

**Manual 180**  
**for**  
**RBX100-2T2U**

# Contents

<b>GENERAL INFORMATION</b>	<b>5</b>
1. Introduction	5
2. Technical data	6
A. Radio interface	6
B. Telephone interface	6
C. General data	6
3. Description of the block diagram	8
<b>OPERATING INSTRUCTIONS</b>	<b>10</b>
4. Survey of controls and sockets	10
5. Directions for use	11
A. Installation	11
B. Setting-up instructions	13
Switch and strap selection	13
C. Operating instructions	16
<b>SERVICE INSTRUCTIONS</b>	<b>18</b>
6. Wiring table (Motherboard)	18
7. Mains power supply, 290-171	21
Checking and adjusting	21
8. 24V DC power supply, 290-179	25
Checking and adjusting	25
9. Base station interface, 290-165	28
Checking and adjusting	28
10. Telephone unit, 290-152	32
Duplex	33
Simplex	33
Checking and adjusting	34
Telephone 1	34
Telephone 2	34
11. CPU, 290-186/193	38
Checking and adjusting	38
12. List of standard radio interfaces	42



## List of figures

Fig. 1-1	RBX100-2T2U System set-up	5
Fig. 3-1	Block diagram	9
Fig. 4-1	Front of the equipment	10
Fig. 5-1	Connections	11
Fig. 5-2	Wall-mounting	12
Fig. 5-3	Mains power supply	13
Fig. 5-4	Base station interface	14
Fig. 5-5	Telephone module	14
Fig. 5-6	CPU main board	14
Fig. 5-7	CPU code board	15
Fig. 6-1	Motherboard, front view	18
Fig. 7-1	Component location, mains power supply, 290-171	22
Fig. 7-2	Circuit diagram, mains power supply, 290-171	23
Fig. 8-1	Component location, 24V DC power supply, 290-179	26
Fig. 8-2	Circuit diagram, 24V DC power supply, 290-179	27
Fig. 9-1	Definitions	29
Fig. 9-2	Component location, base station interface, 290-165	30
Fig. 9-3	Circuit diagram, base station interface, 290-165	31
Fig. 10-1	Level diagram, telephone line	33
Fig. 10-2	Definitions	35
Fig. 10-3	Component location, telephone module, 290-152	36
Fig. 10-4	Circuit diagram, telephone module, 290-152	37
Fig. 11-1	Component location, CPU main board, 290-186/193	39
Fig. 11-2	Component location, CPU code board	40
Fig. 11-3	Circuit diagram, CPU, 290-186/193	41

## GENERAL INFORMATION

### 1. Introduction

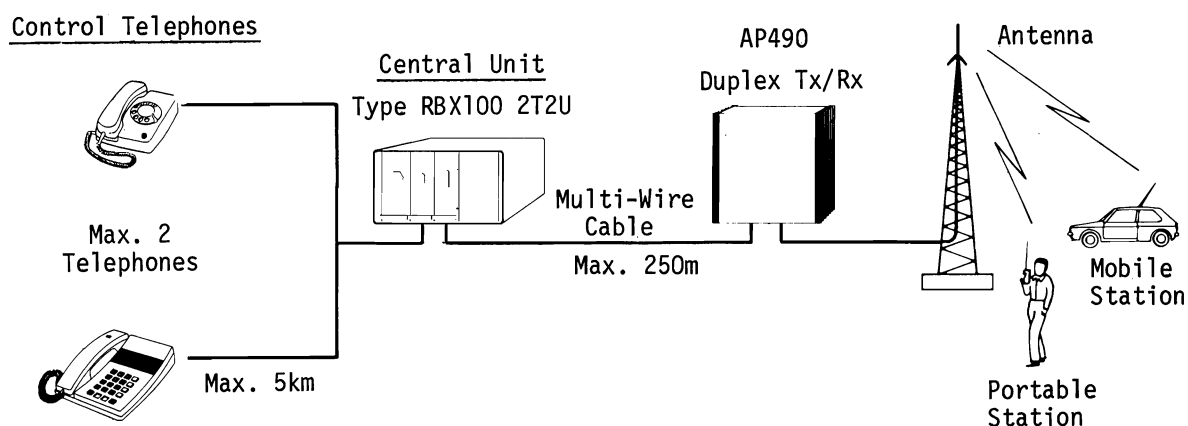


Fig. 1-1 RBX100-2T2U System set-up



The system can be regarded as a telephone exchange with 3 subscriber connections. Two of these are devoted to telephone sets and the third to a duplex radio station type AP490. For connection via the radio station, a number of mobile and/or hand-held radios can be used. In the manual only mobile radios are mentioned, as there is no principal difference, i.e. the text about mobile radios also applies to hand-held radios. The mobile radios can communicate with each other or with the telephone sets. Calling-up can be done from either end. In addition, the telephones can communicate with each other in which case the radio station is not used. Two mobile radios can communicate with each other by means of the talk-through (T/T) facility. Enabling the T/T means that the AP490 receiver output is fed to the transmitter modulation input. T/T is always in function when one mobile radio communicates with another mobile radio. In this mode only simplex operation is possible. Communication is restricted to the area covered by the AP490. It is possible to set-up the central unit for enabling the T/T from either mobile stations, from the telephones or from both.

## 2. Technical data

### A. Radio interface

Modulation output	: 600Ω/-10dBm (245mV) for 70% modulation.
AF input	: 600Ω/-10dBm (245mV) for 70% modulation.
KEY output	: Floating relay output. Max. 50V DC/0.5A.
Squelch input	: Floating optical coupler input. 5-50V DC.

### B. Telephone interface

Telephone set type	: Standard type with 10Hz or 16Hz dialling pulses.		
Line impedance	: Nominal 600ohms.		
Line level	: -10dBm (70% modulation).		
Line voltage	: 45-55V DC		
Short-circuit current	: Limited to 50mA.		
Line loop resistance:	: <u>Digital 2000</u>	: <u>Siemens desk type</u>	
	Duplex mode	Max. 1kohm	Max. 2.7kohms
	Simplex mode	Max. 600ohms	Max. 1.5kohms
Line attenuation	: Max. 10dB.		
Ringling signal	: 50V/50Hz.		
Dialling tone	: 400Hz.		
Engaged tone	: 250ms	250ms	250ms etc.
			
Parallely connected telephones	: Max. 3		

### C. General data

Tone systems	: CCIR tone system. ZVEI tones on special request.
Mains frequency	: 50Hz.

Mains voltage : 220V AC.

Consumption : 12W in idle condition, 18W when telephone 1  
telephone 2 conversation.

Width X depth X height : 260 X 260 X 150mm.

CCIR digit no.:	Frequency
1	1124Hz
2	1197Hz
3	1275Hz
4	1358Hz
5	1446Hz
6	1540Hz
7	1640Hz
8	1747Hz
9	1860Hz
0	1981Hz
R	2110Hz

Tone duration 100ms

Valid with CPU 290-186

ZVEI digit no.:	Frequency
1	1060Hz
2	1160Hz
3	1270Hz
4	1400Hz
5	1530Hz
6	1670Hz
7	1830Hz
8	2000Hz
9	2200Hz
0	2400Hz
R	2600Hz

Tone duration 70ms

Valid with CPU 290-193

### 3. Description of the block diagram

The Central unit contains the following units:

- 1) Power Supply (PS).
- 2) Central Processing Unit (CPU).
- 3) Telephone Module (TM).
- 4) Base Station Interface (BSI).

The CPU contains the "telephone exchange", tone encoder and decoder, all controlled by a microprocessor with accompanying logic circuitry and memories. The microprocessor is controlled by a PROM program. This program contains sub-routines performing the function of timers, sequencing and a 400Hz oscillator used for e.g. the dialling tone. The TM is the interface between the telephone and the CPU. It contains two identical interface circuits, one for each telephone. Each interface contains amplifiers for both talk directions, circuits for detecting dialling etc., and a relay for putting a 50Hz ringing signal on the line when the telephone has been called.

The BSI is the interface between the AP490 and the CPU. It contains amplifiers for both talk directions and circuits for connecting the AF side of the radio during T/T. The Key signal to the AP490 and control signals for internal use are obtained from logic circuits. These function according to the demands of the system as well as to the features selected. The AP490 receiver is always on. Otherwise the CPU cannot detect calls from the mobile radios. The transmitter turns "ON" (carrier) when the following conditions appear:

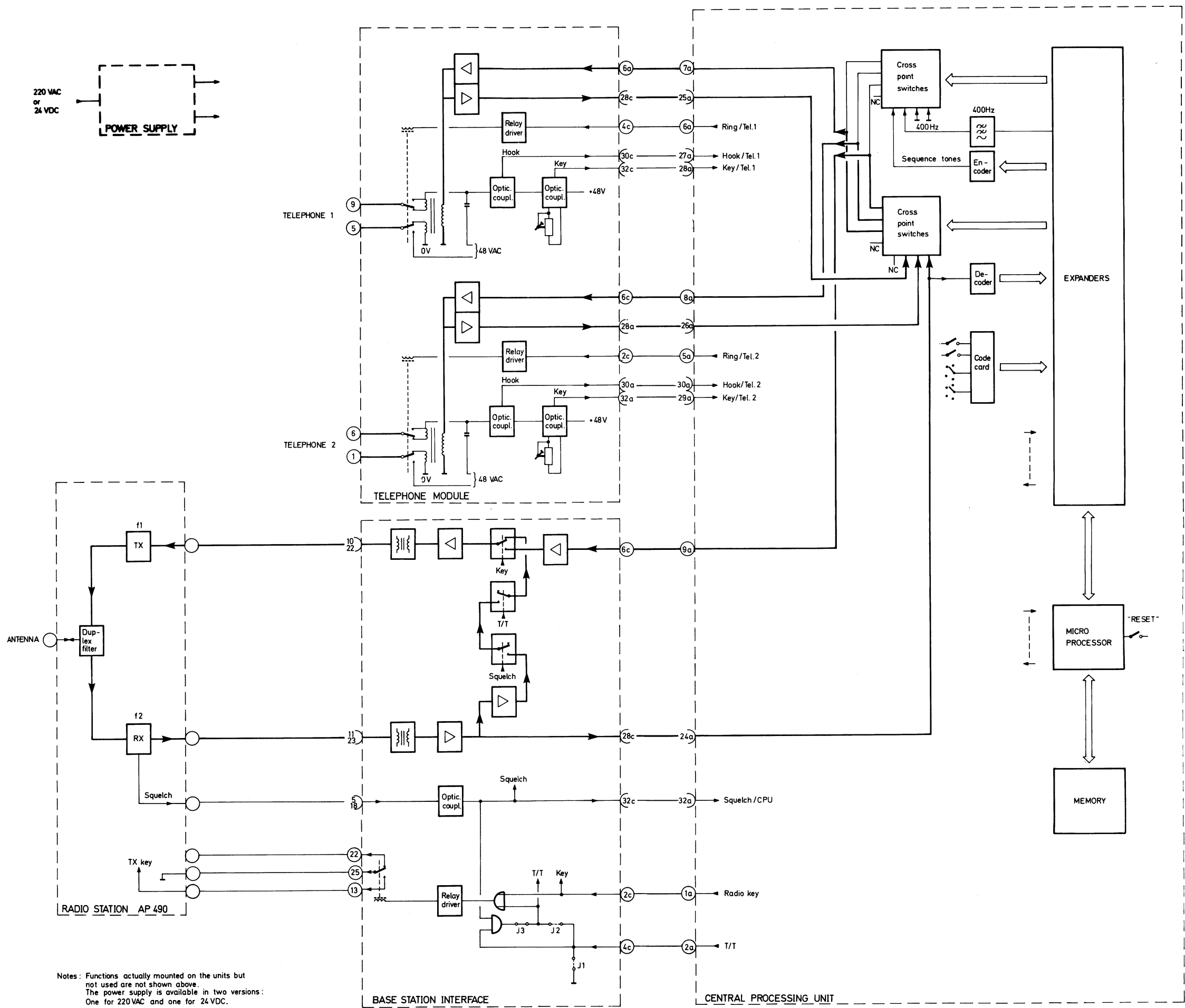
#### During T/T

When the squelch level of the AP490 is exceeded (if jumper J3 is connected). If jumper J2 is connected, the AP490 continuously transmits carrier while the AF modulation is blocked until the squelch level is exceeded. This mode is not allowed in some countries.

#### When no T/T

The AP490 turns "on" (carrier) when the key line from the CPU is low.

Note: Jumper J1 causes continuous T/T. This feature allows the CPU to be repaired without affecting the T/T capability.



