
MED64

The most sensitive microelectrode array system
for *in vitro* extracellular electrophysiology

Product Manual

MED64 Multiplexer

P/N: MED-A64SF1 / MED-A64SF2



ALPHA MED SCIENTIFIC

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Alpha MED Scientific Inc.

Saito Bio-Incubator 209, 7-7-15, Saito-asagi,
Ibaraki, Osaka 567-0085, Japan

E-mail: support@med64.com

Website: <http://www.med64.com>

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1. Safety precautions

Before using this unit please read these operating instructions carefully. Take special care to follow the warnings indicated on the unit itself as well as the safety suggestions listed below. Keep these precautions at hand for future reference.

1-1. Placement

- Avoid placing the unit in areas of:
 - direct sunlight.
 - high temperature.
 - high humidity.
 - excessive vibration.
 - uneven surfaces. (Place the unit on a flat level surface.)

Such conditions might damage the cabinet and/or other component parts and thereby shorten the unit's service life.

1-2. Stacking

- Never place heavy items on top of the unit, the DC power supply unit, or AC power cord.

1-3. Voltage

- Avoid the use of a "high voltage" AC power source. It is an extremely dangerous fire hazard.
- A DC power source cannot be used. Be sure to check the power source carefully.
- The working input voltage range is 90-264V AC.

1-4. Power cord protection

- Avoid using AC power cords with cuts, scratches, or poor connectors, as this may result in fire or electric shock. Excessive bending, pulling or slicing of the cord should also be avoided.
- Do not pull on the cord when you are disconnecting the power. This could cause an electric shock. Grasp the plug firmly when you disconnect the power supply.
- Never touch the plug with wet hands as a serious electric shock could result.

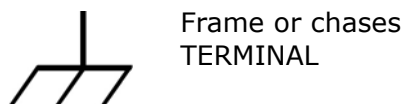
1-5. Foreign materials

- Ensure that no foreign objects (e.g. - needles, coins, screwdrivers), accidentally fall into the unit. Otherwise, a serious electric shock, short circuit, or other malfunction could occur.
- Be extremely careful about spilling water or liquid on or into the unit, as a fire, short circuit, or electric shock can also occur. Disconnect the power plug and contact your dealer immediately if this occurs.
- Avoid spraying volatile chemicals (e.g.- insecticides, alcohol, paint thinner) on or into the unit. They contain flammable gases which can be ignited.
- Insecticides, alcohol, paint thinner and similar chemicals should never be used to clean the unit. They can cause flaking or cloudiness to the cabinet finish.

1-6. Service

- Never attempt to repair, disassemble or modify the unit if there seems to be a problem. A serious electric shock could result if you ignore this precautionary measure.
- If a problem occurs during operation (smoke is detected, etc.) contact your dealer immediately.
- Disconnect the power supply if the unit will not be used for a long time. Otherwise the unit's lifetime could be shortened.

Safety-related symbols used on equipment and documentation:



1-7. Environmental conditions

- Indoor use.
- Altitude up to 2000 m.
- Temperature: 5 - 40 °C.
- Maximum relative humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C.
- Main supply voltage fluctuations not to exceed +/- 10% of the nominal voltage.

1-8. Maintenance

- Clean the cabinet, panel and controls with a soft cloth lightly moistened with mild detergent solution.
- Do not use any type of abrasive pad, scouring power or solvent such as alcohol or benzene.
- Supply voltage fluctuations must not to exceed +/- 10% of the nominal voltage.

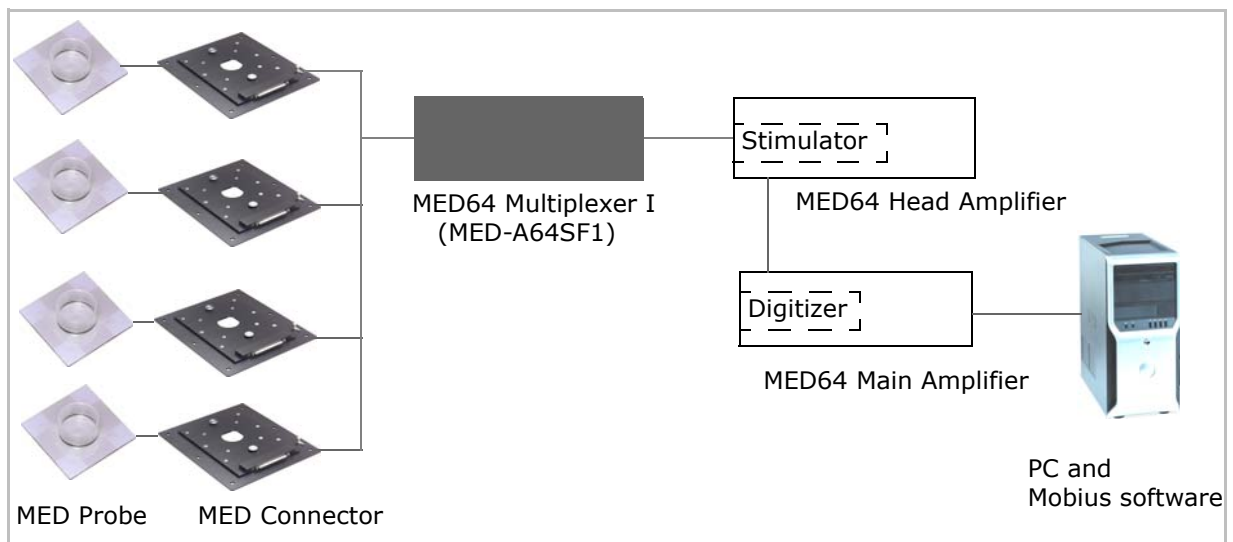
2. MED64 Multiplexer components and functions

The MED64 Multiplexer I (MED-A64SF1) enables the researchers to acquire extracellular signals (field potentials) from 4 of MED Probes/Connectors at all 64 channels sequentially. It automatically switches the acquisition/stimulations from Connector to Connector in turn.

