

MICROCONTROLLED CONSTANT CURRENT AVERSIVE STIMULATOR

ENV-413

USER'S MANUAL

DOC-107

Rev. 1.6

Copyright ©2016
All Rights Reserved

Med Associates Inc.
P.O. Box 319
St. Albans, Vermont 05478

Phone: 802.527.2343

Fax: 802.527.5095

www.med-associates.com

notes

Table of Contents

Chapter 1 Introduction.....	4
Specifications	4
Chapter 2 Driver, Software, and Hardware Installation.....	5
Driver Installation.....	5
Software Installation.....	5
DIG-729PCI Hardware Installation.....	6
ENV-413 Hardware Installation.....	6
Chapter 3 Wiring Instructions	9
Control Cables.....	9
DIG-729USB	9
Output Cables.....	10
Chapter 4 Controlling Aversive Stimulators in MED-PC.....	11
SHOCK	11
SHOCKON.....	11
SHOCKOFF	12
MedState Notation™ Example.....	12
Chapter 5 Beginning & Running an Experiment.....	15
Translating The MED-PC (.mpc) File.....	15
Using the MED-PC Load Wizard.....	16
Viewing/Changing Variable Values	21
Chapter 6 Understanding the Data Files.....	22
Sample Data File	22
Appendix A Contact Information.....	22

CHAPTER 1 | INTRODUCTION

The ENV-413 Microcontrolled Constant Current Aversive Stimulator provides adjustable electric current intensity and duration for in vivo animal testing. The ENV-413 is easily programmed in MedState Notation™. Control via other programming languages is also possible.

The ENV-413 is designed to operate from MED-PC® via a DIG-729 controller. Multiple modules can be installed in a single interface cabinet with solid-state scramblers. Use SG-219D-10 control cables to connect each cabinet to the DIG-729 network and shorter SG-219D cables to interconnect up to 16 modules in the same interface cabinet.

Figure 1.1 – ENV-413 Microcontrolled Constant Current Aversive Stimulator



Specifications

Minimum Shock Current Intensity: 0 mA
Maximum Shock Current Intensity: 10 mA
Current Resolution: ± 0.01 mA

Minimum Shock Duration: 1 ms
Maximum Shock Duration: 60,000 ms (60 seconds)
Duration Resolution: ± 1 ms

CHAPTER 2 | DRIVER, SOFTWARE, AND HARDWARE INSTALLATION

NOTE: If a computer was purchased with the ENV-413 from Med Associates, the driver, software and hardware installation will already be completed. It is only necessary to complete the steps in this chapter if the computer being used was not purchased from Med Associates.

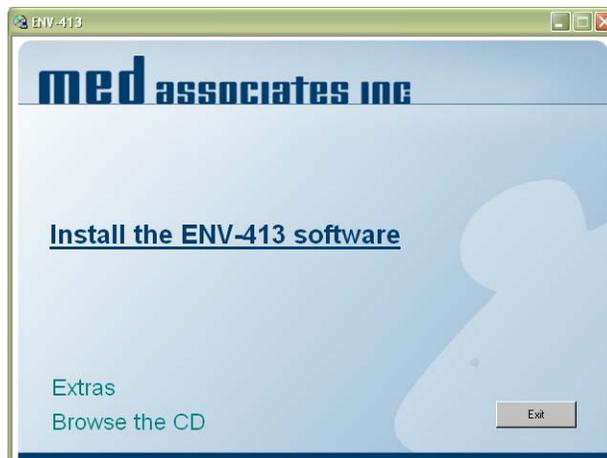
Driver Installation

The DIG-729 drivers are installed during MED-PC installation. Installation of the DIG-729USB driver will be completed after it is connected to the computer. Refer to the Wiring Instructions section of this manual.

Software Installation

To install ENV-413 software, insert the CD into the CD-ROM drive and the screen shown in Figure 2.1 will appear.

Figure 2.1 - SOF-ENV-413 Main Screen



Click **Install the ENV-413 software** and the screen shown in Figure 2.2 will appear.

The installation program will search for the MED-PC installation directory. Several files will be placed in the MED-PC installation directory and existing files in the directory will be edited. The installation program will prompt for MED-PC installation directory verification, as shown in Figure 2.2 on page 6. If this is correct, click **Yes**. If it is not, click **No** and browse to the desired directory.

Figure 2.2 - Default Directory



The ENV-413 may be controlled from MED-PC only if the ENV413.HED file is included in the USER.PAS. The ENV-413 installation procedure will insert the necessary include statement into the USER.PAS file, if the USER.PAS can be found. Do not modify the USER.PAS file unless fully competent in Pascal programming, as doing so could cause existing programs to fail.

DIG-729PCI Hardware Installation

CAUTION: Always turn power off prior to working on the computer or other interface equipment. Installing the DIG-729PCI Card with power applied could result in damage to the computer or microcontroller card.

Note: The DIG-729PCI card is not compatible with a 64 bit operating system.

To install the DIG-729PCI card, follow the instructions included with the computer for installing a PCI card. Handle the card carefully to prevent damage from static electricity. Be sure to use a screw for the L bracket and tighten it securely to prevent dislodging the card while connecting the cable.

