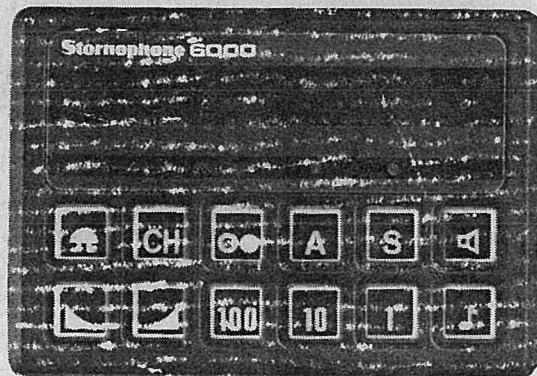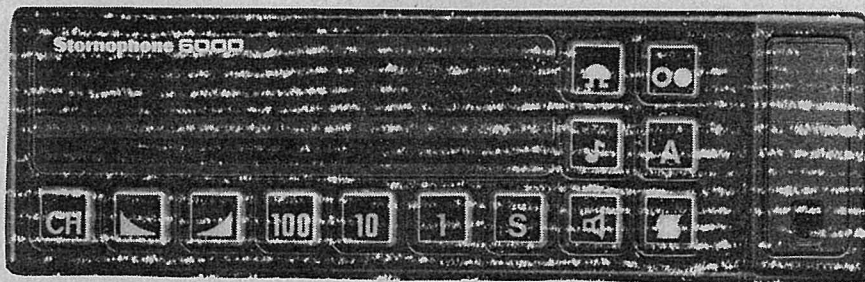# NEW

HIGH & LOW COMPLEXITY
CONTROL BOXES

STORNOPHONE 6000

Sales Release Letter

Re: **New comprehensive IP54 control box for CQM6000**

Because of the market demand for a comprehensive control box which was resistent to water and dust penetration up to the IP54 recommendation (DIN 40050-IP54) a development project was initiated. This control box is now ready for production and accordingly sales released.

Like the other Storno control boxes this one is described and ordered via a combination number:

CB6201AL

DR____ Installation type: L=integrated, R=separate
E
F
G
N
S_____ Market identifier

D Connector facility
 O - None
 Y - Present

If a codeplug (CS6005 for this control box) is desired, please remember to order the **DY** structured option.

The possible CB6201 configurations are shown overleaf.

The new hardware configurations which hereby become available will be thoroughly accounted for in the next update of the Stornophone 6000 Sales Manual.

Installation with comprehensive IP54 CB

Integrated installation:

CB6201 is attached to the radio unit in exactly the same way as the non-IP54 panel control box CB6001. Accordingly, the same cable kits are still used for this configuration (see Stornophone 6000 Sales Manual, chapter 3).

Support for tranceiver as well as loudspeaker & microphone and other accessories are to be specified as usual, according to customer wishes.
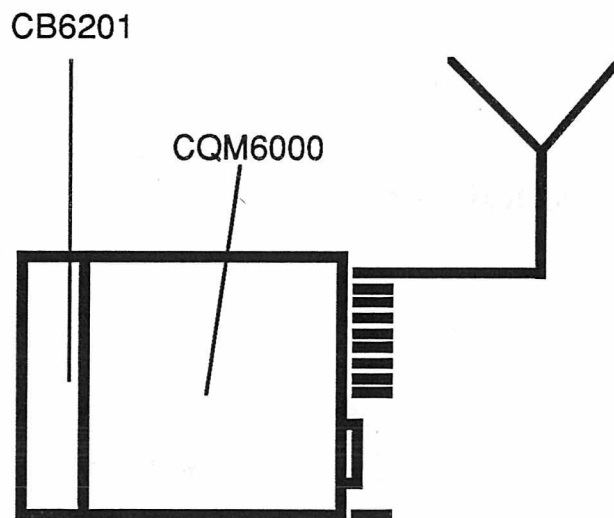
Separate installation:

Here the CB6201 must always be placed in the MN6013 housing kit. MN6013 complies with IP54 and has limited junction box facilities, thus providing connections for microphone, loudspeaker and PTT switch (or a handset) as well as for
emergency switch, ignition switch and horn relay. This gives the following configuration (seen cross-sectional from the side):

MN6013 _____   ____ CB6201

Mic., PTT or
handset, emergency sw.
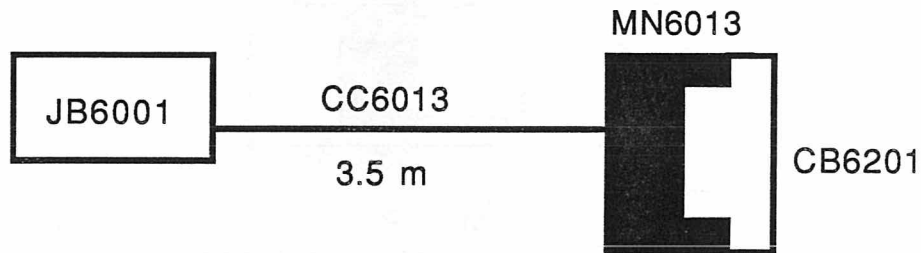Loudspeaker
Ignition switch, horn relay
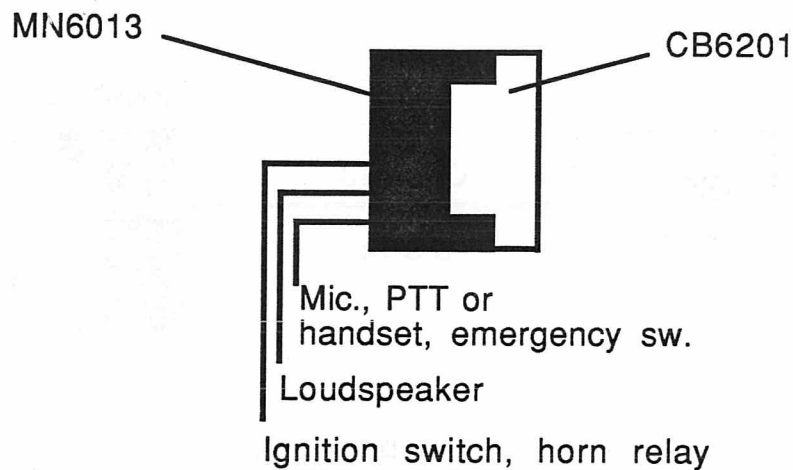
If these limited junction box facilities are sufficient, connections to the radio unit and vehicle battery are always made by either the cable kit CC6001 or CC6010 (see chapter 4 in Stornophone 6000 Sales Handbook).

CB6201

6/3 m

Radio unit

CC6001/6010

6/6 m

MN6013

Vehicle Battery
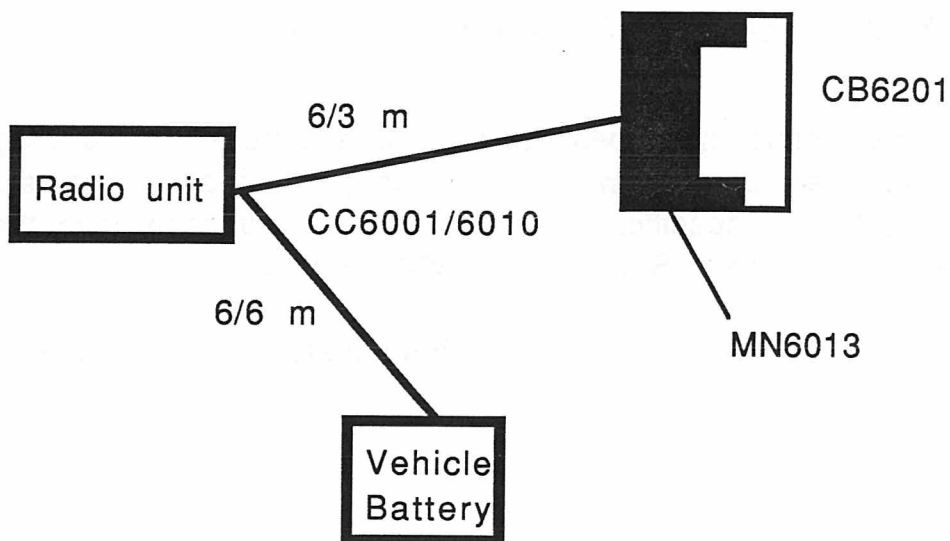
Please remember that if you want to use the radio in a cassette then you must order either MN6008 or MN6009 (see Sales Information lette of 26 January 1988). Alternatively, the radio may be placed either in free-mount casing MN6003 or on the clipboard MN6007.

If you need the full range of junction box facilities, JB6001 must be ordered. MN6013 is then connected to JB6001 via the cable CC6013. The connections between JB, power source and radio unit may then be established in any of the ways shown in chapter 3 of the Stornophone 6000 Sales Manual.

```
                                          MN6013
 ┌─────────┐    CC6013         ┌──────┐
 │ JB6001  │───────────────────│      │ CB6201
 └─────────┘    3.5 m          └──────┘
```

Some new items, which cannot be found neither in the Stornophone 6000 Sales Handbook nor in the ITP price list, have been stated on the previous pages.These items have the following part numbers:

K805892G1 CC6013   **Cable**
L856090G1 MN6013   **Housing for CB6201**
L856098G1 CS6005   **Code plug for service mode**
L856098G2 CS6005   **Code plug for general use**

As the new control box does not add more features to the programme, apart from the increased water resistence, it has been decided not to make a brochure specifically for this box, but to show it in the next update of the general Stornophone 6000 brochure.

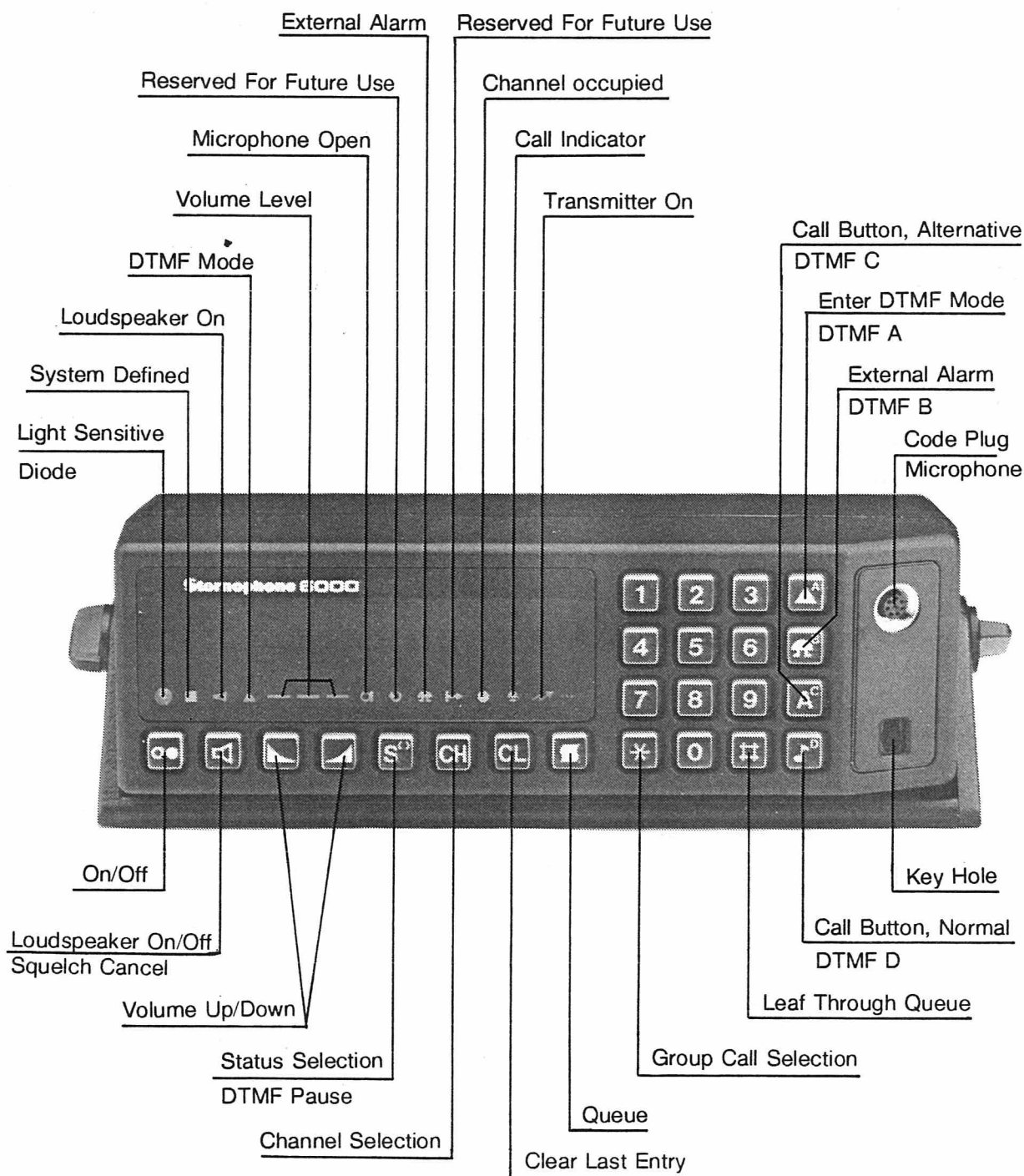Black and white pictures, showing both installation types, are enclosed.

CONTROL BOX CB6201

PRESENTATION

The CB6201 is a control head with an H-bus serial interface. It has a 16 character alphanumeric Vacuum Flourescent Display, a 24 button keypad, 14 LED indicators, a code plug socket or microphone connector, and a lock on the front plate.

The waterproof control box is always delivered with a 3.5 m long cable comprising connector for junction box when remote control has been ordered.

Up to 22 digits may be entered/stored. This is needed when making a call direct to a local telephone number in another country. However, only the last 16 digits appear on the display.

External Alarm
Reserved For Future Use
Reserved For Future Use
Channel occupied
Microphone Open
Call Indicator
Volume Level
Transmitter On
DTMF Mode
Call Button, Alternative
DTMF C
Enter DTMF Mode
DTMF A
Loudspeaker On
External Alarm
DTMF B
System Defined
Code Plug
Microphone
Light Sensitive
Diode

On/Off
Key Hole
Loudspeaker On/Off
Squelch Cancel
Call Button, Normal
DTMF D
Volume Up/Down
Leaf Through Queue
Status Selection
Group Call Selection
DTMF Pause
Channel Selection
Queue
Clear Last Entry

CL6010

CONTROL LOGIC BOARD

CL6010 consists of a microprocessor which controls all general functions.
The serial communication between the CL and the main controller in the radio part is handled by a H-bus (hybrid bus).
By commands from the keyboard various functions, defined by main software in the radio, can be controlled. Information for the user will be displayed on a 16 position dot-matrix VFD display and 14 symbols light emitting diodes on the front.
It is possible to insert a code plug device where personality information can be stored.
The backlight is controlled by a light sensitive switch.

The CL6010 is on a single PWB which contains the following circuits.

- Microcontroller
- H-bus interface
- VFD driver unit
- Voltage switcher
- Light sensitive switch for back light
- Backlight

- Symbols drive
- On/off-reset circuit
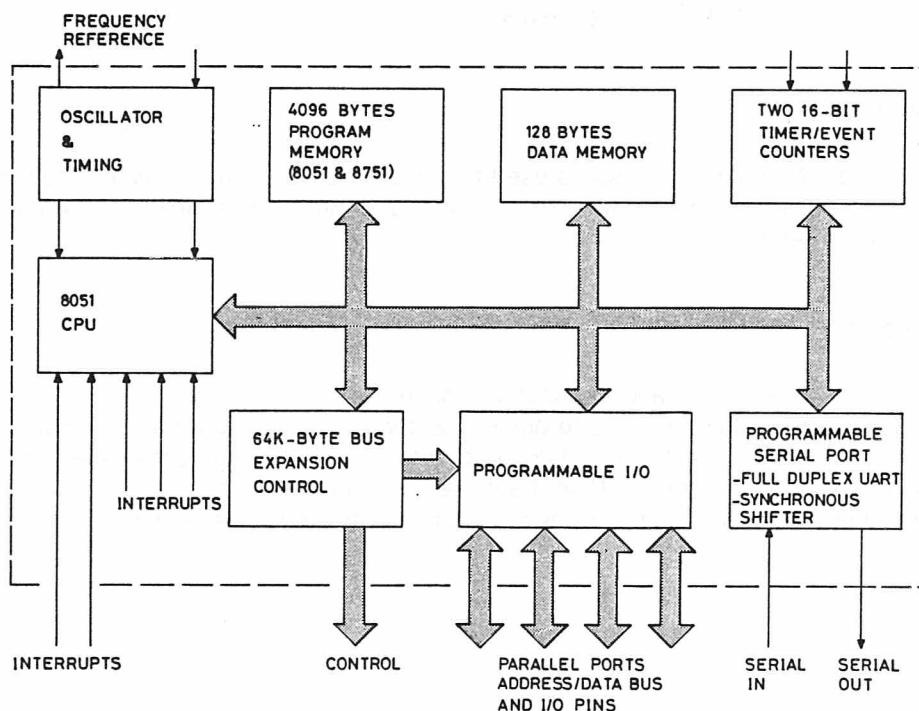- H-bus address designation
- Supply unit
- Connector system.

CIRCUIT DESCRIPTION

MICROCONTROLLER

The central part of the control logic is an 8 bit CMOS microprocessor (80C51) in a 44 lead plastic flat package (U200).
The 8051 contains a non-volatile 4K x 8 read only program memory, a volatile 128 x 8 read/write data memory, 32 I/O lines and on chip oscillator.
The clock frequency of the crystal (Y200) driving the microprocessor is 11.132 MHz.

MICROPROCESSOR PORT CONNECTIONS

Name	Port. pin	Function
	P 0.0	Backlighting disable
	P 0.1	PTT input (low = activated)
	P 0.2	Hook switch input (low = off hook)
	P 0.3	LED indicator C
	P 0.4	LED indicator B
	P 0.5	LED indicator 9
	P 0.6	LED indicator A
	P 0.7	LED indicator 8
	P 1.0	Keypad row input 0
	P 1.1	Keypad row input 1
	P 1.2	Keypad row input 2
	P 1.3	Keypad row input 3
	P 1.4	EEPROM serial clock
	P 1.5	EEPROM serial data
	P 1.6	EEPROM CS (chip select/programming handshake)
	P 1.7	VDF character (grid) serial clock
	P 2.0	LED indicator serial clock
	P 2.1	VDF dot serial clock
	P 2.2	Keypad column output 0
	P 2.3	Keypad column output 1
	P 2.4	Keypad column output 2
	P 2.5	Keypad column output 3
	P 2.6	Keypad column output 4
	P 2.7	Keypad column output 5
RXD	P 3.0	UART receiver data
TXD	P 3.1	UART transmitter data
INT 0	P 3.2	H-bus DIRECTION line
INT 1	P 3.3	H-bus SERVICE REQUEST line
	P 3.4	H-bus tri-state control
	P 3.5	Common serial data output
	P 3.6	Mic. enable
	P 3.7	LS enable

H-BUS INTERFACE

The on-chip UART on the microprocessor is used to handle the serial communication on the H-bus.
The external interface (U201) together with 1 interrupt and 2 control lines including the UART
constitute the H-bus interface.

VFD DRIVER UNIT

The VFD driver unit consists of an anode and a grid drive unit.
An MSC 1162 40 bit anode driver is used to drive a 16 character 5 x 7 dot matrix display in
multiplexed mode. An MSC 1164 20 bit grid driver is used to drive the character select circuitry.
A character is turned on by a logical "1" in the corresponding driver bit.
The input data to the drivers are controlled by the microprocessor in a serial way.

CL6010 CONTROL LOGIC BOARD

VOLTAGE SWITCHER

The purpose of the voltage switcher is to deliver sufficient voltage to the VFD.
It consists of a free-running fly-back switching power supply, which delivers the high voltage (VHV) to the display drivers, and a square wave formed filament voltage to the display.
The power supply can reduce its output voltage as a function of the voltage on the base of transistor Q227, and with a lower output voltage from the switcher the display will reduce its brightness.

LIGHT SENSITIVE SWITCH FOR THE BACKLIGHT

The unit consists of a photo transistor (Q200) and a buffer Q201, which is connected to a Schmitt trigger U200D with a delay preventing flashing in the backlight owing to quick changes in the ambient light. D200 assures a quick backlight on, and a slow backlight off. The following gate U200C is equal to the first and its purpose is to create a well defined shift and to disable the backlight circuit, by putting one of the diodes (D201) to a high level from the microprocessor port.

BACKLIGHT

The backlight consists of 24 miniature LED diodes which are placed under the 24 keyboard buttons.

SYMBOLS DRIVE

The CL board contains 14 LEDs whose functions are to light up the symbols.
The indicators are driven from an MSC 1164 (20 bit driver/shift register) and are turned on by a logic high "1" signal. The 1164 itself is clocked by a low to high transition from the microprocessor.

