

Horloge de base à quartz  
Basis-Quarzhauptuhr  
Basic quartz clock  
Reloj de base de cuarzo

*CristalTime*

**QCM-1**

Oy GEFCO Ab  
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SF-00250 HELSINKI  
Puh. 90-490386/Fax 90-442196

**FAVAG SA** Neuchâtel (Suisse)

Equipements pour installations horaires et acoustiques  
Uhren- und Akustikanlagen  
Equipment for Time-Keeping and Public-address Installations  
Equipos para instalaciones horarios y acústicos



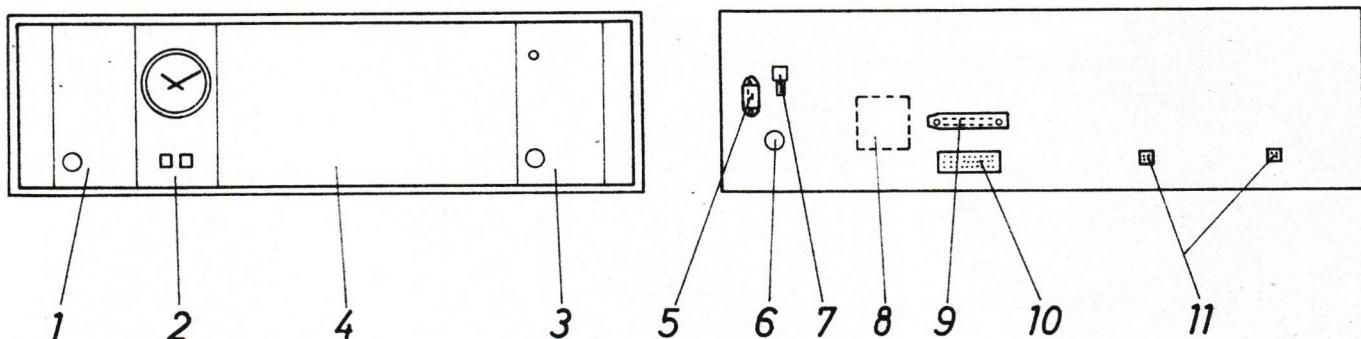
Q U A R T Z   B A S I C   C L O C K   type   QCM-1, ref. 3046.010

The quartz basic clock is the controlling element of a time-keeping installation.

It is equipped with electronic circuits designed for specific functions as follows:

- Stabilized power supply
- Impulse collector
- Quartz time base
- Frequency divider
- Generator of control signals
- Amplifier for minute-line

All those functions are performed by three basic plug-in modules. The clock can be equipped on desire with additional modules such as line relays, programmers, etc. (see table).



1. Impulse collector module ref. 3046.102
2. Control module ref. 3046.103
3. Supply module
4. Space for additional modules
5. Mains connector
6. Mains fuse
7. Switch 110/220 Volts
8. Label plate for connection to plug 9
9. 16-pole plug for connection to the time-keeping network
10. 36-pole plug for connection to other FAVAG instruments
11. Connectors for high-current or step-by-step relays supplied on request (only for clocks equipped with a programmer).

Control pushbuttons

The clock is equipped with pushbuttons of two different types:

- a) Impulse pushbuttons returning to their original position when released.
- b) Latching pushbuttons which need a second push for their release. Latching pushbuttons are lit when they are "in", but only if the power network is active.

CHARACTERISTICS

Power supply:	220/110 Volts, 50 - 60 Hz
Operating precision:	$\pm 0,1$ second/24 hours, from 15 to $25^{\circ}$ C
Control impulses:	Minute-impulses
Polarized minute-impulses:	Output of 24 Volts/1 Amp. (cannot be used if the installation includes other lines)
Impulse time:	1 or 2 seconds, commutable
Operating reserve:	68 hours with electronic impulse collector
Time correction:	Semi-automatically by luminous push-buttons at the frequency of 1 impulse every 2 or 4 seconds
Resetting:	Automatically after a failure of the mains, at the same frequency as that for time correction
Display:	By minute-impulsed control movement
Equipment possibilities:	4 M (see modules thereafter) Current available to the lines: 2 Amps.
Extension possibilities:	1 translation element TRC ref. 3046.034 Programmer EPR ref. 3046.027
Operating temperature range:	from 0 to $60^{\circ}$ C

SYSTEME MODULAIRE — POSSIBILITES D'EQUIPEMENT  
MODULAR SYSTEM — EQUIPMENT POSSIBILITIES

MODULAR-SYSTEM — AUSRUEST — MOEGLICHKEITEN  
SISTEMA MODULAR — POSIBILIDADES DE EQUIPO

		QMS-1		TR-1		QCM-1		TRC		QMS-2 / QMS-3		TR-2 / TR-3		2 QMS-2 / 2 QMS-3		EPR			



## ÉLÉMENTS - ELEMENTEN - ELEMENTS - ELEMENTOS

QMS	Horloge de base à quartz - min./sec. Basisquarzuhr - Min./Sek. Basic quartz clock - min./sec. Reloj de base a cuarzo - min./seg.	QCM	Horloge de base à quartz à collecteur d'impulsions - Basisquarzuhr mit Impulskollektor - Min. Quartz basic clock with impuls collector - min. Reloj de base a cuarzo con memoria de impulsos - min
2 QMS	Double horloge de base à quartz avec commutation automatique min./demi-min./sec. Doppel-Basisquarzuhr mit Ueberwachung und automatischer Umschaltung für Min./Halbmin./Sek. Double quartz basic clocks with automatic change-over min./½-min./sec. Reloj de base a cuarzo doble con conmutador automático min./½-min./seg.	TR	Elément de translation Translationselement Translation Element Elemento de translación
		EPR	Elément de programmation Programm-Element Programme Element Elemento programador

- 1	Alimentation secteur avec réserve de marche Netzspeisung mit Gangreserve Mains Power supply with running reserve Alimentación red eléctrica con reserva de marcha	- 2	Alimentation externe 24 V Externe Speisung 24 V 24 V-external Supply Alimentación externa 24 V	- 3	Alimentation externe 48 V Externe Speisung 48 V 48 V-external Supply Alimentación externa 48 V
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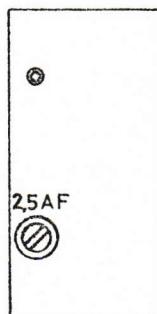
## MODULES COMPLÉMENTAIRES - ZUSATZ-MODULS - ADDITIONAL MODULES - MODULOS COMPLEMENTARIOS

