AcroMill NT

1-8 Axis General Purpose Control Software

Version

OEM Supplement

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Introduction

AcroMill is a general purpose motion control software that allows controlling 2-8 axis of motion. It has built-in EIA-RS274D interface. AcroMill can be used for milling and cutting machines that need multiaxis control, RS274D, DXF interfaces, build-in part libraries, cutter compensation, forward and backwards tracing of programs and a high speed PLC running in the background. AcroMill also allows custom programming of most I/O functions.

AcroMill software also allows manipulation of various system parameters. For example, the software can be used to set the various parameters of a servo loop such as integral gain to tune the motors.

This supplement is designed for the OEM that is customizing AcroMill for his particular machine. It will allow the OEM to add various required features to the standard AcroMill software by working out a custom PLC program that will run concurrent to AcroMill / AcroCut.

As an example, the OEM can write his own TOOL CHANGER routine that will interact with AcroMill and seamlessly interface with the End users M and G Code program.

Another example of customization is the facility of writing specific M-Codes to do various things. This can also be accomplished by the OEM by writing his own Commands in the M-Code files M000.8K, M001.8K....M099.8K.

Additionally, the OEM/VAR can customize or write their own LIBRARY parts .

Similarly, the OEM can implement other interfaces like Pallet Changers, Tool Changers, Turret Indexer, Turret Punches.....etc.

The minimum hardware requirement to run AcroMill is as follows:

System requirement:
Windows NT 4.0 with Service Pack 4 or higher.
Pentium III 500 Mhz or better.
At least 64 MB of RAM. Preferably 128MB
At least 3 Gig Harddrive.
Acroloop Controller plugged into the ISA, PCI or AcroWire IEEE 1394 bus and addressed as Card0 with Version 1.18.05 or later firmware.
1 Open PC Interrupt (Int5 Jumper set on non plug and play controllers) .
800x600 or 1024x768 Graphics Color.

Note:
The reference ACR Card used throughout this document refers to an ACR1500, ACR2000,ACR8010 or ACR8020 Controller Cards.

Auxiliary files used with AcroMill

The following is a list of files that are used to perform various tasks at specific times during the operation of a milling / cutting program when used with the AcroMill program. This is a brief description of their operation.
Familiarity with ACR8000 Acrobasic and an understanding of the operation and program timing of AcroMill is necessary to fully understand the operation of these files.

	The following files are in Acrobasic format and are performed at the card level when used with the AcroMill program.
SYS.8K	This file Initially generated by AcroView contains certain system level commands that sets up various modes on the controller card
PROG0.8k….PROG15.8k	These files are initially generated by AcroView and contain any user programs for custom programming. Note that PROG0..PROG7 are used by AcroMill NT and will be over written.
GAINS.8k	This file is initially generated by AcroView and contains all the gain settings for the machine.
Drunset.8K	Acrobasic instructions in this program are loaded when **DRY RUN** *RUN PROG(F5) - DRY RUN(F4)* of a program is selected.
Exitfile.8K	Acrobasic instructions in this program are loaded when exiting the AcroMill program. (Press CTRL and BREAK keys simultaneously to exit.)
Home0.8K - Home7.8K	There is an Acrobasic program for each motion profile program, these are loaded when **HOME** *(F1)* is selected. These files may be individually edited to determine operation of that axis when homing.
Initfile.8K	Acrobasic instructions in this program are loaded when the AcroMill program is initialized using the **RUN** command.
Jog0.8K - Jog7.8K	There is an Acrobasic program for each motion profile program, these are loaded when **JOG** *MANUAL(F6) - JOG (F1)* is selected. These files may be individually edited to determine operation of that axis when jogging.
Jogexit.8K	Acrobasic instructions in this program are loaded when the AcroMill program exits the **JOG** menu.
M000.8K - M099.8K	The Acrobasic instructions in M codes are executed when called from an operating RS274D program or from **MDI** *MANUAL(F6) - MDI(F4)* mode. The pre-defined M codes listed in the AcroMill user's guide (such as M7 and M8) operate as described and shown in the timing charts. They are inhibited when a program is executed in **DRY RUN** *RUN PROGRAM(F5) - DRY RUN(F4)* mode. If a custom M code is assigned the same number (such as M007.8K to represent M7), it will be executed after the pre-defined M code. Custom M codes can be generated for all M code numbers M0 - M999 not previously defined. The Acrobasic instructions in these commands are executed when the M code is called in **RUN** or **DRY RUN** mode. After sending these files to the controller, AcroMill software will wait for a user specified ACK bit to be cleared. This bit can be set as the very first command in the user mcode. At the end of the mcode, the user can clear this bit to signal AcroMill software to proceed on.
Runfile.8K	Acrobasic instructions in this program are loaded on program powerup after the Initfile.8K and after a **HOME** cycle is completed.

Runset.8K	his program are loaded when **RUN** *RUN PROG(F5) - RUN(F3)* of a
Runstop.8K	Acrobasic instructions in this program are loaded when a program is stopped using the **STOP** *RUN PROG(F5) - STOP(F1)* command.
	The following are ASCII format files and are performed at the program level by the AcroMill program.
Msgfile.fil	This file contains the windows legends, I/O status legends used by the status screen, and the messages used by the I/O message screen. This file can be edited with an ASCII editor at the DOS or windows level. They can also be modified with the **MSGLIST** *SET/DIAG(F9) - SYS PARAMS(F8) - NEXT(F9) - SCREEN(F6) - MORE(F9) - MSGLIST(F8)* function used by the AcroMill program
Password.fil	Contains the NUMERIC ONLY value to be used as a password to restrict access to System Parameters *SET/DIAG(F9) - SYS PARAMS(F8)* **EXAMPLE:** 1942
Powerup.msg	Contains the text that will be displayed in the title area of the AcroMill screen. **DEFAULT:** AcroMill / AcroCut
Useredit.txt	Contains the Path and filename of the ASCII text editor that can be used when using the **EDIT** command. By default, AcroMill uses it's own internal ASCII text editor. This is a very simple editor, the user may wish to use a more sophisticated or familiar editor. To change to a user defined editor, press *SET/DIAG(F8) - SYS PARAMS(F8) - CONTROL(F3)* and go to second list. Change the use native editor setting to 0, AcroMill will then load the file listed in Useredit.txt **EXAMPLE:** C:\DOS\EDIT.COM
	The following commands are used when a DXF file is converted into a text file by the INPORT DXF FILE function of AcroMill / AcroCut.
Start.txt	**USED IN DXF FILE CONVERSION** These RS274D Instructions are inserted at the beginning of the text program
Intool.txt	**USED IN DXF FILE CONVERSION** These RS274D Instructions are inserted into the text program after rapid mode **G0** command(s). This is used to add a specific series of commands when cutting is started.
Outtool.txt	**USED IN DXF FILE CONVERSION** These RS274D Instructions are inserted into the text program before a rapid mode **G0** command(s) are executed following a feed mode command such as **G1**, **G2**, or **G3**. This is used to add a specific series of commands when cutting is halted.
End.txt	**USED IN DXF FILE CONVERSION** These RS274D Instructions are inserted at the end of the text program.

Initialization

Before attempting to use this manual the VAR (Value added reseller) must become familiar with how the ACR8000 /ACR2000 Controller works. This will allow the VAR to write the custom PLC's, modify the various files that AcroMill uses to implement the CNC control package and quickly get the application finished with minimal effort.

AcroMill uses the following critical files for various parts of the machine operation. These files can be edited by the Machine Builder/ VAR to customize the software to suit the particular need. This files contain native ACR CARD commands and are SENT to the ACR CARD controller to implement various features during different parts of the machine operation. The files can be created by any ASCII editor like NOTEPAD or a word processor like WORD in ASCII mode (no formatting). But they should be stored on the disk asTEXT (.TXT) files.

