skanti

INSTRUCTION MANUAL

DIGITAL VOICE SCRAMBLER
TYPE DS6000 AND 6001

skanti

DS6000 AND 6001 INSTRUCTION MANUAL

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Version 2A

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Due to the constant processing of the experience gained during production and operation of our equipment, minor modifications may occur relative to the information given in this manual. Whenever practicable corrections will be listed on a correction sheet inside the front cover of this manual.

DS6000 AND 6001 INSTRUCTION MANUAL

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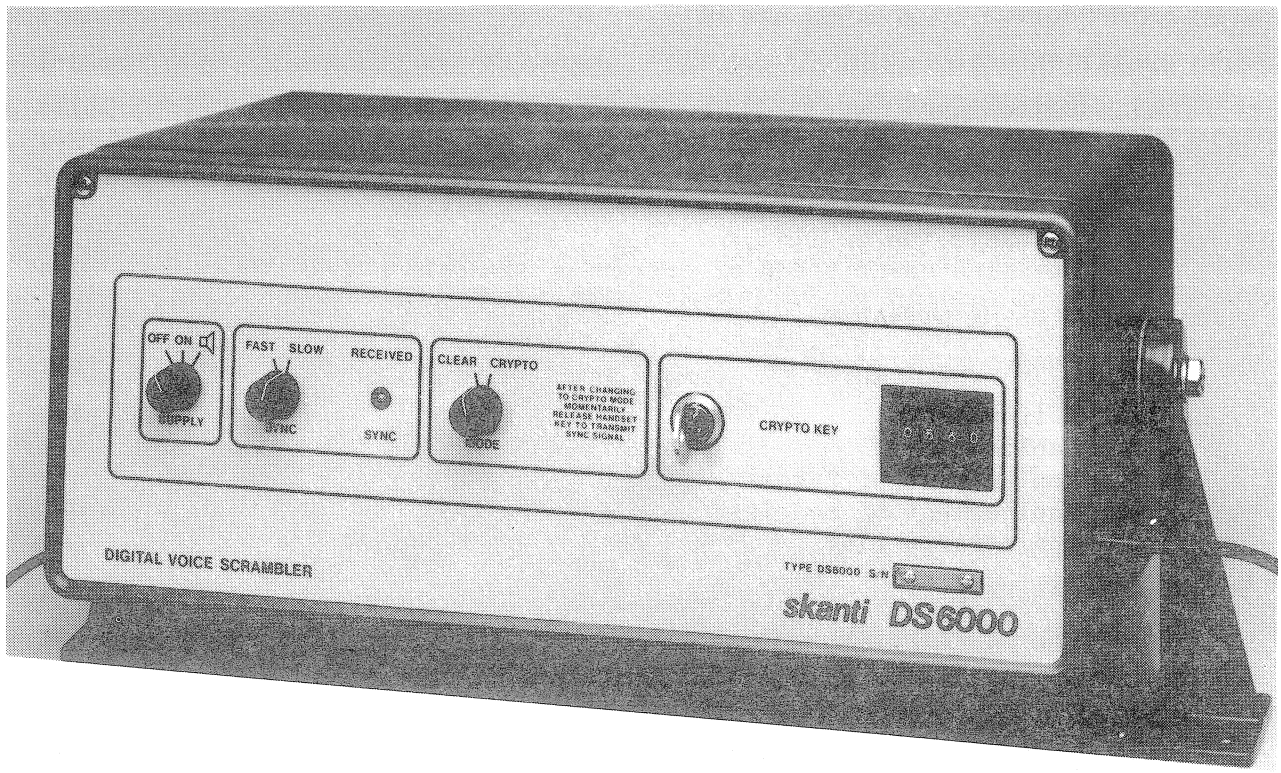
OFF ON
SUPPLY
FAST SLOW
SYNC
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CRYPTO KEY
DIGITAL VOICE SCRAMBLER
TYPE DS6000 S/N
skanti DS6000

INTRODUCTION

The DS 6000 is a digital voice scrambler which may be used in connection with a SKANTI SSB radiotelephone.

Two or more stations wanting to carry on a scrambled conversation - i.e. a conversation which is made unintelligible to the eavesdropper - are equipped with a DS 6000 each.

It is possible to select freely between normal and scrambled conversations, but the equipment will switch to normal conversation automatically if the international distress frequency 2182 kHz is used.

The DS 6000 is inserted in a simple way between the CU 6000 and the microtelephone by means of a special connecting cable. Thus no modification of the TRP 6000 is required for connecting the DS 6000.

If the DS 6000 is connected to a TRP 5000, a special adaptor box is required.

The DS 6000 transmits synchronization and identification signals with certain intervals. The synchronization signal is a tone-code signal, whereas the identification signal is transmitted in clear speech by means of a built-in speech synthesizer.

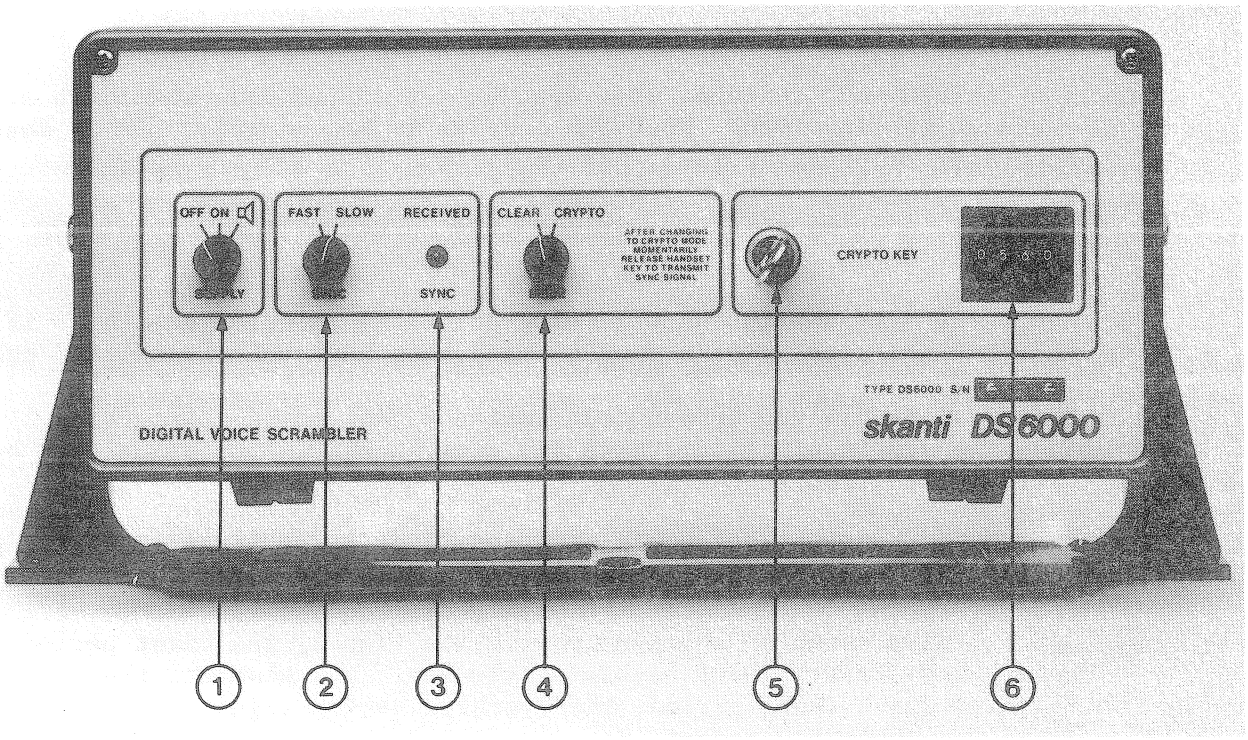
Time-division multiplexing is used during scrambled conversations, meaning that the speech signal is digitized at the transmitter station and divided into time segments of about 30 milliseconds. The individual time segments are rearranged according to changing patterns, and thereafter converted to an analog signal, before being transmitted.

At the receiving station the time segments are rearranged according to inversely changing patterns, with the result that the normal speech signal appears.

The DS 6000 cabinet is identical to the one used for the CU 6000.

The DS 6001 is a version without speech synthesizer, and it is therefore not able to transmit identification signal. Apart from that the DS 6001 is identical to the DS 6000, and the following will thus cover both types, if nothing else is mentioned.

2. OPERATION



2.1. SWITCH ON

1. Turn "SUPPLY" switch (1) to position "ON", or position " ".
2. Turn "SYNC" switch (2) to position "FAST".
3. Turn "MODE" switch (3) to position "CLEAR".
4. Switch on the TRP 6000 or TRP 5000 as described in the instruction manual for this equipment.
5. Switch off the loudspeaker on TRP 6000/5000, as this will give you only scrambled conversation.

2.2. NORMAL CONVERSATION

1. Switch on as described in section 2.1.
2. TRP 6000 or TRP 5000 is operated as if it were a normal transmission without the DS 6000.

   It is important that the "CLARIFIER" is adjusted until the speech is as natural as possible and that "SENSITIVITY" is adjusted to the best possible signal/noise ratio.

   The "SIMPLEX/DUPLEX" switch must be in the "SIMPLEX" - position.
3. In case only a normal conversation is to be carried out, it is not necessary to switch on the DS 6000.

2.3. SCRAMBLED CONVERSATION

1. First a normal connection is established between the stations wanting to carry on a scrambled conversation. (Three or more stations may be involved). This is done as described in paragraph 2.2.

2. The "CRYPTO KEY" switches (6) must be set to the code wanted in all the stations involved. When the code is to be changed, this is done according to paragraph 2.5. points (5) and (6).

3. All participating stations now turn the "MODE" switch to position "CRYPTO".

4. The first station (in the following called A) releases the key - if this has not already been done - and then keys the transmitter again.

   This will result in the synchronization signal being transmitted. When the synchronization starts and ends, a brief tone signal can be heard in the earpiece.

   The whole synchronization signal has a duration of about 1.5 sec., and during this period conversation is not possible.

5. After transmission of the synchronization signal, the first period of speech may start without releasing the key. If, however, the key is released for a short period, the synchronization signal is transmitted again for about 1.5 seconds.

6. All other participating stations will hear the complete synchronization signal in the earpiece and if correct synchronization has been obtained with A, the lamp "SYNC RECEIVED" will give a short flash immediately after the synchronization signal has ended.

7. If the other participating stations have obtained synchronization with A, the subsequent message from A will be decoded correctly and sound as normal speech.

8. When A has passed on his message and released the key, the next station (in the following called B) may key the transmitter.

   This again will result in transmission of the synchronization signal for about 1.5 secconds, only this time from B.

   B will now hear the beginning of the synchronization signal in the earpiece, and after about 1.5 seconds, he may start his first period of speech.

   Remember: do not release the key between the synchronization signal and the period of speech.

9. If A and the other stations have obtained synchronization with B, the subsequent message from B will be decoded correctly and sound as normal speech.

10. In this way you may go on changing from one to another of the participating stations. Whenever a station starts keying, the synchronization signal is transmitted for 1.5 seconds before it is posssible to start talking, as described above.

2.4. SCRAMBLED CONVERSATION WITH CONSTANT KEYING

If one of the participating stations is continuously keying the transmitter for a longer period, the synchronization signal will be transmitted again with certain intervals, but the receiving stations will no longer hear the synchronization signals.

With the "SYNC" switch in position "FAST", the time interval between the synchronization signals is 21 seconds.

With the "SYNC" switch in position "SLOW", the time interval between the synchronization signals is 84 seconds.

If the individual periods of speech are very long, the "MODE" switch may be turned to "SLOW".

Depending on e.g. the transmission conditions, it may be impossible to retain synchronization in position "SLOW". In such cases only operation "FAST" can be used.

If the authorities demand that an identification signal is transmitted after a certain time in order to make it possible to identify the station, the signal is transmitted in clear speech as a speech synthesizer is built into the DS 6000.

The speech synthesizer generates a speech signal, based on the information in a PROM which has been programmed with the code number of the vessel. See paragraph 7.3. concerning programming of the PROM. Note that this feature is not incorporated in DS 6001.

The identification signal is transmitted in continuation of the synchronization signal, at the first keying after switching to "CRYPTO" mode, and then repeated after 5 minutes of transmitted speech.

REMEMBER !

Speech cannot be transmitted as long as the synchronization signal or the identification signal is transmitted.

2.5. TRANSMISSION ON 2182 kHz

If the push-button on the TRP 6000, or the "BAND" switch on the TRP 5000, is activated due to call or alarm transmission on 2182 kHz, the DS 6000 changes automatically to "CLEAR" mode, to ensure that the transmitted signal is not scrambled.

2.6. DETAILED DESCRIPTION OF OPERATING CONTROLS

(1) "SUPPLY"

"OFF"	Switch off of DS 6000.
"ON"	Switch on of DS 6000.
"  "	Switch on of DS 6000 and external speaker.

(2) "SYNC"

"FAST"	21 seconds between synchronization signals at constant keying.
"SLOW"	84 seconds between synchronization signals at constant keying.

(3) "SYNC RECEIVED"

A short flash at the receiving station indicates that the synchronization signal has been received and that synchronization has been obtained.

(4) "MODE"

"CLEAR"	Normal, not scrambled conversation.
"CRYPTO"	Scrambled conversation.

(5) "KEY LOCK"

LOCKING	By means of a special key, the protection cover for the "CRYPTO KEY" switches (6) may be locked. Push the protection cover entirely to the right so as to hide the "CRYPTO KEY" switches (6), and turn the key clockwise.
UNLOCKING	Turn the key anti-clockwise and push the protection cover entirely to the left.

(6) "CRYPTO KEY"

The protection cover is pushed aside as mentioned under point (5). Thereafter the 4 switches are adjusted to the code agreed upon prior to the transmission. All the participating stations must use the same code.

Any arbitrary code may be used, and frequent change of code will improve the security of concealment.

ATTENTION:

The code "0000" should be avoided, as it causes incomplete scrambling.

3. PREVENTIVE MAINTENANCE

To ensure maximum performance and minimum repair trouble, we strongly recommend you to follow below stated headlines for preventive maintenance.