LM	Module de ligne à minute pour branchement parallèle Minuten-Linienmodul für Parallelbetrieb Minute-line module - parallel connection Modulo de linea de minuto conexión en paralelo	LMs	Module de ligne à minute pour branchement série Minuten-Linienmodul für Seriebetrieb Minute-line module - series connection Modulo de linea de minuto conexión en serie
LS	Module de ligne à seconde pour branchement parallèle Sekunden-Linienmodul für Parallelbetrieb Second-line module - parallel connection Modulo de linea de segundo, conexión en paralelo	LSS	Module de ligne à seconde pour branchement série Sekunden-Linienmodul für Seriebetrieb Second-line module - series connection Modulo de linea de segundo, conexión en serie
LdM	Module de ligne à demi-minute pour branchement parallèle Halbminuten-Linienmodul für Parallelbetrieb ½-minute line module - parallel connection Modulo de linea medio-minuto - conexión en paralelo	LdMs	Module de ligne à demi-minute pour branchement série Halbminuten-Linienmodul für Seriebetrieb ½-minute line module - series connection Modulo de linea medio-minuto - conexión en serie
PR	Programmateur à 2 circuits Programm-Modul für 2 Kreise 2-circuits Programmer Programador de 2 circuitos	SY-M	Module pour synchronisation par impulsions externes Modul für Synchronisation durch externe Minutenimpuls Module for synchronization by external minute impuls Modulo para sincronización por impulsos externos de
L12S	Module de ligne à impulsions chaque 12 secondes Linienmodul für Impulse alle 12 Sekunden Line Module for impulses every 12 seconds Modulo de linea para impulsos cada 12 segundos	L36S	Module de ligne à impulsions chaque 36 secondes (1/100) Linienmodul für Impulse alle 36 Sekunden (1/100 Std.) Line Module for impulses every 36 seconds (1/100th o Modulo de linea para impulsos cada 36 seg. (1/100 d
OS	Oscillateur thermostaté de haute précision (0,002 s/24 h) Thermostatisierter Präzisionsoszillator (0,002 S/24 Std.) High-precision thermostated Oscillator (0,002 s/24 h) Oscilador de alta precisión con termostato (0,002 s/24 h)	OSG	Idem OS avec générateur demi-minute incorporé Idem OS mit eingebautem Halbminuten-Generator Idem OS with incorporated ½-minute generator Idem OS con generador ½-minute incorporado
GdM-M	Générateur demi-minute/minute Halbminuten/Minuten-Generator ½-minute/minute Generator Generador ½-minuto/minuto	HBG	Récepteur HBG Prangins Empfänger HBG Prangins HBG Prangins Receiver Receptor HBG Prangins

## OPTIONS - OPTIONEN - OPTIONS - OPCIONES

ST	Surveillance de tension de batterie Batteriespannungs-Ueberwachung Battery-voltage surveillance Vigilancia de tensión bateria	ALD	Relais d'alarme à distance Relais für Alarm-Fernübertragung Remote-alarm Relay Relé de alarma a distancia
MES	Volt-Ampèremètre d'alimentation Volt- und Ampèremeter für Speisung Power Supply Voltmeter-Ammeter Volt-Ampermétre de alimentación	OS-TC	Oscillateur thermocompensé précision (0,02 s/24 h) Thermokompensierter Präzisionsoszillator (0,02 Sek. Thermo-compensated Oscillator precision (0,02 sec./ Oscilador termo-compensado precisión (0,02 seg./24
SYNC	Dispositif pour la synchronisation par des impulsions externes à minute ou à seconde Einrichtung für die Synchronisation durch externe Minuten- oder Sekunden-Impulse Device for the synchronization by external minute or second impulses Dispositivo para la sincronización por impulsos externos de minute o de segundo	CTF	Relais courant fort 250 V/10 A Starkstromrelais 250 V/10 A 250 V/10 Amps-strong current Relay Relé de corriente fuerte 250 V/10 A
ALS	Dispositif d'alarme en cas de panne secteur Alarmkreis für Netzspannungsüberwachung Alarm device in case of mains failure Dispositivo de alarma en caso de avería del sector	PP	Relais pas-à-pas 250 V/10 A Schrittschaltrelais 250 V/10 A 250 V/10 Amps step-by-step Relay Relé paso a paso 250 V/10 A

S U P P L Y M O D U L E 220/110 Volts, ref. 3046.100



This module transforms the mains alternating voltage into the 24-Volt direct voltage required to feed the lines and the clock. It includes:

On the rear:

- A mains input plug
- A protecting fuse for the transformer  
for 220 Volts: 0,4 AT  
for 110 Volts: 0,8 AT
- A 220/110 Volt switch

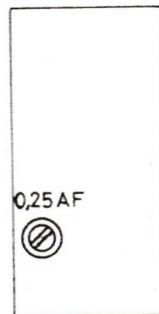
On the front plate:

- A mains pilot-light
- A 2,5 AF protecting fuse for the power supply

Input voltage

The module is normally supplied for 220 Volts. For operation on 110 Volts proceed as follows:

1. Disconnect the mains cord
2. Unscrew the data plate blocking the voltage switch 7
3. Exchange the 0,4-AT fuse against a 0,8-AT fuse
4. Reverse the switch 7
5. Replace the data plate to the 110-Volt side

IMPULSE COLLECTOR MODULE, ref. 3046.102

The impulse collector replaces the traditional operating reserve unit made of a battery of accumulators. It isn't a real operating reserve unit, but rather an automatic resetting device. It operates in the following cases:

- a) In case of an interruption of the mains
- b) In case of a short-circuit on the minute-line connected to the control module

Principle of operation

An interruption of the mains or a short-circuit on the line stops the installation. The time base and the impulse collector only remain in operation thanks to a small water-tight battery of high capacity. At the moment the breakdown occurs an electronic memory starts to count and store the lost impulses. As soon as the main is on again, or the short-circuit disappears, the memory shall restore the lost impulses at an accelerated rate until the installation is again on time. Normal operation shall re-start at that instant.

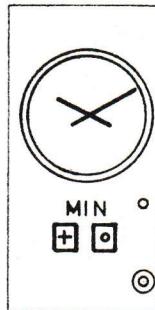
Memory capacity: 68 hours in minute-operation  
34 hours in half-minute-operation

Application with a programmer

While an installation is being automatically reset at an accelerated rate it becomes preferable not to transmit programmed signals. To this purpose a signal is sent to the programmer to stop emitting. At the end of resetting, the installation shall automatically return to normal operation.