INITFILE.8k

This file contains the initial setup commands for the ACR CARD. This file is dumped immediately upon bringing up the MACHINE CONTROL.. This file also contains DIMENSIONING information that allocates any GLOBAL variables that might be needed to implement some feature by the VAR Also any special PLC programs that the user might want to be running should be placed. In general, PROG0.....PROG7 are used by AcroMill to do JOG,HOME....etc. The VAR can use PROG8 for his special program and PLC0.....PLC7 to implement his special PLC functions.
A sample INITFILE.8K is listed below

```
PROG0
ECHO 4

PROG0
HALT
NEW
DETACH

PROG1
HALT
NEW
DETACH

PROG2
HALT
NEW
DETACH

PROG3
HALT
NEW
DETACH


PROG4
HALT
NEW
DETACH
```

```
PROG5
HALT
NEW
DETACH

PROG6
HALT
NEW
DETACH

PROG7
HALT
NEW
DETACH

PROG8
HALT
NEW
DETACH

PLC0
HALT
NEW

PLC1
HALT
NEW

PROG15
HALT
NEW
DETACH

SYS
CLEAR
DIM P5
DIM PROG0(5000)
DIM PROG1(5000)
DIM PROG2(5000)
DIM PROG3(5000)
DIM PROG4(5000)
DIM PROG5(5000)
DIM PROG6(5000)
DIM PROG7(1000)
DIM PROG8(5000)
DIM PROG15(5000)
DIM PLC0(1000)
DIM PLC1(1000)



REM SETUP PLC FOR ESTOP/RESET
REM 43 = ALLOW RESET
REM PLC0
REM LD 10
REM OUT 43
```

```
REM RUN

REM SETUP PLC FOR EXC ERROR.
REM 42 = SYSTEM FAULT OUT
REM 9  = FAULT IN
REM 44 = TEMP FOR DISPLAYING

REM PLC1
REM 10 LD NOT 769
REM 20 OR NOT 801
REM 25 OR 9
REM 30 OUT 42
REM 40 LD NOT 769
REM 50 OR NOT 801
REM 60 OR 44
REM 70 AND NOT 43
REM 80 OUT 44
REM RUN

REM TURN SPINDLE OFF BEFORE
REM STARTING

P6448=0
P9993=0

REM DAC3 has the spindle output
PROG7
10 P6448=P9993
20 P8457=P8201
21 P8713=P8201
22 P8969=P8201
23 P9225=P8201
24 P9481=P8201
25 P9737=P8201
27 SET 55
38 DWL 0.1
39 CLR 55
40 GOTO 10
RUN

PROG0
ATTACH MASTER0
ATTACH SLAVE0 AXIS0 "X"
ATTACH SLAVE1 AXIS1 "Y"
ATTACH SLAVE2 AXIS2 "Z"
ATTACH SLAVE3 AXIS3 "A"
ATTACH SLAVE4 AXIS4 "B"
ATTACH SLAVE5 AXIS5 "C"
ATTACH SLAVE6 AXIS6 "U"
ATTACH SLAVE7 AXIS7 "V"
RES X Y Z A B C U V

REM UNREM THIS FOR GANTRY VERSION
REM LOCK A Z

DETACH
```

```
REM TURN OFF ANY AXES NOT
REM BEING USED
REM AXIS3 OFF
REM AXIS4 OFF
REM AXIS5 OFF
REM AXIS6 OFF
REM AXIS7 OFF
```

HOME0.8K.....HOME7.8K

These files are used exclusively during the HOME cycle. Note that there are 8 files (1 for each Axes). For HOMING each of these files is setup to do 1 axes. The AcroMill software uses USER BITS 130.....138 to synchronize the order of each axis if the axes are not set up to HOME at the same time. By setting up the HOME priority in the system parameters, (Priority 0 for not to HOME, 1 for Home first 2 for 2nd and so on) the user can do an ordered sequence of HOME for all axes.

AcroMill uses the following LOCAL VARIABLES to implement the HOME Sequence for each axes:

DV0= ACC.DEC.STOP rates for the Axis.
DV1= Velocity towards the HOME Switch. If this is zero the program just seeks the marker.
DV2= Velocity Away from the HOME switch.
DV3= Velocity towards the marker.
LV0 = 1 to HOME in the positive direction, -1 to HOME in the minus direction.
LV1 = HOME LIMIT SWITCH INPUT#. A NEGATIVE number disables it.

An example of the HOME file is given below:

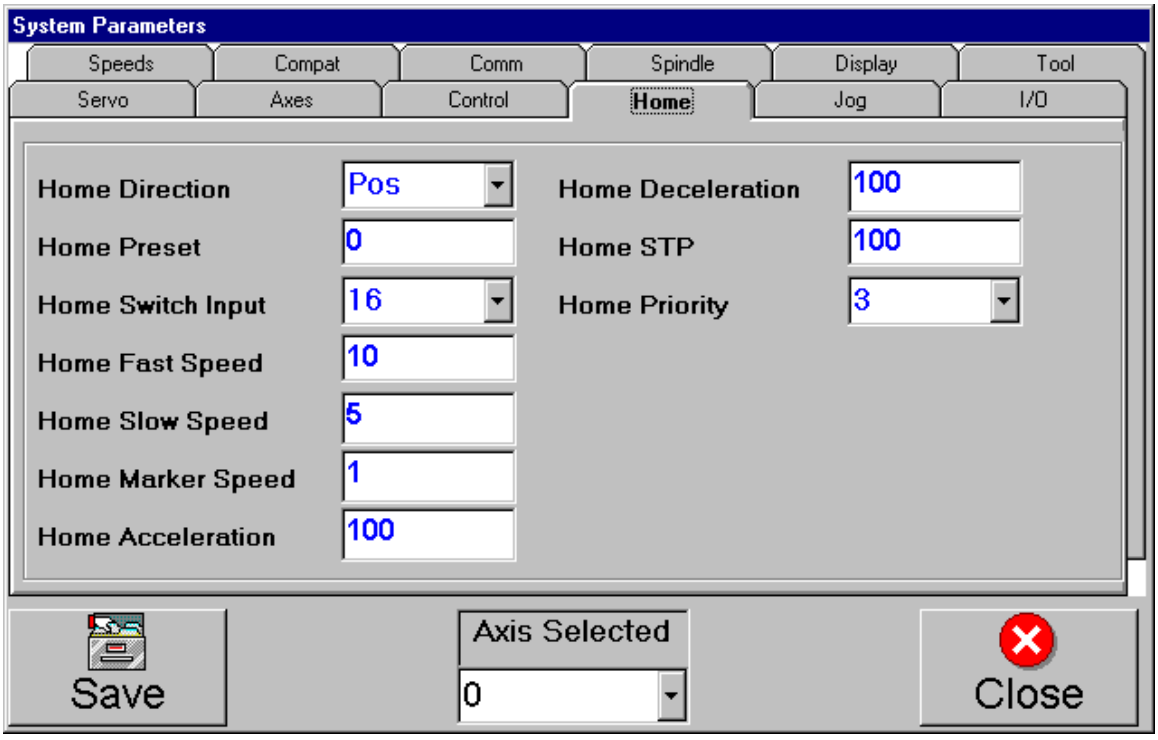
```
ECHO 4

PROG0
HALT
NEW
DETACH
ATTACH MASTER0
ATTACH SLAVE0 AXIS0 88

100 RES X FVEL 0
105 INH 130
110 IF (DV1<=0) THEN END
120 ACC(DV0) : DEC(DV0) : STP(DV0)
130 IF (LV1<0) GOTO 400
140 IF (BIT(LV1)) GOTO 300
200 VEL (DV1)
210 X/(LV0*1000)
220 INH (LV1) TRJ
300 VEL (DV2)
310 X/(-LV0*1000)
320 INH -(LV1) TRJ
400 VEL (DV3)
410 MSEEK X(LV0*1000,0)
420 INH -516

DIM LV(10)
DIM DV(10)
```

Note that the program is written in “PARAMETRIC” form. That is to say that variables LV0,LV1 and DV0...DV3 will determine how the homing will take place. AcroMill front end software sets these variables depending on what the SYSTEM PARAMETERS that are set by the machine builder are set to. Then the proper variable values are dumped to the ACR CARD and then the “RUN” command issued to each of PROG0.....PROG7 (Depending on how many axes are hooked up
Using the above home file, the homing of the machine can be customized very easily by the OEM. For each axes, the following parameters can be changed in the SYSTEM PARAMETER setup from AcroMill / AcroCut. The following parameters can be input for each axis.

NOTE: *Before filling this menu, the OEM/VAR should determine which direction the machine needs to move in each axis when a positive move is commanded for that axis. This will determine two parameter that must be set before HOME setup can be accomplished. These parameters are the DAC POLARITY and ENCODER MULTIPLIER. These parameters can be adjusted from the SERVO PARAMETERS screen. Normally the DAC Polarity is +1 and Encoder Multiplier is +1 or +2 or +4 (Depending on what kind of encoder resolution is needed). In order to flip the direction of motor rotation for a POSITIVELY commanded move, both the DAC polarity and the Encoder Multiplier should be changed to a negative number.*

If a runaway motor condition exists it can be corrected in software by changing the polarity of either the DAC or encoder multiplier. In wiring by swapping CHA and NOT CHA of the encoder or the Motor / Tach leads or the DAC polarity (the negative of the DAC is referenced to Ground on the ACR CARD board).

Once the proper motor directions are set, the following parameters should be set for the HOME cycle.



Home Direction
This will depend on where the HOME LIMIT switches are mounted on the machine.

Home Preset
This is what the Current Position registers will show after the machine seeks the home switch and marker. This parameter is usually left at ZERO.

Home Switch Input
This is the I/O number of the HOME LIMIT SWITCH. This number can point to either an input or an output of the ACR CARD board.

Home Fast Speed
This is the GO TOWARDS home switch feedrate. If this feedrate is ZERO the home cycle will only seek the MARKER on the encoder. This feature is used for machines that do not have a HOME switch.

Home Slow Speed
This is the GO AWAY from the home switch feedrate. Keep this fairly slow.

Home Marker Speed
This is the seek Marker speed. This can be left medium to fast. All the Acroloop controller boards have high speed marker seeking hardware.

Home Acceleration Rate
This is accel rate for starting the Home index toward, away from the switch and marker.

Home Deceleration Rate
This is the decel rate during the home index. This is used mostly if operator pushes FEEDHOLD during the cycle.

Home STP Rate
This is the stopping decel rate during the home index when the HOME switch is hit , then unhit and finally when the marker is found and the HOME cycle terminates.

Home Priority (0..8)
This determines the order of the home sequence A priority of 0 will not home the Axes. If all axes have a priority of 1, they will all home together. If some have a priority of 1 and others 2 and 3, then the axes with priority of 1 will home first, then the ones with priority of 2 and finally the ones with the priority of 3 and so on.