Notes: Functions actually mounted on the units but not used are not shown above.  
The power supply is available in two versions:  
One for 220VAC and one for 24VDC.

APM830207

Fig. 3-1 Block diagram



## OPERATING INSTRUCTIONS

### 4. Survey of controls and sockets

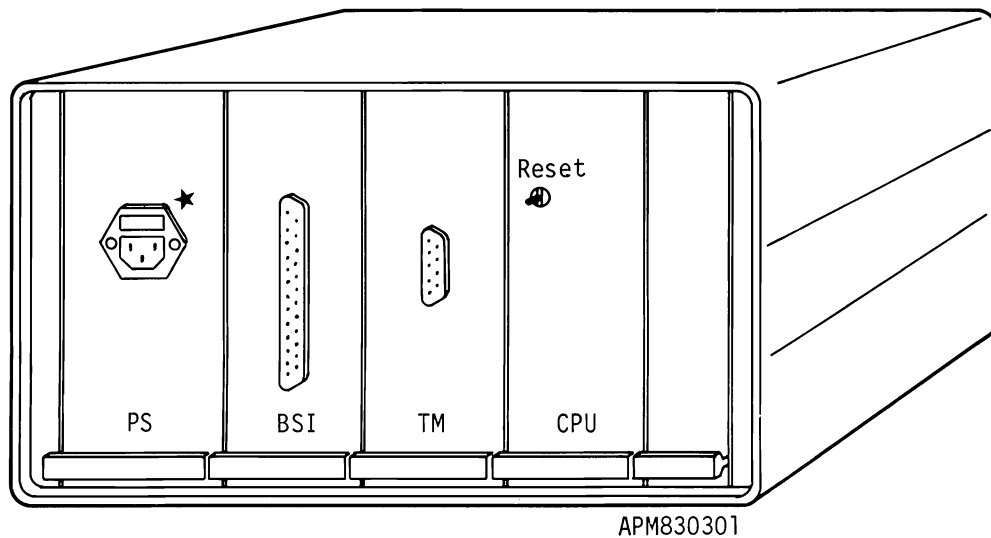


Fig. 4-1 Front of the equipment

The equipment contains the following controls and sockets:

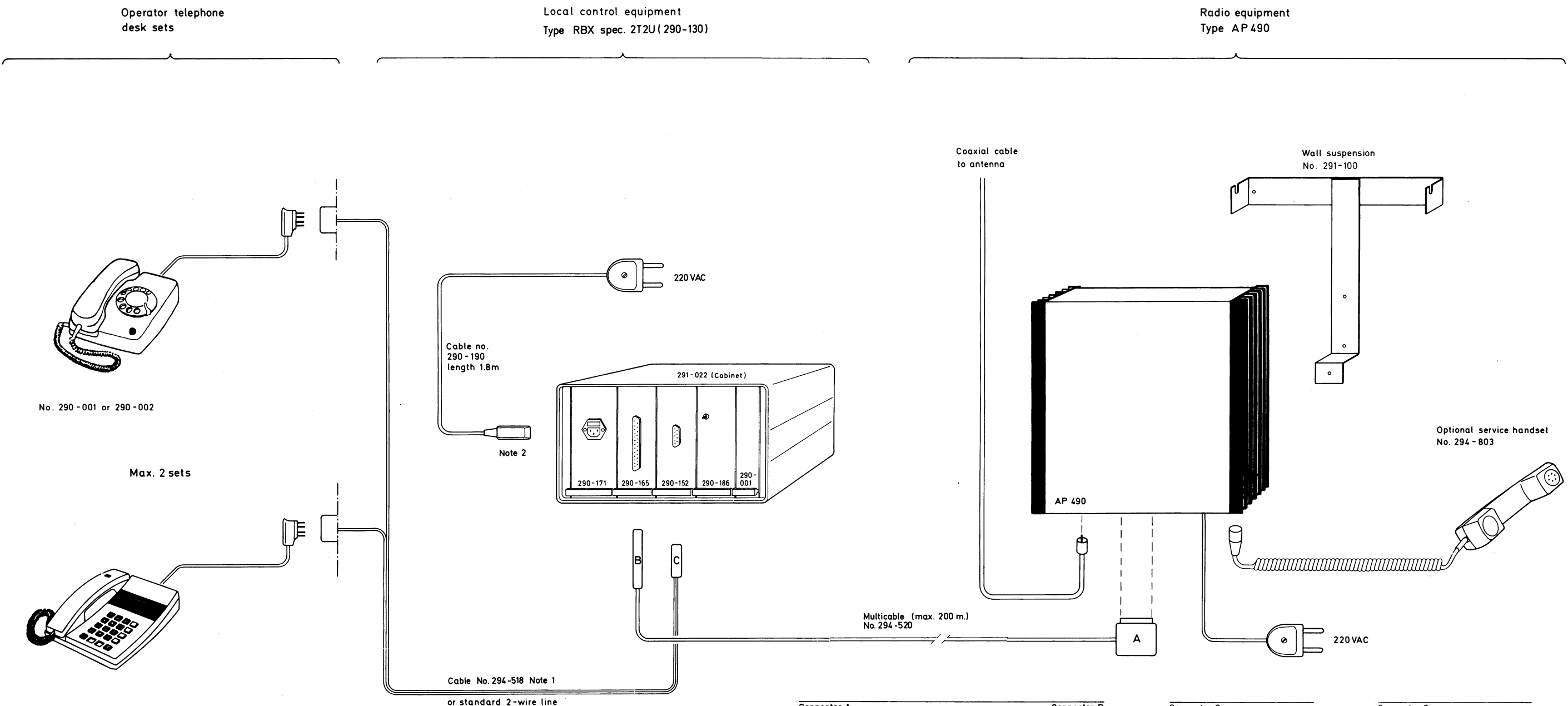
Unit

PS ★	Mains connector/fuse holder. The fuse holder contains two fuses. One of these is spare.
BSI	Connector for the base station.
TM	Connector for the telephones.
CPU	"Reset" - button. When activated the microprocessor is reset. The button shall normally not be pressed.

★ Alternatively a 24V DC/DC converter can be used.

# 5. Directions for use

## A. Installation



No. 290-001 or 290-002

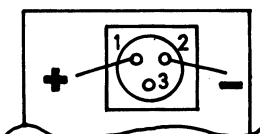
Max. 2 sets

No. 290-001 or 290-002

Note 1: Loop resistance for type 290-002 max. 1kohm corresponding to approx. 5km.  
 Loop resistance for type 290-001 max. 2kohms corresponding to approx. 10km.

Note 2: 24V DC power supply type 290-179 is also available.

Connection:



Front view (cable connector soldering side).

Connector A 15 pol. male		Connector B 25 pol. male
15	0.14mm <sup>2</sup>	red
14	0.14mm <sup>2</sup> Modulation	blue
11	0.2mm <sup>2</sup>	yellow
12	0.2mm <sup>2</sup> AF output	green
6	0.2mm <sup>2</sup>	blue
7,8	0.2mm <sup>2</sup> Key	white
1	0.2mm <sup>2</sup>	black
3	0.2mm <sup>2</sup> Squelch	brown
	0.2mm <sup>2</sup>	grey
	0.2mm <sup>2</sup>	red

Connector C for 290-001	Desk
5	red
9	blue
8	yellow
2	o w
3	o
1	red
6	blue
7	yellow
4	o

Connector C for 290-002	Desk
5	red
9	blue
8	yellow
2	o
3	o
1	red
6	blue
7	yellow
4	o

APM830214

Fig. 5-1 Connections

Fitting instructions for wall mounting kit (291-101).

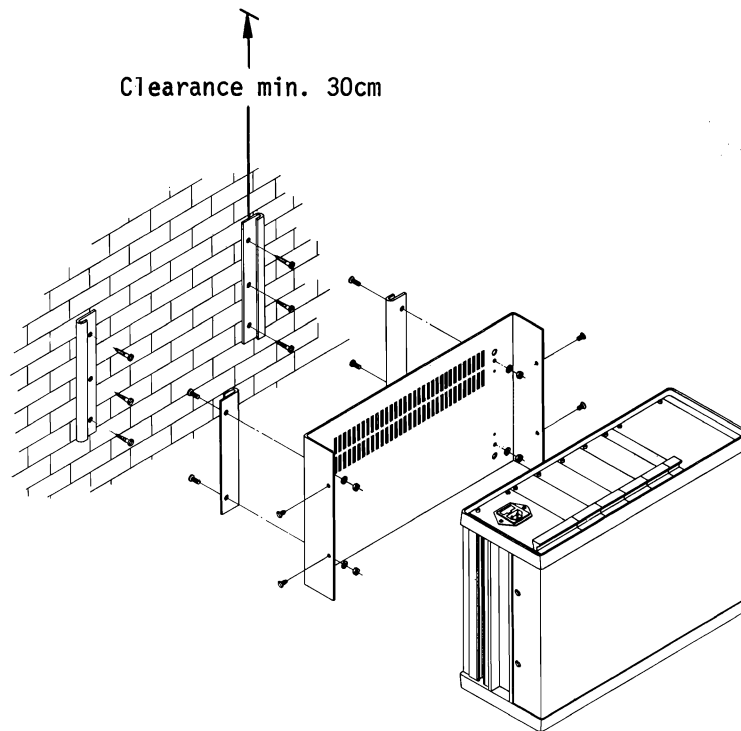


Fig. 5-2 Wall-mounting

The unit is delivered as standard for placing on a table or shelf.

The unit may also be wall-mounted by means of a special wall-mounting kit.

All installation cables should be long enough to allow service of the individual modules when placed on extender boards.

- 1) Place the unit with the front upwards.
- 2) Remove the top and bottom covers by removing the side screws, as these covers are to be reversed.
- 3) Remount the cover without ventilation holes on the unit as shown in fig. 5-2.
- 4) Remove the plastic feet on the ventilated cover by pressing out the centre-pins.
- 5) Hold this cover against the wall where the unit is supposed to be mounted. There are four sets of three screw holes. Mark the wall through the four middle holes (4.4mm diameter).
- 6) Draw two horizontal lines connecting the four marks just made.
- 7) Measure in 3cm from the end of each line, and make new marks. These are used as drilling points for the mounting brackets.
- 8) Drill the four holes and fix the two mounting brackets (with end stop downwards) to the wall. If the wall is porous, use three screws per bracket.
- 9) Mount the two other brackets to the ventilated cover of the unit with the supplied hardware.

- 10) Remount this cover on the unit (with ventilation holes uppermost) using the screws removed in step 2.
- 11) Slide the unit into the brackets and connect the cables.

**B. Setting-up instructions**

The equipment is delivered with straps etc. according to customer specifications i.e. it is ready for use. The information below is a survey of these customer adaptations.

**Switch and strap selection**

1. Mains power supply

	<u>Alternative</u>	<u>Strap</u>
Ringing signal	48V AC	J1
	75V AC	J2

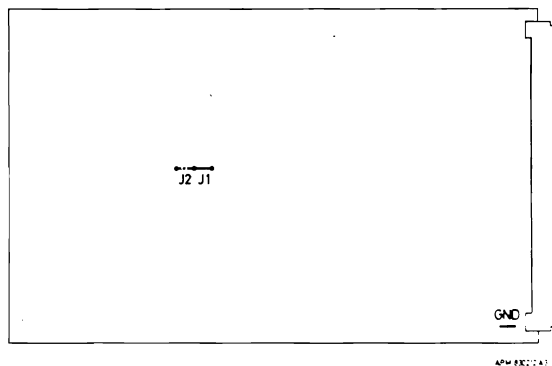


Fig. 5-3 Mains power supply

2. Base station interface

Alternative	Strap			
	J1 ★	J2	J3	J4 ★★
Continuous KEY of TX when in T/T mode	-	x	-	-
KEY of TX by squelch	-	-	x	-
Continuous T/T	x	-	-	-

x = strap made. - = strap not made.

★ Strap J1 shall normally not be made. It is intended for use e.g. while repairing the CPU module. Selection of J1 overrides the other strap selections.

★★ Strap J4 shall never be used in RBX100-2T2U.

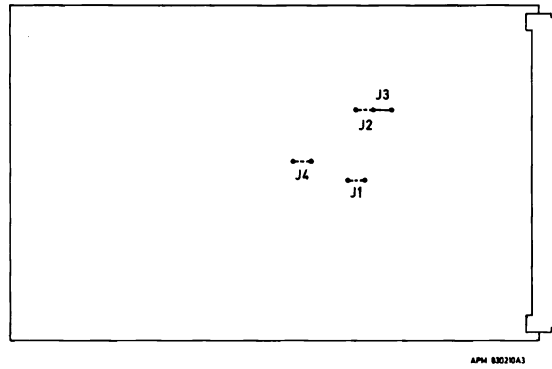


Fig. 5-4 Base station interface

3. Telephone module

Straps J1 and J2 must not be interrupted in RBX100-2T2U. The setting of the DIP-switches is described in section 10.