ENV-413 Hardware Installation

Node Values

Each ENV-413 is referenced by a unique "node value" set by the SW1 switches on the printed circuit board (PCB). ENV-413 modules installed by MED Associates have these switches in the correct position. A sticker on the front panel indicates the preset node value. Programming in MedState Notation™ is simplified by using the box or chamber number for each stimulator. By following this convention, the MedState Notation™ identifier BOX may be used as the Stimulator Node Value in the SHOCKON command so that a single procedure can be run for any test chamber. See the "SHOCK" and "SHOCKON" commands in Chapter 4 (page 11) for more information on controlling the stimulator using MED-PC.

Each ENV-413 stimulator card must be set to a network node value from 1 to 16 using SW1. The last stimulator in the series requires the terminate switches on SW1 to be in the ON position. Refer to the following "Setting the Node Address Switches" section on page 7 for more information.

Setting the Node Address Switches

The node value is preset by MED Associates prior to shipping and should not need to be changed. However, should these settings need to be changed, do so by using the set of eight DIP switches labeled SW1 on the ENV-413 circuit board. The switches should appear as shown in Figure 2.3. Switches SW1-1 to SW1-4 are used to set the node. When set to the OFF position, the switch values are added together to get the node value. SW1-1=1, SW1-2=2, SW1-3=4, and SW1-4=8. For example, to set a stimulator to node 5, place both SW1-1 (value of 1) and SW1-3 (value of 4) in the OFF position. The node value is now 5. The exception is node 16, where all the switches are set to ON. Refer to Table 2.1 on page 8 for switch settings for each node address.

Setting the Line Termination Switches

Switches SW1-6, SW1-7, and SW1-8 are used for differential line terminations. Do not change the position of these switches unless additional ENV-413 Aversive Stimulators are being added to the configuration. Only the last stimulator in the series should have switches SW1-6, SW1-7, and SW1-8 set to ON. All other preceding stimulators in the series should have these switches set to OFF. Switch SW1-5 is not used.

In Figure 2.3 the stimulator's address is set to 1 and since the terminate switches are all set to ON, it is the last stimulator in the series.

Figure 2.3 - Diagram of SW1 on the ENV-413 Card

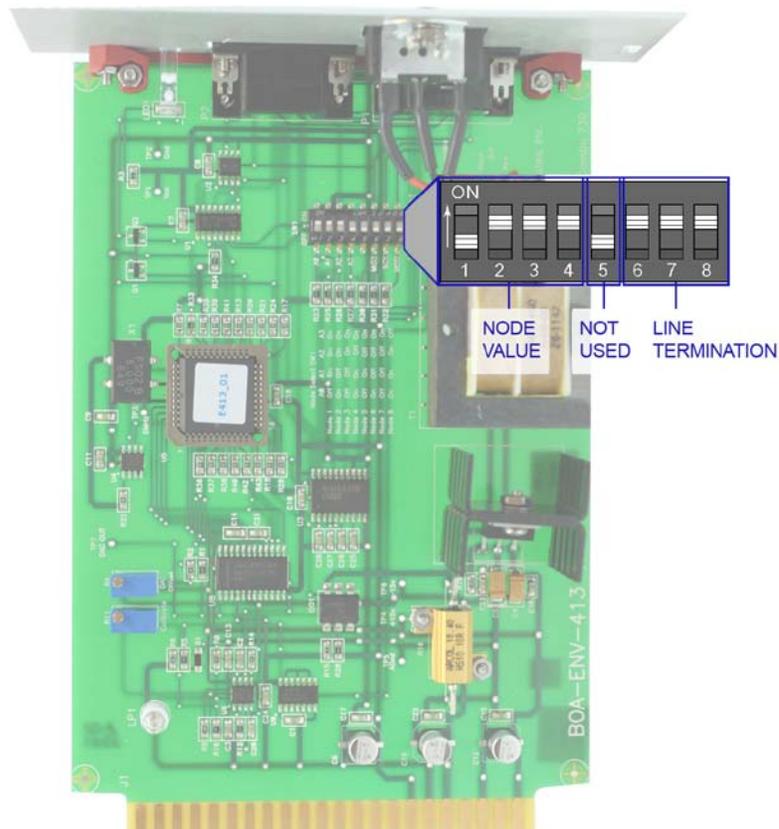


Table 2.1 – SW1 Address Switch Positions

Node Address	Switch Number			
	(SW1) 1 (PCB) A0	2 A1	3 A2	4 A3
1	OFF	ON	ON	ON
2	ON	OFF	ON	ON
3	OFF	OFF	ON	ON
4	ON	ON	OFF	ON
5	OFF	ON	OFF	ON
6	ON	OFF	OFF	ON
7	OFF	OFF	OFF	ON
8	ON	ON	ON	OFF
9	OFF	ON	ON	OFF
10	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF
12	ON	ON	OFF	OFF
13	OFF	ON	OFF	OFF
14	ON	OFF	OFF	OFF
15	OFF	OFF	OFF	OFF
16	ON	ON	ON	ON