JOG0.8K.....JOG7.8K

These files are used by AcroMill to implement the JOG feature. The VAR can insert his special commands if any special features are needed by him during the JOG menus.

```
ECHO 4
PROG0
HALT
NEW
DETACH
ATTACH MASTER0
ATTACH SLAVE0 AXIS0 "X"
FVEL0
AXIS0 ON
```

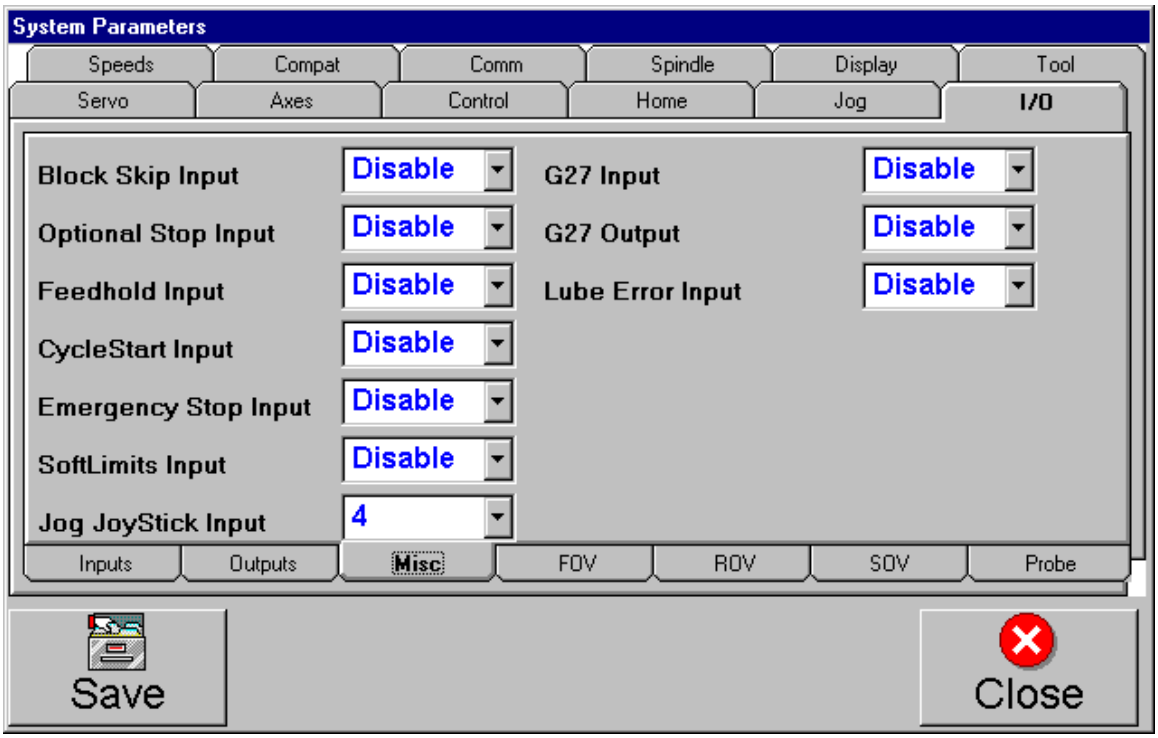
VECDEF X1

Note that the above file is not doing anything else except detaching previously attached axes and attaching just 1 axis to Master0. This way the AcroMill front end software just has to send a single axis move command to move the axis to its soft limit. Because each axis is handled independently, the feedrate override that ACROMILL front end sends to the ACR CARD is only sent for Master0.

Prog8; running on the ACR CARD has the responsibility to copy the Master0 FOV to Master1....MasterN FOV parameters (where N is the number of Axes being controlled).

The JOG feature also allows the OEM/VAR to wire in a joystick for each axis in to CONSECUTIVE inputs on the ACR CARD. These inputs are to be energized (Shorted to External Ground) to cause the particular axis to start Jogging.

The specification for enabling the Joystick is done in the System Parameter Setup, I/O SETUP MISC screen.



The parameter entry is called “Jog joystick Input “.

NOTE: *This entry must be left as “Disable” if the Joy stick is not being used. Otherwise unpredictable jogging will result as some of the I/O changes state.*

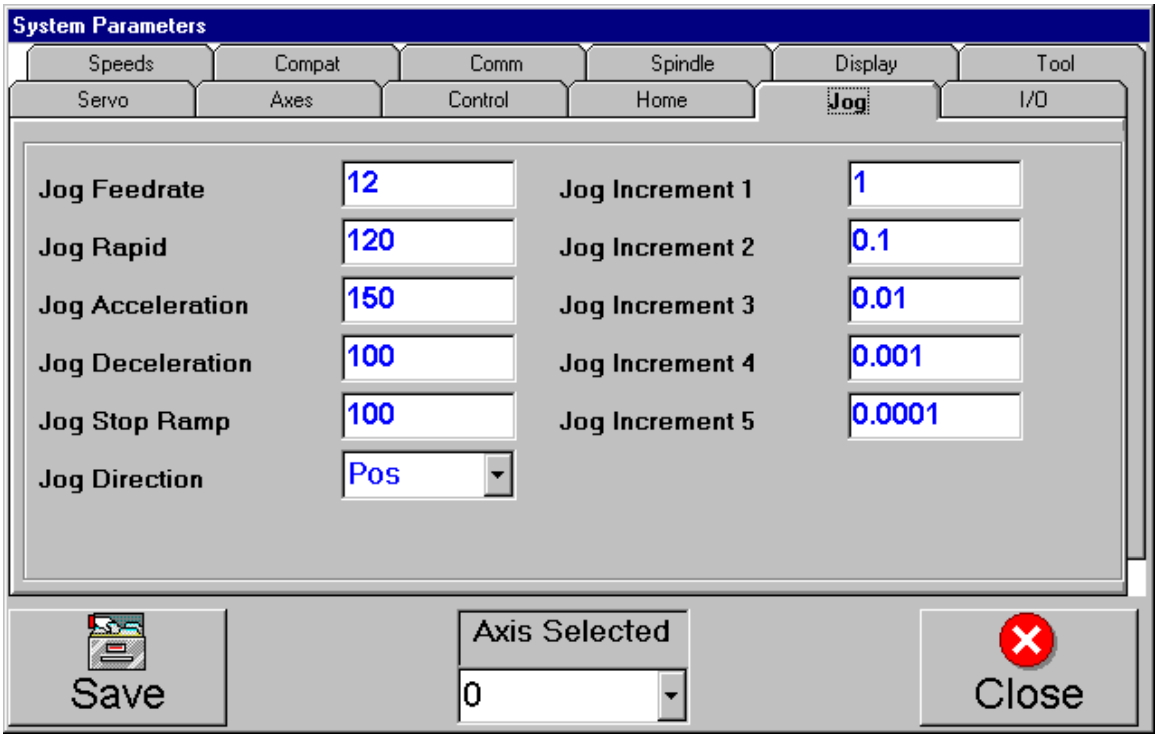
Each axis being used must have two reserved I/O numbers for joystick inputs (one for each direction of jog) even if only some of the axes actually have an installed joystick. Additionally, the joystick I/O numbers must be in consecutive order.

As an example, if there are 4 axis being used and a joystick is installed for only X and Y Axes starting at inputs 16, the following setup is required:

Wiring Chart

Input Number	**Assignment**
16	joystick X+
17	joystick X-
18	joystick Y+
19	joystick Y-
20	No Connect
21	No Connect
22	No Connect
23	No Connect

With the above case, the Jog JoyStick I/O # parameter must contain 16
To set the INCREMENTAL JOG increments, the following screen must be accessed in the SYSTEM PARAMETER setup



This screen allows different ACC/DEC and increments for each axes to be programmed.

RUNFILE.8K

This file is dumped to the ACR CARD when the Axis has finished HOMEING or JOGGING. This contains the necessary Axes attachments to run the machine. Again, the VAR can insert his commands in this file. The following is an example of the RUNFILE.8K
Note that the RUNFILE.8K is not using PLC0 and PROG8 as these programs were already dumped to the ACR CARD in the INITFILE.8K. If on the other hand the VAR wants to have differently running PLC'S in the INITFILE.8K and RUNFILE.8K, they can be included in the RUNFILE.8K

```
ECHO 4

PROG6
HALT
NEW
DETACH

PROG5
HALT
NEW
DETACH

PROG4
HALT
NEW
DETACH

PROG3
```

```
HALT
NEW
DETACH

PROG2
HALT
NEW
DETACH

PROG1
HALT
NEW
DETACH

PROG0
HALT
NEW
DETACH

PROG0

ATTACH MASTER0
```

Note that in the above program, only MASTER0 is being attached. This is because after sending the RUNFILE.8K to the ACR CARD, AcroMill Software attaches as many slaves as necessary to run the machine.

As should be obvious, extreme care should be taken not to override the commands that AcroMill is sending on its own to implement the CNC control. The VAR can cause the Control to malfunction be creating a problem in any of the above files.

Note the AcroMill uses several resources on the ACR CARD to accomplish the task of implementing a CNC control system.

These resources must not be changed by the VAR program. The resources are listed below.