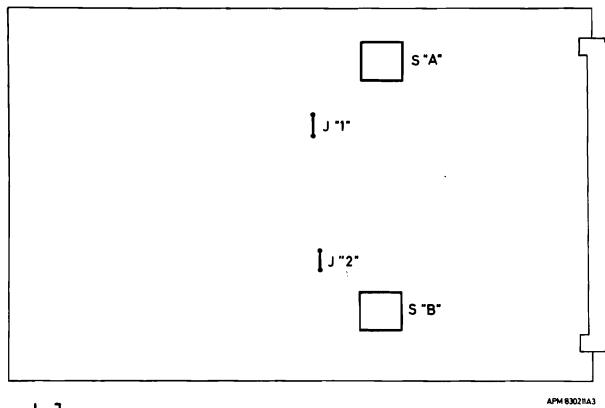


Fig. 5-5 Telephone module

4. CPU

Strap J1 shall always be made in RBX100-2T2U.

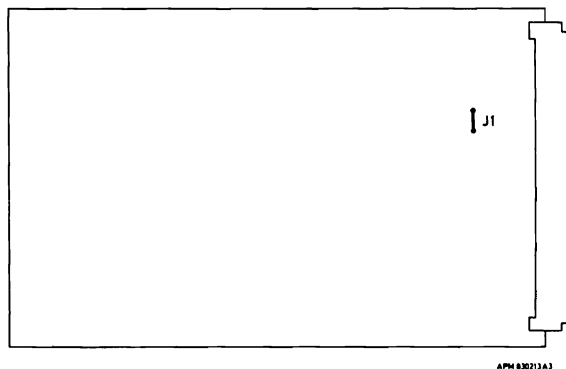
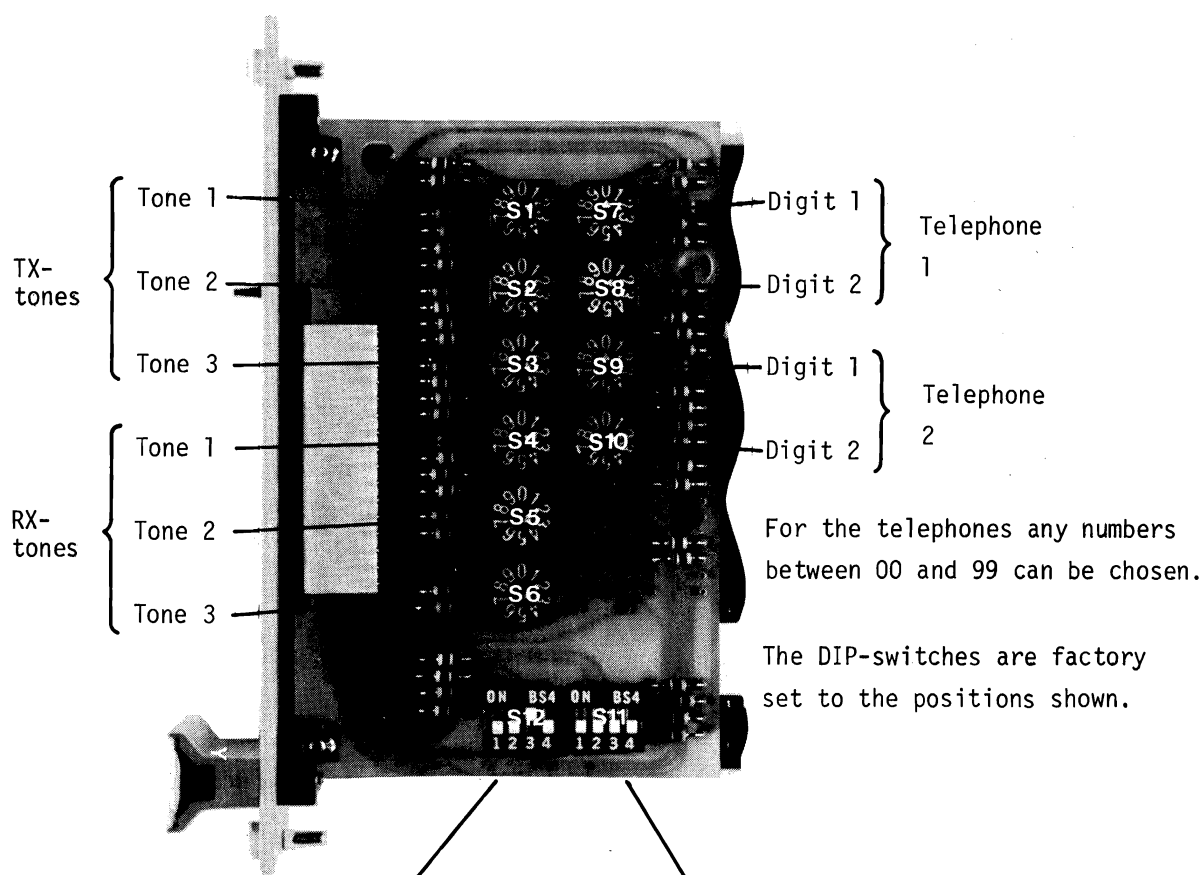


Fig. 5-6 CPU main board



1. OFF: <sup>★</sup> Danish/Norwegian telephone  
ON : Swedish/Oslo telephone.
2. OFF: Oslo dial pulses  
ON : Swedish dial pulses.
3. OFF: T/T enabled from telephone  
ON : T/T not enabled from telephone.
4. OFF: T/T enabled from mobile radios  
ON : T/T not enabled from mobile radios.

1. OFF: (Always OFF in RBX100-2T2U).
2. OFF: Digit 4 & 5 variable  
ON : Digit 3 & 5 variable.
3. OFF: Normal 1st tone (100ms)  
ON : Long 1st tone (500ms)
4. OFF: Engaged signal (blocking) when squelch  
ON : No engaged signal when squelch.

★ If selected, the setting of switch 2 is ignored.

Fig. 5-7 CPU-code board

### C. Operating instructions

#### Calling from telephone set to mobile radio

- Lift the hand-set. A dialling-tone is heard.
  - Dial the required mobile number, (2 digits).
  - If the AP490 is free, the call number followed by ring tones is transmitted. If there is no answer before ring tone no. 9 (approx. 40s) the line is disconnected.
  - If the AP490 is engaged, ★ an engaged tone is heard.
  - The line is disconnected when the hand-set is returned to the cradle.
- ★Talkthrough enabled; conversation between the other telephone set and a mobile radio or the squelch enabled by stations not belonging to the systems.

#### Calling from telephone set to telephone set

- Lift the hand-set. A dialling tone is heard.
- Dial the number.
- If the telephone set is free, ring tones are heard, otherwise the engaged tone.
- If there is no answer before ring tone no. 9 (approx. 40s), the line is disconnected.
- The line is also disconnected when the hand-set is returned to the cradle.

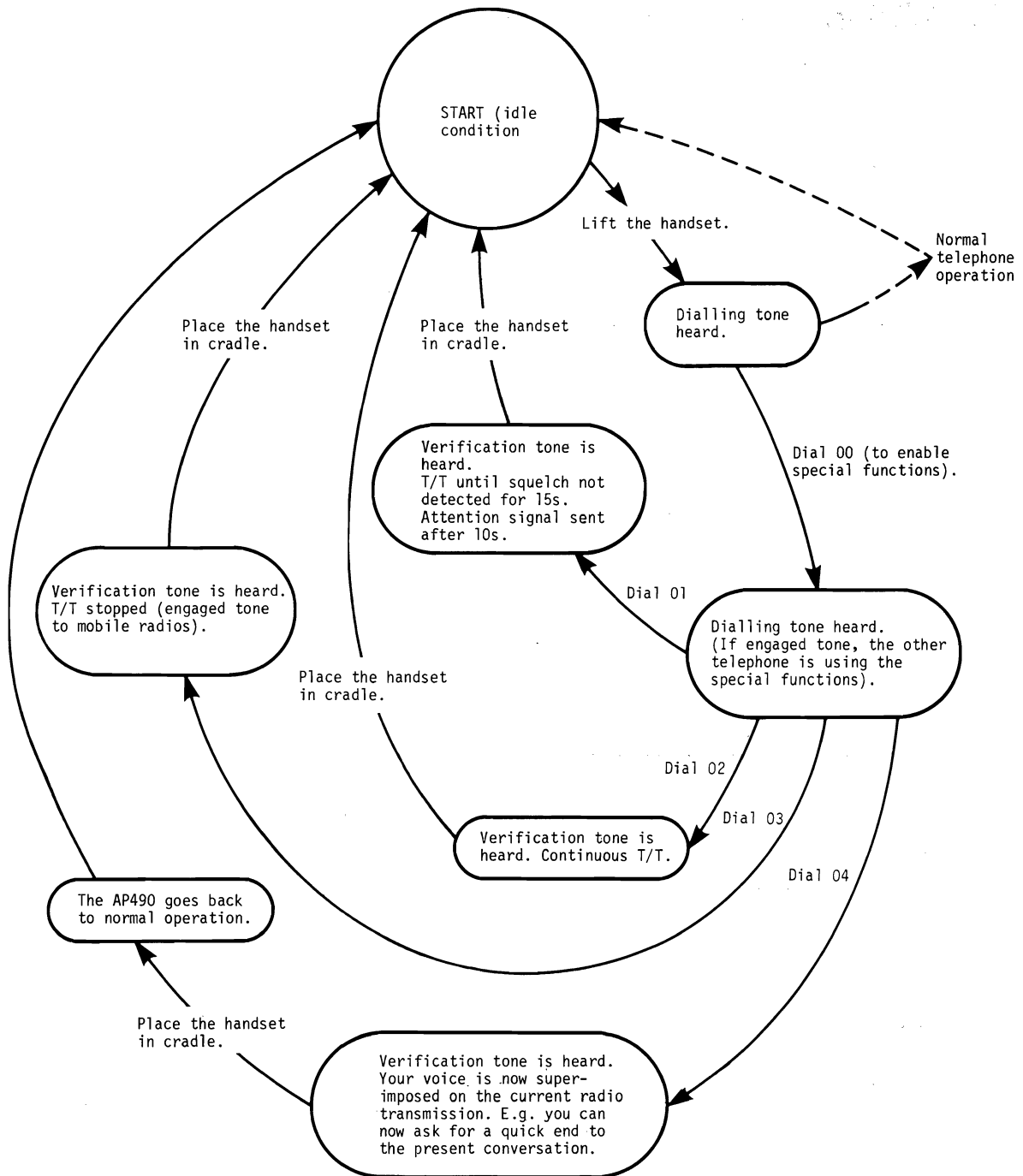
#### Calling from mobile radio to telephone set

- Select and send the calling number of the telephone set.
- When the telephone set rings, the ring signals are heard.
- If the telephone set is free, ring tones are heard. If there is no answer before ring tone no. 9 (approx. 40s), the line is disconnected.
- If the telephone set is engaged an engaged tone is heard, and the line is disconnected after 2.5s.
- The mobile radio can cancel the call or disconnect the line by sending the call number again.

#### Calling from mobile radio to mobile radio T/T

- Select the calling number of the mobile radio and send it twice.
- The first time the number is sent, the AP490 switches to talkthrough mode. A 2.5s verification tone is heard. The second time the number is sent, the mobile radio is called. Conversation takes place in simplex mode.
- If a squelch signal has not been detected for 15s, the line is disconnected (talkthrough disabled). However, after 10s, an attention signal is heard.

Telephone enabled special functions



Note: If a valid function e.g. 05 is called, an engaged tone is obtained.  
 An engaged tone is also obtained if functions 01 and 02 are called and the proper DIP switch settings in the CPU are not made.



