

DENTAL CHAIR

MCX- II P.C.Board

(FOR THE LEGREST-FOLDING CHAIRS)

TECHNICAL INFORMATION

Micro Computer Chip ; Version1.5

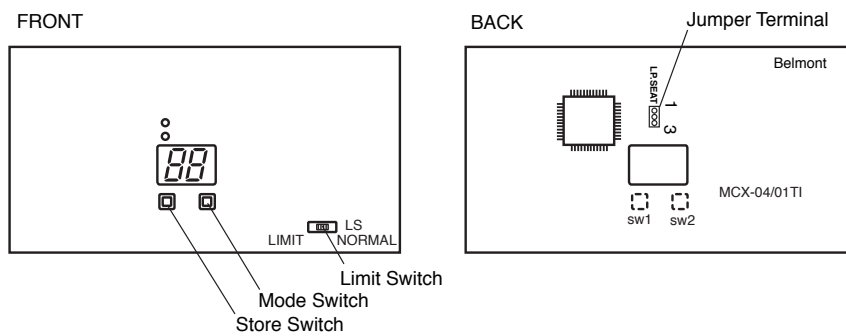
**FUNCTION
AND
OPERATION**

 **Belmont[®]**

3.E

This instruction manual describes the following switches (referred to as SW hereafter).

1. Limit SW : The red slide switch on the p.c.board, closer to the p.c.board center as the limit position.
2. Store SW : The push button SW to the left under the indicator.
3. Mode SW : The push button SW to the right under the indicator.
4. JP1 : The jumper terminal on the p.c.board.



1. The options available for each function are described below.

The following options are available, depending on the model used.

1. Last-position operation options:

The operation varies depending on the JP1 configuration on the p.c.board.

1-2 short: Backrest movement only.

2-3 short: Backrest and up/down operations.

2. P3/Last position function options:

Whether to use the LP SW as the P3 switch or last position switch is selected.

The change and setup procedures for this programmable switch are described separately.

3. Operation sound on/off options:

Whether or not to enable the SW operation sound is selected. The change and setup procedures are described separately.

4. Doctor ID options:

Up to four doctor IDs can be registered for an associate dental clinic. Preset (P1 to P3) for up to four doctors are available.

Auto return and rinsing positions are shared. The modification and setup procedures are described separately.

2. Basic operations

Prohibit all input:

The input stops all the operations of the chair.

If an operation SW is turned on while the input is present, the alarm will sound while the SW is on.

The Prohibit all input is assigned to the No. 3 and No. 4 pins of the S4 connector and enabled by setting the jumpers.

Prohibit lowering input:

This input stops lowering, full reclining, and auto operations.

If the operation SWs above are turned on while the input is present, the alarm will sound while the SW is on.

This input is assigned to the No. 1 and No. 2 pins of the S4 connector, and enabled by setting the jumpers.

Manual operation:

The chair is operated while the SW is pressed and held down.

1.Up : The chair goes up while the Up SW is pressed and held down (up to its upper limit).

2.Down : The chair goes down while the Down SW is pressed and held down (down to its lower limit).

3.Raise : The backrest rises while the Raise SW is pressed and held down (up to its raise limit).

4.Recline: The backrest reclines while the Recline SW is pressed and held down (down to its recline limit).

Auto operation:

Once the SW is pressed, the operation will continue after the SW is released.

When Auto and manual operations are activated simultaneously, the manual operation will over-ride.

1. Auto Return (P0)

Chair returns to the initial preset position.

2. P1, P2

Chair moves to a preset position.

The leg rest will also move to the preset position. (Appended June 28, 2005)

3.P3 (Note: Alternative to Last Position function.

Chair moves to a preset position. (Appended June 28, 2005) The leg rest will be extended to the extension limit.

4.Last Position (Note: Alternative to P3 function)

Every time the LP SW is pressed, the chair shifts between the present (treatment) position and the rinsing position.

The rinsing position can be arbitrarily setup with the reclining operation only or a combination of reclining and up-down operations.

If the operation is suspended and the LP SW is turned on for the next time, the operation will resume from the point where it was suspended. The treatment position is retained until the power is turned off.

If a rinsing position is specified by the first LP SW operation after power is on, an error occurs and an alarm will sound (due to lack of treatment position destination data).

5.Mid-operation cancellation of Auto operation.

Operation will stop when any operation SW is pressed.

Operation stays stopped while the SW is pressed and held down.

6.Time limit for Auto operation

If the Auto operation is continued for 60 seconds and more, the controller assumes a failure status and stops the operation. A 'plip' alarm will sound for the status above.