RESOURCE	USAGE
User BIT flags 130.....138	(used to implement HOME Sequencing).
PC Interrupt request triggered by “SET 112” command	(Used to sequence Axes moves).
Global Variable P0	(used to transmit T-Code to VAR Program).
Global Variable P1	This variable is updated with an integer number

	that corresponds to the current MENU active on the display. This allows the VAR to do various things on the ACR CARD depending on which menu the operator is in.
Global Variable P2...P9	Reserved for future use.
Master0 Start Move Inhibit Flag Bit 540	(used to implement AUTO/BLOCK feature).
Master7 Feedrate Override Parameter P9993	(used to send DAC Output signal to Spindle DAC).
Master1..Master6 Feedrate Override parms P8457,P8713,P8969,P9225,P9481,P9737	These are used in the JOG mode to override the JOG feedrate along with Master0. The manual override only affects Master0 feedrate override. Commands in PROG8 Load the value from P8201 (Master0 Feedrate Override) into Master1..Master6 Feedrate Override parms.

EXITFILE.8K

This file is downloaded to the Control when the AcroMill software is exited from. This allows the VAR to put various commands into this file that will sort of “CLEAN UP” when the system is being shut down. Since the ACR CARD is a self contained, when the AcroMill software exits, the ACR CARD PLC’s and programs keep on running. This might be a problem in some cases. To get around that the following commands put into EXITFILE.8K will do a general system shut down on the ACR CARD. Each unique application might require a different EXITFILE.8k.

```
PROG0
HALT
NEW
DETACH

PROG1
HALT
NEW
DETACH

PROG2
HALT
NEW
DETACH

PROG3
HALT
NEW
DETACH

PROG4
HALT
NEW
DETACH
```

```
PROG5
HALT
NEW
DETACH

PROG6
HALT
NEW
DETACH

PROG7
HALT
NEW
DETACH

PROG8
HALT
NEW
DETACH

PLC0
HALT
NEW


PLC1
HALT
NEW

SYS

CLEAR

REM The following turns all the Outputs OFF.

P4097=0
```

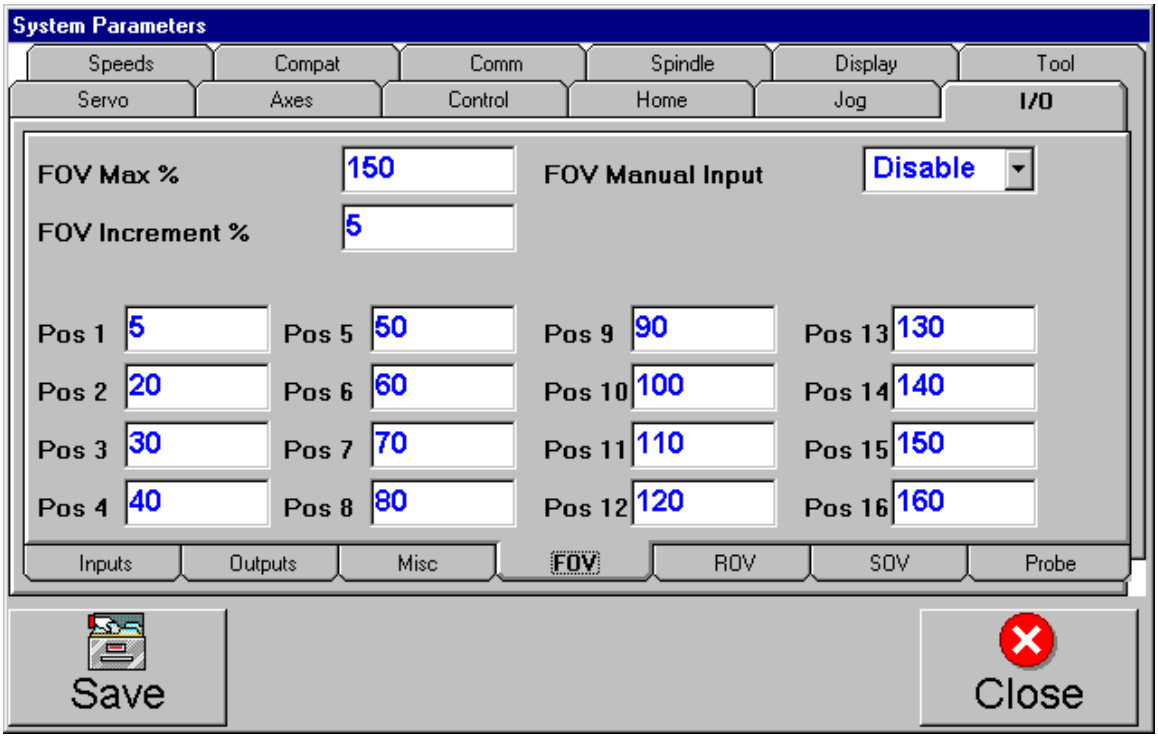
Manual Feedrate Override Binary Selector Switch

In the INITFILE.8K there was a section of code that sent a program into PROG8 to transfer the FOV parameter from MASTER0 into MASTER1…..MASTER6.
During the running of the AcroMill program, when ever the operator changes the Feedrate Override either from the softkeys or by turning the optional Manual Feed Override Binary Selector Switch, the frontend software updates the MASTER0 FOV parameter with this value. From that point onwards, the OEM/VAR program in PROG8 transfers this parameter into the FOV parameters for MASTER1.....MASTER6. Note that the MASTER7 FOV parameter is not being updated. This is because, MASTER7 FOV parameter is used up by the optional Manual Spindle RPM Override Binary Selector Switch explained next.
In order to implement the Manual Feedrate Override Binary Selector Switch, a Binary 16 position switch AMCS Part# SW-010 must be used. This Switch has 5 connections that need to be made. Four of the wires go directly to inputs on the ACR CARD. The fifth wire goes to the External 24V ground. the following chart will illustrate.

SW-010 Wire	ACR CARD Inputs
BCD 8	Input
BCD 4	Input+1
BCD 2	Input+2
BCD 1	Input+3
Comm	Ext GND

In the above chart 'Input' is the first I/O assigned to the FOV switch. Note that the 4 inputs wired to the FOV switch MUST be in ascending order.

The last remaining step is to tell the AcroMill that there is a FOV Binary Selector Switch hooked up. This is done by setting the following parameters in the Setup/ Feedrate Override Setup screen.



The **"Maximum"** override percentage is usually set to 100% and is meant to avoid the operator turning the FOV too high.
The **"Increment"** sets the percentage change between each "INCREASE" and "DECREASE" soft keys from the keyboard. Note that this entry is NOT USED for the Manual Feedrate Override Binary Selector Switch.

The **"Manual Input"** entry must be set to "Disable" if the Manual Feedrate Override is disabled or set to the first input where the manual Binary Selector Switch is wired into.

The manual FOV Binary Selector Switch is a 16 position switch. Therefore in addition to the STOP (0%) position, there are 15 positions that divide the entire range of the program feedrate.

AcroMill allows the OEM/VAR to set what percentage is desired for each of the 16 switch positions. This allows for a non linear override effect if required..

In the above menu, the POS 1….POS 16 entries are in percentages and can be random numbers. It is customary to have the first entry as ZERO and the last entry as 100%

Manual RAPID Feed Override Binary Selector Switch

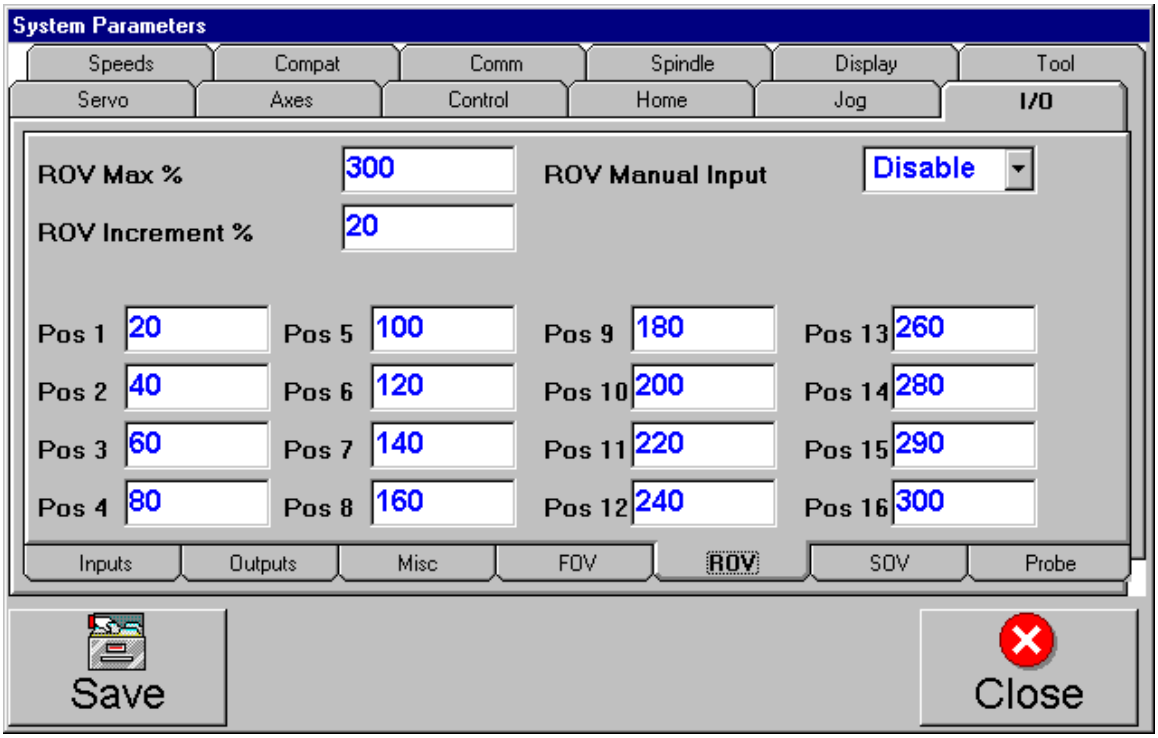
In addition to having a switch that overrides all cutting moves, ACR controllers have a second feedrate overrid mechanism that overrides only the RAPID moves. This is the ROV command on the controller card. AcroMill simply tells the controller what type of move each move is, as it is sent to the controller.

