SOFTCR™ FOR WINDOWS

THE SOFT CUMULATIVE RECORDER

SOF-721

USER'S MANUAL

DOC-034
Rev. 1.4

notes

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CHAPTER 1 | INTRODUCTION

The Soft Cumulative Recorder (SoftCR) software package contains the file SOFTCR.EXE, which allows the user to produce screen and printer plots of all four MED-PC® and SmartCR™ data file formats. The distribution disk also contains an assortment of data files in various formats and lengths to illustrate the new features found in this update.

SoftCR for Windows includes all the features available in the DOS version, with the added ability to print to any printer or plotter that can be configured by Windows.

Backing Up Software

It is strongly encouraged that a backup of all data files be made before proceeding. Refer to the Windows manual for assistance if necessary.

Installing SoftCR

A password is required to complete the installation of this software. Please take a moment to fill out the registration supplied with the software and return it to MED Associates, Inc. to obtain the password.

Insert the distribution CD. If the installation program does not start automatically, click the **Start** button and select **Run**. Use the **Browse** button to select the file **AUTORUN.EXE** from the CD drive.

CHAPTER 2 | RUNNING SOFTCR

To run the SoftCR program, select the SoftCR program group and double click on the SoftCR icon. The first time you run SoftCR, the following screen displays. Refer to Figure 2.1.

Figure 2.1 - SoftCR for Windows Opening Screen
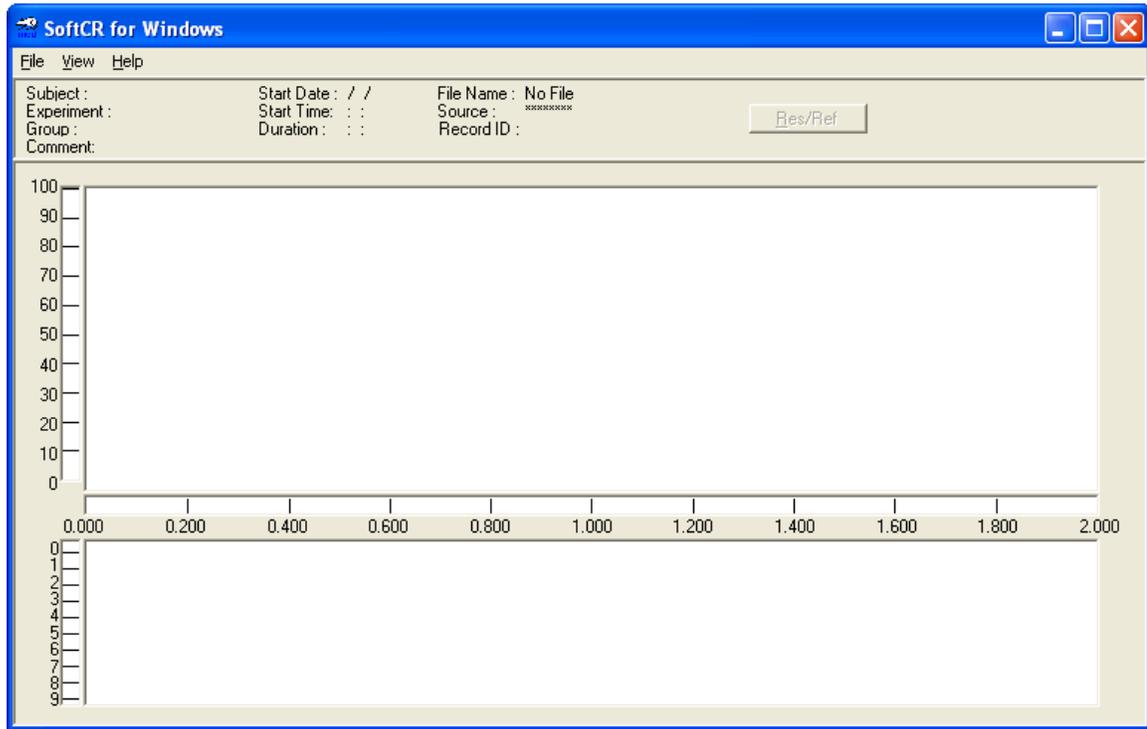
The Graphical User Interface

SoftCr is designed to resemble DOS to make SoftCR as user-friendly as possible; however, a few important differences exist:

- The menus are more similar to standard Windows-interface programming.
- File selection uses the file open dialog, which allows you to change directories without referencing the **Configuration | Data Directory Path** and **Files | Select File** DOS menu options.
- Printing uses the standard Windows print dialog, which offers several printing options such as printing a single page at a time. This takes the place of the **Print/Plot | Print Screen**, **Print/Plot | Print Record**, and **Configuration | Printer Configuration** DOS print options.

CHAPTER 3 | APPLICATIONS AND DEFINITIONS

The SoftCR Main Menu

The Main Menu consists of the following selections. Each selection may be made with either: (1) left-clicking with the mouse, (2) typing ALT + the underlined letter in the selection title, or (3) in some cases the designated function key may also be used to select the desired option.

File

        Open   F2

        Close

        Save Plot As…   Ctrl+S

        Edit Parameters   F3

        Print   F5

        Print Batch

        Exit

View

        Data Set >

        Options

   Scroll Forward   F8

        Scroll Back   F7

Help

        About

File Menu Options

Open <F2>

This option selects the data to be displayed and printed. First, select the file to be displayed (refer to Figure 3.1). The Dialog Window shown is from Windows XP, so the Window may look different in other operating systems. After selecting the file, choose the parameters for the file that will be displayed (see Figure 3.2).