# SERVICE INSTRUCTIONS

## 6. Wiring table (Motherboard)

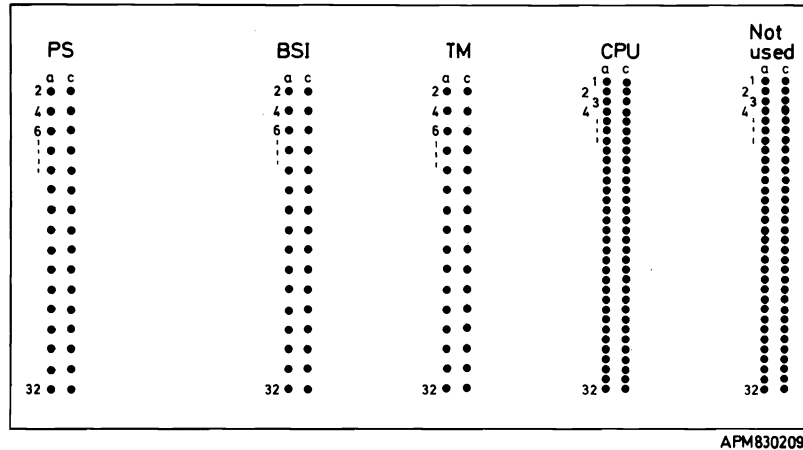


Fig. 6-1 Motherboard, front view

Note: Arrows in the signal names refer to signal directions in the block diagram and circuit diagrams.

PS	Connected to				Signal name
	PS	BSI	TM	CPU	
14a	-	14a	14a	-	0V (48V AC)
16a	-	16a	16a	-	0V (+48V)
18a	18c	18a,18c	18a,18c	16a,16c	GND
20a	22a,22c	20a	20a	18a,18c	+5V
22a	20a,22c	20a	20a	18a,18c	+5V
14c	-	14c	14c	-	48V AC
16c	-	16c	16c	-	+48V
18c	18a	18a,18c	18a,18c	16a,16c	GND
20c	-	20c	20c	17a,17c	+15V
22c	20a,22a	20a	20a	18z,18c	+5V

BSI	Connected to				Signal name
	PS	BSI	TM	CPU	
2a	-	-	-	1c	
4a	-	-	-	2c	
14a	14a	-	14a	-	0V (48V AC)
16a	16a	-	16a	-	0V (+48V)
18a	18a,18c	18c	18a,18c	16a,16c	GND
20a	20a,22a,22c	-	20a	18a,18c	+5V
30a	-	-	-	31c	
32a	-	-	-	32c	

BSI	Connected to				Signal name
	PS	BSI	TM	CPU	
2c	-	-	-	1a	Radio key
4c	-	-	-	2a	T/T
6c	-	-	-	9a	AF/BSI←CPU
14c	14c	-	14c	-	48V AC
16c	16c	-	16c	-	+48V
18c	18a,18c	18a	18a,18c	16a,16c	GND
20c	20c	-	20c	17a,17c	+15V
28c	-	-	-	24a	AF/BSI→CPU
30c	-	-	-	31a	
32c	-	-	-	32a	Squelch/CPU

TM	Connected to				Signal name
	PS	BSI	TM	CPU	
2a	-	-	-	4a	
4a	-	-	-	3a	
6a	-	-	-	7a	AF/Tel. 1←CPU
14a	14a	14a	-	-	OV (48V AC)
16a	16a	16a	-	-	OV (+48V)
18a	18a,18c	18a,18c	18c	16a,16c	GND
20a	20a,22a,22c	20a	-	18a,18c	+5V
28a	-	-	-	26a	AF/Tel. 2←CPU
30a	-	-	-	30a	Hook/Tel. 2
32a	-	-	-	29a	Key/Tel. 2
2c	-	-	-	5a	Ring/Tel. 2
4c	-	-	-	6a	Ring/Tel. 1
6c	-	-	-	8a	AF/Tel. 2←CPU
14c	14c	14c	-	-	48V AC
16c	16c	16c	-	-	+48V
18c	18a,18c	18a,18c	18a	16a,16c	GND
20c	20c	20c	-	17a,17c	+15V
28c	-	-	-	25a	AF/Tel. 1←CPU
30c	-	-	-	27a	Hook/Tel. 1
32c	-	-	-	28a	Key/Tel. 1

CPU	Connected to				Signal name
	PS	BSI	TM	CPU	
1a	-	2c	-	-	Radio key
2a	-	4c	-	-	T/T
3a	-	-	4a	-	
4a	-	-	2a	-	
5a	-	-	2c	-	Ring/Tel. 2
6a	-	-	4c	-	Ring/Tel. 1
7a	-	-	6a	-	AF/Tel. 1←CPU
8a	-	-	6c	-	AF/Tel. 2←CPU
9a	-	6c	-	-	AF/BSI←CPU

CPU	Connected to				Signal name
	PS	BSI	TM	CPU	
10a	-	-	-	10c	
11a	-	-	-	11c	
12a	-	-	-	12c	
13a	-	-	-	13c	
14a	-	-	-	14c	
15a	-	-	-	15c	
16a	18a,18c	18a,18c	18a,18c	16c	GND
17a	20c	20c	20c	17c	+15V
18a	20a,22a,22c	20a	20a	18c	+5V
19a	-	-	-	19c	
20a	-	-	-	20c	
23a	-	-	-	23c	
24a	-	28c	-	-	AF/BSI→CPU
25a	-	-	-	-	AF/Te1. 1→CPU
26a	-	-	28c	-	AF/Te1. 2→CPU
27a	-	-	30c	-	Hook/Te1. 1
28a	-	-	32c	-	Key/Te1. 1
29a	-	-	32a	-	Key/Te1. 2
30a	-	-	30a	-	Hook/Te1. 2
31a	-	30c	-	-	
32a	-	32c	-	-	Squelch/CPU
1c	-	2a	-	-	
2c	-	4a	-	-	
10c	-	-	-	10a	
11c	-	-	-	11a	
12c	-	-	-	12a	
13c	-	-	-	13a	
14c	-	-	-	14a	
15c	-	-	-	15a	
16c	18a,18c	18a,18c	18a,18c	16a	GND
17c	20c	20c	20c	17a	+15V
18c	20a,22a,22c	20a	20a	18a	+5V
19c	-	-	-	19a	
20c	-	-	-	20a	
23c	-	-	-	23a	
31c	-	30a	-	-	
32c	-	32a	-	-	

## 7. Mains power supply, 290-171

The mains power supply contains two conventional regulators IC1 and IC2 and one switched mode regulator IC3.

The transformer delivers AC for the telephone bells and to two rectifier bridges. One of these are connected to both the +15V regulator and the +5V DC/DC converter.

### Checking and adjusting

- Put the mains power supply on an extension board.
- Check that +5V is obtained at terminal 20a.
- If not, adjust P1.

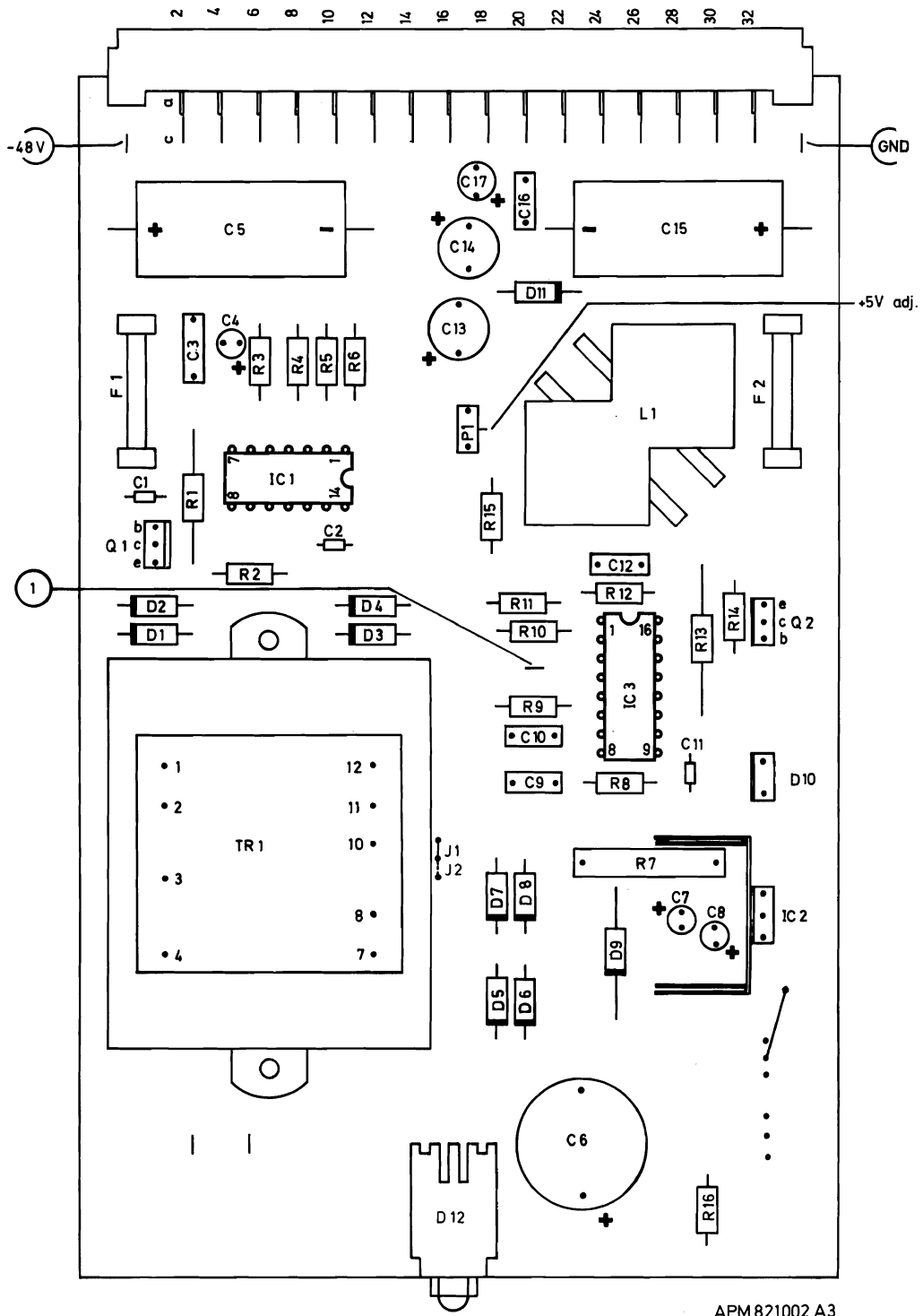
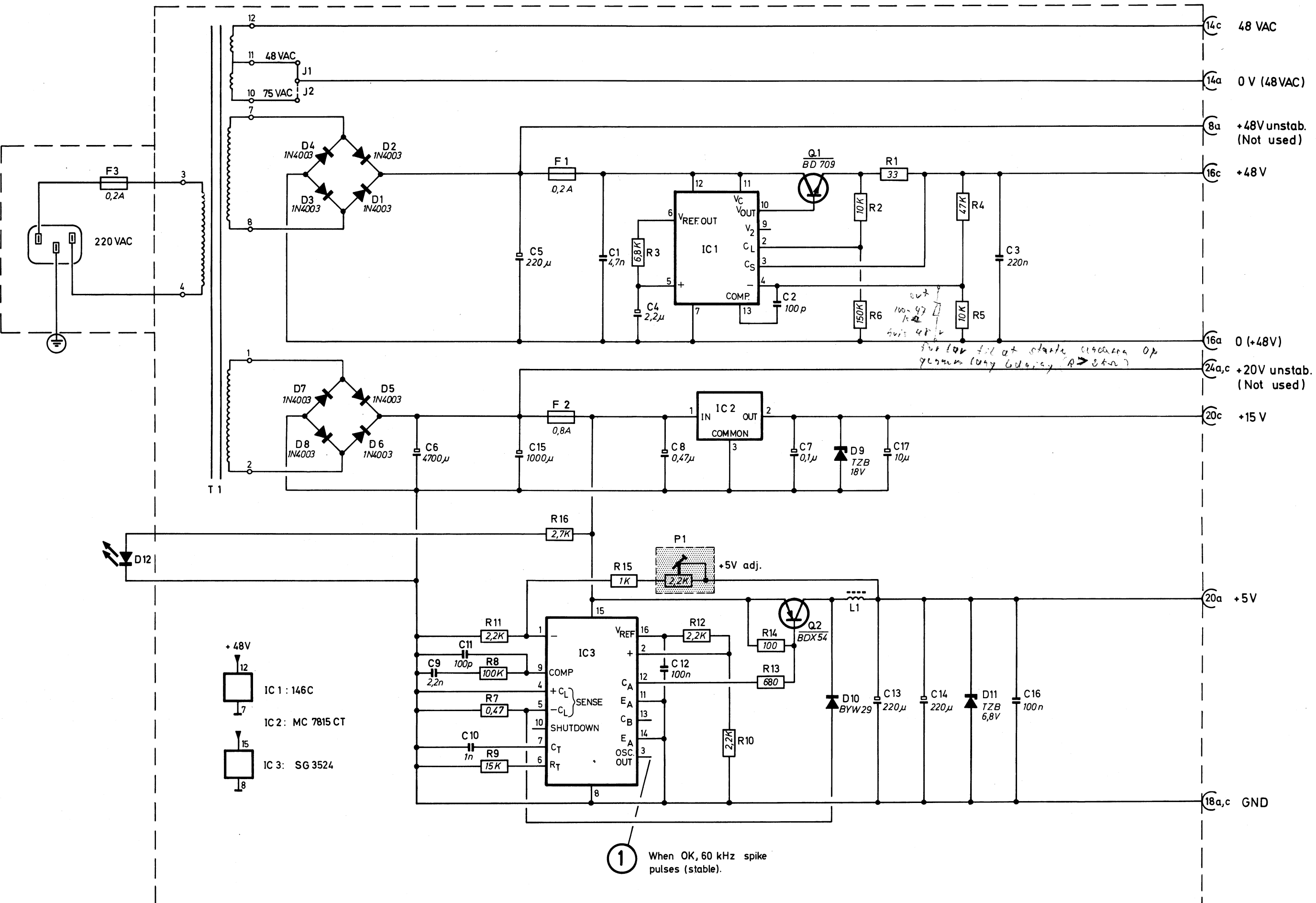


Fig. 7-1 Component location, mains power supply, 290-171  
306/1



1 When OK, 60 kHz spike pulses (stable).

## 8. 24V DC power supply , 290-179

The power supply is fed with 24V DC and delivers the necessary DC voltages as well as AC ringing voltage.