1. Always keep the battery fully charged.

2. Check cable connections at regular intervals.

3. Keep your DS 6000 clean and dry externally to ensure continued function of the front panel controls.

4. If DS 6000 has not been used for a long period of time combined with exposure to extreme environmental conditions, open the unit and make a visual inspection. Remove salt, water or ice with a moist cloth before switching on the equipment.

5. For general maintenance and top performance, call an authorized service technician to give the complete installation including the DS 6000 a general check every 12 - 18 months.

4. SIMPLE SERVICE

4.1. Malfunction:

If the equipment is not functioning correctly, a check should be made that the TRP 6000 transmitter and receiver are operating correctly with the DS 6000 switched off. If both units are working normally, then switch on the DS 6000 and check that it is being operated properly according to chapter 2.

4.2. Cables:

Check all interconnection cables, connectors, and screw terminals, to see if they are broken or loose.

4.3. Replacement of fuses:

If the DS 6000 is totally dead and the red and yellow lamps on the power supply unit [406] are extinguished, replace the fuse.

If only the external speaker is dead, the fuse on the front panel board [411] should be replaced.

The fuses become accessible, when the hinged front panel is opened by loosening the two screws on front.

Spare fuses are placed inside the DS 6000.

NOTE: Set supply switch to "OFF" and open external supply voltage switch before replacing the fuse.

4.4. Replacement of modules:

When a fault has been located to one of the modules [406] or [412] / [413], the unit is very easily replaced.

Set supply switch to "OFF", disconnect the cables to the module and pull out the faulty module.

NOTE: Make sure to state the exact part number of the faulty module when ordering a replacement. Refer to the spare parts list in section 4.5.

4.5. SPARE PARTS LIST

	Part No.
Standard shipborne spares	
1 fuse 3.15 amps slow	720 331 50
1 fuse 1 amp slow	720 310 01
Depot spares for DS 6000	
[406] Switch mode power supply	107 440 61
[411] Front panel board	107 441 11
[412] Scrambler	107 441 21
[413] Speech module	107 441 31
Code switch with cable, 4 pcs.	106 403 70
Left cover for code switch	763 000 18
Right cover for code switch	763 000 19
Interconnection cable DS 6000/1	106 403 80
60 lead flat ribbon cable	373 452 91
External loudspeaker	860 000 08
Adapter box DS 6000 - TRP 5000	107 405 10

NOTE: Only the above type of loudspeaker should be used with the DS 6000, to ensure a fair reproduction of the speech.

5. TECHNICAL DATA

The SKANTI DS 6000 is in the first place designed to operate with the TRP 6000. To operate with TRP 5000 a special adapterbox is needed.

COMMUNICATION CHANNEL REQUIREMENTS

Frequency bandwidth	350 to 2700 Hz
Frequency offset	+/- 100 Hz
SINAD	>10 dB
Time dispersion	< 3 msec.

AUDIO QUALITY

Frequency response	150 to 2500 Hz
Audio delay	0.50 sec. (0.25 sec. per scrambler)
Audio output	5 W into special external speaker

SECURITY

Scrambling concept	Time Segment Permutation (TSP)
Number of segments	8
Time duration of segment	31.2 msec.
Possible permutations	8! = 40320
Optimal permutations	32 stored in PROM
Coding concept	Pseudo-Random Binary Sequence (PRBS)
Number of states	$2^{23}-1 = 8388607$
Time between code changing	0.25 sec.
Total number of code sequences	$32^{84} = 2.71^{126}$
User selectable codes	65536 (4 digits, hexadecimal)

SYNCHRONIZATION

Synchronization signal	1600/2000 Hz FSK, 64 baud
Synchronization time	1.25 sec.
Resynchronization	Automatically every 21 sec. in "FAST" Automatically every 84 sec. in "SLOW"

OPERATIONAL POSSIBILITIES

Radio communication system	IF/HF
Modulation methods	AM/SSB
Mode of operation	Simplex
Type of operation	Voice
Interface to TRP 6000	Direct via 6-pole DIN socket
Interface to TRP 5000	Through special interface box
Operating temperature	-10 to +55 ^{o}C

POWER REQUIREMENTS

Supply voltage	24 V DC -10 to +30 %
Power consumption	12 W

WEIGHT AND DIMENSIONS

Weight	5.5 kgs
Width x depth x height	372 x 235 x 152 mm

6. TECHNICAL DESCRIPTION

6.1. GENERAL

Scrambling concept

The digital voice scrambler DS 6000 uses the so-called time segment permutation (TSP) method. The audio input signal is sampled at 8.2 kHz and digitized by a "CODEC" according to the CCITT PCM specification. The resultant 8 bit words are stored in a random access memory (RAM) of 4 kbytes by mapping the address through a permutation programmable read only memory (PROM) to achieve a permuted group of 8 time-slices (segments) each 31.2 msec. long, corresponding to 256 samples. When these data are fetched in a linear sequence and converted to an analog signal by the "CODEC", a scrambled signal with the same bandwidth and spectrum as the original will emerge, making it possible to use normal radio transceivers and telephone lines for transmission.

Permutation PROM

Out of the theoretical number of permutations (8!), 32 are selected using the criterion that the average time segment shift is larger than 3.4 . In this way only those permutations are selected, which ensure an unreadable scrambled signal.

Code selection and code generator

The four hexadecimal thumbwheel switches concealed behind a locked panel enable the user to select one of 65536 codes, which are used for initializing a pseudo ramdom binary sequence (PRBS) generator with a total length of 23 bits, which 4 times per second selects a new permutation from the permutation PROM.

Synchronization

The scrambler is synchronized by a 80 bit synchronization pattern transmitted by means of 1600/2000 Hz FSK. During the synchronization process, the communication is interrupted for 1.25 seconds and the total bandwidth is used for the synchronization signal.

Speech synthesizer identification signal

An optional speech synthesizer board permits the automatic transmission of a programmed identification signal consisting of up to 12 characters in clear language. The interval between the transmissions is 5 minutes. The programming of the identification signal is described on page 7-4. The speech synthesizer board is not found in the DS 6001.

For security reasons, the scrambler unit is not described in further details, except for the overall block schematic.

6.2. FRONT PANEL [411]

All manual controls are mounted on the front panel board, and all external connections pass this board except for the handset which is plugged direct into the scrambler unit.

The audio output to the loudspeaker can be adjusted by R6 on the back of the board, the level to the earpiece is fixed, preset from factory.

The fuse covers the amplifier for the speaker and the optional interface box for TRP 5000.

NOTE: Only the Special loudspeaker, designed for DS 6000 should be used, as other types may reduce the audio quality considerably.

6.3. SWITCH MODE POWER SUPPLY [406]

The 24 volts from the battery is fed through a relay switch, controlled by the overvoltage and reverse polarity circuit, and through a noise filter before it is allowed to flow to the converter itself.

It is a fly back converter where a part of the 7.5 volts rectified secondary output is compared to a reference voltage and the result is transferred to the primary side via an optocoupler and is used to control the duty cycle of the converter. This is done by regulating the duty cycles of the pulses from the 20 kHz oscillator, before they are used as a driving signal for the converter driver. This means that we have a regulating loop, where the output voltage from the converter is fairly stable independent of the battery voltage variations and different loading conditions on the DC outputs.

By means of optocouplers, in both the voltage and current control feedback path, the secondary side of the converter is galvanically isolated from the primary side and thereby from the battery.

The converter is designed so that the 15 volts output is tracking correctly when the 7.5 volts output is well stabilized. Each rectified output is equipped with a current sensor. The 2 sensors and the overvoltage protector, attached to the 7.5 volts line, disables the regulating loop and forces the converter into a low power mode if an abnormal loading condition exists on the outputs.

Two lamps indicate the presence of output, yellow for the 7.5 volts and red for the 15 volts.

6.4. REPAIR AND REALIGNMENT OF POWER SUPPLY [406]

6.4.1. Preparation

To repair and realign the switch mode power supply, it is necessary to remove it from the cabinet and place it on top of the cabinet with the flat ribbon cable connected to the unit.

6.4.2. Measurements

a. Check of the battery voltage

Measure the 24 volts battery input voltage between TP 1 - and the fuse FS 1 +, both sides. The voltage must be within the limits -10% to +30% equal to 21.6 volts to 31.2 volts.

b. Check of DS ON control

Measure that the +24 volts is present at DS ON 1 input when the SUPPLY switch on the DS 6000 is in position ON. Measure between TP 1 and the strap close to the fuse.

c. Check of DC output voltages

Check that the red and yellow LED's are lit, which indicates: Red LED on = +15 volts OK. Yellow LED on = +7.5 volts OK.

If the DC output voltages are suspect, measure these accurately with a voltmeter or an oscilloscope, and adjust if necessary as explained in point 6.4.3.

Tolerances of the output voltages must be measured with a nominal load of approx. 1 ampere on each DC output simultaneously,

The 7.5 volts output must be within 7.45 to 7.8 volts.
The 15 volts output must be within 14.9 to 16.0 volts.

Measure between TP 3 / TP 4 and ground e.g. at C 33, 100 µF close to TP 3.

The nominal load can be established by removing the 60 pin connector from the scrambler unit and removing the fuse on the front panel board. Then apply a 15 ohms 15 watts resistor to TP 4 and a 7.5 ohms 7.5 watts resistor to TP 3 and connect both resistors to ground.

d. Check of 20 kHz oscillator

Check by means of an oscilloscope that the 20 kHz oscillator is running. The signal is measured at TP 2 relative to -24 volts at TP 1.

Check the frequency and check that the mark/space relationship alters with the changes in the load of the DC outputs.

6.4.3. Realignment

Establish the nominal 1 amp load on both outputs as described above in point 6.4.2.c.

a. Realignment of 7.5 volts output

With both loads connected, adjust R 67 until the measured 7.5 volts output is within the limits 7.4 volts to 7.8 volts.

Check that the 15 volts DC output is within the limits of 14.9 volts to 15.6 volts.

b. Realignment of peak current

Adjust R 41 to centre position.
Connect the 15 ohms load to TP 4 as above.
Replace the 7.5 ohms load with a 2.5 ohms load connected to TP 3.

Adjust R 41 until the peak current limiter is activated and the 7.5 volts output therefore decreased. Then adjust R 41 in the opposite direction until the DC output is just back to normal again.

7. INSTALLATION

7.1. General

The DS 6000 is mounted by means of a mounting rack as shown on fig 7.1. It is mounted close to the CU 6000 so that both units can be operated from the same place.

7.2. Connection of DS 6000 in conjunction with TRP 6000

7.2.1. Microtelephone

The micro telephone which is normally connected to the exciter PCB No. 403 in CU 6000, is moved to the DS 6000 as shown on fig. 7.2.

The cable must be secured by putting it through the cable clamp inside the front of DS 6000.

7.2.2. Connecting cable DS 6000 / CU 6000

The multicable itself is a standard cable which will be supplied together with the equipment. The colour code is shown on fig. 7.4. Please note that it is only a 5-pole plug at the end connected to the CU 6000, the yellow wire being led out of the plug.

In DS 6000 the cable is connected as shown on fig. 7.2.

In CU 6000 the cable is connected as shown on fig. 7.3. The 5 pole plug is connected to the DIN socket where the micro telephone is normally plugged in, and the separate yellow wire is connected to the terminal marked 2182 on the front panel, as shown on fig. 7.3.

7.2.3. Supply voltage to DS 6000

The DS 6000 is to be supplied from the 24 volts battery, which also supplies the TRP 6000.

The two cables, +24 volts and -24 volts are connected to the terminal strip on the front panel of DS 6000 as shown on fig. 7.2. The maximum current consumption is 0.5 amperes, and the necessary supply cables should be:

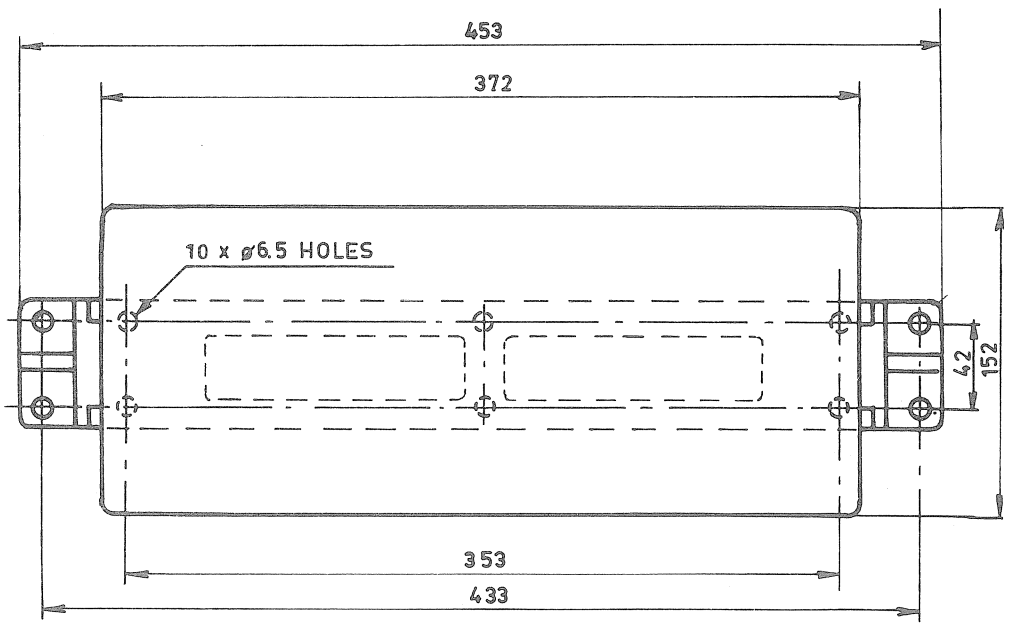
2 x 0.75 sqmm at maximum 6 m cable length, fuse 6 amperes
2 x 1.00 sqmm at maximum 12 m cable length, fuse 6 amperes

7.2.4. Test of scramble inhibit function on 2182 kHz

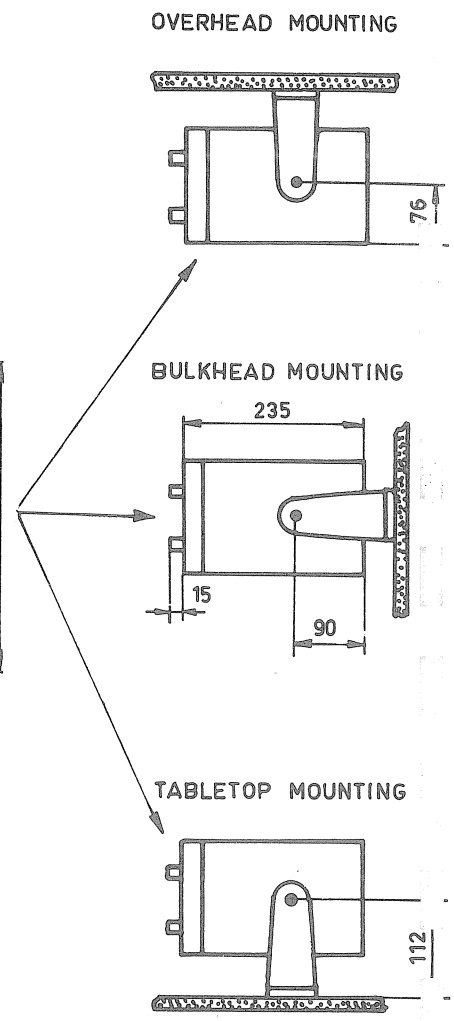
When DS 6000 and CU 6000 are connected it must be checked that the DS 6000 automatically switches to "CLEAR" mode when 2182 kHz is selected on the CU 6000. It is necessary to check that conversation is in clear language as the mode switch on DS 6000 will stay on "CRYPTO".

