Master-8

EIGHT CHANNEL
PROGRAMMABLE PULSE STIMULATOR

Operation Manual

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Thank you for buying **Master-8 - the best stimulator.**

Master-8 is an 8-channel pulse stimulator, based on advanced technology, thus offers many useful features.
You will find that **Master-8** is user friendly and the programming simple and easy to learn. **Master-8** is an attractive unit and you will enjoy using it.

Please read this manual carefully and become familiar with all the possible options and operating modes.

Table of Contents

1. Introduction

Master-8 is an 8-channel stimulator which enables you to switch your set-up between completely different experiments (paradigms). **Master-8** stores eight user's preprogrammed paradigms. Each paradigm can use all eight channels. You can switch your set-up to the selected setting by using a single command. This option is very useful in the following cases:

a. where the current protocol requires modification during the course of the experiment. You can preset the modifications in different paradigms.
b. where several users of a set-up run different experiments. Each user retrieves his specific settings from the **Master-8** memory.

All parameters of the 8 paradigms are stored in the memory even after the power is switched off.

The **Master-8-cp** and **Master-8-vp** models can operate as stand alone units via the front panel keys in the same way as **Master-8**. In addition they can communicate with a PC.
The communication with a PC can be performed in the following ways:

1) Using the **Master-8 Control Software**.
   Using the **Master-8 Control Software** you see and modify on the screen of the PC all the parameters of the present paradigm. You can connect/disconnect channels with one mouse-click within the connection table.
   Another powerful feature of this software is the **Scheduler**. You can set a list of events that you want to happen at scheduled times like: triggering channels, switching paradigms, modifying time parameters, etc. You can also make loops of these events.
2) By your own applications, using our **Master-8 SDK (Software Development Kit)**.
   Using the **Master-8 SDK (Software Development Kit)** you can control the **Master-8** via a variety of applications like WORD or Excel, with script like VBScript or JavaScript, or by writing your own program, with Microsoft Visual Studio, Borland Delphi, or other development tools.

2. Front & Rear Panel Description

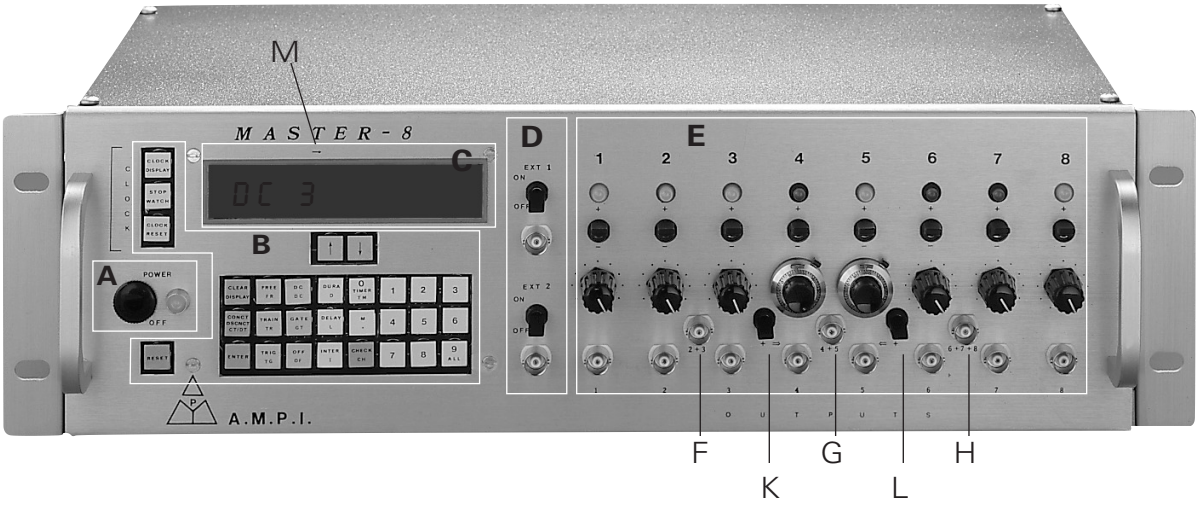


Figure 1

2.1 Front Panel

The Front Panel contains five sections (see Figure 1):
A- Power Switch and Power On Indicator
B- Front Panel keys
C- Digital Display
D- External Trigger Input Section
E- Output Section

a. **Power Switch and Power On Indicator** (Figure 1A)
The Power Switch and the Power On Indicator are located on the left side of the front panel.

b. **Front Panel Keys** (Figure 1B)
The front panel keys are color-coded and comprise 5 groups:
1. Digits: 0 to 9.
2. Operation mode keys: FREE (Free Run), TRAIN, TRIG, DC, GATE, OFF.

