PROCESS CONTROL RECIPE EDITOR SOFTWARE

SOFTWARE USERS MANUAL

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INNOVATIONS

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ILLUSTRATIONS

1.0 Introduction

This manual describes the installation and use of the Process Control Recipe Editor (PCREditor) software. The PCREditor software is used to construct process control recipes used by the MRP's local micro-controller. A process control recipe is defined as the sequence of operating modes and switching logic (exit conditions) used by the micro-controller in the MRP module to perform chamber decontamination and evacuation operations. The process control recipe Editor software provides a graphical user interface which is designed to aid the user in constructing and modifying process control recipe's.

The process control recipe Editor software is designed to be accessed and operated using the Windows 95 platform. After installing and accessing the software, a series of 'user friendly' windows will appear allowing the operator to easily construct, modify and download process control recipe's to the MRP module's internal micro-controller. This manual assumes that the operator is familiar with the operation of the MRP and does not include a discussion of MRP operations.

While the PCRE software is a 'stand alone' program, it is designed to be used in conjunction with the other programs comprising the HGRS System Control and Monitoring Software.
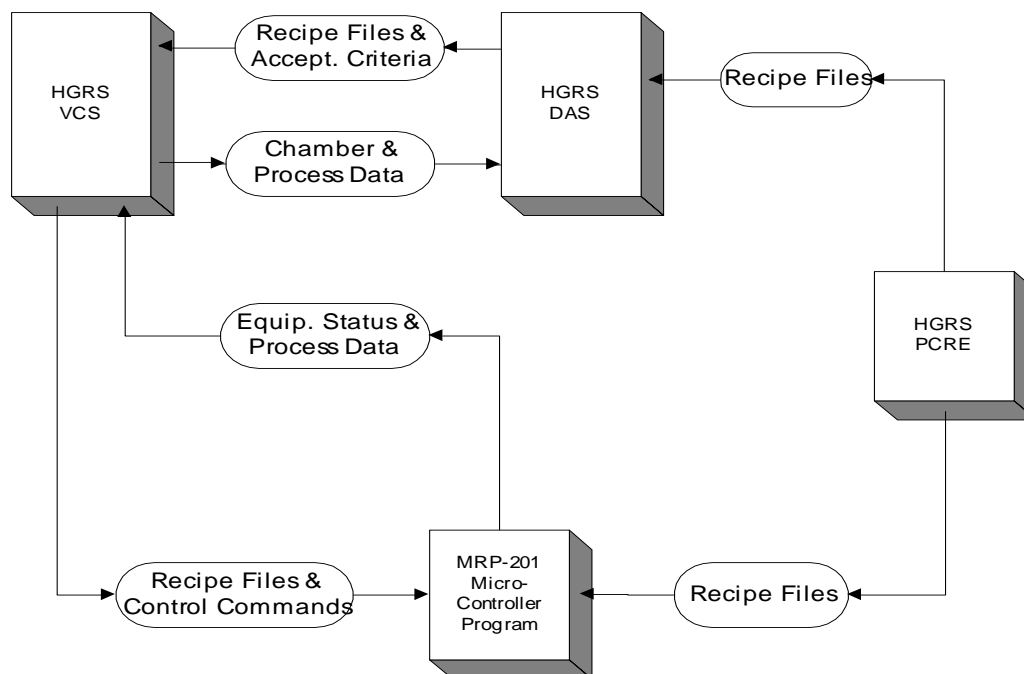
Figure 1 - 1 HGRS Software Configuration Diagram

1.1 Scope of Manual

Figure 1-1 depicts the four software programs comprising the System Control And Monitoring Software, and their relationship to each other. The four basic programs shown are:

- HGRS PCRE; this is the Process Control Recipe Editor which is used to develop process control recipes for execution by a MRP unit and is the subject of this manual

- HGRS VCS; This is the Visual Control System which provides primary control over the MRP for chamber processing.

- HGRS DAS; This is the Data Acquisition System which configures an Access database used for defining acceptance criteria and reporting chamber processing results.

- The MRP-201 micro-controller program interprets and executes VCS commands and process control recipes.

This manual was written for an operator/technician familiar with Microsoft Windows 95 and who is properly trained in the use and operation of the MRP. This manual covers the installation and use of the PCREditor software only. The installation, operation and use of the MRP, Data Acquisition System and the Visual Control System programs are the subject of separate manuals.

This manual includes descriptions of the PCREditor features and functions as well as instructions for program installation and creating HGRS Process Control Recipes. The manual is organized as follows:

- Program Installation - Section 2.0

- Description of Program Features - Section 3.0

- Creating HGRS Process Control Recipes - Section 4.0

2.0 Installation

The following instructions describe installation of the PCRE software used to configure and download process control recipe files.

2.1 Prerequisites

In order to complete installation of the software, the following operating platform will be required:

A. **Processor:** 233 MHz Pentium II with 32 MB RAM and 1.0 GB hard drive.

B. **Software:** Windows 95 with HGRS suite only, installation and/or use of other programs/applications is not recommended.

C. **Network:** Windows Network Protocols, including NetBui and TCPIP.

D. **Communications:** Cable connecting the computer to the MRP, Galiso part number 200-41-6483B

2.2 Installing the Software

The program will be provided on 3-1/2 inch floppy disks or CD-ROM.

2.2.1 Installation from Floppy Disk

The following steps describe installation of the program from floppy disk:

A. Insert disk 1 in the computers' A: drive. Access the A: drive file listing, and double click on the Setup.exe file from the list of disk 1 files.

B. The Welcome window will appear, click on OK, then select/type in the directory location you wish the program to be installed. The default directory is C:\Program Files\Editor.

C. Click OK and an icon will appear, click this icon to begin installing the program files. The system will prompt the user when to install the remaining disks.

D. When complete the system will indicate that the program has been successfully setup, click OK

Program installation automatically adds a new icon to the Start menu on your system. To run the program either click on the Editor.exe file from MS Explorer or double click the icon in the Start menu.

2.2 Installing the Software, continued

2.2.2 Installation from CD ROM

The Editor program may be supplied on CD ROM along with the other HGRS software programs. To install from CD, proceed as follows:

A. Insert the CD into the computer's CD drive. The CD will automatically begin it's installation routine. Click on the desired operation from the installation menu selections shown in figure 2-1.

Figure 2 - 1

B. Click on the Install Process Editor bar to begin Editor installation. The system will prompt the user through the installation process.

C. When the installation is complete, the Editor program may be accessed from the Windows 95 programs menu.

2.3 Installation Notes

The following installation notes are provided th help the user with specific installation issues.

A. The PCRE install program uses various .dll files, including Mfc40.dll and Msvcrt40.dll. The use of these files may cause a "Unable to register file" error depending on the version of Microsoft Windows/Office installed. See Microsoft Technical Support, Knowledge Base articles Q163556 and Q153733 for instructions regarding resolution of this potential problem.

B. The Editor program comes with the following Employee/Password setup:

- Employee Number = 100

- Password = Password

Note that the factory Employee Number and Passwords may only be changed (and/or new ones added) via the DAS program. See the DAS Users Manual for instructions regarding program user access.

2.4 Editor Program Initialization File Configuration

When the Editor program is installed, the factory default initialization, or .ini file is installed to the C:\Program Files\Editor\Editor.ini subdirectory. The .ini file is used to setup the communications and screen display parameters. An annotated file listing of the default Editor.ini file is shown below. To change the Editor.ini file settings, proceed as follows:

A. From Explorer, go to the C:\Program Files\Editor\Editor.ini subdirectory.

B. Right Click on the Editor.ini file and select Properties.

C. Un-check Read-only and Hidden and close the Properties box.

D. Double click the Editor.ini file, and type in the desired changes in accordance with the notes provided below.

E. Close the file.

2.4 Editor Program Initialization File Configuration, continued

Editor.ini file listing:

```
[MicroDac Setup]
Comm Port=1
Baud Rate=9600
Data Bits=8
Stop Bits=1
Parity=N
AutoStart=0
FaultMode=0
DigitalScanRate=0002
AnalogScanRate=0001
FaultTimeDelay=0000
File 1=Test1
File 2=Standard
File 3=Test
File 4=NONE
CDG 2=1

[MRP Options]
Varian Leak Detector=FALSE
DPS Chamber=FALSE

;make sure that the data log path exists and is a legal dos path name
;This path is used for manual state data logging and as the default
;path for the automatic process data log file.
[Initialize]
DataLogPath=C:\DATA\DAS\DASHGRS.MDB
VCSAPPPath=C:\HGRS\hotgas.ini
```

Set Com Port to match hardware configuration

1 Torr CDG Label and Range Definition

Set to True for HLD option
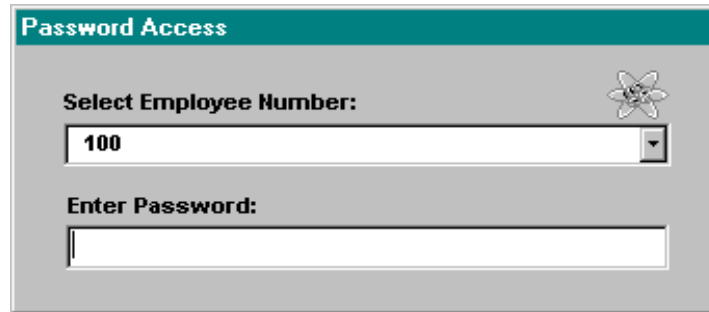
Set to True for Dual Chamber option

Location of DAS Access database file

Location of Hotgas.ini File

3.0 User Interface

When the PCREditor program is accessed, the password access window followed by the main process control recipe file editing window shown below in figures 3-1 and 3-3 will appear. Section 3.1 describes the functions provided by the file editing window.