The 24V DC is fed via a filter to the two DC/DC converters with IC1 and IC2. The filter prevents that the battery cable is fed with the high harmonic content signal generated.

The two DC/DC converters operate at 30kHz. Regulation is done by pulse width modulation of the transistors Q1 and Q2.

Q5 and Q6 form a multivibrator which gives the ringing signal.

### Checking and adjusting

- Put the power supply on an extension board.
- Check that +15V is obtained at terminal 20c.
- If not, adjust P1.
- Check that +5V is obtained at terminal 20a.
- If not, adjust P2.

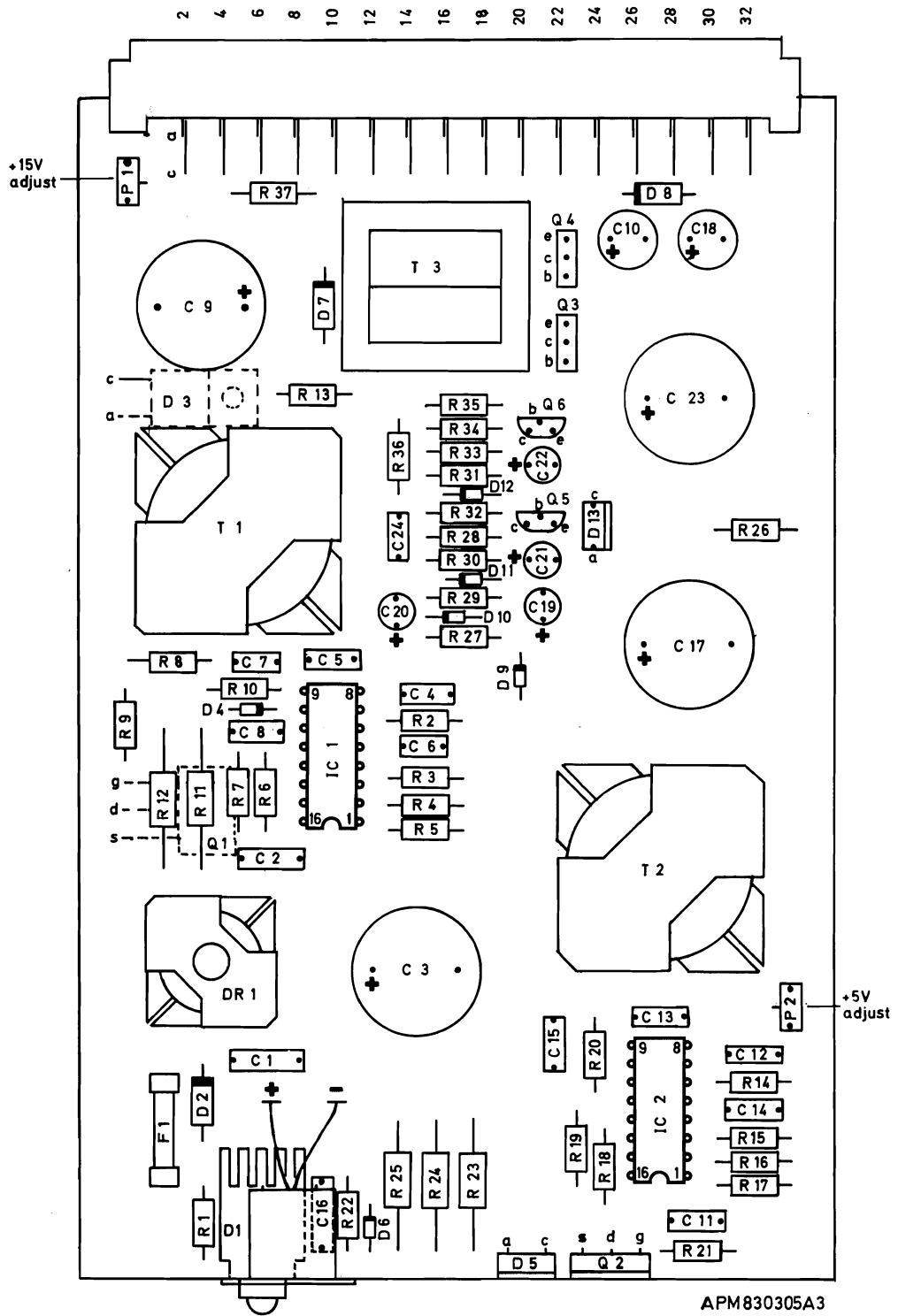
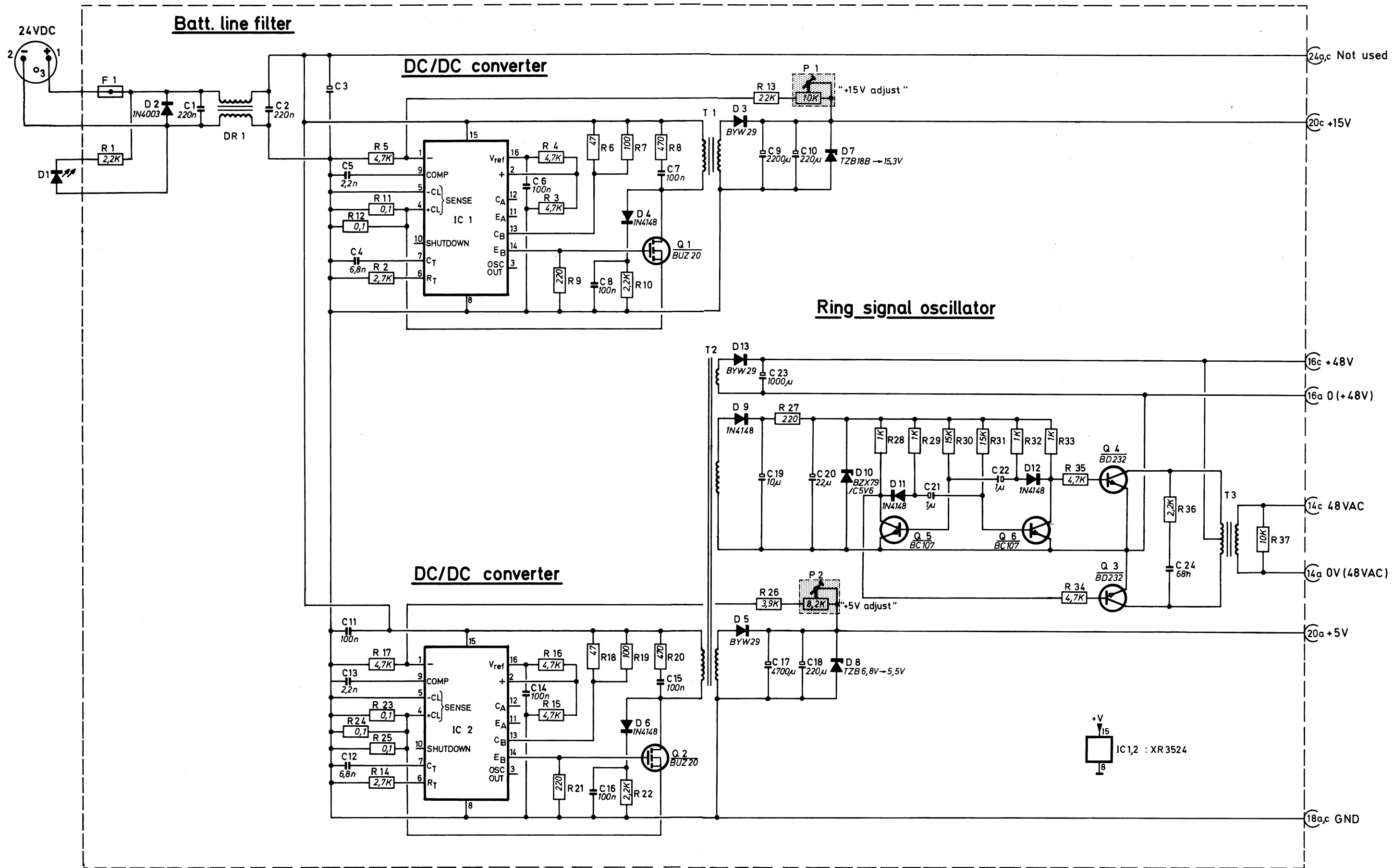


Fig. 8-1 Component location, 24V DC power supply, 290-179





APM830302

Fig. 8-2 Circuit diagram, 24V DC power supply, 290-179

## 9. Base station interface, 290-165

As the name indicates, the unit serves as an interface between the base radio station AP490 and the CPU. The connections to the radio are floating. The unit contains amplifiers for both directions, T/T circuits and some logic circuits with jumpers J1-J3 to adapt the unit to different customer requirements.

The three electronic switches "key", "T/T" and "squelch" make it possible to perform connection of the receiver output to the transmitter (T/T mode) if certain requirements are met.

The block diagram (page 9) fully shows how the three switches behave with different signals to the unit and with different jumper combinations (see setting-up instructions). The complex function of the unit is solved with the programming of the CPU.

### Checking and adjusting

#### Adjusting the AF level to CPU

- Connect a tone generator across terminals 11 and 23 on the front connector.
- Check that  $V_{AF}$  is -10dBm.
- If not, adjust P1.

#### Adjusting the AF to radio

- Connect a tone generator to terminal 6c.
- Close S1 and check that  $V_M$  is -10dBm.
- If not, adjust P3.

#### Adjusting the T/T level

- Connect a tone generator across terminals 11 and 23.
- Close S2 and S3. S1 must be open.
- Check that  $V_M$  is -10dBm.
- If not, adjust P2.