3. Parameter keys: DURA (Duration), DELAY, INTER (Interval Time), M (Number of pulses per train), '↑', '↓'.
4. Clock keys: CLOCK-DISPLAY, STOP WATCH, CLOCK-RESET, TIMER.
5. Command keys: CLEAR-DISPLAY, CONNECT/DISCONNECT, CHECK, ENTER, RESET.
   Note:
   Some of the keys perform a dual function

The key code is noted on the key. For example, the code of FREE-RUN is FR.

c. **Digital Display** (Figure 1C)
Pressing a key will result in a response on the display.

d. **External Trigger Input Section** (Figure 1D)
The external trigger input section is divided into two parts - EXT 1 for channel 1 and EXT 2 for channel 2. Each has a BNC socket and an ON/OFF switch for enabling or disabling the input.

e. **Output Section** (Figure 1E)
On the panel from the top down are: the channel number, a LED indicating that the channel is active, a switch for selecting the polarity of the output pulses, a knob for adjusting the output amplitude, and a BNC socket for connecting the output to external devices.
Outputs '2+3', '4+5' and '6+7+8' (Figures 1F, 1G & 1H) are the summations of outputs 2+3, 4+5 and 6+7+8 respectively. You can use these outputs for multi-level pulses (e.g. biphasic pulses). The two switches (Figures 1K & 1L) add the summations '2+3' and/or '6+7+8' to the '4+5' output, resulting in the '4+5' output delivering up to 7 level pulses + GND.

2.2 Rear Panel

The rear panel contains the following components:

a. A switch to connect or disconnect the ground to/from the chassis. You can use this switch to reduce the noise level of the system.

b. A USB interface to communicate with a computer (for the **Master-8-cp** and **Master-8-vp** models).

3. Theory of Operation

Each channel uses its own clock, and can thus run independently of the other channels. You can also connect the channels internally to each other (no connection wires between the channels are needed), in all possible combinations in order to form simple or complex protocols.

Each channel operates in any of the following modes:

- FREE-RUN - the channel delivers pulses continuously
- TRIGGER - following a trigger, the channel delivers a single pulse
- TRAIN - following a trigger, the channel delivers a train of pulses
- DC - the channel is time independent, it can be turned on and off manually
- GATE (channels 1 and 2 only) - the channel delivers pulses continuously while it is externally gated

Channels 1 and 2 can receive external triggers. This enables synchronizing channels with external devices.

Master-8 features a clock which measures the time that has elapsed after pressing the CLOCK-RESET key (e.g. the experiment time). It also features a timer which can change the operational mode of a channel at a certain hour (e.g. turn the channel on or off).

You can adjust the amplitude of the output pulses from -10V to +10V, with a maximum current of 20mA.

4. Operation

Master-8 is simple to operate and can be learned in a short time.

Each instruction is carried out only after pressing the ENTER key. As long as the ENTER key has not been pressed, the instruction can be changed or deleted by giving new instructions (e.g. the CLEAR-DISPLAY instruction).

4.1 Parameters

You can set the following parameters for each channel (see Figure 2):

- DURA (duration) - defines the time elapsed from the onset of the output pulse to its end.
- DELAY - defines the time elapsed from the beginning of the input trigger to the beginning of the output pulse.
- INTER (interval) - defines the time elapsed between the beginning of a pulse and the beginning of the following pulse (interval = 1/rate).
- M - defines the number of pulses per train in the TRAIN mode.

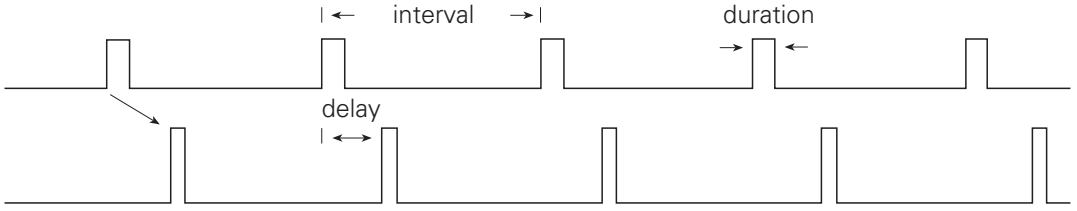


Figure 2

5. Applications

Figure 3 shows you how **Master-8** works. Do not try to follow the programming yet, Section 6 will enable you to practice programming the **Master-8**.