7.2.5. Earthing

Usually it is not necessary to earth the DS 6000. If, for special reasons, earthing of the DS 6000 is required, this may be done by connecting an earth wire to the terminal marked GND/⏚ as shown on Fig.7.2.



DRILLING PLAN.



MOUNTING POSSIBILITIES

UNIT :	APPR. WEIGHT :
DS6000	5.5 kg

TOLERANCES : ± 1mm
DIMENSIONS IN mm

Fig. 7.1 MOUNTING OF DS6000

FIG. 7.2 CABLE CONNECTIONS FOR DS6000

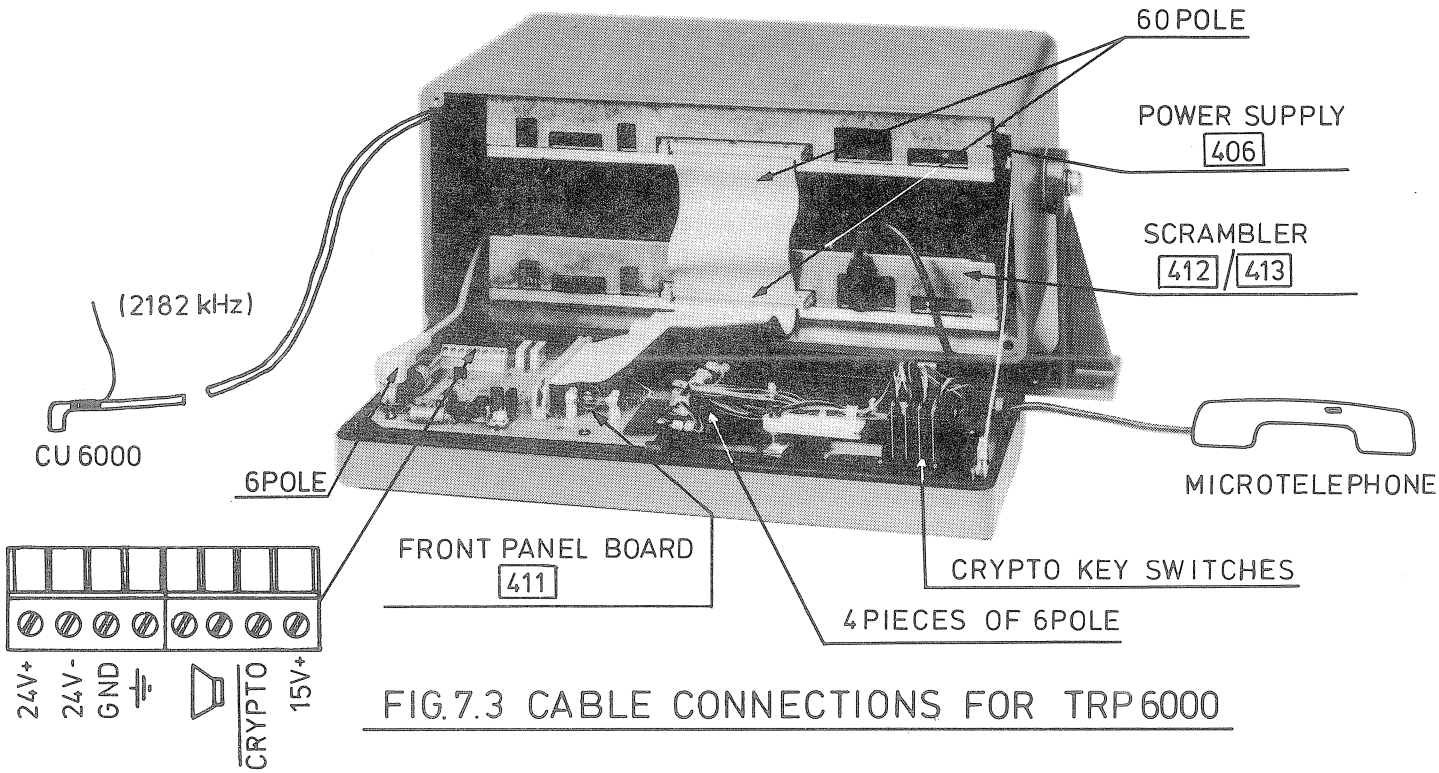


FIG. 7.3 CABLE CONNECTIONS FOR TRP 6000

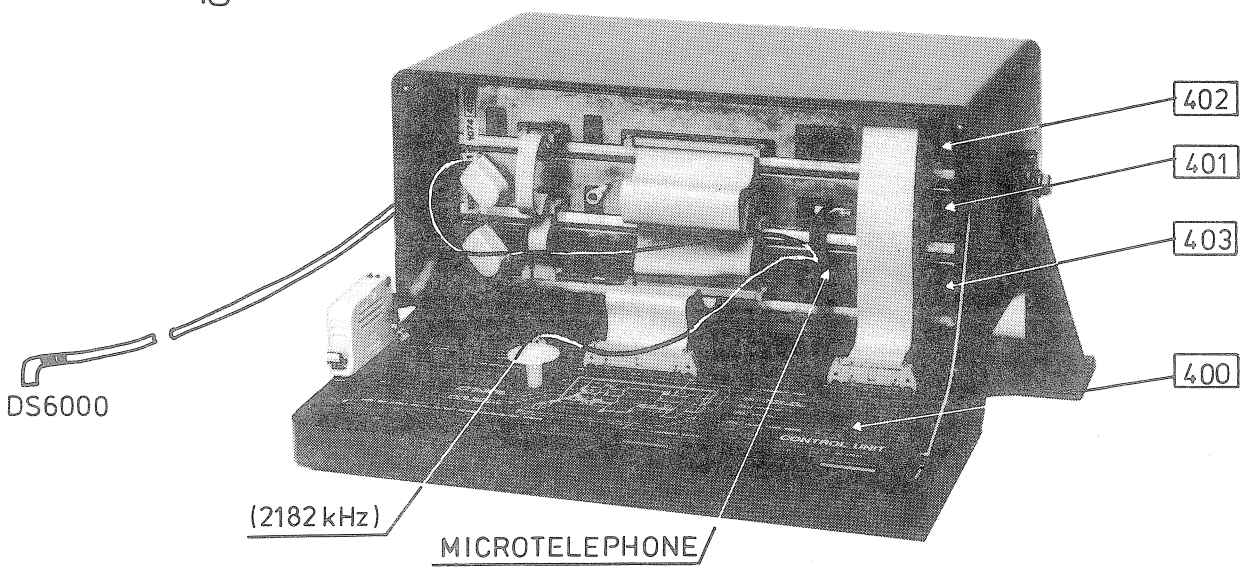
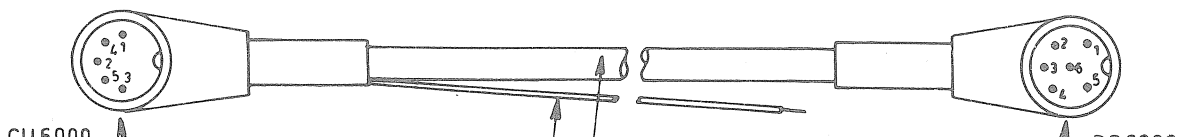


FIG. 7.4 CONNECTING CABLE FOR DS6000 - TRP6000



5pole plug	5 leads multi cable	6pole plug
pin no	lead colour	pin no
1	black	1
2	screen	2
3	blue	3
4	brown	4
5	beige	5
NC	yellow	6
Plug connections		

7.3. Programming of PROM with the identification signal.

Each vessel has its own identification signal, call signal, which is transmitted as described in section 2.4. The identification signal transmitted by the individual DS 6000 depends on the contents of a PROM.

Such an identification signal may e.g. be the following:

XP 2589, this is X-ray, papa, two, five, eight, nine.

The phonetic alphabet from alpha to zulu and all numbers from 0 to 9 may be applied, as listed on page 7-7.

In order to separate the individual letters and numbers from each other, which makes it easier to understand what is said, pauses may be put in. There are two different lengths of pauses.

According to the Radio Regulations, the identification signal is always to start by "This is", followed by a pause. After that there is space for maximum 12 characters, letters, numbers and pauses.

On page 7-8 is shown an example of programming of the identification signal X - P - 2 - 5 - 8 - 9.

By using the table on page 7-7, the PROM is programmed as follows:

a. Address 000: The bits representing "This is": (11010010)

b. Address 001: The bits representing a long pause: (11010011)

c. Addresses 002 to 013: The bits representing up to 12 characters which may be chosen freely, according to the table on page 7-7. The character is programmed in bits 1 to 7, and a 1 in bit 8 for the addresses into which characters have been programmed. If a smaller number than 12 possible characters is used, bit 8 in the subsequent addresses must be 0.

d. Adresses 014 and 015: 0 in bit 8.

e. The remaining bits are not programmed which means 0.

The PROM used contains 32 x 8 bits and the following types can be used:

74 LS 188 or TBP 18 S A030N

7.4. Connection of DS 6000 in conjunction with TRP 5000.

By means of a separate adapter box, it is possible to operate the DS 6000 in conjunction with the TRP 5000.

The installation guide on the following 2 pages is supplied together with adapter box and necessary cables when part No. 107 405 10 is ordered.

INSTALLATION OF ADAPTERBOX DS6000

The adapterbox is inserted between the two shielded boxes in DS 6000 as shown on fig. 7.6

The short cable with the black connector is connected to the handset socket in the lower shielded box.

The cable with the grey connector is guided behind the flat cable and connected to the socket in the left side of the front panel board.

The red wire is connected to the terminal strip mrk. "+15V". The blue wire is connected to the terminal strip mrk. "crypto".

The long cable and the grey wire is guided through the back of DS 6000. ATTENTION!! It is necessary to remove the screw and the rotating sleeve while the cable is guided through the back. The cable is connected to the handset socket in the TRP 5000 exciter.

The exciter is pulled out and the grey wire is guided through the backside of TRP 5000, beneath the exciter and soldered on PL2 pin 1a on PCB 231, see fig. 7.7

