

SERVICE MANUAL & PARTS LIST

(without price)

REF. NO. S/M-242

APRIL 1987

MODULE NO.

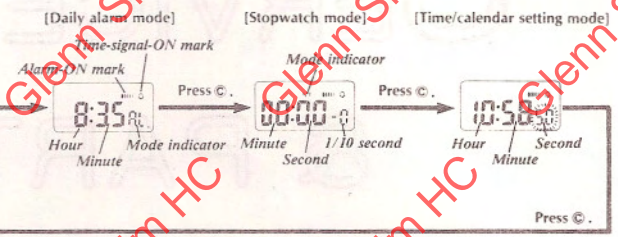
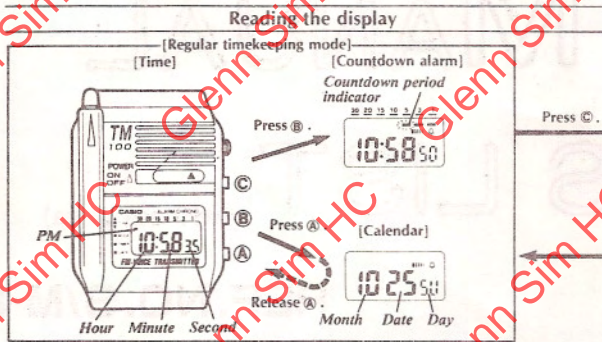
QW-661



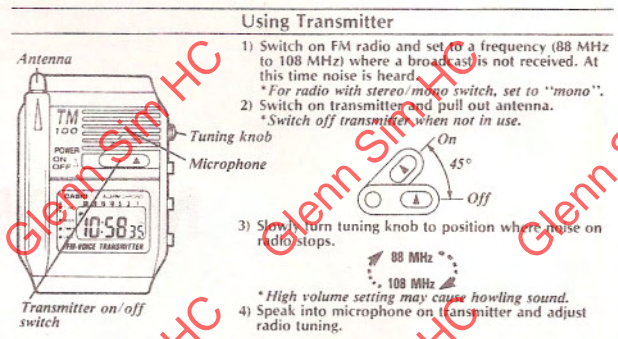
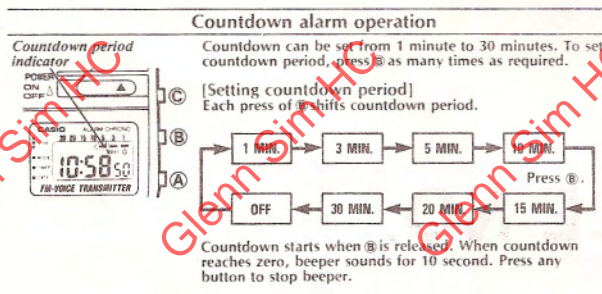
TM-100

CASIO®

OPERATION CHART: MODULE QW-661



(Reversion to regular timekeeping) The watch reverts to regular timekeeping mode when © button is pressed after operation, regardless of mode.
 (Auto-retrieve function) Daily alarm and Time/calendar setting modes will automatically return to regular timekeeping mode if no button is pressed for 1 to 2 minutes.



Daily alarm operation

Beeper sounds for 20 seconds at preset time every day until cleared when daily alarm is set. Press any button to stop beeper. Signal sounds every hour on the hour if time signal is set.

(Sound demonstration) Press and hold A in alarm mode to sound beeper.

[Setting daily alarm]

- Press B in daily alarm mode to set hour. Pressing A increments digit. Keep pressed for high speed change.
- Press C to set minute digits. Pressing A increments digit. Keep pressed for high speed change.

(Auto-retrieve function) Display automatically returns to initial daily alarm mode display if no button is pressed for 1 to 2 minutes.

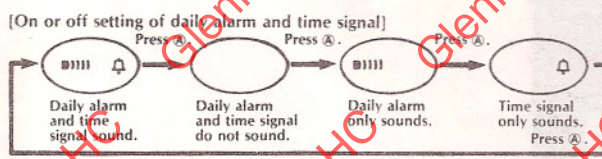
Press C to complete.