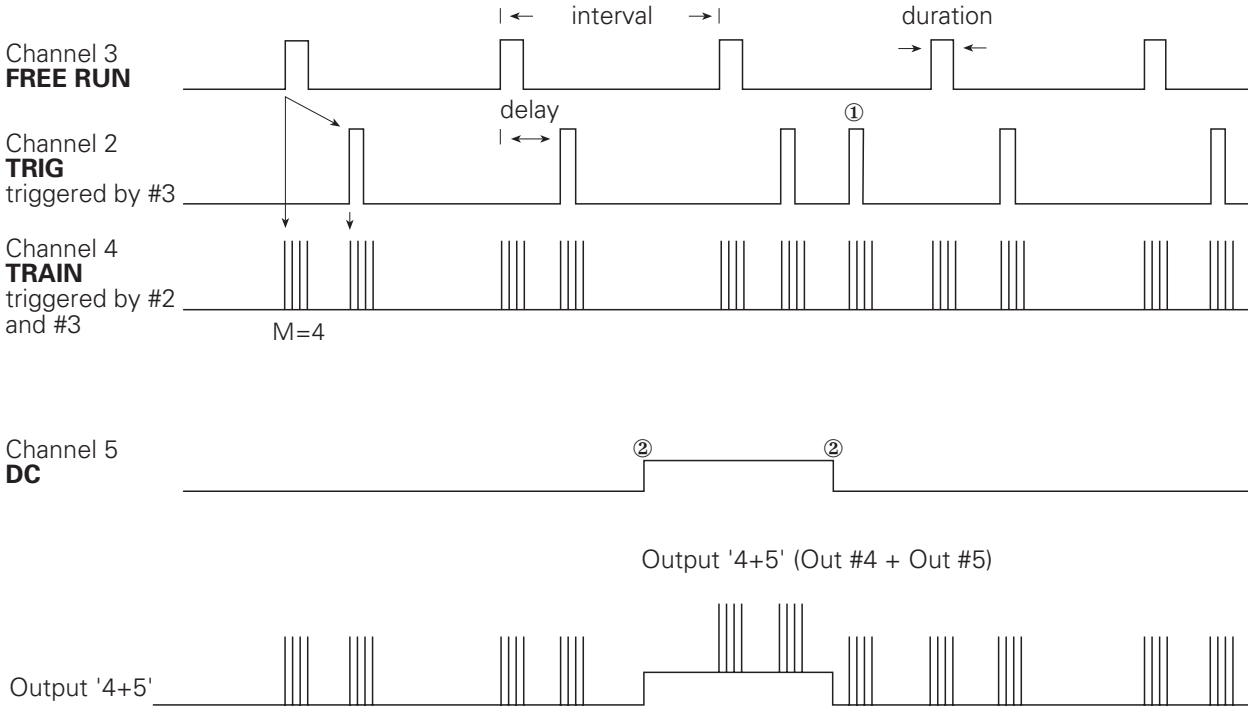


Figure 3

Notes:

①. Triggered externally or manually (by one keystroke)

②. Turned on and off manually (by one keystroke).

Channel	Mode	Parameters in Use	Triggered by
#3	FREE-RUN	duration, interval	none
#2	TRIG	duration, delay	#3
#4	TRAIN	duration, interval, M	#2 & #3
#5	DC	none	none

A special feature of **Master-8** is the 3 multilevel outputs which you can use for multilevel pulses (e.g. biphasic pulses). These outputs are ‘2+3’, ‘4+5’ and ‘6+7+8’ (Figures 1F,1G & 1H), which deliver the summation of outputs 2+3, 4+5 and 6+7+8 respectively. Using the two switches (Figures 1K & 1L) you can add the summations ‘2+3’ and/or ‘6+7+8’ to the ‘4+5’ output, thus the ‘4+5’ output can deliver up to 7-level pulses + GND.

Examples of outputs that you can obtain through the ‘4+5’ output are shown in Figure 4.