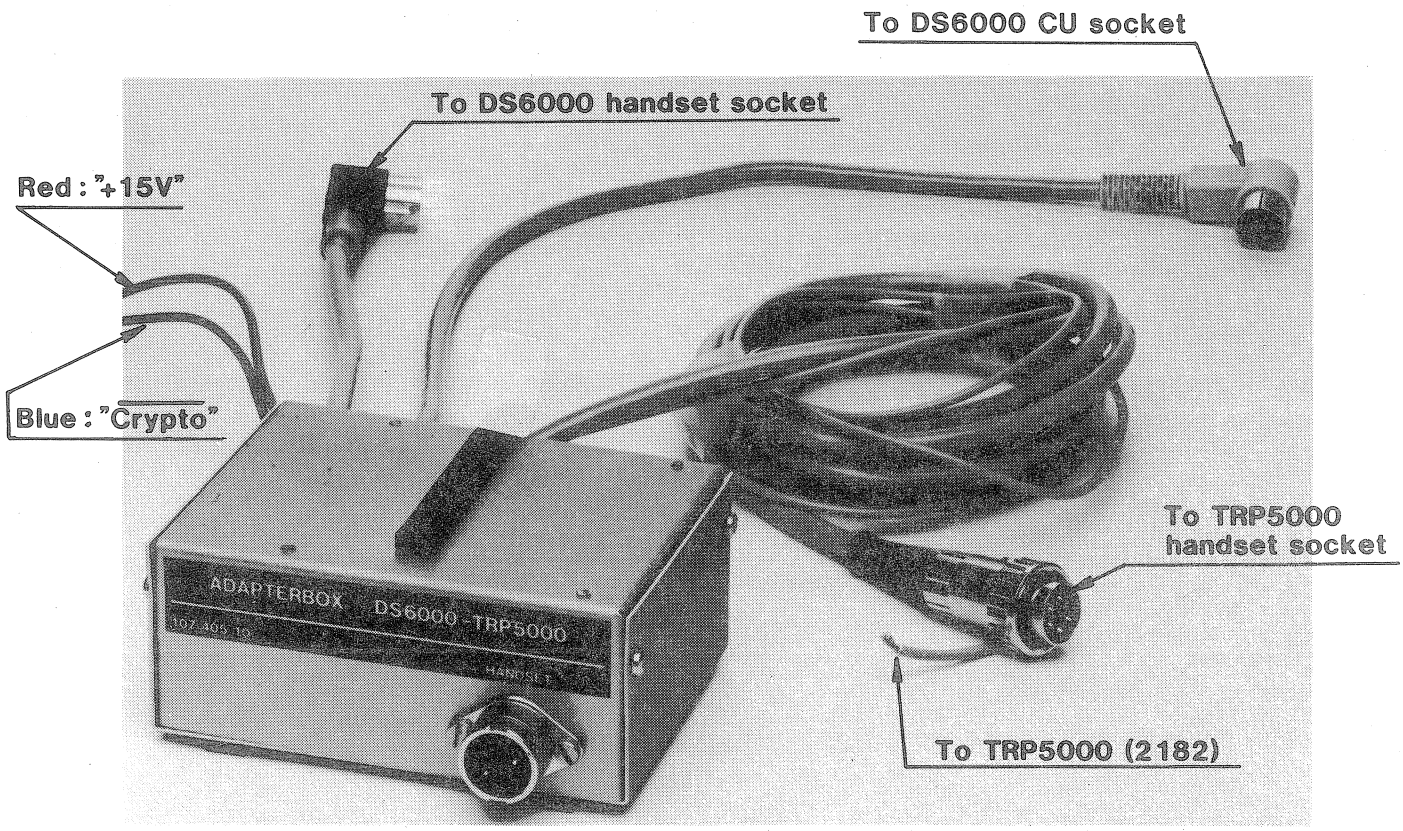


Fig. 7.5 : The adapterbox

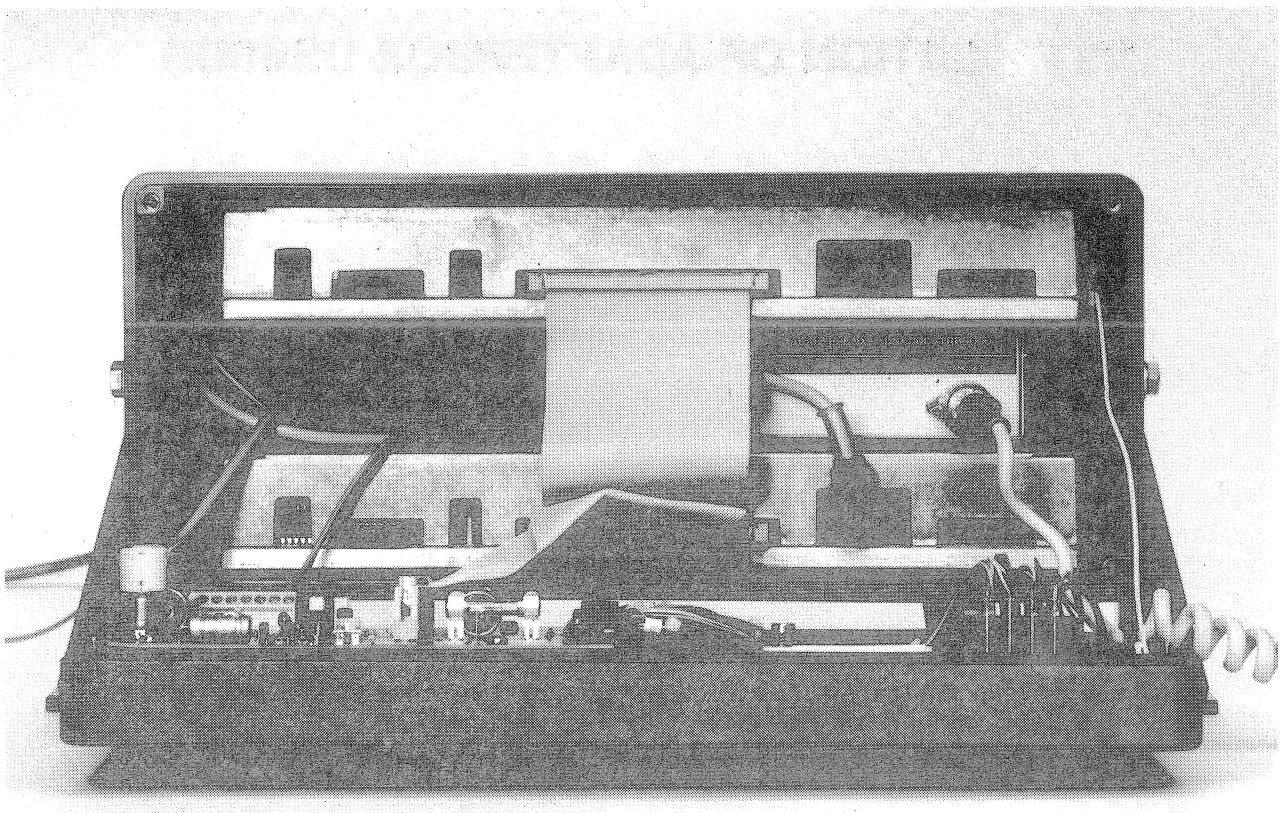


Fig. 7.6 : The adapterbox inserted between the two shielded boxes in the DS6000.

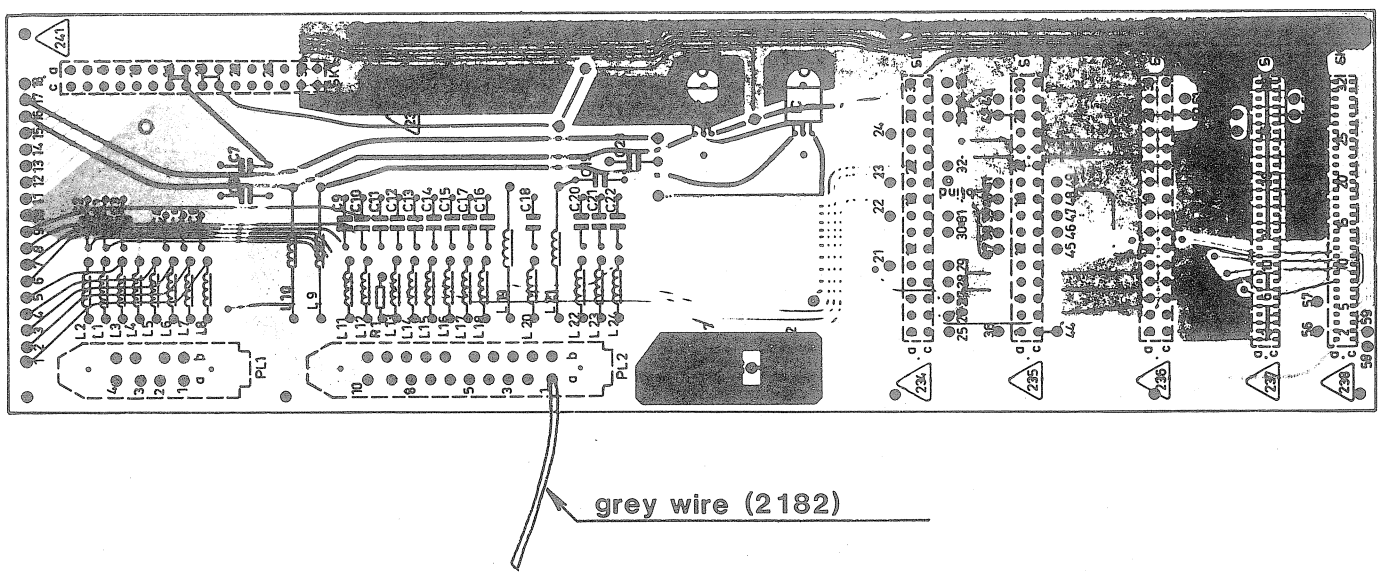


Fig. 7.7 : The PCB 231 in the TRP5000

CHARACTER	OUTPUT CODE Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1
This is	1	1	0	1	0	0	0	1
Long pause	1	1	0	1	0	0	1	1
Short pause	1	1	0	1	0	0	1	0
A Alpha	1	0	0	0	1	0	1	0
B Bravo	1	0	0	0	1	0	1	1
C Charlie	1	0	0	0	1	1	0	0
D Delta	1	0	0	0	1	1	0	1
E Echo	1	0	0	0	1	1	1	0
F Foxtrot	1	0	0	0	1	1	1	1
G Golf	1	0	0	1	0	0	0	0
H Hotel	1	0	0	1	0	0	0	1
I India	1	0	0	1	0	0	1	0
J Julliette	1	1	0	0	0	0	0	0
K Kilo	1	1	0	0	0	0	0	1
L Lima	1	1	0	0	0	0	1	0
M Mike	1	1	0	0	0	0	1	1
N November	1	1	0	0	0	1	0	0
O Oscar	1	1	0	0	0	1	0	1
P Papa	1	1	0	0	0	1	1	0
Q Quebec	1	1	0	0	0	1	1	1
R Romeo	1	1	0	0	1	0	0	0
S Sierra	1	1	0	0	1	0	0	1
T Tango	1	1	0	0	1	0	1	0
U Uniform	1	1	0	0	1	0	1	1
V Victor	1	1	0	0	1	1	0	0
W Whiskey	1	1	0	0	1	1	0	1
X X-ray	1	1	0	0	1	1	1	0
Y Yankee	1	1	0	0	1	1	1	1
Z Zulu	1	1	0	1	0	0	0	0
0 O	1	0	0	0	0	0	0	0
1 One	1	0	0	0	0	0	0	1
2 Two	1	0	0	0	0	0	1	0
3 Three	1	0	0	0	0	0	1	1
4 Four	1	0	0	0	0	1	0	0
5 Five	1	0	0	0	0	1	0	1
6 Six	1	0	0	0	0	1	1	0
7 Seven	1	0	0	0	0	1	1	1
8 Eight	1	0	0	0	1	0	0	0
9 Nine	1	0	0	0	1	0	0	1

Coding of PROM for identification signal

TRUTH TABLE FOR SN74188AN OR EQUIVALENT 32 WORDS 8BIT PROM

INPUT ADDRESS		OUTPUT							
		Pin 9	Pin 7	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1
		Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1
0 0 0	This is	1	1	0	1	0	0	0	1
0 0 1	long pause	1	1	0	1	0	0	1	1
0 0 2	X-ray	1	1	0	0	1	1	1	0
0 0 3	Papa	1	1	0	0	0	1	1	0
0 0 4	short pause	1	1	0	1	0	0	1	0
0 0 5	two	1	0	0	0	0	0	1	0
0 0 6	five	1	0	0	0	0	1	0	1
0 0 7	eight	1	0	0	0	1	0	0	0
0 0 8	nine	1	0	0	0	1	0	0	1
0 0 9		0							
0 1 0		0							
0 1 1		0							
0 1 2		0							
0 1 3		0							
0 1 4		0							
0 1 5		0							
0 1 6									
0 1 7									
0 1 8									
0 1 9									
0 2 0									
0 2 1									
0 2 2									
0 2 3									
0 2 4									
0 2 5									
0 2 6									
0 2 7									
0 2 8									
0 2 9									
0 3 0									
0 3 1									

"0" = output low
"1" = output high

skanti DENMARK

PROM FOR IDENTIFICATIONSIGNAL:
"THIS IS XP 2589"

TEGN. NR.:
dwg no:

L93

TRUTH TABLE FOR SN74188AN OR EQUIVALENT 32 WORDS 8 BIT PROM

INPUT ADDRESS				OUTPUT							
				Pin 9	Pin 7	Pin 6	Pin 5	Pin 4	Pin 3	Pin 2	Pin 1
				Y 8	Y 7	Y 6	Y 5	Y 4	Y 3	Y 2	Y 1
0	0	0	This is long pause	1	1	0	1	0	0	0	1
0	0	1		1	1	0	1	0	0	1	1
0	0	2									
0	0	3									
0	0	4									
0	0	5									
0	0	6									
0	0	7									
0	0	8									
0	0	9									
0	1	0									
0	1	1									
0	1	2									
0	1	3									
0	1	4		0							
0	1	5		0							
0	1	6									
0	1	7									
0	1	8									
0	1	9									
0	2	0									
0	2	1									
0	2	2									
0	2	3									
0	2	4									
0	2	5									
0	2	6									
0	2	7									
0	2	8									
0	2	9									
0	3	0									
0	3	1									

"0" = output low
"1" = output high

skanti DENMARK

PROM FOR IDENTIFICATIONSIGNAL:
This is ------

TEGN. NR.:
dwg. no:

L93

8. PARTS LIST

PARTS LIST
FOR
411 VERSION 1A

Printed Circuit Board Complete					107 441 11
IC1	TBA810S				850 081 00
D1	MV5353				823 000 01
R1	47 kohm	5%	1/4W	Carbon	501 447 00
R2	100 kohm	5%	1/4W	Carbon	501 510 00
R3	56 ohm	5%	1/4W	Carbon	501 156 00
R4	100 ohm	5%	1/4W	Carbon	501 210 00
R5	1 ohm	5%	1/4W	Carbon	501 010 00
R6	10 kohm			Pot.	582 410 00
C1,12	470 uF		40V		652 847 00
C2	0.47 uF	10%	63V	Polyes.	622 547 00
C3	22 uF		63V	Tantal	650 722 00
C4	10 nF	10%	63V	Polyes.	622 410 01
C5,6	4.7 nF		44V	Cer.	602 347 01
C7,10	100 uF		25V		652 810 00
C8	5.6 nF	1%	125V	Polyst.	613 356 00
C9	820 pF	1%	125V	Polyst.	613 282 00
C11	0.22 uF	10%	63V	Polyes.	622 522 00
C13	0.1 uF	10%	63V	Polyes.	622 510 00
C14,15	0.1 uF	10%	250V	Polyes.	624 510 00
FS1	1A/220V	SIKRING			720 310 01
TS1	4 POL.	KLÆMRÆKKE			770 000 19
PL1	60 POL.	STIK			756 060 02
PL2	6 POL.	STIK			751 001 08
PL3-6	6 POL.	STIK			751 000 92
SK1	4 POL.	OMSKIFTER			373 409 71
SK2,3	4 POL.	OMSKIFTER			373 409 81

PARTS LIST
FOR
414 VERSION 1A

Printed Circuit Board Complete					107 441 41
Q1,2,4	BC547				840 054 70
Q3	BC337				840 033 70
RL1-5	RELÆ DIL 1POL				780 000 25
R1	2.2 kohm	5%	1/4W	Carbon	501 322 00
R2	820 ohm	5%	1/4W	Carbon	501 282 00
R3,4,6,7,10	15 kohm	5%	1/4W	Carbon	501 415 00
R5	270 ohm	5%	1/4W	Carbon	501 227 00
R8	220 ohm	5%	1/4W	Carbon	501 222 00
R9,11-13	10 kohm	5%	1/4W	Carbon	501 410 00
C1,2	2.2 uF		35V	Tantal	652 622 01
C3	0.1 uF	10%	63V	Polyes.	622 510 00