Figure 3.1 - Select File Screen
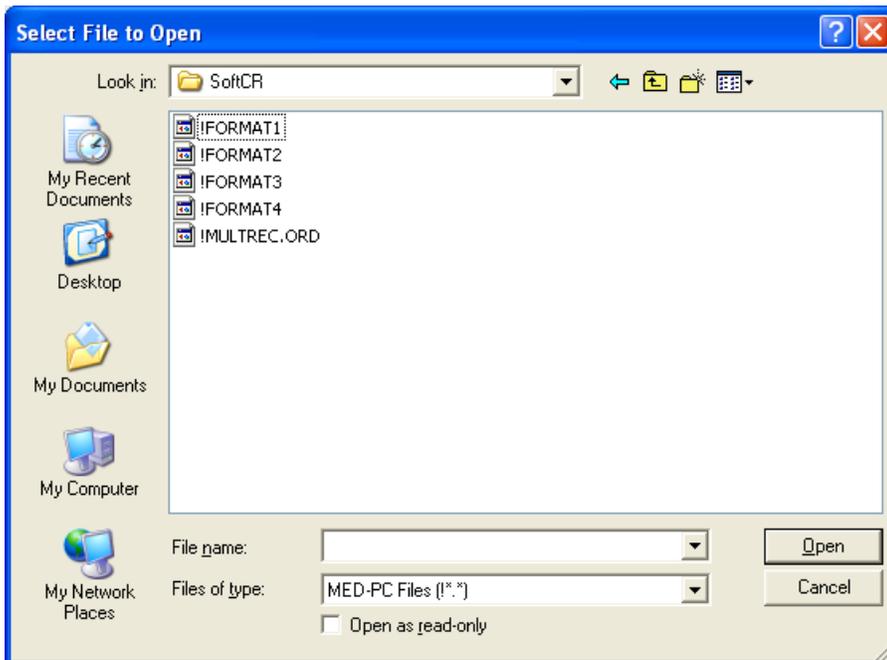
The default data path for selecting a file is the same directory or sub-directory containing the program SOFTCR.EXE. The default file name prefix is "!" (e.g. !FORMAT1.CGS -see the MED-PC manual for standard file name selection). After selecting a data file, the SoftCR Parameters form automatically opens. For more information about this form, refer to the Edit Parameters section.

Close

Closes the current data file, leaving the program running.

Save Plot As… <Ctrl+S>

The **Save Plot As** option allows the user to save a picture of the runtime screen as either a Portable Document Format (PDF), Windows Meta File (WMF), or as a Bitmap (BMP). Saving as a Bitmap file is advantageous because every file is saved as the same size and these files will most likely fit onto a floppy disk; however the resolution of Bitmap files is not very good, and the

resolution noticeably deteriorates when zooming in or out. Windows Meta File provides superior picture resolution, but the size of the file size may be very large. Saving a file as PDF automatically embeds a Windows Meta File into a PDF document, but a PDF reader is required in order to open this file. The PDF format may be the best choice overall because the file size is small, but this option provides the best picture resolution.

The "Save Plot As" screen may also be viewed by typing Ctrl+S, but this option is unavailable until you have opened a data file.

Edit Parameters <F3>

The **Edit Parameters** option permits SoftCR to be configured to the file Format, Array, Resolution, and Data Format used in the data file. Use **Edit Parameters** to change the display format for the purposes of printing or scaling the window to best fit your screen. The **Edit Paramete**rs window automatically appears whenever a new file is opened, and it can always be accessed from either the File menu or by pressing the F3 function key at any time (see Figure 3.2).

Figure 3.2 - SoftCR Parameters Screen

Specific information about the data file is required to properly enter values in this form. This information may be obtained from the MedState Notation procedure used to collect the data, from the SmartCR general configuration printout, or from a printout or screen display of the data file itself. It is recommended that the SoftCR parameters be verified carefully whenever there is a problem with the graphical display.

Table 3.1 - Edit Parameters

Item	Description
Format Type (1/2/3/4):	MED-PC and SmartCR create data files in one of four possible Format Types. Schedule Manager only produces Format 1 data files:

Format 1	Annotated	MED-PC, Schedule Manager and SmartCR
Format 2	Stripped	MED-PC and SmartCR
Format 3	Stripped, C Array Only	MED-PC and SmartCR
Format 4	Stripped with Variable ID	MED-PC and SmartCR

The Format Type needs to be chosen before the data is collected. Although a single data file may contain several separate Cumulative Records, it is important to use the same Format Type for each. A file with multiple Format Types will have to be carefully edited to separate each Format Type into a separate file before the data can be displayed or printed using SoftCR.

If the Format Type is unknown, a visual inspection of the created file and comparing it with the samples provided in Appendix A, will generally reveal the file Format Type.

Because the Format Types (1, 2, 3, or 4) are not stored as part of the data, the user must know which data format the data file is saved in, and must enter the correct type number in the Edit Parameters form. The two most often used formats are Format 1 and Format 4.

Item	Description
Reset Pen Up/Down:	A Reset is generated when the response count equals the value entered in the Y-Axis Responses box. This entry defines the Pen Reset Mode, i.e., whether or not a vertical line is drawn when the Pen "Resets" from the top of the display to the bottom. Enter "U" for "UP" if no vertical line is desired at reset or "D" for "DOWN" to have a vertical line drawn at Reset.
Array Var/Nbr to Plot:	Although any letter of the alphabet may be dimensioned or defined as an array in MED-PC, "C" is most often used. SmartCR also uses the "C" array. However, since other letters may be used, in fact it is possible to generate multiple Cumulative Records within the same procedure, the array letter to plot must be entered in SoftCR for Formats 1, 3, and 4. Since Format 2 has no letter identifiers, and array data may be saved in any order, it is necessary to indicate by number which variable to use. To display MED-PC files saved in Format 2, enter 1 for the first array, 2 for the second, etc., regardless of the array letter. To display SmartCR files saved in Format 2, enter 1.