In the INITFILE.8K there was a section of code that sent a program into PROG8 to transfer the FOV and ROV parameter from MASTER0 into MASTER1…..MASTER6.
During the running of the AcroMill program, when ever the operator changes the RAPID Feed verride either from the softkeys or by turning the optional Manual RAPID Override Binary Selector Switch, the AcroMill software updates the MASTER0 ROV parameter with this value. From that point onwards, the OEM/VAR program in PROG8 transfers this parameter into the ROV parameters for MASTER1.....MASTER6. Note that the MASTER7 ROV parameter is not being updated. This is because, MASTER7 ROV parameter is used up by the optional Manual Spindle RPM Override Binary Selector Switch explained next.
In order to implement the Manual RAPID Feed Override Binary Selector Switch, a Binary 16 position switch AMCS Part# SW-010 must be used. This Switch has 5 connections that need to be made. Four of the wires go directly to inputs on the ACR CARD. The fifth wire goes to the External 24V ground. the following chart will illustrate.

SW-010 Wire	**ACR CARD Inputs**
BCD 8	Input
BCD 4	Input+1
BCD 2	Input+2
BCD 1	Input+3
Comm	Ext GND

In the above chart ‘Input’ is the first I/O assigned to the ROV switch. Note that the 4 inputs wired to the ROV switch MUST be in ascending order.

The last remaining step is to tell the AcroMill that there is a ROV Binary Selector Switch hooked up. This is done by setting the following parameters in the Setup/ Feedrate Override Setup screen.



The **"Maximum"** override percentage is usually set to 100% and is meant to avoid the operator turning the FOV too high.
The **"Increment"** sets the percentage change between each "INCREASE" and "DECREASE" soft keys from the keyboard. Note that this entry is NOT USED for the Manual Feedrate Override Binary Selector Switch.

The **"Manual Input"** entry must be set to "Disable" if the Manual Feedrate Override is disabled or set to the first input where the manual Binary Selector Switch is wired into.

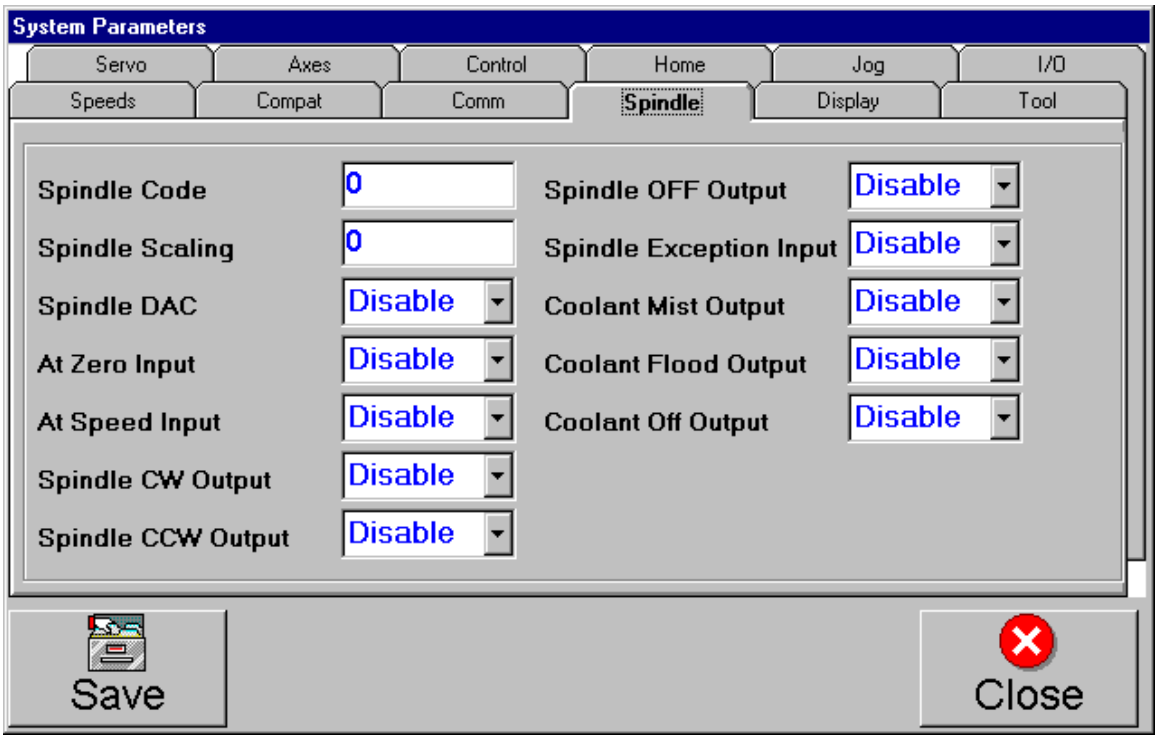
The manual ROV Binary Selector Switch is a 16 position switch. Therefore in addition to the STOP (0%) position, there are 15 positions that divide the entire range of the program feedrate.

AcroMill allows the OEM/VAR to set what percentage is desired for each of the 16 switch positions. This allows for a non linear override effect if required..

In the above menu, the POS 1….POS 16 entries are in percentages and can be random numbers. It is customary to have the first entry as ZERO and the last entry as 100%

Manual Spindle Override Binary Selector Switch

For machines equipped with an automatic speed control for their spindle motors, the AcroMill software allows an optional Spindle Override Binary Selector Switch to be hooked up by the OEM/VAR. Whenever the machine operator causes the Spindle override to be changed, the AcroMill Software sends the new FOV into global parameter P9993 (Master7 FOV parameter).
From this point, a OEM/VAR can insert his program commands into PROG8 to do the actual setting of the available DAC output reserved for the spindle. The number of the DAC reserved for the spindle DAC is entered in the setup parameters in the SPINDLE SETUP screen and is shown below



"Spindle DAC "

So these following set of commands can be inserted into the INITFILE.8k under the rest of the PROG8 commands already in that program. As an example, the following commands will take P9993 (Master7 FOV parameter) and multiply it by 32767 (full scale of the DAC) and send it directly to the DAC3 Output parameter.

80 P6448=32767*P9993
90 GOTO 10

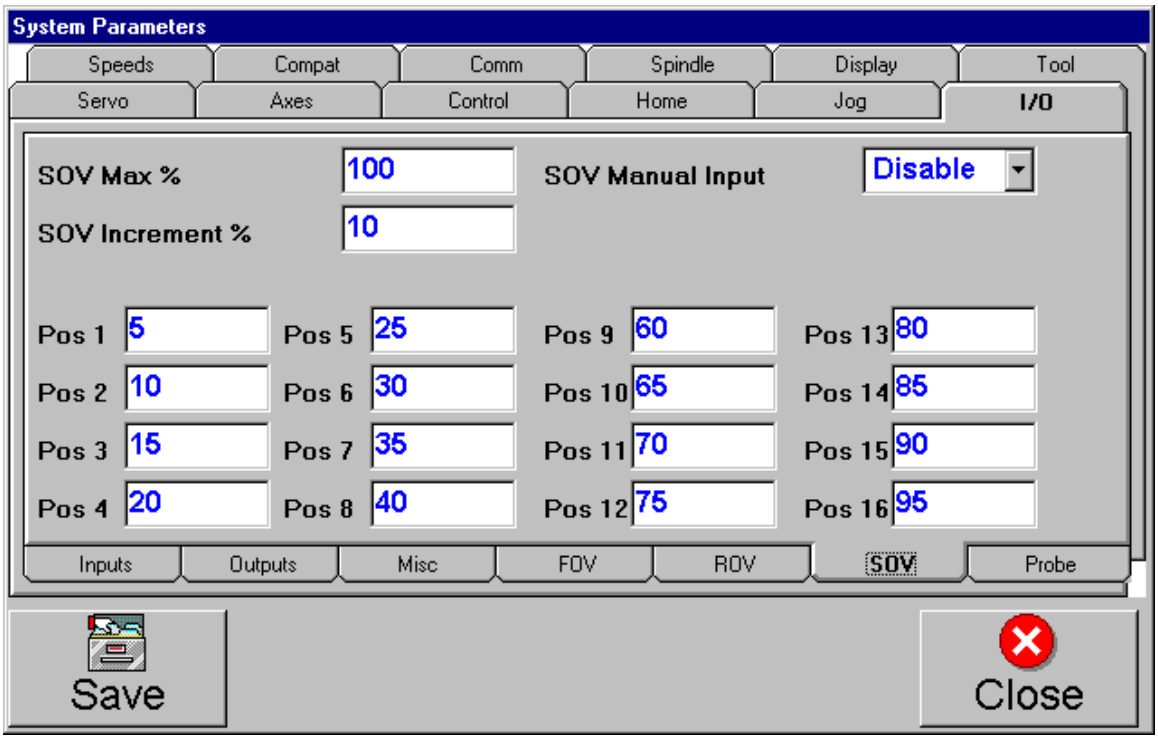
The reason that the above program is shown starting with line 80 is that the INITFILE.8k shown earlier has lines 10....80 with some other commands. So the lines 80 and 90 shown above can simply be tacked on to the end of the earlier PROG8. Also consider that the above lines are not making sure that P6448 does not exceed 32768 which is the Max range of the DAC. This is because the AcroMill front end software will clamp the FOV at 1.0.

