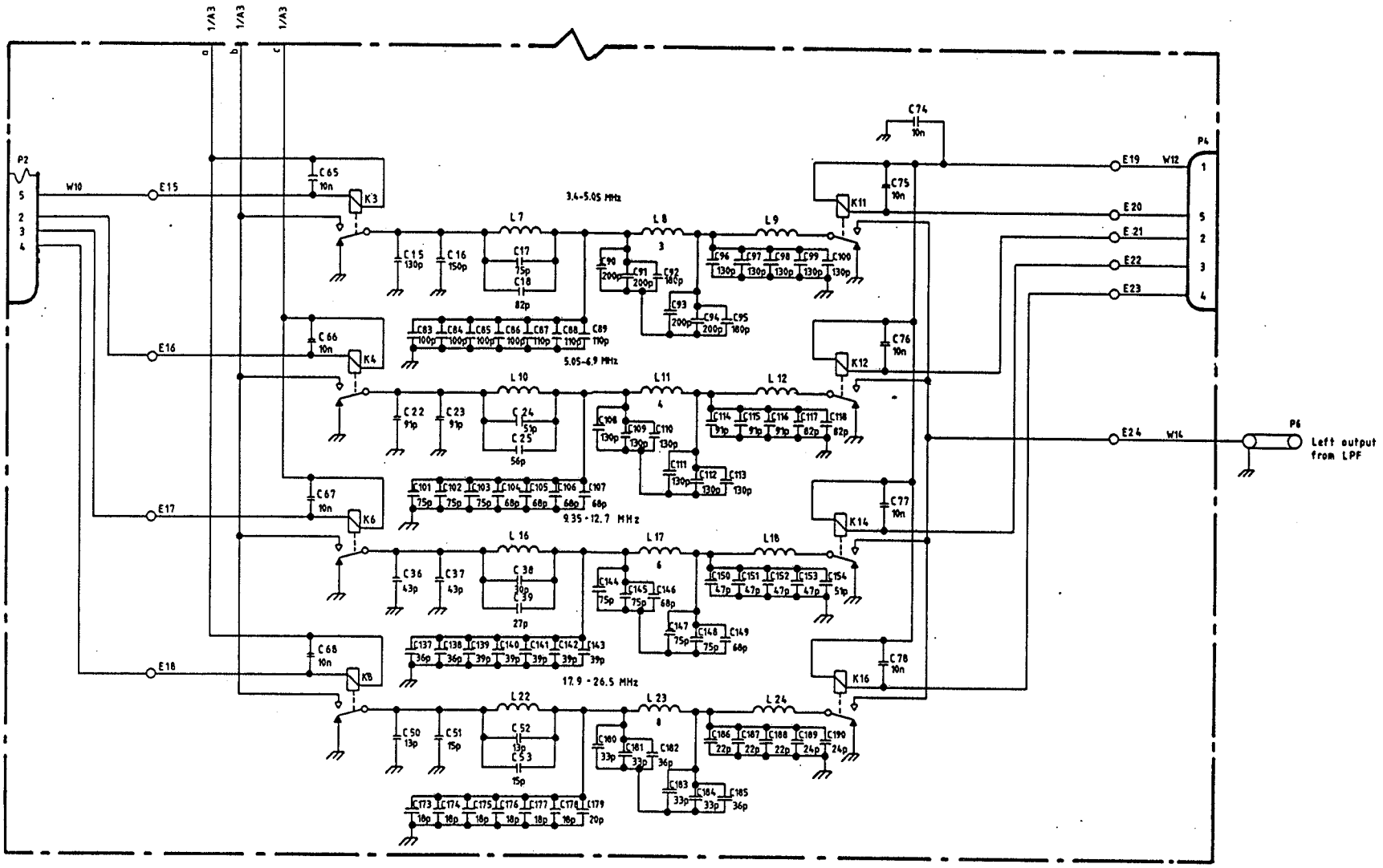
TITLE: OUTPUT FILTER

FIRST ANGLE PROJECTION

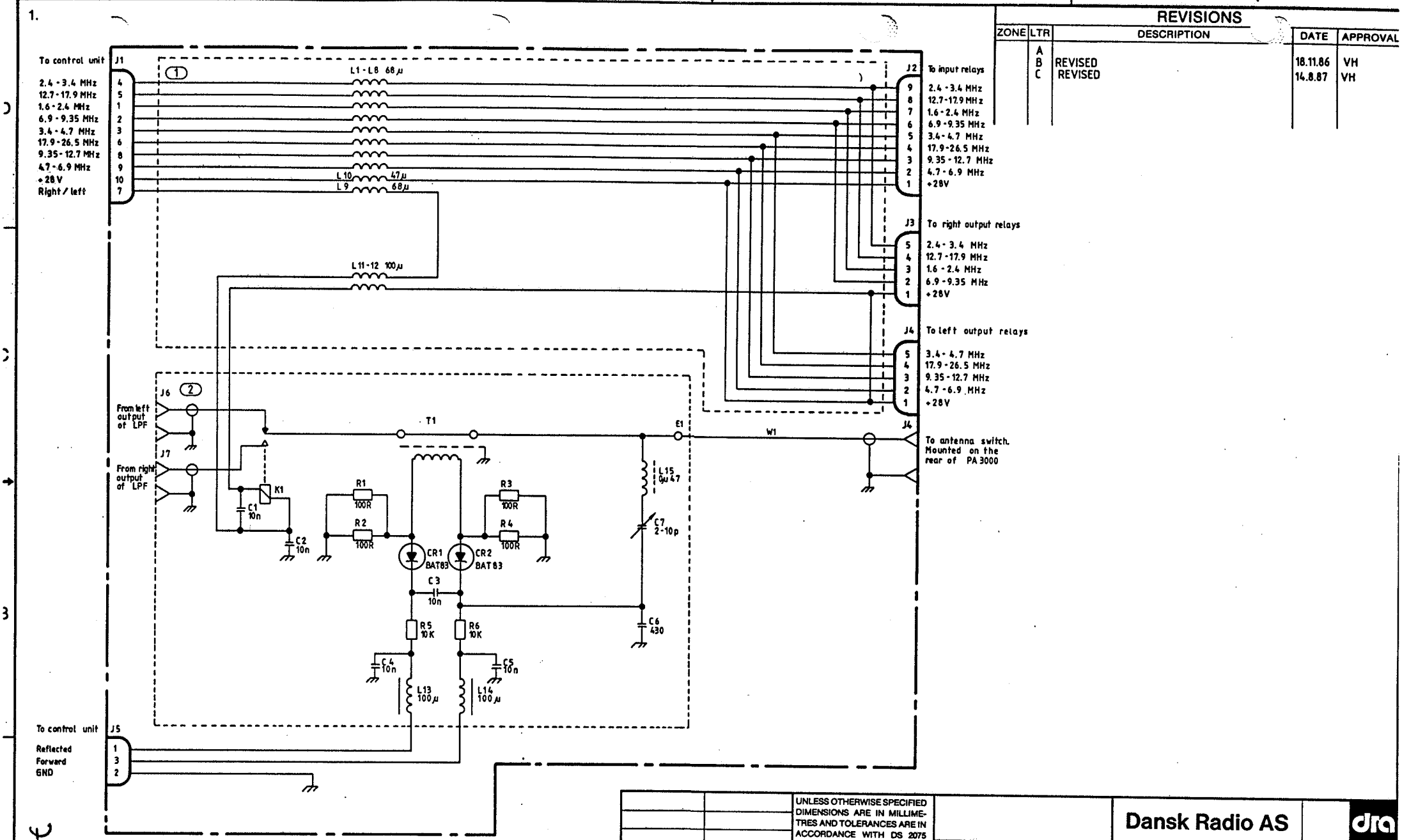
SIZE	CODE IDENT	DRAWING NO.
A2		48 23 58

SCALE | SHEET 1 OF 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	18.11.86	VH
	C	REVISED	2.4.87	VH



FIRST ANGLE PROJECTION	SIZE	CODE IDENT	DRAWING NO.
	A2		48 23 58
	SCALE		SHEET 2



REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED	18.11.86	VH
	C	REVISED	14.8.87	VH

	PA 3000
NEXT ASS'Y	USED ON
APPLICATION	

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

ANGLES

LIN. DIM.

MATERIAL

DR.	V.H.	7. 4 1986
CH.		
AP.		5/5-87
AP.		

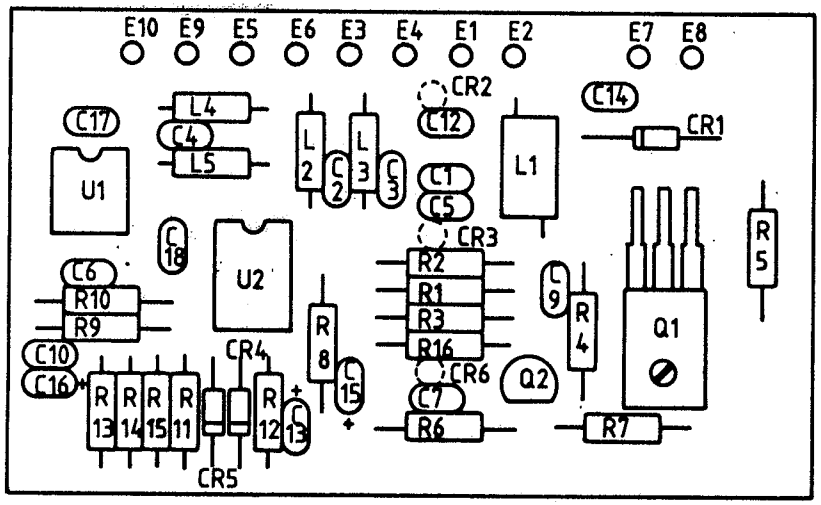
FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE: DIRECTIONAL COUPLER