Figure 3 - 1 Password Access

The PCREditor software requires a RS-232 serial communications link to a MRP micro-controller, an Access database .mdb file and the Hotgas.ini file for full functionality . The program will display an error message if the communications link is not installed. Acknowlegement of this message (potentially several times) will provide the user with all editor functions except the capability to download recipes for MRP execution.
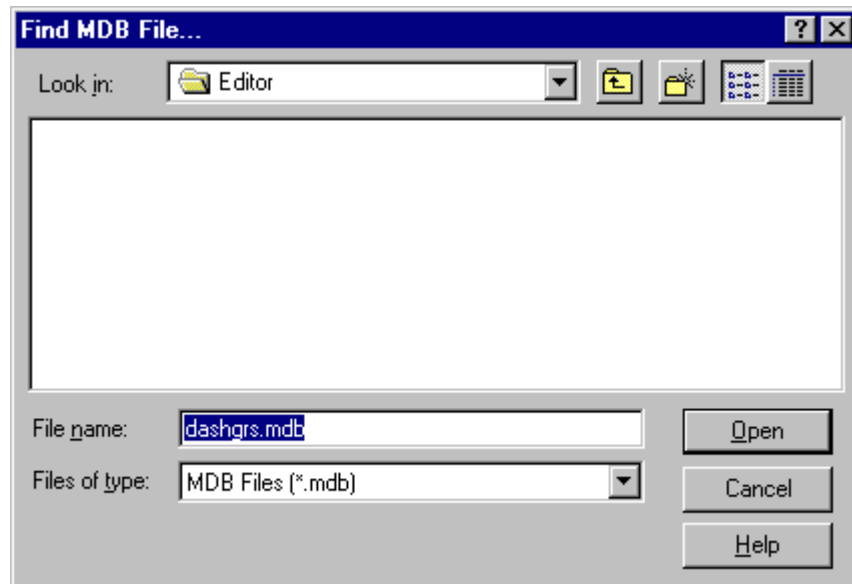
Figure 3 - 2 Access Database File Location

3.0 User Interface, continued

If the necessary Access database (.mdb) file or the Hotgas.ini file is not found, the program will prompt the user for the file location as shown in figure 3-2. The PCREditor program will not run without an Access database file present on the system.

3.1 Process Control Recipe File Editing Screen

The recipe editor screen shown in figure 3-3 provides a user friendly interface to quickly develop recipes for a wide variety of HGRS and other chamber processing activities.
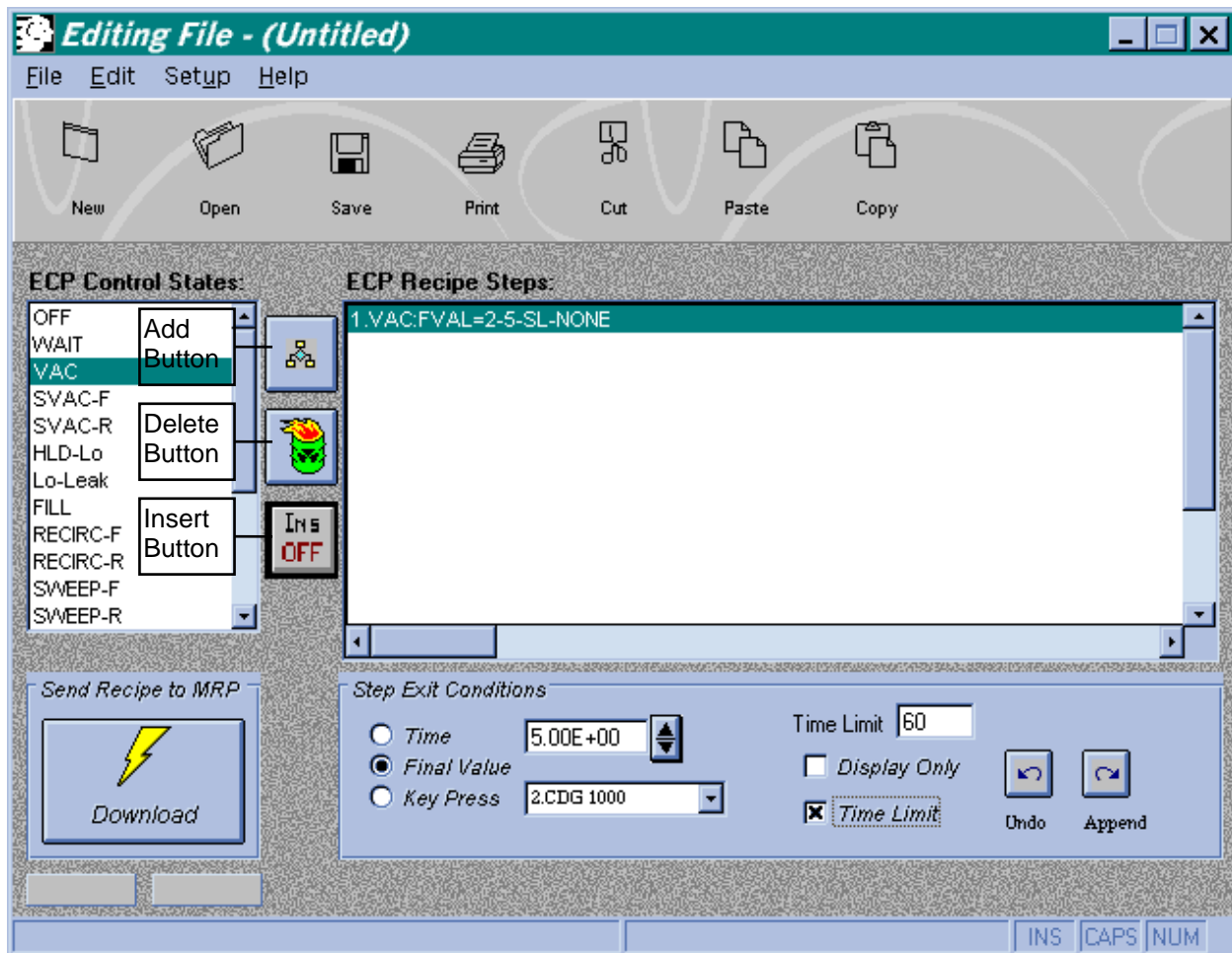
Figure 3 - 3 File Editing Window

The various features and functions available from the recipe editor screen are described in the following sections.

3.1 Process Control Recipe File Editing Screen, continued

3.1.1 Title Bar

The title bar, as for most windows based editor programs, displays the name of file being edited in parentheses. When the program is first accessed no default file will be opened. The program will allow the user to build a process control recipe but it will not be saved until it is saved as a named file.

3.1.2 Pull Down Menu Bar

The File, Edit, Setup and Help pull-down menus are discussed below.

A. File Menu

The pull down file menu allows the user to save process control recipes to a file, or open a previously saved process control recipe (.ecp) file to edit. In addition, ASCII files may be imported and/or exported using this menu. There is also the option to close the editor program in this menu. When editing a process control recipe, the changes are taking place in a copy of the recipe file stored in memory. If the user exits without saving the changes, there will be a dialog box giving the user the chance to save the changes to a file. Figure 3-4 shows the ASCII file import and file open pop-up windows accessed from the File menu.