[Transmitter precautions]

- This product is not intended to be used to invade the privacy of others.
- Never attempt to increase the power of the transmitter by altering the internal circuitry or extending the antenna. Doing so may be violation of local laws governing the use of radio transmitters.
- Avoid frequencies used by commercial radio station.
- Efficiency of the transmitter is reduced in low temperatures.
- The maximum communication distance is 60 meters under optimum conditions. The actual distance, however, is determined by surroundings and the condition of the radio.
- Orient the antenna to find the best position for communication.
- Stable reception may be difficult to obtain when using radios which utilize headphone and earphone cords as antennas. For best results, use a high sensitivity FM radio.

[Transmitter applications]

- Sending a voice to a remote radio unit.
- Recording of conversation on a radio cassette recorder.
- Using a radio as a wireless PA device.
- Intercommunication between motor vehicles over the FM radio.



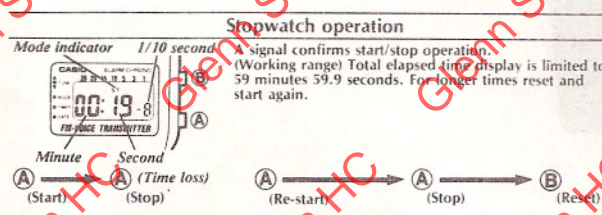
[Transmitter battery maintenance]

Transmitter signal weakens when battery power decreases. Battery should then be replaced.

- Using a coin, remove rear battery cover.
*Do not throw away ring.
- Replace battery.
*Ensure that plus side of battery is facing up.
- Place ring on top of battery and screw on cover.
*Ring protects unit from dust and humidity.

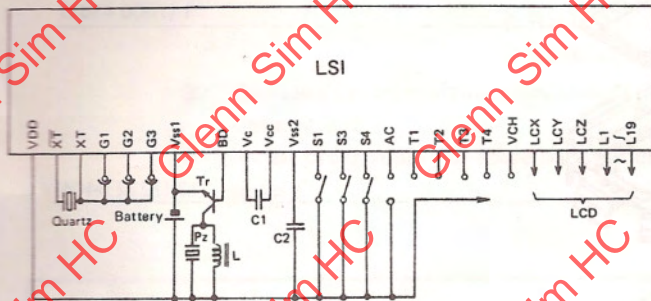
Cover Ring

* Transmitter battery should be replaced periodically every 2 years. Do not leave dead battery in unit to avoid malfunction caused by battery leakage.
* Remove battery when transmitter is not used for extended periods.