ON/OFF RESET CIRCUIT

The purpose of the on/off reset circuit is to deliver an on/off pulse to the on/off circuit in the radio part and to reset the microcontroller.
A high pulse from the keyboard switch is regulated by two diodes (D208, D207) to on/off line level (1.2 V). The 1.2 V is going to the on/off circuit on the radio part which turns the +5 V ref. to the CL board on and resets the whole radio. This reset pulse would come back to the CL from the radio and turns the Q222 on which resets the microprocessor. During the time passing between the +5 V power supply goes on and the reset pulse arrives, C226 resets the microprocessor.

H-BUS ADDRESS DESIGNATION

Connecting the anode of D202 to one of the keypad pins (on the microprocessor) with a strap, will determine which of the 11 precoded addresses will be used.
It should be noted that not connecting any strap at all is also an address.

SUPPLY UNIT

The purpose of the supply unit is to create +5 V for the board.
The +13 V line is being filtered by means of L200 and C200. The regulation is done by U201 and an on/off circuit (Q203, Q202). This circuit is controlled by the 5 V reference line.

CONNECTOR SYSTEM

All connections to the CL board are undertaken by 3 connectors. Below is shown a list of the signals available on the connectors.

1) (J100) Connector for the radio (remote or local).

2) (J300) Keyboard connector. A connector where the keyboard foil is inserted

3) (J200) Connector for: 1) Microphone/H-bus
                               2) Microphone/Code-plug
                               3) Monophone (speakermike)

TECHNICAL SPECIFICATIONS

The CL6010 is supplied by two voltages from the radio.

Supply voltage 1
10.8 - 15.6 V DC (13.2 V nom.)

Current drain 1
max. 170 mA (Backlight off)

Supply voltage 2
+5V ±10%

Current drain 2
max. 1.5 mA

Temperature range
Operating -25°C to +60°C
Storage   -40°C to +70°C

H-BUS CONTROL SIGNALS

Maximum input
Lo voltage: (1.0 V)

Minimum input
Hi voltage: (3.2 V)

Maximum outputs
Lo voltage: (0.4 V)

OUTPUTS

On/off signal: J100 pin 7 (active high) pulse
Hi voltage >1.2 V
Lo voltage <0.2 V

Audio select: (active Lo)
Mic. enable J100 pin 13 < 0.2 V
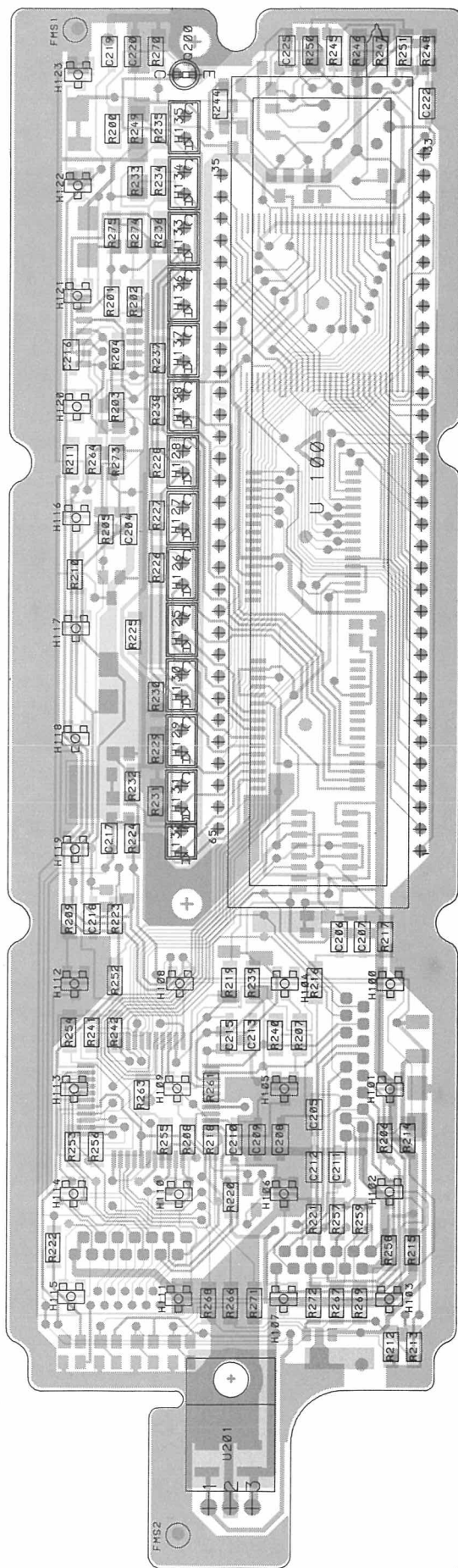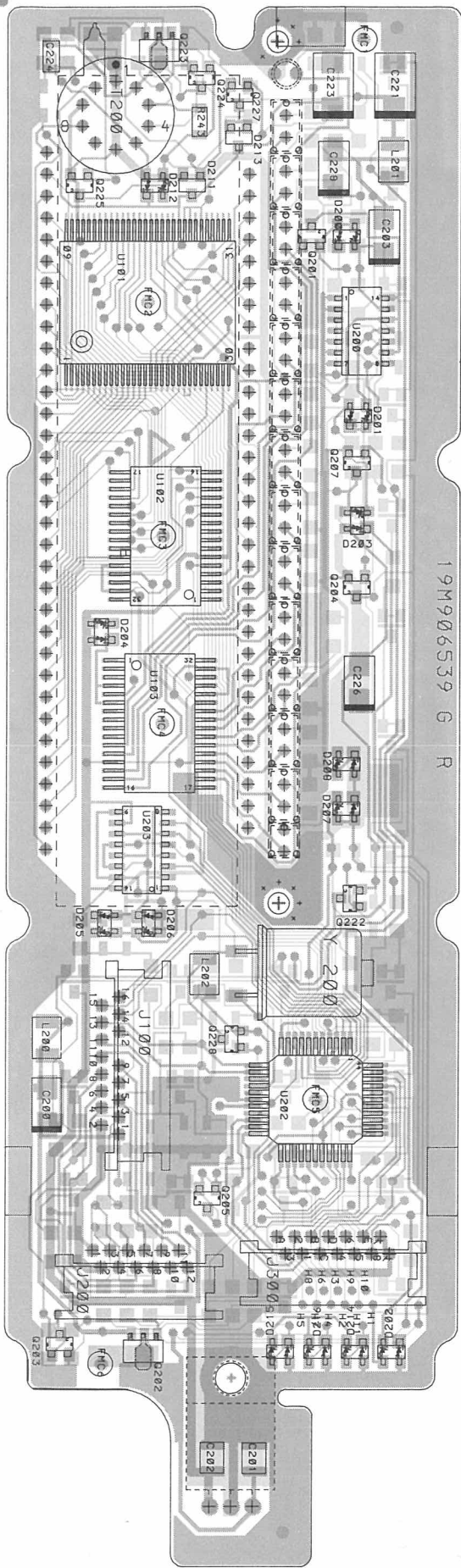LS   enable J100 pin 12 < 0.2 V

INPUTS

J100 pin 14 hook switch and J100 pin 15 PTT are active low inputs. The bounce time for the switches should be less than 9 msec. in order to avoid a multiple of on/off telegrams generated from a single activation.
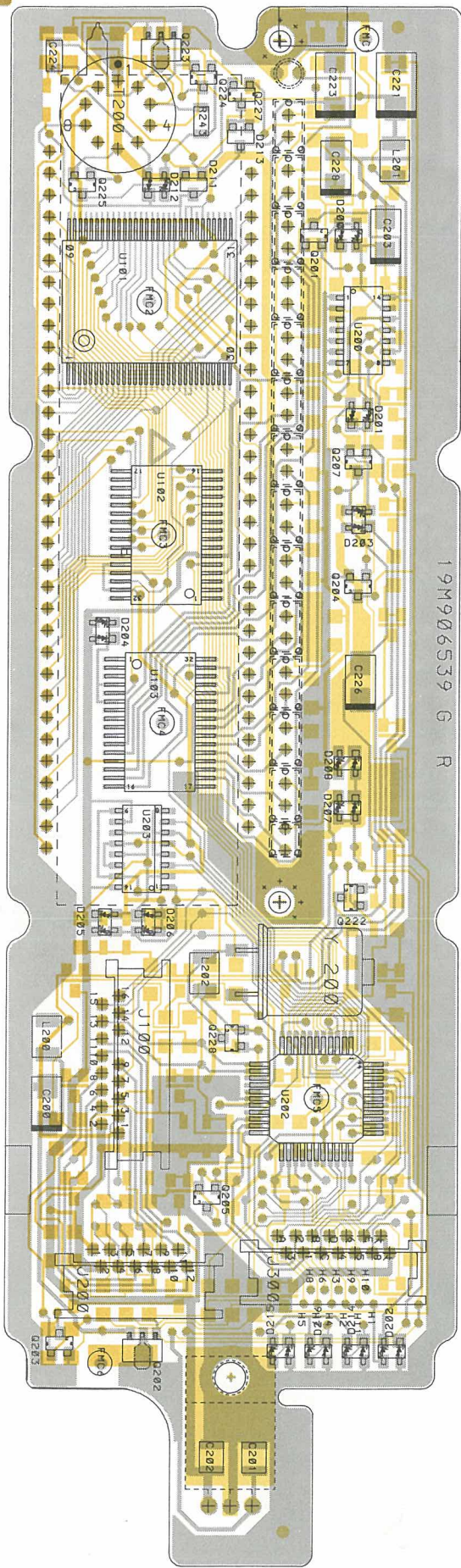
ACCESSORIES

Mic-enable, LS-enable, and mic2-enable (hands free) are 3 control outputs. They are active low, logical "0" means "on".
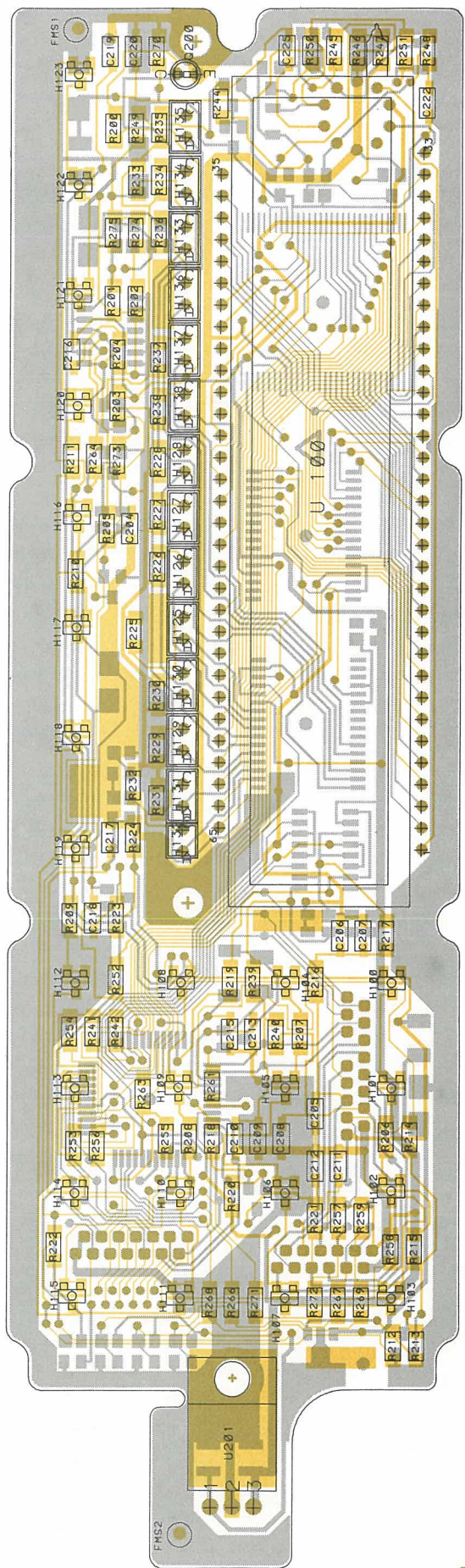
CONTROL LOGIC BOARD CL6010
COMPONENT LAYOUT
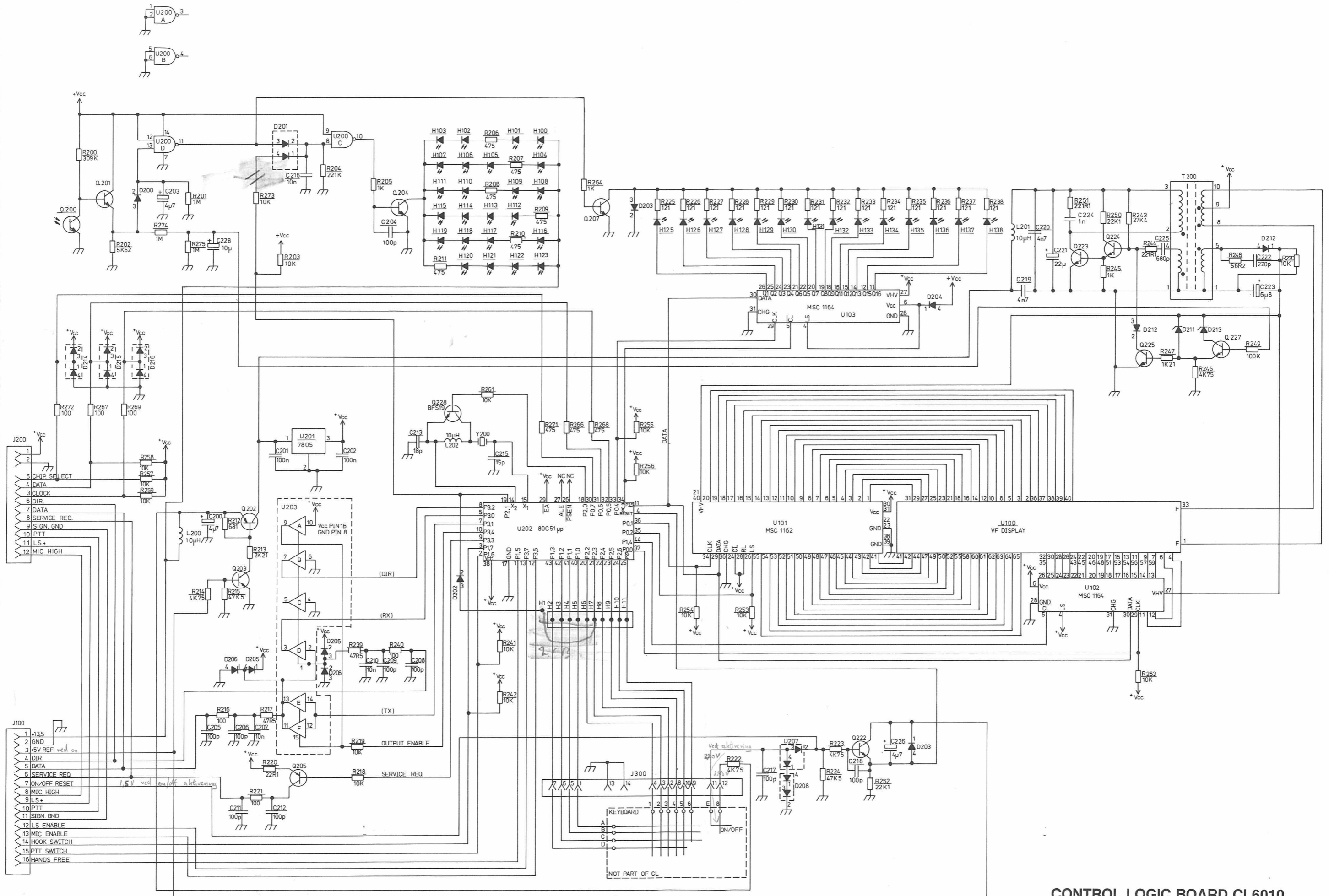
| D405.169/3 | CODE NO. M906539G1/G2

CONTROL LOGIC BOARD CL6010
COMPONENT LAYOUT

D405.169/3   CODE NO. M906539G1/G2

CONTROL LOGIC BOARD CL6010
CODE NO. M906539G1/G2 D405.163/3

Sales Release Letter

Re: **New low complexity IP54 control boxes for CQM6000**

In recent years Storno has got many inquiries from the sales organization regarding control boxes which were resistant to water and dust penetration according to the IP54 recommendation and offering larger buttons as well as an easier-to-handle selection of functions than provided by the comprehensive control box. These boxes should primarily be aimed at heavy duty applications on motor cycles, road and forestry machines, trains and the like.

Two such boxes are now available. They are ordered by their combination number - the same procedure as already known from the comprehensive control box. The two boxes are shown on enclosed figures and have the following combination numbers, respectively:

Standard: **CB6202AL**
                  DR __ Installation type: L=integrated
                  E   R=separate
                  G
                  F
                  N
                  S __ Market identifier

Compact: **CB6402AR** __ Installation type: R=separate
                  D
                  E
                  G
                  F
                  N
                  S __ Market identifier

Please note that the compact box is only available in a separate (remote) version; all possible configurations with the two boxes are shown on enclosed pages.

Please also note that no code plug is available for these two boxes.

Brochures showing the new boxes and mentioning the functions supported by them are planned but yet not in production.

Demo orders as requested in my letter of 6 June 1988 are being shipped to your attention.

A special motorcycle package application note is planned to be issued in the near future: the intention behind this is to account of the experience gained within different parts of the organization for this highly demanding kind of installation - and to present this in a form which should be applicable for everybody considering selling equipment for such applications.

The application note will recommend equipment and describe the problem areas which particularly have to be dealt with in this context: vibration, splashing water, antenna positioning, EMC, mounting, radiated power, special accessories etc.

The new hardware configurations which hereby become available will be thoroughly accounted for in the next update of the Stornophone 6000 Sales Manual. All fundamental configurations are shown schematically on enclosed 5 pages.
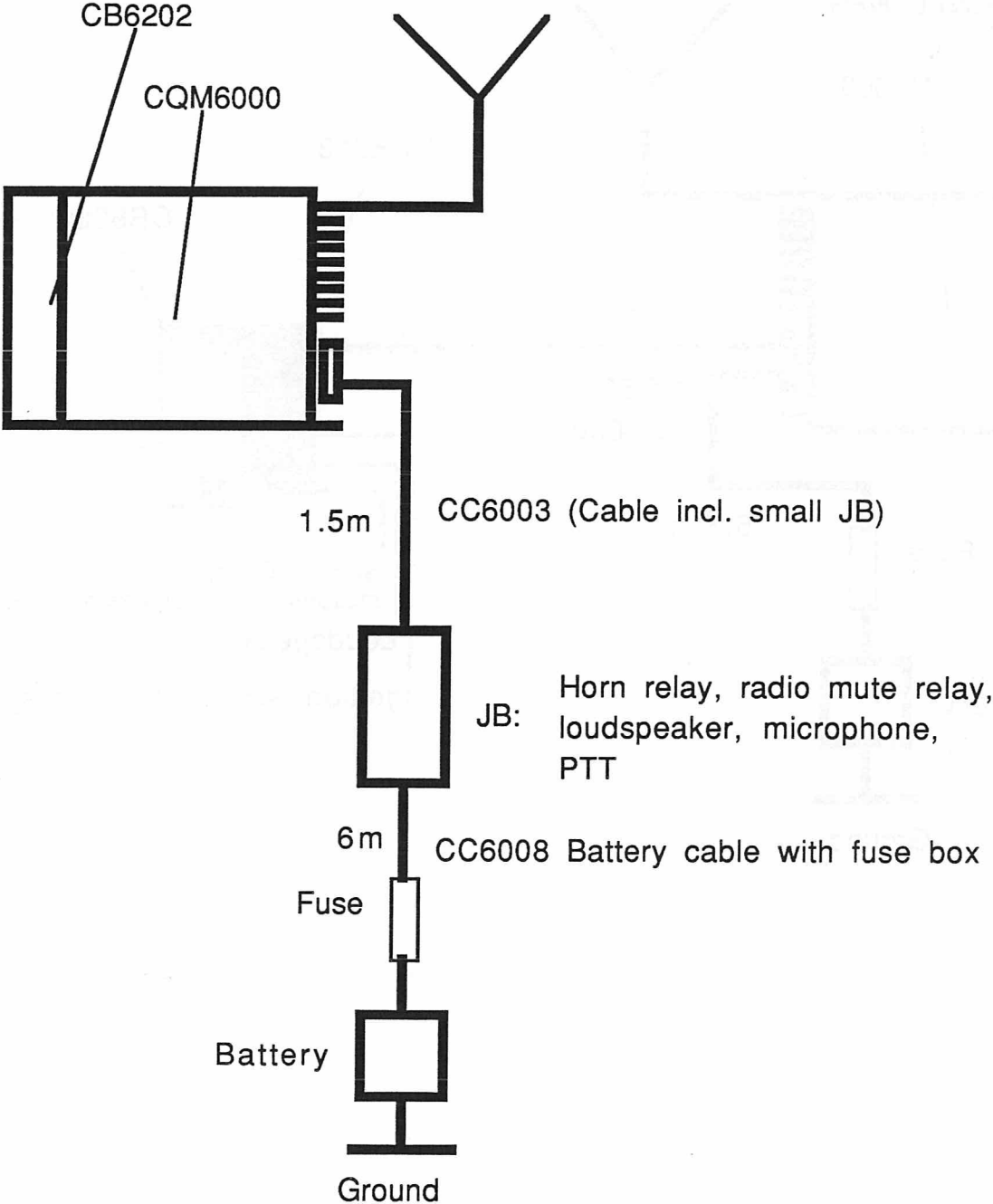
Some, not earlier released, accessories are mentioned on these pages, these are stated with part numbers below here:

K806092G1, CC6034 Cable Kit
L856090G1, MN6013 Housing Kit
L856214G1, CC6029 Cable Kit
K805892G1, CC6013 Cable kit

Black and white pictures, showing the Standard and Compact boxes in separate installations , can be seen on the next page. Please note that a drop of ink has been spilt on the Standard picture in the upper right hand side of the box - this could, unfortunately, not be removed from the photo.
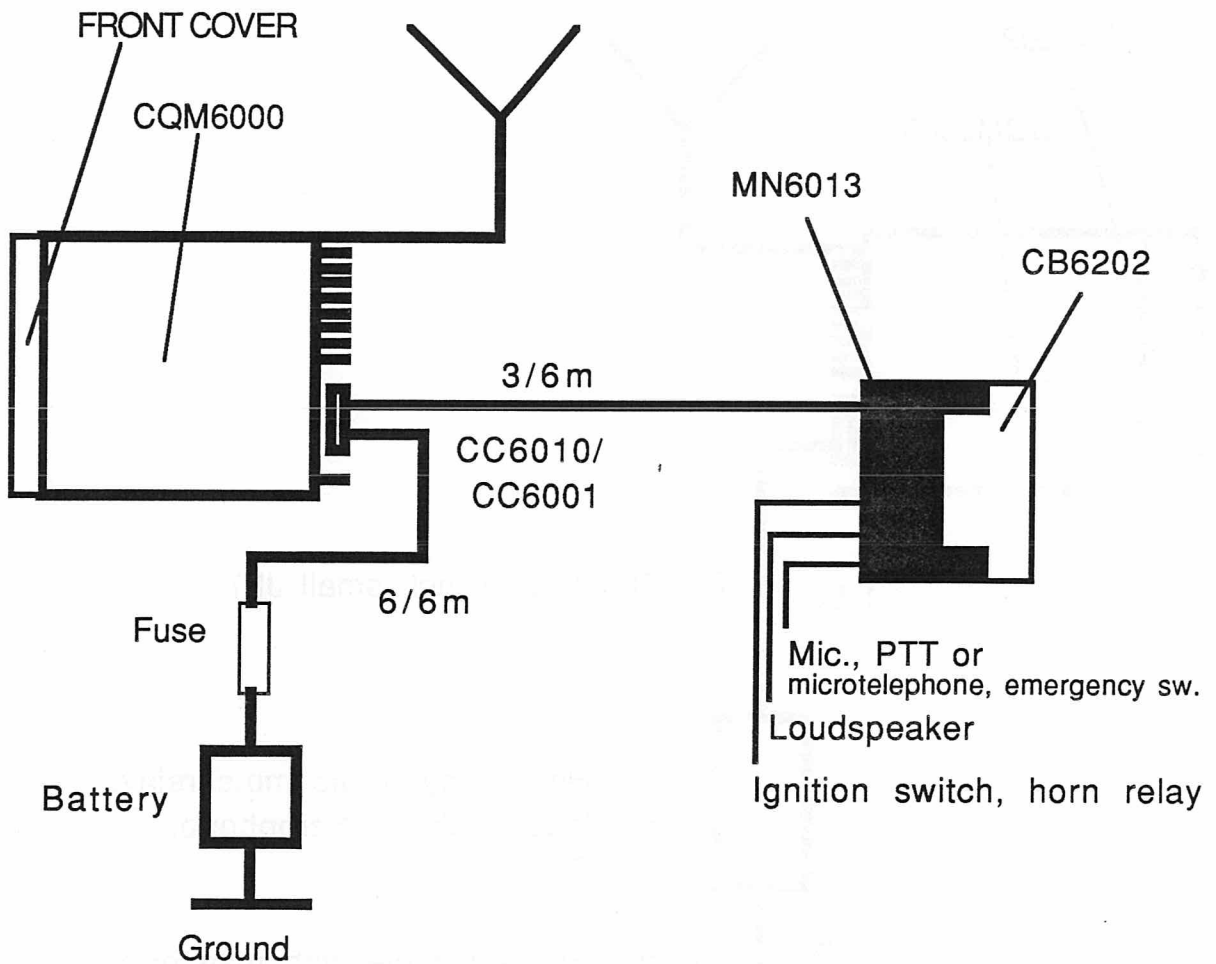
Integrated installation with Standard CB and JB

Support for tranceiver as well as loudspeaker&microphone and other accessories to be specified according to the customers wishes.
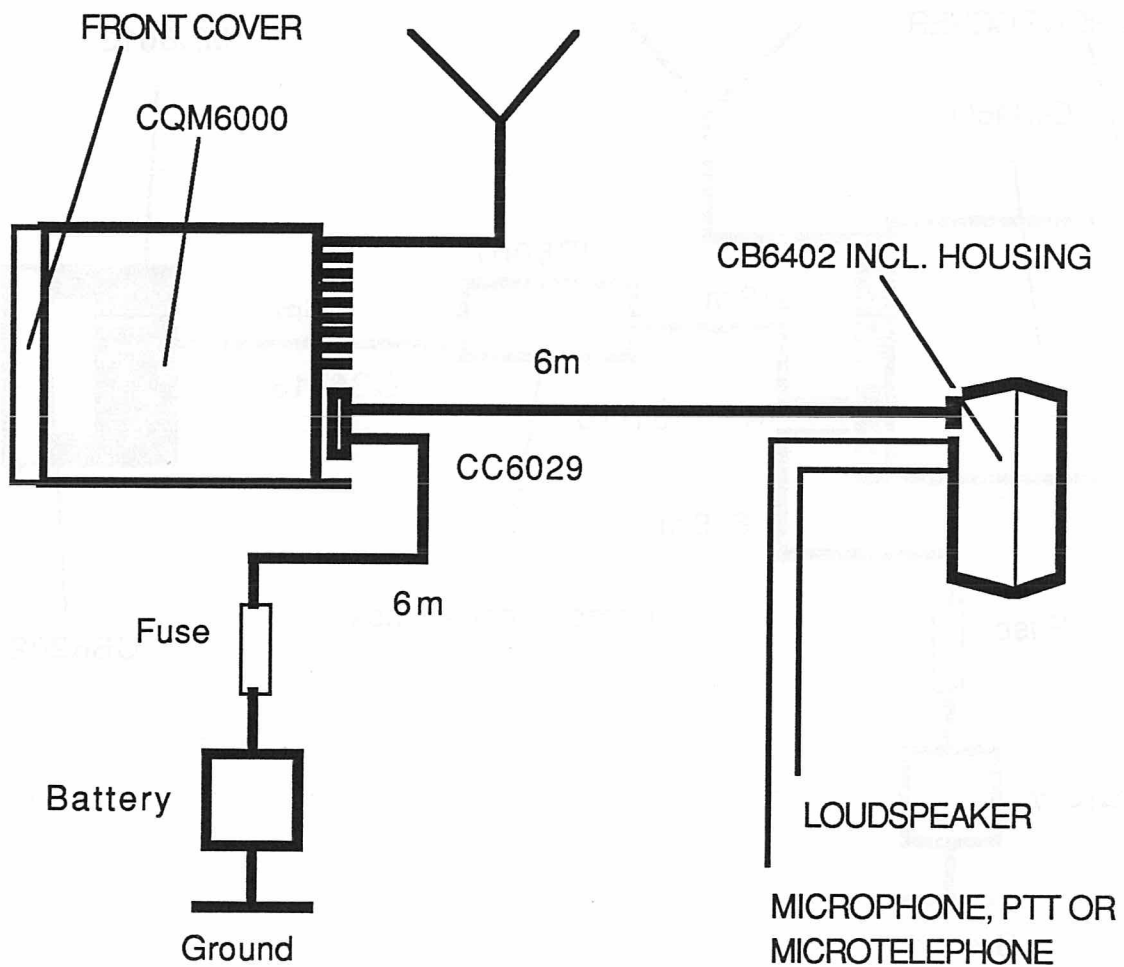
CB6202

CQM6000

1.5m CC6003 (Cable incl. small JB)

JB: Horn relay, radio mute relay, loudspeaker, microphone, PTT

6m CC6008 Battery cable with fuse box

Fuse

Battery

Ground

Separate installation with Standard CB

No extra JB is needed, support for tranceiver as well as loudspeaker&microphone
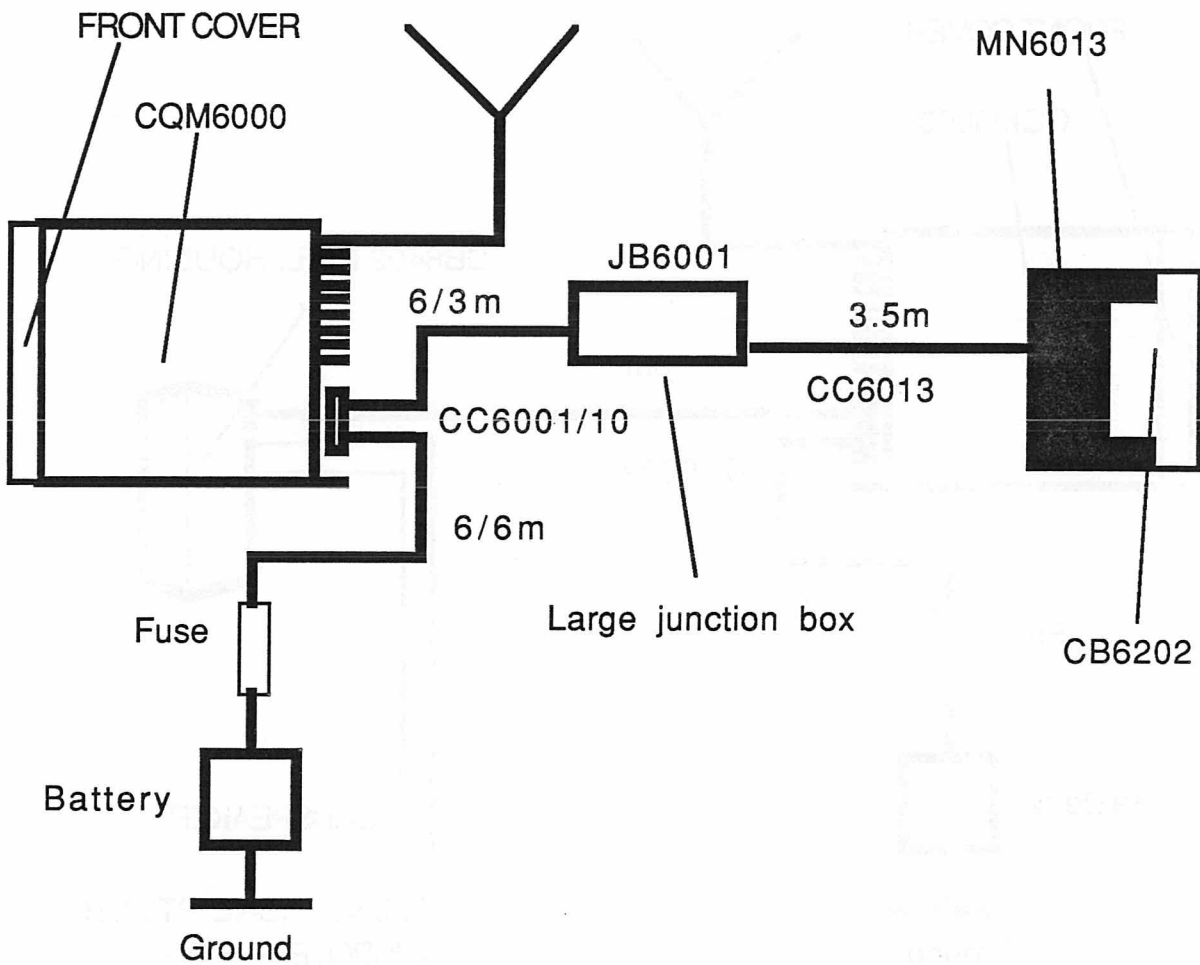to be specified according to the customer's wishes.

FRONT COVER

CQM6000

MN6013

CB6202

3/6 m

CC6010/
CC6001

6/6 m

Fuse

Battery

Ground

Mic., PTT or
microtelephone, emergency sw.

Loudspeaker

Ignition switch, horn relay

Separate installation with Compact CB

No extra JB is needed, support for tranceiver as well as loudspeaker&microphone to be specified according to the customer's wishes.

FRONT COVER

CQM6000

CB6402 INCL. HOUSING

6m

CC6029

6m

Fuse

Battery
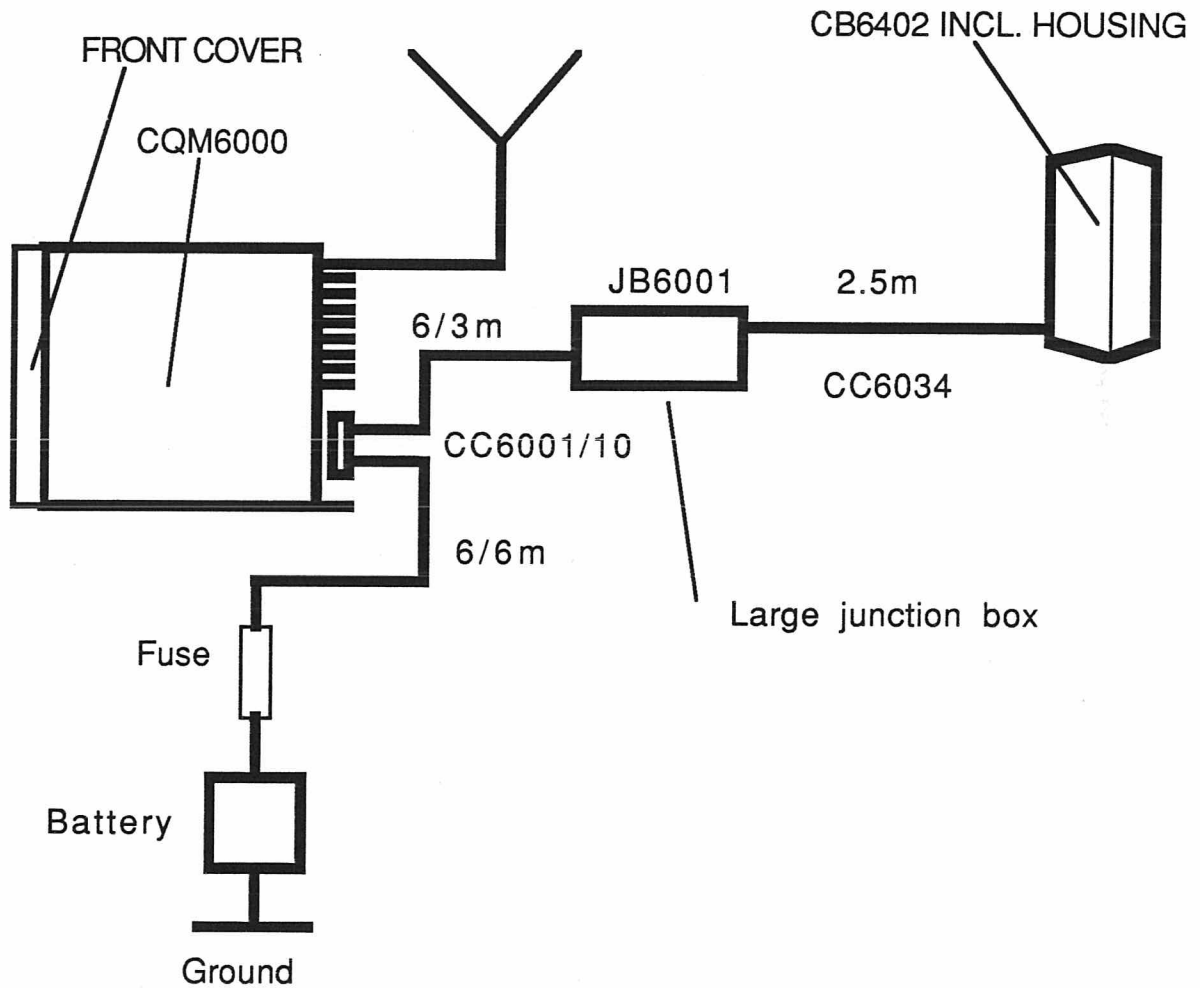
Ground

LOUDSPEAKER

MICROPHONE, PTT OR
MICROTELEPHONE

Separate installation with Standard CB and JB

Because of demand for many connections an additional junction box is specified. Support for tranceiver as well as loudspeaker & microphone must be specified according to the customer's wishes.

FRONT COVER

CQM6000

MN6013

JB6001

6/3 m

3.5m

CC6001/10

CC6013

6/6 m

Large junction box

Fuse

CB6202

Battery

Ground

Separate installation with Compact CB and JB

Because of demand for many connections an additional junction box is specified. Support for tranceiver as well as loudspeaker & microphone must be specified according to the customer's wishes.

CB6402 INCL. HOUSING

FRONT COVER

CQM6000

JB6001

2.5m

6/3m

CC6034

CC6001/10

Large junction box

6/6m

Fuse

Battery

Ground

CONTROL BOX CB6202

PRESENTATION

The CB6202 is a control head with a H-bus serial interface. It has a 16 character alphanumeric Vacuum Flourescent Display, a 13 button keypad, 11 LED indicators, a photosensible transistor and a lock on the front.

The control box is primarily aimed at heavy-duty applications offering larger buttons and an easier-to-handle selection of functions than the comprehensive control boxes.
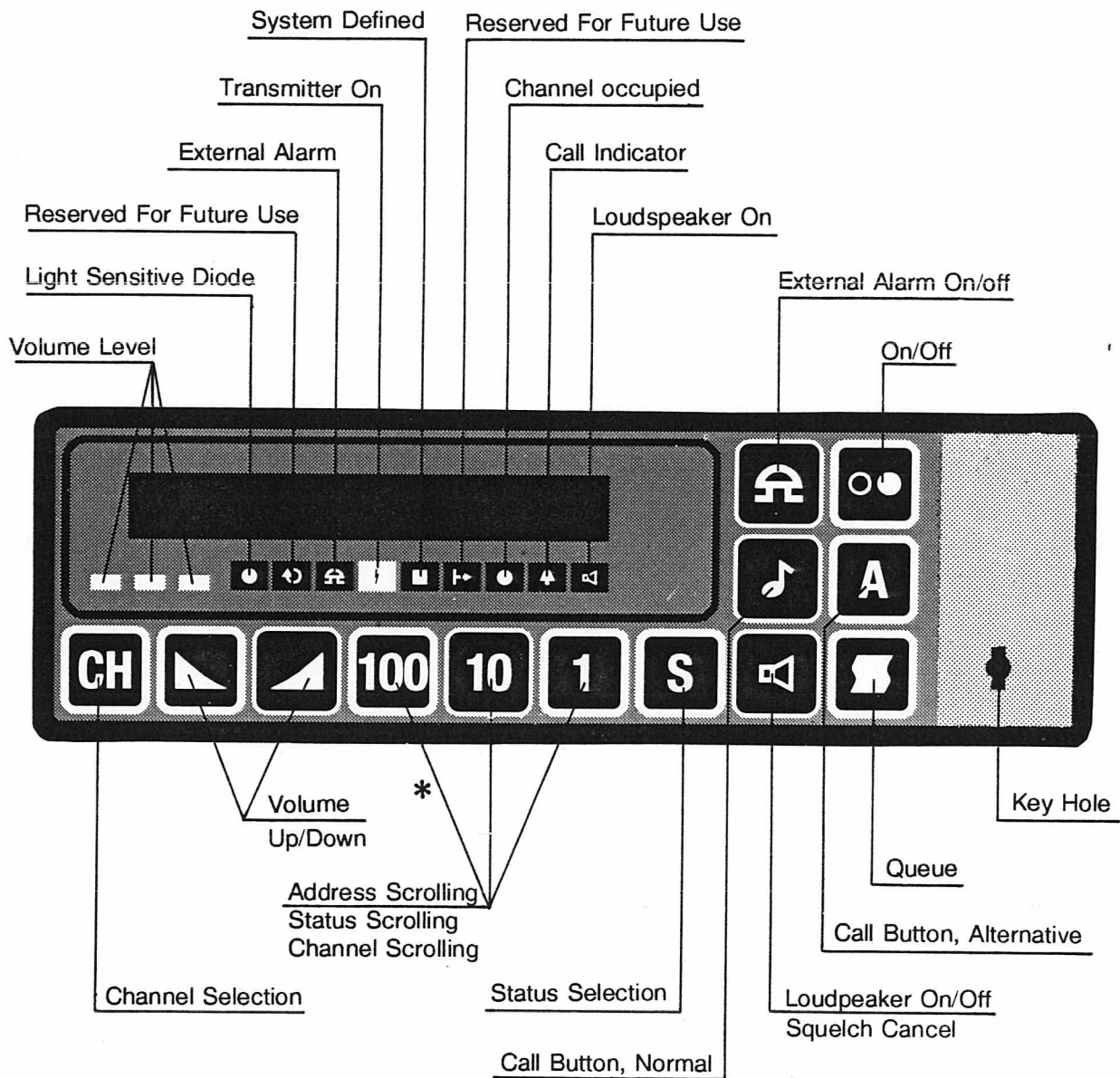
* Address Only

CL6011

CONTROL LOGIC BOARD

The CL6011 is used as the controller in the Control Box. A microprocessor controls all general functions of the control logic board.