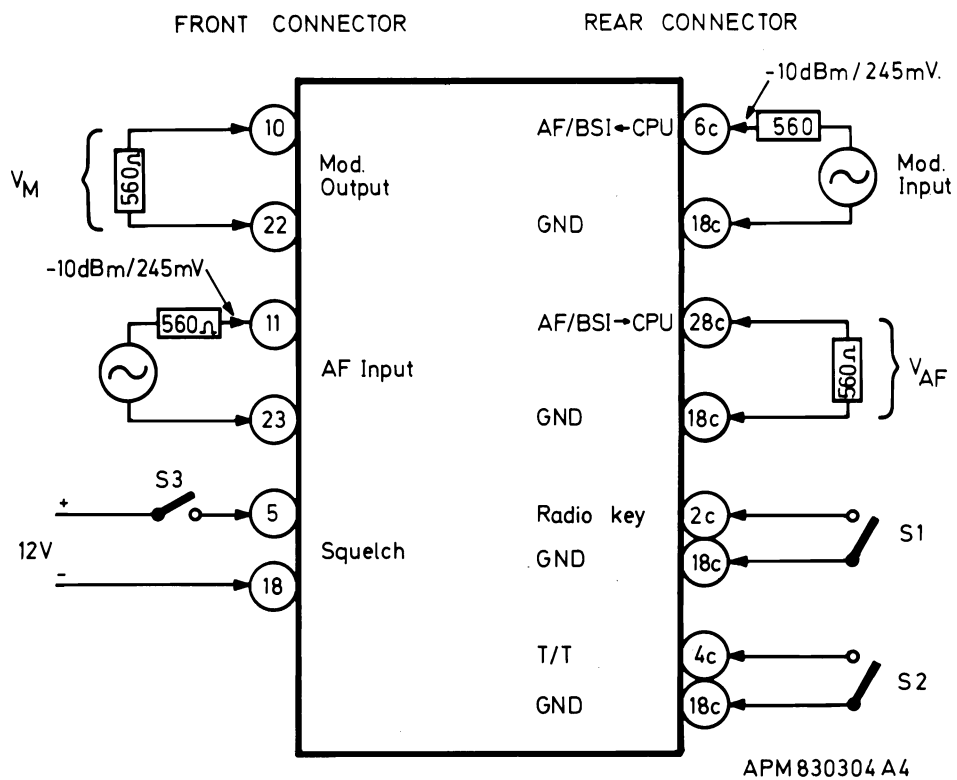


Fig. 9-1 Definitions

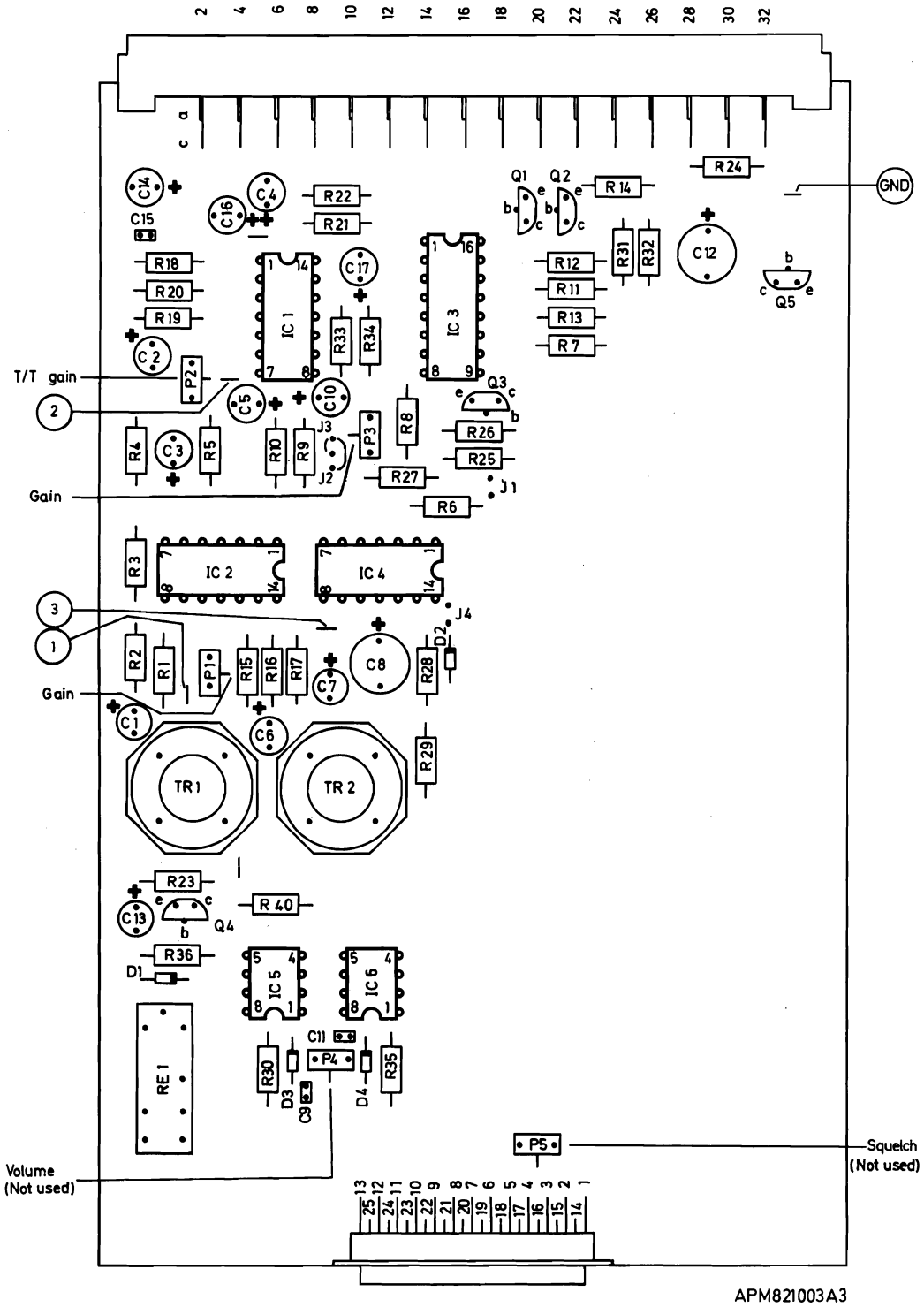
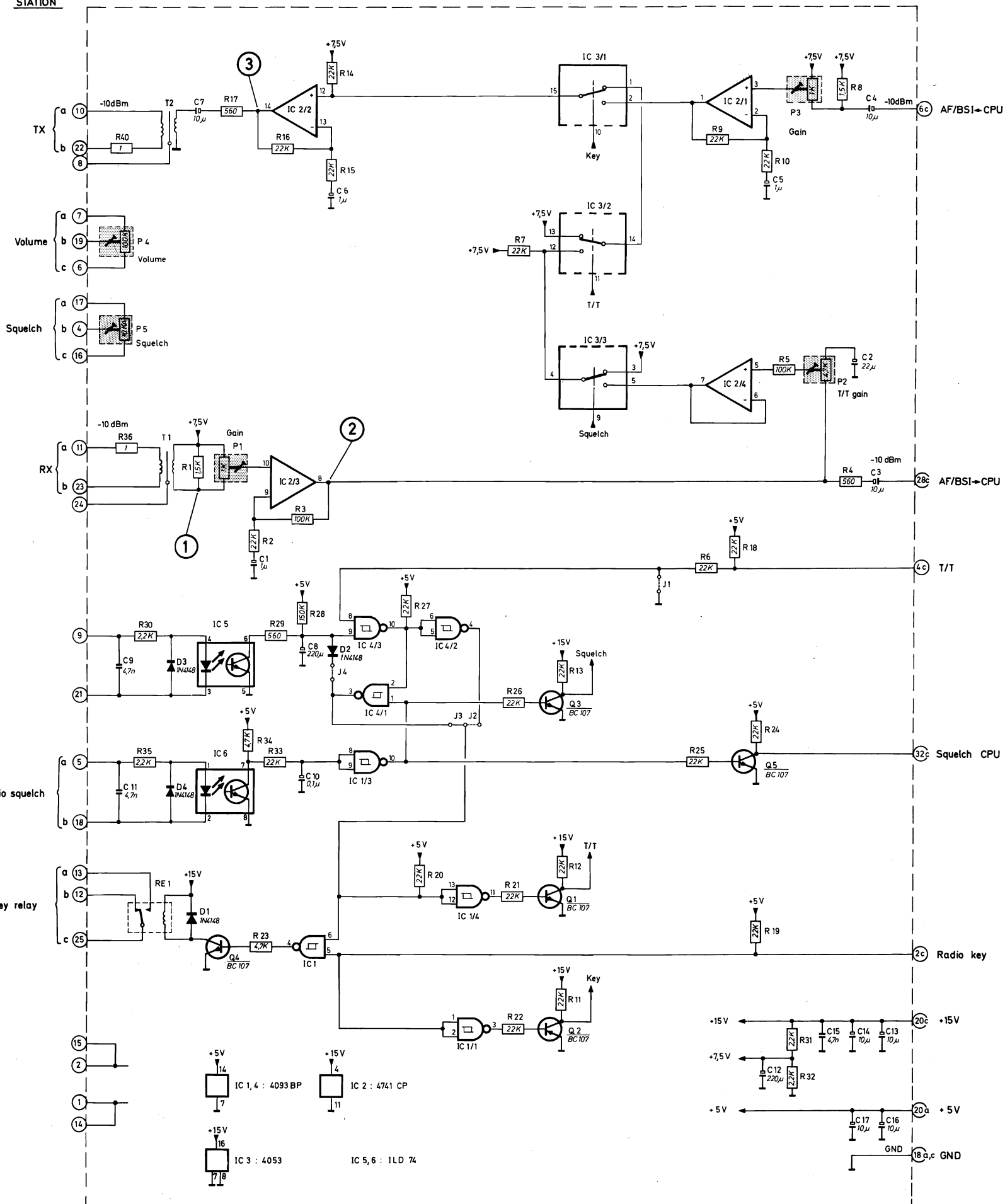


Fig. 9-2 Component location, base station interface, 290-165

354/4

TO RADIO STATION



APM821107

Fig. 9-3 Circuit diagram, base station interface, 290-165

## 10. Telephone unit , 290-152

The telephone unit is the interface between the "exchange" in the CPU and the two independent telephones. The unit is designed for 2-wire telephones with pulse dialling. A few telephones can be connected in parallel to each line, see technical data. As the circuits for the two telephones are identical, only the channel for telephone 1 is described.

The AF from the CPU is fed to terminal 6a. IC2/3 is a clipper with 0dBm clipping level. This level is not reached in normal operation.

IC2/4 amplifies the signal and limits the frequency response.

The AF signal is further amplified in IC2/1 and fed via some passive components to the line transformer TR"A". The line current is introduced in series with the line side of the transformer. The transzorb protects against transient spike pulses which may occur. The telephone line is connected to terminals 5 and 9 of the front connector.

Going from the telephone to the CPU, the audio is fed in the opposite way to point R19/R14/C9/D4. This point is common for the two directions. IC2/2 is a summation amplifier which is fed with the signal from the line and, 180° out of phase, the signal to the line.

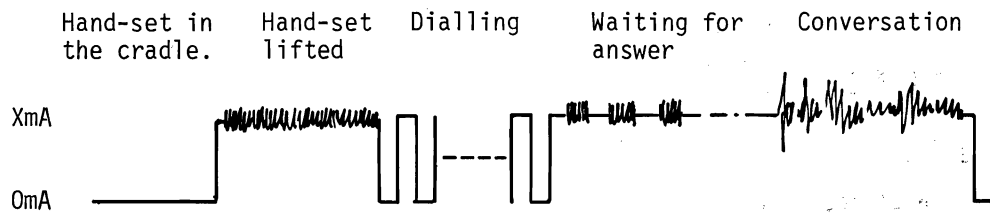
By adjusting with S"A" and the potentiometer P2, cross-talk is minimized. With the potentiometer P4 the level to the CPU is adjusted. Maximum possible total gain is 10dB. The transistor Q3 is with associated components a high-pass filter. Its main purpose is to compensate for the low frequency roll-off in the line balance circuits. In addition, the filter tailors the frequency response to suit the telephones. The signal is fed to the exchange in the CPU via terminal 28c.

DC line current is fed to the telephone from the +48V obtained at terminal 16c. The line current is limited by the resistor R1. With the opto-coupler IC1/2 it is detected when the handset is lifted (>3mA line current). IC1/1 detects when the current exceeds the detection level set by the trimpotentiometer P1. This is used to detect "key" when simplex telephones are used. The information about lifted handset, "key" and dialling pulses are sent to the CPU for processing in the microprocessor.

Short description of the telephone

The telephone operates as shown in the level diagram below. With a balancing circuit built into the telephone, it is possible to use the telephone set in full duplex with only two wires. As shown in the level diagram, 0mA flows with the hand-set in the cradle. The bell is connected via a blocking capacitor, therefore an AC signal can make it ring.

**Duplex**



**Simplex**

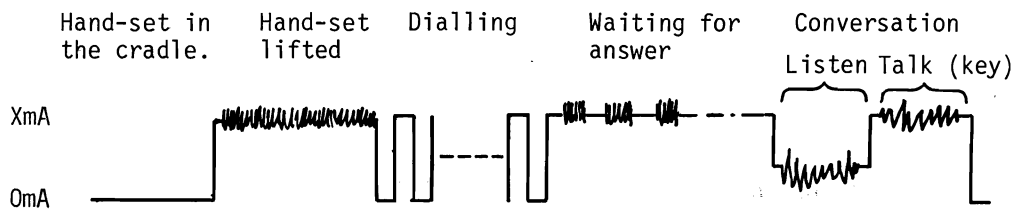


Fig. 10-1 Level diagram, telephone line

## Checking and adjusting

See fig. 10-2.

### Telephone 1

- Connect load Y to terminals 5 and 9.
- Connect a tone generator to the AF input terminal 6a.
- Check that -10dBm (245mV) is obtained across load Y. If not, adjust P3.
- Adjust S"A" and P2 for minimum output at terminal 28c.
- Connect the Gen Z to terminal 5 and 9. -10dBm (245mV), 1kHz.
- Check that Vout is -10dBm. If not, adjust P4.