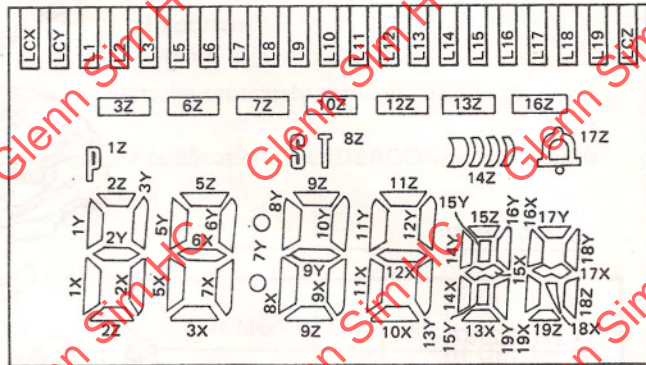


PART 1: WATCH BLOCK

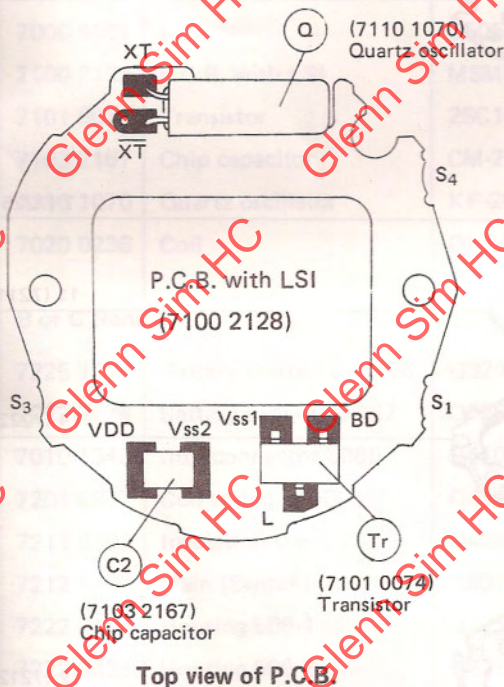
1. CIRCUIT DIAGRAM



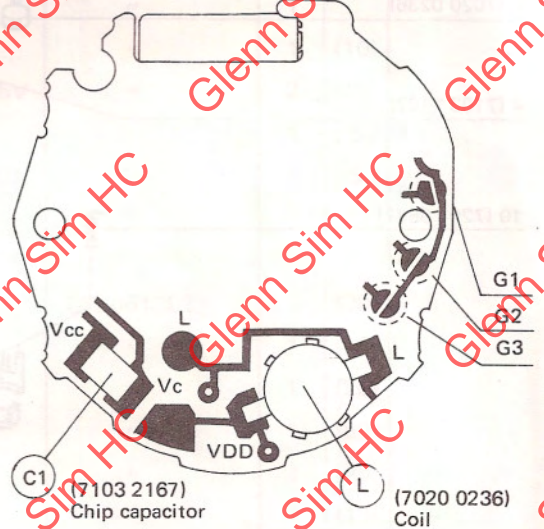
LCD drive terminals



2. CHECKING TERMINALS AND COMPONENTS



Top view of P.C.B.