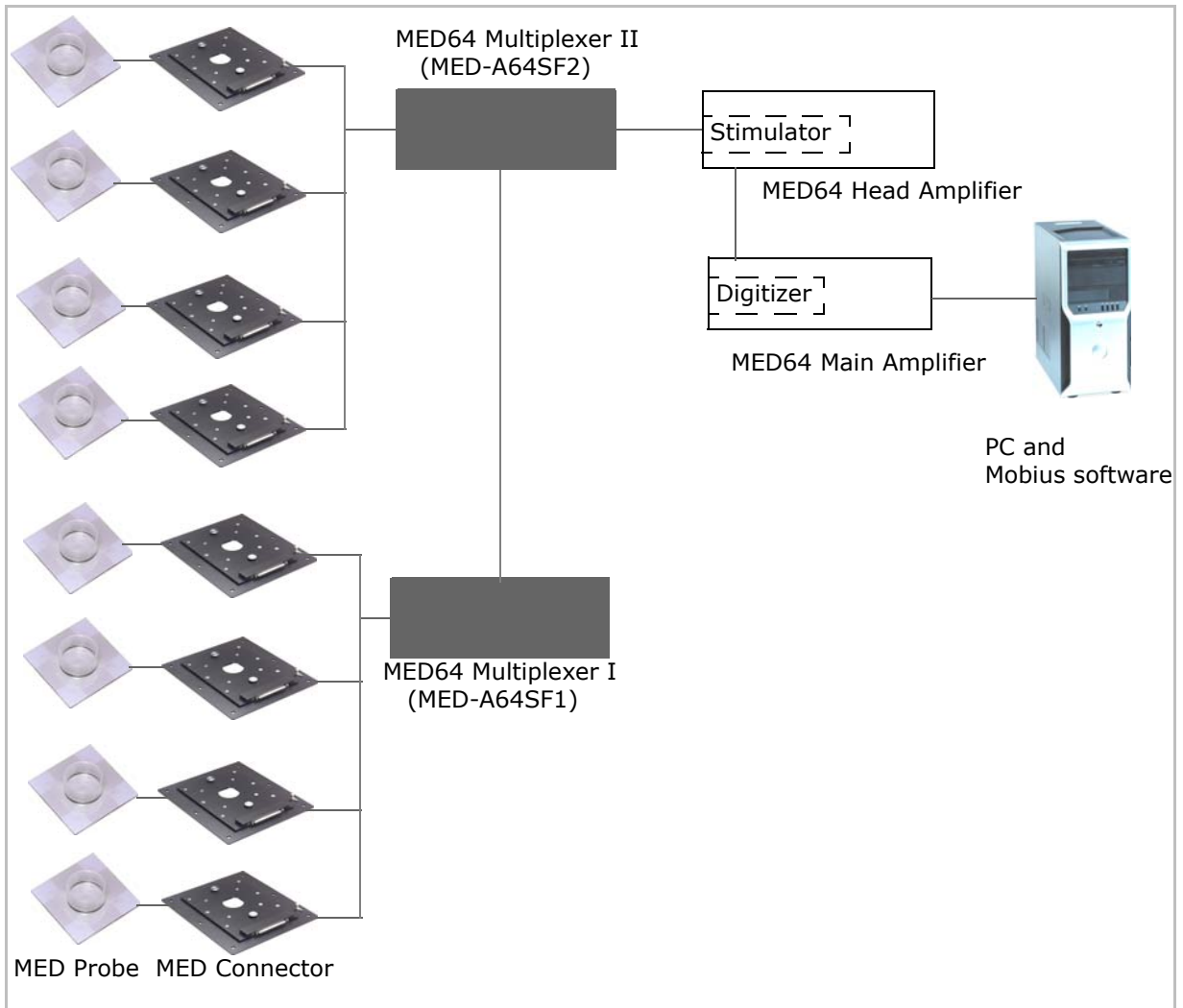
The MED64 Multiplexer II (MED-A64SF2) connects MED-A64SF1 and another 4 MED Connectors, thus allowing acquisition/stimulations between 8 Connectors.

2-1. System configurations

MED64-Plex4 System



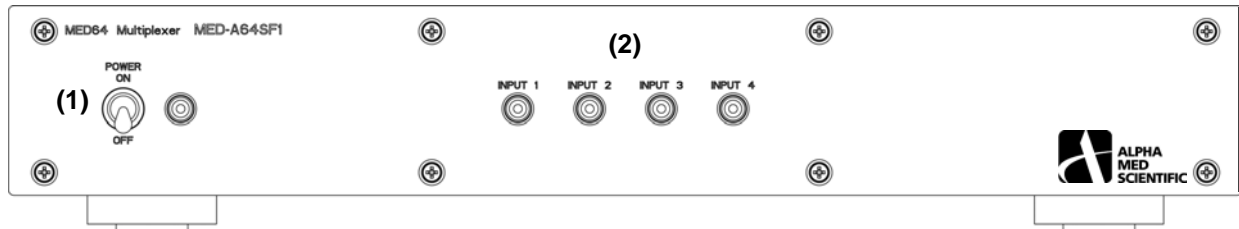
MED64-Plex8 System



2-2. Components and their functions

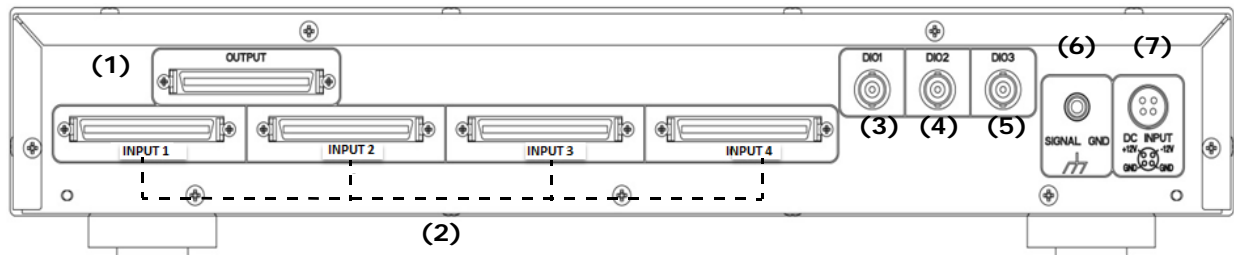
MED64 Multiplexer I (MED-A64SF1)

Front panel



- (1) POWER
Turns the MED64 Multiplexer ON and OFF.
- (2) INPUT 1-4 lamp
Lights up the Input in which acquisition is currently made.