Fuse

A 0,25-AF fuse is mounted on the front panel. It protects the battery and permits to put it out of operation during transport or during an interruption of the mains lasting longer than the capacity of the memory.

CONTROL MODULE M, ref. 3046.103

- 9<sup>5</sup>

DESCRIPTION

This module can be considered as the actual clock since it includes the quartz oscillator and generates all control signals required by the time-keeping installation, as well as polarized 24-Volt minute-impulses to operate the secondary clocks. All these functions are realized by two printed circuits. The front plate includes a minute-impulsed control movement and resetting pushbuttons designed for the following functions:

0 MIN Blocking of the control impulses. This function stops the control movement and the whole installation

+ MIN Accelerated action of the control movement and the whole installation at the following rate:

1 impulse every two seconds for an impulse time of 1 second.

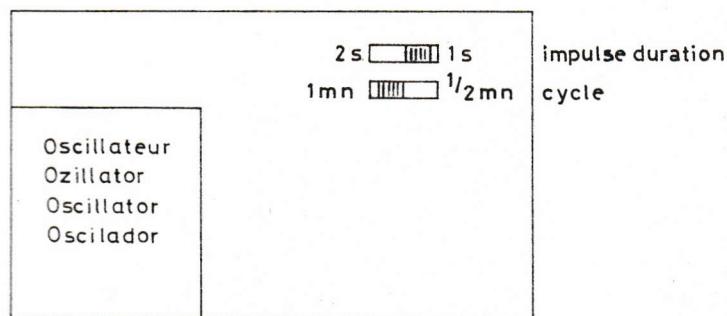
1 impulse every four seconds for an impulse time of 2 seconds.

Pushbutton 0 MIN has priority over pushbutton + MIN.

CIRCUITSControl circuit (placed to the right)

This circuit includes a frequency divider and a logic to produce the necessary control signals to the minute-line relays. Furthermore, it holds the plug-in quartz oscillator.

The control impulses can be selected for a time of 1 or 2 seconds by means of an inverter mounted on the circuit.



It must be remembered that the operating reserve is shorter with 2-second impulses. The clocks are usually supplied for 1-second impulses.

Note: The cycle inverter must always be in the position as shown on the drawing.

Line amplification circuit (placed to the left)

This circuit transforms control impulses into polarized 24-Volt minute-impulses. The output current is 1 Amp. and the amplifier is protected against overloads by means of an electronic fuse with automatic re-starting. This circuit feeds also the control movement of the module. Resetting is obtained with pushbuttons 0 MIN and + MIN.

Since resetting is not independent from the control movement the line output of this amplifier must be used only if the time-keeping station includes no other line modules.

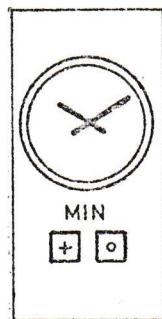
Line output: The line output is connected to terminals 3a/3b of plug 9.

Connect the line by means of the 16-pole plug supplied with the instrument

Important: All secondary clocks must indicate the same time as the control dial.

Fuse 1,6 AF: A miniature fuse is mounted on the printed circuit. It protects the amplifier in case of short-circuit between line and ground. The fuse must not burn in normal operating conditions.

MINUTE - LINE MODULE LM, ref. 3046.099



This module is designed as an accessory to the basic clocks and to the translation elements. It is a minute-line amplifier producing polarized impulses of 1-Amp maximum current under a voltage of 24 or 48 volts depending on the power supply.

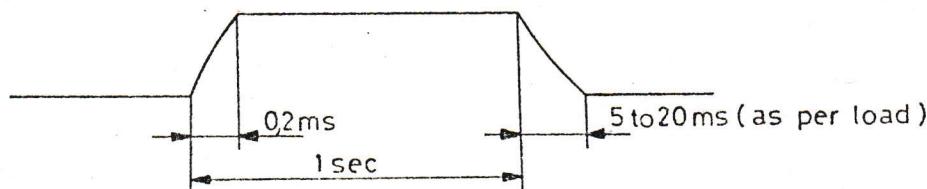
The front plate includes a line control movement and pushbuttons for the following functions:

- 0 MIN To stop the polarized line impulses
- + MIN To accelerate the emission of polarized impulses at the rate of:
  - 1 impulse every two seconds for an impulse time of 1 second (see control module)
  - 1 impulse every four seconds for an impulse time of 2 seconds (see control module)

Pushbutton 0 MIN has priority over pushbutton + MIN

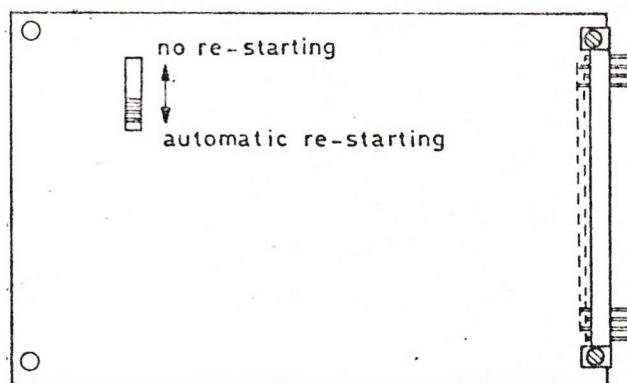
Impulses

In order to avoid overloads resulting from the inductivity of the line load, the amplifier is equipped with a device producing slope-sided impulses.



### Protection

The amplifier is protected by an electronic fuse which interrupts the output impulses in case of overload or short-circuit on the line. The amplifier shall re-start automatically as soon as an occasional fault has disappeared. However, re-starting can be prevented by operation of a switch mounted on the printed circuit inside of the module.



After operation of the electronic fuse the pushbutton 0 MIN lights up and blinks. This signal stays on even if the amplifier has automatically re-started.

Push the button 0 MIN to stop the signal.

### Operation with automatic re-starting

During an overload on the line, the output impulses are interrupted by the electronic fuse. Normal transmission of the impulses re-starts upon resumption of normal load. The fault signal appears as soon as the electronic fuse has operated and stays on until one pushes the button 0 MIN.

### Operation without automatic re-starting

In case of overload on the line, the electronic fuse shall interrupt the output impulses and start the fault signal. As the overload disappears, the output remains interrupted. Push the button 0 MIN to stop the fault signal and to re-start the output impulses.

### Note

The electronic fuse operates only if an overload or a short-circuit occurs during the time of an impulse. A short-circuit on the line between two impulses has no effect.