Figure 3 - 4 ASCII File Import and File Open Windows

3.1.2 Pull Down Menu Bar, continued

A. File Menu, continued

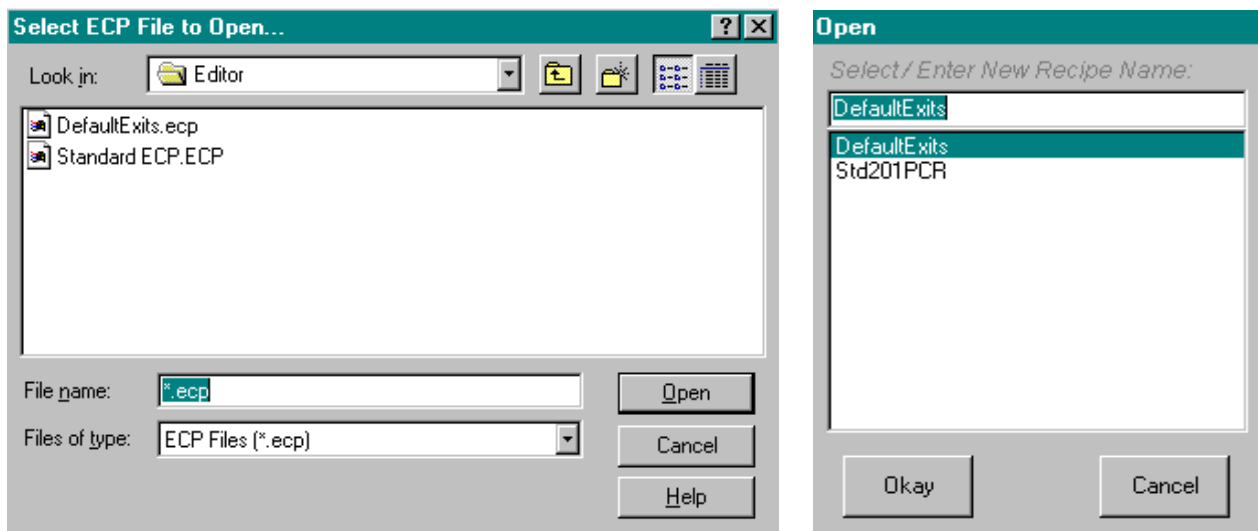Note that the system will only import files with the .ecp file extention. Also, the user must specify a file path subdirectory and file name to use the Export function.

B. Edit Menu

The edit menu provides the cut, copy, and paste functions. Note that these functions are also available on the tool bar.

C. Setup Menu

The setup pull down menu allows the user to select and change either the RS-232 communication settings or the Micro-controller settings. The communication settings must be specified to allow a computer to communicate with the MRP's micro-controller. See Sections 3.2 and 3.3 for additional information on how to perform Micro-controller and communications settings.

D. Help Menu

The help pull down menu provides the option of displaying the 'About' window. The About window shows the current version of the editor program.

3.1.3 Tool Bar

The tool bar contains control buttons for the standard windows create NEW file, OPEN existing file, SAVE current file, and PRINT current file. Note that the SAVE button operates identically to the 'Save As' command. The CUT, PASTE and COPY buttons are only activated once a recipe is initiated or imported and function the same as the standard windows cut, paste and copy controls.

3.1.4 ECP Control States List

The ECP Control States list is a list of all available operating modes that may be used in constructing a process control recipe. Place an operating mode in a process control recipe by either double clicking on the desired mode or using the enter key or 'Add' button when the mode is highlighted. The function and operation of each operating mode is described in a separate equipment manual. Note also that the list of available ECP Control States can be changed by re-configuring the Editor.ini file, see Section 2.4 for Editor.ini file configuration instructions.

3.1.5 Recipe Control Buttons

The three recipe control buttons, ADD, DELETE and INSERT are called out in figure 3-3. The ADD button adds the currently highlighted ECP Control State or operating mode immediately after the currently highlighted step (when the Insert button is OFF). The DELETE button will delete the step currently highlighted in the ECP Recipe Steps window. The INSERT button toggles between the Add and Insert functions. When the INSERT function is activated, a new step is inserted immediately preceding the currently highlighted step in the ECP Recipe Steps window. This function can be particularly helpful in modifying existing recipe files. The program will automatically re-number the recipe sequence for the ADD, DELETE and INSERT functions. Note that the keyboard Delete button will also delete the currently highlighted process control recipe step.

3.1.6 ECP Recipe Steps

The ECP Recipe Steps window shown in figure 3-3 shows the process control recipe the user is creating or editing. This display shows the operating mode execution sequence and the switching logic used to change from one operating mode to the next. These lines are automatically formatted for each step as the user builds a recipe. Double clicking or pressing the enter key on a highlighted step in the process control recipe display will allow the user to manually change any of the specified parameters. For those cases you want to manually edit, or verify the correct syntax, the format for each step is as follows:

        \<Step #>.\<Operating Mode Name>:\<End Condition>=\<Input Number>-\<Set Point>-\<Switch Condition>-\<Logical Operator>-\<interlock>

A. Step #

The step numbers are sequential starting with the number 1. The maximum number of steps in any one process control recipe is approximately 50. This is based on available memory of 2815 bytes with each step being approximately 30 bytes dependent on the number of end conditions specified.

B. Operating Mode Name

The operating mode name must be chosen from the predefined list of valid operating modes displayed in the ECP Control States list window. The operating mode name defines the output mask for the particular step.

3.1.6 ECP Recipe Steps, continued

C. End Condition

The End Condition determines when the MRP will switch to the next operating
mode in the process control recipe. There are three options for switching to the
next operating mode; TIME, FVAL, or KPRESS. The operating mode selected
will continue until one of the specified End Conditions is reached.

D. Input Number

The input number selects the data I/O position that the Micro-controller controller
(or VCS software, for external pressure gauges) will monitor to determine when
to terminate the current operating mode. For the TIME end condition, there is no
input number and this field must have the place holder <NONE>. Note that for the
ROR modes, a pressure gauge input channel must be specified so that the
pressure rise per unit time may be calculated. For FVAL end conditions the input
number defines which analog input the control system should monitor. For the
standard MRP there are four analog inputs; two temperature inputs and two
pressure inputs. The valid input numbers for a FVAL end condition are shown
below:

FVAL Instrument	I/O Channel No.
Forward Temperature	0
Reverse Temperature	1
1000 Torr CDG Pressure	2
1 Torr CDG Pressure	4

The input number for KPRESS is defined as the input connected to the start
switch, this input is located at (I/O) position 5 on the MRP Micro-controller. When
a KPRESS end condition is selected, the program defaults the Input Number to
5. If 5 is not used as the Input Number for a KPRESS end condition the MRP will
not switch operating modes when the start button is pressed. This will lock up the
MRP in the current operating mode and require the MRP to be shut down (or
reset) in order to download a new process control recipe.

3.1.6 ECP Recipe Steps, continued

E. Set Point

When a FVAL end condition is defined, an analog input value in Torr for
pressure inputs and degrees centigrade (°C) for temperature inputs must be
specified. The Micro-controller controller will the monitor the appropriate input
and terminate the current operating mode when the set point value is reached.
For TIME end conditions, the desired time duration (in seconds) for the operating
mode must be specified. A place holder such as <NONE > must be used in this
field for KPRESS end conditions.

F. Switch Condition

The valid options for Switch Condition are SH(set point high), SL(set point low)
and DO(display only). For FVAL end conditions the SH option will switch the
MRP to the next operating mode in the process control recipe when the analog
input value monitored by the Micro-controller controller is equal to or greater than
the set point specified. SL will switch operating modes when the monitored
value is less than or equal to the set point value.

For TIME end conditions, SH will cause the time, as shown on the MRP display,
to count down from the set point to zero. SL will cause the time, as shown on
the MRP display to count up from zero to the set point. Both SH and SL will
automatically switch the MRP to the next operating mode in the process control
recipe when the time set point is reached.

The switch condition should always be set to SH for a KPRESS end condition. If
SL is used for a KPRESS end condition, the MRP will switch immediately to the
next step, essentially skipping the SL/KPRESS step.

The display only, DO, switch is used to provide a display of a process variable
(pressure, temperature or time) on the MRP display. If the DO switch is used,
another end condition must be added to the step using a Logical Operator. The
DO switch should not be used with the first end condition in a step and should
never be used with a KPRESS end condition. If a step specifies a single end
condition and the DO switch is used, the MRP will not switch to the next
operating mode and will need to be shut down in order to download a new
process control recipe.

3.1.6 ECP Recipe Steps, continued

G. Logical Operator

There are three choices available for specifying/using a logical operator. They are:

- **OR**: The logical operator OR allows the use of up to five end conditions (including an interlock) for any one step. If two end conditions are specified for a process control recipe step, the completed step will appear as follows:

   <Step #>.<Operating mode Name>:<End condition>=<Input Number>-<Set point>-<Switch Condition>-OR, <End condition>=<Input Number>-<Set point>-<Switch Condition>-NONE

   Note that the place holder NONE or an INTERLOCK condition must be added to define the end of a step.