Back panel



- (1) OUTPUT
Signal output. Connects to the [INPUT] terminal on the MED64 Head Amplifier (MED-A64HE1S).
- (2) INPUT 1, 2, 3, 4
Signal input for the MED Connector (MED-C03 or MED-CP02H). Connect to the 68 pin terminals of the Connector(s).
- (3) DIO1
Digital Input/Output port 1.
For Plex4: Leave this terminal free from any connections.
For Plex8: Connects to the [DIO1] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO1] on the MED-A64SF2 using 2 BNC cables + 1 T-shaped adapter".
- (4) DIO2
Digital Input/Output port 2.
For Plex4: Connects to the [DIO2] on the MED64 Main Amplifier (MED- A64MD1) with the BNC cable.
For Plex8: Connects to the [DIO2] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO2] on the MED-A64SF2 using 2 BNC cables + 1 T-shaped adapter".

(5) DIO3

Digital Input/Output port 3.

For Plex4: Connects to the [DIO3] on the MED64 Main Amplifier (MED- A64MD1) with the BNC cable.

For Plex8: Connects to the [DIO3I] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO3] on the MED-A64SF2 using 2 BNC cables + 1 T-shaped adapter.

(6) SIGNAL GND

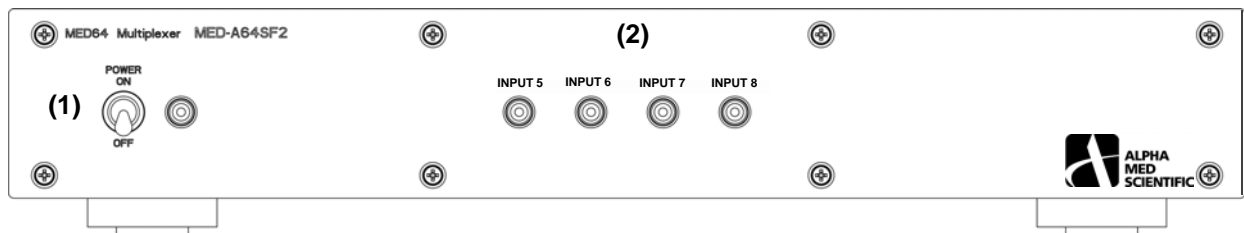
Ground terminal for signals. The grounding here is not usually necessary.

(7) DC INPUT

DC power supply cord inserts here.

MED64 Multiplexer II (MED-A64SF2)

Front panel



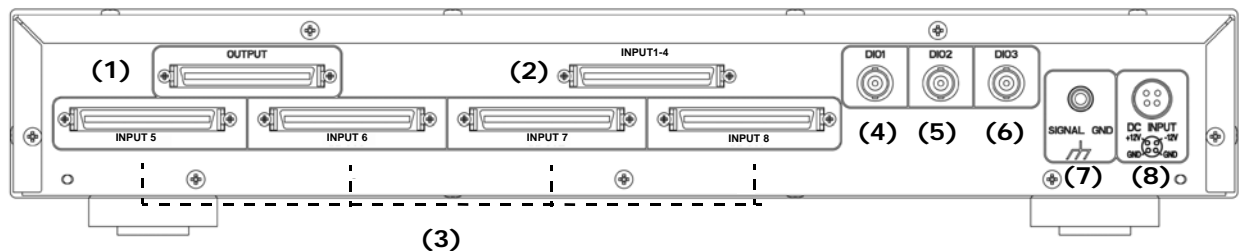
(1) POWER

Turns the MED64 Multiplexer ON and OFF.

(2) INPUT 5-8 lamp

Lights up the Input in which acquisition is currently made.

Back panel



(1) OUTPUT

Signal output. Connects to the [INPUT] terminal on the MED64 Head Amplifier (MED-A64HE1S).

(2) INPUT1-4

Input for processing the signals coming from INPUT1-4 (with bypassing MUX). Connects to the [OUTPUT] on the MED64 Multiplexer I (MED-A64SF1).

-
- (3) INPUT 5, 6, 7, 8
Signal input for the MED Connector (MED-C03 or MED-CP02H). Connect to the 68 pin terminals of the Connector(s).
 - (4) DIO1
Digital Input/Output port 1. Connects to the [DIO1] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO1] on the MED-A64SF1 using 2 BNC cables + 1 T-shaped adapter.
 - (5) DIO2
Digital Input/Output port 2. Connects to the [DIO2] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO2] on the MED-A64SF1 using 2 BNC cables + 1 T-shaped adapter.
 - (6) DIO3
Digital Input/Output port 3. Connects to the [DIO3] on the MED64 Main Amplifier (MED-A64MD1) and the [DIO3] on the MED-A64SF1 using 2 BNC cables + 1 T-shaped adapter.
 - (7) SIGNAL GND
Ground terminal for signals. The grounding here is not usually necessary.
 - (8) DC INPUT
DC power supply cord inserts here.