Item	Description
Y Axis Response:	This value defines the Y-axis of the graph. The Y-axis on the graph has ten equal divisions, from zero to the magnitude of this parameter. This also determines the number of responses required to generate a Pen Reset. Note: after returning to the graphical screen, the Up/Down arrow keys will "dynamically" change this value. Press the "Up Arrow" to add 10 to the value of the Y-axis response or the "Down Arrow" to subtract 10. Displayed data will be automatically plotted each time the value is changed.
X Axis Width (Min):	This value determines the X-axis of the graph, which is the Elapsed Time of the displayed data, and may be entered as a whole number or decimal. The X-axis is plotted in minutes and is divided into 10 equal divisions. Like the Y-Axis Response, this value may also be changed "dynamically" while in the graphical screen. Use the "Shift +Left Arrow" key to reduce the amount of time on the X-axis by 0.1 minutes and the "Shift + Right Arrow" key to increase the X-axis time by 0.1 minutes. To move along the X-axis, refer to the Scroll Width section.
Resolution:	This value is critical. Entering an incorrect value can drastically distort the graphical display and skew the occurrence of events in time, i.e., change their position along the X-axis. In SmartCR, this value is the same as the Resolution configured for the program, and is generally set to 10 ms. In MED-PC, although the resolution may be 10 ms, the "timer" written in the procedure to measure IRT's is often 100 ms. All sample files supplied with SoftCR except !FORMAT2 have a resolution of 100 ms. !FORMAT2 has a resolution of 10 ms.
	The data elements in the IRT array in MED-PC or the C array in SmartCR actually consist of two parts. The numbers to the right of the decimal point are codes to indicate that the time element "marks" the occurrence of a Response, a change in Event-Pen status, or Reinforcement occurred. For example, a value of 153.1 has a code of "1"; therefore, it represents a Response data element. An explanation of all codes is provided in Appendix B.
	The integer value of the number to the left of the decimal point provides the time stamp, and the actual value is the result of multiplying the integer value by the Resolution value. Therefore, if a Resolution value of 10 ms is used, a value of 153.1 would represent a Response with a time value of 1.53 seconds (153 x 0.01 seconds). If the "timer" in MED-PC is incremented every 100 ms, the same value of 153.1 would represent a Response with a time value of 15.3 seconds (153 x 0.1 seconds).
	The default value for Resolution is 100 milliseconds. (Enter 100 for the !FORMAT1, !FORMAT3, !FORMAT4, and !MULTREC.ORD sample files supplied with SoftCR.)

Item	Description
Data Format (Absolute/Relative)	The "time stamp" referred to in the resolution section may represent time in one of two ways. The time value for each data element may represent the elapsed time since the procedure or recorder was started. Time values of this type are said to be "Absolute."
	When the "timer" used to determine the time value is reset to zero following each Response, Reinforcement, or Event, the "time stamp" portion of the data element is only the elapsed time since the previous array element. Time values of this type are said to be "Relative."
Start Time (Min):	SoftCR plots a Cumulative Record beginning any time between zero and the Record's maximum time. Start time may be chosen using the parameters form box and/or using the left and right arrow keys to scroll the data in "real time."
Scroll Width:	Scroll width allows the user to select the distance in time that the X-axis is scrolled each time the right arrow key or the left arrow key is depressed. Enter this value as a whole or decimal member. The maximum practical value is a value equal to the X-axis value, which causes the entire screen to refresh with each scroll and is practically useful for a quick overview of lengthy Records. Although this value cannot change dynamically, scrolling through the Record is a dynamic function. Use the "Right Arrow" key or F8 key to scroll forward in the Record and the "Left Arrow" key or F7 key to scroll back.
Save Plot… Size:	This changes the size of the Bitmap that is to be saved. You can choose between 50% or 100% of the screen size or 3 standard Windows sizes. If you choose a larger size for the Bitmap, then the file size will be larger.
Trace 0 – 9:	Allows the User to change the color of the Trace Pen in the upper window of the graph.
Event Pens:	Allows the User to change the color of the Event Pens in the lower window of the graph.
Back Ground:	Allows the User to change the color of the background of the graph.
Printer:	Allows the User to change the background color that is used when printing.
Screen Pen Size:	Sometimes when you save a Bitmap the Pen lines may be too small to see. This will allow you to select a larger size for the Pens on the screen so that when a Bitmap picture of the screen is taken, the Pens will show up in the Bitmap.
Printer Pen Size:	The same as Screen Pen Size, but it affects the size of the Pens that are used for the Printer.

Print <F5> <F6>

The **Print** option allows the user to select their print options and send output to the printer (see Figure 3.3). The F5 function key brings up the Print screen with the **Selection** option automatically selected for printing the current screen. The F6 function key brings up the Print screen with the **All** option automatically selected for printing the entire Record.

Figure 3.3 - Printer Selection Dialog
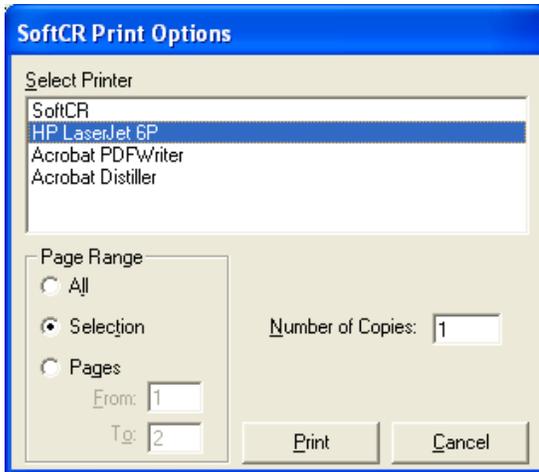
Table 3.2 - Printer Dialog Options

Item	Description
Select Printer	Allows the User to select which printer to send the output to.
	Note: The SoftCR pdf printer will only work with the SoftCR program and will not work with any other program.
Print Range	**All**
	Selecting "All" prints the entire Record for the experiment. This option is the same as choosing pages and entering 1 to the last page of the experiment.
	Selection
	Prints the page currently being displayed.
	Pages
	Choosing pages allows the User to enter beginning and ending pages to be printed. If only one page is to be printed, enter the page number in both the "From" and "To" fields.
Number of Copies	Allows the User to enter the number of copies of printed output they would like.