CHAPTER 3 | WIRING INSTRUCTIONS

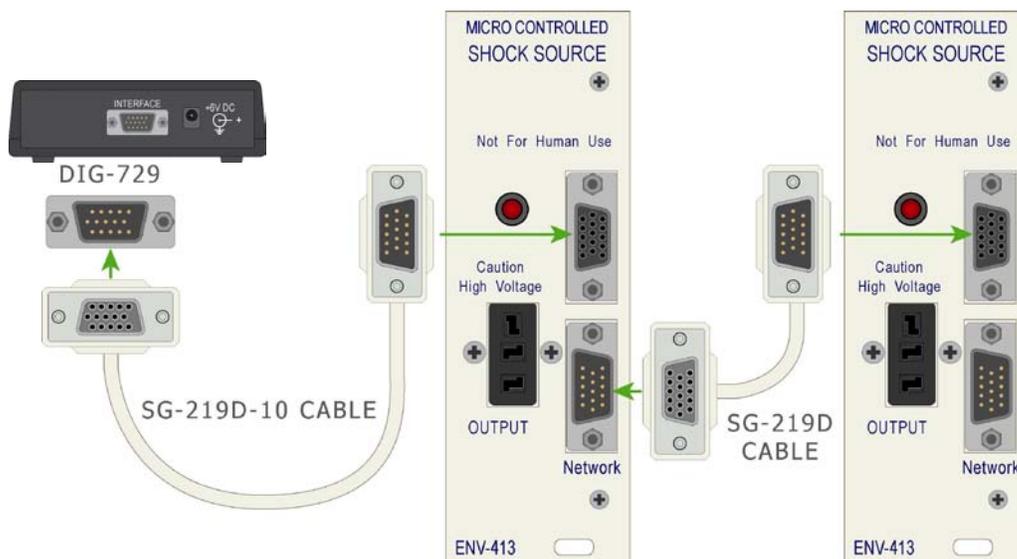
NOTE: Be sure that all devices are disconnected from power prior to completing the instructions in this chapter.

Control Cables

Complete this section of the Wiring Instructions if using either a DIG-729PCI or DIG-729USB. Additional wiring must be completed if using a DIG-729USB, see instructions in the DIG-729USB section below.

Using the Control Cable Wiring Diagram (Figure 3.1) as a guide, connect the SG-219D-10 control cable from the male DB-15 connector on the DIG-729 (PCI or USB) to the female DB-15 connector on the first ENV-413 stimulator. Using an SG-219D cable, connect the male DB-15 connector on the first stimulator to the female DB-15 connector on the second stimulator. Continue with SG-219D cables until the last stimulator in the chain is reached. Be sure to place the line termination switches on SW1 to the ON position for the last stimulator. Refer to “Setting the Line Termination Switches” section on page 7.

Figure 3.1 - Control Cable Wiring Diagram



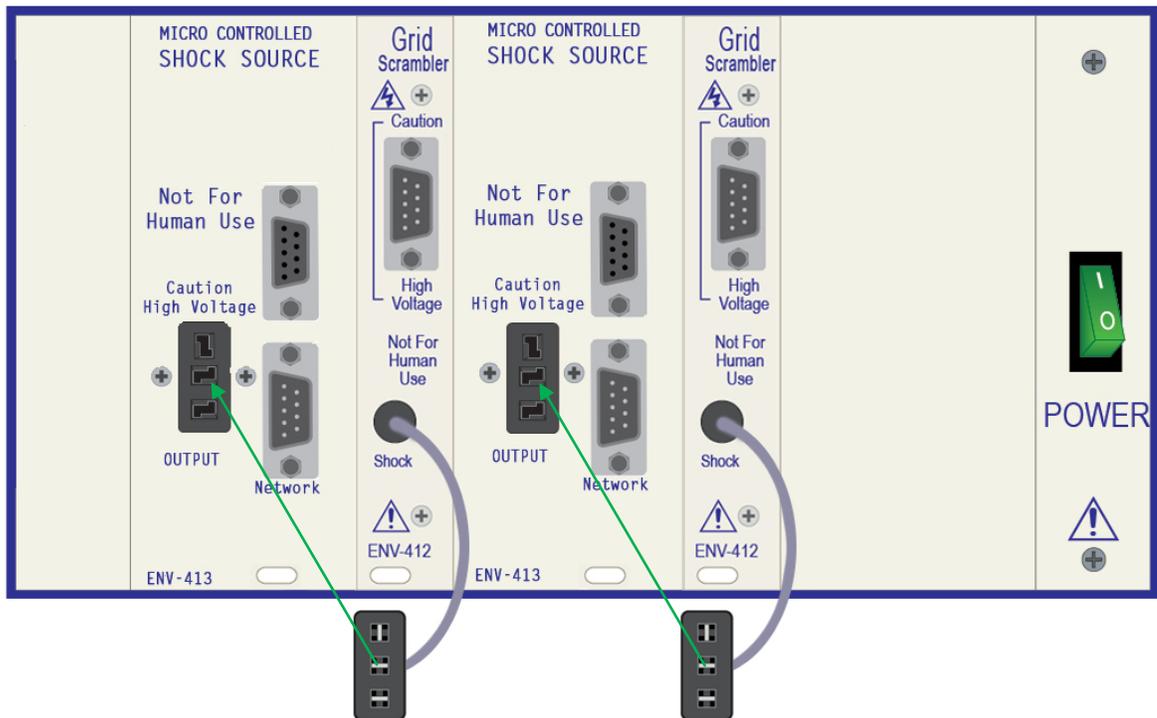
DIG-729USB

Connect the DIG-729USB to the first ENV-413 in the stimulator series as described above in the Control Cables section. Then connect the USB port on the DIG-729USB to any available USB port on the computer using the included USB cable. Next, use the included power adapter to plug the DIG-729USB into a standard wall outlet. Follow the prompts on the computer to install the necessary drivers prior to using the DIG-729USB.