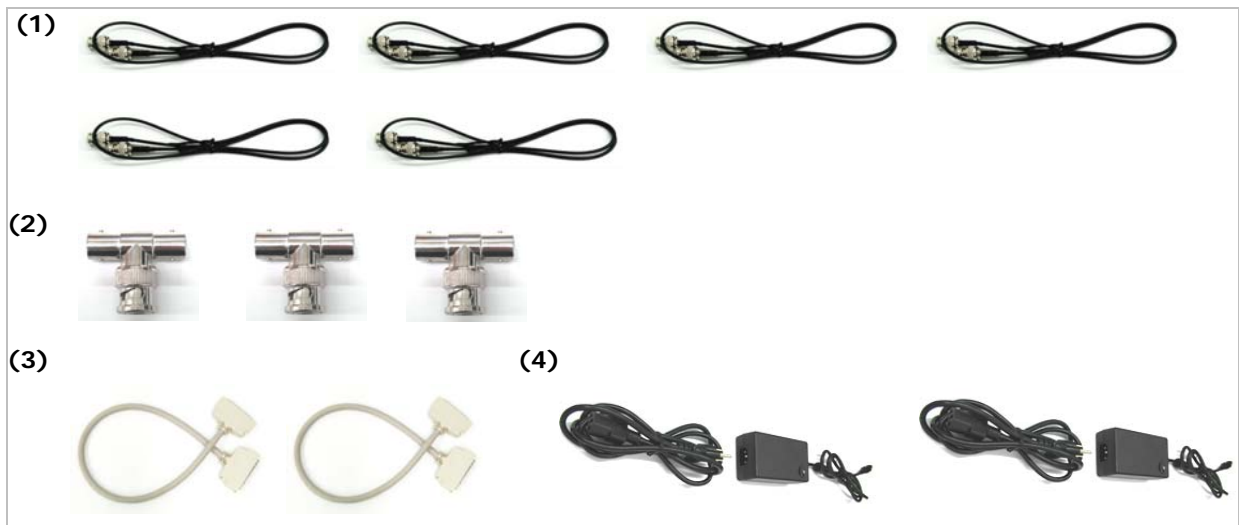
Accessories

For the Plex4 System



- (1) BNC Cable -2 units-
Connects the [DIO2/3] to the [DIO2/3] on the MED64 Main Amplifier.
- (2) 68 pin cable -1 unit-
Connects the [OUTPUT] terminal to the [INPUT] terminal on the MED64 Head Amplifier (MED-A64HE1S).
- (3) Power supply unit -1 unit-

For the Plex8 System



(1) BNC Cable -6 units-

(2) T-shaped adaptor -3 units-

Connect 2 of BNC Cables with a T-shaped adaptor (See Figurer-1) to make 3 sets of "combined cables". Connect DIO1-3 among for the MED64 Multiplexer I (MED-A64SF1), MED64 Multiplexer (MED-A64SF2), and the MED64 Main Amplifier (MED-A64MD1), and the with those cables.



Figure 2-1. Combined BNC cable

(3) 68 pin cable -2 units-

Connects the [OUTPUT] terminal to the [INPUT] terminal on the MED64 Head Amplifier (MED-A64HE1S).

Connects the [INPUT 1-4] to the [OUTPUT] terminal on the MED64 Multiplexer I (MED-A64SF1).

(4) Power supply unit -2 units-

3. Installation for the MED64-Plex4/8 System

The MED64 Systems have several technical advantages due to the low-impedance platinum-black microelectrodes on the MED Probe (typically 10 k Ω at 1kHz for 50 μ m electrodes). These include:

1. The system is more resistant to exogenous noise (e.g. hum noise).
2. Very low Johnson noise (baseline noise) as low as a few microvolts can be achieved.
3. The MED Probe/Connector can be physically separate from the amplifier (such as during long-term recordings in a humidified incubator). It is connected with a cable as long as 2m without noise or signal attenuation.

The MED64 Systems do NOT usually require a Faraday cage or vibration isolation table, which are necessary for conventional electrophysiology rigs. It is recommended that the MED64 system be **installed on a STABLE TABLE**, with aluminum foil underneath the connector (except when the system is used in conjunction with other equipment such as an incubator or microscope).

Install the MED64 Plex 4/8 System using the following instructions:

1. Place the system on a stable table.
2. Place the Multiplexer I, Multiplexer II, MED64 Head Amplifier and Main Amplifier from bottom up (See Figure 3-1). This orientation provides the MED Connector Cable (the cable connecting the MED Connector to the Multiplexers) more stability, and prevents noise. (A laptop PC needs to stay away from Head Amplifier and Multiplexer, otherwise will introduce noise.)
3. Ground all hardware (Multiplexer, MED64 Amplifiers, ThermoClamp, Peristaltic pump, incubator if used) with a single power strip.
 - Connect all equipment power cords to a single power-supply cord (Figure 3-1), and then connect it to a power supply on a wall socket which is FREE from any other power cord.
4. Place any power supply unit (including the ones for amplifiers and multiplexers) AWAY from the MED64 Multiplexer, MED64 Head/Main Amplifiers, and MED Connector Cables.