PARTS LIST
FOR
406 VERSION 2A

Printed Circuit Board Complete 406		107 440 61
IC1,8	LM723CN	850 072 30
IC2,3	NE555	850 055 50
IC4,7	CNY17	825 000 00
IC5,6	LM2903	850 290 30
Q1,6,7,10	BC547B	840 054 70
Q2,3	BD158	842 015 80
Q4,8	BC327	840 032 70
Q5	BC557B	840 055 70
Q9	BUZ20	843 002 00
Q11	BD135	842 013 51
D4	BZX79B8V2	832 798 20
D1,3	10D4	831 010 40
D2	10D2	831 102 00
D5	BZX87C39V	832 853 90
D6,7	BZX79C12V	832 791 21
D8,10	1N4148	830 414 80
D9,15-17	BZX79C9V1	832 799 11
D11	BYV27/200	831 272 00
D20	1S920	830 192 00
D13	VSK330	831 033 00
D12	BYW72	831 007 20
D14,20	TIL220	823 000 02
D19	MV5353	823 000 01
RL1	15.6V	780 000 26

R2	47 kohm	5%	1W	Carbon	504 447 00
R3	12 kohm	5%	1/3W	Carbon	501 412 00
R5-7	56 kohm	5%	1W	Carbon	504 456 00
R1	150 ohm	5%	1/2W	Carbon	502 215 00
R4	2.7 kohm	5%	5W	WW	527 327 01
R8,71	680 ohm	5%	1/3W	Carbon	501 268 00
R9,33	56 ohm	5%	1/3W	Carbon	501 156 00
R10	180 kohm	5%	1/3W	Carbon	501 518 00
R11,34,49	10 kohm	5%	1/3W	Carbon	501 410 00
R12,39,53	1.5 kohm	5%	1/3W	Carbon	501 315 00
R16	390 ohm	5%	1/2W	Carbon	502 239 00
R13,25,32,54	4.7 kohm	5%	1/3W	Carbon	501 347 00
R40	390 ohm	5%	1/3W	Carbon	501 239 00
R18	470 ohm	5%	1/2W	Carbon	502 247 00
R17,21,28	1 kohm	5%	1/3W	Carbon	501 310 00
R14,22,26	5.6 kohm	5%	1/3W	Carbon	501 356 00
R15,62,65	100 ohm	5%	1/3W	Carbon	501 210 00
R27	2.2 kohm	5%	1/3W	Carbon	501 322 00
R19	15 kohm	5%	1/3W	Carbon	501 415 00
R20,54	47 kohm	5%	1/3W	Carbon	501 447 00
R23	6.8 kohm	5%	1/3W	Carbon	501 368 00
R29	47 ohm	5%	1/3W	Carbon	501 147 00
R24	33 kohm	5%	1/3W	Carbon	501 433 00
R31	100 ohm	5%	1W	Carbon	504 210 00
R30	0.08 ohm	5%	1W	WW	523 000 80
R36	68 ohm	5%	1/3W	Carbon	501 168 00
R37	22 ohm	5%	1/3W	Carbon	501 122 00
R35,43,45,51	1 Mohm	5%	1/3W	Carbon	501 610 00
R72,60	0.1 ohm	5%	1W	WW	523 001 00
R42,44	39 kohm	5%	1/3W	Carbon	501 439 00
R38,56,59	27 kohm	5%	1/3W	Carbon	501 427 00
R41	1 kohm			Pot.	582 310 00
R52,68,58	1 kohm	5%	1/3W	Carbon	501 310 00
R50	1.2 kohm	5%	1/3W	Carbon	501 312 00
R64	3.3 ohm	5%	1/2W	Carbon	502 033 00
R46,47,55	22 kohm	5%	1/3W	Carbon	501 422 00

406 VERSION 2A

R61	33 ohm	5%	3W	WW	526 133 00
R48	3.3 kohm	5%	1/3W	Carbon	501 333 00
R63	330 ohm	5%	1/3W	Carbon	501 233 00
R67	100 ohm			Pot.	582 210 00
R69	390 ohm	5%	1/3W	Carbon	501 239 00
R57	100 kohm	5%	1/3W	Carbon	501 510 00
R66	82 ohm	5%	1/3W	Carbon	501 182 00

C1,2,12,14,15	0.1 uF	10%	250V	Polyes.	624 510 00
C5,3,4	1 uF	10%	250V	Polyes.	624 610 01
C7,16,25,27	2200 uF		40V	W.alum.	652 922 00
C8	220 uF		40V	W.alum.	652 822 01
C9	0.1 uF	10%	100V	Polyes.	623 510 01
C4,10	1 uF	10%	100V	Polyes.	623 610 00
C13	22 uF		16V	Tantal	651 722 01
C29,31,32	0.47 uF	10%	63V	Polyes.	622 547 00
C17,34	1 nF	1%	500V	Polyes.	615 310 01
C18	470 pF	1%	500V	Polyes.	615 247 00
C19	910 pF	1%	500V	Polyes.	615 291 00
C20,21,26,28	10 nF	10%	250V	Polyes.	624 410 01
C22,24	22 nF	10%	250V	Polyes.	624 422 00
C23	750 pF	1%	500V	Polyes.	615 275 00
C30,33	100 uF		25V	W.alum.	652 810 00

L1	2x6.8HM	740 368 00
L2-7	25 uH	740 125 00

T1	103 403 42

FS1	3.15A	720 331 50

PL1

756 060 00

9. CIRCUIT DIAGRAMS

9.1. Symbol Explanation

9.1.1 Arrows:

A black arrow on a line indicates in which direction an AC-signal flows.

A white arrow on a line indicates in which direction the information of a DC signal flows. An exception from this rule is the supply lines and their connections, which are always indicated by a supply voltage level or its associated label.

9.1.2 Logic circuits:

A small circle at an external input means that the specific input is active LOW, i.e. it produces the desired function, in conjunction with other inputs if its voltage is the lower of the two logic levels in the system, otherwise the specific input is HIGH.

A clock input is indicated by an open triangle. A small circle at a clock input means that the outputs change on the HIGH to LOW clock transition.

A small circle at an output indicates that when the function designated is true, the output is LOW.

Inputs and outputs are labelled with labels as described in table 10.1.

9.1.3 Logic Functions:

Logic functions are labelled with labels in brackets. an active LOW function is given a bar over the label.

9.1.4 Voltages:

Typical DC voltages are indicated on the circuit diagrams next to the points to which they refer and are marked with a "V".

Typical logic levels are indicated in brackets (LOW/HIGH) on the circuit diagrams next to the point to which they refer and are marked with a "V".

Typical AC voltages are likewise indicated on the circuit diagrams. They are marked with "Vpp" or "mVpp".

ABBREVIATIONS

A	= ampere, amperes
B	= battery, motor
C	= capacitor
Car.	= carbon
Cer.	= ceramic
D	= diode
F	= farad, fan
FS	= fuse
H	= henry
IC	= integrated circuit
k	= kilo or 10^3
L	= inductor
LS	= loudspeaker
lin.	= linear
log.	= logarithmic
m	= milli or 10^{-3}
M	= mega or 10^6
ME	= instrument
MF	= metal film
Mi	= mica
MP	= metallized paper
u	= micro or 10^{-6}
n	= nano or 10^{-9}
NPO	= temp. coefficient 0
N150	= temp. coefficient -150
NTC	= neg. temp. coefficient
p	= pico of 10^{-12}
PL	= connector (plug)
Polyes.	= polyester
Polyst.	= polystyrene
PTC	= pos. temp. coefficient
Q	= transistor
R	= resistor
RL	= relay
SW	= switch
SK	= connector (socket)
SL	= lamp
T	= transformer
Tan	= tantalum electrolytic capacitor
V	= working voltage DC or volts
Vl	= valve
Vac.	= working voltage AC
Var.	= variable
Vpp	= peak to peak voltage
Varicap	= variable capacitance diode
ww	= wire wound
W	= watt, watts
W.alum.	= wet aluminium electrolytic
X	= crystal, crystal osc. or crystal filter

Table 9.1

Label	Short for	Meaning
A	Trig Input	triggers one-shot on falling edge
A_x	Address	selects a memory location (data word) or a multiplexer input.
B	Trig Input	triggers one-shot on rising edge
B/D	Binary/Decimal	selects counting mode (modulus 16 or 10)
BI	Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display)
C_xY	Control Signal	programmable bidirectional hand-shake signal to/from peripheral
CEP, CET	Clock Enable	enables clock signal to counter
CP	Clock Pulse	edge activated input for updating synchronous circuit
CS_x	Chip Select	selects a memory or peripheral circuit (bus slave)
D_x	Data	input to D flip-flop and register or bidirectional information path for bus connected device
E	Enable Input	enables clock signal
EO	Enable Output	activates output(s) from combinatorical circuit.
EQ	Enable Output	activates output(s) from sequential circuit.
HLT	Halt	suspends MPU activity and releases busses.
I_xY	Input Data	input for combinatorical circuit
IRO_y	Interrupt Request	wired-OR flag from peripheral to MPU indicating interrupt detected.

Table 9.1 (continued)

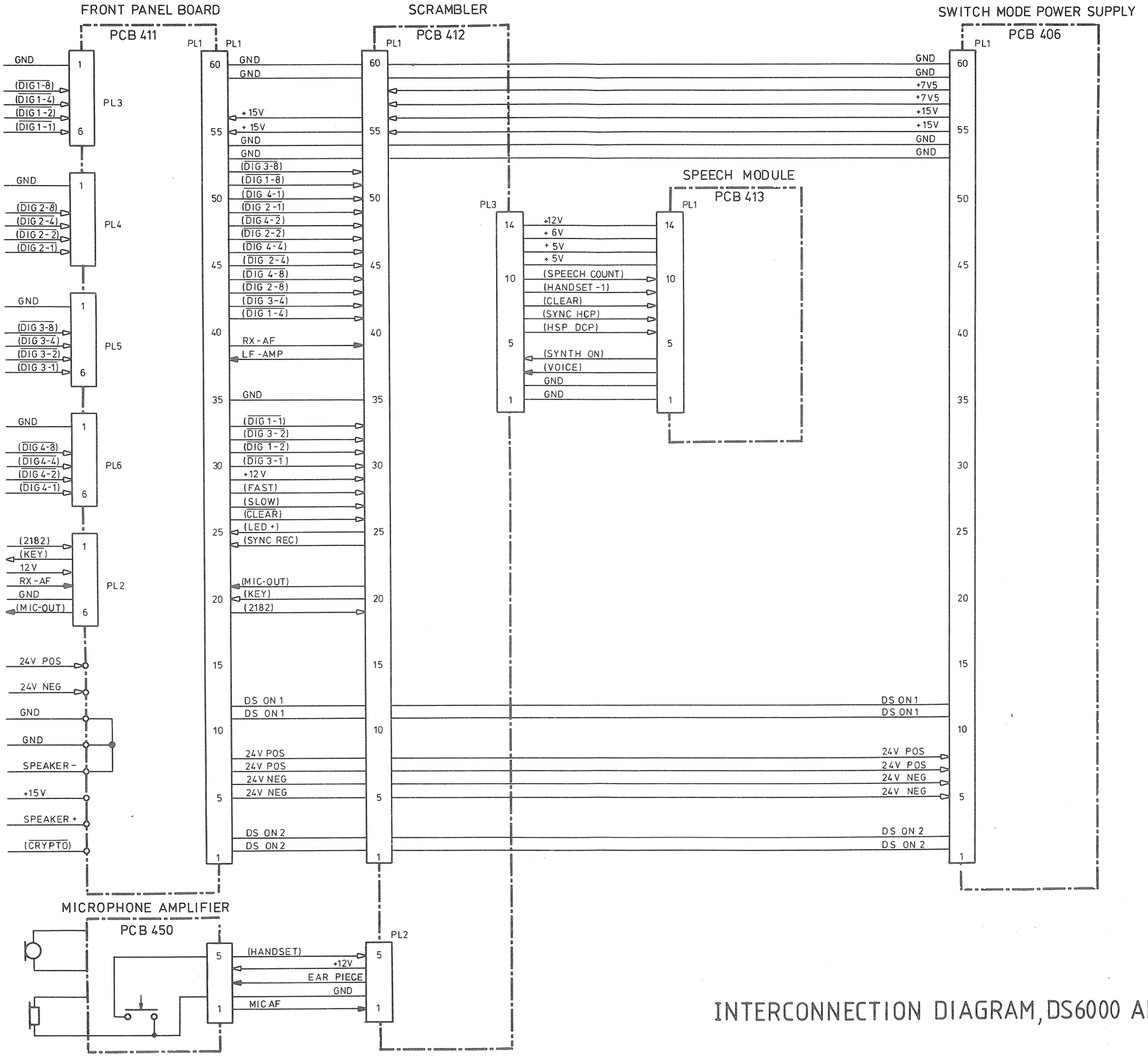
Label	Short for	Meaning
J, K	Data	input to J-K flip-flop
K_x	Mode Select	selects counting mode for programmable counter
LE	Latch Enable	updates latching register
LT	Lamp Test	Activates all outputs on BCD-to-7 segment decoder
MR	Master Reset	input for initializing MPU or clearing programmable registers in peripheral circuit
MRDY	Memory Ready	hand-shake flag to MPU indicating new bus cycle may be started
NMI	Non-maskable Interrupt	flag to MPU, which cannot be masked softwarewise indicating interrupt detected
O_x	Output	output from combinatorical circuit
P_xY	Data (bidirectional)	input to programmable counter or programmable bidirectional signal to/from peripheral
PE	Parallel Enable	loads P_x data into programmable counter
Q_x	Output	output from sequential circuit
R	Reset	forces flip-flop(s) to LOW state
RBI	Ripple Blank Input	deactivates BCD-to-7 segment decoder (blanks connected display) if data correspond to leading zero, when decoders are cascaded.
RS_x	Register Select	addresses programmable registers in peripheral circuit
S	Set	forces flip-flop(s) to HIGH state
S_y	Select Data	selects data path through multiplexer