3. Batch initialization

The circuit memory can be configured as follows in one step.

Beeper sound at operation SW pressing	Enabled
Beeper sound at Prohibit Lowering input	Enabled
Beeper sound at other inputs	Disabled
Transmission speed	4800 bps
Dental light interlock	Enabled
Standard margin value	(03 for up/down, 02 for raise/recline)
Doctor ID	0
Prohibit lowering input	Backrest reclining is also prohibited.

Setup procedure

1. Slide the limit SW on the p.c.board to the limit position. (The red LED on the p.c.board turns on.)
2. Press and hold down the mode SW.
3. After the 'purrr-purrrrrrr' beeper sound, release the SW to complete the procedure.
4. Slide the limit SW on the p.c.board to the normal position.

[Note]

Communication specifications: 2400/4800 bps, Stop bit = 2, Parity = none, Data bits = 8 bits

4. Limit position setup

Position limits for each operation are registered.

[Setup procedure]

1. Slide the limit SW on the p.c.board to the limit position. (The red LED on the p.c.board turns on.)
The beeper will sound 'pip, pip' at 1.5-second intervals.
2. Move the desired part of the chair to the desired position.
(Note: The leg rest extends by pressing the P1 SW and retracts by pressing the P0 SW.
The leg rest will not move when the chair is in the low position. Raise the chair first to move the leg rest.)
3. Press the Store SW (the yellow SW on the p.c.board).
The beeper will sound twice at 'pip-pip, pip-pip, pip-pip'
4. Depending on the part for which the limit position is set up, press the SW in the table below.
If the wrong SW is pressed, restart the process from 3.
Repeat the process from 2 to 4 to set up more than one limit position.

Limit position to be registered	Operation SW	Limit position to be registered	Operation SW
Upper limit	Up SW	Lower limit	Down SW
Raise limit	Raise SW	Reclining limit	Recline SW
Leg rest extension limit	P1 SW	Leg rest retraction limit	P0 SW
Chair height for legrest extention/retraction	LP SW		

5. To abort the setup process, press the Store SW once again. The status returns to 1.

6. To exit the setup process, slide the limit SW on the p.c.board to the normal position. (The red LED on the p.c.board turns off.)

5. Auto return, preset, and rinsing position setup

There are two different setup procedures but the results are the same.

[Setup procedure 1]

1. Move the chair to the desired position.
(Also, move the leg rest to the desired extension or retraction limit position.
For the procedure to move the leg rest, refer to 8. Independent operation of the leg rest.)
2. Press the desired SW (0, P1, P2, LP etc.) for that position until the beeper sounds (about 5 seconds) to complete the procedure.
0: Auto return P1, P2: Preset, LP: Rinsing position as the last position

[Setup procedure 2]

1. Move the chair to the desired position.
(Also, move the leg rest to the desired extension or retraction limit position.
For the procedure to move the leg rest, refer to 8. Independent operation of the leg rest.)
2. Press and hold down the Store SW (about 2 seconds).
After the initial beeper sound, the beeper keeps on sounding once at the 'pip, pip' (ten times at one second intervals).
3. Press the desired SW (P1, LP etc.) for that position to complete the procedure.
If the step 3 does not take place within 10 seconds, the procedure is terminated. (Setup of the Auto return position is not available.)
4. To exit the procedure during the step 2, press the Store SW once again.

[Note] Setting up the same position for the second time for the switch to which the position is already programed is not available.

For example, an attempt to setup the P1 position while the chair is in the P 1 position is ignored. To set up an Auto return position, follow the procedure described in [Setup procedure 1].

If the rinsing position is set up at the same position as the upper limit, lower limit, or forward limit position, the actual rinsing position will be set a little short to each limit position to ensure operational stability. For example, if the registered rinsing Position is identical to the lower limit position, the actual rinsing position will be set a little higher than the lower limit.

6. Doctor ID setup

Preset positions can be set up for four doctors using doctor IDs, which is useful for an associate clinic.

[Setup procedure]

1. Press the mode SW until the beeper sounds (about 2 seconds). The beeper will sound three times.
2. Press the SW shown below according to the doctor ID to complete the setup.

Doctor ID	Doctor 0	Doctor 1	Doctor 2	Doctor 3
SW to be pressed	0	P1	P2	LP

[Note] To abort the registration, press the Store SW. Pressing the mode SW will shift the mode to the beeper sound setup mode.

The registration mode is terminated automatically after a lapse of 10 seconds. When the chair is connected to a unit equipped with a communication system, changing the doctor IDs on the chair will not affect the IDs on the unit side.