Print Batch

The **Print Batch** option allows the user to select multiple files and data sets to print. All of the files in a batch must be saved in the same format and directory. First, choose the file parameters to use in printing (refer to Figure 3.2). After selecting the parameters, select the file(s) to print (refer to Figure 3.1). Each Record will be displayed in a window similar to Figure 3.4.

The file dialog allows the User to select multiple files using the mouse and the Ctrl or Shift key. A list is displayed of all data sets in each file selected. From this list, all or some of the data sets contained in each data file can be selected using the mouse and the Ctrl or Shift key. After selecting the desired data sets and choosing "OK," the data will be sent to the printer selected.

Figure 3.4 - Multi-Data Set Selection
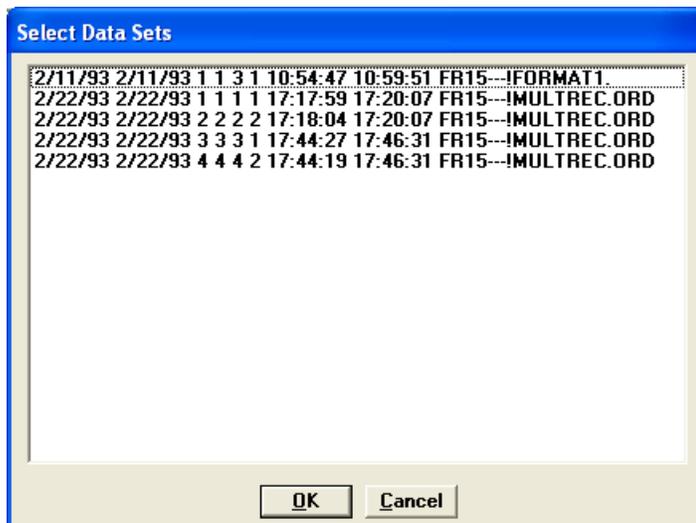
NOTE: After selecting files, each file has to be scanned to determine how many data sets it contains, and this process may take some time depending on the size of the data files, the number of files selected, and the speed of the computer.

Exit

Exits the program, closing any open files and releasing all resources.

View Menu

Data Set <F4>

The Data Set option displays a menu listing of each data Record appended to a given data file. The currently selected data is indicated with a check mark. The data index displays Records and associated data in the order that they appear in the file. Each entry consists of the Start and End Date, Subject, Experiment, Group, Box Number, Start and End Time, and, if a Format 1 file, the source (MedState Notation procedure name or SmartCR) for each Record or index item. Although each "index" may represent multiple arrays (e.g. C,D,E…1,2,3), only the selected arrays are displayed and plotted.

The Data Set screen may also be viewed by pressing the F4 function key or by right-clicking the mouse when the mouse is positioned over the main display screen. Note that the Data Set option is unavailable until a data file is opened. Also, the cumulative tracing (with associated event lines) displays on the screen only after a data Record has been selected.

Options

The Display/Print Options window affects which Events and Pens are displayed to the screen, saved in the Bitmap or Windows Meta File, and sent to the printer. The window also lets the User select if an axis or a scale is to be displayed.

Figure 3.5 - Display/Print Options
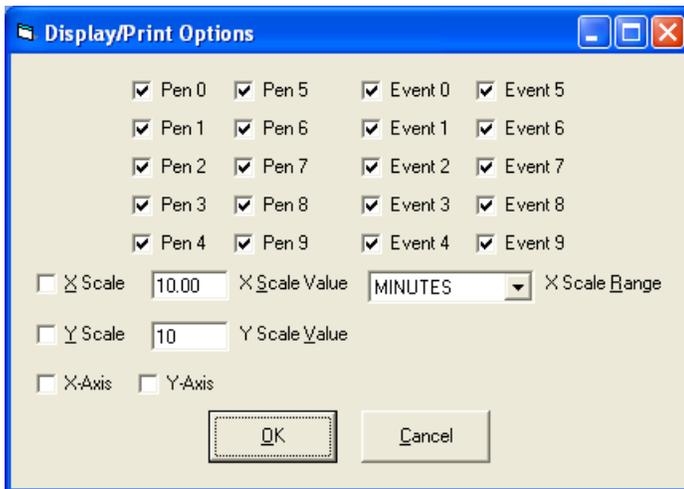
Table 3.3 – Display/Print Options

Item	Description
Pen 0 – 9	Allows the user to turn on or off the respective Pen.
Event 0 – 9	Allows the user to turn on or off the respective Event.
X Scale	Allows the user to turn on or off the X Scale.
Y Scale	Allows the user to turn on or off the Y Scale.
X Scale Value	The time value to map on the X Scale.
Y Scale Value	The number of responses to map on the Y Scale.
X Scale Range	Allows the user to select whether the X Scale is in milliseconds, seconds, minutes, hours, or days.
X Axis	Allows the user to turn on or off the X Axis.
Y Axis	Allows the user to turn on or off the Y Axis.

Scroll Forward <Right Arrow> <F8>

The **Scroll Forward** option scrolls data to the right, forward in time, toward the end of the Record. The Scroll Forward command can be utilized by pressing the right arrow key or the F8 function key.   The Scroll Width parameter determines the width (in minutes) of X-axis movement with each invocation of the Scroll Forward option.