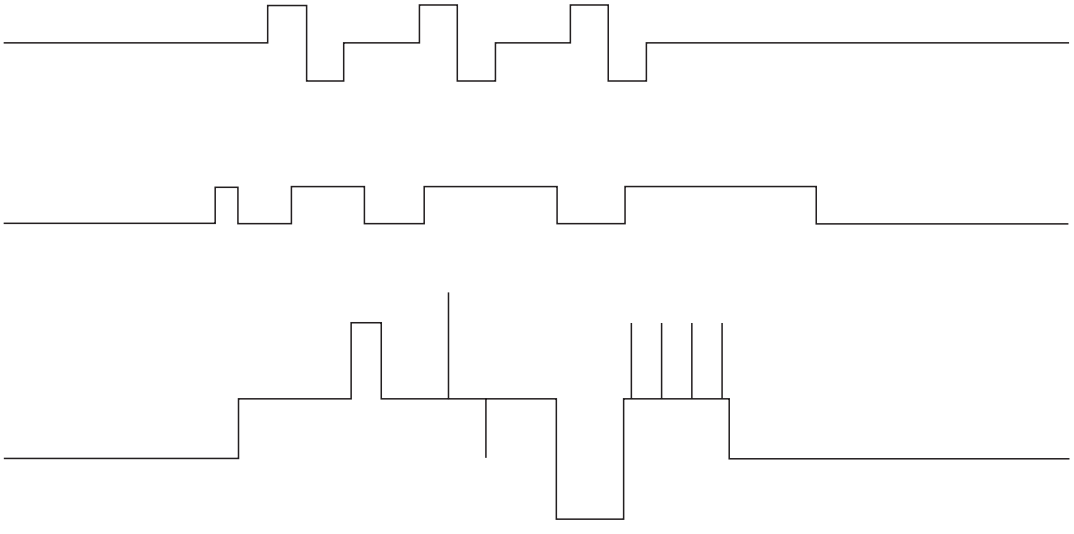


Figure 4

6. Demonstration of Programming Master-8

This section demonstrates how to program the **Master-8**. Please follow the instructions and notice how simple and straightforward they are.

Notes:
1. Each instruction is followed by a reference enabling you to find more details on similar instructions.
2. Before continuing, make sure that you are familiar with the location of different keys (see Section 2.1).

Before you begin to program, the entire **Master-8** memory must be cleared.
Press keys: 'OFF, ALL, ALL, ALL, ENTER' (see Section 11).
This instruction clears all paradigms of **Master-8**.
Now you are ready to program it.

1. Set channel #1 to the FREE-RUN mode (see Section 7).
   Press keys: 'FREE, 1, ENTER'.
   Channel #1 now delivers pulses continuously. Since you have not yet set the time parameters, the channel is running with its default times: 0.1 sec. duration and 0.2 sec. interval (from the beginning of a pulse to the beginning of the next one).

2. Set the duration time of channel #1 to 9.5 msec. (see Section 8).
   The format of 9.5 msec. will be 9.5 x 10^{-3} sec. (or several other formats, see Section 8).
   Press keys 'DURA, 1' - the previous duration is displayed. Since the duration time of channel #1 has not been set yet, the result now is 'FFFF FF'
   Now to continue -
   Press keys: '9.5, ENTER, 3, ENTER'.
   ('3' for msec. For seconds use '0', for μsec use '6'). The duration of channel #1 is now exactly 9.5 msec. (Please check with an oscilloscope).

3. Set the interval time of channel #1 to 2 sec. (see Section 8).
   Press keys: 'INTER, 1, 2, ENTER, 0, ENTER'.
   (The '0' indicates that you are counting in seconds.) Now channel #1 is running in the FREE-RUN mode. Its duration time is 9.5 msec. and its interval is 2 sec.

4. Set channel #2 to the TRIGGER mode (see Section 7).
   Press keys: 'TRIG, 2, ENTER' .
   Nothing happens since channel #2 is now in the TRIGGER mode, but is waiting to accept a trigger. You can trigger it in 3 ways (see Section 9):
   a) MANUAL TRIGGERING -
      Press key: '2'.
      ('2' is the channel number.) Note that each press on '2' delivers the triggered pulse. Press '**2**' several times (see Section 9).
   b) EXTERNAL TRIGGERING -
      Whenever there is an input pulse in the 'EXT 2' input, it triggers channel #2 (see Section 9).
   c) INTERNAL TRIGGERING -
      You can internally connect each channel to any number of the other channels (see Section 9).

5. Connect channel #1 internally to channel #2 (see Section 9).
   Press keys: 'CONNECT, 1, 2, ENTER'.
   The channels are now connected. Each output pulse of channel #1 triggers channel #2.

   Notes:
   a. There is no need to connect wires between channels.
   b. You don't have to worry about the amplitude or polarity of the trigger source.
   c. You can add manual pulses by pressing '2'.
   d. The instruction itself is straightforward (i.e. similar to the way you would say it: - "CONNECT from #1 to #2, ENTER").

6. Set the duration of channel #2 to be 15 msec. (see Section 8).
   Press key: 'DURA, 2, 15, ENTER, 3, ENTER'.

7. Set the delay of channel #2 to be 100 msec. (see Section 8).
   Press keys: 'DELAY, 2, 100, ENTER, 3, ENTER' .
   Please check the new delay.

8. Set channel #3 to the TRAIN mode (see Section 7).
   Press keys: 'TRAIN, 3, ENTER'.
   Channel #3 is now in the TRAIN mode and is waiting for a trigger.