The serial communication between the CL and the main controller in the radio part is handled by an H-bus.

By commands from the keyboard various functions, defined by main software in the radio, can be controlled. Different information to the user will be displayed on a 16 position dotmatrix VFD display and 13 symbols light emitting diodes on the front.

It is possible to insert a codeplug device where personality information can be stored.

The backlight is controlled by a light sensitive switch.

The CL6011 is on a single PWB which contains the following circuits.

- Microcontroller
- H-bus interface
- VFD driver unit
- Voltage tripler
- Filament voltage
- Light sensitive switch for back light

- Backlight
- Symbols drive
- On/off-reset circuit
- H-bus address designation
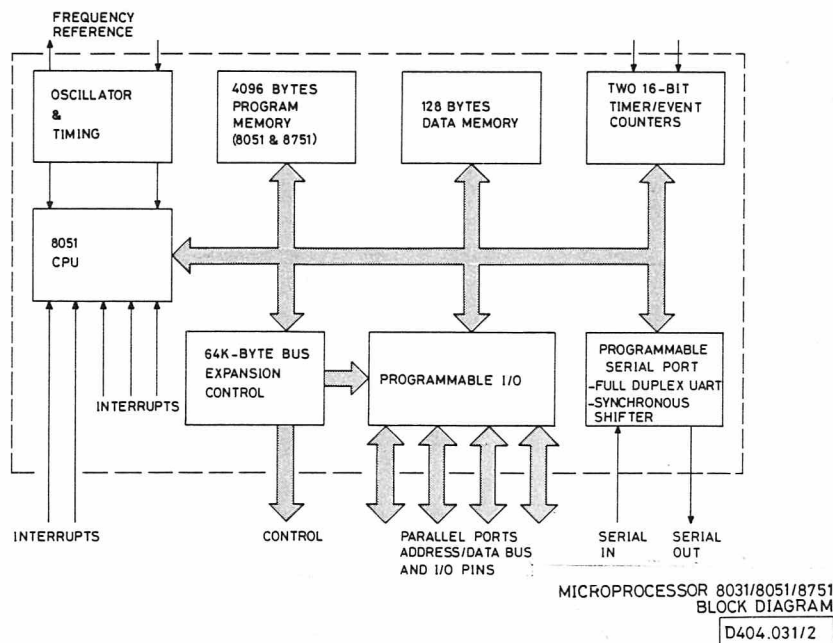- Supply unit
- Connector system

CIRCUIT DESCRIPTION

MICROCONTROLLER

The central part of the control logic is an 8 bit CMOS microprocessor (80C51) in a 40 pin DIP. (U200).

The 8051 contains a non-volatile 4k x 8 read only program memory, a volatile 128 x 8 read/write data memory, 32 I/O lines and on chip oscillator.

The clock frequency of the crystal (Y200) driving the microprocessor is 11.132 MHz.

MICROPROCESSOR 8031/8051/8751
BLOCK DIAGRAM
D404.031/2

MICROPROCESSOR PORT CONNECTIONS

Name	Port. pin	Function
	P 0.0	Backlighting disable
	P 0.1	PTT input (low = activated)
	P 0.2	Hook switch input (low = off hook)
	P 0.3	LED indicator C
	P 0.4	LED indicator B
	P 0.5	LED indicator 9
	P 0.6	LED indicator A
	P 0.7	LED indicator 8
	P 1.0	Keypad row input 0
	P 1.1	Keypad row input 1
	P 1.2	Keypad row input 2
	P 1.3	Keypad row input 3
	P 1.4	EEPROM serial clock
	P 1.5	EEPROM serial data
	P 1.6	EEPROM CS (chip select/programming handshake)
	P 1.7	VFD character (grid) serial clock
	P 2.0	LED indicator serial clock
	P 2.1	VDF dot serial clock
	P 2.2	Keypad column output 0
	P 2.3	Keypad column output 1
	P 2.4	Keypad column output 2
	P 2.5	Keypad column output 3
	P 2.6	Keypad column output 4
	P 2.7	Keypad column output 5
RXD	P 3.0	UART receiver data
TXD	P 3.1	UART transmitter data
INT0	P 3.2	H-bus DIRECTION line
INT1	P 3.3	H-bus SERVICE REQUEST line
	P 3.4	H-bus tri-state control
	P 3.5	Common serial data output
	P 3.6	Mic. enable
	P 3.7	LS enable

H-BUS INTERFACE

The on-chip UART on the microprocessor is used to handle the serial communication on the H-bus.
The external interface (U201) together with 1 interrupt and 2 control lines including the UART
constitute the H-bus interface.

VFD DRIVER UNIT

The Vacuum Flourescent Display driver unit consist of an anode and a grid drive unit.
To drive the 35 anodes in the 5x7 matrix on the display a high voltage display driver has been
used (U100).
The interface to the microprocessor is a serial data line and a serial clock line.
The grid drive consists of two 8 bit shift registers (U205/U206) where the 16 outputs are buffered
by 16 transistors to the display grids.

The input data to the shift registers is controlled by the microprocessor in a serial way.
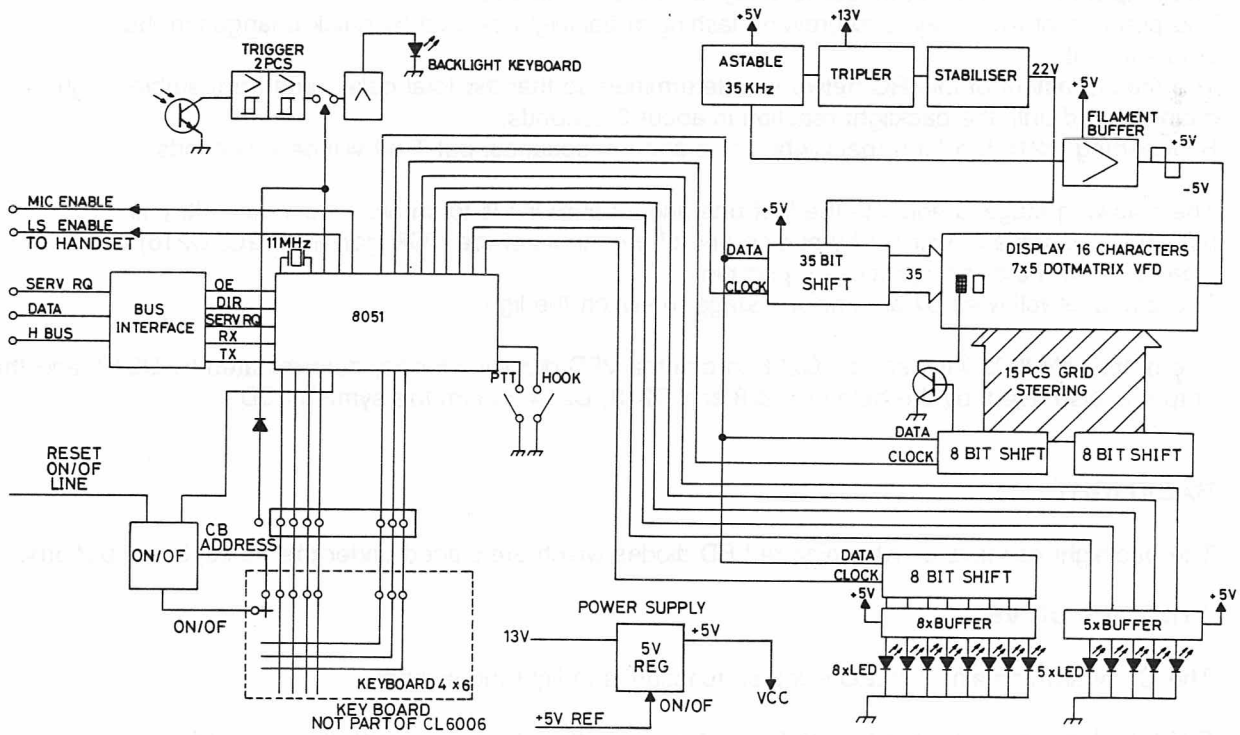
BLOCK DIAGRAM

D404.555

VOLTAGE TRIPLER

The purpose of the voltage tripler is to deliver sufficient voltage to the VFD.
It consists of an astable multivibrator (U203A) running at a frequency about 35 kHz.
This squarewave is amplified and boosted by Q211, Q212, Q213.
Then the voltage is tripled by the arrangement around D203, D204, D205.
The purpose of D206 is to create catode bias voltage to the VFD.
The D207 is to stabilise the display voltage.

FILAMENT VOLTAGE

The squarewave formed by U203A is amplified by U203B and delivered to a symmetrical booster bridge (Q222, Q223, Q224, Q225). The output from this bridge is floating because of the capacitors C220, C221 and supplies the filament on the VFD with a peak-peak voltage about -5 V and +5 V.

LIGHT SENSITIVE SWITCH FOR THE BACKLIGHT

This unit consist of a photo transistor (Q200) and amplified by Q201 which is connected to a Schmitt trigger. The purpose of the Schmitt trigger is to create a well defined threshold level of the light.
The output of this Schmitt trigger is delayed by R211 and C204.
The purpose of this delay is to prevent flashing in backlight caused by quick changes in the ambient light.
The time constant of this RC network is determined so that the total delay time from ambient light changes and until the backlight reaction is about 2 seconds.
By inserting D210 the T.on (backlight on) is about 0 seconds, but T.off will be 2 seconds.

The following stage is equal to the first one and its purpose is to create a defined shift. It is possible to disable the circuit by putting one of the inputs of the NOR gate (U202C, D216) to a high level from the microprocessor port pin.
The output is followed by an amplifier stage to switch the light.

The output of U202D is used by Q226 to dim the VFD display intensity determinated by D212, and the output is also used, by the help of Q228 and D213, D214, to dim the symbol LED's.

BACKLIGHT

The backlight consists of 13 miniature LED diodes which are placed under the 13 keyboard buttons.

SYMBOLS DRIVE

The CL board contains 13 LED's whose function is to light the symbols.

Eight diodes are connected to a shift register and buffer stages. A serial data line and serial clock supply the shift register with the right information. Another five diodes are connected directly to the microprocessor port pin via a buffer stage.
The buffer stages are in all 13 positions transistors.
When the backlight is turned on the supply voltage to all the diodes is decreased by a voltage drop about two diodes (D213-D214) to create a dim function on the symbols.

ON/OFF-RESET CIRCUIT

The purpose of the on/off reset circuit is to deliver a on/off pulse to the on/off circuit in the radio part and to reset the microcontroller.
A high pulse from the keyboard switch is regulated by two diodes (D202-D215) to on/off line level (1.2 V).

This 1.2 V is going to the on/off circuit on the radio part which turns the +5 V ref. to the CL board on and resets the whole radio. This reset pulse would come back to the CL from the radio and turns the Q204 on which resets the microprocesssor. During the time passing between the +5 V power supply goes on and the reset pulse arrives, C227 resets the microprocessor.

H-BUS ADDRESS DESIGNATION

Connecting the anode of D211 to one of the keypad pins (on the microprocessor) with a strap, will determine which of the 11 precoded addresses will be used.
It should be noted that not connecting any strap at all is also an address.

SUPPLY UNIT

The purpose of the supply unit is to create +5 V for the board.
The +13 V line is being filtered by means of L100 and C234 and a capacitor on the filter board (FN6007). The regulation is done by U207 and an on/off circuit which has been inserted (Q230, Q229).
This circuit is controlled by the 5V reference line.

CONNECTOR SYSTEM

All connections to the CL board are made by 3 connectors except in the handset control, where the reed switch is connected into the PWB by a wire.
It also possible to insert a PTT switch wire on the board.
Below is shown a list of the signals available on the connectors.

1) (J203) Connector for the radio (remote or local):
- On/off reset line
- GND (BATT)
- +13.2 V +5 V
- Reference H-bus: request, data and direction.
- Mic high LS+ PTT
- Analog GND

2) (J203) RX and TX (audio select)
pin 13 and pin 14 are control signals for audio in the handset version.

3) (J201) Keyboard connector:
A connector where the keyboard foil is inserted

TECHNICAL SPECIFICATIONS

The CL6011 is supplied by two voltages from the radio.

Supply voltage 1
10.8 - 15.6 V DC (13.2 V nom.)

Current drain 1
max. 210 mA (Backlight off)

Supply voltage 2
+5 V ± 10%

Current drain 2
max. 1.5 mA

Temperature range
Operating -25°C to +60°C
Storage   -40°C to +70°C

H-BUS CONTROL SIGNALS

Maximum input
Lo voltage: (1.0 V)

Minimum input
Hi voltage: (3.2 V)   ,

Maximum outputs
Lo voltage: (0.4 V)

OUTPUTS

On/off signal: J203 pin 7 (active high) pulse
Hi voltage >1.2 V
Lo voltage <0.2 V

Audio select: (active Low)
Mic. enable J203 pin <0.2 V
LS enable J203 pin <0.2 V

INPUTS

Hook
The handset control version of CL6011 has a HOOK input. This input is on the PWB called H12. When connecting this point to GND the handset is on hook.

PTT
The CL6011 is prepared for a PTT input. This input is on the PWB called H13 (Low causes at PTT signal on the H-bus).
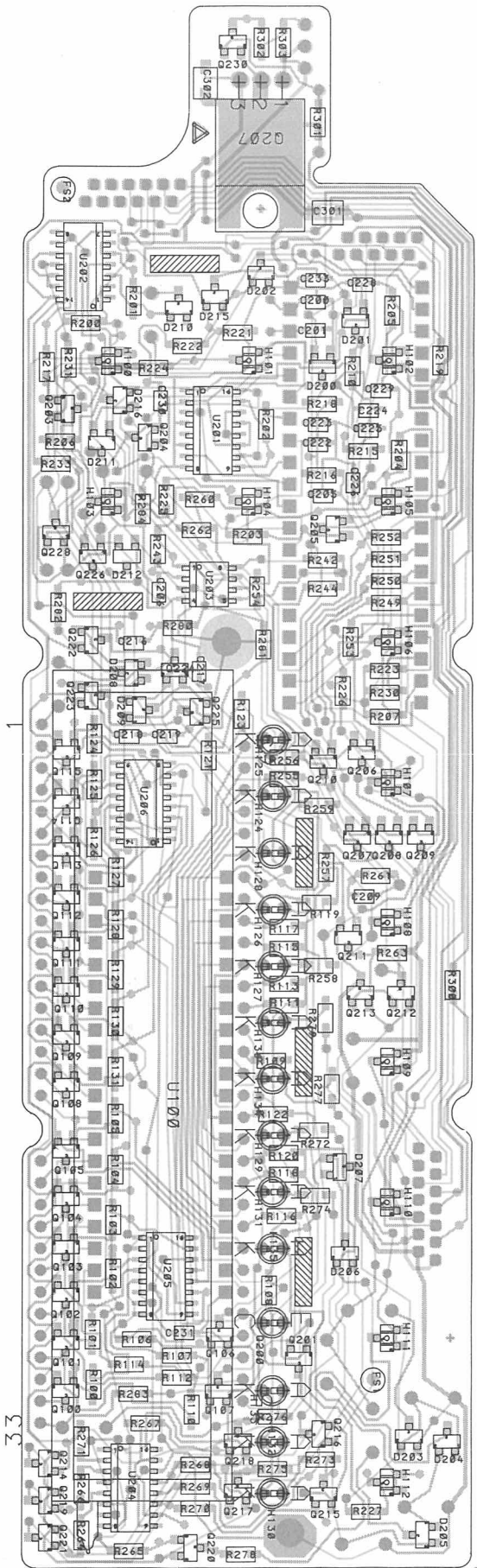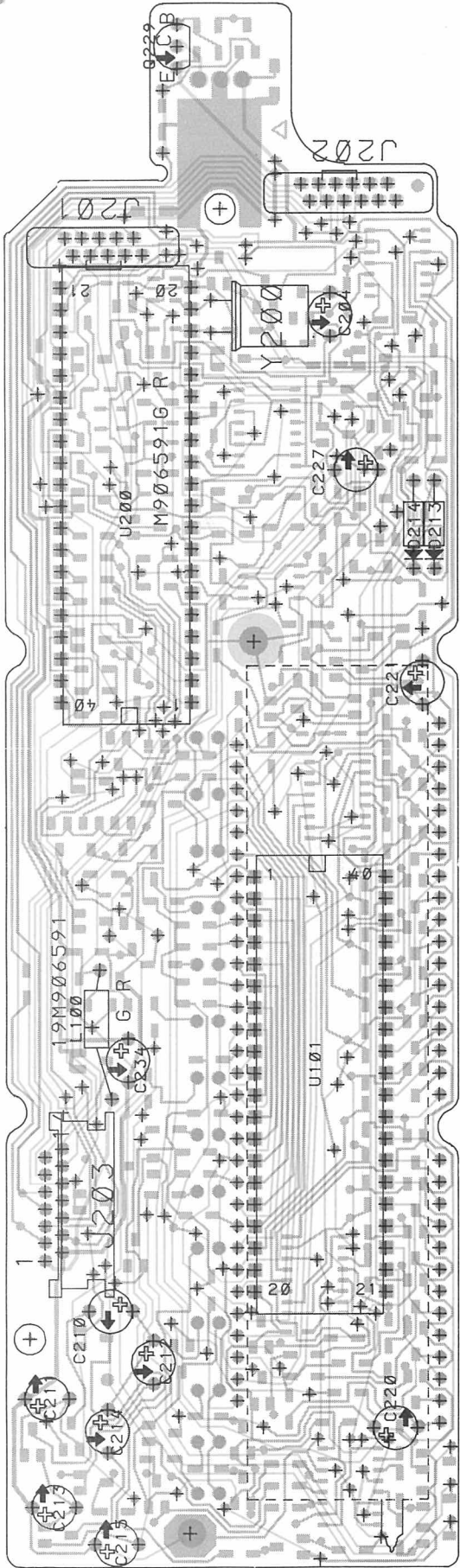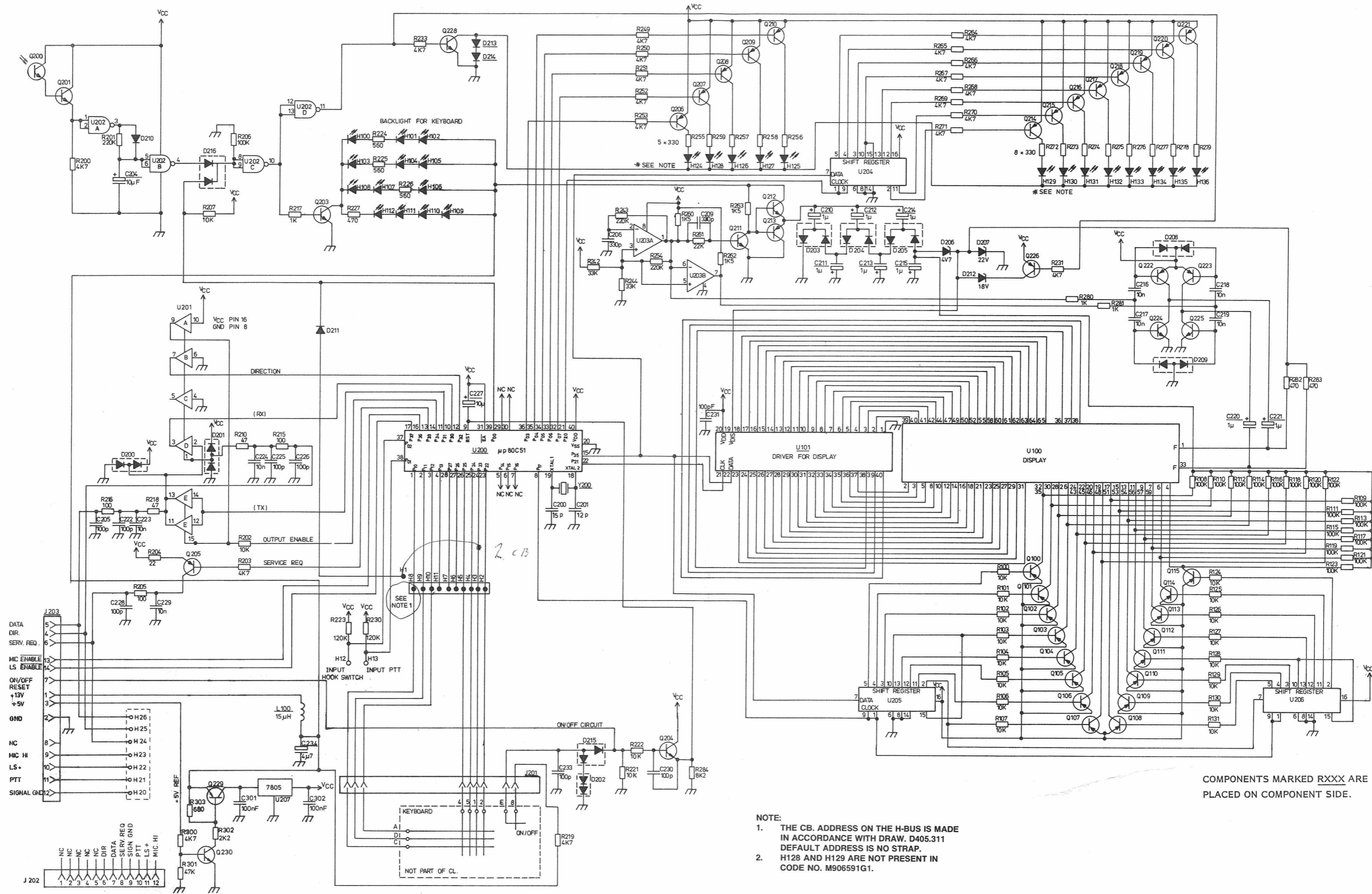
CONTROL LOGIC BOARD CL6011
COMPONENT LAYOUT