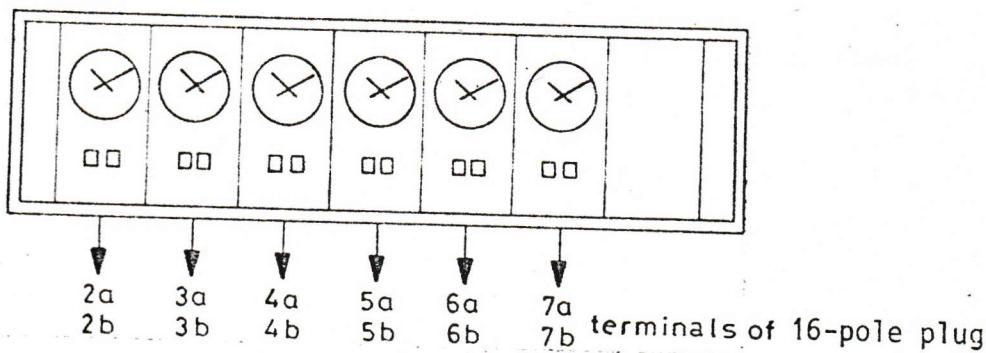
Fuse 1,6 AFF

A super fast-acting miniature fuse is mounted on the printed circuit. It protects the amplifier in case of a short-circuit between line and ground. This fuse must not burn in normal operating conditions.

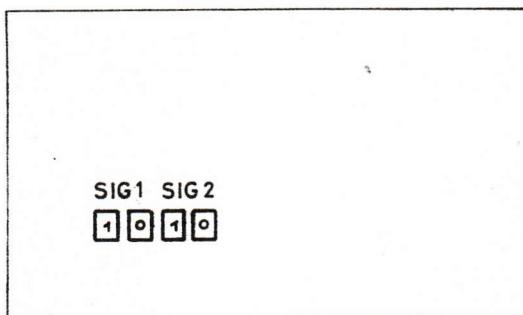
Connections

The LM module can be installed in different places of a basic clock or translation element. Each place includes two terminals connected to the 16-pole plug mounted on the rear of the chassis. The output terminals corresponding to a line module are therefore determined by the relative position of that particular module in the chassis.

Connect the minute-line to the module as per following indications. The same indications are repeated on the label plate mounted next to the plug 9.



Important: All the secondary clocks must indicate the same time as the module control dial.



See also on page 7

### 1. Generalities

The programmer is designed for the distribution of signals over two circuits with two possibilities of programmes each. It is driven by a movement with polarized minute-impulses.

To remove the module, loosen 4 screws on the side of the front frame and take the frame off. Unscrew both knurled knobs up to the stop and pull the module out.

The programmer is a mechanical assembly including:

- 1) One 60-minute-wheel "a" made of 6 discs with 60 notches each. The distance from one notch to the next corresponds to one minute. These discs can actionate 6 contacts (1 to 6, B-view).
- 2) One 24-hour-wheel "b" made of 6 discs with 288 notches each. The distance from one notch to the next corresponds to 5 minutes. These discs can operate 6 contact (7 to 12, C-view).
- 3) One week-wheel "c" made of 4 discs with 14 notches each. The distance from one notch to the next corresponds to half a minute. These discs can operate 4 contacts (13 to 16, C-view).

The notches No. 1 correspond to sunday morning  
from 00.20 to 12.20 h

The notches No. 2 correspond to sunday afternoon  
from 12.20 to 00.20 h

The notches No. 3 correspond to monday morning  
from 00.20 to 12.20 h  
etc.

The notches No. 14 correspond to saturday afternoon  
from 12.20 to 00.20 h

In addition to its mechanical elements the programmer is equipped with:

- 4) A timer "d" to adjust the time of the signals from 1 to 30 seconds by means of potentiometers. Potentiometer P1 limit the time of circuit 1 and P2 the time of circuit 2. Clockwise rotation of a potentiometer increases the time. The circuit includes also 2 relays with one contact each of following characteristics:

U max : 125 VAC / 110 VDC  
I max : 2,5 AAC / 1 ADC  
P max : 100 VA / 30 W

The output plug for the signals is of low-current type. One or two high-current relays with step-by-step contacts and separate outputs can be supplied on request.

- 5) Four pushbuttons SIG 1 and SIG 2 ("1" and "0")  
A push on the button(s) "1" sends a signal to the corresponding circuit. The time of the signal corresponds to the time of the push. A push on the button(s) "0" interrupts the signals to the corresponding circuit (vacations, holidays, etc.). A second push on the button "0" is necessary to release it.
- 6) Two switches "e1" and "e2" to permit switching over to the appropriate tracks as per selected programmes and circuits (see commutation of tracks on the following page).

## 2. To establish the programmes

To establish a programme inserts are placed into the notches of the 60-minute-disc "a", 24-hour-disc "b" and week-disc "c" to the selected minutes, hours and half days.

An insert placed on the 24-hour wheel "b" closes the contacts 7 to 12 for 5 minutes. This lapse of time should be increased by about 2 minutes for contact rise and by about 2 minutes for contact drop.

The instrument is equipped with a number of tracks large enough to permit switching over to an adjacent track in case 2 inserts placed too close to each other on the minute-axle "a" were to produce undesired signals. Therefore one insert only should be placed on the 60-minute-disc "a" in the zones comprised from:

3 to 12 ; 8 to 17 ; 13 to 22 ; 18 to 27 ; 23 to 32 ; 28 to 37 ;  
33 to 42 ; 38 to 47 ; 43 to 52 ; 48 to 57 ; 53 to 02 ; 58 to 07

### Programme example

Programme 1: from monday to friday 07.00; 11.52; 13.44; 17.25 circuit 1

Programme 2: saturday morning 07.00; 11.30

Programme 3: from monday to friday 07.00; 11.42; 13.09; 17.13 circuit 2

Programme 4: saturday morning 07.00; 11.30

It can be observed from these examples that in programme 1, 13.44 and 11.52 are in a one-insert zone. The same remark applies to programme 3, 13.09 and 17.13. It will therefore be necessary to switch over to another track.

Selection of the track commutation (see diagrams on the following)

The various tracks available can be distributed over two circuits in 4 different ways. The connections are obtained by means of the switches "e1" and "e2" shown on the diagrams.

- A: Fits programmes of complexity identical for each circuit.
- B: Allows 2 programmes on each circuit but doesn't fit the case of simple programmes on circuit 2 and complex programmes on circuit 1.
- C: Allows 3 complex programmes on circuit 1 and one simple programme only on circuit 2.
- D: Permits 3 programmes on circuit 1 and one only on circuit 2.

In order to apply the best adapted commutation it is advisable to examine the diagrams for each case.