Output Cables

Output from the ENV-413 stimulator is via a 3-pin female Cinch-Jones connector (see *Figure 3.2*). The two horizontal pins are the stimulus output and the single vertical pin is used to synchronize the ENV-412 grid scrambler (if used). The output cable is built into the ENV-412 grid scrambler as shown in *Figure 3.2*. To use the ENV-250A Switching Contact Lickometers, the SG-219N Shock Output Adapter cable may be purchased from Med Associates.

Figure 3.2 – Table-top Cabinet with ENV-413 Shocker and Optional ENV-412 Scrambler



Note: In an SG-6080C cabinet (seen in *Figure 3.2*), a maximum of 3 shockers and 3 scramblers can be added, utilizing 9 slots total. A maximum of 4 shockers and 4 scramblers can be placed in an SG-6010 cabinet, utilizing 12 slots total.

CHAPTER 4 | CONTROLLING AVERSIVE STIMULATORS IN MED-PC

The ENV-413 is compatible with MED-PC Version 2.09 and higher. Because the stimulator commands SHOCK, SHOCKON, and SHOCKOFF are passed as a Pascal procedure, they must be enclosed in tildes " ~ ~ ". Also note that the semicolon line terminator inside the tildes is required. This does not replace the semicolon used to separate multiple commands in the same statement as required in MedState Notation™.

SHOCK

The SHOCK command sets up the stimulation parameters for the aversive stimulator and retains them until changed with a subsequent shock command or power is turned OFF. It is not necessary to issue a SHOCK command each time the stimulator is turned ON with the SHOCKON command. Allow at least one clock tick (10 ms by default) between the SHOCK command and the SHOCKON command, i.e., do not place both commands in the same State.

Syntax: ~SHOCK (MG, BOX, I, D);~

Where: MG = MED-PC Global Parameter

BOX = MED-PC Box Parameter

I = The Shock Current Intensity (0 to 10 mA, 0.5 mA default).

D = The Shock Duration (1 to 60,000 ms, 5000 ms default).

Comments: Sets up stimulation parameters and retains them until changed or powered OFF.

SHOCKON

The SHOCKON command turns the stimulator ON. It is not necessary to issue a SHOCK command each time the stimulator is turned on with the SHOCKON command. Allow at least one clock tick between the SHOCK command and the SHOCKON command, i.e., do not place both commands in the same State.

Syntax: ~SHOCKON (MG, BOX);~

Where: MG = MED-PC Global Parameter

BOX = MED-PC Box Parameter

Comments: Turns the stimulator on using the default parameters or the parameters set in the SHOCK command.

SHOCKOFF

SHOCKOFF is used to stop an aversive stimulus prior to the end of the pre-established duration setting. Since most aversive stimulus durations are quite short this command is seldom used. For extended periods of aversive stimulus, however, it would be possible to set duration for some maximum value and actually turn aversive stimulus on and off with these two commands.

Syntax: ~SHOCKOFF (MG, BOX);~

Where: MG = MED-PC Global Parameter

 BOX = MED-PC Box Parameter

Comments: Stops the aversive stimulus prior to the end of the duration setting.