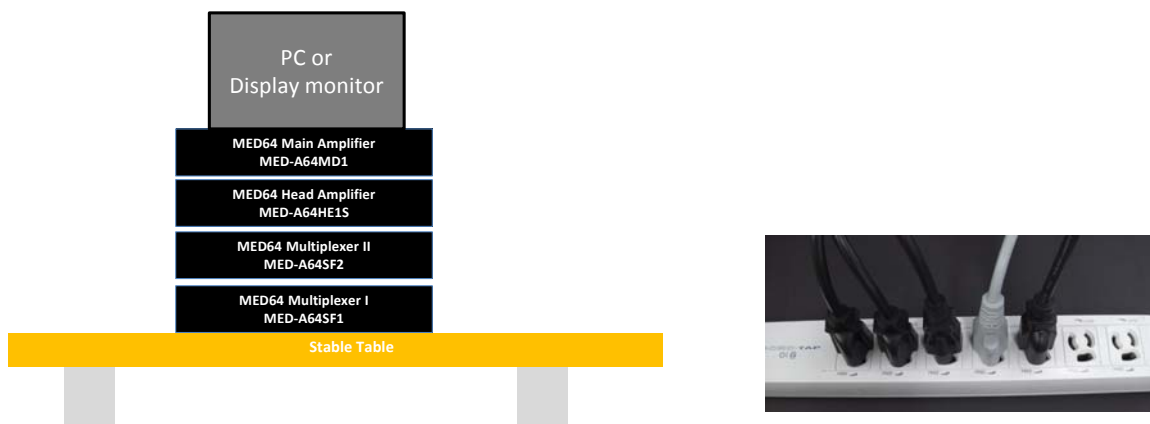
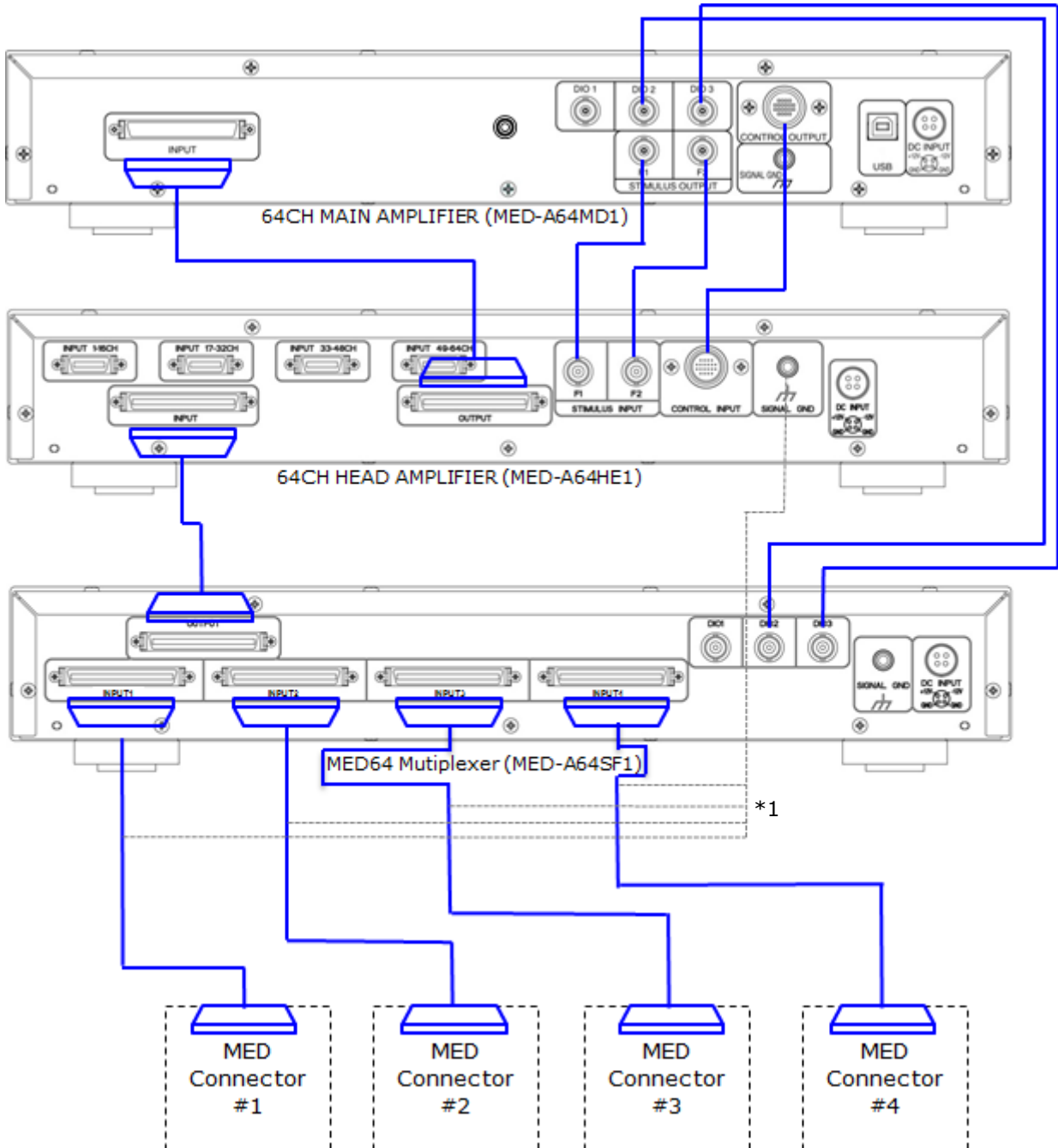


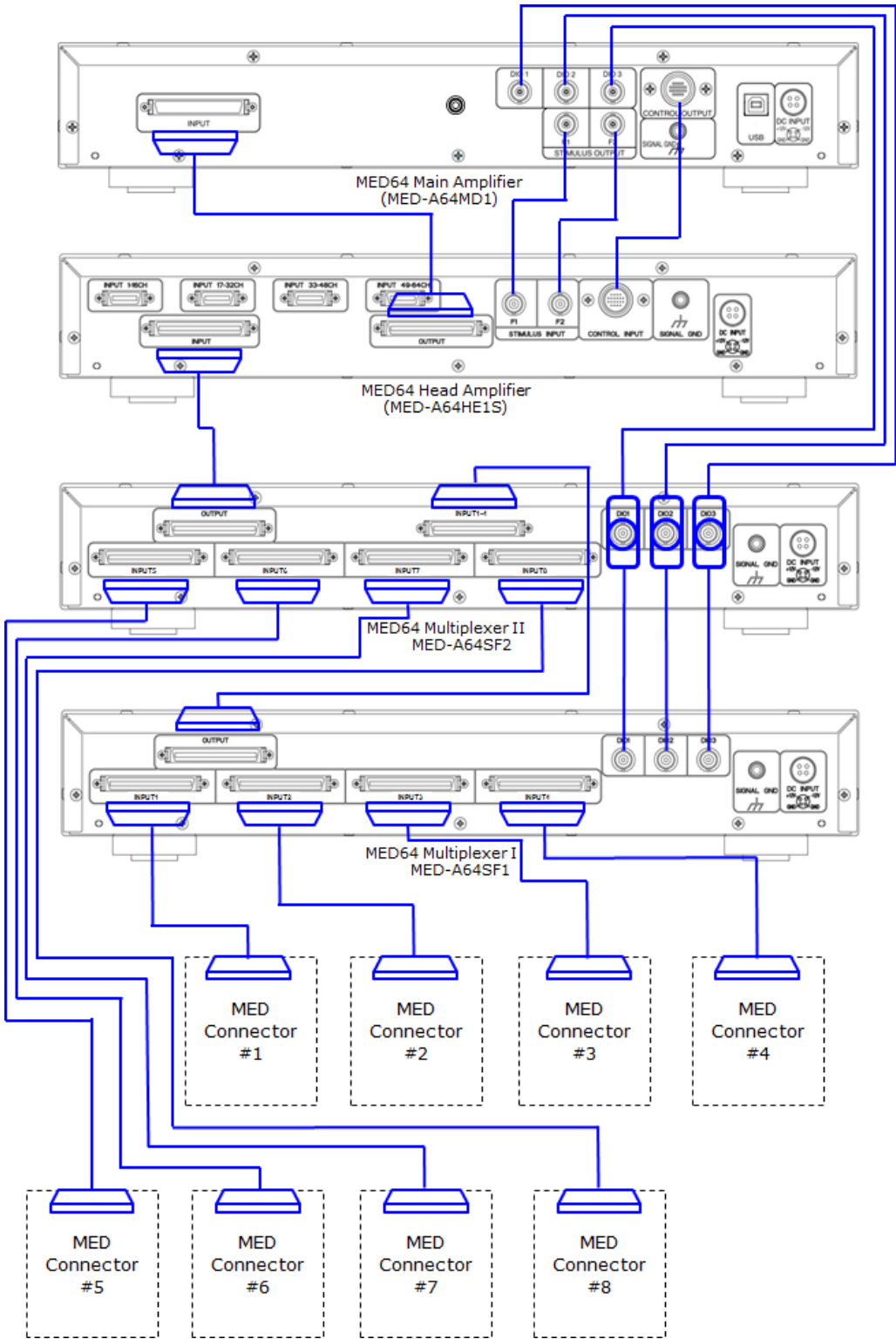
Figure 3-1. Installation of hardware for the Plex8 (left), and grounding through a single power strip (right).