D405.309   CODE NO M906591G1

CONTROL LOGIC BOARD CL6011
**COMPONENT LAYOUT**

D405.309   CODE NO M906591G1
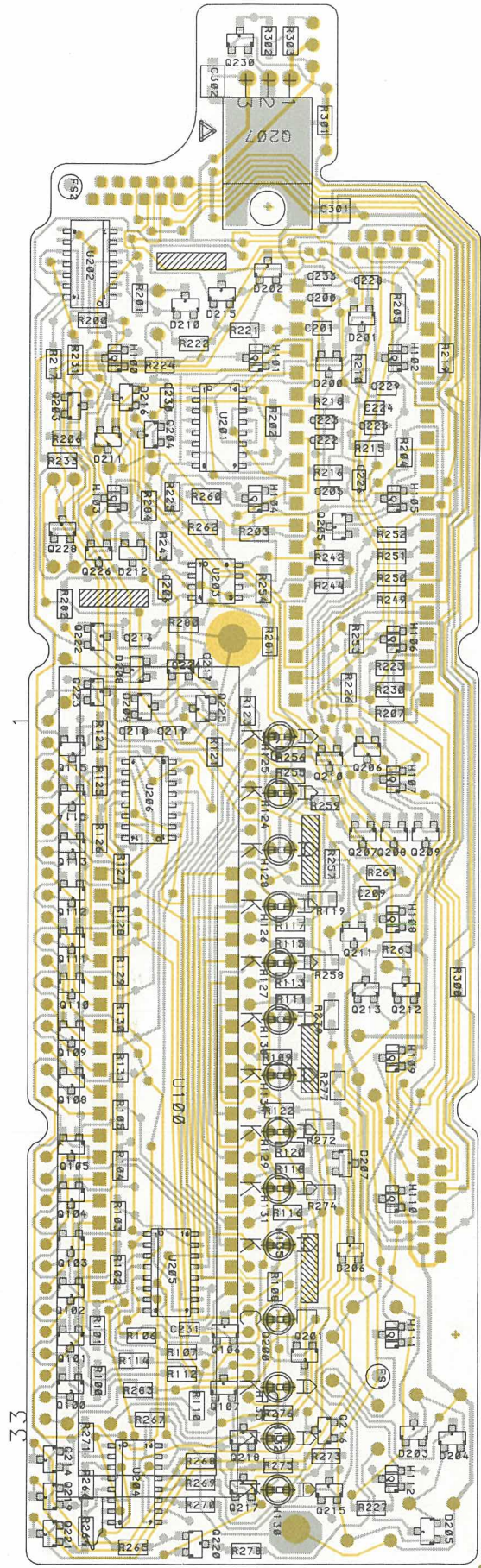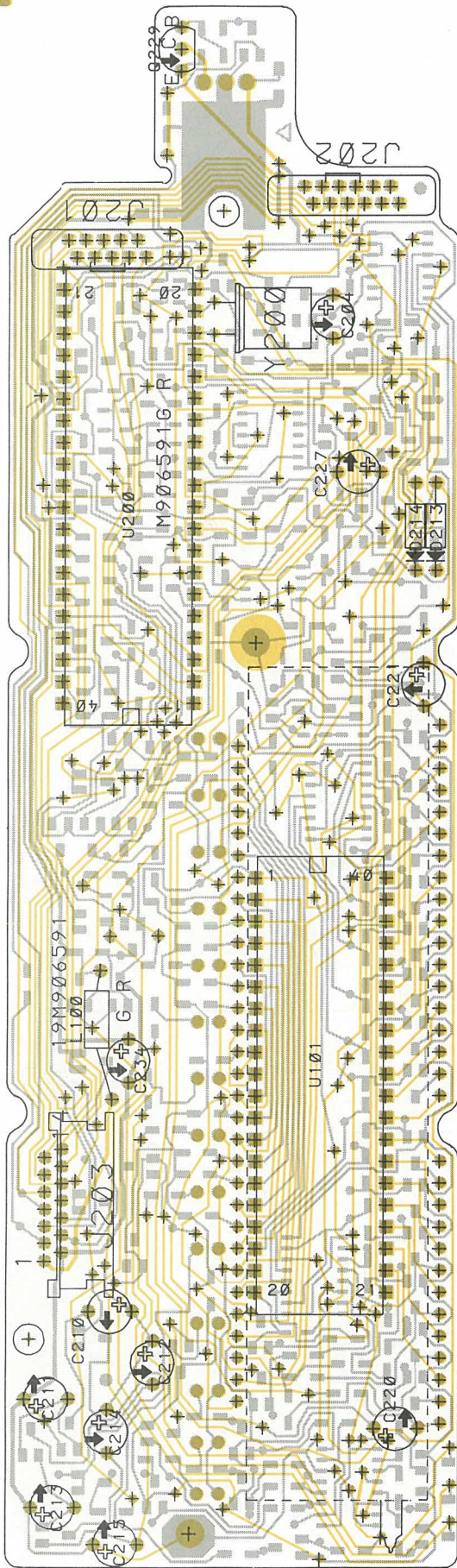
NOTE:
1. THE CB. ADDRESS ON THE H-BUS IS MADE IN ACCORDANCE WITH DRAW. D405.311 DEFAULT ADDRESS IS NO STRAP.
2. H128 AND H129 ARE NOT PRESENT IN CODE NO. M906591G1.

COMPONENTS MARKED RXXX ARE PLACED ON COMPONENT SIDE.

CONTROL LOGIC BOARD CL6011
CODE NO M906591G1   D405.308

H7 H6 H5 H4 H3 H2
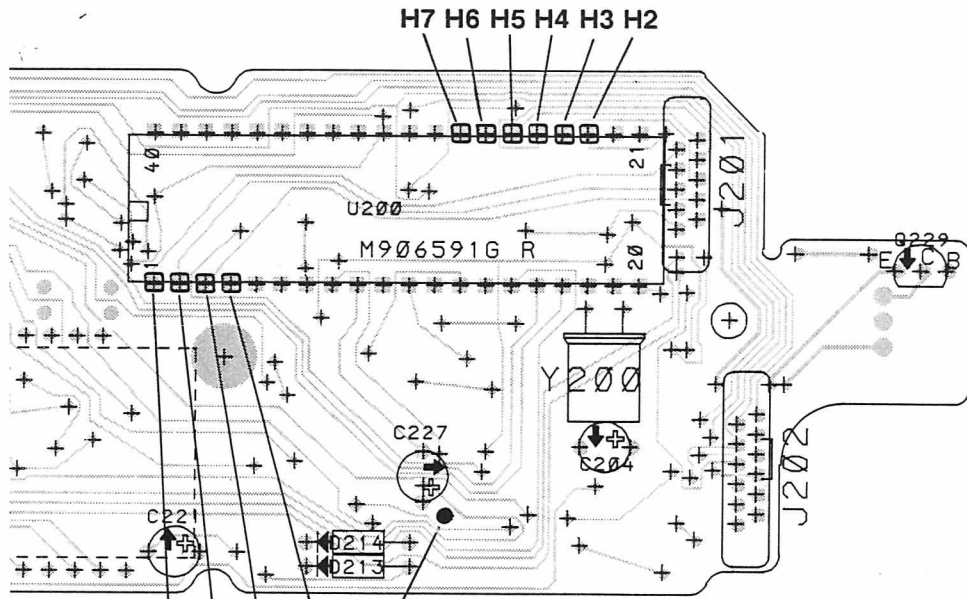
H8 H9 H10 H11 H1

IN THE SAME INSTALLATION:

-ONE BOX AT LEAST MUST HAVE ADDR. 20H, WHICH MEANS NO STRAP.
-TWO BOXES MUST NOT HAVE THE SAME ADDRESS.
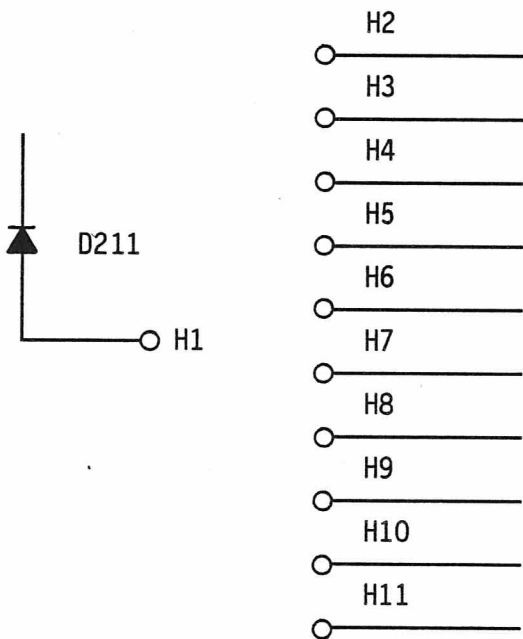
| CB ADDRESS	H-BUS ADDRESS
NO STRAP	20H
H2	21H
H3	22H
H4	23H
H5	24H
H6	25H
H7	26H
H8	27H
H9	28H
H10	29H
H11	2AH

ADDRESSING INSTRUCTIONS H-BUS ON CL6011

D405.311

CONTROL BOX CB6402

PRESENTATION

The CB6402 is a watertight control box primarily intended for mounting on a motorcycle. The control box affers larger buttons as well as an easier-to handle selection of functions than the comprehensive control boxes.

This compact heavy duty control box is only available in a remote version.

It has a 16 character alphanumeric Vacuum Flouresent Display, a 12 button keypad, 10 symbol indicators and a light sensitive diode on the front.

* Address Only
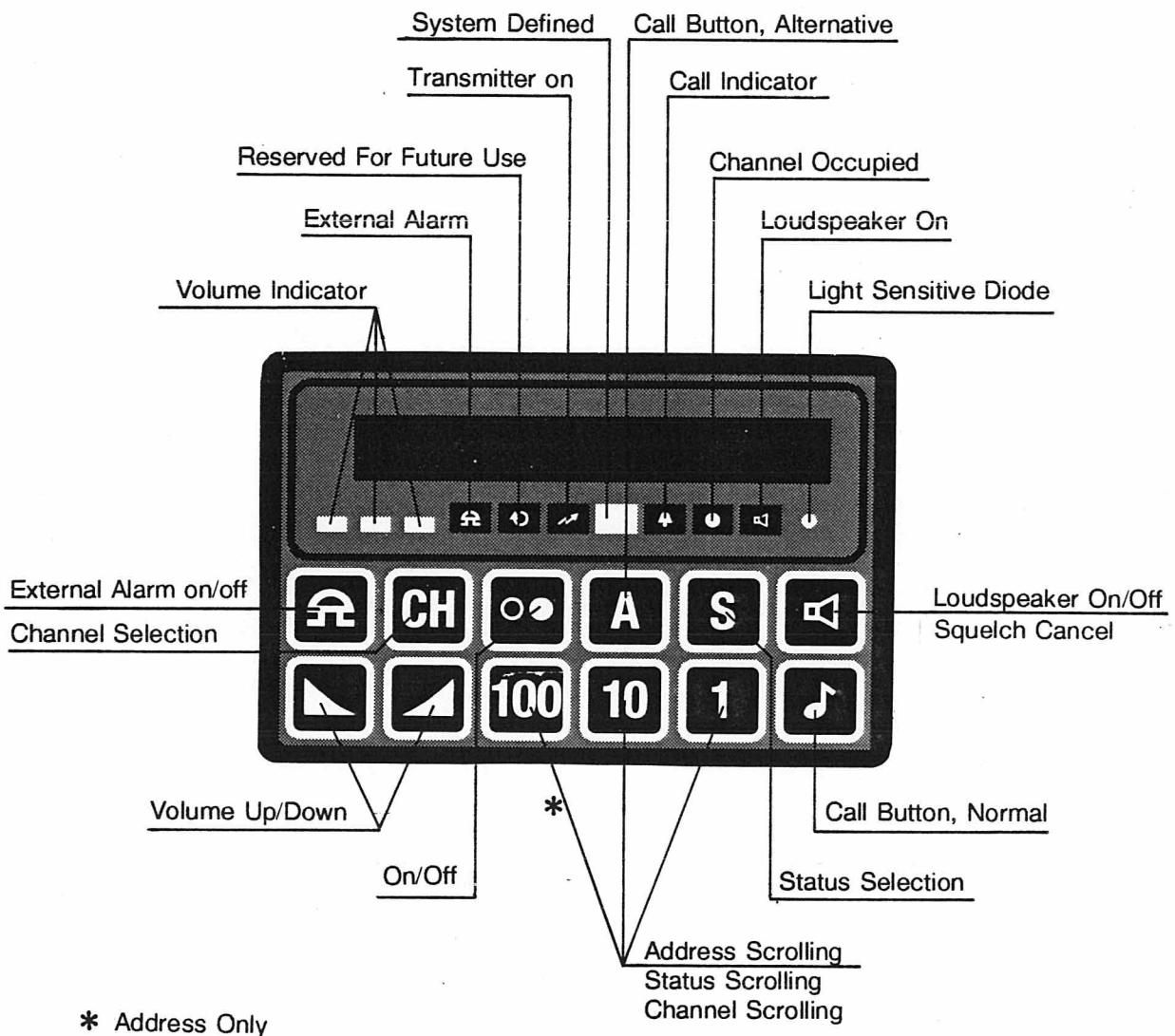
CB6402

COMPACT CONTROL BOX

The CB6402 consists of three PWB's: control board, display board and junction board. The control board and display board consist of a microprocessor which controls all general functions of the CB.

The serial communication between the CB and the main controller in the radio part is handled by an H-bus. By commands from the keyboard it is possible to control different functions defined by main software in the radio. Different pieces of information for the operator will be displayed on a 16 position dot matrix VFD display and 10 symbols light emitting diodes on the front.

The backlight is controlled by a light sensitive switch.
The junction board comprises a voltage regulator and connection to the radio.

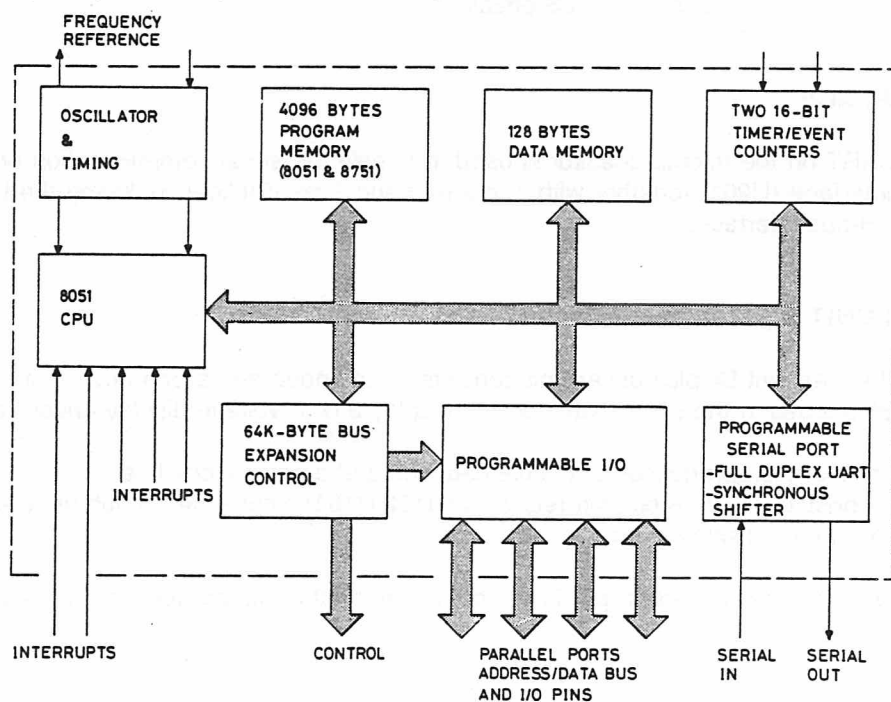The CB6402 is on three PWB's containing the following circuits:

- Microcontroller
- H-bus interface
- VFD driver unit
- Voltage tripler
- Filament voltage
- Light sensitive switch for back light

- Backlight
- Symbols drive
- On/off-reset circuit
- H-bus address designation
- Connector system

CIRCUIT DESCRIPTION

MICROCONTROLLER

The central part of the control logic is an 8 bit NMOS microprocessor (80C51) in a 40 pin DIP (U200). The 8051 contains a non-volatile 4k x 8 read only program memory, a volatile 128 x 8 read/write data memory, 32 I/O lines and on chip oscillator.
The clock frequency of the crystal (Y200) driving the microprocessor is 11.132 MHz.

Microprocessor port connections

Name	Port.pin	Function
	P0.0	Backlighting disable
	P0.1	PTT input (low = activated)
	P0.2	Hook switch input (low = off hook)
	P0.3	LED indicator C
	P0.4	LED indicator B
	P0.5	LED indicator 9
	P0.6	LED indicator A
	P0.7	LED indicator 8
	P1.0	Keypad row input 0
	P1.1	Keypad row input 1
	P1.2	Keypad row input 2
	P1.3	Keypad row input 3
	P1.4	EEPROM serial clock
	P1.5	EEPROM serial data
	P1.6	EEPROM CS (chip select/programming handshake)
	P1.7	VFD character (grid) serial clock
	P2.0	LED indicator serial clock
	P2.1	VDF dot serial clock
	P2.2	Keypad column output 0
	P2.3	Keypad column output 1
	P2.4	Keypad column output 2
	P2.5	Keypad column output 3
	P2.6	Keypad column output 4
	P2.7	Keypad column output 5
RXD	P3.0	UART receiver data
TXD	P3.1	UART transmitter data
INT0	P3.2	H-bus DIRECTION line
INT1	P3.3	H-bus SERVICE REQUEST line
	P3.4	H-bus tri-state control
	P3.5	Common serial data output
	P3.6	Mic. enable
	P3.7	LS enable

H-BUS INTERFACE

The on-chip UART on the microprocessor is used to handle the serial communication on the H-bus.
The external interface (U201) together with 1 interrupt and 2 control lines including the UART
constitute the H-bus interface.

VFD DRIVER UNIT

The Vacuum Flourescent Display driver unit consists of an anode and a grid drive unit.
To drive the 35 anodes in the 5 x 7 matrix on the display a high voltage display driver has been
used (U100).
The interface to the microprocessor is a serial data line and a serial clock line.
The grid drive consists of two 8 bit shift registers (U102/U103) where the 16 outputs are buffered
by 16 transistors to the display grids.

The input data to the shift registers (pin 7) are controlled by the microprocessor in a serial
way.

The shift registres (clocked by a low-to-high transition) are used for driving the character select circuitry. A character is turned "on" by a logical "0" in the corresponding shift register bit.