#### Simplex

- ★ Connect load X and adjust it for 15mA line current.
- Adjust P1 so that "Key/tel. 1" just goes high ("Key/tel. 1" = 5V at 15mA line current), ("Key/tel. 1" = 0V (active) at 16mA line current).

#### Duplex

- Set P1 fully clock-wise.

### Telephone 2

- Connect load Y to terminals 1 and 6.
- Connect a tone generator to the AF input terminal 6c.
- Check that -10dBm (245mV) is obtained across load Y. If not, adjust P7.
- Adjust S"B" and P6 for minimum output at terminal 28a.
- Connect the Gen Z terminals 1 and 6. -10dBm (245mV), 1kHz.
- Check that Vout is -10dBm. If not, adjust P8.

#### Simplex

- ★ Connect load X and adjust it for 15mA line current.
- Adjust P5 so that "Key/tel. 2" just goes high ("Key/tel. 2" = 5V at 15mA line current), ("Key/tel. 2" = 0V (active) at 16mA line current).

#### Duplex

- Set P5 fully clock-wise.

★ If DIGITAL 2000 telephone is used, adjust to 20mA.



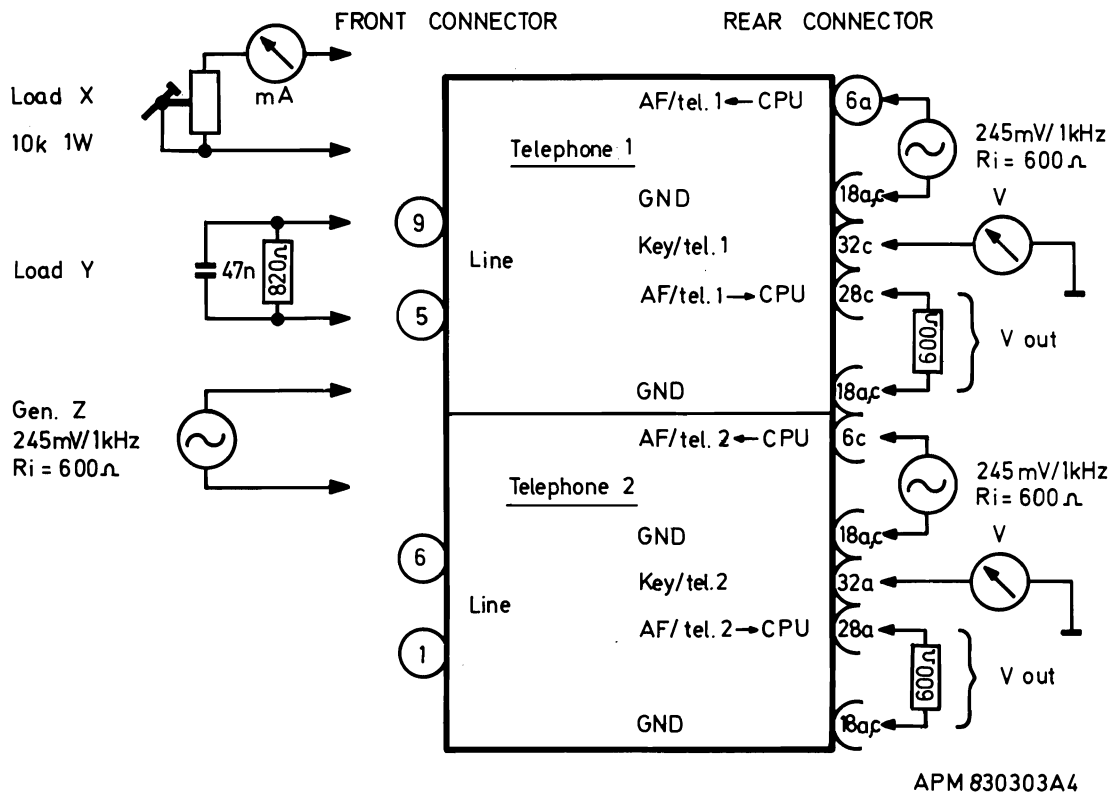


Fig. 10-2 Definitions

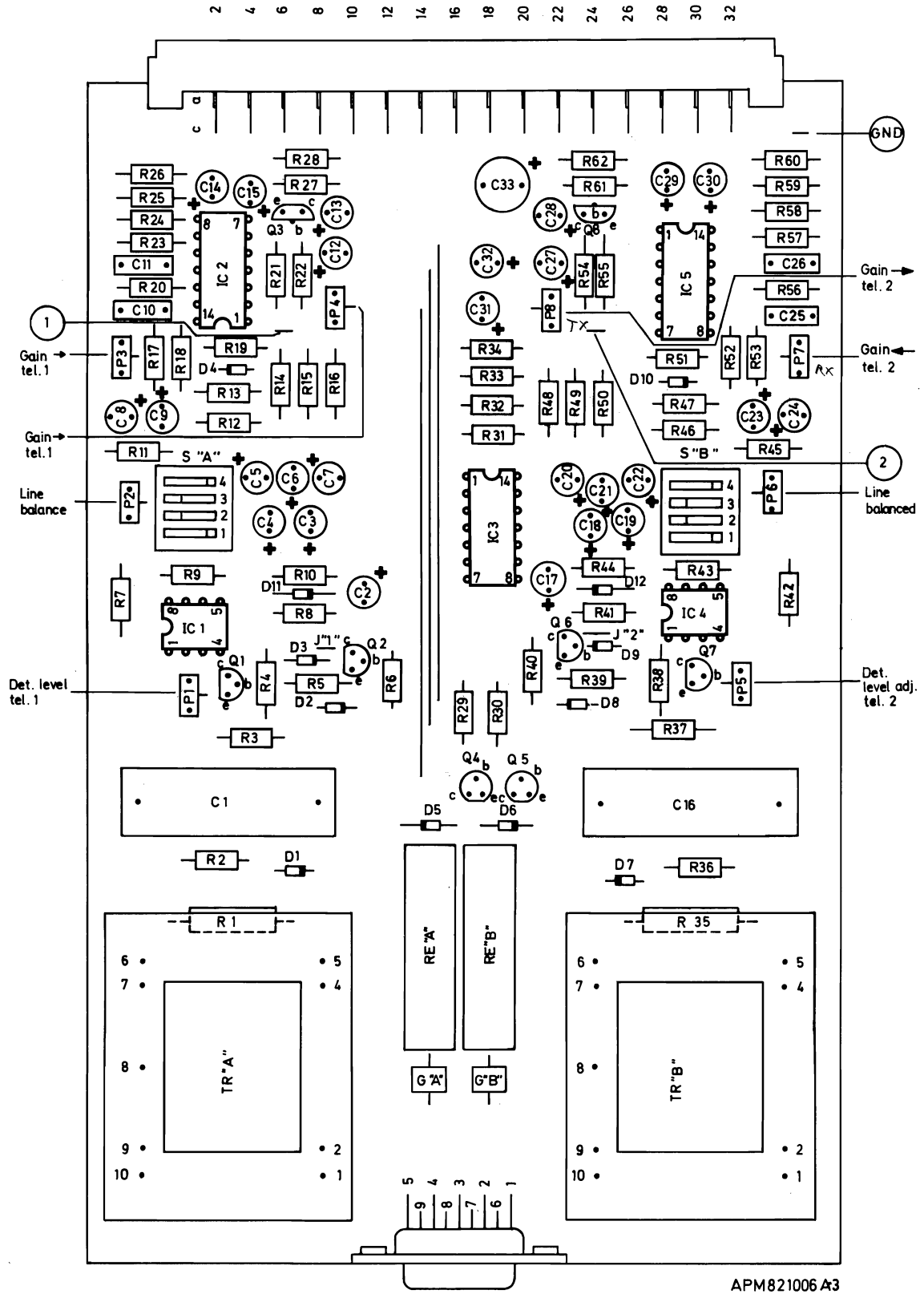
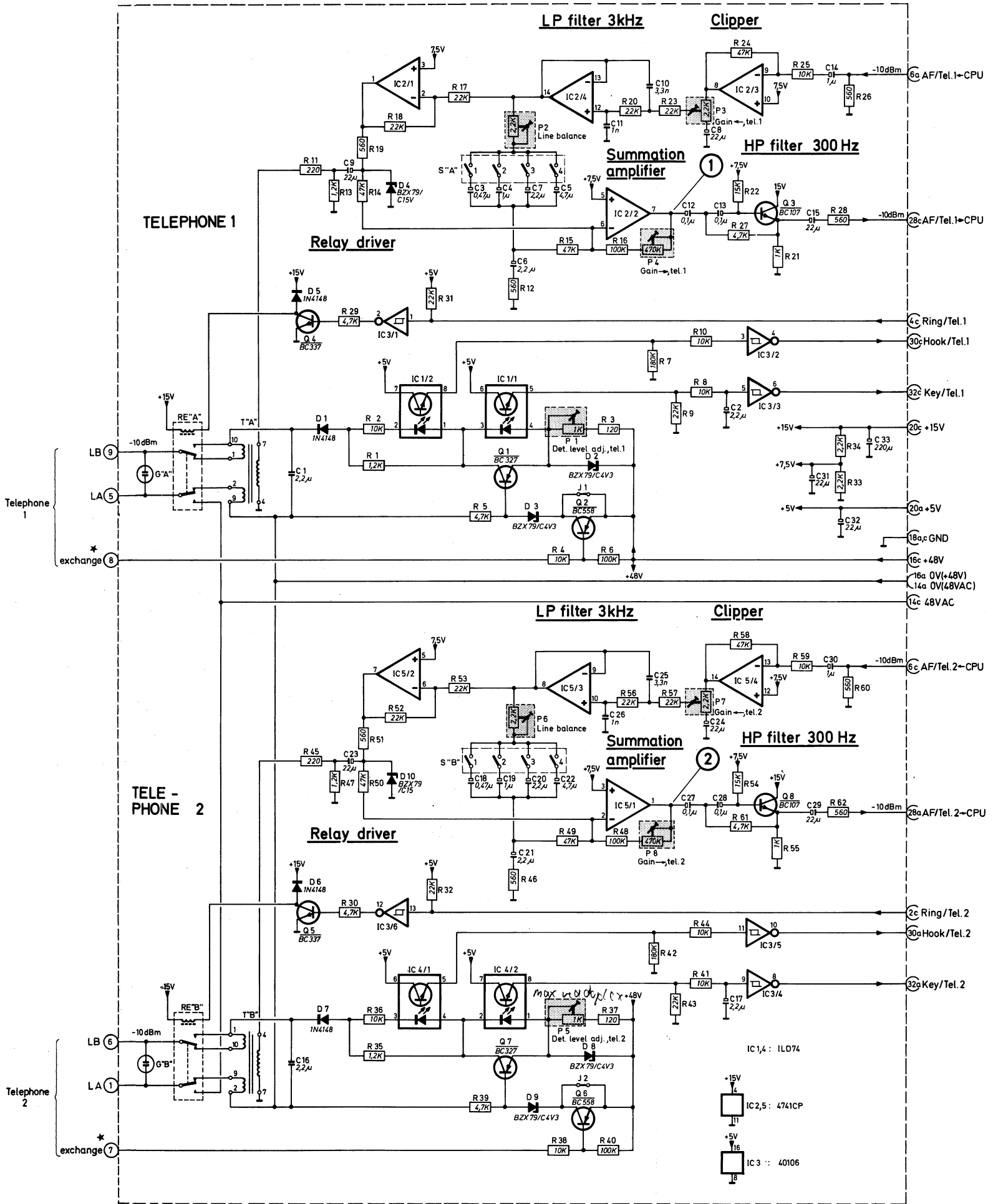


Fig. 10-3 Component location, telephone module, 290-152.

324/1



APM821103

Fig. 10-4 Circuit diagram, telephone module, 290-152

## 11. CPU, 290-186/193

The CPU is available in two versions: No. 290-186 for 5-tone CCIR and 290-193 for 5-tone ZVEI. Different IC's are used for IC5, 8 & 9.

The unit contains the matrix switches, tone encoder, tone decoder and a microprocessor with accompanying circuits.

The microprocessor must work with more inputs and outputs than it has pins. Therefore three expanders are used.

The microprocessor operates according to instructions in the memory. The AF from the radio station is via the BSI fed to the matrix switch IC11.15 and to the tone decoder. The tone decoder converts the tones to 4-bit words which are sent to the microprocessor. Correspondingly, 4-bit words from the microprocessor are fed to the tone encoder for conversion to tones. The tone encoder output is fed to the matrix switch IC11.14. With a subroutine, a 400Hz tone is made. With an LP filter the square wave is transformed to sinusoidal wave. During the start of the programme execution, the setting of the switches is read. Thereafter the setting is stored in the memory.