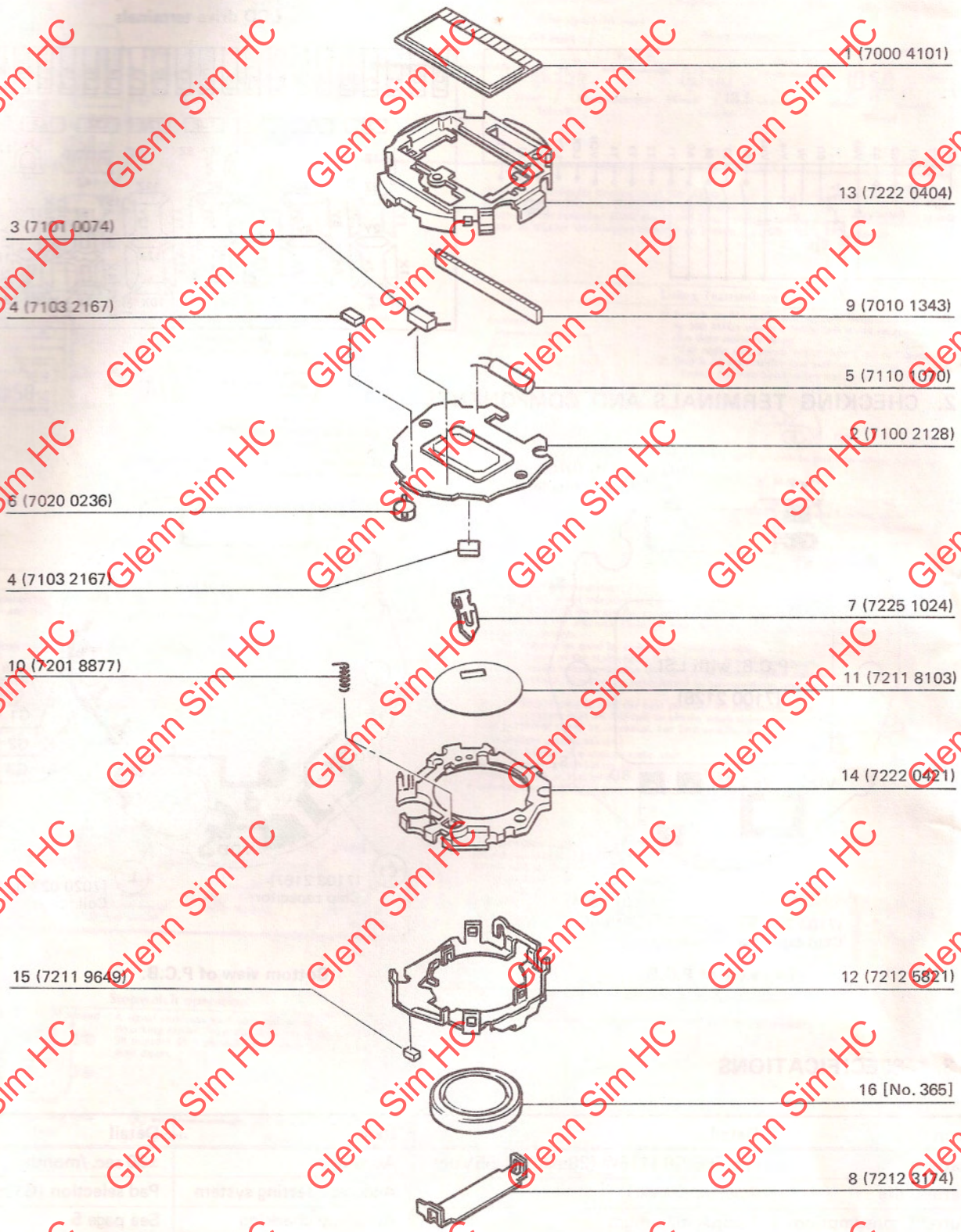


Bottom view of P.C.B.

3. SPECIFICATIONS

Item	Detail	Item	Detail
Battery	No. 365/SR116W (28mAH, 1.55Vdc)	Accuracy	±30 sec. /month
Battery life	Approx. 2 years	Accuracy setting system	Pad selection (G1~G3)
Current consumption	1.55µA maximum	Accuracy checking	See page 5
Alarm system	Piezo plate on back cover	Accuracy setting	+0.9 ~ -0.7 sec./day

4. EXPLODED VIEW



5. PARTS LIST

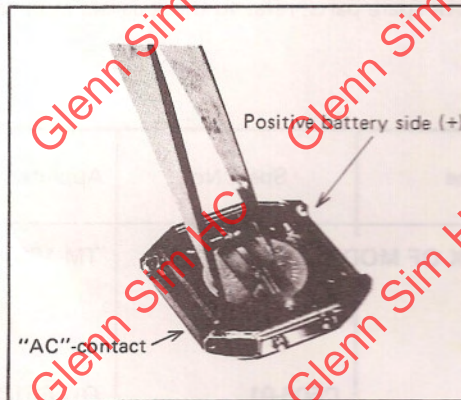
- Note: 1. Prices and specifications are subject to change without prior notice.
 2. Spare parts are classified as follows according to their importance in after-sales service.
 A Rank Very Important
 B Rank Important
 C Rank Others
3. Our sales department supplies all batteries, so order batteries separately through Casio Sales Department.
4. As for order/supply of spare parts, refer to the separate publication "GUIDEBOOK for spare parts supply".

Item	Code No.	Part Name	Spec. No.	Applicable Model	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)
		WATCH BLOCK OF MODULE	QW-661C02	TM-100			
		A Rank					
1	7000 4101	LCD	C506-01	QW-661C02	1		
2	7100 2128	P.C.B. with LSI	MSM6087C-459	"	1		
3	7101 0074	Transistor	2SC1622A	"	1	(10)	
4	7103 2167	Chip capacitor	CM-21YV104P15V	"	2	(10)	
5	7110 1070	Quartz oscillator	XF-26GT	"	1	(5)	
6	7020 0236	Coil	OL3.3 x 1.6DR-01	"	1	(5)	
		B or C Rank					
7	7225 1024	Battery contact (-) 156	Q32496-1	QW-661C02	1	(20)	
8	7212 3174	Battery supporter 187	Q32612A-1	"	1	(10)	
9☆	7010 1343	Interconnector 506B	Q410135-1	"	1	(20)	
10☆	7201 8877	Coil spring 506B	Q410700A-1	"	1	(50)	
11	7211 8103	Insulation sheet 231	Q43835-1	"	1	(20)	
12☆	7212 5821	Main (Switch) plate 661	Q23065-1	"	1	(10)	
13	7222 0404	Housing 506-1	Q22124-1	"	1	(20)	
14	7222 0421	Housing 506-2	Q22125-1	"	1	(20)	
15	7211 9649	Cushion 506B	Q49500	"	1	(20)	
16		Battery	No. 365 (SR1116W)	QW-661C02	1		

Note: ☆ -- Newly employed parts
 Q'ty -- Quantity used per unit
 * -- Minimum order/supply quantity

6. AC (ALL CLEAR)

- Press the AC (All Clear) contact when inserting a new battery, or the memories and/or counters may give erratic displays.
- Touch the AC contact and the positive battery side (+) with metal tweezers.
- The touch should be made for about 2 seconds.



7. ACCURACY CHECKING

It is not possible to check the accuracy with the LCD sensor of a quartz timer, unless the following operations are performed, because the internal display drive wavelength is 42.6 Hz. To check the accuracy (by 32 Hz): Select the "ACCURACY CHECKING MODE".