In our example, we shall select the commutation A since the programmes of circuits 1 and 2 are identical.

To place the inserts

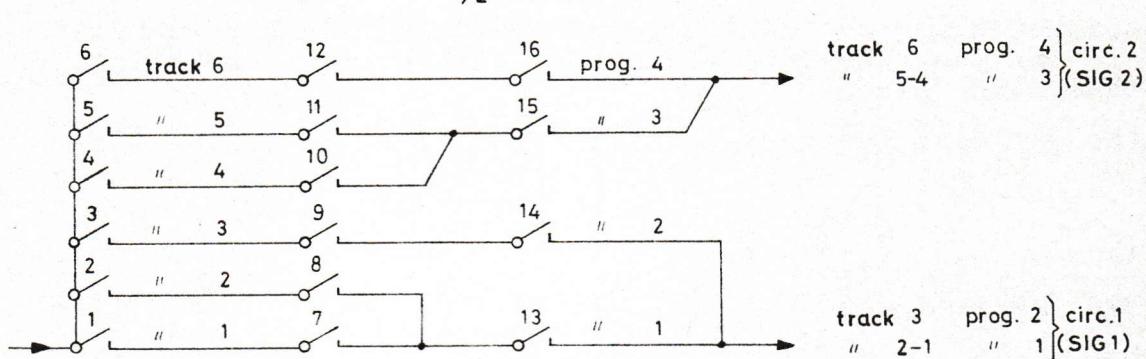
- 1) Press the spring "h" in order to disengage the 2-tooth pinion "f", manually rotate the minute-axle "a" in the direction of the arrows in order to bring the 24-hour wheel "b" between 2 and 3 hours and to release the week-wheel "c".
- 2) Unscrew the knurled knob "k" and remove the 24-hour wheel "b".
- 3) Press the spring "h", manually rotate the 60-minute axle "a" and push the inserts firmly into the following places:

on the 1st disc (contact 1)	00 ; 25 ; 52	programme 1
on the 2nd disc (contact 2)	44	
on the 3rd disc (contact 3)	00 ; 30	programme 2
on the 4th disc (contact 4)	00 ; 09 ; 42	programme 3
on the 5th disc (contact 5)	13	
on the 6th disc (contact 6)	00 ; 30	programme 4
- 4) Push the inserts firmly into the following places of the 24-hour wheel "b" (removed):

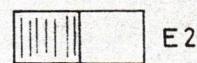
on the 1st disc (contact 7)	07.00; 11.50; 17.25	programme 1
on the 2nd disc (contact 8)	13.45	
on the 3rd disc (contact 9)	07.00; 11.30	programme 2
on the 4th disc (contact 10)	07.00; 11.40; 13.10	programme 3
on the 5th disc (contact 11)	17.15	
on the 6th disc (contact 12)	07.00; 11.30	programme 4

# TRACK SWITCHES

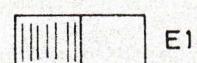
Minutes      Hours       $\frac{1}{2}$  Days



Position of switches

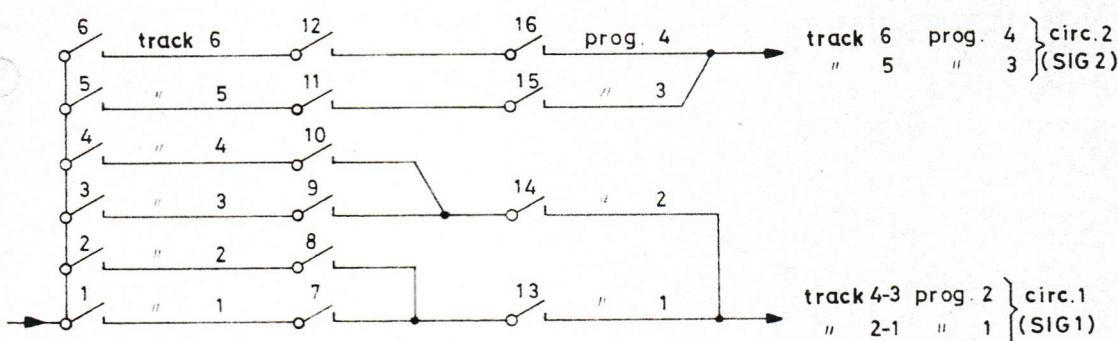


E2



E1

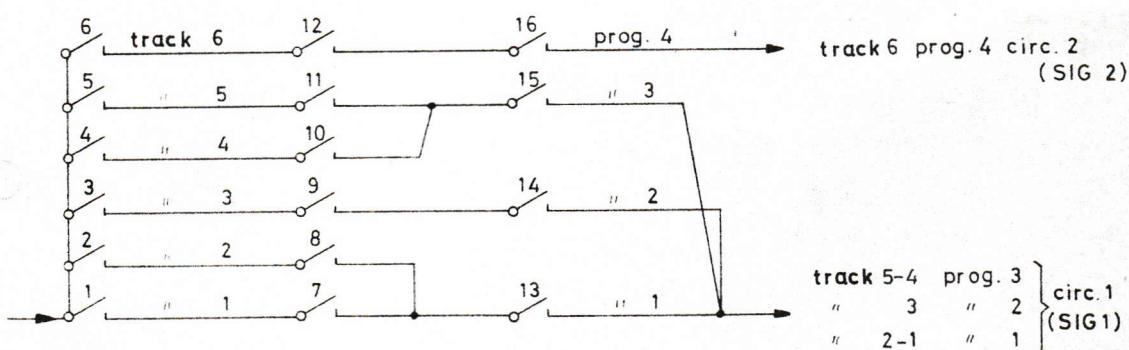
A



E2

E1

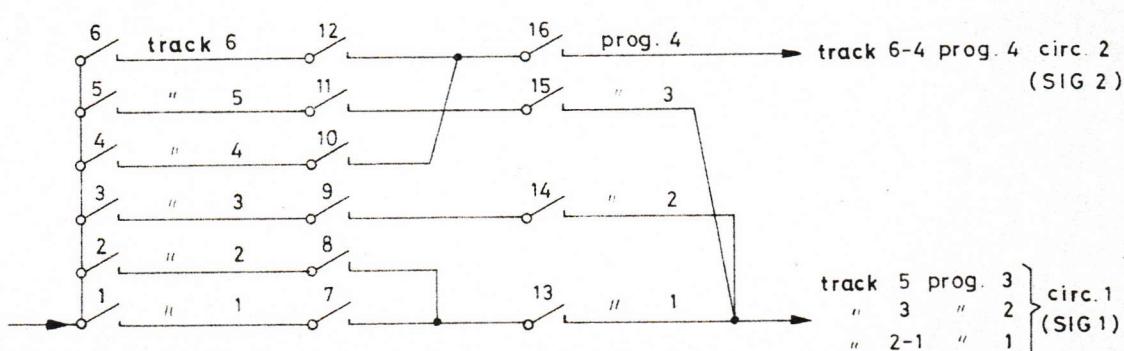
B



E2

E1

C



E2

E1

D

5) Actionate the ratchet-holding lever "1" in order to manually rotate the week-wheel "c" then push the inserts firmly into the following places:

On the 1st disc (contact 13) 3; 4; 5; 6; 7; 8; 9; 10; 11; 12  
(programme 1, from monday morning to friday afternoon)

On the 2nd disc (contact 14) 13 (programme 2, saturday morning)

On the 3rd disc (contact 15) 3; 4; 5; 6; 7; 8; 9; 10; 11; 12  
(programme 3, from monday morning to friday afternoon)

On the 4th disc (contact 16) 13 (programme 4, saturday morning)

After all inserts have been set replace the 24-hour wheel "b".

It is evident that the positions of the inserts as described above concern our programme example only. They must always be chosen in a similar way in compliance with each selected programme.

#### Module insertion

The programmer module must be reset from the control dial prior to its insertion into the clock. Press the spring "h" and rotate the 60-minute axis "a" in the direction of the arrows until the programmer indicates:

For basic clocks with a second-control dial:

1 minute more than the control

For basic clocks with a minute-control dial:

same time as the control dial

Proceed by inserting the module into the clock and observe that printed circuit penetrates freely into the upper and lower slides. Push the module as its front plate touches the traverses. Rotate the knurled knobs so that the opened side of their plastic latch shows to the right.

Do not re-install the frame yet.

#### 3. Programme modification

Since the programmer stops as it is being removed from the clock the following precautions must be taken to avoid a new phasing procedure (see under start up) and consequent time discrepancy.

1. Remove the module between two minute-impulses.
2. Check if the programmer has stopped on an even minute (0, 2, 4, 6...) or on an odd minute (1, 3, 5, 7....)
3. As it is being re-inserted the module is to be reset to the time of the control movement but on a minute of the same parity as noted under 2.

Examples:

Stop at 10 h 12 min. (even number)

Insertion of module at 11 h 15 min. (time of control dial)  
Set the programmer on 11 h 16 min. (even number)

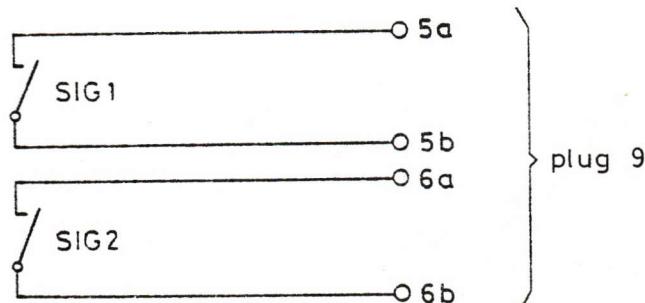
Stop at 14 h 19 min. (odd number)

Insertion of module at 14 h 45 min. (time of control dial)  
Set the programmer on 14 h 45 min. (odd number)

#### 4. Signal output

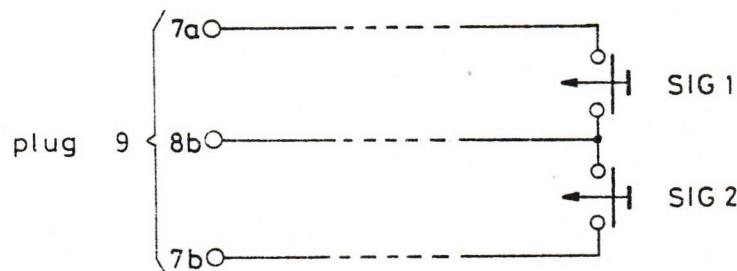
The signals given by the programmer can be taken from plug 9. They permit to operate bells, hooters, electronic gongs.

Connect the signalization circuits to the plug 9 by means of the 16-pole plug supplied with the clock as follows:

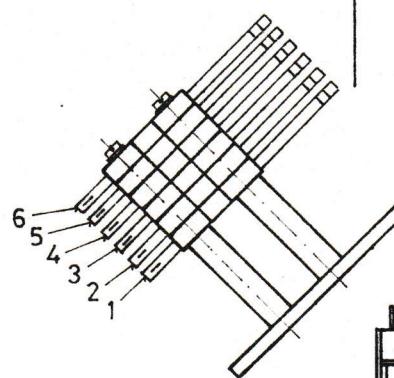


## Remote control

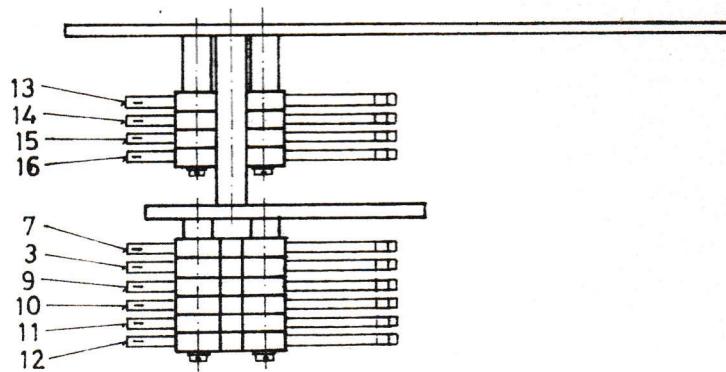
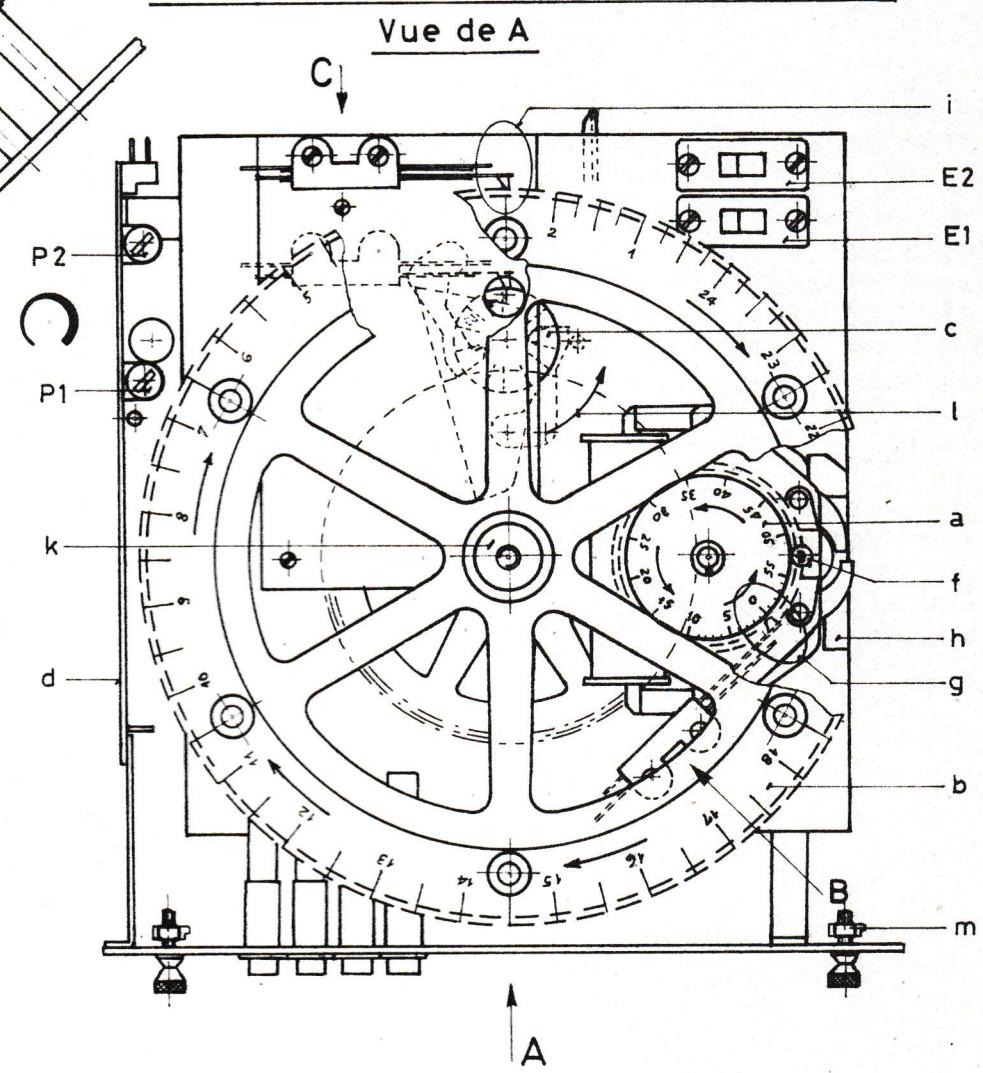
Remote-controlled signals can be given manually and separately to the circuits 1 and 2 by connecting certain terminals of the plug 9 as shown below. A signal lasts as long as the terminals are connected.



SIG1 SIG2  
 1 0 1 0



Vue de B



Vue de C

TO START UP - MODULAR QUARTZ BASIC CLOCKS

QMS      Press the control module button 0 SEC  
            Press the HBG button SYNC (for QMS/HBG only)

QCM      Press the control module button 0 MIN

1. CONNECTION TO THE POWER SUPPLY

1.1 Clocks supplied by the mains

Verify that the mains voltage corresponds to the voltage shown on the label plate blocking the switch 4. If not, refer to the description of the supply module ref. 3046.100.

Connect the clock to the mains by means of the cord supplied with the clock. Insert the fuse and its sleeve, both have been removed for transport and are kept in a bag, at the rear of the instrument.

Give an impulse to the button .

1.2 Clocks supplied by a DC voltage

Verify that the nominal external voltage corresponds to the indication near the plug 2 and that it is in accordance with the limits indicated in the characteristics.

Connect the clock to its supply by means of the plug supplied with the instrument. NOTE CAREFULLY, the positive pole (+) to the terminal No. 2 and the negative pole (-) to the terminal No. 1. It is recommended to ground this plug.

Mount the fuse and its sleeve. They had been removed for transport and are kept in a bag at the rear of the instrument.

Give an impulse to the button .

2. PHASING PROCEDURE

The secondary clocks operate with polarized impulses, that is, their polarity is constantly reversing. Consequently, the secondary clocks must be in phase, together, and also with respect to the control dials of the quartz clock.

2.1 Programmer PR

QMS    - Press 0 MIN  
          - Release 0 SEC  
          - Release 0 MIN at next passage over 60 of the second-hand  
          - Press 0 SEC approx. 65 to 70 seconds after the preceding operation.

QCM    - Press + MIN  
          - Release 0 MIN and wait approx. 15 seconds  
          - Press 0 MIN  
          - Release + MIN

Remove the programmer and verify the indicated time. If necessary adjust it to that of the control dial.

Replace the programmer into the clock, screw the knurled knobs on and replace the frame.

2.2 Secondary clocks connected to a line-module MSR ref. 3046.097 (for QMS only)

- Release the control module button 0 SEC
- Press button + MIN for about 20 seconds then press 0 MIN
- Release + MIN

Observe the secondary clocks where three cases are possible:

- a) All the clocks indicate the same time, they are in phase
- b) Some of the clocks indicate one impulse more than the others. Proceed as follows:

Clocks with an extra-flat movement (red cover)  
Reverse the connecting plug.

Clocks with a normal movement

- Remove the glass cover
- Push axially the center of the hand and rotate it one division backwards

- c) Some clocks are one impulse behind the other clocks. Proceed as follows:

Clocks with an extra-flat movement (red cover)  
- Reverse the connecting plug

- Rotate the hand 2 divisions forward by means of the disc mounted on the movement cover. The disc has a hole and can be easily rotated after insertion of a sharp-pointed object.

Clocks with a normal movement

- Remove the glass cover
- Press axially the center of the hand and rotate it one division forward.

2.3 Secondary clocks connected to a control-module M or MS ref. 3046.103 or 3046.104

QMS    - Release the control module button 0 SEC and wait approx. 10 seconds  
      - Press 0 SEC

QCM    - Press the control module button + MIN  
      - Release 0 MIN and wait approx. 20 seconds  
      - Press 0 MIN  
      - Release + MIN

Observe the secondary clocks with respect to the dial of the control module as per 2.5.