7. Beeper sound setup

Enables or disables the beeper sound at SW inputs.

[Setup procedure]

1. Press and hold down the mode SW until the beeper sounds (about 2 seconds).
The beeper will sound three times. (The mode shifts to the doctor ID setup mode.)
2. Press the mode SW once again. The beep will sound four times.
3. Press the following operation SWs to select a function. Enabled and Disabled statuses toggle every time the SWs (other than A.R.) are pressed.

Operation SW	Beeper functions to be changed
A.R.	All the beeper sounds below, except for setup and alarm, are disabled.
Chair-up	The beeper sound at the operation SW pressing is enabled/disabled.
Chair-down	The beeper sound at the 4-bit input is enabled/disabled.
Backrest-raise	The beeper sound at the operation signal from the serial (communication line) input is enabled/disabled.
Backrest-recline	The beeper sound at the Prohibit lower input is enabled/disabled.
P1	The beeper sound at the Prohibit all input is enabled/disabled. The beeper enable/disable setups can be performed successively.

4. After the setups are done, press the Store SW.

[Note] The only way to cancel the setup mode is to leave it for 10 seconds or more without any operations. Pressing the mode SW again will shift the mode to the leg rest operation mode. The mode is terminated automatically after a lapse of 10 seconds.

8. Independent operation of the leg rest.

1. Press and hold down the mode SW until the beeper sounds (about 2 seconds). The beeper will sound three times. (The mode shifts to the doctor ID setting mode.)
2. Press the mode SW once again. The beep will sound four times.
3. Press the mode SW once again. The beep will sound five times.
4. To extend the leg rest, press the P1 SW.
To retract the leg rest, press the AR SW.

[Note] When the chair is at the low position, the leg rest will not move to avoid collision with the floor. In this case, E1 is indicated.

Without any events, the mode is terminated automatically after a lapse of 10 seconds. Press the mode SW again to exit the mode.

9. Up/down operation setup for the LP (last position) operation

In addition to reclining operations, up/down operations for the LP operation can be enabled or disabled.

[Important] This setting must be disabled for CLESTA -II.

Be sure to set the No. 1 and No. 2 jumpers of the JP1 terminal.

1. If the jumpers for terminals 1 and 2 of JP1 on the p.c.board are set, up and down operations are disabled.
If the jumpers for terminals 2 and 3 are set, up and down operations are enabled.

10-1. Manual setup of the margin

Sets up the value of the margin between the stop command issue and the target position for the stop operation in auto operations and limit stops. The margins include chair-up, chair-down, backrest-raise, and backrest-recline margins.

Narrower margins tend to result in a movement between P1 and P2 positions where they are supposed to be identical, whereas wider margins tend to result in a greater error in the moving direction. If the chair does not reach the preset position, the margin value should be reduced; if the chair goes beyond the position, the margin value should be increased.

[Setup procedure]

1. Slide the limit SW on the p.c.board to the limit position. The beeper will sound once.
2. Press the mode SW. The beeper stops sounding.
3. Depending on the setup target, press the SWs shown below.

Margin	SW to be pressed	Margin	SW to be pressed
Chair up	Chair up	Chair down	Chair down
Backrest raise	Backrest raise	Backrest recline	Backrest recline

4. To increase the margin, press the P1 SW. When the maximum value is reached, the sound frequency becomes higher.
To reduce the margin, press the A.R. SW. When the minimum value is reached, the sound frequency becomes lower.
The margin can be specified between 01 and 09.
5. After the margin is confirmed, press the Store SW.
6. To setup additional margins, repeat the steps from 3 to 5.
7. After the setup is complete, slide the limit SW to the normal position.

[Note] If the mode SW is pressed during the setup process, the mode shifts to the limit setup mode. (The beeper will sound once.)

If another SW shown in the table in 3 is pressed during the setup, the margin will be set for the additionally pressed SW.

10-2. Automatic setup of margins (for versions 1.3 and higher)

The margin described above is set up automatically. Attention must be paid to the chair moving automatically.

To obtain practical data, it is ideal to perform automatic setup with the chair loaded with that close to the actual loading (ideally, with an adult on the chair).