Scroll Back <Left Arrow> <F7>

The **Scroll Back** option scrolls data to the left, back in time, toward the start of the Record, and this option may be invoked by pressing the left arrow key or the F7 function key. The scroll width parameter determines the width (in minutes) of the X-axis movement with each invocation of this option.

About Menu

Selecting the **About** menu option displays the software revision and release date.

Screen and Printout Labeling

Both screen display and printer plots include complete header information as illustrated in Figure 3.6. A brief description of each label follows.

Figure 3.6 - Screen Display of Cumulative Record
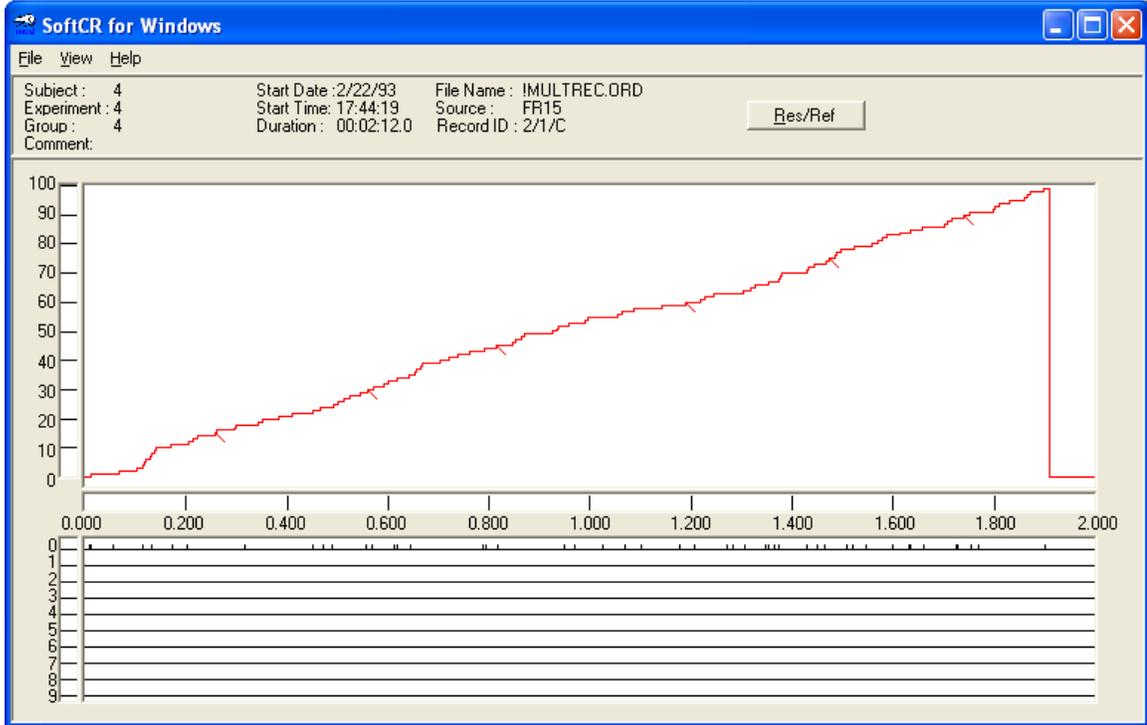
Table 3.4 – SoftCR Screen Display Labels

Item	Description
Subject **Experiment** **Group**	Identification string entered under each heading in MED-PC, Schedule Manager, or SmartCR.
Comment	The comment string entered in MED-PC or SmartCR.
Start Date	In MED-PC, this is the date the test chamber was loaded with the procedure that produced the data file; note that this is not necessarily the date the #START command was issued. In SmartCR, Start Date is the date the Record was started. If a Record is repeatedly started and stopped without saving the data, only the date the Record was last started is reflected.

Item	Description
Start Time	In MED-PC, this is the time the test chamber was loaded with the procedure that produced the data file. This may not be the same time the #START command was issued; however, the special identifiers STARTHOURS, STARTMINUTES, and STARTSECONDS, may be set in MED-PC to reflect this difference. In SmartCR, this is the time the Record was started. If a Record is repeatedly started and stopped without saving the data, only the time the Record was last started is reflected.
Duration	Elapsed time measured from the Start Time to the Stop Time. Duration measured along the X-axis may vary depending upon the "Start Time."
File Name	The complete data file name.
Source	Origin of the data. SmartCR or the MED-PC procedure file name, without the .MPC extension, used to create the data file. "********" will appear when displaying data files in Format 2, Format 3, and Format 4.
Record ID	The Record ID provides three pieces of information regarding the Record in the current screen display or on the printout: the Box number, the Format Type (1, 2, 3, or 4), and the Array Letter or Number.
Res/Ref	This button opens a window that displays the Total Responses/Total Reinforcements for the entire Record and the number of Responses/Reinforcements that are currently on the screen.

APPENDIX A | DATA FILE FORMATS

Any properly formatted ASCII file can be used with SoftCR. MED-PC, Schedule Manager, and SmartCR are designed to generate such files. MED-PC and SmartCR can both produce four format types. MED-PC can place data in any array from A to Z, as defined by the procedure. Schedule Manager and SmartCR always place the data in the C array. Schedule Manager only produces Format 1 files.

The sample data files, !Format1, !Format3, and !Format4 were created with MED-PC using the procedure in Appendix C. Each contains a single Record that is 2 – 5 minutes in length with Relative data elements in the C Array, Event 0 Pips, and a Resolution of 100 milliseconds (0.1 seconds). The file !Format2 was created with SmartCR and contains a single Record that is 2 minutes in length with Absolute data elements in the 1st Array, Event 0 Pips, Event 1 "square waves," and a Resolution of 10 milliseconds (0.01 seconds). The file !MULTIREC.ORD contains four 2 minute Records, Format 1, Relative data elements in the C array, Event 0 Pips, and a Resolution of 100ms.