MedState Notation™ Example

```
\ Copyright (C) 2016 MED Associates, All rights reserved.
\
\ SHOCK.MPC
\ Sample MED-PC Program for ENV-413 micro-processor controlled shocker.
\
\ The first Left Lever Response turns on the Left Light and Shock output
\ producing a Shock starting at Current Intensity "A(0)" (0.5 mA unless changed
\ prior to #START). Right Lever responses are ignored at this time.
\
\ Each subsequent Left Lever Response turns on the Left Light and Shock output
\ while increasing the Shock Current Intensity by "A(2)" (0.1 mA unless changed
\ prior to #START) at the same time.
\
\ Each subsequent Right Lever Response turns on the Right Light and Shock output
\ while decreasing the Shock Current Intensity by "A(2)" (0.1 mA unless changed
\ prior to #START) at the same time.
\
\ A K1-pulse turns all Outputs and Shocker OFF, resets the control variables to
\ their default values, and resets the Response Counters to zero. The Left
\ Lever and Right Lever continue to function as before.
\
\ The program has no end criteria.
\
\
\ Shock     - Sets up the stimulation parameters for the aversive stimulator.
\
\ ShockOn  - Turns the stimulator on at the set Current for the set Duration.
\
\ ShockOff - Used to stop an aversive stimulus prior to the end of the
\           pre-established duration setting.
\
\
\
\ MG     - This is the MED-PC Global Pointer. It allows the ENV-413 to pass back
\        information about any errors that might have occurred.
\
\ BOX    - This parameter specifies which ENV-413 the command is for. When this
\        program is running in Box 1, then the BOX parameter will equal 1 and the
\        ENV-413 that is set to Node 1 will receive the command. When this
\        program is running in Box 2, then the BOX parameter will equal 2 and the
\        ENV-413 that is set to Node 2 will receive the command, etc. This
\        allows the same program to be run in multiple Boxes and control the
\        different Chambers.
\
\
\ Inputs
\ ^LeftLever = 1
```

```

^RightLever = 2

\ Outputs
^LeftLight = 1
^RightLight = 2

\ A() = Control Variables with Assigned Aliases as Defined
Var_Alias Starting Output Current Intensity (mA) = A(0) \ Default = 0.5 mA
Var_Alias Shock Duration (ms) = A(1) \ Default = 5000 ms
Var_Alias Step Increments by which Intensity is Adjusted (mA) = A(2) \ Default = 0.1 mA

^Current = 0
^Duration = 1
^Step = 2

\ List Data Variables Here
\ D(0) = Response Counter for Left Lever
\ D(1) = Response Counter for Right Lever

\ List Working Variables Here
\ B(0) = Default Output Current Intensity (mA)
\ B(1) = Default Shock Duration (ms)
\ B(2) = Default Step Increments by which Intensity is Adjusted (mA)

DIM A = 2
DIM B = 2
DIM D = 1

\ K-Pulses Used in this Program
\ K1 = Turns all Outputs and Shocker OFF, resets the control variables to
\ their default values, and resets the Response Counters to zero.

\*****
\ Shock Schedule
\ S1 - Set Default Values
\ Starting Output Current Intensity (0.5 mA)
\ Shock Duration (5000 ms)
\ Step Increments by which Intensity is Adjusted (0.1 mA)
\*****
S.S.1, \ Shock Control
S1,
  0.01": SET A(^Current) = 0.5, A(^Duration) = 5000, A(^Step) = 0.1 ---> S2
S2, \ First Statement: Wait for START signal. Store Default values.
\
\ Second Statement: Update screen display with default values
\ for Control Variables. This will show any changes made via
\ the "Configure | Change Variables" Window prior to START.
#START: SET B(^Current) = A(^Current);
SET B(^Duration) = A(^Duration);
SET B(^Step) = A(^Step);
~Shock(MG, BOX, A[0], A[1]);~ ---> S3
1": SHOW 1,Shock,A(^Current), 2,Duration,A(^Duration), 3,Step,A(^Step) ---> SX
S3, \ Wait for first response on Left Lever
\ and then deliver first Shock.
\ Right Lever responses are ignored at this time.
#R^LeftLever: ON ^LeftLight; ~ShockOn(MG, BOX);~ ---> S4
S4, \ A K1-pulse will turn off all outputs and reset the
\ Control Variables back to the Default Values
\ A Left Lever response will deliver Shock and increase the Shock Intensity
\ A Right Lever response will deliver Shock and decrease the Shock Intensity
#K1: ~ShockOff(MG, BOX);~;
OFF ^LeftLight, ^RightLight;

```

```

    SET A(^Current) = B(^Current);
    SET A(^Duration) = B(^Duration);
    SET A(^Step) = B(^Step);
    SHOW 1,Shock,A(^Current), 2,Duration,A(^Duration), 3,Step,A(^Step) ---> S4
#R^LeftLever: ON ^LeftLight;
              OFF ^RightLight;
              SET A(^Current) = A(^Current) + A(^Step);
              ~Shock(MG, BOX, A[0], A[1]);~ ---> S5
#R^RightLever: ON ^RightLight;
              OFF ^LeftLight;
              SET A(^Current) = A(^Current) - A(^Step);
              ~Shock(MG, BOX, A[0], A[1]);~ ---> S5

S5,          \ Deliver Shock
              \ Update Display to new Shock Values
#K1: ~ShockOff(MG, BOX);~;
      OFF ^LeftLight, ^RightLight;
      SET A(^Current) = B(^Current);
      SET A(^Duration) = B(^Duration);
      SET A(^Step) = B(^Step);
      SHOW 1,Shock,A(^Current), 2,Duration,A(^Duration), 3,Step,A(^Step) ---> S4
0.01": ~ShockOn(MG, BOX);~;
      SHOW 1,Shock,A(^Current), 2,Duration,A(^Duration), 3,Step,A(^Step) ---> S4

\*****
\          RESPONSE COUNTERS
\*****
S.S.2,
S1,
  #START: SHOW 4,Left Lever,D(0), 5,Right Lever,D(1) ---> S2

S2,
  #K1: SET D(0) = 0, D(1) = 0;
      SHOW 4,Left Lever,D(0), 5,Right Lever,D(1) ---> SX
  #R^LeftLever: ADD D(0); SHOW 4,Left Lever,D(0) ---> SX
  #R^RightLever: ADD D(1); SHOW 5,Right Lever,D(1) ---> SX