Table 9.1 (continued)

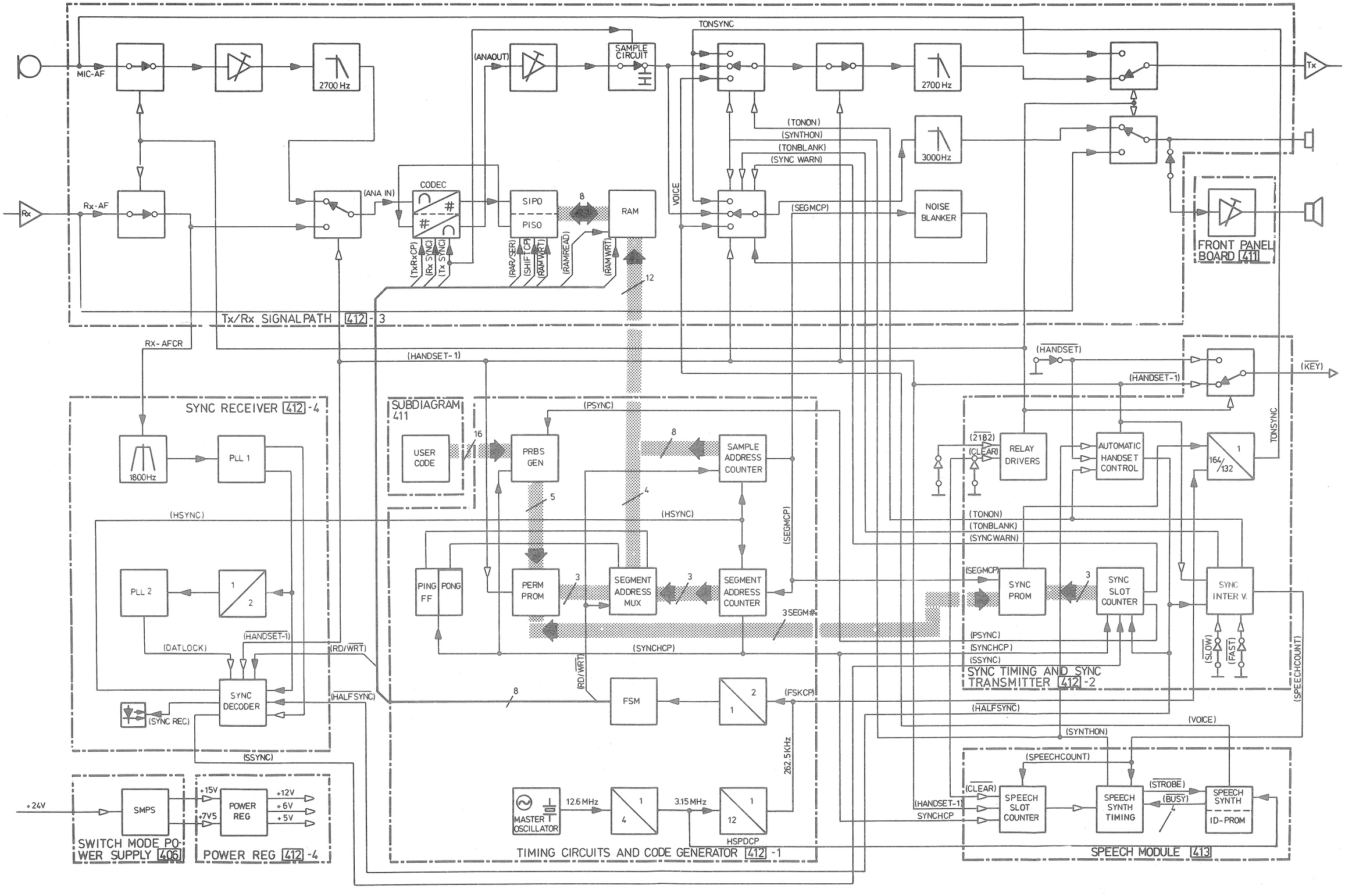
Label	Short for	Meaning
SYNC	Synchronize	issued from bus master (MPU) to synchronize data transfer
TC	Terminate Count	output from counter indicating new cycle started (corresponds to carry or borrow depending on counting direction)
U/D	UP/Down	selects counting direction
VMA	Valid Memory Address	issued from bus master (MPU) to indicate stable address bus
WI	Write Input	input to bus slave to make it accept data from master
WQ	Write Output	output from bus master (MPU) when it is a data source.

(1) "x" is a numerical index (zero origin indexing) corresponding to bit position

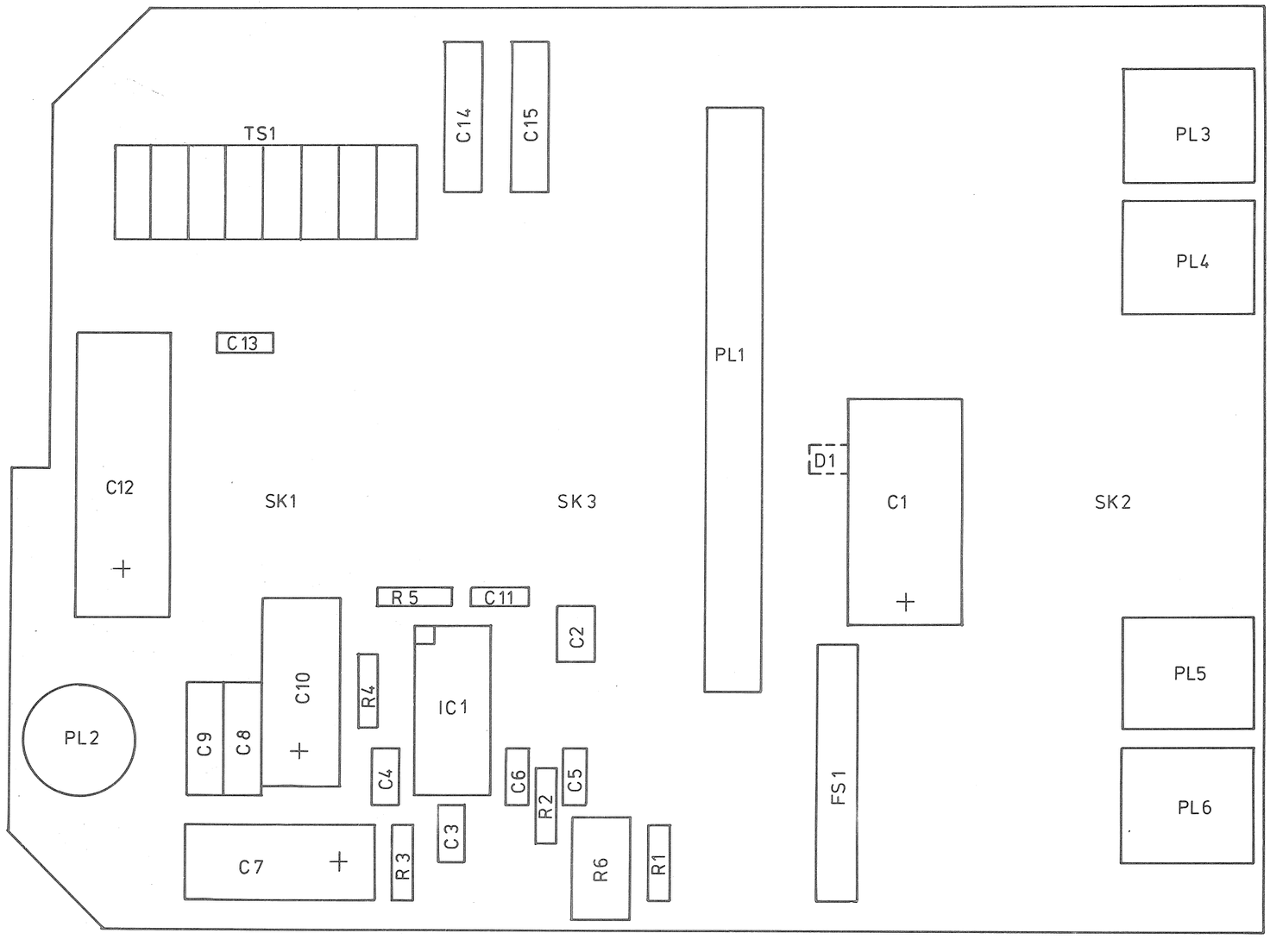
(2) "y" is an alphabetical index used for multiple ports.



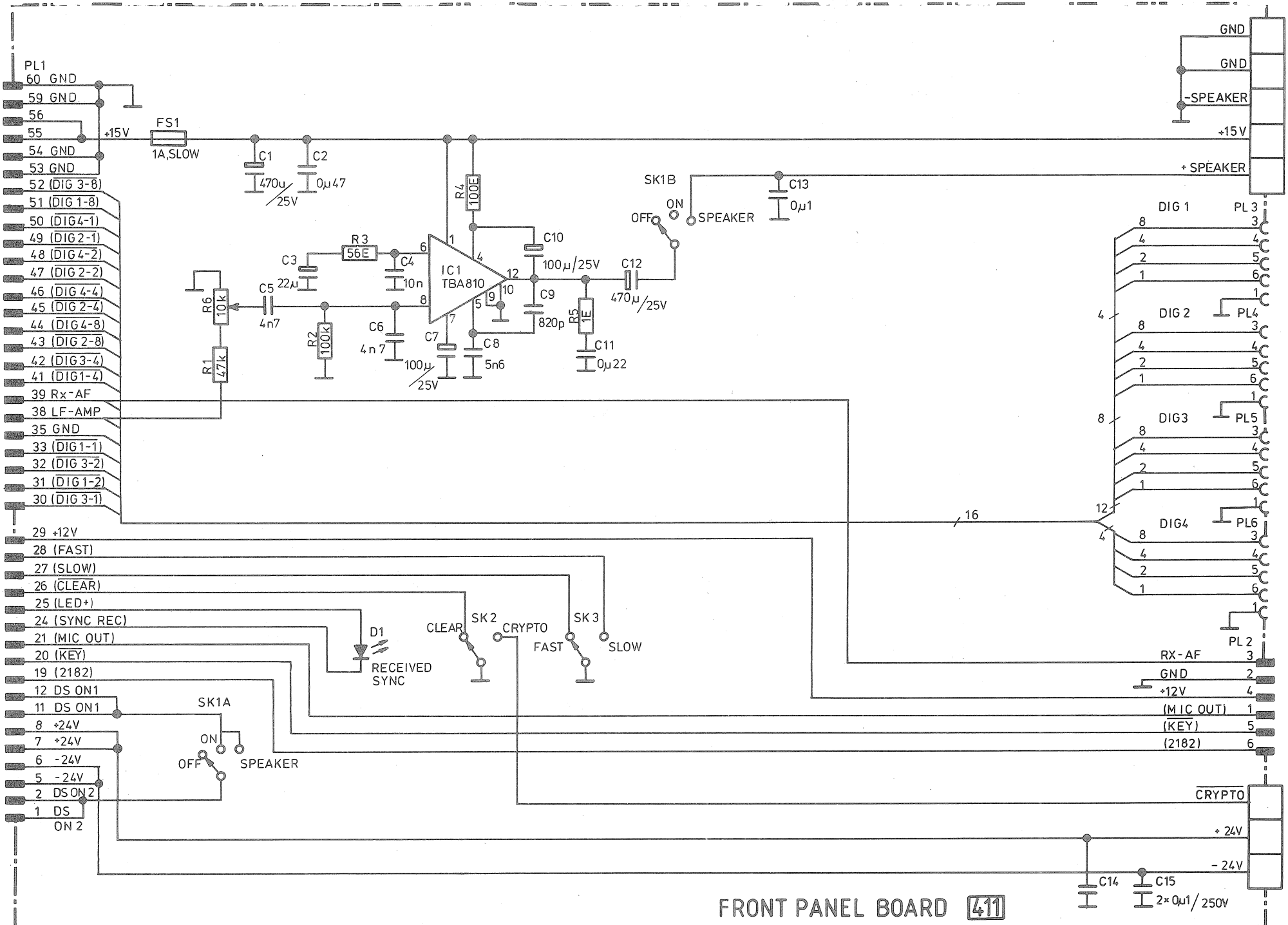
INTERCONNECTION DIAGRAM, DS6000 AND 6001 Version 1A