- **AND**: The AND operator is only used in conjunction with the ROR stabilization times. The AND operator is necessary in this case because two Time end conditions are used in the same recipe step. The first end condition for the ROR states is the stabilization time which allows the MRP/process chamber system to reach a (quasi) equilibrium condition prior to datalogging the pressure for a specified time period, which is the second time end condition.

- **NONE**: This operator is used to define the end of a process control recipe step when an interlock condition is not used.

H. Interlocks

There are several Interlock conditions designed to provide equipment protection including:

- **OPI1**:. The OPI1 interlock is defined as Over Pressure Interlock number 1 and is set to switch an MRP unit to the OFF state if the system pressure, as monitored by the 1 Torr CDG, rises above 0.0005 Torr. This interlock is the default end condition for the HLD-Hi operating mode.

3.1.6 ECP Recipe Steps, continued

H. Interlocks, continued

- **OPI2:** The OPI2 interlock is defined as Over Pressure Interlock number 2 and is set to switch an MRP unit to the OFF state if the system pressure, as monitored by the 1000 Torr CDG, rises above 5.0 Torr. This interlock is the default end condition for the HLD-Lo operating mode.

- **OPI3:** The OPI3 interlock is defined as an Over Pressure Interlock number 3 and is set to switch an MRP unit to the off state if the system pressure, as monitored by the 1000 Torr CDG, rises above 100 Torr. This interlock is the default end condition for the SVAC operating modes.

- **VTLI:** The Variable Time Length Interlock is designed to provide automatic shut-down of the MRP unit after a specified time period for process steps with final value end conditions. This step exit condition is typically added to FVAL conditions to prevent the MRP from getting 'stuck' in an operating mode due to a faulted system condition (such as a significant leak during the VAC process). Note that this interlock cannot be used for Display Only final value end conditions. To add a time limit to a process recipe step with a FVAL end condition, click on the Time Limit box and type in the desired time limit in seconds.

Note that only one interlock can be specified for each recipe step.

3.1.7 Step Exit Condition Controls

As discussed in Section 3.1.6 above, step exit conditions define when the MRP can/will switch to the next step, or operating mode. This area on the file editing screen provides the features necessary to specify exit conditions.

There can be up to five exit conditions specified per process control recipe step (including interlocks). The first step exit condition defined is used to display the set point next to the operating mode on the first line of the MRP's display. Only the set point for the first exit condition can be displayed, due to the limited space on the display. The rest of the exit conditions may be in any order. The Step Exit Condition control button functions are described below.

3.1.7 Step Exit Condition Controls, continued

A. Time Button

Selects the TIME end condition for the currently highlighted step in the process
control recipe display. When specifying TIME as an end condition, click on the
Time button and use the Up and Down arrows to specify the time value in
seconds, see figure 3-5. Then, click on the Append button to add the exit
condition to the highlighted process control recipe step. Note that the VTLI
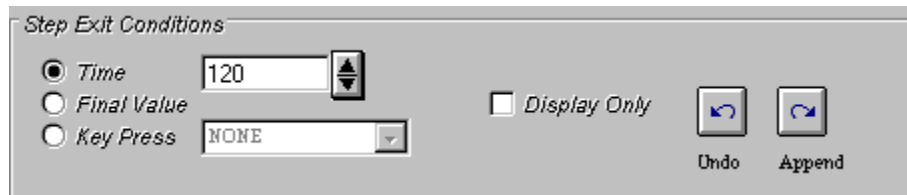Interlock may not be used for steps with a Time end condition.

Figure 3 - 5 Time End Condition Selection

The Time end condition is the only allowable end condition for the ROR
operating modes. For the ROR modes, a ",GAUGE=<gauge I/O channel no.>" is
automatically added to the end of the step. In addition to the ROR test and
stabilize times, the I/O channel number for the gauge to be read during ROR
mode operation must be specified. The gauge (and associated I/O channel
number) desired is selected from the drop down box which appears next to the
Keypress button when one of the ROR modes is chosen, see figure 3-6. The
available selections are imported from the VCS Hotgas.ini file which may be
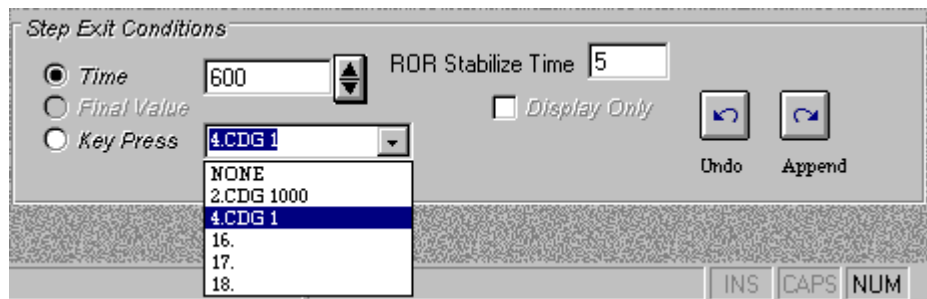configured as described in the VCS Users Manual.

Figure 3 - 6 ROR Instrument Channel Selection

3.1.7 Step Exit Condition Controls, continued

B. Final Value Button

Selects the Final Value end condition for the currently highlighted step in the process control recipe window. The final value window initially displays the default set point for a particular end condition. The arrows to the right of the window may be used to scroll the value higher or lower, or the number may be typed in. Only numbers and decimal points are allowed in this field.
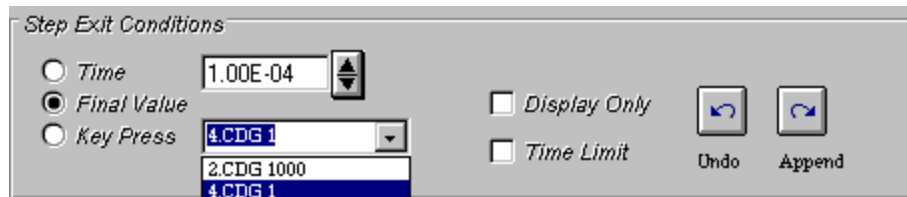

Figure 3 - 7 SVAC Final Value Instrument Channel Selection

The final value exit condition also requires the user to select the instrument channel to be monitored for switching, or use the default channel. The drop down box adjacent to the keypress button (see figure 3-7) is provided for instrument channel selection. Note that the program automatically provides the appropriate instrument selections for the operating mode chosen. That is, temperature or pressure instrument selections will be available depending on the operating mode chosen, ie: temperature for RECIRC modes and pressure for VAC, FILL and SVAC modes.

C. Key Press Button

Selects the key press end condition for the currently highlighted step in the process control recipe window. This end condition is described in section 3.1.6.

D. Display Only Button

The display only button disables the switching logic or exit conditions of the currently selected step. In some cases, the user may be interested in monitoring a process parameter without using that particular parameter for the switch condition. If the display only box is selected for an end condition, an additional end condition must be specified or the MRP will not switch to the next process control recipe step.

3.1.7 Step Exit Condition Controls, continued

E. Time Limit Box

The time limit box is used to add a VTLI interlock to a recipe step with a Final Value end condition. To utilize the VTLI feature, click on the lower Time Limit box and the upper time limit box will appear to specify the time length, in seconds, see figure 3-8. To set the time limit, highlight the default time value and type the desired time limit. Note that the system will not switch to the next operating mode when the time limit is reached, but will stop the recipe and place the MRP in the OFF state until the MRP is reset.
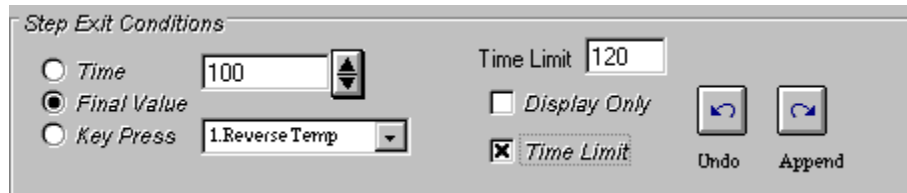

Figure 3 - 8 VTLI Specification

F. Append Button

The append button is the control that adds the information selected in the Step Exit Conditions window to the highlighted step in the process control recipe display. Until this button is pressed no change to the current step will take place.

G. Undo Button

The undo button allows the user to undo the last append to the currently highlighted process control recipe step. The undo button operates only on the last step exit condition append and will not continue to reverse previous actions.