```

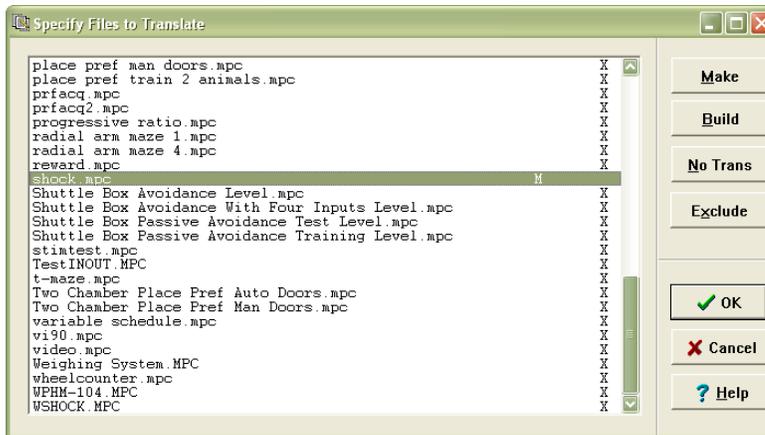
CHAPTER 5 | BEGINNING & RUNNING AN EXPERIMENT

Translating The MED-PC (.mpc) File

Programs written in MedState Notation™ must be translated using Trans before they can be executed in this application. The “MED-PC Programmer’s Manual” explains how to accomplish this translation. Make sure that a copy of the file being translated is present in the directory “C:\MED-PC IV\MPC\” or “C:\MED-PC\MPC\.” Double click the Trans icon on the Start | Programs list or desktop and select **Translation | Translate and Compile**.

Select the program to use for the experiment and select **Make**. Click **OK** to start the translator, and it will parse the MedState Notation™ and then open a DOS screen to compile the Pascal code. Depending on the speed of the computer, each of these steps may not be seen. If any problems are encountered during this process, refer to the on-screen help menu, the “MED-PC User’s Manual”, or contact Med Associates, Inc., for assistance.

Figure 5.1 - Trans Control Panel for Translating and Compiling MedState Notation™ Code



Using the MED-PC Load Wizard

MED-PC is designed to help the researcher run an experiment by guiding selection choices through its Experiment Loading Wizard. This section will describe how to initiate an experiment based upon the shock.mpc procedure. The following steps that start this procedure will also apply to all other .mpc procedures.

Open MED-PC and the MED-PC Experiment Loading Wizard's Welcome screen, shown in Figure 5.2 will appear.

Figure 5.2 -MED-PC Loading Wizard Welcome Screen (Screen display may differ per MED-PC version)



To avoid this load wizard, deselect the checkbox labeled “Run this experiment automatically when starting MED-PC.” Close this screen by clicking the **C**lose button. Closing this screen immediately reveals the MED-PC Run-Time Screen shown in Figure 5.10.

If the choice to continue with the Loading Wizard is made, then select the **Next** button. The next screen seen is the Box Selection screen, as shown in Figure 5.3. It is in this screen that the researcher chooses which boxes will be used in the experiment. Select the boxes that will run the experiment by clicking in the radio button next to the box number. The figure shows that the Hardware Configuration included only 1 box, which was selected.

Figure 5.3 - Box Selection Screen



The next screen seen is the Select a Procedure screen, as seen in Figure 5.4. This is where the procedure to be run is selected. The screen displays a list of all the currently compiled procedures. Simply select the procedure to be run, then click **Next**.

Figure 5.4 - Select a Procedure Screen



The Enter Experiment Data Screen should display next, as shown in Figure 5.5. The purpose of this screen is to allow annotations to be added to the data file that is produced by MED-PC. These annotations will help identify the Subject, Experiment, and Experiment Group upon which data was collected. Comments can be added here as well, and the data file can be given a customized file name to help identify it from other data files. Enter the information desired, and click **Next**.

Figure 5.5 - Enter Experiment Data Screen

Box 1 and SHOCK have been selected

Subject: Subject_1

Experiment: Experiment_1

Group: Group_1

Comments: Av_Stim_Control

Optional Custom Filename: Av_Stim_Subject1_Group1

Close Previous Next

The next screen to appear is the Review Choices screen, as seen in Figure 5.6. This is a method of confirming that the information received from the Box/Procedure Selected is correct. If it is not correct, select **Previous**, and edit the data. If it is correct, select **Next**.

Figure 5.6 - Review Choices Screen

Review Choices

Review the data below.

Box: 1

Procedure: SHOCK

Subject: Subject_1

Experiment: Experiment_1

Group: Group_1

Comment: Av_Stim_Control

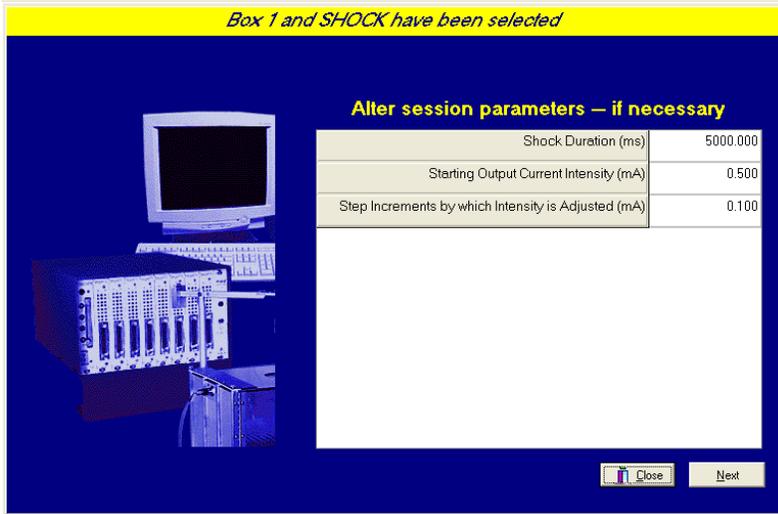
Filename: Av_Stim_Subject1_Group1

Click *Next* to finish loading the box
or *Previous* to correct errors.