The operations are shown below:

A) CHANGE TO THE "ACCURACY CHECKING MODE"

Push all the buttons (A), (B) and (C) at the same time for about 3 seconds.

All the segments will be displayed and the LCD drive signals will change from 42.6 Hz to 32 Hz. Then, check the accuracy with the LCD sensor of a quartz timer.

B) CANCELLATION OF THE "ACCURACY CHECKING MODE"

Push any button.

Then the display will return to the regular timekeeping mode.

Note: The "ACCURACY CHECKING MODE" will automatically return to the regular mode in 1 ~ 2 hour(s) without any operation.



PART 2 : TRANSMITTER BLOCK

1. SPECIFICATIONS

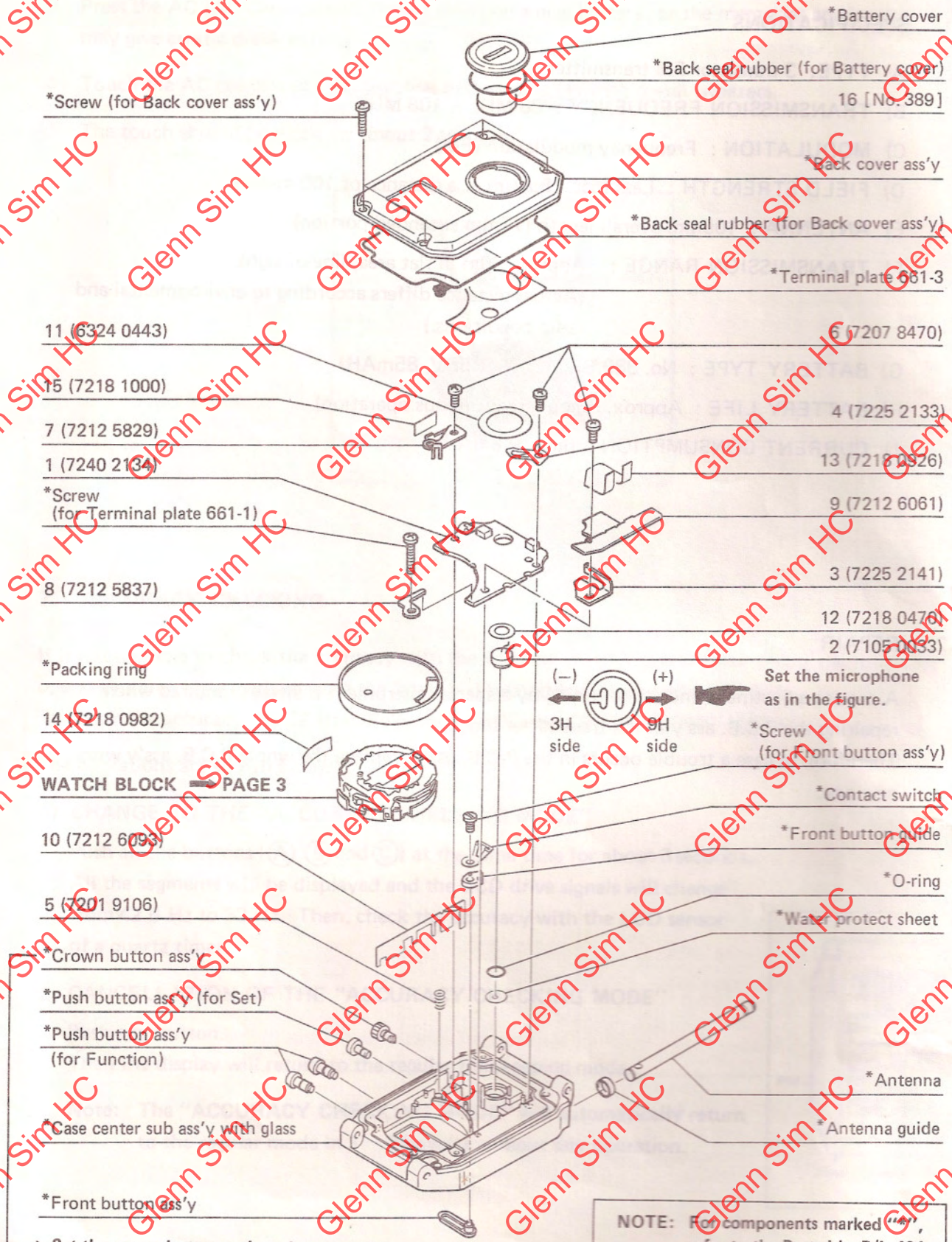
- A) TYPE : 3-transistor FM transmitter
- B) TRANSMISSION FREQUENCY : 88 MHz ~ 108 MHz
- C) MODULATION : Frequency modulation (FM)
- D) FIELD STRENGTH : Less than $15\mu\text{V}/\text{m}$ at a distance of 100 meters
- E) ANTENNA : 105mm overall length (77mm extended portion)
- F) TRANSMISSION RANGE : Approx. 60m in flat area, line-of-sight
(Actual distance differs according to environmental and radio conditions.)
- G) BATTERY TYPE : No. 389/SR1130W (1.55 V, 85mAh)
- H) BATTERY LIFE : Approx. 5 hours (continuous operation)
- I) CURRENT CONSUMPTION : 6mA ~ 8mA