H. Default Exit Conditions

Each operating mode or ECP Control State is pre programmed with a default exit condition which will automatically be displayed in the Step Exit Conditions window. The default exit condition may be added to the process control recipe step operating mode selected by clicking either the Append button.

3.1.7 Step Exit Condition Controls, continued

H. Default Exit Conditions, continued

   The default exit conditions for each operating mode are listed below.

1.VAC:FVAL=2-5-SL-NONE

2.SVAC-F:FVAL=4-0.0001-SL-OPI3

3.SVAC-R:FVAL=4-0.0001-SL-OPI3

4.SVAC-C:FVAL=4-0.0001-SL-OPI3

5.HLD-Lo:KPRESS=5-0-SH-OPI2

6.Lo-Leak:KPRESS=5-0-SH-NONE

7.HLD-Hi:KPRESS=5-0-SH-OPI1

8.Hi-Leak:KPRESS=5-0-SH-NONE

9.ROR:TIME=NONE-5-SH-AND,TIME=NONE-600-SH-NONE,GAUGE=4

10.RORI:TIME=NONE-5-SH-AND,TIME=NONE-600-SH-NONE,GAUGE=4

11.RORC:TIME=NONE-5-SH-AND,TIME=NONE-600-SH-NONE,GAUGE=4

12.FILL-MRP:FVAL=2-770-SH-NONE

13.LOOP:1~2

14.CFP-R:TIME=NONE-300-SH-NONE

15.CFP-F:TIME=NONE-300-SH-NONE

16.SWEEP-R:TIME=NONE-120-SH-NONE

17.SWEEP-F:TIME=NONE-120-SH-NONE

18.RECIRC-R:FVAL=1-100-SH-NONE

19.RECIRC-F:FVAL=0-100-SH-NONE

20.FILL:FVAL=2-550-SH-NONE

21.CONNECT:TIME=NONE-1-SH-NONE

3.1.8 Download Button

The download button sends the currently displayed process control recipe to the MRP's micro-controller. The micro-controller can hold only one process control recipe at a time in battery backed ram disk. To change the process control recipe, the user must either create a new process control recipe and download it, or pull up an archived process control recipe and download it.

The MRP model number (in this case) and Process Control Program version number are pre-programmed into the module's micro-controller at the factory and are displayed immediately below the Download button. Each time a process control recipe is downloaded to the MRP, the process control recipe editor software checks to verify that the micro-controller process control program version and MRP model numbers are correct. If the recipe editor software does not recognize the micro-controller's program version and MRP model numbers, the process control recipe will not download, and the recipe editor program will display an error message.

3.1.9 Error and Status Message Box

The error message box at the bottom of the main file editing window (see figure 3-3) displays all of the information being transmitted to the editor program from the MRP's micro-controller. The status message box contains the serial communications sent to the MRP from the editor program.

3.2 RS-232 Communication Settings

The communications screen shown in figure 3-9 is accessed by clicking on the Setup pull-down menu on the recipe editor window tool bar and selecting RS232 communications.
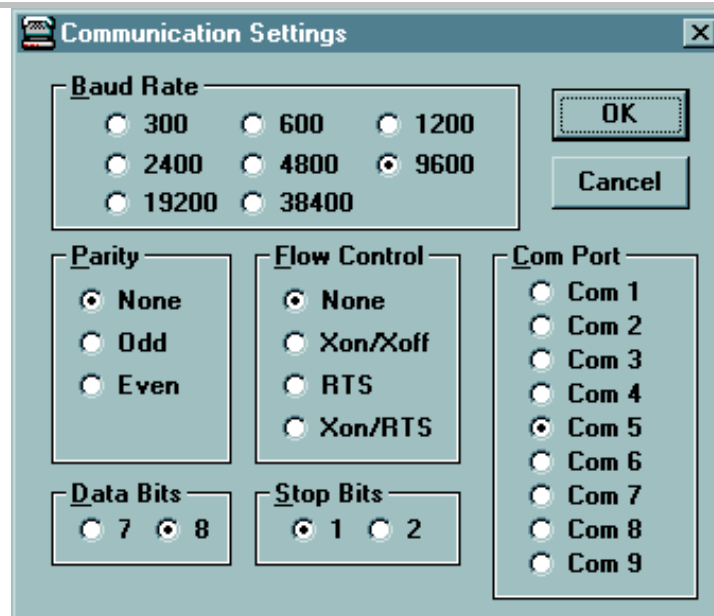
Figure 3 - 9 Communication Settings Screen

3.2.1 Baud Rate

The baud rate determines the speed at which the computer running the editor program will communicate with the MRP's on-board controller. The MRP's micro controller is set up at the factory to communicate at 9600 baud. This setting is easily changed though through a series of dip switches on the controller. If the editor program is not communicating with the MRP the user may try different baud settings.

3.2.2 Data Bits

The number of data bits is hardware preset at 8 bits. This should always be set at 8 bits in order to communicate with the MRP's micro controller.

3.2.3 Stop Bits

The number of stop bits is also hardware preset at 1 bit. Any change to this setting will cause the editor program to cease communicating with the MRP's controller.

3.2.4 Parity

Again, parity is a hardware preset variable and must remain set at "None."

3.2.5 Com. Port

The com port on your computer used to communicate with the MRP must be selected from this menu. Com Port 1 is the factory set default port.

3.2.6 Flow Control

As with the other hardware specific parameters, flow control is hardware preset to "None"

3.2.7 OK Button

By pressing the OK button, the currently selected options for the editors communication settings are stored in an "editor.ini" file in the current working sub directory.

3.2.8 Cancel Button

By pressing the Cancel button, any changes to the communication settings will be ignored.

3.3 Micro-controller Settings

The Micro-controller Settings window shown in figure 3-10 below is accessed by clicking on the Edit menu on the recipe editor window tool bar, and entering the user password.
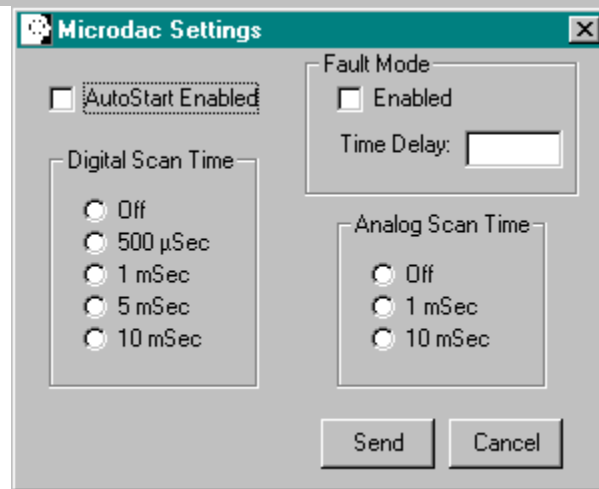
Figure 3 - 10 Micro-controller Settings Window

3.3.1 Auto Mode Enabled

The auto mode enabled button enables or disables the auto start mode on the MRP's micro controller. This bit tells the micro controller when to automatically run the control program. This should always be selected, except when the computer is not connected the MRP.

3.3.2 Digital Scan Time

The digital scan time defines how often the digital I/O is read and written to. For optimum controller performance, the digital scan time should be set to 1 mSec. If you select the off option the digital I/O will not function.

3.3.3 Fault Mode Enabled

This parameter is related to the MRP micro controllers watchdog timer. This should always by disabled in order to communicate with the MRP while it is operating.

3.3 Micro-controller Settings, continued

3.3.4 Fault Time Delay

This field should be left blank when the fault mode is disabled.

3.3.5 Analog Scan Time

Analog scan time determines how often the analog I/O is read and written to. This parameter should always be set to 1 msec for the best results. If this parameter is set to zero, the analog I/O will no longer function.

3.3.6 Send Button

The send button will take the values you have selected and serially transmit them to the micro controller in the MRP module. If the MRP is not connected via the communications port serial cable, the new parameters can not be sent. All current values are kept in flash RAM on the MRP. When the micro-controller settings window is opened the parameters are read from the MRP. The process control recipe editor software contains no local file that stores the Micro-controller settings selected.

3.3.7 Cancel Button

The cancel button will exit the window without making any changes to the parameters in the MRP's micro controller.

4.0 Example Process Control Recipes

4.1 Adding Operating Modes to a Process Control Recipe

The following steps illustrate how to select operating modes for a simple process:

A. Launch the editor program. It will come up in new (blank) process control recipe screen.

B. Using the mouse, double click on the VAC operating mode in the ECP control states list click (or click on VAC and press the ADD STEP button). Add SVAC-F, ROR, FILL-MRP and OFF in the same manner described for the VAC mode.