3-1. Connecting the MED64 Multiplexer to other components

MED64-Plex4 System



MED64-Plex8 System



* Ground all Connector cables (cables connecting MED Connector and Multiplexer) to the GND on the MED-A64HE1 ONLY if your Connector cables are wrapped with the gray conductive tape.

4. Instructions for use

4-1. Running the MED64-Plex4/8 System

The MED64 Multiplexer can be run using the Mobius's [Acquire MED64R2 Data w/Stim] module for acquisitions both WITH and WITHOUT stimulation.

Activating the Multiplexer

1. Right-click the dark-gray bar in the top of [Acquire MED64R2 Data w/Stim].
2. Select "Advanced Setting".
3. Check the "Enable multiplexing".
4. Click OK.

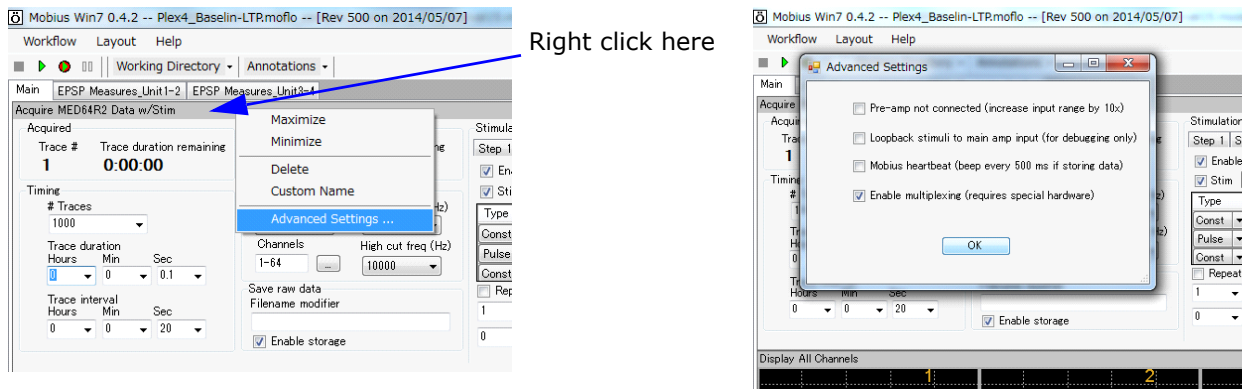


Figure 4-1. Activating the Multiplexer.

Note:

Make sure for the "Enable multiplexing" to be checked whenever the Plex System is run. If unchecked, acquisition is made from Unit/Connector 1 only.

Running the Multiplexer

The "Step 1-8" in the "Acquire MED64R2 Data w/Stim" is assigned to the Input (MED Connector) 1-8. (e.g., Step 1 > Connector 1 (Input 1)). Checking the "Enable Step" activate the same number of the Input (Connector). Enable Step 1-4 while disabling Step 5-8 for the Plex4 System. Enable all Step 1-8 for the Plex8 System. Disable the steps you will not use. For example, acquisition will be made only from the Connector 2 and 3, in turn, when only Step 2 and 3 are activated.

The lamp on the Multiplexer shows the unit where acquisition is currently being performed. Please note that the indicator light will move to the following position immediately after finishing an acquisition. This might give the impression that you are recording from the next Connector when a short duration time (e.g., 0.1 sec) is set for acquisition.

For spontaneous recording (without stimulation)

Uncheck both of the F1 and F2 stimulators for all activated Steps.