9. Trigger it manually (see Section 9).
   Press key: '3' ('3' is the channel number).
   You then obtain the train of pulses.

10. Number of pulses per train (see Section 8).
    Set the number of pulses per train of channel #3 to be 5.
    Press keys : 'M, 3, 5, ENTER, 0, ENTER' .
    Trigger channel #3 manually again by pressing '**3**'.

    Note: *You can use a single channel in order to obtain the whole train.*

11. Connect channel #1 to trigger #3 (see Section 9).
    Press keys: 'CONNECT, 1, 3, ENTER' .
    Channel #1 will now trigger both channels #2 & #3.

    Note *the '→' sign on the panel above the '1.3' digits (Figure 1M).*
    This arrow indicates the direction of the connection.

Now, assume that you programmed all the 8 channels to run in a specific pattern - your present experiment (paradigm), and now you want to switch to a new pattern that also uses all the 8 channels. With **Master-8** this is an easy process, but you are first required to set the other paradigm.

12. **Press key: 'ALL'** (see Section 10) -
    The name of the present paradigm (now '1') is displayed.
    To switch to paradigm #5,
    Press keys: '5, ENTER'.

    Note:
    Since this is a new paradigm all the channels are off, all the internal connections are disconnected and all the time parameters have their default values.

13. Set all the 8 channels to the FREE-RUN mode (see Section 7)
    Press keys: 'FREE, 1, ENTER', 'FREE, 2, ENTER', etc.
    Each of the 8 channels now runs continuously at its own rate, independently of the other channels.

14. Now you can switch back to the previous paradigm by recalling it.
    Press keys: 'ALL, 1, ENTER' and you obtain the previous paradigm.
    Press keys: 'ALL, 5, ENTER' and you obtain the other one. (All the channels are now working in synchronization since you started them together).

15. Turn the power off.

    Note:
    Master-8 *stores all the 8 paradigms even when the power is turned off.*

16. Switch the power on. **Master-8** immediately continues working in the last paradigm, exactly as before you switched the power off.

17. Switch to paradigm #1.
    Press keys: **'ALL, 1, ENTER'**.

    Note:
    This paradigm is also stored in the memory after switching the power off.

18. Before continuing, clear all the **Master-8** memory (see Section 11) -
    Press keys: 'OFF, ALL, ALL, ALL, ENTER'.

Dear User,

The last section was a brief demonstration of how to use **Master-8**.
Now you have a rough idea of how **Master-8** works. However, here are many instructions that you are not yet familiar with e.g. DC, GATE, CHECK, TIMER. Even the features that are demonstrated above are only partially demonstrated.
Please read the rest of this manual carefully so that you will not miss any important feature. Sections 7 to 13 deal with the operation of **Master-8**. Section 14 is about the communication between **Master-8-cp** and a computer.

7. Modes of Operation

Each of the 8 channels can operate in one of the following modes:

Mode	Description	Parameters in Use
FREE - RUN	The channel delivers pulses continuously according to the programmed duration and interval times. The channel is independent of the other channels.	Duration, Interval
TRAIN	Following a trigger, the channel delivers a train of pulses according to the programmed duration and interval times. The number of pulses per train is set by 'M'.	Duration, Interval, M
TRIG	Following a trigger, the channel delivers a single pulse according to the programmed delay and duration times.	Delay, Duration
DC	The channel is time independent, you can turn it on and off manually.	None
GATED	Channels 1 and 2 can be externally gated via the EXT 1 or EXT 2 inputs. The channel delivers pulses continuously while it is externally gated. When the external input stops, the channel stops working. A new input reactivates the channel.	Duration, Interval

Please note that there is no delay in the TRAIN mode. The channel delivers the train of pulses immediately after receiving the trigger input. In order to obtain a delay time, you should use an intermediate channel in the TRIG mode.

7.1 Setting the Modes of Operation

To set the mode of operation of a channel, first press the selected mode key and then the channel number.

Example 1: To set channel #2 to the FREE-RUN mode -
Press keys: 'FREE, 2, ENTER'.
Channel #2 now delivers pulses continuously according to its duration and interval times (or the default times).

Example 2: To set channel #3 to the TRAIN mode -
Press keys: 'TRAIN, 3, ENTER'.
Channel #3 is now in the TRAIN mode. You can trigger it in several ways (see Section 9). Trigger it now manually by pressing **'3'** (the channel number).

Example 3: To set channel #5 to the DC mode -
Press keys: 'DC, 5, ENTER'.
Channel #5 is now in the DC mode, it is time-independent and delivers a continuous pulse. You can manually stop and start the pulse by pressing **'5'** (the channel number).