Format 1 - Annotated

The "Annotated" file format creates an output file that is the easiest to read with labels for each data element and may contain data from multiple sessions, depending upon the file naming conventions used to generate the data. Annotated data files always begin with the name of the data file on line 1. Two lines are then skipped and header information begins. All simple variables are listed next, followed by all array elements. These will normally be in alphabetical order, unless otherwise specified in the "DISKVARS" command. In the event that more than one data set is in the data file, two lines are skipped following the last data element in one data set and the "Start Date," which is the first line of the next data set. The file designation line is not repeated.

Format 1 Sample Printout

```
File:  !FORMAT1                     File name appears only on 1st line.

Start Date:  2/11/93               Date Box was loaded, without zeros.
End Date:  2/11/93                 Date Box was stopped.
Subject:  1
Experiment:  1                     Subj., Exper., and Group ID numbers
Group:  3
Box:  1
Start Time:  10:54:47              Time Box loaded, without leading zeros.
End Time:  10:59:51                Time Box was stopped.
Source code:  FR15                 MPC procedure name, Experiment name
                                   in Schedule Manager, or "SmartCR."
A:     109.000
B:     12.000
D:     0.000                       Simple Variables
E:     0.000
F:     0.000
G:     0.000
H:     0.000
I:     139.000                     In MED-PC, Simple Variables are User
J:     0.000                       defined.
K:     0.000
L:     0.000
M:     0.000                       In SmartCR:
N:     0.000                       A = Total Responses
O:     0.000                       B = Total Reinforcements
P:     0.000                       D = Clock Ticks (10ms Resolution)
Q:     0.000
R:     0.000
S:     0.000
T:     2.000                       In MED-PC, the Array Letter, Resolution,
U:     0.000                       and Time Elements (Relative or Absolute)
V:     0.000                       are User defined.
W:     0.000
X:     0.000                       In SmartCR only Resolution (standard of
Y:     0.000                       10 ms) is User defined.  Absolute
Z:     0.000                       data elements are always in C Array.
C:
     0:       49.100      15.600      0.500      2.100      22.100
     5:       57.100      35.100     12.100     22.100      52.600
    10:        0.500      77.100      2.100     10.100      27.100
    15:       25.100      52.600      0.500      5.100      12.100
    20:       17.100       0.200      2.100     25.100      72.100
    25:       10.600       0.500     45.100     10.100      12.100
    30:       12.100      10.100     10.100     25.100       5.100
    35:       37.100       7.100      2.100      2.100       0.200
    40:       37.100      17.100     57.100     27.100      10.600
    45:        0.500      22.100     37.100     15.100      27.100
    50:       17.100      20.100     32.600      0.500      52.100
    55:       22.100      50.600      0.500     75.100      45.100
    60:       17.100       0.200      5.100     15.100      67.100
    65:       25.100       5.100     27.100     35.100      15.100
    70:       17.100       5.100     22.100     30.100      12.100
    75:       17.100      57.100      0.200     17.100      20.100
    80:       10.100     110.100      7.100     12.100       7.100
    85:       40.100      37.100     65.100     12.100       7.100
    90:       40.600       0.500     17.100     27.100      10.100
    95:        0.200      35.100      2.100      2.100       7.100
   100:       30.100      10.100      2.100      2.100       7.100
   105:       25.100     100.600      0.500     10.100      20.100
   110:        2.100       2.100      5.100      0.200      50.100
   115:       15.100      17.100     10.100     97.100      10.100
   120:        2.100      12.100     67.100     15.600       0.500
   125:       15.100      25.100     62.100     57.100       5.100
   130:       12.600       0.500      2.100      0.200      25.100
   135:        2.100      25.100     10.100     17.310
```

Full Headers

The above example uses the "Full" Header format, with 9 lines of Header information. Keep in mind that the "Start" Date and Time are defined the moment the procedure is loaded to a Box, irrespective of the #START command. Dates are not padded by leading zeros (February is shown as "2" above not "02") and do contain slash characters. Also, note that times contain colons and the hour does not necessarily contain a leading zero if the hour is less that 10; however, if the hour is 0, then a 0 appears in the hour column. The last line of the Header contains the name of the MedState Notation .MPC procedure file that generated the data, the Experiment Name in Schedule Manger, or the label "SmartCR."

Condensed Headers

The MED-PC DISKOPTIONS command permits the user to specify a "CONDENSED" Header, which is shown below. Two blank lines still precede each session's data, irrespective of Header format.

```
BOX:  1  SUBJECT:  1  EXPERIMENT:  1  GROUP:  3  SOURCE CODE:
FR15

START:  2/11/93  10:54:47  END: 2/11/93  10:59:51
```

Format 2 - Stripped

The MED-PC and SmartCR "Stripped" file format is devoid of all labels, including the File Name or Source. It begins with the first data element, namely the Month the Box was loaded. Determining the "meaning" of the column of numbers that follows is totally dependent upon understanding the file format. The example that follows contains information similar to that of the Annotated file shown previously, except that Absolute time values are used with a Resolution of 10 milliseconds. Two blank lines separate multiple data sets within the same data file.

The number of elements listed is the total number of elements actually in the data file, which may not necessarily be the number of elements declared in the MED-PC procedure. The discrepancy between the dimension declared in the MED-PC procedure and the number listed in the data file may arise due to the use of -987.987 to stop array printing. Also, an array declared as "DIM A=100" actually contains 101 elements because element 0 is included in the total.