SIZE	CODE IDENT	DRAWING NO.
A2		48 32 57
SCALE		SHEET 1 OF 1

REVISIONS			
LTR	DESCRIPTION	DA	APPROVAL



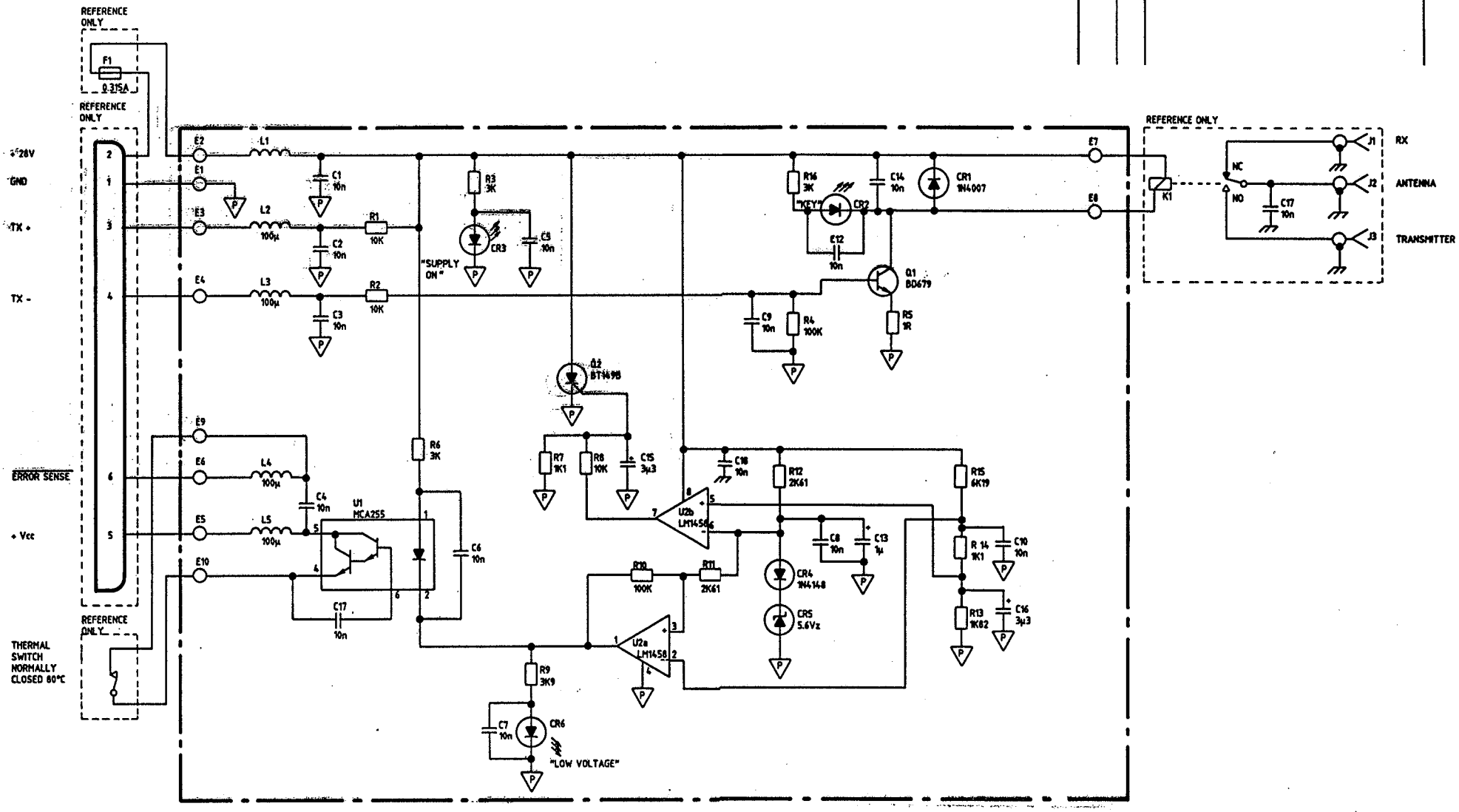
		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2078.	
		ANGLES	DR. VH 19.8.86
		LIN. DIM.	CH.
		MATERIAL	AP.
			AP.
	TR3000		
NEXT ASSY	USED ON		
APPLICATION			FIRST ANGLE PROJECTION

Dansk Radio AS dra

TITLE
COMPONENT LOCATION
ANTENNA SWITCH
AS3000

SIZE	CODE IDENT NO.	DRAWING NO.
A 3		47 95 19
SCALE 2:1		SHEET 1 OF 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVAL
	A			
	B	REVISED R114 to R14	14.8.87	VH



INDICATES COMMON WITH 0V ON MAIN 28V TO TR3000

INDICATES COMMON WITH CHASSIS

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETRES AND TOLERANCES ARE IN ACCORDANCE WITH DS 2075	
		ANGLES	
		LIN. DIM.	
	TR3000	MATERIAL	
NEXT ASSY	USED ON		
APPLICATION			

DR.	VH	19.8 1986
CH.		
AP.		19.8 1986
AP.		

FIRST ANGLE PROJECTION

Dansk Radio AS

TITLE
ANTENNA SWITCH
AS3000

SIZE	CODE IDENT.	DRAWING NO.
A2		47 95 19
SCALE		SHEET 1 OF 1