Example 4: To turn off channel # 2 - **Press keys: 'OFF, 2, ENTER'**.

Example 5: To turn off all the channels -
Press keys: 'OFF, ALL, ENTER'.

8. Setting Parameters

To set the time parameters (DURA, DELAY or INTER), first press the selected parameter key and then the desired time.

Example: To set the duration of channel 6 to be 52 msec (52 x 10^{-3} sec, the time is given in seconds).
Press keys: 'DURA, 6' - the previous duration is displayed.
(If the duration time has never been set, the sign 'FFFF FF' is displayed).
Press keys: '52, ENTER, 3, ENTER' ('3' for msec).

52 msec can be inserted also as 0.052 x 10^{0} sec, or 5.2 x 10^{-2} sec,
or 5200 x 10^{-5} sec, etc.

For your convenience it is recommended to use only exponents of 6 (μsec), 3 (msec) or 0 (sec).
Thus, for 52 msec. use either 52 msec. or 0.052 sec.

Note:
The new parameter becomes operative the instant you press the last ENTER.

8.1 Using the '↑' and '↓' Keys

You can increase or decrease each time parameter using the '↑' and '↓' keys.
Example:
Press keys: 'DURA, 6'.
Hold down the '↑'or '↓' keys to change the duration of channel 6.
Note: *The change takes place only when releasing the key.*

Press key: 'CLEAR-DISPLAY' in order to clear the display.

8.2 Setting the 'M' Parameter

Example: To set M=80 pulses per train for channel 8 -
Press keys: 'M, 8' - The previous M8 is displayed.
Press keys: '80, ENTER, 0, ENTER'.

Note:
Only integer numbers are accepted for M.
The exponent should equal 1 only for M > 9999.

8.3 Counting the Pulses

Whenever channel 8 is in the TRAIN mode, the display shows how many pulses still remain in the existing train.
Press keys: 'TRAIN, 8, ENTER'.
Now trigger channel 8 manually -
Press key: '8'.

8.4 Table 1 - Parameters and Error Indication

Parameter	Min	Max	Error indication for illegal values. (x is the channel number)
M	1	59,900	Mx Err
DURATION	40 μsec	3,999 sec	Dx Err
DELAY	100 μsec Delay>Duration/10,000	3,999 sec	Lx Err Lx Err
INTERVAL a)Normal usage: b)Train Mode: c)If the channel internally activates other channels:	60 μsec Interval> Duration + 9 μsec Interval> Duration + 59 μsec Interval >500 μsec	3,999 sec	Ix Err Rx Err (Rate err) Tx Err (Train err) Cx Err (Connect err)

<u>Example</u>: The message 'R7 Err' indicates 'Rate error' on channel #7. The reason is that the channel is now running in FREE-RUN, GATE or TRAIN mode and the interval is shorter than the duration, or at least
INTERVAL < DURATION + 9 μsec.

In order to remove the R7 Err message you should do one of the following:

a. increase the interval time of channel #7, or
b. decrease the duration time of channel #7, or
c. change the mode of channel #7 to TRIG, DC or OFF.

9. Triggering

In either TRAIN or TRIG mode you can trigger the channel in the following ways:

1. Manually
2. The internal connections
3. The external inputs EXT 1 and EXT 2

9.1 Manual Triggering

In the TRAIN, TRIG or DC modes you can trigger the channel manually by pressing the channel number.

Example 1: When channel 3 is in the TRAIN mode, every keystroke on the '3' key evokes a train of pulses according to the parameters of channel 3.

Example 2: When channel 4 is in the DC mode, every even keystroke on the '4' key turns the channel on and every odd keystroke turns it off.

When a channel is not in one of the above modes, or if it has already received a trigger but has not yet completed its response, pressing the channel number does not affect the channel (it just clears the display).

9.2 Setting the Internal Connections

In the TRAIN or TRIG modes, you can trigger the channel by other channels internally. Each channel has an internal input and an internal output. By inserting the right instruction, you can connect internal inputs to internal outputs.

Example 1: To connect the output of channel 2 to the input of channel 3 -
Press keys: 'CONNECT, 2, 3, ENTER'.

Note that the arrow on the front panel above the display (Figure 1M) shows the direction of the connection. For example, $\overrightarrow{2.3}$ means that channel 2 is connected to trigger channel 3. Each channel can be connected concurrently to several other channels. The level or polarity of its output does not affect the triggering.

To disconnect press the **'CONNECT'** key twice.

Example 2: To disconnect an existing connection between 2 and 3 -
Press keys: 'CONNECT, CONNECT, 2, 3, ENTER'.