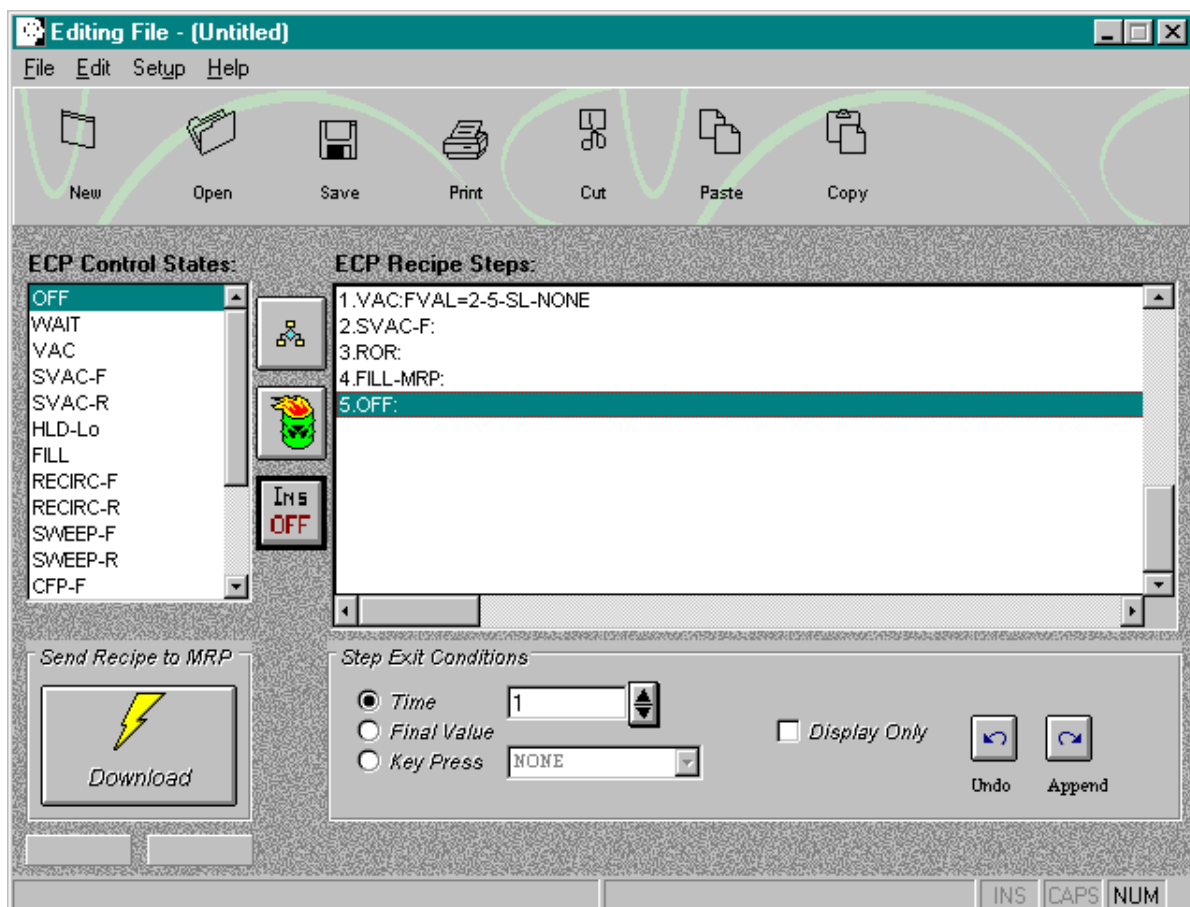Figure 4-1 shows what your screen should look like at this point:

Figure 4-1 Adding Recipe Steps

4.2 Specifying Step Exit Conditions

The following steps illustrate the process of specifying exit conditions:

A. Highlight (click on) the SVAC-F step in the recipe steps display window. The default step exit conditions are final value (FVAL) and 0.0001 (Torr) as read by the 1 Torr CDG (I/O channel 4). This will result in the MRP switching to the next step when the pressure drops below (switch low - SL) 0.0001 Torr.

B. Accept the default exit condition by pressing the Append button.
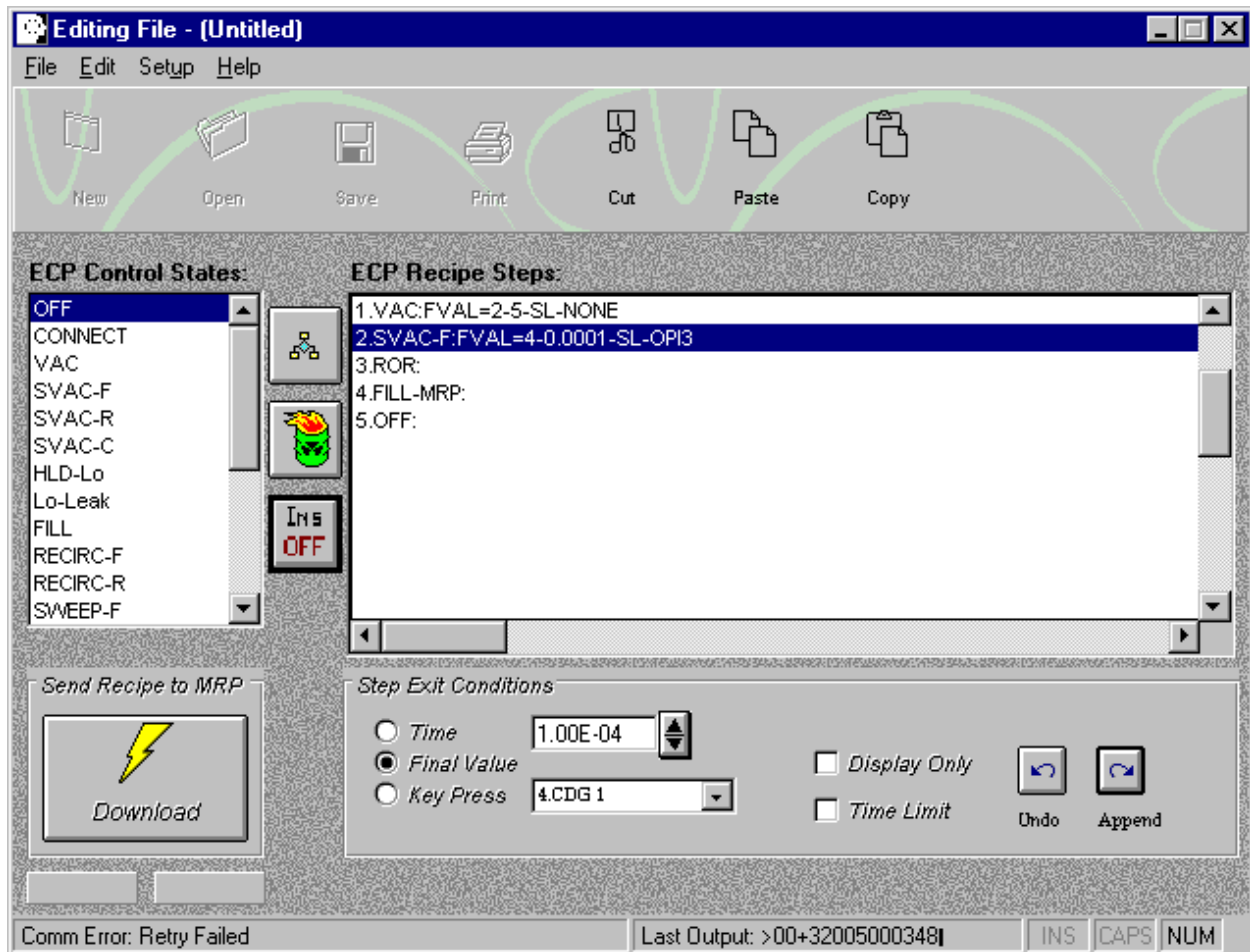
Figure 4-2 shows what the recipe should now look like:

Figure 4-2 Edit VAC Step

C. Note that the step ends with the OPI3 interlock instead of a 'none' as the VAC operating mode did. This is because the editor recognized the SVAC-F operating mode as a mode that uses the blowers and automatically adds the default interlock for equipment protection (see section 3.1.5.H).

4.2 Specifying Exit Conditions(continued)

D. Now with the SVAC-F step still selected, go to the step exit conditions section and click on the key press button. Press the append button. This will add the OR KEY PRESS end condition to this SVAC-F step. As the process control recipe is running, either reaching a final value of 1E-4 Torr, or pressing the start button on the MRP will cause the control system to go on to the next operating mode, ROR in this case.