Format 2 Sample Printout

```
02          Month Record was Started
22          Day Record was Started
93          Year Record was Started
02          Month Record was Stopped
22          Day Record was Stopped
93          Year Record was Stopped
22          Subject Number
0           Experiment Number
4           Group Number
1           Record Number
12          Hour Record was Started
52          Minute Record was Started
48          Second Record was Started
12          Hour Record was Stopped
54          Minute Record was Stopped
48          Second Record was Stopped
25          Total Number of Simple Variables
1           Total Number of Arrays
262         Total Number of Elements in the Array
241         Value of First Simple Variable A (Response Count)
12          Value of Second Simple Variable B (Reinforcement Ct.)
12001       Value of Third Simple Variable D (Total Clock Ticks)
0           Value of Fourth Simple Variable E
0           F
0           G
0           H
0           I
0           J
0           K
0           L
0           M
0           N
0           O
0           P
0           Q
0           R
0           S
```

```
0              T
0              U
0              V
0              W
0              X
0              Y
0              Z
1.100          Value of first element in Array C (Response Step)
48.100
98.100
148.100
198.100
248.100
298.100
348.100
398.100
448.100
498.100
548.100
598.100
632.200        Value of fourteenth element (Reinforcement Pip)
   *
   *
   *
2912.600       Value of Nth element (Event Pen "0" mark up)
2913.500       Value of N+1 element (Event Pen "0" baseline)
   *
   *           Zero time between the .6 code and the
   *           .5  code will produce a "spike" on the event
   *           line.  Any time disparities will produce a square wave
   *           from the time of the .6 code to the time of the .5 code.
   *           Response codes, Reinforcement codes, and other event
   *           codes may appear between the occurrence of a mark up
   *           and a mark down (baseline) code.
   *
5164.610       Event Pen "1" mark up
   *
   *
   *
7155.510       Event Pen "1" mark down
   *
   *
   *
12001.310      Value of last element (Pen Reset w/pen down)
```

Format 3 - Stripped, C Array Only

By definition, this format produces a data set with no simple variables and one array. The following example should be self-explanatory. If the C Array is empty, the header information will be presented with the last three lines of the data set being 0, 1, 0. 0 indicates no simple variables, 1 indicates one array, and 0 indicates no data elements.

Format 3 Sample Printout

```
2              Month Box Loaded
12             Day Box Loaded
93             Year Box Loaded
2              Month Box Stopped
12             Day Box Stopped
93             Year Box Stopped
333            Subject ID Number
0              Experiment ID Number
0              Group ID Number
1              Box Number
12             Hour (24 Hour Format) Box Loaded
58             Minute Box Loaded
21             Second Box Loaded
13             Hour Box Stopped
00             Minute Box Stopped
25             Second Box Stopped
0              Number of Simple Variables (Always 0)
1              Number of Arrays (Always 1)
126            Number of Elements in the Array
18.1           Response step element
15.1
22.1
7.1
5.1
12.1
7.1
22.1
5.1
12.6           Event element on event 0, pen up
0.5            Return pen 0 to baseline
12.1
20.1
12.1
2.1
12.1
2.1
0.2            Reinforcement pip mark
7.1
17.1
  *
  *
  *
1.31           Reset element, pen down
```

Format 4 - Stripped With Variable Identification

This format provides the same information as Format 2-Stripped, with the added feature of maintaining the alphabetical order of variables and arrays, and identifying the number of elements assigned to each variable. Therefore, simple variables are always associated with one element, while arrays may contain from 1 to 1,000,000 elements. Unlike the simple stripped format, it is not necessary to have access to the MPC code that produced the data set in order to match variable letters to data elements.

Format 4 Sample Printout

```
2              Month Box Loaded
22             Day Box Loaded
93             Year Box Loaded
2              Month Box Stopped
22             Day Box Stopped
93             Year Box Stopped
17             Subject ID Number
4              Experiment ID Number
2              Group ID Number
1              Box Number
16             Hour (24 Hour Format) Box Loaded
44             Minute Box Loaded
07             Second Box Loaded
16             Hour Box Stopped
50             Minute Box Stopped
31             Second Box Stopped
25             Total Number of Simple Variables
1              Total Number of Arrays
.3             .3 is a "Marker Number" only.  (Data analysis
               programs may use this value to identify the
               start of variable identification.)
1              Variable A is simple (1 element)
1              Variable B is simple (1 element)
117            Variable C is an Array (117 elements)
1              D
1              E
1              F
1              G
1              H
1              I
1              J
1              K
1              L
1              M
1              N
1              O
1              P
1              Q
1              R
1              S
1              T
1              U
1              V
1              W
1              X
1              Y
```

```
1               Z
96              Value of First Simple Variable A (Response Count)
10              Value of Second Simple Variable B (Reinforcement Ct.)
11.1            Value of First Element in Array C (Response Step)
35.6            Value of Second Element in C (Event "0" Mark Up)
0.5             Value of Third Element in C (Event "0" Mark Down)
10.1
5.6
0.5
5.1
5.1
10.1
5.1
37.1
18.1
36.1
21.1
9.1
4.1
27.1
5.1
17.1
0.2             Value of 20th Element in C (Reinforcement Pip)
  *
  *
  *
3.31            Value of 117th Element in C (Pen Reset with Pen Down)
0               Value of Fourth Simple Variable D
0               E
0               F
0               G
0               H
117             I       (Used in MED-PC as Array Subscript)
0               J
0               K
0               L
0               M
0               N
0               O
0               P
0               Q
0               R
0               S
3               T       (Used in MED-PC to Count Ticks)
0               U
0               V
0               W
0               X
    0           Y
0               Z
```

APPENDIX B |DATA CONTROL ELEMENTS

Each element in the "Cumulative Record" data array consists of two components. The integer value or value to the left of the decimal point is the time component. The decimal value to the right of the decimal point is a SmartCR/SoftCR code component.