It is possible to disconnect all inputs or outputs of any single channel.
Example 3: To disconnect all internal outputs from channel #5 -
Press keys: 'CONNECT, CONNECT, 5, ALL, ENTER'.

Example 4: To disconnect all internal inputs to channel #5 -
Press keys: 'CONNECT, CONNECT, ALL, 5, ENTER'.

Example 5: To disconnect all internal inputs and outputs from all channels -
Press keys: 'CONNECT, CONNECT, ALL, ALL, ENTER'.

9.3 External Inputs

In the modes: TRAIN, TRIG or GATE channels 1 and 2 can be triggered or gated externally. EXT 1 activates only channel 1. EXT 2 activates only channel 2. (channels 1 and 2 can activate the other channels internally).

The external input has to be in the range of 5 to 10V.

Note:
A computer can trigger each channel directly 'manually' via the USB interface *of* ***Master-8-cp*** *(see Section 14).*

10. Eight Stored Paradigms

A paradigm specifies the modes and parameters of all the channels and their internal connections. **Master-8** stores eight different programmed paradigms.

10.1 Switching to Another Paradigm

Example: To switch to paradigm number 7 -
Press key: 'ALL' (the present paradigm number is displayed) **'7, ENTER'**.
You don't have to worry about saving the previous paradigm, each instruction is saved the moment you insert it.

Note:
Switching from one paradigm to another does not affect the clock, the stop-watch or the timer.

10.2 Copying Paradigms

Copying paradigms is very useful when you want to save a backup paradigm, or when you want a new paradigm with just some modification from a present one. Instead of programming the whole new paradigm, you can copy the present one and just modify it.

Example: To copy paradigm 2 to paradigm 6 -
Press keys: 'ALL, 2, 6, ENTER'.

Note the arrow sign ('→') for the source/target direction (Figure 1M).
Paradigm 2 is not affected by this instruction.

11. Clearing the Memory

To turn off all the channels -
Press keys: 'OFF, ALL, ENTER' (see Section 7.1).

To disconnect all the internal connections (in the present paradigm) -
Press keys: 'CONNECT, CONNECT, ALL, ALL, ENTER'.
(See Section 9.2).

To clear all the memory of the present paradigm -
Press keys: 'OFF, ALL, ALL, ENTER'.
This will turn off all the channels, disconnect all the internal connections and change all the parameters of all the channels to the initial values 'FFFF FF'.

Note:
Clearing the present paradigm does not affect the other paradigms, the clock, the stop-watch and the timer.

To clear all the memory of all the 8 paradigms (**Master-8** will then be without any user program) -
Press keys: 'OFF, ALL, ALL, ALL, ENTER'.

12. Verification Checks

There are many details you can check.

Note:
All the checking instructions begin with the word 'CHECK'.

1. To check the modes of all the channels -
   Press keys: 'CHECK, ENTER'.
   The display shows the modes of all the channels that are not turned off and the present paradigm number.

2. To check the mode and the parameters (DURATION, DELAY, INTERVAL and M) of a specific channel (e.g. channel 2) -
   Press keys: 'CHECK, 2, ENTER'.

   You can check (and change) each parameter individually, as described in 'Setting Parameters' (Section 8).

3. Checking the internal connections:
   Example 1: To check which channels are internally connected to the output of channel 4 -
   Press keys: 'CHECK, 4, CONNECT, ENTER'.
   If channel 4 does not have any output connections this instruction just clears the display.

   Example 2: To check which outputs are internally connected to the input of channel 7 -
   Press keys: 'CHECK, CONNECT, 7, ENTER'.

   Example 3: To check all the internal connections -
   Press keys: 'CHECK, CONNECT, CONNECT, ENTER'.
   (or: **'CHECK, CONNECT, ENTER'**.)

13. Clock Options

In addition to its standard 8 channels, **Master-8** features 2 internal clocks. The first is called 'clock' and counts the time in seconds up to 24 hours. The other called 'stop-watch' counts the time in tenths of seconds up to 1 hour.

13.1 Clock

The clock is used:

1. to measure the time that elapsed from an event (e.g. beginning of the experiment).
2. for the TIMER option (see below).

The clock time can always be displayed by pressing the **'CLOCK-DISPLAY'** key. The clock can be reset by pressing the **'CLOCK-RESET'** key. The resetting can be performed **only when the clock time is displayed**.
The clock never stops running. A second keystroke on **'CLOCK-DISPLAY'** (or any other key except the **'CLOCK-RESET'** key) clears the clock display.