2.4 Secondary clocks connected to a line-module LM or LS  
ref. 3046.098 or 3046.099

QMS - Release the control module button 0 SEC  
QCM - Release the control module button 0 MIN

For all types:

- Press the line module button + for approx. 20 seconds
- Press the line module button 0
- Release the button +

Observe the secondary clocks with respect to the control dial of the line module connecting the clocks as per 2.5

2.5 Phase check of the secondary clocks

Five cases are possible

- a) All the clocks indicate the same time as the line module control dial. They are in phase.
- b) All the clocks indicate one impulse more than the control dial. Proceed as follows:
  - Reverse the line connections on the plug 9
- c) All the clocks indicate one impulse less than the control dial. Proceed as follows:
  - Reverse the line connections on the plug 9
  - Remove the crown of the control dial (two notches are cut in the crown)
  - Rotate the outer hand two divisions backwards by means of a small plastic slotted tube kept in a bag at the rear of the instrument.
  - Replace the crown
- d) Some clocks indicate one impulse more than the control dial. Proceed as follows:

Clocks with an extra-flat movement (red cover)

  - Reverse the connecting plug

Clocks with a normal movement

  - Remove the glass cover
  - Press axially the center of the hand and rotate it one division backwards
- e) Some clocks indicate one impulse less than the control dial. Proceed as follows:

Clocks with an extra-flat movement (red cover)

  - Reverse the connecting plug
  - Rotate the hand 2 divisions forward by means of the disc mounted on the movement cover. The disc has a small hole and can easily rotate after insertion of a sharp-pointed object.

Clocks with a normal movement

  - Remove the glass cover
  - Push axially the center of the hand and rotate it one division forward.

3. RESETTING

3.1 Resetting the lines with respect to the quartz basic  
Minute-line connected to a module MSR ref. 3046.097  
Resetting of this line is performed from the control  
module.

- Press + MIN
- Release 0 MIN and allow the line to proceed until it  
has passed the time of the control dial by one or two  
minutes
- Press 0 MIN
- Release + MIN
- Release 0 MIN at the instant the control dial is in  
coincidence with the secondary clocks. Release the  
button at the exact instant the second-hand is on 60.  
This procedure is necessary to guarantee the synchroni-  
zation of the 60-second minute-impulses.

Line connected to a module LM or LS ref. 3046.098  
or 3046.099

For QMS only:

- Press the control module button 0 MIN
- Release the control module button 0 MIN at the next  
passage on 60 of the second-hand. This procedure  
guarantees the synchronization of the 60-second  
minute-impulses.

For all types:

- Press the line module button +
- Release 0 and allow the line to proceed until it has  
passed the time of the control module by one or two  
minutes
- Press 0
- Release +
- Release 0 as the time of the control module is in  
coincidence with that of the line module

3.2 Exact resetting of the installation

When the basic clock and all the lines indicate the same  
time, the procedure of exact resetting can be carried  
from the control module.

QMS

a) The installation runs slow

- Press + SEC. The installation operates at double  
speed. Allow the installation to catch up until  
the control movement be about 10 seconds fast with  
respect to the exact time, then release + SEC.
- Press 0 SEC as the second-hand reaches 60.
- Release 0 SEC at the precise instant of coincidence  
with the exact time.

b) The installation runs fast

- Press 0 SEC as the second-hand reaches 60.
- Release 0 SEC at precise coincidence with the exact time.

Note: Stopping on 60 is not an absolute necessity but it makes resetting easier.

QCM

a) The installation runs slow

- Press + MIN. The installation operates at an accelerated speed (see description of the control module). Allow the installation to catch up until the control movement be one or two minutes ahead of the exact time.
- Press 0 MIN
- Release + MIN
- Release 0 MIN at precise coincidence with the exact time

b) The installation runs fast

- Press 0 MIN
- Release 0 MIN at precise coincidence with the exact time.

MAINTENANCE

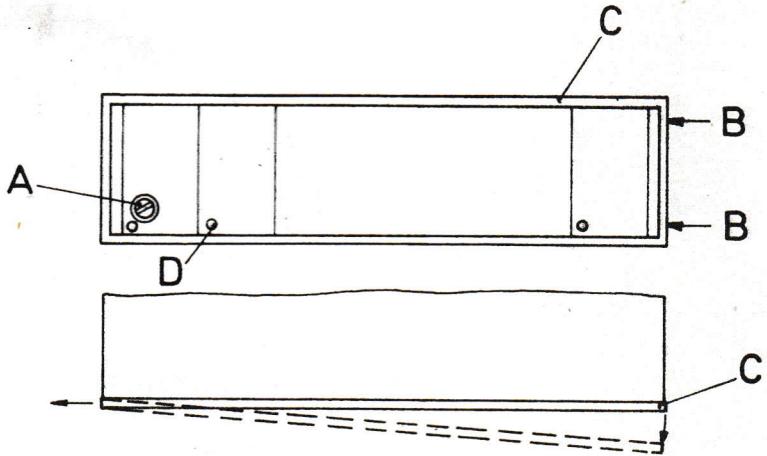
A quartz clock is a precision instrument and must be handled as such. All the circuits have been studied for maximum reliability and to stand up against eventual faulty manoeuvres. Furthermore, the modular conception of the instrument permits fast trouble-shooting and simple replacement of a module in case of defective operation.

MODULE REPLACEMENTTo remove:

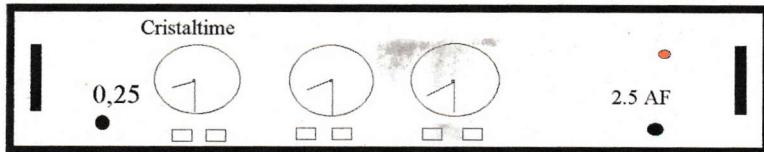
1. Disconnect the supply connector and the fuse A (if any).
2. Loosen the screws B.
3. Remove the frame C.
4. Unscrew the knurled knob(s) D up to the stop.
5. Pull the module out by means of the knurled knob(s).

To install

1. Rotate the knurled knob(s) D in a counter-clockwise direction up to the stop.
2. Insert the module as its front plate touches the traverses. Observe that the printed circuits penetrates freely into the slides.
3. Screw the knurled knob(s) D on.
4. Replace the frame C.



## Adjustment of ship's clock's by use of central unit.



The two boxes under the clock's indicates "+" & "0". (+ for advance and 0 for stop.) This unit is designed for the possibilty to have different times on different clock's on board so when adjusting use clock on left side only. This clock will adjust all clock's which is connected to the central clock system.

To advance forward just press "+" and keep it pressed and the minutes will start to count rappidly forward. When time is correct let go the button and give it a quick press to stop the advance. (Light in button will extinguish)

To retard the time press "0" button and the clock will stop, when correct time press "0" once more and the clock's will start again. (Light in button will extinguish)