Time Components

Time components may be Relative or Absolute. In a Relative file, the time component of a given data element is equal to the elapsed time since the previous element. In an Absolute file, it is equal to the elapsed time since the beginning of the Record. In MED-PC, a variable counter determines the time component, which is generally incremented with a resolution of 0.1 seconds (100 milliseconds). For example, if a Relative file contained a Record with just two elements: 35.1 and 33.1; the Record would consist of one Response Step at 3.5 seconds (35 * 0.1) and a second Response Step 3.3 seconds later at 6.8 seconds on the X-Axis. In Schedule Manager and SmartCR, the time component is determined by the Interrupt Resolution and is generally set at 10 milliseconds (0.01 seconds). Also, SmartCR data files are always Absolute. Therefore, to produce the same Record as the previous example, a SmartCR file would contain elements 350.1 and 680.1.

Control Code Components

The control code component indicates whether the element is a Response Step, Reinforcement Pip, Pen Reset, Event Pen Up, or Event Pen Down element. Up to 10 Event Pens (0 - 9) may be specified in MED-PC, Schedule Manager and SmartCR and up to 10 Trace Pens (0 - 9) may also be specified in MED-PC and SmartCR. Schedule Manager only uses one Trace Pen. In addition, Resets may be made with the Pen "Up" (no vertical tracing) or "Down." Additional coded information may be possible in the future.

Data Element Format

Each data element must conform to the following format:

nnnnn.xyz

Where:

nnnnn = Time Component

xyz = Control Code Component

x = Datum Type

y = Datum Index

z = Reserved

NOTE: If there are more then three numbers past the decimal point, then the array will be considered invalid and will be ignored by SoftCR.

Allowed datum types and indices are:

nnnnn.1yz = Response or Step

y = Index (0 - 9) for Multi-Trace Files

"NULL" for Single Trace Files

nnnnn.2yz = Reinforcement or Pip

y = Index (0 - 9) for Multi-Trace Files

"NULL" for Single Trace Files

nnnnn.3yz = Reset Trace Pen

For Single Trace data files and y is Pen Mode where:

y = 0; Trace 0 Pen Up During Reset

y = 1; Trace 0 Pen Down During Reset

Note: This format overrides the Up/Down

option in edit parameters.

For Multi-Trace data files:

y = Index (0 - 9)

nnnnn.4yz = Unused

nnnnn.5yz = Set Event Pen To Level 0 ("Down" or at baseline), where

y = Event Pen Number (0 - 9)

nnnnn.6yz = Set Event Pen To Level 1 ("Up"), where

y = Event Pen Number (0 - 9)

nnnnn.7yz = Unused

nnnnn.8yz = Unused

nnnnn.9yz = Unused

Data in the array being plotted that does not conform to the above rules are ignored.

SoftCR for Windows stores in memory the maximum number of array elements allowed in MED-PC IV, which is currently 1,000,000 elements. The maximum number of arrays allowed per Record is 26 (the MED-PC limit).

APPENDIX C| CREATING CUMULATIVE RECORD FILES IN MED-PC

The !FORMAT2 data file that was created with SmartCR used a constant Response pulse stream at 500 millisecond intervals, Reinforcement Pips every 10 seconds, and random Event marks. All other sample files utilized the following FR-15 procedure run in MED-PC. Responses to Lever 1 generate a Response step, while responses to Lever 2 produced a Pip on Event Line 0. Responses were generated with a random generator interrogated every 250 milliseconds. The probability of a Response to "Lever 1" occurring was 10%, while the probability of a response to "Lever 2" occurring was 1%.

FR15.MPC Source Code Procedure

```
\ Variables and Z-Pulses used in this procedure
\ I  = Subscript for the IRT Array C.
\ T  = Clock Ticks for IRT's.  Resolution = 0.1 second.
\ Z1 = Reinforcement Pulse


\ Inputs
^Lever1 = 1
^Lever2 = 2

\ Outputs
^StimLight1 = 1
^StimLight2 = 2
^Pellet     = 3


DIM C = 1000  \ Dimension Array C for 1001 data points.


\*********************************************
\          FR - 15 Schedule on Lever 1
\*********************************************
S.S.1,
S1,
  #START: ---> S2

S2,
  15#R^Lever1: ON ^Pellet; Z1 ---> S3

S3,
  .05": OFF ^Pellet ---> S2


\*********************************************
\    Increment Time T for IRT's and Event
\*********************************************
S.S.2,
S1,
  #START: ---> S2

S2,
  0.1": ADD T ---> SX


\*********************************************
\        SET RESPONSE IRT's IN ARRAY C
\*********************************************
```

```
S.S.3,
S1,
  #START: ---> S2

S2,
  #R^Lever1: SET C(I) = T + 0.1, T = 0; ADD I;
             IF I = 1000 [@T, @F]
                 @T: ---> S1
                 @F: SET C (I) = -987.987 ---> SX
  #R^Lever2: SET C(I) = T + 0.60, C(I+1) = 0.50, T = 0, I = I + 2;
             IF I = 999 [@T, @F]
                 @T: ---> S1
                 @F: SET C(I)= -987.987 ---> SX


\*******************************************
\      SET REINFORCEMENT CODE IN ARRAY C
\*******************************************
S.S.4,
S1,
  #START: ---> S2

S2,
  #Z1: SET C(I) = 0.2; ADD I;
       IF I = 1000 [@T, @F]
           @T: ---> S1
           @F: SET C(I) = -987.987 ---> SX


S.S.5,  \ Optional Session Timer (2 Minutes) w/Pen Reset Code
S1,
  #START: ---> S2

S2,
  2': SET C(I) = T + 0.31; ADD I;
      SET C(I) = -987.987 ---> STOPABORTFLUSH
```

APPENDIX D | 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.