The first bit clocked into the display driver is dot no. 35 followed by the others in descending order, and the first character loaded into the driver is the leftmost.
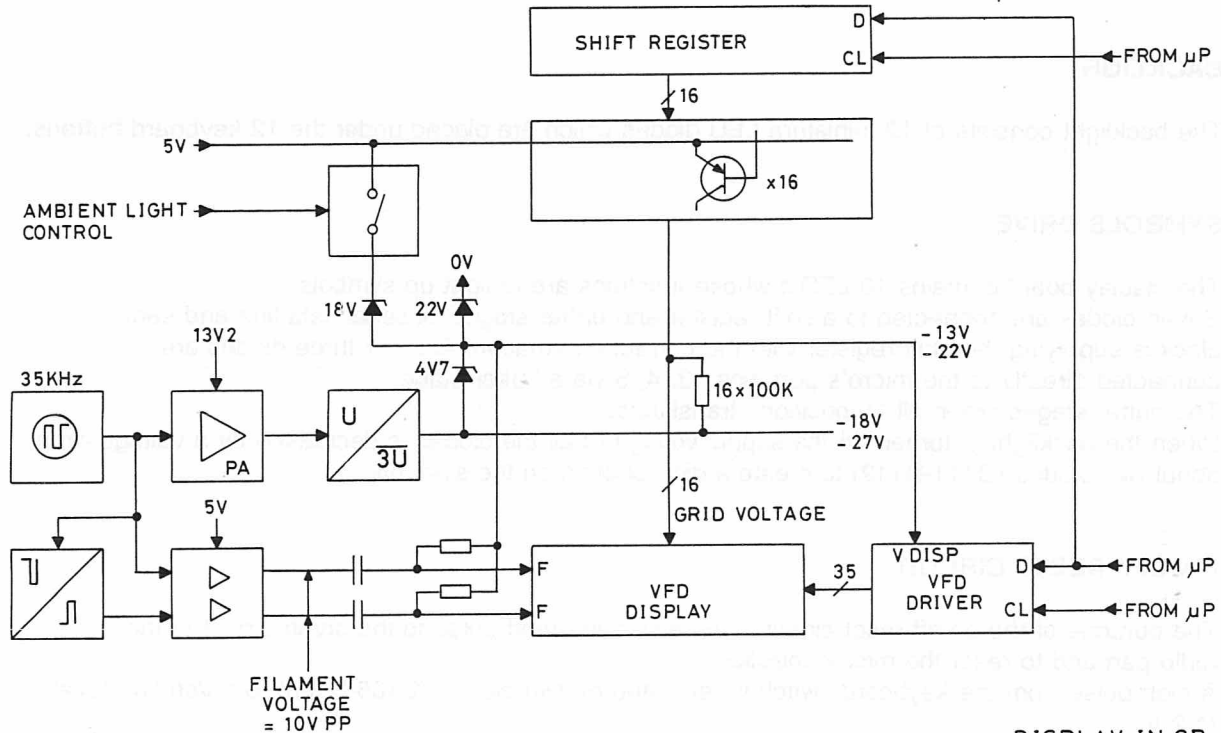
DISPLAY IN CB

VOLTAGE TRIPLER

The purpose of the voltage tripler is to deliver sufficient voltage to the VFD.
It consists of an astable multivibrator (U105) running at a frequency about 35 kHz. The squarewave is amplified and boosted by Q128, Q129, Q130. Then the voltage is tripled by the arrangement around D105, D106, D107.
The purpose of D108 is to create catode bias voltage to the VFD and D110 stabilizes the display voltage.

FILAMENT VOLTAGE

The squarewave formed by U105A is amplified by U105B and delivered to a symmetrical booster bridge (Q131, Q132, Q133, Q134). The output from this bridge is "floating" because of the capacitors C116, C117 and supplies the filament on the VFD with a peak-peak voltage of about -5 V and +5 V.

LIGHT SENSITIVE SWITCH FOR THE BACKLIGHT

This unit consists of a photo transistor (Q123) and is amplified by Q124 which is connected to a Schmitt trigger. The purpose of the Schmitt trigger is to create a well defined threshold level of the light.
The output of this Schmitt trigger is delayed by R148 and C103.
The purpose of this delay is to prevent flashing in backlight caused by quick changes in ambient light.
The time constant of this RC network is so determined that the total delay time from the ent light changes to the backlight reaction is about 2 seconds.

The following stage is equal to the first its purpose being to create a defined shift. It is possible to disable the circuit by putting one of the inputs of the NOR gate (U106C, D102) to a high level from the microprocessor's pin 39.
The output is followed by an amplifier stage to switch the light.
The output of U106D is used by Q123 to dim the VFD display intensity determinated by D109 and the output is also used by the help of Q125 and D111, D112 to dim the symbol LED's.

BACKLIGHT

The backlight consists of 12 miniature LED diodes which are placed under the 12 keyboard buttons.

SYMBOLS DRIVE

The display board contains 10 LED's whose functions are to light up symbols.
Seven diodes are connected to a sh'ft register and buffer stages. A serial data line and serial clock is supplying the shift register with the correct information. Another three diodes are connected directly to the micro's port pins 13, 4, 6 via a buffer stage.
The buffer stages are in all 10 positions transistors.
When the backlight is turned on the supply voltage to all the diodes is decreased by a voltage drop about two diodes (D111-D112) to create a dim function on the symbols.

ON/OFF-RESET CIRCUIT

The purpose of the on/off reset circuit is to deliver an on/off pulse to the on/off circuit in the radio part and to reset the microcontroller.
A high pulse from the keyboard switch is regulated by two diodes (D105-D106) to on/off line level (1.2 V).
This 1.2 V is going to the on/off circuit on the radio part which turns the +5 V ref. to the display board on and resets the whole radio. This reset pulse returns to the display board from the radio and turns the Q101 on which resets the microprocessor. In the time between the +5 V power supply is going on and the reset pulse is coming, C108 is resetting the microprocessor.

H-BUS ADDRESS DESIGNATION

Connecting the anode of D107 to one of the keypad pins (on the microprocessor) with a strap, will determine which of the 11 precoded addresses will be used, for control box identification.
It should be noted that not connecting any strap at all is an address too.

SUPPLY UNIT

The purpose of the supply unit is to create +5 V to the board.
The +13 V line is being filtered by the help of L100 and C121 and a capacitor on the JB board. The regulation is done by U100 and an on/off circuit which has been inserted (Q100, Q101).
This circuit is controlled by the 5 V reference line.

CONNECTOR SYSTEM

Connection to the radio is made by a D connector (P102) which is placed on the junction board. A 9 wired jumper (J103) soldered into the junction provides connection to the control board. This jumper fits into a connector on the control board (P101). The connection between control board and display board is provided by a male connector (J100) on the control board and a female connector (P100) on the display board. On the control board a keyboard connector (J101) is placed where the keyboard foil has to be inserted.

TECHNICAL SPECIFICATIONS

The CB6402 is supplied by two voltages from the radio.

Supply voltage 1
10.8 - 15.6 V DC (13.2 V nom.)

Current drain 1
max. 210 mA (Backlight off)

Supply voltage 2
+5 V ± 10%

Current drain 2
max. 1.5 mA

Temperature range
Operating -25°C to +60°C
Storage   -40°C to +70°C

H-BUS CONTROL SIGNALS

Maximum input
Lo voltage: (1.0 V)

Minimum input
Hi voltage: (3.2 V)

Maximum outputs
Lo voltage: (0.4 V)

OUTPUTS

On/off signal: (active high) pulse
Hi voltage >1.2 V
Lo voltage <0.2 V

INPUTS

Hook (SW2)
The CB6402 has a HOOK input. This input is called SW3. When connecting this point to GND the helmet is on and the front symbol for helmet will light up.
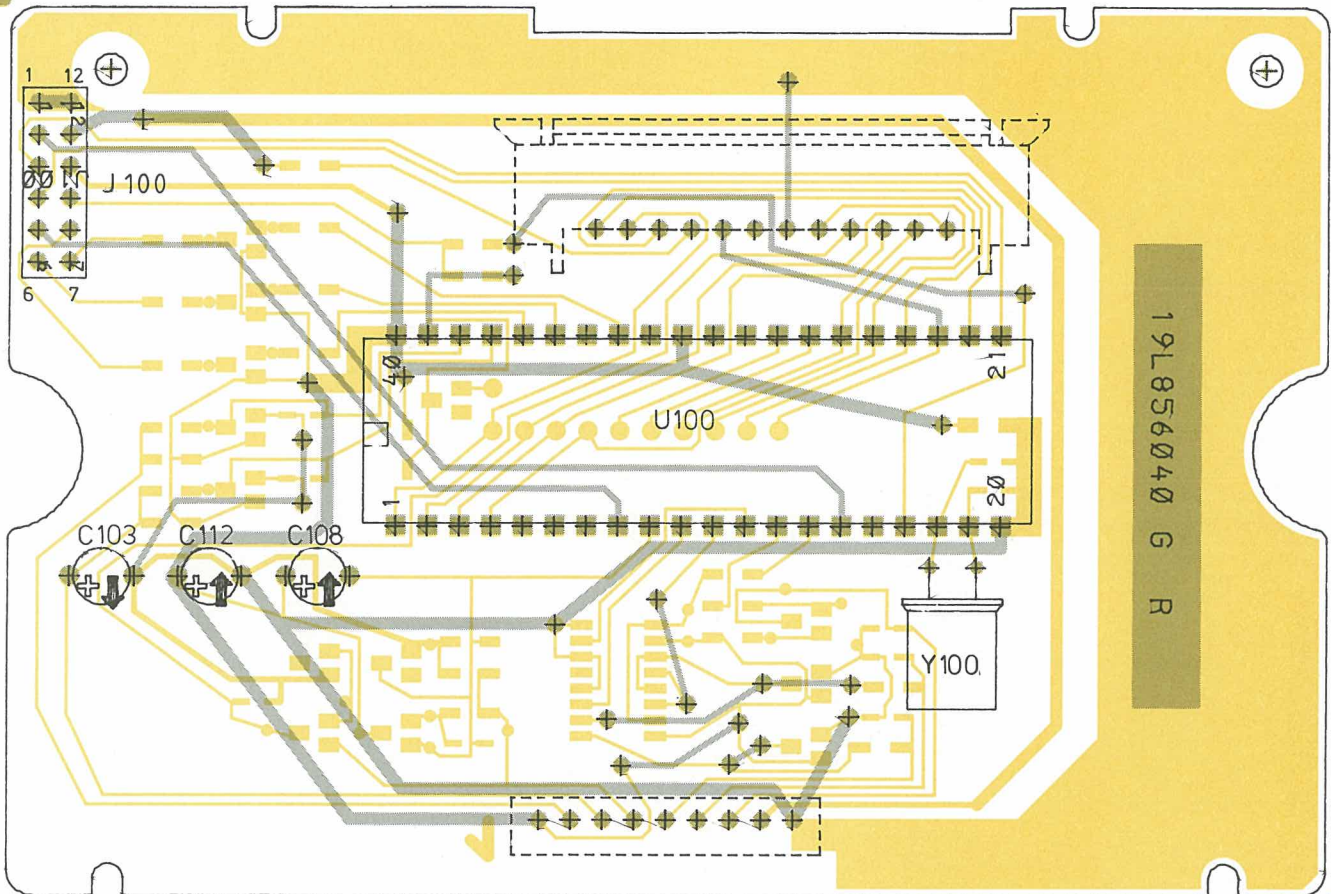
PTT (SW1)
The CB6402 is prepared for a PTT input. This input is on the PWB called SW1 (Low causes a PTT signal on the H-bus).
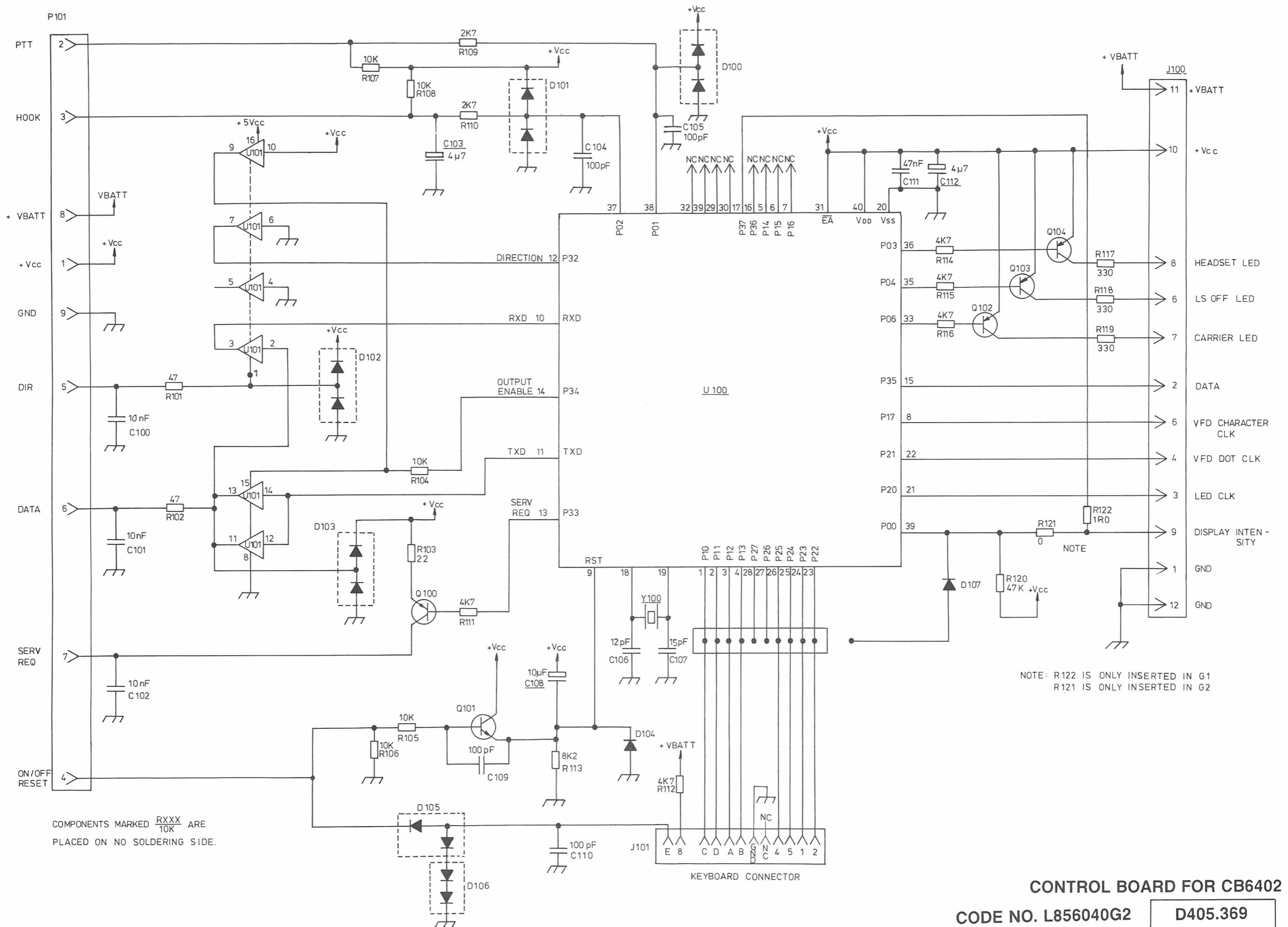
CONTROL BOARD FOR CB6402
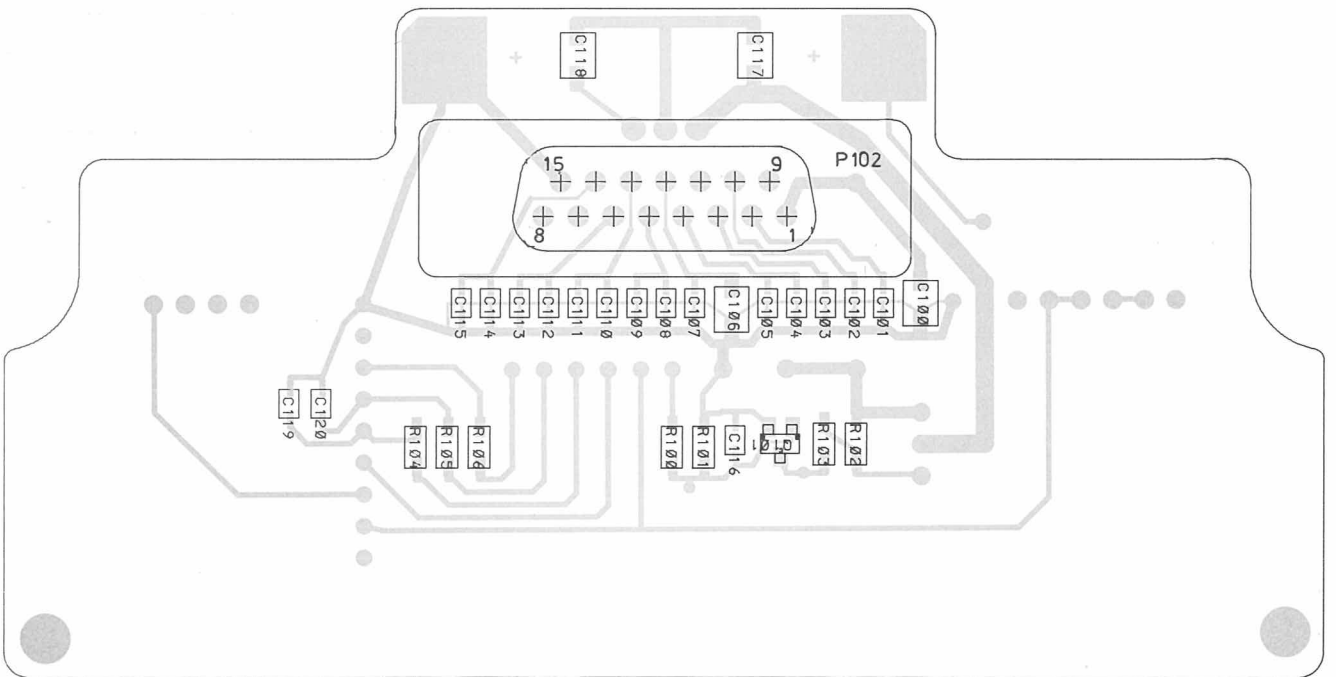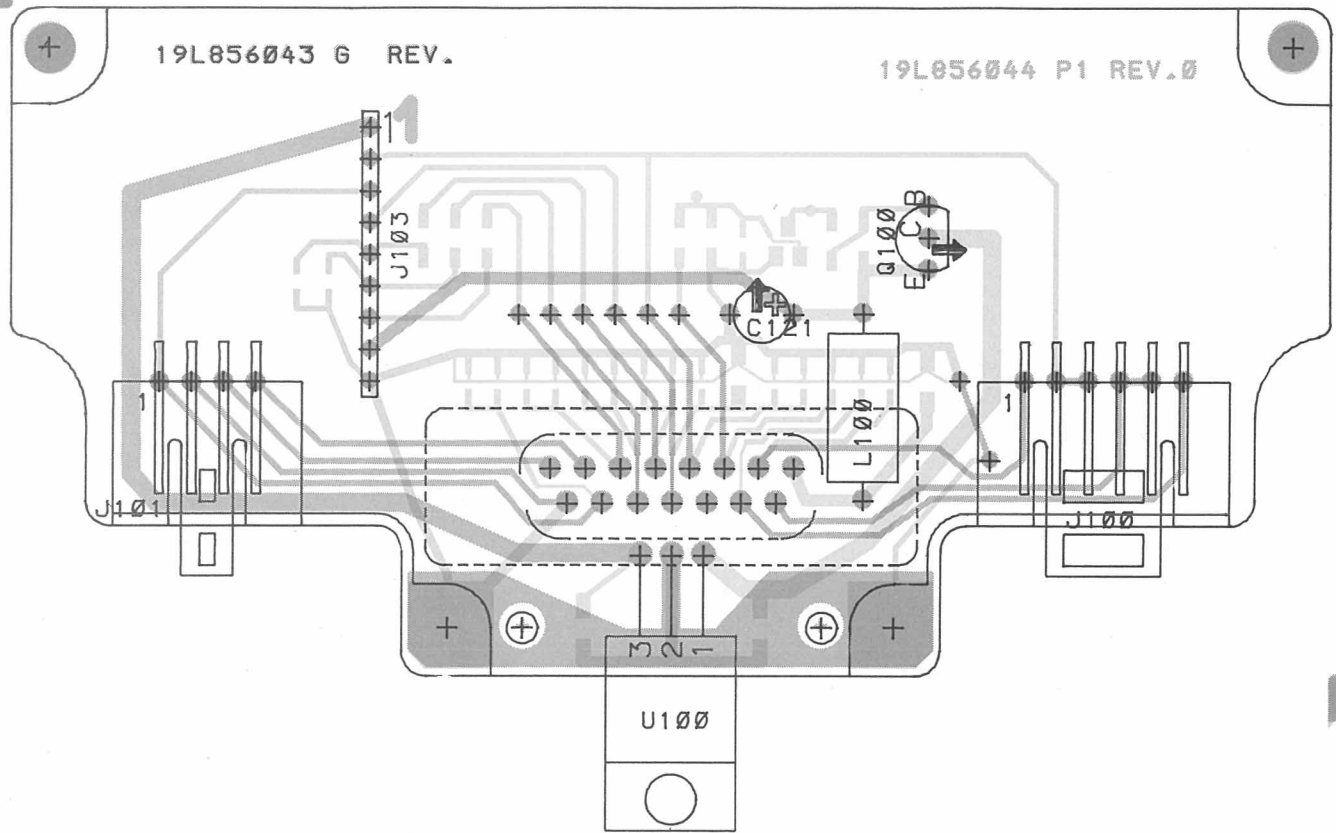**COMPONENT LAYOUT**