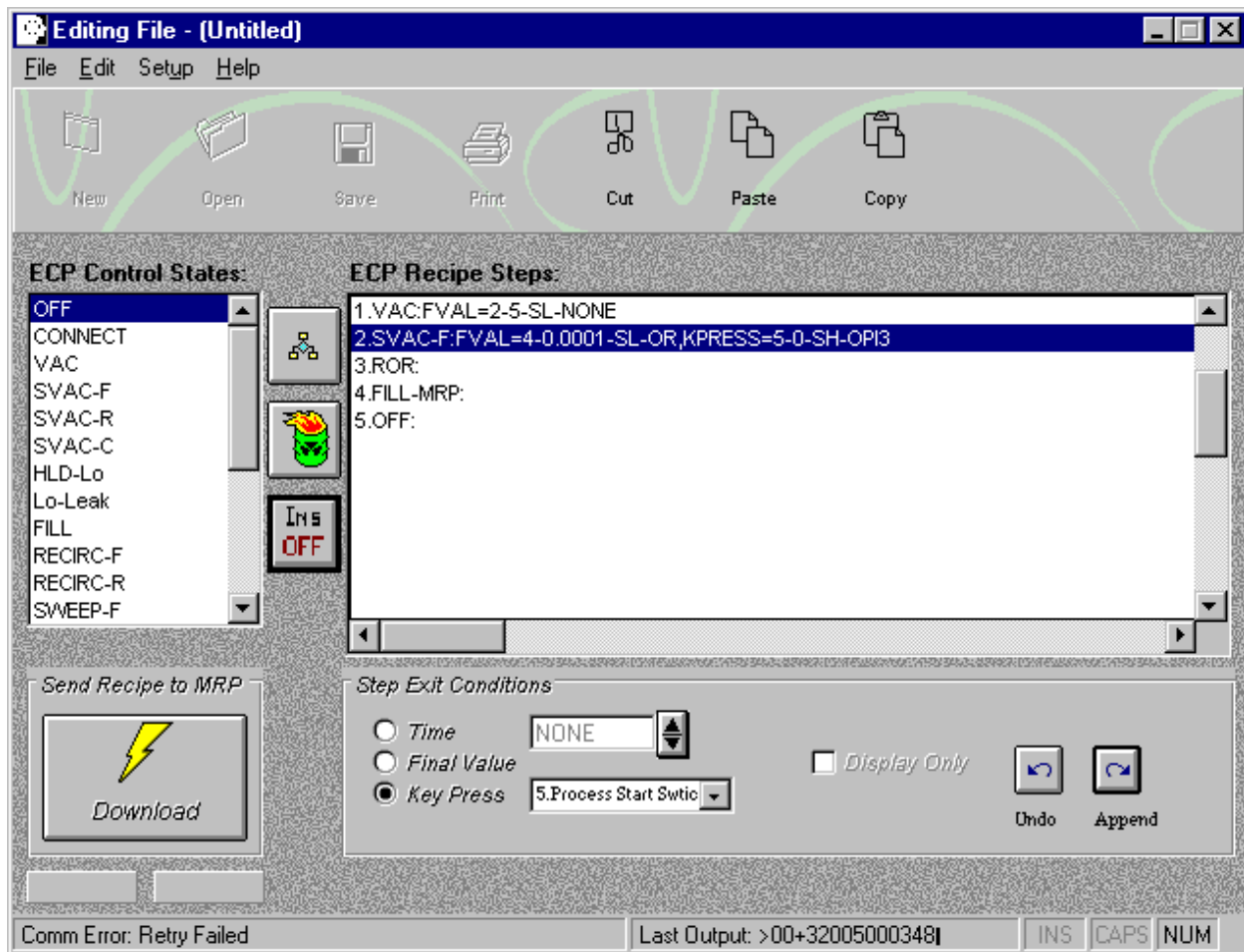Figure 4.3 shows what the recipe window should now look like.

Figure 4-3 Edit SVAC-F Step

E. Click the Undo button and the Keypress end condition will be removed. Figure 4-4 shows what the screen should look like.

4.2 Specifying Exit Conditions(continued)

F. Now highlight the ROR step in the ECP Recipe Steps window. The default step exit conditions are Time, for 600 seconds. Note that the ROR Stabilize Time text box appears with a time of 5 seconds. This allows the chamber to stabilize for a minimum of 5 seconds prior to initiating the instrument readings required for ROR mode calculations. The stabilize time may be increased to a value between the 5 second minimum and the ROR process time specified (600 seconds) by highlighting the time value and typing in the desired value.

G. Press the append key to accept the default exit conditions, figure 4.4 shows what the screen should now look like. Note that the ROR step ends with the ",GAUGE=4" statement. This statement tells the VCS software which gauge I/O channel to obtain pressure readings from for calculating the chamber rate of rise.
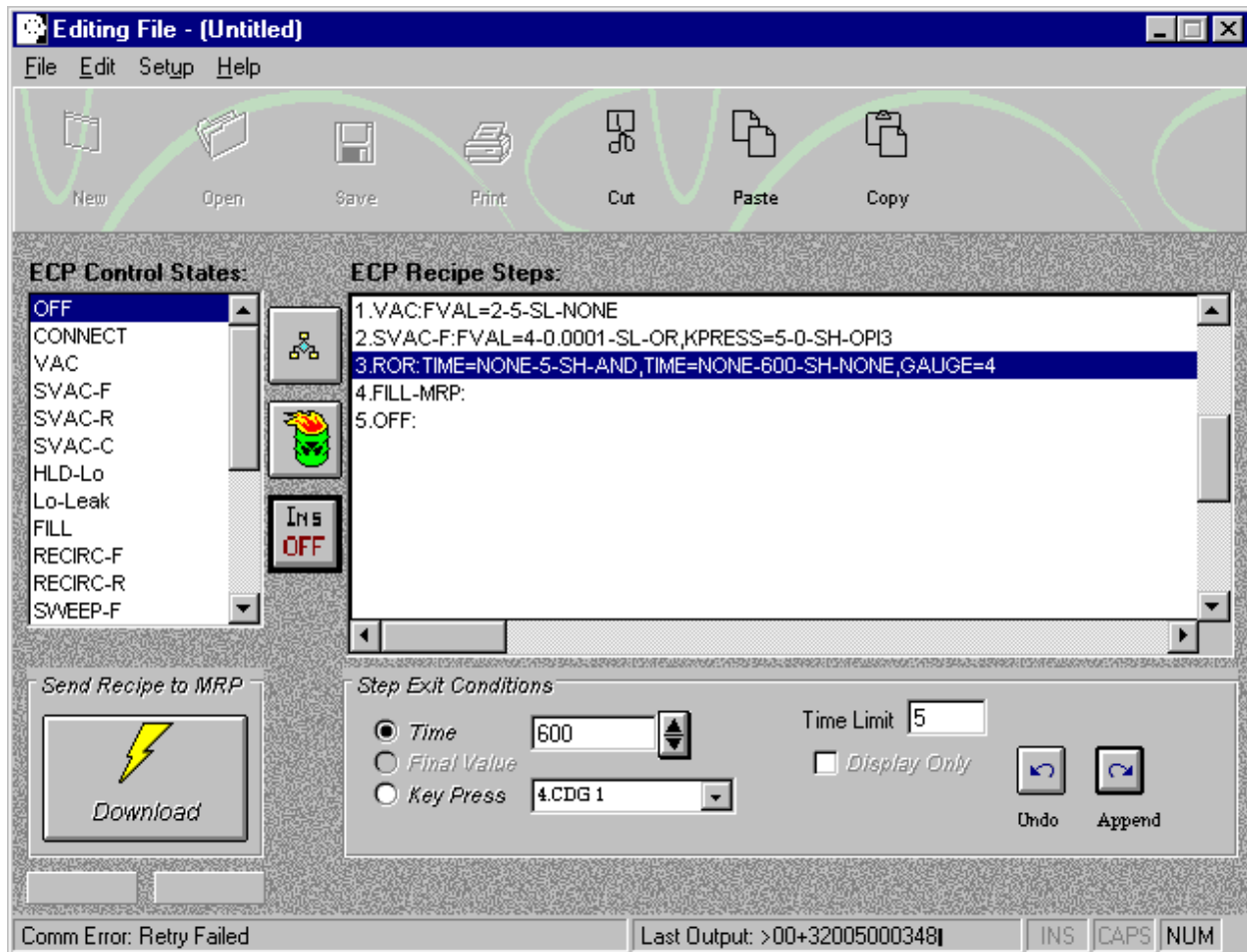

Figure 4-4 Edit ROR Step

4.2 Specifying Step Exit Conditions(continued)

H. Now highlight the FILL-MRP step in the ECP Recipe steps window. Note that the default step exit conditions are a FVAL from input 2, the 1000 Torr CDG, of 770 Torr.