13.2 Stop-Watch

The first keystroke on the **'STOP-WATCH'** key displays its present status. Then every odd keystroke activates it and every even keystroke stops it.
The stop-watch can be reset by the **'CLOCK-RESET'** key **only when the stop-watch time is displayed**.
Note: *The main **'RESET'** key resets both clocks, regardless of what was shown on the display.*

13.3 Timer

The **TIMER** is linked to the clock and can change the mode of any single channel at a fixed time. For example, if you want to set the experiment to start or stop at a given time you can instruct one channel (or all of them) to do so.

<u>Example 1</u>: To turn off channel #2 at 3:45 (as counted by the clock) -
Press keys: 'TIMER, ENTER'.
Now the timer shows its last setting (if no instruction was inserted, it shows 'OFF').
Press key: 'OFF, 2, ENTER, 3, ENTER, 45, ENTER'.
Check by pressing: **'TIMER, ENTER'**.

To exit from the TIMER checking - **Press key: 'CLEAR-DISPLAY'**.

<u>Example 2</u>: If the TIMER is already set and you want to cancel the TIMER action, you can turn the TIMER off.
Press keys: 'TIMER, OFF, ENTER'.

14. Master-8-cp

14.1 Programming by a computer

You can program **Master-8-cp** through the front panel keys in the same way as **Master-8**. In addition **Master-8-cp** can be programmed via a computer.

In order to program Master-8-cp with a computer, download the suitable packages from our website: www.ampi.co.il
Click DOWNLOADS then DOWNLOADS FOR MASTER-8.

Download and save the following packages:

1. **USB Driver:** This driver is required in order to connect **Master-8-cp** to the computer. (See 14.2)
2. **Master-8 control software.** (See 14.3)
3. **Master-8 SDK (Software Development Kit).** The SDK is optional. It is intended for users who want to control the **Master-8-cp** from a variety of applications and development tools. (See 14.4)

14.2 Installing the USB Driver:

The first time that you use the USB port, you have to install the **USB driver** for windows to recognize it.
Connect the USB cable to the **Master-8-cp** and to your PC.
Your PC finds that there is a new device, and tries to locate its driver (it takes a few minutes).
Whenever the PC requests a file, browse to this **USB Driver** in the CD.

14.3 Master-8 Control Software.

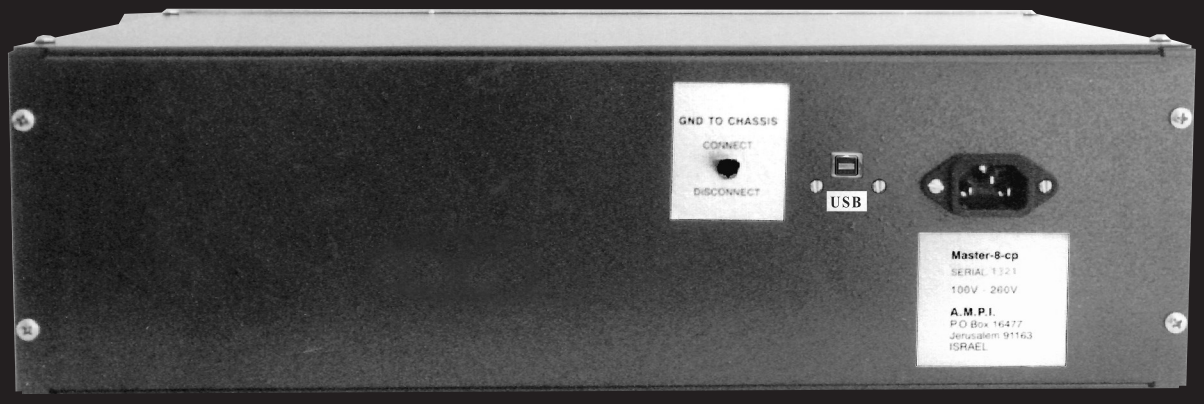
Run **Setup.exe** of this directory. It opens a new icon named **Master-8** in your desktop.
Whenever you click this **Master-8** icon, you run the communication program.
Using this program you see and modify on the screen of the PC all the parameters of the present paradigm. You can connect/disconnect channels with one mouse-click within the connection table.

Another powerful feature is the **Scheduler**. You can set a list of events that you want to happen at scheduled times like: triggering channels, switching paradigms, modifying time parameters, etc. You can also make loops of these events.

14.4 Master-8 SDK (Software Development Kit)

The SDK is a set of files which enables **Master-8-cp** to be connected to other software and programming tools.
Using the SDK you can control the **Master-8-cp** via a variety of applications like WORD or Excel, with script like VBScript or JavaScript, or by writing your own program, with Microsoft Visual Studio, Borland Delphi, or other development tools.

The SDK includes Installation Instructions, Manual, Examples in different languages, and a Function Library, which expose the **Master-8-cp** functionality.



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