[Setup procedure]

1. Slide the limit SW on the p.c.board to the limit position. The beeper sounds once.
2. Press the mode SW. The beeper stops sounding.
3. Press the P1 SW until the beeper sounds. (About 3 seconds.)
When the SW is released, the chair moves to the auto-return position. Then, the chair moves up to a quarter of the total stroke. (The chair-up margin is retrieved.) The chair moves up to half the total stroke, then moves down to a quarter of the stroke. (The chair-down margin is retrieved.) The backrest reclines backward to three-quarters of the total reclining angle. (Backrest recline data is retrieved.) The backrest reclines fully and is then raised forward up to three-quarters of the total angle. (Backrest raise data is retrieved.) The setup is completed and the beeper sounds continuously.
4. Slide the limit switch back to the normal position.

11. LP switch function setup (LP or P3)

The LP (last position) operation SW can be set up as a regular preset switch.

[Setup procedure]

1. Slide the limit SW on the p.c.board to the limit position. The beeper sounds once.
2. Press the mode SW. The beeper stops sounding.
3. Press the P2 SW to set the LP SW as P3, or press the LP SW to set it as LP.
4. Slide the limit SW back to the normal position.

12. Potentiometer voltage and installation

1. The potentiometer for detecting the vertical up-down position of the chair is connected to S5.
The voltage is low in the down direction with the lower limit of 0.2 V and higher, and high in the up direction with the upper limit of 4.8 V and lower.
The voltage is measured in VDC by connecting the black test lead of the multimeter to the GND pin on the p.c.board, and the red lead to the TP1 pin.
2. The potentiometer for detecting the reclining angle is connected to S6.
The voltage is low in the reclining direction with the lower limit of 0.2 V and higher, and high in the raising direction with the upper limit of 4.8 V and lower.
The voltage is measured in VDC by connecting the black test lead of the multimeter to the GND pin on the p.c.board, and the red lead to the TP2 pin.
3. The potentiometer for detecting the leg rest angle is connected to S7.
The voltage is low in the retracting direction, and high in the extending direction.
The voltage is measured in VDC by connecting the black test lead of the multimeter to the GND pin on the p.c.board, and the red lead to the TP3 pin.

[Note] The important factor here is that the voltage changes smoothly according to the operation of the chair rather than the absolute value of the voltage.

The symptom that there is little change in voltage near position limits (for example, the voltage stays around 0.2 V) indicates the poor installation of the potentiometer onto the chair; the potentiometer should be reinstalled.

13. Functions of the LEDs and connectors on the p.c.board.

Color	Function
LED 1 Green	Ready-to-output indicator. The LED is off if a prohibit-all input is present right after power is on.
LED 2 Green	Power LED. Indicates the power supply to the p.c.board.
LED 3 Red	Limit status indicator. The LED is on while the slide SW is at the limit position.
LED 4 Amber	Serial 3 transmission indicator. The LED is turned on when the flow of transmission current is detected. The LED is off when data to be transmitted does not exist or if there is an open circuit.
LED 5 Characters	When there is no setup or malfunction, the chair position is indicated (to the right). When a mode is specified, the present mode is indicated. When there is some sort of malfunction, the corresponding error code is indicated. At power-up, a program number is indicated.
Connector No.	Function
S1-A S1-B	SW input connector for chair operation. No. 10 is common.
S2-A S2-B	SW input connector for headrest operation. No. 6 is common.
S3-B	4-bit input terminal (for connection with Siela and other units).
S4-1 S4-2	Input connector for operation prohibition. Nos. 1-2: Prohibits lowering. Nos. 3-4: Prohibits all the operations.
S5	Connector for the potentiometer for up/down operation.
S6	Connector for the potentiometer for the backrest.
S7	Connector for the potentiometer for the leg rest.
S8	Output connector for the relay board. (With a leg rest terminal, 12P)
S9	Output connector for dental light control
S10	Output connector for the relay board. (Without a leg rest terminal, 10P)
S11	Output connector for the relay board. (For leg rest, 3P)
S12	Communication connector (receive only). Nos. 2- 3: input, No. 1: 5 V No. 4: ground.
S13	Input connector for chair lowering prohibition
S14	Communication connector 1-2: Transmission 3-4: Reception
S15	Power input 14 VAC