Close Previous Next

The Alter Session Parameters Screen, shown in Figure 5.7, is the next screen to appear, and is an important screen for the researcher. The Alter Session Parameters screen allows the researcher to alter the parameters by which a procedure executes. The Send Start Command Screen appears next. The options available on the screen vary depending upon how many boxes are described in the Hardware Configuration.

Figure 5.7 - Alter Session Parameters Screen

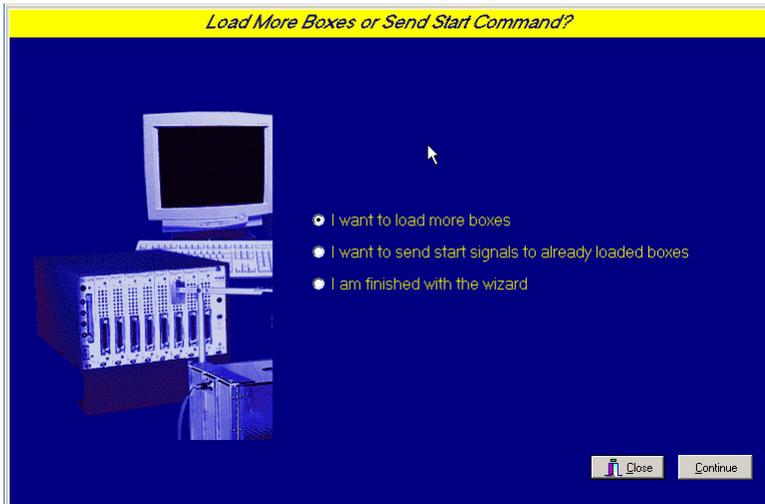


In this example only 1 box is described in the Hardware Configuration, so Figure 5.8 will appear next. If more than 1 box is in the Hardware Configuration, then Figure 5.9 will appear.

Figure 5.8 - Send Start Command Screen for Single Box Configuration

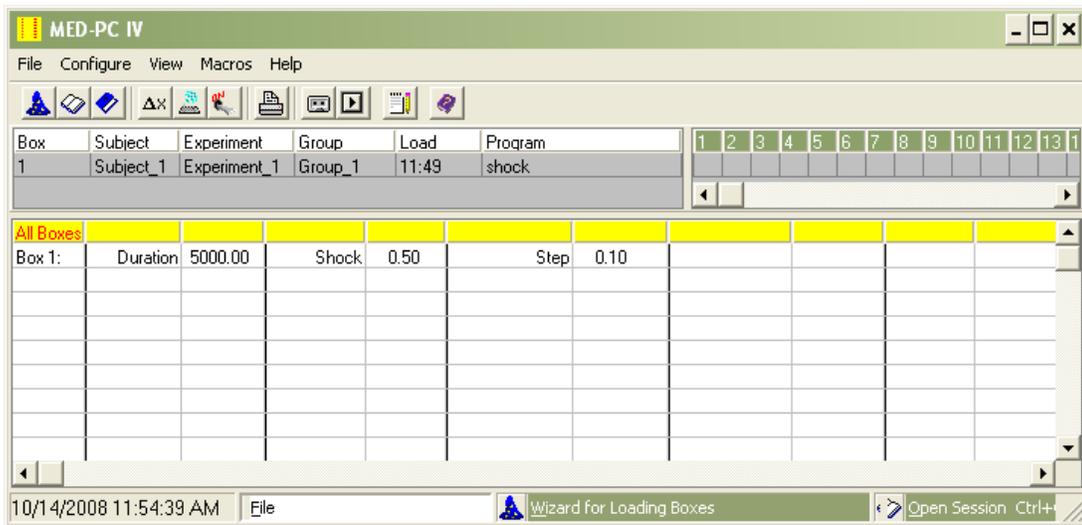


Figure 5.9 - Send Start Command Screen for Multiple Box Configuration



In both cases (Figure 5.8 and Figure 5.9), the screens are where the researcher decides to either load more boxes, send a start signal to boxes that are already loaded, or enter the MED-PC run-time environment without sending a start signal by selecting “I am finished with the wizard”. This option results in the MED-PC IV Run-Time screen shown in Figure 5.10.