2. REPAIR

A precise adjustment and a fine tuning by a special instrument is always required when repairing the P.C.B. ass'y in the transmitter block.

Therefore, in case a trouble occurs in the P.C.B. ass'y, replace the whole P.C.B. ass'y with new one.

3. EXPLODED VIEW



*Screw (for Back cover ass'y)

*Battery cover

*Back seal rubber (for Battery cover)

16 [No. 389]

*Back cover ass'y

*Back seal rubber (for Back cover ass'y)

*Terminal plate 661-3

11 (6324 0443)

6 (7207 8470)

15 (7218 1000)

4 (7225 2133)

7 (7212 5829)

13 (7218 4526)

1 (7240 2134)

*Screw (for Terminal plate 661-1)

9 (7212 6061)

8 (7212 5837)

3 (7225 2141)

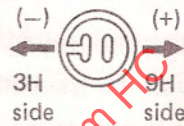
*Packing ring

12 (7218 0476)

14 (7218 0982)

2 (7105 4033)

WATCH BLOCK → PAGE 3



Set the microphone as in the figure.

*Screw (for front button ass'y)

10 (7212 6093)

*Contact switch

*Front button guide

5 (7201 9106)

*O-ring

*Water protect sheet

*Crown button ass'y

*Push button ass'y (for Set)

*Push button ass'y (for Function)

*Antenna

*Case center sub ass'y with glass

*Antenna guide

*Front button ass'y

→ Set the crown button ass'y to be correctly joined with the trimmer capacitor on the R.C.B. ass'y.

NOTE: For components marked with an asterisk, refer to the Parts List P/L-401.

4. PARTS LIST

- Note: 1. Prices and specifications are subject to change without prior notice.
 2. Spare parts are classified as follows according to their importance in after-sales service.
- | | | |
|--------|-------|----------------|
| A Rank | | Very Important |
| B Rank | | Important |
| C Rank | | Others |
3. Our sales department supplies all batteries, so order batteries separately through Casio Sales Department.
 4. As for order/supply of spare parts, refer to the separate publication "GUIDEBOOK for spare parts supply".

Item	Code No.	Part Name	Spec. No.	Applicable Model	Q'ty	*	Unit Price N.R. Yen (¥) (FOB: JAPAN)
		TRANSMITTER BLOCK OF MODULE					
			QW-661C02	TM-100			
		A Rank					
1 ☆	7240 2134	P.C.B. ass'y	Q23164*2	QW-661C02			
2 ☆	7105 0033	Microphone	WM-62A	"	1		
		B or C Rank					
3 ☆	7225 2141	Battery contact (+) 661	Q311052-1	QW-661C02	1	(20)	
4 ☆	7225 2133	Battery contact (-) 661	Q311048-1	"	1	(20)	
5 ☆	7201 9406	Coil spring 661	Q412827-1	"		(50)	
6	7207 8470	Screw 465B	Q48694B-1	"	3	(50)	
7 ☆	7212 5829	Terminal plate 661	Q311051-1	"	1	(20)	
8 ☆	7212 5837	Terminal plate 661-1	Q412892-1	"	1	(10)	
9 ☆	7212 6061	Terminal plate 661-2	Q311482-1	"	1	(20)	
10 ☆	7212 6093	Terminal plate 661-4	Q311694-1	"	1	(10)	
11	6324 0443	Insulation seal for battery	A43337-1	"		(10)	
12 ☆	7218 0470	Insulation sheet 661	Q412889-1	"	1	(20)	
13 ☆	7218 0926	Insulation sheet 661-1	Q413218-1	"	1	(20)	
14 ☆	7218 0982	Insulation sheet 661-2	Q413396-1	"	1	(20)	
15 ☆	7218 1000	Insulation sheet 661-3	Q413397-1	"	1	(20)	
16		Battery	No. 389 (SR1130W)	QW-661C02			