BLOCKDIAGRAM DS6000 AND 6001 Version 1A

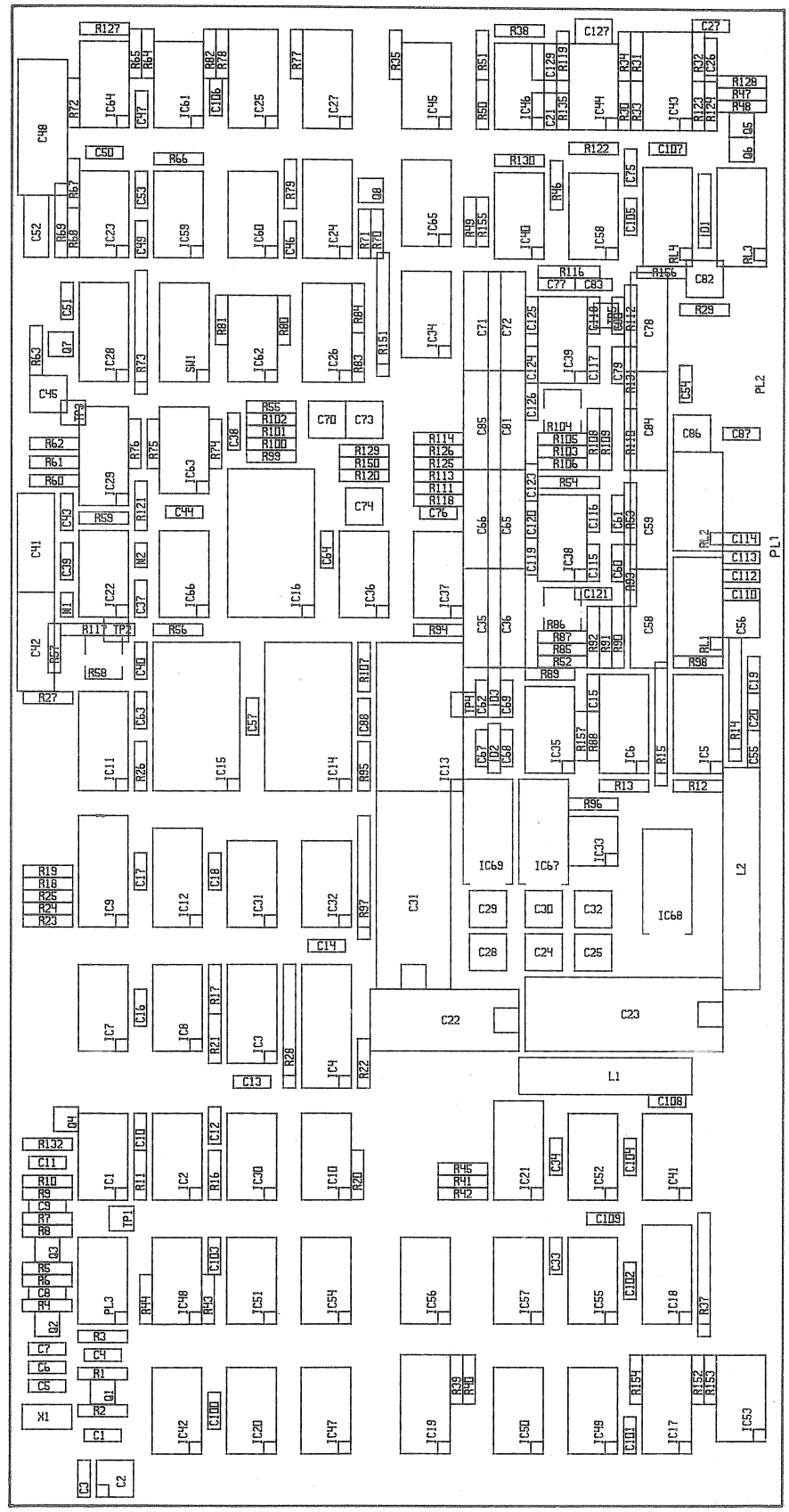


FRONT PANEL BOARD 411
ASSEMBLY DRAWING Version 1A



FRONT PANEL BOARD 411

CIRCUIT DIAGRAM Version 1A



SCRAMBLER 412
ASSEMBLY DRAWING Version 2A

MASTER OSCILLATOR

DIVIDERS

FSM

CODE GENERATOR

+5V

Q2 BF240

Q1 BF240

Q3 BF240

Q4 BF240

X1 12,6MHz

C1 0µ1

C2 2-22p

C3 22p

C4 10n

C5 180p

C6 330p

C7 0µ1

C8 10n

C9 10n

C10 0µ1

C11 0µ1

C12 0µ1

C13 0µ1

C14 0µ1

C16 0µ1

R1 10k

R2 10k

R3 10k

R4 1k

R5 10k

R6 3k9

R7 470E

R8 150E

R9 3k9

R10 330E

R11 1k

R16 100E

R17 100E

R21 470E

R22 100E

TP1

12,611MHz

3,151MHz

262,5KHz

131,25KHz

IC1 74LS93 COUNT

IC2 74LS92 COUNT

IC8 74LS93 COUNT

IC3 18SA030 PROM

IC4 74LS273 REG

R28 8×2K2

R14 8×12k

R15 8×12k

PL1-44 (DIG 4-8)
PL1-46 (DIG 4-4)
PL1-48 (DIG 4-2)
PL1-50 (DIG 4-1)
PL1-52 (DIG 3-8)
PL1-42 (DIG 3-4)
PL1-32 (DIG 3-2)
PL1-30 (DIG 3-1)

PL1-43 (DIG 2-8)
PL1-45 (DIG 2-4)
PL1-47 (DIG 2-2)
PL1-49 (DIG 2-1)
PL1-51 (DIG 1-8)
PL1-44 (DIG 1-4)
PL1-31 (DIG 1-2)
PL1-33 (DIG 1-1)

(MSPOCP) PL3-6
(FSKCP) 412-2

(RAMREAD) 412-3
(R×SYNC) 412-3
(PAR/SER) 412-3
(RD/WRT) 412-6
(RAMWRT) 412-3
(SHIFTCP) 412-3
(T×SYNC) 412-3
(T×R×CP) 412-3

(SEGMCP) 412-2 412-3
(RAMA0-7) 412-3
(RAMCS) 412-3
3 (RAMA8-10) 412-3
3 (SEGM #) 412-2
(SYNCHCP) 412-2
(SYNC HCP) PL3-7

412-3 (HANDSET-1)
412-2 (PSYNC)
412-4 (H SYNC)

IC31 74C04

16

TIMING CIRCUITS AND CODE GENERATOR 412-1
CIRCUIT DIAGRAM Version 2A

AUTOMATIC HANDSET CONTROL

RELAY DRIVERS

SYNC SLOT COUNTER

DIVIDER

SYNC INTERVAL

PL4-19 (2182)

PL4-25 (CLEAR)

PL3-4 (SYNTH ON)

PL2-5 (HANDSET)

412-1 (FSKCP)

412-1 (SYNCHCP)

412-4 (SSYNC)

412-1 (SEGM #)

412-1 (SEGMCP)

PL1-27 (SLOW)

(FAST)

PL1-28

(HANDSET-1) PL3-9

(HANDSET-1) 412-1 412-3 412-4

(CLEAR) PL3-8

(SYNCWARN) 412-3

(TONON) 412-3

(HALFSYNC) 412-4

(SPCOUNT) PL3-10

(TONBLANK) 412-3

(TONSYNC) 412-3

(PSYNCH) 412-1

2000/1600

SYNC TIMING AND SYNC TRANSMITTER 412-2

CIRCUIT DIAGRAM Version 2A

412-1 (SEGMCP)

PL2-1 (MIC-AF) C54 0µ1 — C89 10n — RL1 — R85 6K8 — +6V — IC38 LM348

MICROPHONE PCM FILTER

C59 5n6 — C66 680p — C58 820p — C60 0µ1 — +12V — C61 0µ1 — R90 27K4 — R91 27K4 — C116 1n — C115 1n — R87 6K8 — R86 10K — C121 10n — R92 95K3 — R93 95K3 — C65 560p — C120 1n — IC38 LM348 — C123 10n

TRANSMIT PCM FILTER

C72 5n6 — C84 680p — R108 27K4 — R109 27K4 — C117 1n — C71 680p — IC39 LM348 — R110 95K3 — R131 95K3 — C118 1n — C85 560p — TP5 — C86 0µ47 — C83 10n — R106 6K8

PL1-39 (Rx-AF) C55 10n — RL1 — C56 1µ — R88 12K — R89 12K — R157 1K — D2 — D3 2x 1N4448 — R98 470R — IC35 4066

IC36 4066 — R150 12K — +6V

RL2 831C-4 — 7/8 (MIC-OUT) PL1-21

(Rx-AFC) 412-4

EARPIECE PCM FILTER

C81 1n8 — R111 15K — R112 40K2 — R116 40K2 — C79 0µ1 — C80 0µ1 — C82 22µ — C78 910p — C185 1n — R113 10K — C77 10n — IC39 LM348

RL3 831C-4 — 7/8 (EARPIECE) PL2-3 — (LF-AMP) PL1-38

412-2 (TONBLANK)

412-2 (HANDSET-1) — IC32 74C906 — R97 12K — IC31 74C04 — IC32 74C906 — R97 12K

412-1 (T×RxCP) — IC32 74C906

412-1 (R×SYNC)

412-1 (T×SYNC) — R92 12K — R97 12K — R97 12K — R92 12K — IC32 74C906

IC13 14404 CODEC — C62 0µ22 — C88 0µ1 — TP10 — R95 27K — R94 3K3 — IC33 1403 VSTAB — R96 33K — C67 2n2 — C68 2n2 — C69 3n9 — R103 3K3 — R107 47K — C70 0µ47

SAMPLE CIRCUIT

IC39 LM348 — R105 3K3 — C124 1n — R104 10K — C126 10n — C73 6µ8 — R118 12K — IC42 74C02 — IC34 74C906 — R115 12K — IC36 4066

R114 12K — IC37 4066 — C76 47n — IC37 4066

IC41 74C10 — IC31 74C04 — R151 12K — IC34 74C906

NOICE BLANKER

IC43 74C221 — +5V — R122 18K — C75 0µ22 — C107 0µ1 — R124 47K — R123 47K

IC36 4066 — R129 47K — IC34 74C906 — R151 12K — R130 47K — R120 12K — R125 15K — C74 0µ47

RAM — IC14 2016P — C57 0µ1 — +5V

RAM — IC15 2016P — C63 0µ1

IC31 74C04

PISO/SIPO — IC16 4034 — C64 0µ1 — R101 47K — R102 47K

IC37 4066 — IC40 74C08 — IC34 74C906 — R151 12K

R99 15K — R100 12K

412-2 (TONSYNC)

412-2 (TONON)

PL3-4 (SYNTHON)

412-2 (SYNCWARN)

PL3-3 (VOICE)

412-1 (RAMCS)

412-1 (RAM A8-10) / 3

412-1 (RAM A0-7) / 8

412-1 (RAMWRT)

412-1 (RAMREAD)

412-1 (SHFTCP)

412-1 (PAR/SER)

Tx/Rx SIGNAL PATH 412-3
CIRCUIT DIAGRAM Version 2A

412-C (HALFSYNC)

412-2 (HANDSET-1)

412-3 (RX-AFCA)

SYNC RECEIVER

412-1 (RD/WAT)

PL1-29 (+12V)

PL1-55

PL1-56

PL1-57

PL1-58

PL1-53

PL1-54

PL1-35

PL1-59

PL1-60

IC64 4013

IC65 74C04

IC58 74C00

IC58 74C00

+5V

(LED+) PL1-25

(HSYNC) 412-1

(SSYNC) 412-2

R70 330Ω (SYNC REC) PL1-24

R71 15k

Q8 BC547B

R72 47k

POWER REG.

PL2-4

IC67 7812C

IC68 7805C

IC69 7806C

L1 100µ/1A

L2 25µ/3A

C22 100µ/25V

C24 0µ47

C23 220µ/25V

C25 0µ47

C28 0µ47

C29 47µ/25V

C30 47µ/25V

C31 220µ/25V

C32 47µ/25V

+12V PL3-14

+6V PL3-13

+5V PL3-12

PL3-11

PL2-2

PL3-2

C110 0µ1

C112 0µ1

C113 0µ1

C114 0µ1

PL1-1,2

PL1-5,6

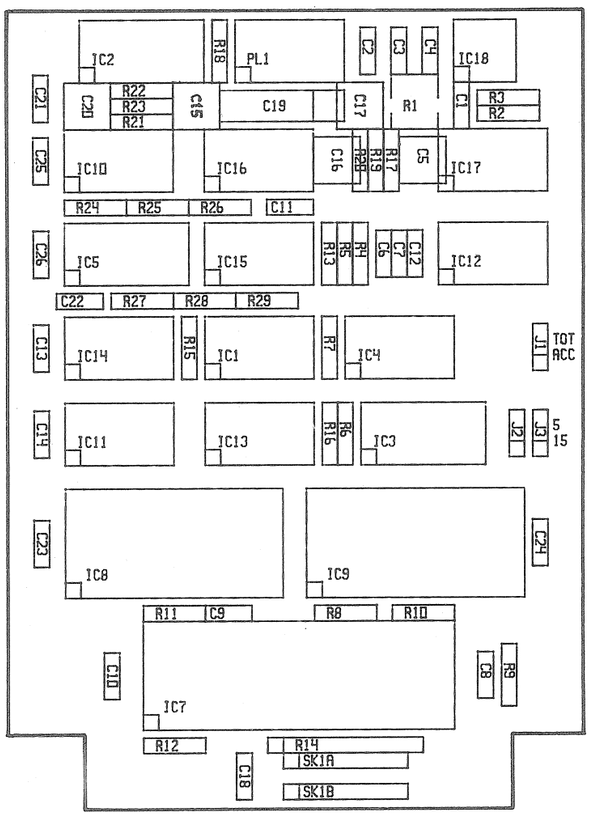
PL1-7,8

PL1-11,12

SYNC RECEIVER 412-4

POWER REG 412-4

CIRCUIT DIAGRAM Version 2A



SPEECH MODULE 413
ASSEMBLY DRAWING Version 1A

SPEECH SLOT COUNTER

SPEECH SYNTH TIMING

ID - PROM

SPEECH SYNTH

PL1-10 (SPEECH COUNT)

PL1-14 +12V

PL1-13 +6V

PL1-12 +5V

PL1-11

PL1-8 (CRYPTO/CLEAR)

PL1-9 (HANDSET-1)

PL1-7 (SYNCHCP)