In order to implement the Manual Spindle Override Binary Selector Switch, a Binary 16 position switch AMCS Part# SW-010 must be used. This Switch has 5 connections that need to be made. Four of the wires go directly to inputs on the ACR CARD. The fifth wire goes to the External 24V ground. the following chart will illustrate.

SW-010 Wire	**ACR CARD Inputs**
BCD 8	Input
BCD 4	Input+1
BCD 2	Input+2
BCD 1	Input+3
Comm	Ext GND

In the above chart 'Input' is the first I/O assigned to the SOV (Spindle Override) switch. Note that the 4 inputs wired to the FOV switch MUST be in ascending order.

The last remaining step is to tell the AcroMill that there is a SOV Binary Selector Switch hooked up. This is done by setting the following parameters in the Setup/ Spindle Override Setup screen.



The **"Maximum"** override percentage is usually set to 100% and is meant to avoid the operator turning the SOV too high.
The **"Increment"** sets the percentage change between each "INCREASE" and "DECREASE" soft keys from the keyboard. Note that this entry is NOT USED for the Manual Spindle Override Binary Selector Switch.

The **"SOV Manual Input"** entry must be set "Disable" if the Manual Spindle Override is disabled or set to the first input where the manual Binary Selector Switch is wired into.

The manual SOV Binary Selector Switch is a 16 position switch. Therefore in addition to the STOP (0%) position, there are 15 positions that divide the entire range of the spindle RPM.

AcroMill allows the OEM/VAR to set what percentage is desired for each of the 16 switch positions. This allows for a non linear override effect if required.

In the above menu, the entries are in percentages and can be random numbers. It is customary to have the first entry as ZERO and the last entry as 100%

Custom M-Codes

AcroMill also allows the VAR to customize all the M-Codes to some extent. Most of the standard M-Codes will do what the RS274D language specifies no matter what. But in additionally, the user can insert his own command in files on the hard disk to be sent to the ACR CARD as soon as the command is executed either in MDI or in a program.

Simply put, when ever the AcroMill software sees a M0.....M99 in a command line, it looks for and sends to the ACR CARD, corresponding files called M000.8K.....M099.8K from the disk.

Note that the file must have 3 digits after “M” on the disk.

So as an example, if the VAR wants Output 63 to come on when ever an M0 is executed, the following command put into file called M000.8K

SET 63

As an another example the following code will pulse output 63 for 100msec each time the M code is executed.

```
SET 63
DWL .1
CLR 63
```

The following guidelines must be followed in order to ensure that the customized M-Codes will work properly.

The Mcode commands must be placed in a text file with the file name in the range of M000.8K.....M099.8K. The three digit number is the handle of the M-Code.

Care must be taken to limit the kinds of commands that are stored into the m code files.

1. Must not contain any axes move commands (or any commands that affect axes moves).
2. Do not include DWELL commands longer than 1 second.

The commands can be among the following type of commands.

1. SET,CLR Commands to affect I/O.
2. Assign values to a Global or Local parameter.(Assuming those have been dimensioned).
3. DWL command of 1 second or less.
4. Commands to PRINT data to the ACR CARD Serial Port COM1 or COM2. (If they have been opened).
5. Commands to select various programs, plc and start and stop these programs.
6. Conditional Execution commands with expression.

   Example:

   IF(BIT 32=1) THEN SET 44

Library Parts

Library parts can be customized by the VAR using the following steps.

STEP 1

Choose a number between 000 and 999 for this new library part.

STEP 2.

Create an M&G Code program written in PARAMETRIC form and store it in a text file with the name in the following range:

LIB000.LIB.....LIB999.LIB

For the purpose of the subsequent discusstions the file will be refered to as LIBXXX
(here XXX is any number between 000.....999).

Note that the last 3 digits in the file name correspond to the library part number.

STEP 3.

Create LIBXXX.DEF text file that will contain information telling ACROMILL software how to ask the operator for parameter input and then call the VAR library part up. All the entries in the LIBXXX.DEF text file are numbers except for the TEXT that the LIBXXX part wants to show up in the data menu that will come up on the screen when the particular library part is called up.

Each data entry that the PLC library part requests the machine operator to input, is automatically put by the ACROMILL software into GLOBAL VARIABLE parameters P1.....P10. Additionally, the lead in radius is stored by ACROMILL in parameter P100.
This way the VAR library part can generate any tool path using the Parameters P1...P10 that were entered by the Machine Operator when he loaded the library part.

Note: regardless of how many entries the library part requires, the file must still have the full 10 entry worth of "dummy" lines. This means that the LIBXXX.DEF file should always have a total of 42 Lines.

MaxEntries

Column Start

1st Entry Code
2nd Entry Code
3rd Entry Code
4th Entry Code
5th Entry Code
6th Entry Code
7th Entry Code
8th Entry Code
9th Entry Code
10th Entry Code

1st Entry Length
2nd Entry Length
3rd Entry Length
4th Entry Length
5th Entry Length
6th Entry Length
7th Entry Length
8th Entry Length
9th Entry Length
10th Entry Length

1st Entry Fraction Part
2nd Entry Fraction Part
3rd Entry Fraction Part
4th Entry Fraction Part
5th Entry Fraction Part
6th Entry Fraction Part
7th Entry Fraction Part
8th Entry Fraction Part
9th Entry Fraction Part
10th Entry Fraction Part

1st Entry Text Part
2nd Entry Text Part
3rd Entry Text Part
4th Entry Text Part
5th Entry Text Part
6th Entry Text Part
7th Entry Text Part
8th Entry Text Part
9th Entry Text Part
10th Entry Text Part

The Max entries is a number between 1 to 10

The Column Start is a number between 1 to 80. This tells ACROMILL which column to put numerical data that the operator is entering in the SELMENU Window . The SELMENU Window automatically pops up when the operator selects loading of a library part .

The ENTRY codes tell ACROMILL what kind of date the library part wants for each of the possible 10 entries.

ENTRY CODE	MEANING
1	INTEGER NUMBER
2	REAL NUMBER

The ENTRY length tells ACROMILL how many maximum digits to accept for each of the maximum possible 10 entries

The fraction part tells ACROMILL how many maximum digit to accept after the decimal point in case the number is a REAL number.

The TEXT part is the explanation that will show up on the SELMENU Window port before each of the ten possible entries

STEP 4.

Generate a Text/Graphic template file for the library part. This Text/Graphic will get displayed up on the MESSAGE screen and aid the operator in entering the right parameters for the library part. This can be done in one of two ways. The easiest way is to create a bit map file LIBXXX.BMP whre the XXX can be 001….999.
For backward compatibility, AcroMill NT will also read Text/Graphic files from the DOS version that are files of the name LIBXXX.GRP. Again, XXX is the library part number in the range of 000…999.

The following commands are allowed in this Text/Graphic file.

TITLE

This command puts up a title for the library part
Ex: TITLE TRIANGLE PART

GOTO

This command moves the cursor on the window. Note that these are pixel addresses. So (0,0) is in the Top left hand corner .
Ex: GOTO X10 Y20

LINE

This command draws a line from the current cursor position.
Ex: LINE X10 Y30

CIRCLE

This command draws a circle using the current cursor position as its center.
Ex: CIRCLE R10

ARC

This command draws a circle using the current cursor position as its center.
Ex: ARC A0 A90
This will draw an arc with a start angle of 0 and end angle of 90 degrees.

ELLIPSE

This command draws an ellipse using the current cursor position as its center.
Ex: ELLIPSE A0 A90 R10 R5
This will draw an ellipse with start angle of 0 and end angle of 90 degrees and radii of 10 and 5

TEXT
This command puts up text at the current cursor position.
Ex: TEXT PART WIDTH

This completes the necessary step to create or modify an existing library part.

Now with all the files in place, when the ACROMILL software is asked to load the library part, it will bring up the LIBXXX.GRP graphic/data information and put it up on a pop up window. Then it will read the LIBXXX.DEF file to bring up the SELMENU Window and ask the operator for input parameters. Then it will store the input parameters into P1....P10 and load up the LIBXXX.LIB M&G Code program that the VAR has created or modified.

As an example, the following files were created for LIB002.

LIB002.LIB

```
(--------------------------------)
( Standard Style Rectangle     )
( P1 = 0=Hole 1=Piece          )
( P2 = Base                    )
( P3 = Height                  )
( P4 = Lead-in                 )
( P5 = Leadout                 )
(--------------------------------)

N100 (INITIALIZATION)

IF P1=0 THEN GOTO 1000
IF P1=1 THEN GOTO 1100
M02


N1000 (RECTANGLE HOLE)

G00 XP4  YP4
G41
M07
G01 X0   Y0
G01 XP2  Y0
G01 XP2  YP3
G01 X0   YP3
G01 X0   Y0
G01 XP5  YP5
M08
G40
M02


N1100 (RECTANGLE PIECE)

G00 X0   Y-P4
G41
M07
G01 X0   YP3
```

```
G01 XP2  YP3
G01 XP2  Y0
G01 X-P5 Y0
M08
G40
M02
```

The above file is on the disk and is stored as a TEXT file.