| D405.370 | CODE NO. L856040G2 |

J 100

U100

19L856040 G R

C103   C112   C108

Y100

P101
1 2 3 4 5 6 7 8 9

D105   Q101   C109
C110   R105
D106   D104   R106
             R113

D102   R101
       C100
D103   R102
       C101
G100   C102

U101

R103
R111
R104

R108
R110   Q101   C104
R107   Q100   R120
R109   Q100   C105   D107

R117   Q104   R114
R118   Q103   R115
R119   Q102   R116

R121
R122

R112

C107
C106
C111

J101
5 C 1 8 2 Nc B E A 4 D
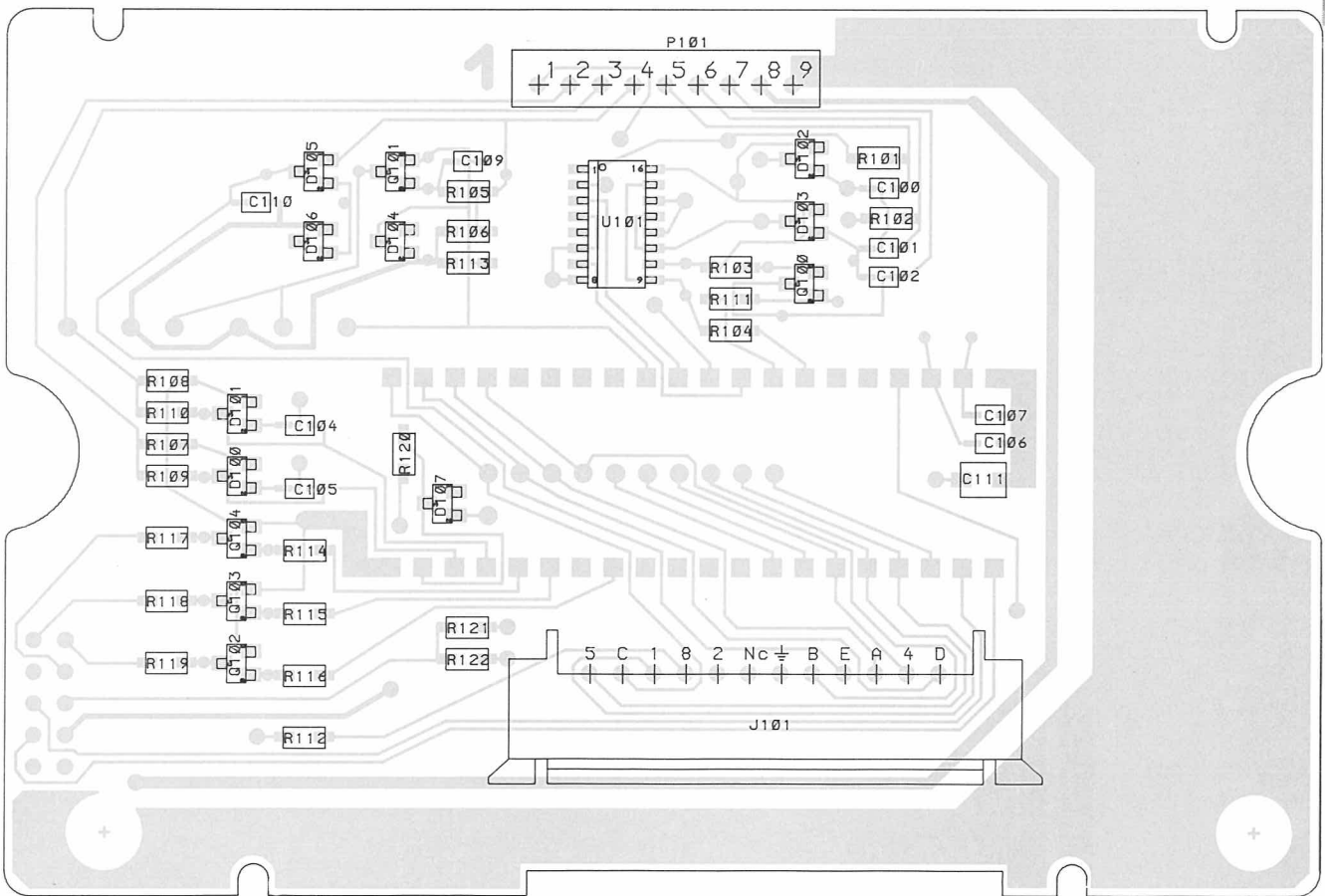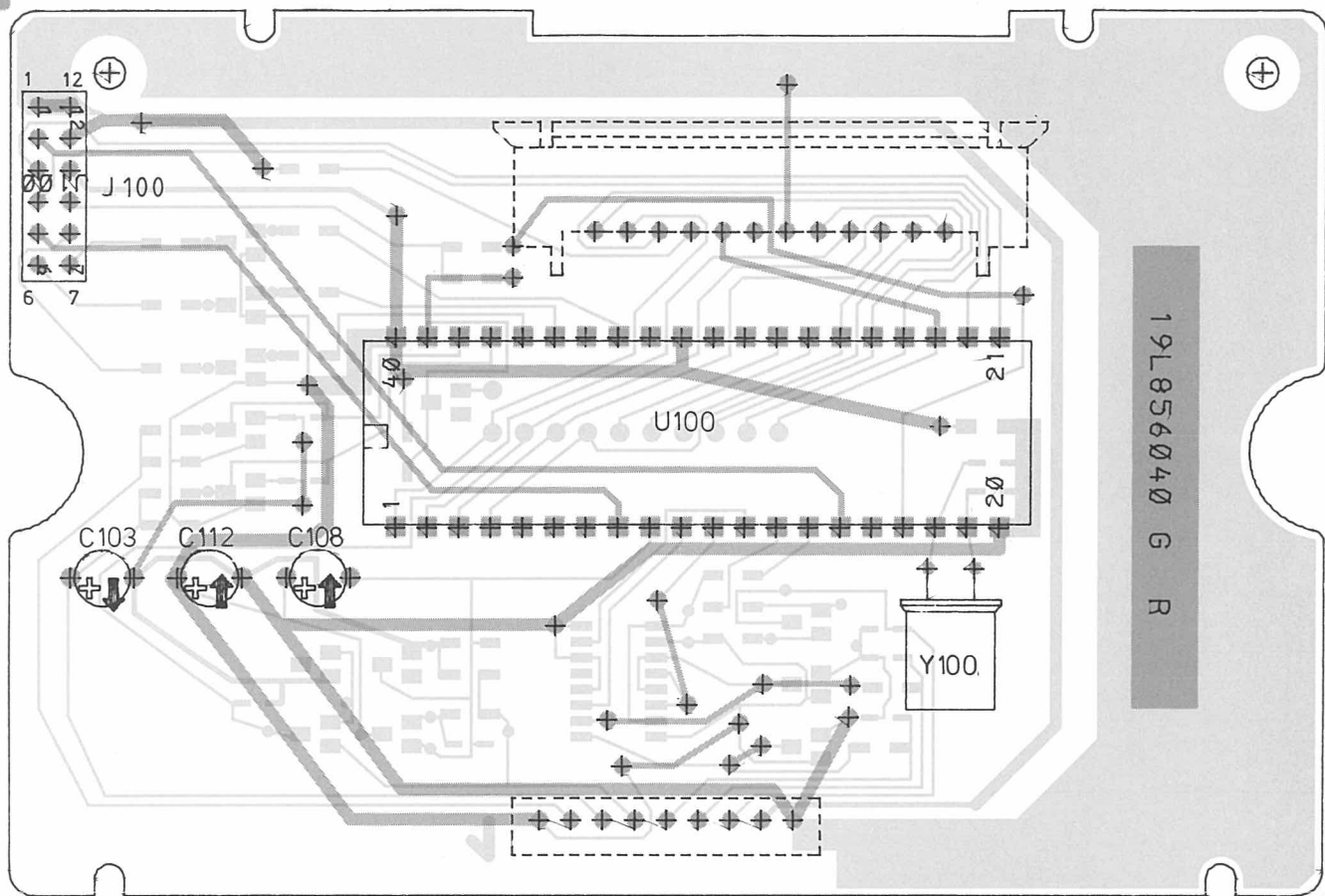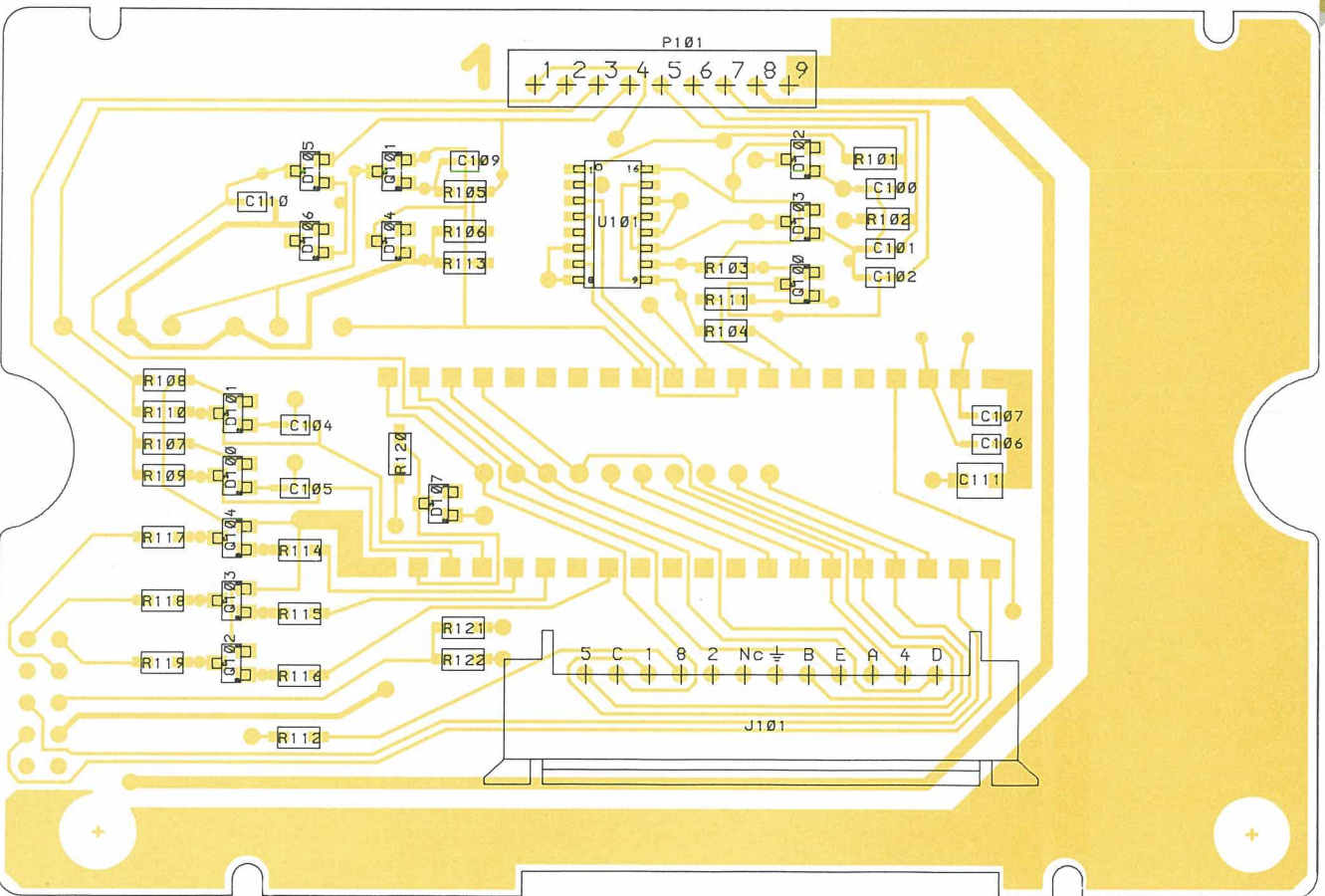
CONTROL BOARD FOR CB6402
COMPONENT LAYOUT

D405.370   CODE NO. L856040G2
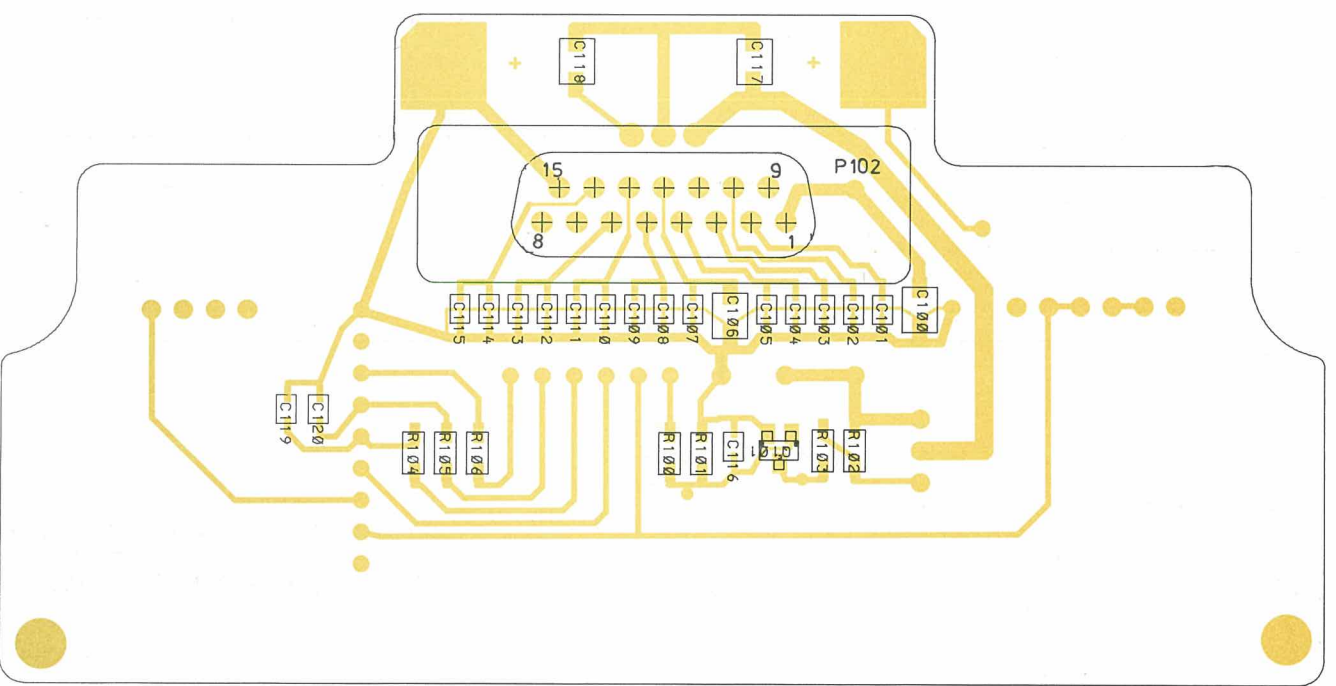
CONTROL BOARD FOR CB6402

CODE NO. L856040G2   D405.369

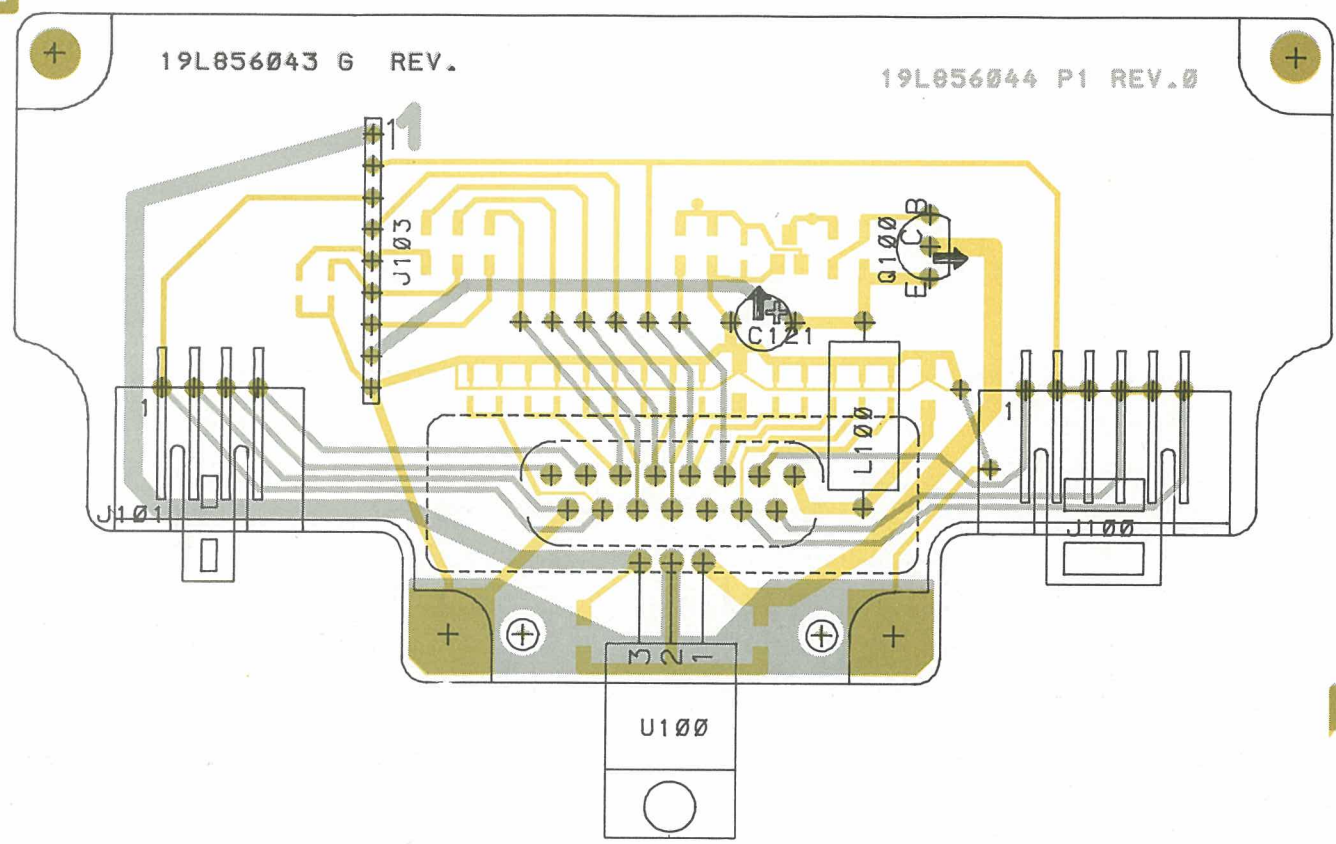19L856043 G REV.

19L856044 P1 REV.0

J103

J101

Q100
E C B

C121

U100

J100

U100

C118

C117

15   9
P102

8   1

C115 C114 C113 C112 C111 C110 C109 C108 C107 C106 C105 C104 C103 C102 C101 C100

C119 C120

R104 R105 R106   R100 R101 C116   R103 R102

JUNCTION BOARD FOR CB6402
COMPONENT LAYOUT

D405.373   CODE NO. L856043G2

19L856043 G REV.