- Note: ☆ - Newly employed parts
 Q'ty - Quantity used per unit
 * - Minimum order/supply quantity

5. TRANSMITTER CHARACTERISTIC

A. Field strength and transmission range

What is meant by a field strength of $15 \mu\text{V/m}$?

It is a value indicating the strength of a radio wave which is expressed by the voltage induced in a conductor of 1 meter long (unit length) placed in space. In other words, the value of $15 \mu\text{V/m}$ means that the voltage induced in a 1-meter-long conductor by a radio wave is $15 \mu\text{V}$ ($15/1,000,000$ of one volt).

Transmission range by a field strength of $15 \mu\text{V/m}$

A highly sensitive radio set is normally possible to receive an input of several dB for practical use. However, if the noise level in surroundings is high, reception will be almost impossible, unless the desired signal input level is considerably higher than the noise input level.

The relation between the desired signal and the noise levels is normally expressed as a signal-to-noise (S/N) ratio. In general, the S/N ratio needs to be more than 20 dB (that is, the signal strength is ten times the noise strength).

The field strength of $15 \mu\text{V/m}$ is equivalent to 23.5 dB.

The field strength measured at 23.5 dB is good enough for practical use in suburbs where the noise level is lower, but in urban or industrial areas where the noise level is higher, the S/N ratio becomes lower. It is, therefore, necessary to get near to the radio source in order to improve the S/N ratio.

- Transmission range varies depending on radio set performance (sensitivity, etc.)
- Transmission range varies depending on the noise level around the receiving station. (Normally, the noise level in urban areas is approximately 20 dB.)
- When there are high-rise buildings or hills on the propagation path, the practical transmission range will be shorter.

B. Transmission range depending on surroundings

Since the field strength produced by the TM-100 is very feeble and the antenna is shorter for the radio wavelength in use, the transmission range may be affected by the conditions of surroundings.

Any conductive material located close to the TM-100 makes the radio field strength weak or strong. Such variations are closely related to the radio wavelength.

Radio field strength becomes weak in the following cases

- Communication between a room enclosed by metallic material (such as a ferro-concrete building) and the outside
- Though the window is open, it is smaller for the radio wavelength.
- Communication over obstacles such as fences

Radio field strength becomes strong in the following cases.

- Field strength is induced around a conductive object near the TM-100.
- Areas close to the water
- The TM-100 is being operated at a high altitude.

C. Transmission techniques for the TM-100

The radio wave produced by the TM-100 is very weak, and the antenna is also so short that it can be retracted into the watch case. This means that it is far shorter than a conventional rod antenna.

The antenna is so designed that variations in the radio field strength will occur depending on the direction in which the person holding the TM-100 faces or the position of his wrist at which the TM-100 is worn.

Example: When the person holding the TM-100 turns his back toward the receiving station, reception will be better, since directivity is produced in the backward direction.

Also, variations in the radio field strength will be caused by the height of the person holding the TM-100.

(When the holder bends forward, a similar result is obtained.)

Like other transmitters, the distance travelled by radio waves will differ according to the voice input level through a microphone.

If the voice input level is lower and the communication distance is longer, the articulation of speech will be reduced. When a microphone is positioned too close to the speaker's mouth, the sound will be distorted. Keep your mouth 5 to 8 cm off the microphone and speak at the proper input level.

Note: Never attempt to increase the power of the transmitter by altering the internal circuitry or extending the antenna. Doing so may be violation of local laws governing the use of radio transmitters.

D. Receiving techniques by radio sets

To increase the transmission range without violating of local laws, radio set performance also needs to be improved.

- Connect a high-performance antenna to the radio antenna.
- Attach an FM receiving amplifier sold on the market.

By adjusting the direction of the receiving antenna, the best receiving effect can be obtained.