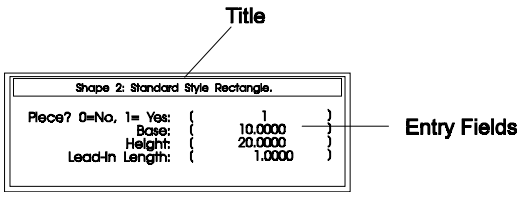
LIB002.DEF

```
5
26
1
2
2
2
2
1
1
1
1
1
9
9
9
9
9
9
9
9
9
9
5
5
5
5
5
5
5
5
5
  Piece? 0=No, 1= Yes :
                 Base :
               Height :
      Lead-In Length :
     Lead-Out Length :
```

Note that in the above file, the number of entries are 5,
The column to start data entry is 26.
The first entry is an Integer
The next 4 Entries are REAL numbers.
For all entries, a total of 9 digits are allowed with 5 digits to the right of the decimal point.

Note that even though there are only five entries requested in the library part, there is “DUMMY” information for the remainder of the 10 maximum possible entries on the this file.

When the library part is called the following screen will show up



Note the placement of the title on the top.

LIB002.GRP

TITLE Shape 2: Standard Style Rectangle

```
GOTO X55   Y15
TEXT PIECE
GOTO X35   Y70
LINE X0    Y-45
LINE X80   Y0
LINE X0    Y40
LINE X-85  Y0

GOTO X270  Y15
TEXT HOLE
GOTO X245  Y65
LINE X0    Y-40
LINE X80   Y0
LINE X0    Y40
LINE X-80  Y0
LINE X5    Y-5

GOTO X60   Y75
TEXT Base
GOTO X35   Y79
LINE X20   Y0
GOTO X95   Y79
LINE X20   Y0
GOTO X35   Y74
LINE X0    Y9
GOTO X115  Y74
LINE X0    Y9
```

```
GOTO X125  Y42
TEXT Height
GOTO X127  Y25
LINE X0    Y12
GOTO X127  Y52
LINE X0    Y12
GOTO X122  Y25
LINE X9    Y0
GOTO X122  Y64
LINE X9    Y0

GOTO X220  Y25
TEXT +Y
GOTO X231  Y35
LINE X0    Y43
LINE X76   Y0
GOTO X310  Y74
TEXT +X
```

The above file will put up the graphics to help the operator input the necessary parameters for the library part.

This concludes the description of the LIB002 library part.

Setting up “RUN” batch File

AcroMill program is supplied on a disk with the EXE file called AcroMillNT.EXE.

The Machine Builder/ VAR can set up this file to run for various number of Axes. The following format should be stored in a batch file to run when the computer is powered up.

ified on the same line separated by spaces.

Screens Setup

There are several screens used throughout the ACROMILL software for displaying various data. Most of these screens can be resized by the designer to suit particular needs.

All screen coordinates and screen sizes are in pixels. The top left hand corner of the entire CRT screen is (0,0) and the bottom right hand corner is (639,479) in the case of VGA display and (799,599) in the case of SVGA.

Windows.

The following list of screen are offered for use in the AcroMill software.

Upper Window.

This window acts as a background for various status windows during the normal operation of the machine. It defaults to dividing the entire screen into 4 horizontal sections.

Lower Window.

This window acts as a background for various data input and tool path graphics windows during the normal operation of the machine. It defaults to dividing the entire screen into 4 horizontal sections.

History Window.

This window is reserved for showing the Version Number and Time Clocks during the running of part programs.

Input Window.

This window is used for data entry for changing variables during parameter setup. It is also used to display the part program if the tool path graphics are also being displayed.

Fmenu Window.

This window is reserved for showing the F1....F10 keys for selection of various menus.

Status Window.

This window is reserved for showing I/O Status's and the online HELP.

Message Window.

This window is reserved for showing Communication Errors to the ACR CARD Controller and output from the "PRINT" command in the RS274D Program.

Current Position Window.

This window shows the Current position of the axes.

Next Position Window.

This window shows the Next Position that each axes is going towards when running a part program.

Floating Zero Window.

This window shows the position of the last active G92 floating zero command.

Machine Status Window.

This window shows several different types of status's.

Program Status Window.

This window shows various program modal values during the execution of a program

Menu Select Window.

This window is used for operator entry of various parameters.

Graphic Display Window.

This window is reserved for showing the Tool Path graphics when running a program. Most of the time, this window sits right on top of the LOWER Window.

Window attributes.

For each window, the operator can change the following parameters.

Parameter	Description
Size X	Width of the window in pixels
Size Y	Height of the window in pixels
Origin X	Top left-hand corner X for the window in pixels
Origin Y	Top left-hand corner Y for the window in pixels
Top Space	Width of space filler on top of the window in pixels
Window Type	Type of Window (1,2,3,4) Type 1 Ridge This window looks like a picture frame with a border all around it. It also allows an optional Header Bar on top. This header can display a user entered string. The string can be one of 32 strings entered in a MESSAGE file. This message file is edited via its separate menu. Type 2 Indented This window looks like a "depression" in the screen. This still allows a "message" string to be displayed on top but there is no header as in Type 1. Type 3 Raised This window is similar to the Indented Type 2 window except instead of a "depression" it looks "raised" from the background. Like the Type 2 , the Type 3 window allows for a "message" to be displayed on top but without a header.

	Type 4 Switch panel This window looks like a raised push-button. It allows a message to be displayed on top
Window On	0 Will turn the window OFF. 1 Turns it on
Top bar	Entering a “1” enables and a “0” disables a header bar to appear on the top of the window.
Header	Pointer (0.....99) that points to which message is to be displayed on the header part of the window.
Text Color	Color of Main Text
Header Color	Color of Header
Window Color	Color of Window
Light Color	Color of Lighted parts of window
Shadow Color	Color of shadowed parts of windows
Frame Color	Color of frames of window
BackGround	Color of background. This should be set to what ever color one wishes to see if the particular window is erased from the screen.

Note that several windows appear right on top of each other. The trick to placing them around the screen is to ensure that during normal running of the machine, they do not conflict with one another.
AcroMill handles the STATUS screen as a special case. The status screen should not be placed in a position that it will cover the HISTORY, LOWER, INPUT and the FMENU Windows.

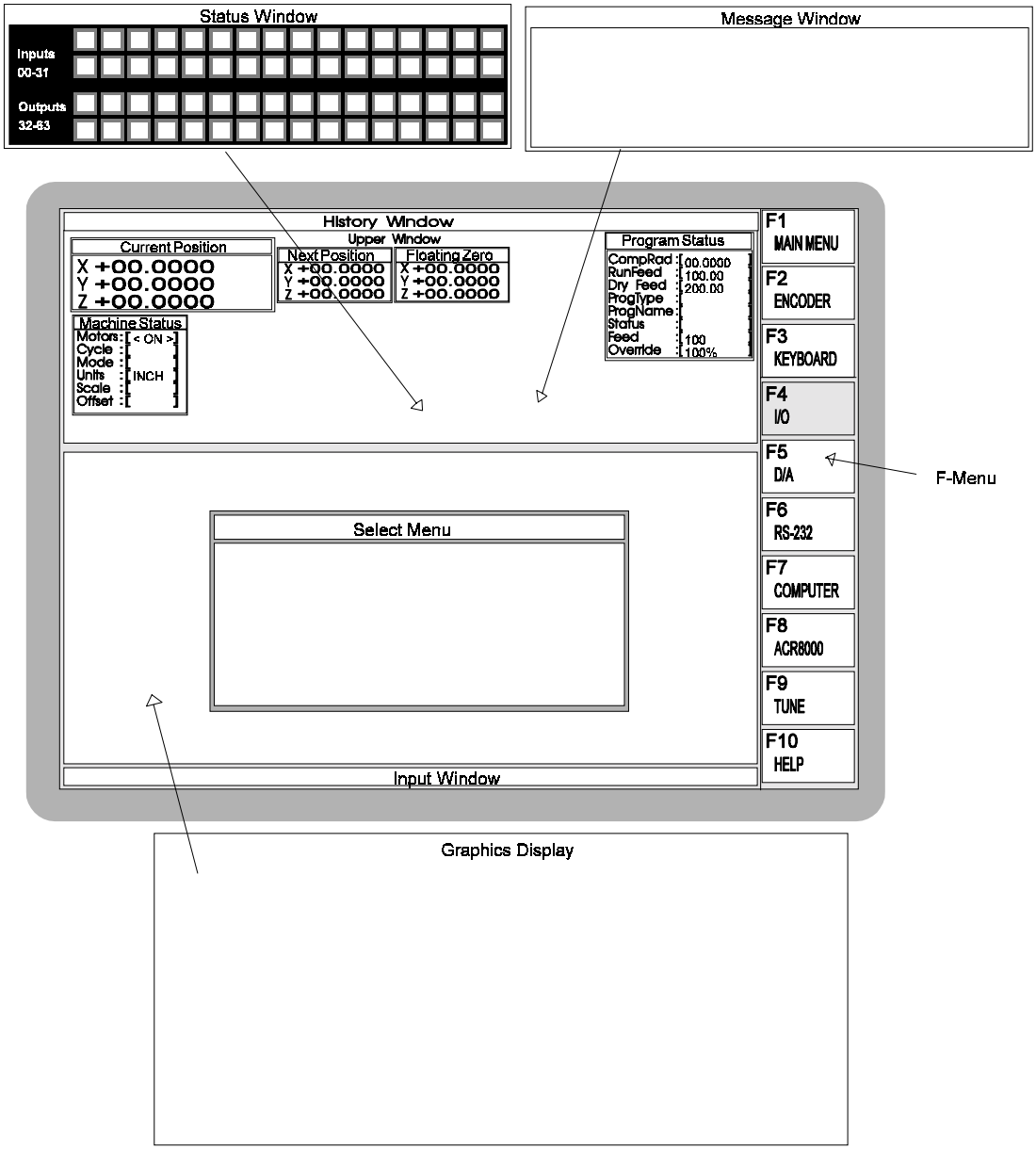
This is because as soon as the operator selects a STATUS (even while the machine is cutting a part), the status window will appear. In doing so it will SHUT down any window lying underneath it. These windows will remain shut down until the operator decides to clear the status window.