When the "RESET" button is pressed, the programme execution stops at the present step. When the button is released the microprocessor starts from the beginning.

### Checking and adjusting

- Check that 23.300kHz is obtained at test point 3.
- If not, adjust the trim capacitor CT1.
- Set DIP-switch S11 switch 3 ON (long 1st tone).
- Set switch S1 to position 6.
- Connect a frequency counter to test point 4, and a level meter to terminal 6c.
- Enable a tone sequence by dialling a mobile number.
- Press the "RESET" - button during the 1st tone and keep it pressed.
- Check that 1540Hz for CCIR or 1670Hz for ZVEI is obtained at test point 4.
- If not, adjust the trim capacitor CT2.
- Check that -10dBm (245mV) is obtained at terminal 6c.
- If not, adjust P2.
- Lift the handset on telephone 1 or telephone 2.
- Check that the level of the dialling tone is -10dBm (245mV) at terminal 7a or 8a respectively. The level can also be measured at Q1.e.
- If not, adjust P1.
- Disconnect the instruments, set the switches to the proper positions and press the "RESET" - button once.

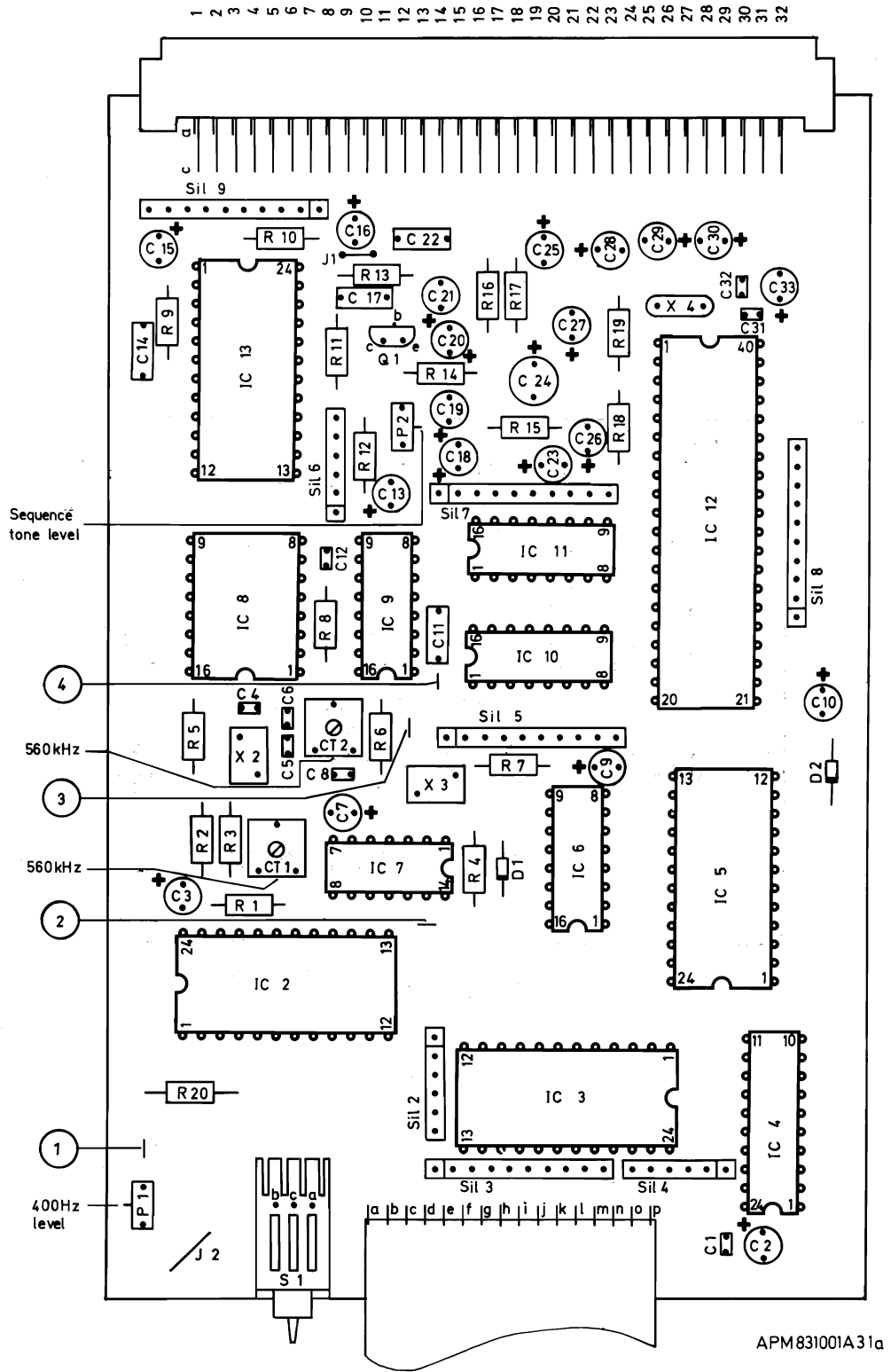
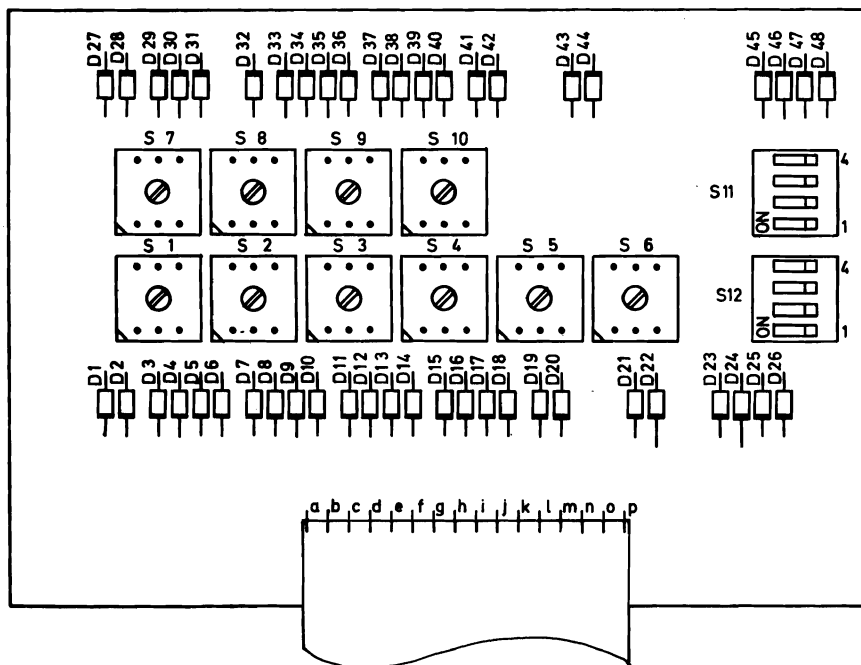


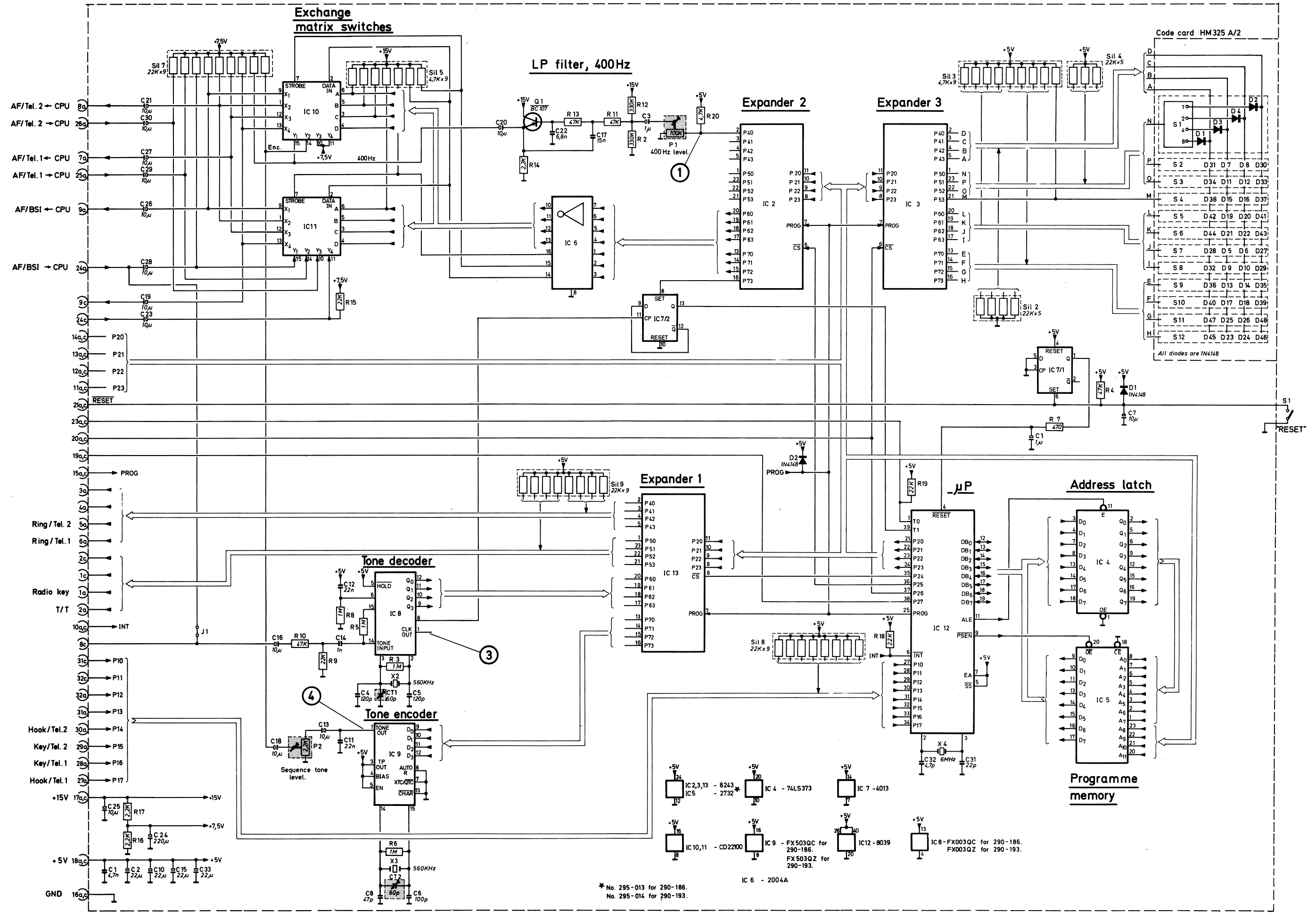
Fig. 11-1 Component location, CPU main board, 290-186/193

319/6



APM821001 A3 1b

Fig. 11-2 Component location, CPU code board



## 12. List of standard radio interfaces

Type	Max. no. desk telephone sets.	Sel. call CTR.	Sel. call ZVEI.	Power supply 220V AC.	Power supply 24 V DC.	Order no.
RBX100-2T2U	2	X		X		290-130
RBX100-2T2U	2	X			X	290-134
RBX100-2T2U	2		X	X		290-136
RBX100-2T2U	2		X		X	290-138





radiotelefon a/s

JENAGADE 22 · POSTBOX 1818 · DK-2300 KØBENHAVN S · TLF.: (01) \*547777 · TELEX 31201 REF.: COAP · GIRO: 6514480

(Philips Industri og Handels A/S) Aktieselskabsregister, København nr. 24.905

Til vore forhandlere

Deres ref.

Vor ref. 43/Ely/IR

Dato

1983-07-28

Vedlagt service manual for styreudstyr type RBX100-2T2U.

Service manualen er fremsendt uden beregning.

Yderligere eksemplarer kan bestilles som varenumme 296-180 formelst 100,- kr. pr. stk.

Service manualer for det øvrige styreudstyr vil fremkomme efterhånden som de bliver trykt.

Med venlig hilsen  
ap radiotelefon a/s

*E. Lyngesen*  
E. Lyngesen

o  
Bilag.

ifly. Jan 10<sup>1/2</sup> - 87

- Tryk 00 klartone 01 manuel retrax i 15 sek
- 00 - 02 bryder ind i igennemværende  
samtale uden at  
nedbryde den
- 00 - 04 + opkald. nr. nedbryder igennem-  
værende samtale  
og overlægger sty-  
ringen
- 00 - 09 Nedbryder replater