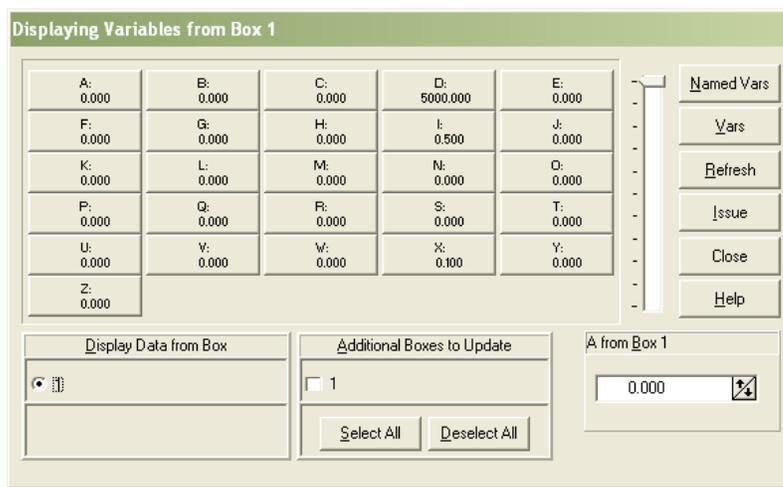
Figure 5.10 - The MED-PC Run-Time Screen



Viewing/Changing Variable Values

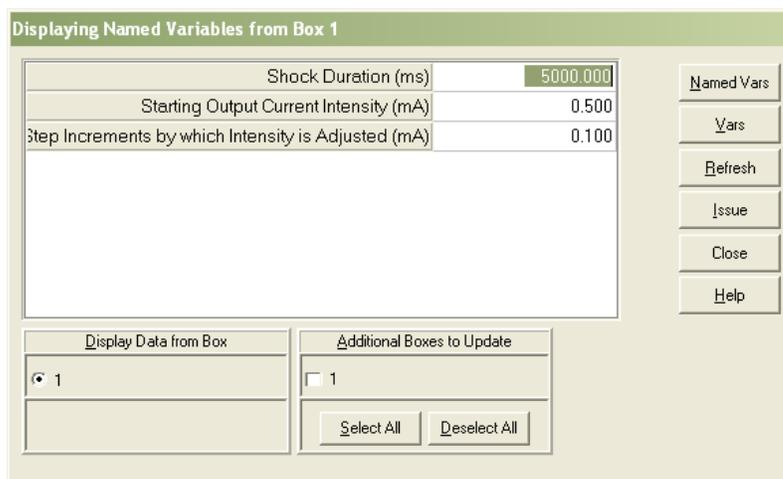
Before a “Start” command has been issued, any variable may be changed on the MED-PC change variables screen. Simply highlight the value to change, and then enter the new value. Once a session is in progress, change variables by selecting **Configure | Change Variables**, or click the 4th tool bar item **ΔX**. In the lower left hand corner of the Change Variables window, find the “Display Data from Box” display, and choose the chamber(s) to modify. By clicking additional boxes in the “Additional Boxes to Update” section, changes made to a single box are automatically loaded to all of the selected boxes.

Figure 5.11 - Changing Variables Screen



Click **Named Variables** to produce the display in Figure 5.12. Change variables here as needed.

Figure 5.12 – Displaying Named Variables



CHAPTER 6 | UNDERSTANDING THE DATA FILES

Unless otherwise specified, data will be saved to C:\MED-PC IV\DATA or C:\MED-PC\DATA. Within each data file, the headings are created for each Subject, Experiment, Group, Box, etc., (see below). Data files may be opened with Notepad, Wordpad, or any word processor or spreadsheet; however, be sure they are always saved “unformatted” in case a data extraction utility such as MED-PC to Excel might ever be used. Data file formats are explained in detail in the “MED-PC User’s Manual”.

Sample Data File

File: C:\MED-PC IV\DATA\!2008-10-06_10h32m.Subject Subject 1

```

Start Date: 10/06/08
End Date: 10/06/08
Subject: Subject 1
Experiment: Experiment 1
Group: Group 1
Box: 1
Start Time: 10:32:35
End Time: 11:05:15
MSN: shock
A:      5.000      -- Response Counter for Left Lever
B:     11.000      -- Response Counter for Right Lever
C:       0.000      -- Not Used
D:     5000.000    -- Aversive Stimulus Duration (ms)
E:       0.000      -- Not Used
F:       0.000      -- Not Used
G:       0.000      -- Not Used
H:       0.000      -- Not Used
I:       0.500      -- Starting Output Current Intensity (mA)
J:       0.000      -- Not Used
K:       0.000      -- Not Used
L:       0.000      -- Not Used
M:       0.000      -- Not Used
N:       0.000      -- Not Used
O:       0.000      -- Not Used
P:       0.000      -- Not Used
Q:       0.000      -- Not Used
R:       0.000      -- Not Used
S:       0.000      -- Not Used
T:       0.000      -- Not Used
U:       0.000      -- Not Used
V:       0.000      -- Not Used
W:       0.000      -- Not Used
X:       0.100      -- Step Increments by which Intensity is Adjusted (mA)
Y:       0.000      -- Not Used
Z:       0.000      -- Not Used

```

Appendix A | Contact Information

Please contact Med Associates, Inc. for information regarding any of our products.

Visit our website at www.med-associates.com for contact information.

For technical questions, email support@med-associates.com.