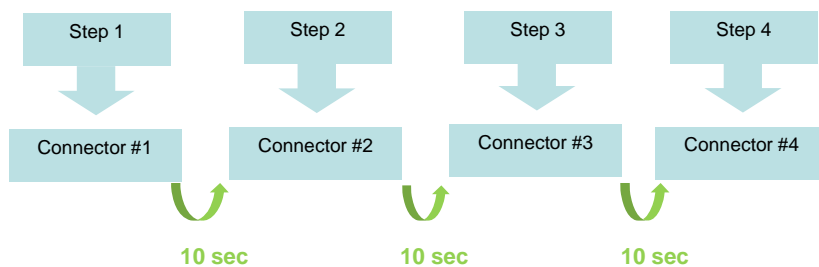
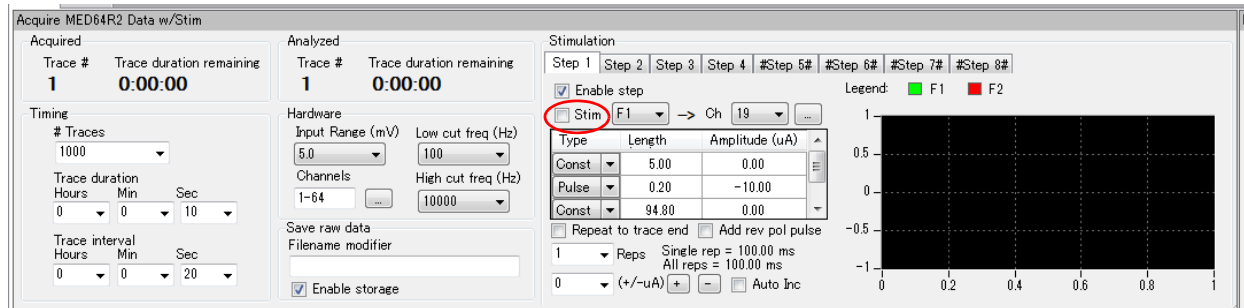


Figure 4-2. Example for spontaneous recording for Plex 4. Acquisition is made for 10 seconds, and moved to the next Connector with the interval of 10 seconds.

For acquisition with stimulation

Enable the stimulator for all Steps. Independent stimulus parameters can be set for each Connector.

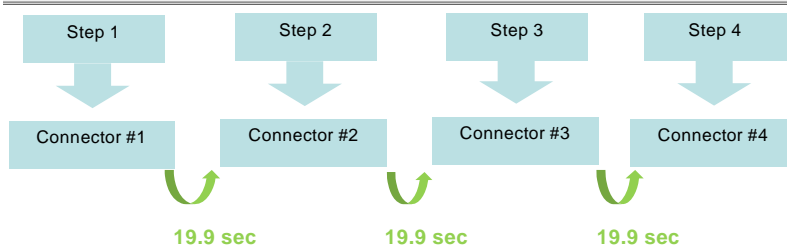
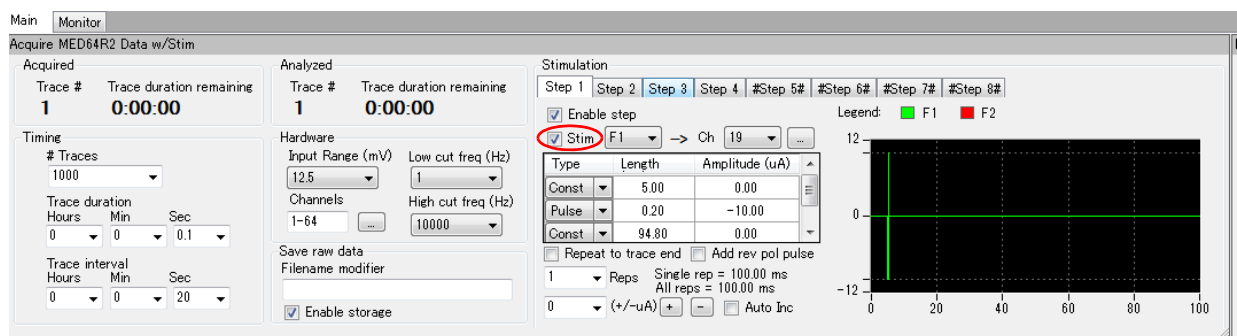


Figure 4-3. Example for acquisition with stimulation for Plex 4.

Saving data file independently per sample

Acquired data (.modat file) can be saved independently per sample (unit) using Mobius’s [Export Raw Data] module. This can be made by:

1. Adding 4 (or 8 for Plex 8) of [Export Raw Data] modules directly under the [Acquire MED64R2 Data_w/Stim] module.
2. Checking “Enable storage” for all [Export Raw Data].
3. Select “Mobius (16bit)” for Format.
4. Check “Step filter”, and select Step1-4 (up to 8 for Plex 8) for each.
5. Select the folder where data is saved in the “Export Directory”. (Name of directory can be copied and pasted to another [Export Raw Data]).
6. Uncheck “Enable storage” in the [Acquire MED64R2 Data_w/Stim].