I. Press the append button to accept the default exit conditions.

J. Now double click on the FILL-MRP step (step 4) in the ECP Recipe Steps window and note that the step edit window appears towards the bottom of the screen, see figure 4-5.

K. Highlight the last NONE in the OFF step and press the delete key on the keyboard. Press the Enter key and observe that the error message shown in figure 4-5 appears.

L. If the YES button is pressed, the program will accept the incomplete step, however, the recipe will not download and an additional error message will appear indicating that the recipe contains an error in one (or more) step(s).
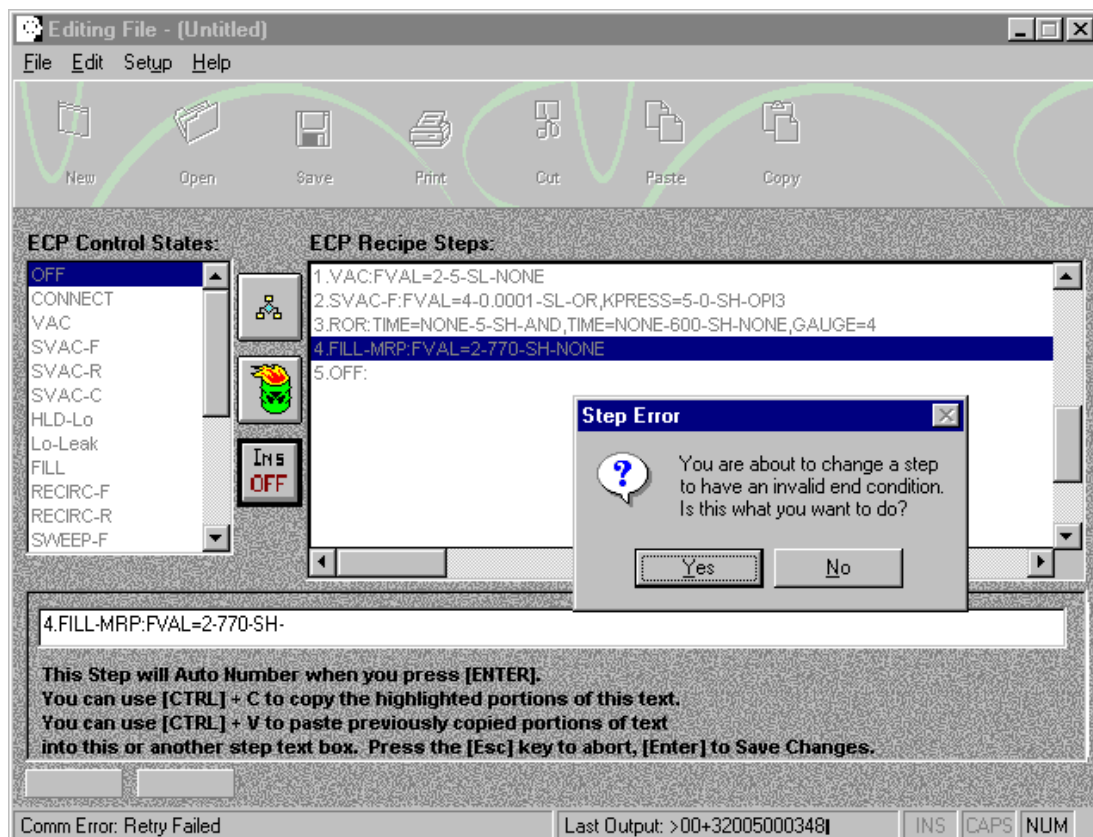

Figure 4-5 Edit FILL-MRP Step

4.3 Specifying Loop Conditions

In some cases it may be desirable to repeat certain steps or portions of process control recipes. To do this a LOOP step may be specified. The following example demonstrates use of the LOOP function.

A. Highlight the ROR step (step3) and press the Insert button (to the ON position).

B. Scroll down the ECP Control States window to find the LOOP mode. Double click (or click and press the ADD button) on LOOP. Note that the LOOP is inserted immediately before the previously highlighted step, ROR in this case, see figure 4-6.

C. The default loop index, 1~2, is shown in the box adjacent to the Time button in the Step Exit Conditions window. The first number shown is the step index, and the last number is the loop counter. This means that the MRP's micro-controller will return to step one in the process control recipe twice.

D. To change either the step index or loop counter, highlight the item, type in the desired value and press the Append button.
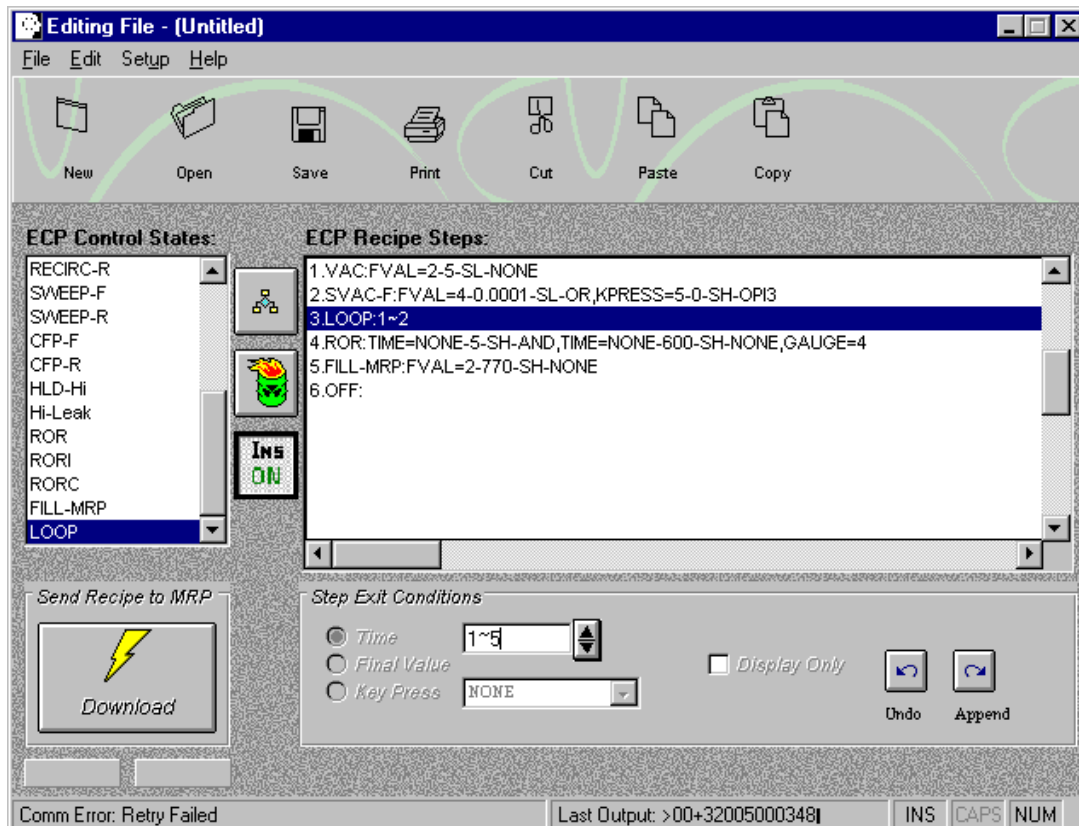

Figure 4 - 6   Adding a LOOP Function

4.4 Downloading and Saving Recipe Files

Ensure that the communications cable is connected between the host computer and the MRP. Press the download button to download the process control recipe to the MRP. If a recipe is incomplete or contains a syntax error, the system will return an error message and will not download the recipe. Also if the Editor and Micro-controller software versions are not compatible, a communications error message will appear at the bottom of the main file editing window, (see figure 4-7) and the recipe will not download.
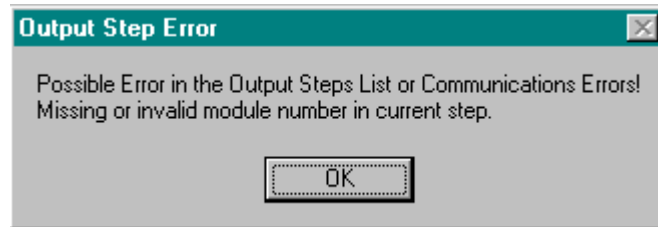

Figure 4 - 7 Download Error Message

To save a recipe file to the DAS database press the Save button or click on the Save As bar on the File pull down menu. Specify the recipe name and press Save. This places the recipe file in the DAS database so that the VCS can access the file for automated chamber processing operations

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