19L856044 P1 REV.0

JUNCTION BOARD FOR CB6402
COMPONENT LAYOUT
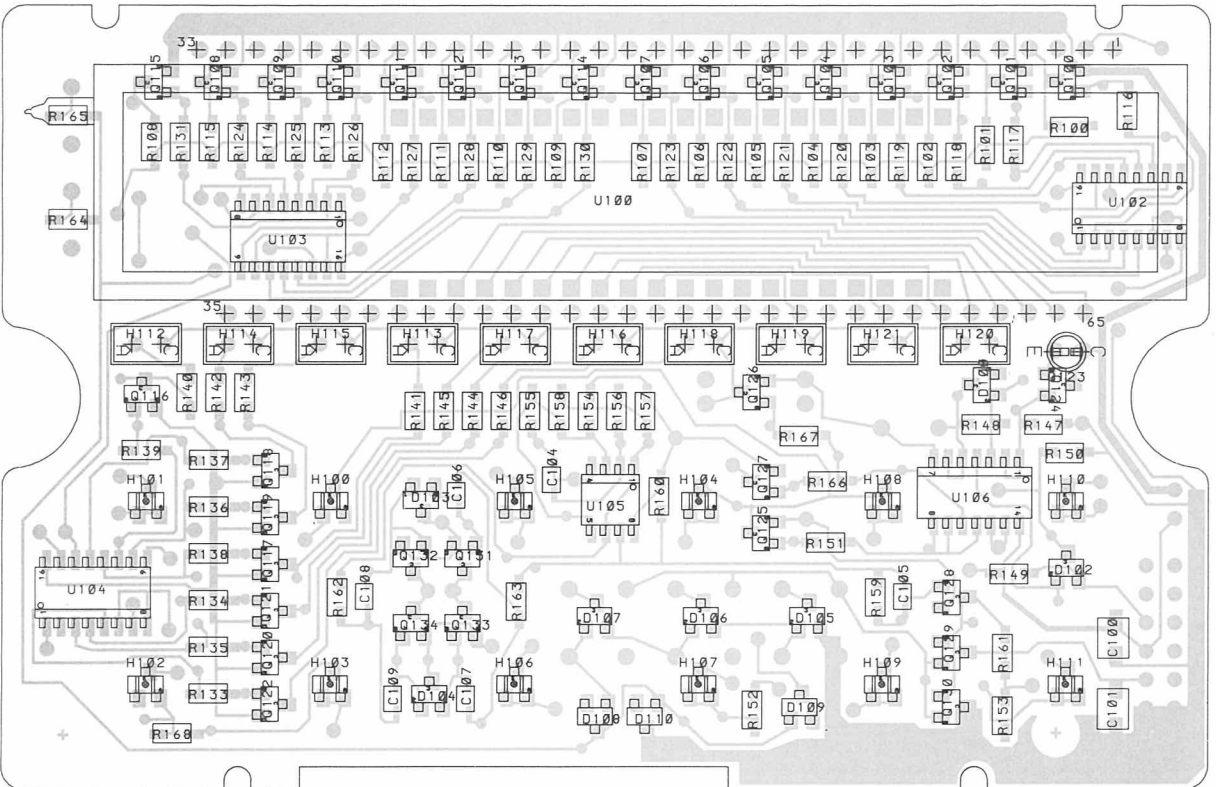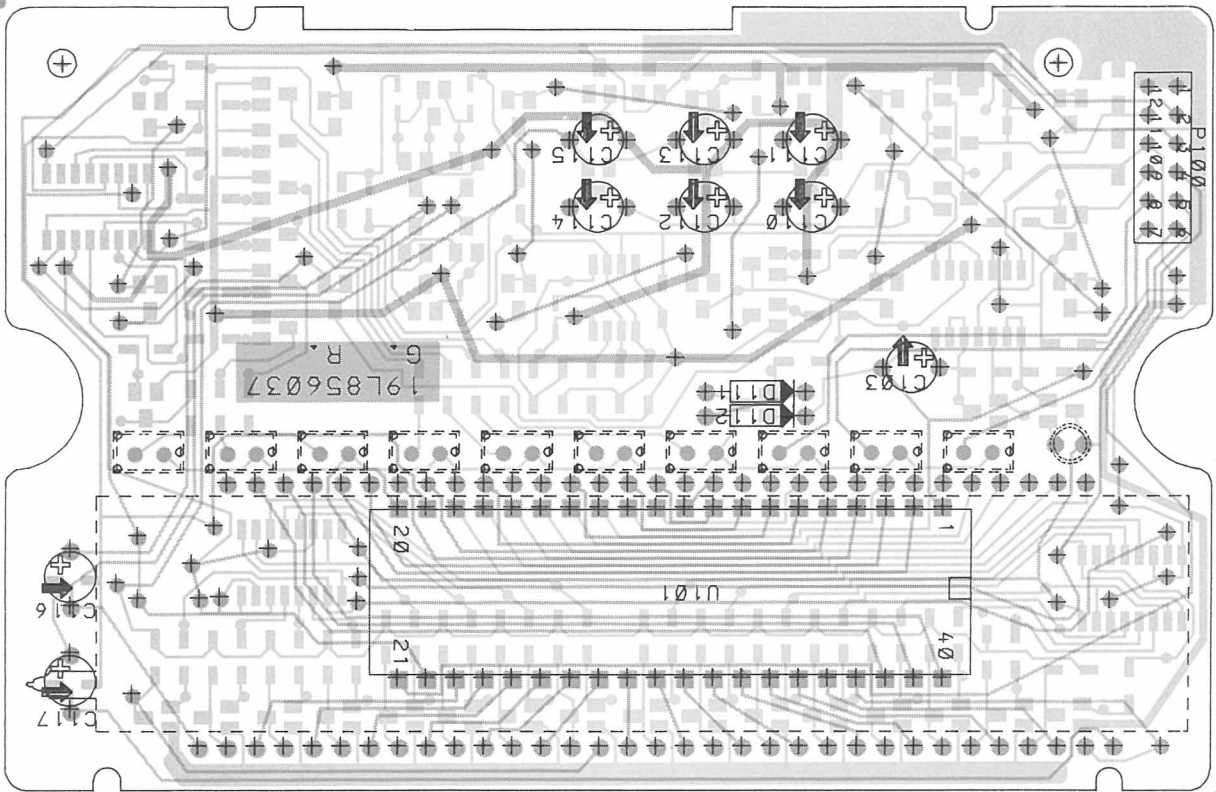
D405.373   CODE NO. L856043G2
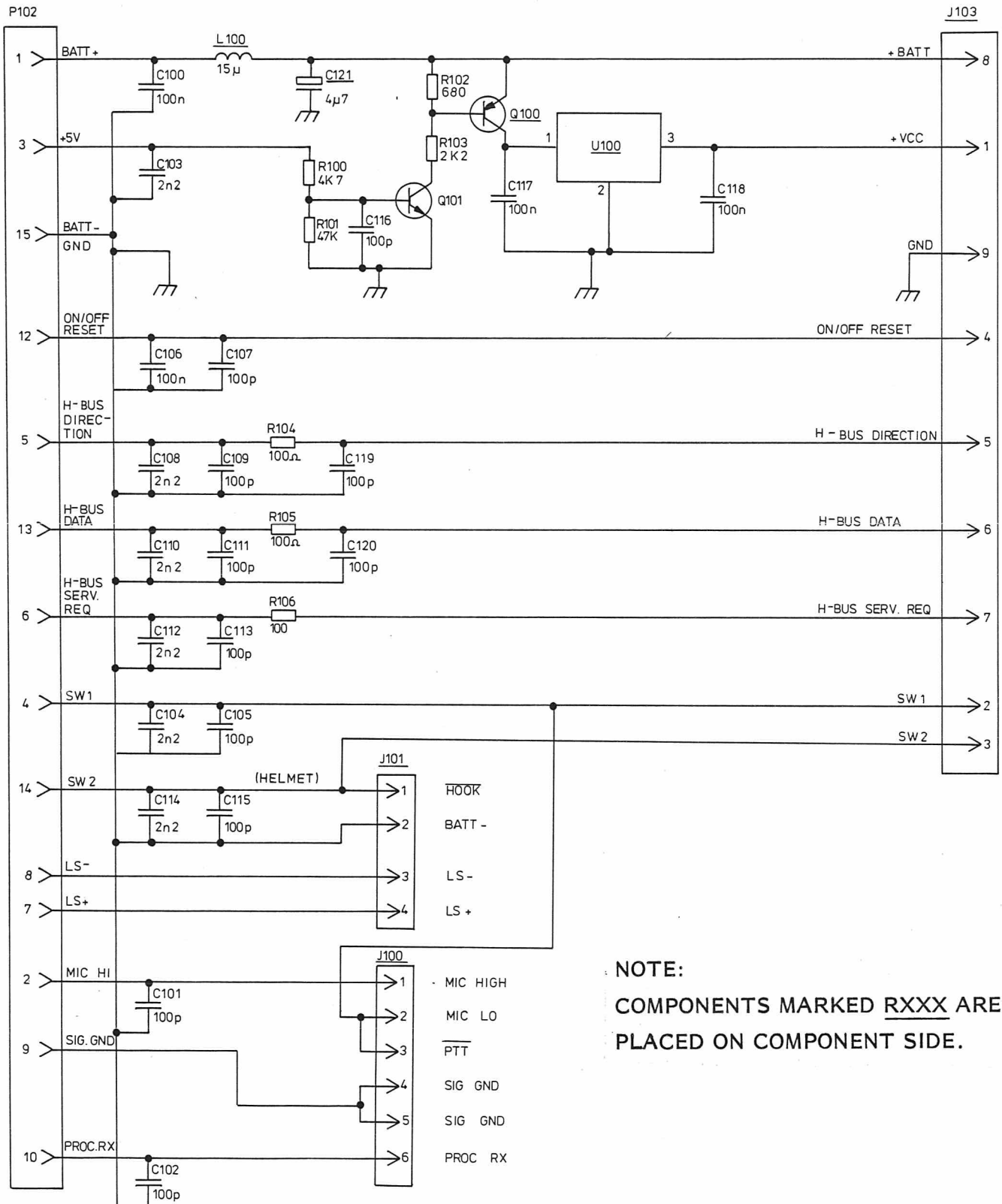
NOTE:

COMPONENTS MARKED RXXX ARE

PLACED ON COMPONENT SIDE.

JUNCTION BOARD FOR CB6402
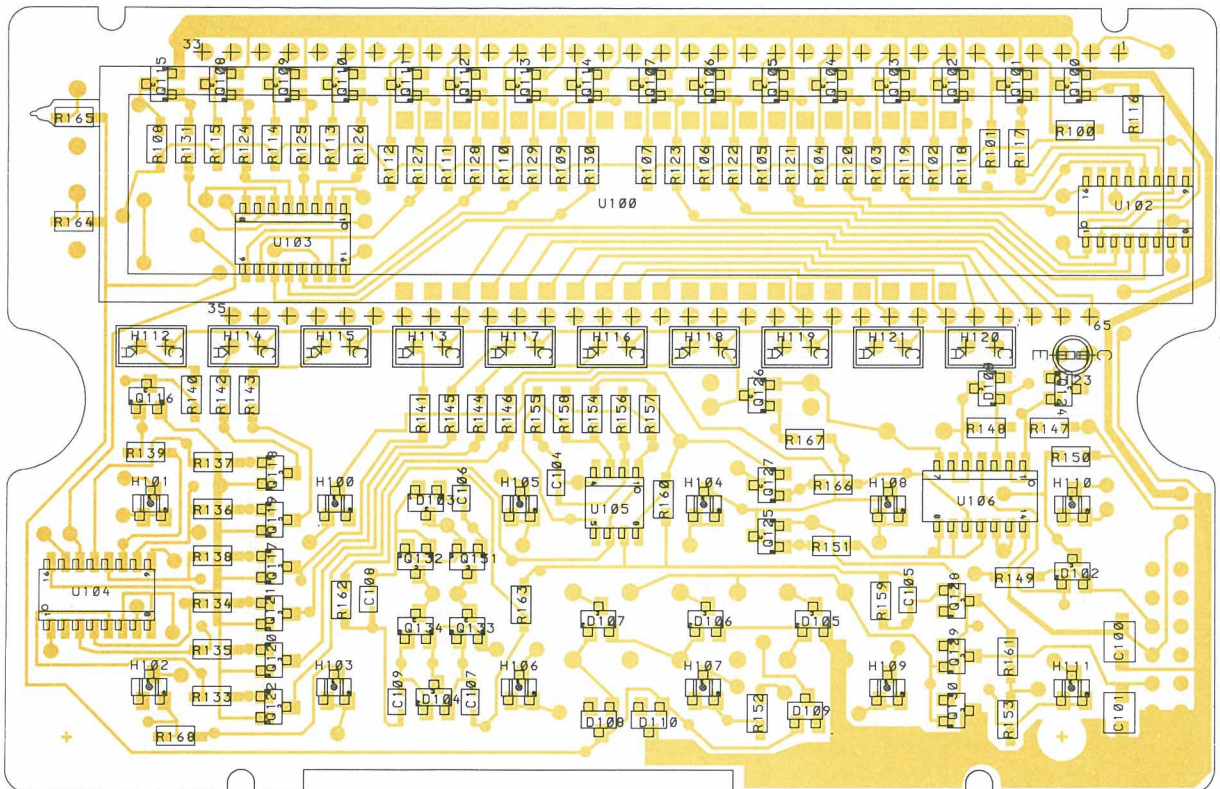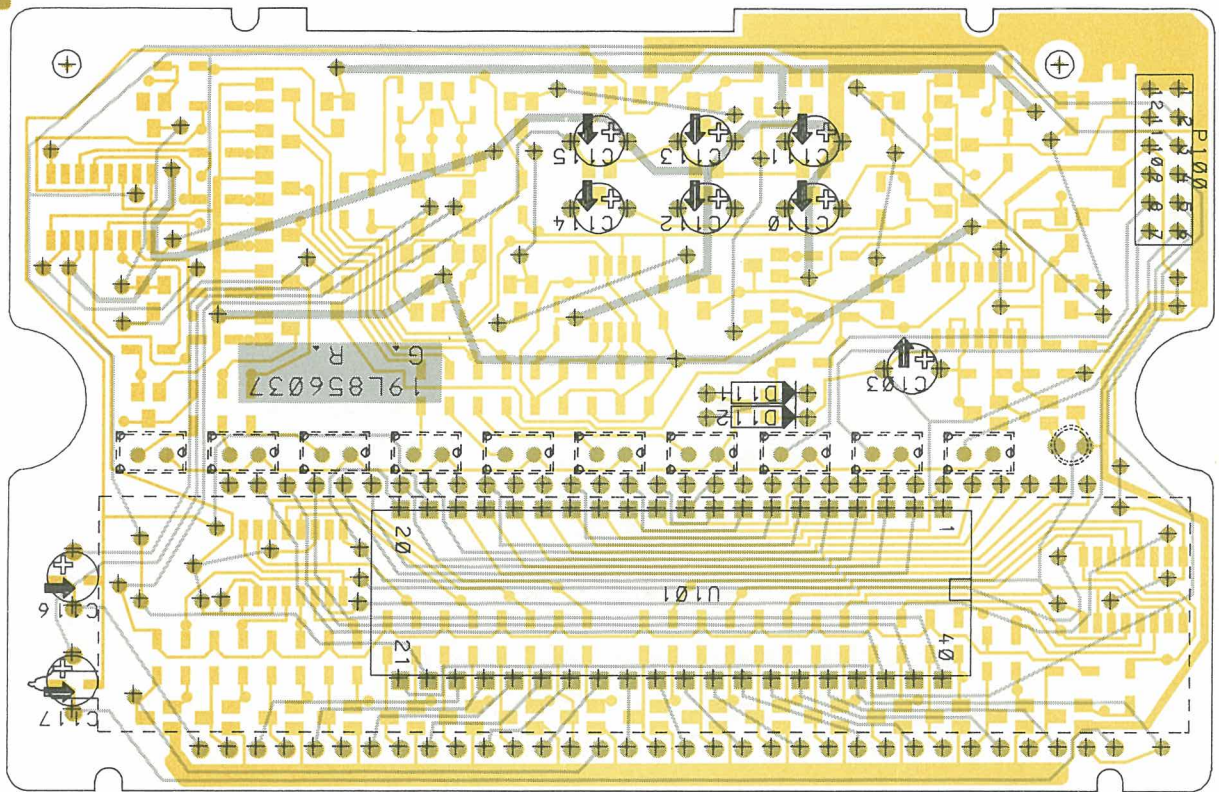
CODE NO. L856043G2 D405.372

DISPLAY BOARD FOR CB6402
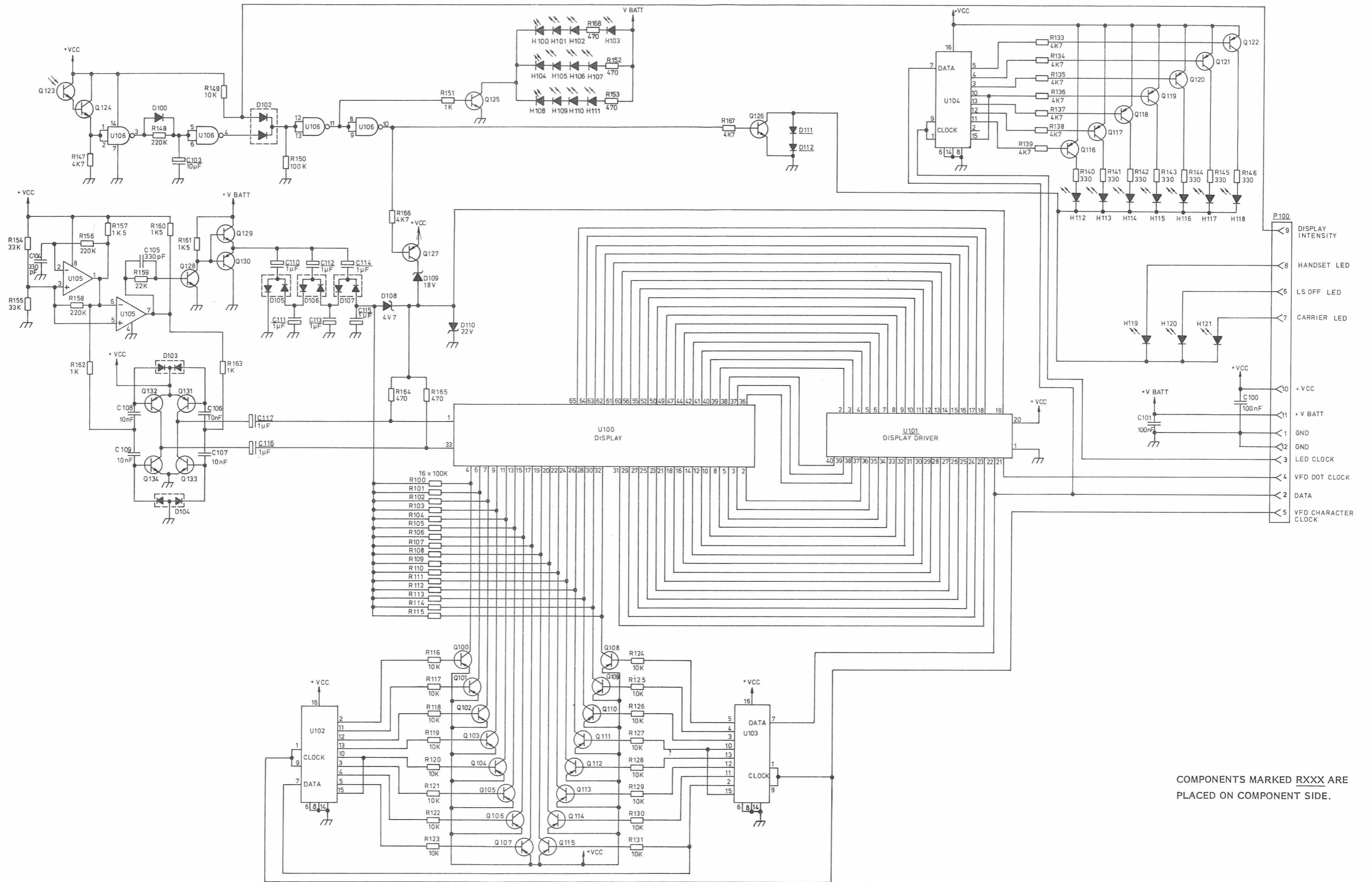COMPONENT LAYOUT

D405.376   CODE NO. L856037G2

DISPLAY BOARD FOR CB6402
COMPONENT LAYOUT

| D405.376 |

CODE NO. L856037G2

DISPLAY BOARD FOR CB6402
CODE NO. L856037G2   D405.375

COMPONENTS MARKED RXXX ARE
PLACED ON COMPONENT SIDE.

Sales Information Letter

Re: **Add-on to CQM6000 EF software nomenclature**

The introduction of the CB6202, CB6201 and CB6402 control boxes has caused that a new software option is added to the software nomenclature, describing the type of control applied for the actual tranceiver.

Likewise, a few parametres in the the standard EF software have been affected as they are either not supported by the new control boxes or only supported to a limited extent. These differences are accounted for below.

Moreover, some problems regarding the compatibility of the EC and EF firmware packages have been identified recently; these are for convenience stated below and incorporated in the add-on to the software nomenclature.

One issue arises from the fact that the **PRI** option subfunctions have got different default values depending on the value assigned to **PRI**.

Finally, a timer (not stated in the software nomenclature!) has been added; this "call answer timer" has caused inconvenience in a few cases. The timer is fixed at 30 seconds, that is, the loudspeaker is automatically closed 30 seconds after carrier disappearence on reception of a selective call - in order to force a call into the queue after giving e.g. a lorry driver half a minute to respond. If, and only if, a **,BDT** of less than 30 seconds is specified then this timer will control loudspeaker switch off.

With reference to the "CQM6000 SOFTWARE MANUAL" the hereby caused additions and comments are stated below:

The following main term identifier is added between the **PAK** and **CNU** options:

CBT Control Box Type 1 = CB6001 Comprehensive Panel (Default value)
2 = CB6101 Comprehensive Handset
3 = CB6202 Standard
4 = CB6201 Comprehensive IP54
5 = CB6402 Compact

The following EF software parametres are affected by the new control boxes:

GTE Group Tone Entry The group tone will be displayed as a "*"
when the multicall sequence is scrolled
through - if **CBT** = 3 or 5 is specified

ADI Address Digit May only assume the values 0 - 3 if
Indicator **CBT** = 3 or 5 is specified.

SDI Status Digit May only assume the values 0 - 1 if
Indicator **CBT** = 3 or 5 is specified

,DTM DTMF Mode Cannot be used if **CBT** = 3 or 5 is specified
Enable

,PAU Pause Cannot be used if **CBT** = 3 or 5 is specified

BYE DTMF Termination
Cannot be used if **CBT** = 3 or 5 is specified
Telegramme

The different **PRI** subfunction defalt values, as controlled by the value assigned to **PRI**, are stated below:

PRI	N	Y
,BDT	N	10
,MAT	Y	Y
,MAC	Y	N

Finally, it is remarked that queue mode cannot be accessed if
CBT = 5 is specified and that code plug can not be used for CBT= 3 or 5

The abovementioned changes and additional information will be stated in the next update of the CQM6000 Software Manual.

Regards

Jorgen D. Pedersen

Product Marketing Copenhagen