14. If a failure is suspected, the following inspection should be conducted.

Symptom	Inspection target	Troubleshooting
The beeper sounds continuously and the chair will not move at limit setup.	Measure the potentiometer voltage. The operation is prohibited around 0 V or 5 V, which are potentiometer limits.	Reinstall the potentiometer to the chair.
The beeper sounds continuously at limit setup whereas the chair is operable.	The wiring to the potentiometer may be improper. Check the no. 1 and 3 lines. If the symptom is momentary, the condition is normal.	If the lines are connected opposite to each other, correct the connection according to the wiring specifications.
The chair will not move.	LED 2 is off.	Check for power supply.
The chair will not move.	LED 1 is off.	Check if prohibit all input is present or not.
Operation from the unit unavailable.	Check the transmission LED on the unit.	If the LED on the unit is off, the malfunction is caused by poor connection or open circuit. If the LED on the unit is on, check for baud-rate consistency and set up as required.
Operation by foot SW unavailable.	Check for open circuit between the SW and the p.c.board.	
The identical positions set for preset, auto-return, and rinsing slightly move in actual operation.	Check the margins.	Increase the margins.
The preset position is not reached.	Check the margin.	Decrease the margin.
The preset position is exceeded.	Check the margin.	Increase the margin.
The chair is not moved by pressing a SW. The beeper sounds while the SW is pressed.	An input to prohibit the chair operation is present. Cancel the input to confirm the kind of prohibit signal.	Cancel the prohibit input.
The beeper sounds at power on and stops when a SW is pressed. The auto operation is disabled thereafter, and the manual operation works only in one direction.	Open or short circuit of the potentiometer. Measure the voltage using a multimeter to check for the malfunction.	Repair the open circuit, replace the cable.
The stop position of the chair becomes	The position of the potentiometer is	Check for loose installation of the device
The legrest does not extend by preset switches.	Check the set up position of legrest.	Manually extend the legrest for setting-up. Extend the legrest in independent mode to the limit position and set the preset.

15. Emergency inspection procedure

Some quick inspection procedures are described below.

1. Operation input inspection.

The inspection should be performed with the cable to the connector S1 disconnected, the relay p.c.board connected, and the power turned on.

Jump the S1s No. 10 pin and the pins No. 1 to No. 8 one by one. If the p.c.board responds, the p.c.board is operating normally.

In this case, inspect the SW.

2. Headrest connector inspection.

The inspection should be performed with the cable to the connector S2 disconnected, the relay p.c.board connected, and the power turned on.

Jump the S2s No. 6 pin and the pins No. 1 to No. 4 one by one. If the p.c.board responds, the p.c.board is operating normally.

In this case, inspect the SW.

3. Inspection of the relay p.c.board.

The inspection should be performed using the harness connector, with the cable to the S10 connector disconnected.

Jump the S10s cable connector No. 10 and pins No. 1 to No. 9 using wire and solder paste and check the relay sound, motor, and solenoid valve operation. The jump to the No.1 pin should be checked momentarily because the pin corresponds to the motor.

4. Always check the potentiometer voltage. Check the voltage over the entire stroke range for smooth variation.

Annex 1. List of beeper sounds and messages

Beeper sound	Current status
Pip, pip, pip, with one second intervals	Store SW has been pressed to shift to the preset position setup mode.
Pip, pip, pip, with 1.5 second intervals	Limit position setup mode (position movement mode) L
Pip-pip, pip-pip, pip-pip...	Waiting for limit position setup to be saved (limit target waiting for a command) L
No beeper sound	Margin setup mode L
Pip-pip-pip, pip-pip-pip, pip-pip-pip...	Communication speed switch mode [24] or [48] in setup mode. L
Poo-poo-poo, Poo-poo-poo...	Doctor ID setup mode
Poo-poo-poo-poo, Poo-poo-poo-poo...	Beeper enable/disable setup mode. The display shows the setup status.
Pip-pip-pip-pip-pip, pip-pip-pip-pip-pip...	Leg rest operation mode
Pip-pip-pip-pip, pip-pip-pip-pip...	An ON SW (ON SWs) at power-up is detected. After 5 cycles of beeper sound, the operation proceeds to the next step.
C, C, C	At power-up: Rise/lower-potentiometer related malfunction occurred.
C-D, C-D, C-D	At power-up: Recline-potentiometer related malfunction occurred.
C-D-E, C-D-E...	At power-up: Leg-rest-potentiometer related malfunction occurred.
C-D-E-F-G, C-D-E-F,	memory failure (Majority voting memory (EEPROM) access discrepancy)
C-D-E-F-G-A...	memory failure (unsuccessful EEPROM writing)
	Prohibit-all input is present.
	"Prohibit lowering" input 1 is present.
	"Prohibit lowering" input 2 is present.
Beep (while the SW is pressed and held down)	An operation SW corresponding the operation-prohibit input target has been pressed.
C-D-E-F-G-A-B-C-D-E...	Batch initialization took place.

The ' L ' to the right in the current status column indicates that the mode is available when the limit SW on the panel is at the limit position.

[Note 1] The beeper keeps sounding while the operation SW is pressed and held down. An operation prohibition input is present (prohibit-all or prohibit-lowering).

NOTE



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