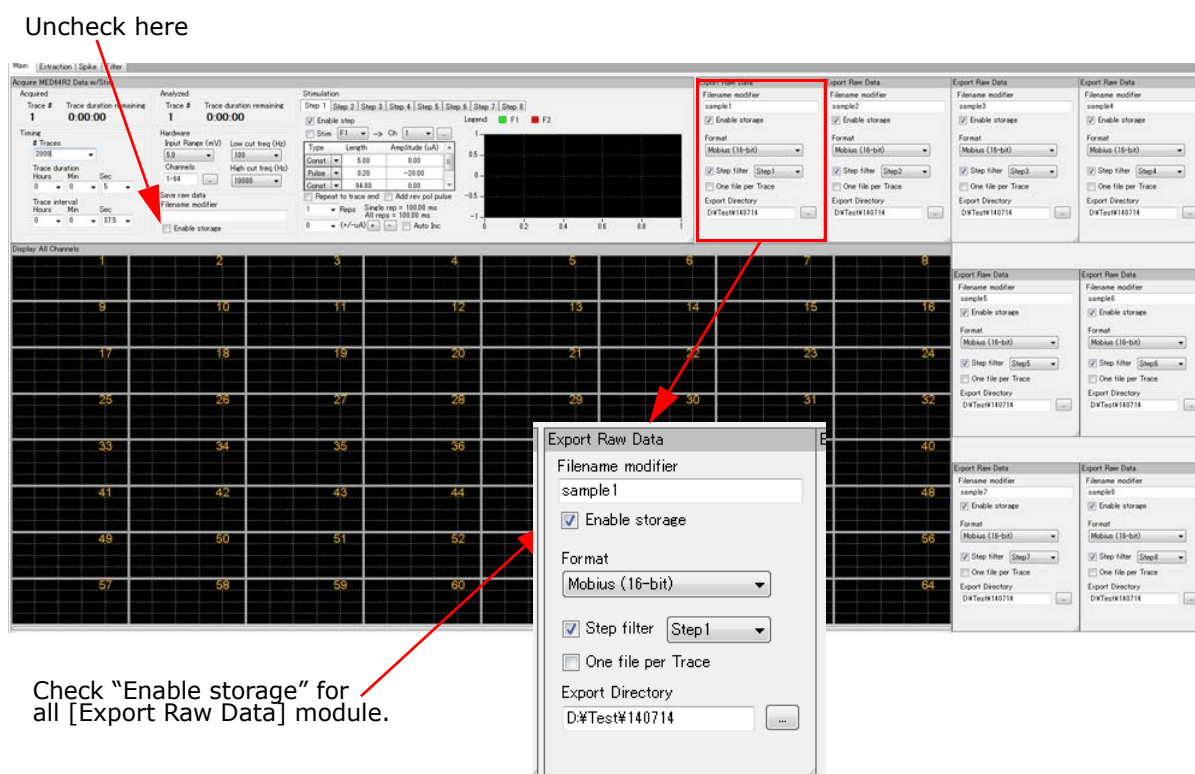


Figure 4-4. Example for an acquisition workflow for Plex 8. [Save raw data] is unchecked while 8 [Export Raw Data] are activated with “Mobius Format” and each “Step” selected. Raw data will be independently saved to 8 different modat files per slice/unit.

NOTE:

When [Extract EP Measures] is used for your analysis (e.g., fEPSPS, LTP), saving all data in a file is recommended. It is because the “Step filter” in this module allows you analyze all data at once.

4-2. Trace intervals to be set

The MED64 Multiplexer requires certain amount of time to switch its acquisition from Connector to Connector. This interval is necessary for the amplifiers to discharge electrical current before starting acquisition at the next Input (Connector). Switching the acquisition to the next Connector introduce large noise, which gives the amplifiers momentary saturation. The amplifiers need several seconds to recover and have the DC level stabilized at 0.

The time necessary for the amplifier's recovery differs depending on the setting for the "Input range" and "Low cut filter". Lower input range as well as smaller number for low cut filter provides longer time for the recovery. Use of stimulation requires longer time for this recovery.

Thus, use the of Multiplexer with **trace intervals described in the Table 4-1 or longer** is strongly recommended.

Stimulation	Input Range	Low cut filter	Trace Interval
No	5.0 mV	1 Hz	Trace duration + 15 sec
No	5.0 mV	10 Hz, 100 Hz	Trace duration + 10 sec
No	12.5 mV	10 Hz, 100 Hz	Trace duration + 5 sec
Yes	5.0 mV	1 Hz	Trace duration + 30 sec
Yes	12.5 mV	1 Hz	Trace duation + 15 sec
Yes	12.5 mV	10 Hz, 100 Hz	Trace duration + 10 sec

Input Range of 2.3 or 2.9 mV is not recommended for use of the Multiplexer.

Table 4-1. Trace intervals for the MED64 Multiplexer.

4-2. Initial calibration

The Multiplexer requires initial calibration before starting all your experiments. The amplifiers need longer time to recover (described in previous section) for the first traces. Doing initial calibration with following steps will help your acquisitions/experiments to be performed smoothly from the beginning. **Please note that the calibration is necessary whenever acquisitions are made with new samples.**

- Set the acquisition parameters as followings:
 - Number of trace: 4 (for Plex 4), 8 (for Plex 8)
 - Trace duration: 10 sec
 - Trace interval: 30 sec
 - Low-cut/High-cut filter: Parameters that will be used for your experiments.
- Enable all Steps.
- Disable all stimulators.
- Run the workflow with the Green button until the end.

NOTE:

Workflow for the calibration is available on our web site.

5. Warranty

This product will be repaired with new or refurbished parts, free of charge, for one (1) year from the date of original purchase in the event of a defect in materials or workmanship.

The product warranty covers failures due to defects in materials or workmanship which occur during normal use. It does NOT cover damage incurred during shipment or problems which are caused by products not supplied by Alpha MED Scientific. In addition, this warranty does not cover problems resulting from alteration, accident, misuse, neglect, faulty installation, maladjustment of user controls, improper maintenance, modifications or service by anyone other than AMS or damage attributable to acts of God.

6. Specifications

MED64 Multiplexer

	MED64 Multiplexer I (MED-A64SF1)	ME64 Multiplexer II (MED-A64SF2)
Number of channels (per an input)	64	64
Number of inputs	4	4
Number of input (Bypassing MUX)	None	1
Maximum input/output voltage	+/-4 V	+/-4 V
Control signal	3bit BCD (refer to Appendix 1)	3bit BCD (refer to Appendix 1)
Control signal level	TTL	TTL
Power supply	DC +/- 12 V	DC +/-12 V
Weight	6.1 Kg	6.2 Kg
Dimensions	W430 x L437 x H74 (mm)	W430 x L437 x H74 (mm)

Power supply unit

Input	AC 100-240 V (50-60 Hz)
Output	DC +/-12 V

Appendix 1

Control terminals			MED-A64SF1 INPUT NO	MED-A64SF2 INPUT NO
DIO 1	DIO 2	DIO 3		
L	L	L	INPUT 1	OFF
L	L	H	INPUT 2	OFF
L	H	L	INPUT 3	OFF
L	H	H	INPUT 4	OFF
H	L	L	OFF	INPUT 5
H	L	H	OFF	INPUT 6
H	H	L	OFF	INPUT 7
H	H	H	OFF	INPUT 8

*Specifications may not be satisfied depending upon the type of computer or operating environments used.
Only for use in animal studies research.*

Specifications and external appearance are subject to change without notice.

February 1, 2016



Alpha MED Scientific Inc.

Saito Bio-Incubator 209, 7-7-15, Saito-asagi,
Ibaraki, Osaka 567-0085, Japan

Phone: +81-72-648-7973 FAX:+81-72-648-7974
<http://www.med64.com> support@med64.com

Manufactured by **Alpha MED Scientific Inc.**

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