PL1-6 (HSPDCP) 3.15 MHz

PL1-2

PL1-1

(SYNTH ON) PL1-4

(VOICE) PL1-3

IC 1 74C93 COUNT

IC 2 74C221

IC 3 4520 DUAL COUNT

IC 4 74C93 COUNT

IC 5 74C221

IC 6 18SA030 PROM

IC 7 PIC1650A-170

IC 8 2764

IC 9 SP 0250

IC 10 74C08

IC 11 74C08

IC 12 74C04

IC 13 74C04

IC 14 74C02

IC 15 4070

IC 16 4093

IC 17 74C00

IC 18 LM 301

R1 47k

R2 1k

R3 3k3

R4 33k

R5 33k

R6 4k7

R7 47k

R8 47k

R9 47k

R10 100k

R11 18k

R12 220E

R13 10k

R14 8x4k7

R15 47k

R16 47k

R17 2k7

R18 27k

R19 4k7

R20 100k

R21 100k

R22 47k

R23 47k

R24 22k

R25 47k

R26 47k

R27 10k

R28 47k

R29 47k

C1 33p

C2 0µ1

C3 0µ1

C4 0µ1

C5 6µ8

C6 1n

C7 10n

C8 0µ1

C9 47p

C10 0µ1

C11 47n

C12 150p

C13 0µ1

C14 0µ1

C15 6µ8

C16 2µ2

C17 6µ8

C18 0µ1

C19 10µ/25V

C20 6µ8

C21 22n

C22 22n

C23 0µ1

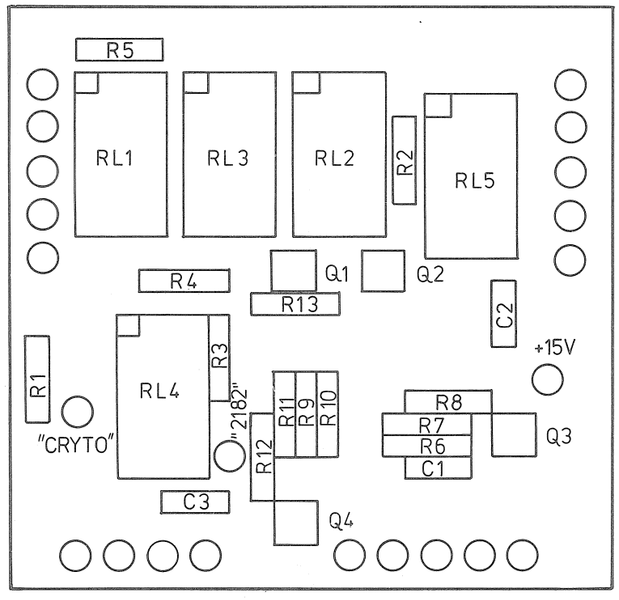
C24 0µ1

C25-C26 0µ1

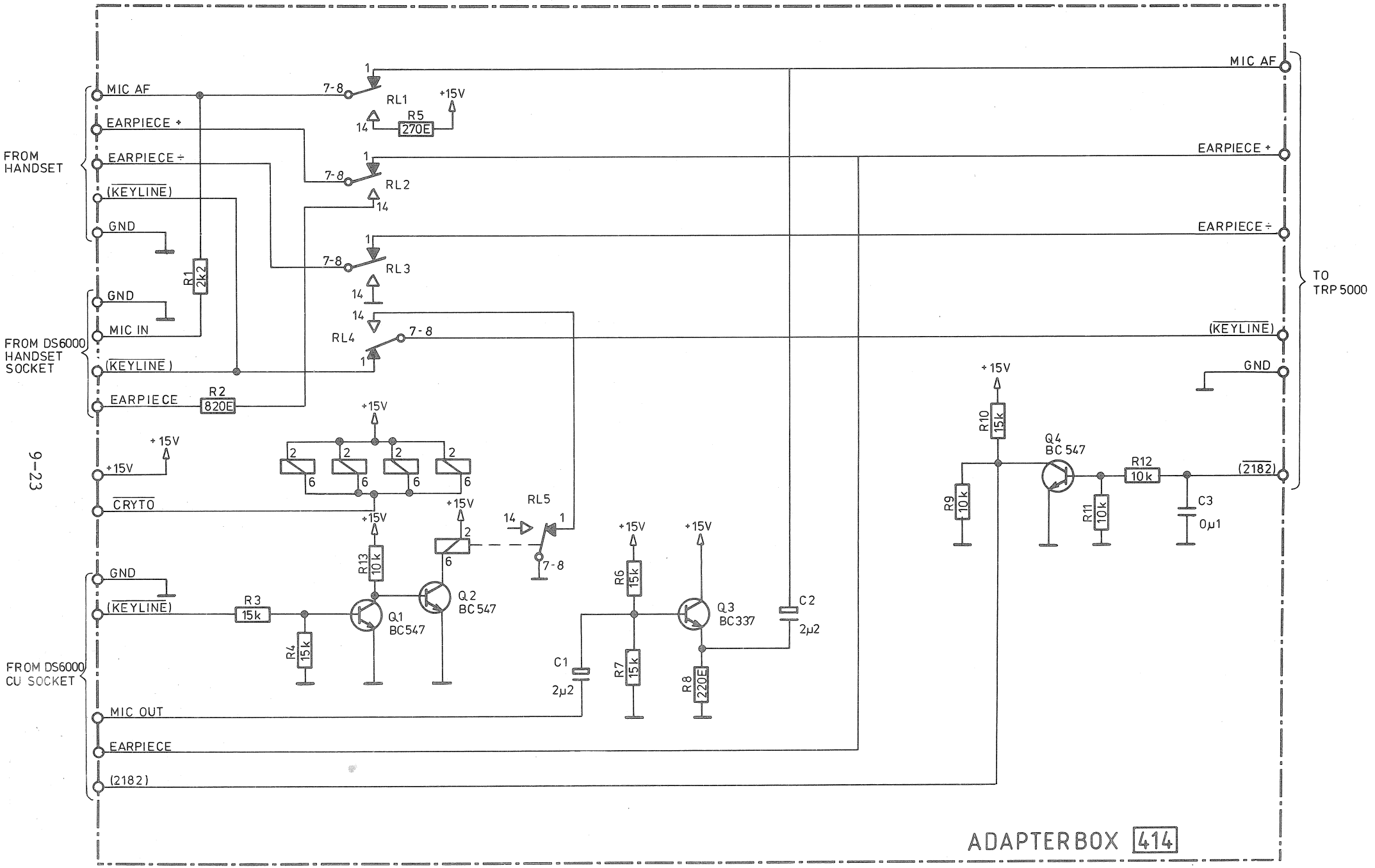
ACC TOT

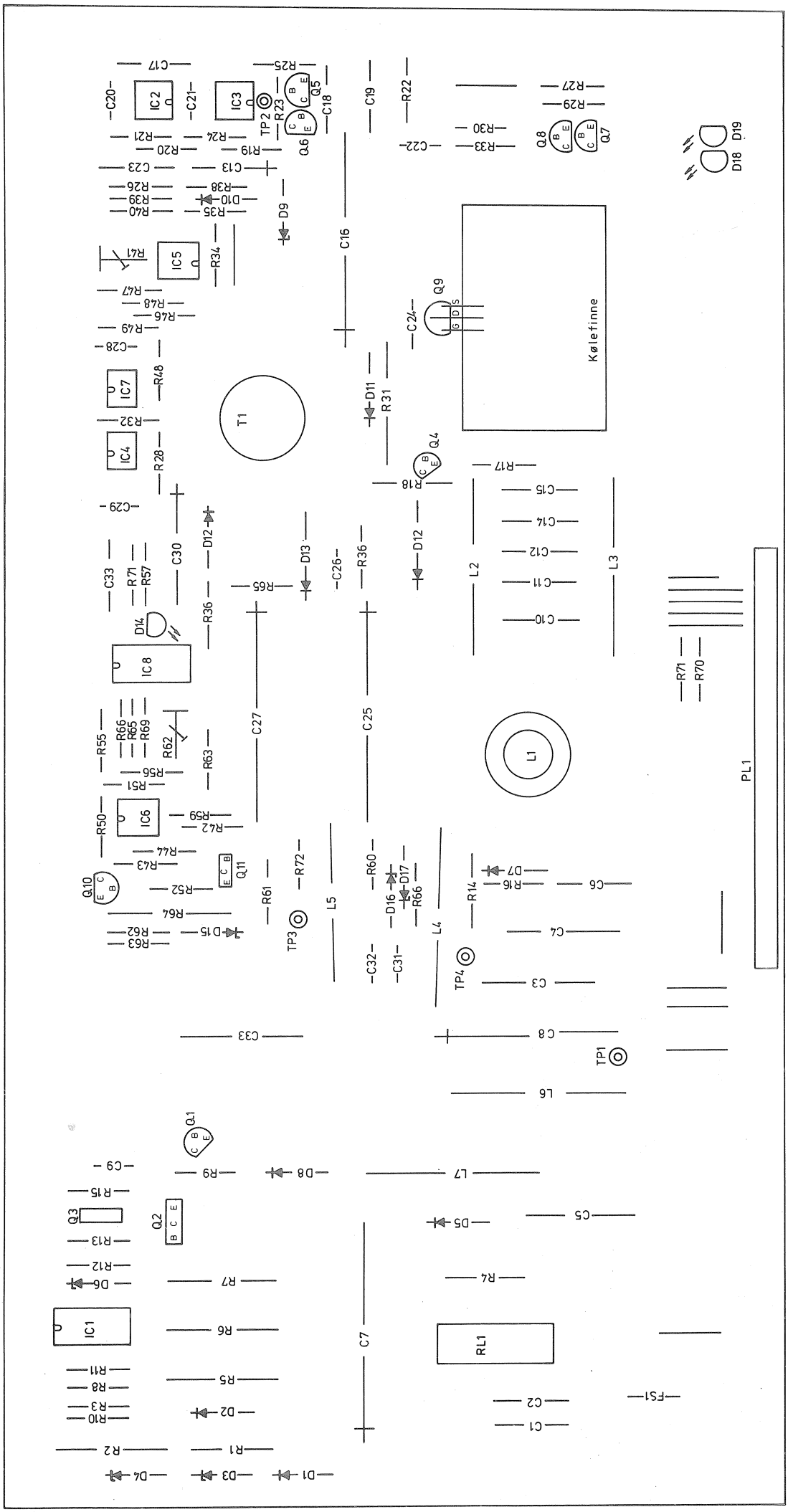
SPEECH MODULE 413

CIRCUIT DIAGRAM Version 1A



ADAPTERBOX 414
ASSEMBLY DRAWING Version 1A


MIC AF
EARPIECE +
EARPIECE ÷
(KEYLINE)
GND
GND
MIC IN
(KEYLINE)
EARPIECE
FROM HANDSET
FROM DS6000 HANDSET SOCKET
FROM DS6000 CU SOCKET
R1 2k2
R2 820E
RL1
RL2
RL3
RL4
RL5
R5 270E
+15V
7-8
CRYTO
R3 15k
R4 15k
R6 15k
R7 15k
R8 220E
R9 10k
R10 15k
R11 10k
R12 10k
R13 10k
C1 2µ2
C2 2µ2
C3 0µ1
Q1 BC547
Q2 BC547
Q3 BC337
Q4 BC 547
MIC OUT
EARPIECE
(2182)
TO TRP 5000
ADAPTERBOX 414
CIRCUIT DIAGRAM Version 1A


SWITCH MODE POWER SUPPLY 406
ASSEMBLY DRAWING Version 2A
Kølefinne
T1
L1
L2
L3
L4
L5
L6
L7
PL1
RL1
IC1
IC2
IC3
IC4
IC5
IC6
IC7
IC8
TP1
TP2
TP3
TP4
FS1

CONVERTER DRIVER

TRANSFORMER

OVERCURRENT SENSOR'S

PL1-7 +24V
PL1-8 +24V
FS1 3,15A
R4 2k7
C1 0µ1
C2 0µ1
C3 1µ
C4 1µ
C5 1µ
D5 BZY93 C39V
C6 1µ
C7 2200µ
C8 220µ
L1 6,8 mH
6,8 mH
C10 1µ
L2 25µH
C11 0µ1
C12 0µ1
L3 25µH
C14 0µ1
C15 0µ1
C16 2200µ
C18 470p
R23 6k8
Q5 BC557B
Q6 BC547B
C19 910p
R19 15k
R22 5k6
Q7 BC547B
Q8 BC327
R27 2k2
C22 22n
D10 1N4148
D11 BYV27/200
R31 100E
C24 22n
Q9 BU220
R29 47E
R30 0E08
R33 56E
T1
D12 BYW72
C25 2200µ
D13 VSK330
C26 10n
R36 68E
C27 2200µ
R37 22E
R72 0E1
D20 1S920
R43 1M
R51 1M
R42 39k
R50 1k2
IC6 LM2903
R59 27k
R60 0E1
R44 39k
R56 27k
L4 25µH
L5 25µH
L6 25µH
L7 25µH
TP4
TP3
+15V
PL1-55
+15V
PL1-56
R66 82E
C31 0µ47
R70 820E
D18 TIL220 RED
D16 2×BZY79 C9V1
D17
+7V5
PL1-57
+7V5
PL1-58
C32 0µ47
C33 100µ
R71 680E
D19 MV5353 YELLOW
R61 33E
Q11 BD135
R62 100E
D15 BZX79 C9V1
Q10 BC547B
R52 1k
R63 330E
R64 3E3
OUTPUT VOLTAGE
R65 100E
R67 100E
R69 390E
R68 1k
VOLTAGE REFERENCE ERROR AMPLIFIER
C30 100µ
D14 RED TIL220
C29 0µ47
IC8 723
IC7 CNY17
R48 3k3
R53 1k5
R55 22k
R57 100k
R58 1k
C34 1n
GND PL1-53
GND PL1-54
GND PL1-59
GND PL1-60

PL1-11
PL1-12
DS ON2
RL1
D2 10D2
R1 150E
D1 10D4
PL1-1
PL1-2
DS ON1
D3 10D4
R2 47k
R5 56k
R6 56k
R7 56k
Q2 BD158
Q1 BC547B
R9 56E
R10 180k
R11 10k
IC1 723
N1
V REF
VCC
VOLTAGE REGULATOR
INV
GND
TP1
D6 BZX79C 12V
R8 680E
R3 12k
D4 BZX79B 8V2
R12 1k5
Q3 BD158
R13 4k7
R15 100E
C9 0µ1
R14 5k6
D8 1N4148
D7 BZX79C 12V
R17 1k
R16 390E
R18 470E
Q4 BC327
C13 22µ
D9 BZX79 C9V1
R25 4k7
TP2

20 kHz OSCILATOR

PULSE WIDTH MODULATOR

PEAK CURRENT (ERROR MODE)

R20 47k
IC2 555
RESET VCC
DISCHARGE
TRESH
TRIGGER
OUT
GND CONT.
R21 1k
C17 1n
C20 10n
R24 33k
IC3 555
TIMER
C21 10n
R26 5k6
C23 750p
R28 1k
R32 4k7
IC4 CNY17
R34 10k
IC5 LM2903
R35 1M
R38 27k
R40 390E
R41 1k
IC5 LM2903
R45 1M
R46 22k
R47 22k
R49 10k
C28 10n
R54 4k7
R39 1k5

SWITCH MODE POWER SUPPLY 406

CIRCUIT DIAGRAM Version 2A