All the windows are shown on the next page.

When changing screen parameters, keep in mind that the screen coordinates are (0,0) on the top left hand corner and (639,479) or (799,599) on the bottom right hand corner.

For Monochrome settings choose all the background colors , the window color as BLACK and text color....etc. as white.

There are sixteen colors available. These colors will show up on the AcroMill screen when the Window setup is being done.


Status Window
Inputs 00-31
Outputs 32-63
Message Window
History Window
Upper Window
Current Position
X +00.0000
Y +00.0000
Z +00.0000
Next Position
X +00.0000
Y +00.0000
Z +00.0000
Floating Zero
X +00.0000
Y +00.0000
Z +00.0000
Program Status
CompRad : 00.0000
RunFeed : 100.00
Dry Feed : 200.00
ProgType :
ProgName :
Status :
Feed Override : 100 100%
Machine Status
Motors : < ON >
Cycle :
Mode :
Units : INCH
Scale :
Offset :
F1 MAIN MENU
F2 ENCODER
F3 KEYBOARD
F4 I/O
F5 D/A
F6 RS-232
F7 COMPUTER
F8 ACR8000
F9 TUNE
F10 HELP
F-Menu
Select Menu
Input Window
Graphics Display

Alarm Screen

AcroMill has a facility for the var. to display up to 32 messages that will pop up on the Message Window triggered by various inputs and outputs. These messages can be of various colors (Color 0...15) and can be displayed at any desired Cursor position within the Message Window. Starting with AcroMill Version 1.12C, these messages are triggered by a high level on any of the programmed trigger inputs. As long as there is room in the message window, all 32 messages can be displayed simultaneously on the screen.

To program the message window:

1. Place the message window using the Windows setup to a desired location on the screen. Keep in mind that the message window should not overlap other windows as it can pop up any time.
2. Go into the System Parameter setup screen select “MSG LIST” to program what messages to bring up on the Alarm Screen. Messages 1....14 are used to show headers on top of all the windows. Message#32...96 are used to label the 64 inputs and outputs so that when a I/O STATUS is done, English names for all the I/O can be displayed. The rest of the messages can be used for ALARM displays.
3. Go into the System Parameter setup screen and select “IO MSG” to program the individual I/O triggers and what message they are supposed to display on the message screen along with their trigger input and screen position. The following data will need to be input.

Alarm Screen Programming.

This screen allow programming the ALARM MESSAGE screen. There are 32 Alarms that can be programmed to pop up upon getting triggered by Input00...31 and Outputs 32...63. The following screen will show up.

Parameter	Description
I/O#	This is a number between 00 and 63. This is the source of the ALARM trigger. The alarm will always trigger when the I/O goes from the LOW to the HIGH state.
Message #	This tells the ALARM screen which message to put up when this alarm occurs. This message number points into the MSGLIST described previously
ON/OFF	This turns this alarm on or off.
Message Column	The message can be made to appear at a particular Row or Column in the Message Window. This entry sets the Column
Message Row	The message can be made to appear at a particular Row or Column in the Message Window. This entry sets the Row

Note that as along as there is a valid message to be displayed on the message window, the window will appear on the screen. When there are no mesages that are triggered to be displayed, the window will automatically disappear.

Graphic Verify Screen Setup

In most instances, for graphic verification, the horizontal display window shows the Origin on the bottom left hand corner and positive moves in X moving right and positive moves in Y moving Up. Not all machine mechanics behave in this manner.
AcroMill allows fully customizing the graphic display with the following parameters. From the System Parameter Setup menu, selecting “DISPLAY” the following data can be changed.

Parameter	Description
Color Via D Code	This allows setting a color associated with one of 32 Tool Codes or H Offsets. Then during running of programs, tool paths will show up in different colors depending on which tool or H Code is active.
Flip X Axis	If this entry is set to a 1 from a 0, X axis tool path will go from right to left instead of left to right for positive X movement. Note that this is only for display purposes and does not affect machine operation..
Flip Y Axis	If this entry is set to a 1 from a 0, Y axis tool path will go from top to bottom instead of bottom to top for positive Y movement. Note that this is only for display purposes and does not affect machine operation.
Exchange XY	If this entry is set to a 1 instead of 0, X axis will be shown vertically and Y axis horizontally. Note that this is only used for display purpose and does not affect machine operation.
Control Modes	If this entry is 0, the machine is on the ENGLISH mode. This means that all position, data display is in inches. This is regardless of whether the part program being run is in the G70 (Inch) or G71(Metric) mode. Note that all dimensions for tool tables, floating zeros, feedrates..... are all entered in the CONTROL MODE Units. If this entry is 1 then the control mode is in METRIC.

For Graphic verification of the part, the first entry is useful for showing tool path belonging to different D Codes or H Codes in different colors The second third and fourth parameters define the co-ordinate system with respect to the Graphic Display Screen. The last parameter defines whether the control display should be in INCH or METRIC.

Safety Issues

The Machine Builder/ VAR must take great pains to ensure operator safety in designing the Control/Machine interface. With ACROMILL this is usually a “painless” task for the machine builder/ VAR if the following steps are taken.

STEP 1.

Utilize the onboard WATCHDOG relay provided on the ACR CARD to suppress all external I/O logic
to happen. This will ensure that if for some reason the ACR CARD controller malfunctions, no outputs are left in a dangerous state.

STEP 2.

Provide for an EMERGENCY STOP and RESET pushbuttons to implement the following logic.
Use the EMERGENCY STOP input on the Control and wire it to a contact of the drive power relay (called **CR1** for the purpose of this manual) . When CR1 is ON (and the ACROMILL Estop Input energized), the motors are assumed to be under power. When the operator hits the EMERGENCY STOP switch or if the machine hits a hard overtravel CR1 must be de-energized by the Machine Builder/VAR external logic.
To further ensure safety, as an option, the machine builder/VAR can allow one of the ACR CARD outputs to also be able to de-energize CR1 if an urgency arises. This can be done easily through the user PLC running on the ACR CARD controller

A practical use for this could be a situation like one of the axes not being able to follow the programmed path (or one amplifier might go bad). In this case a Builder/VAR PLC can cause an EMERGENCY STOP condition by de-energizing CR1.

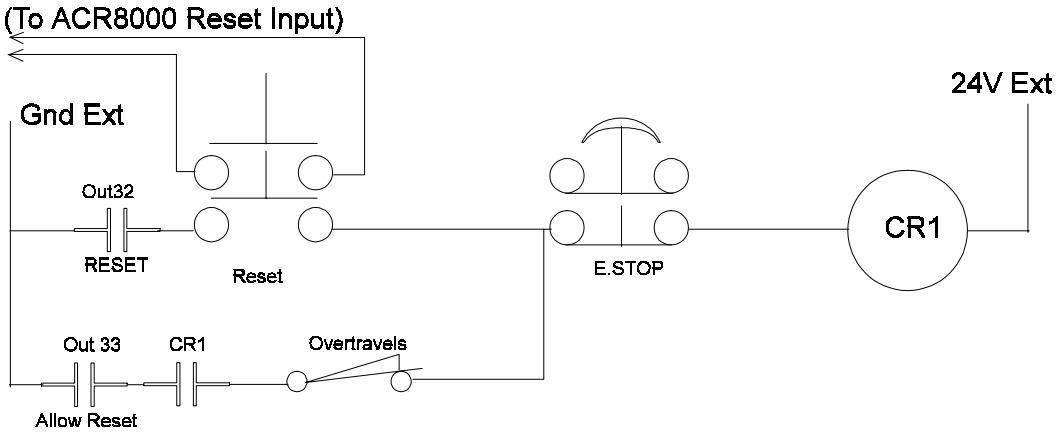
Dedicate an output from the ACR CARD controller to be used to energize the CR1 Relay.

Wire in a RESET switch that will be responsible to energize CR1 upon the command of the machine operator.

As a safety, use on of its normally open contacts to ground an input on the ACR CARD. This will tell the PLC program that the operator is pushing the RESET switch and wants the motor power to come on.

Then use the other normally open contact to series wire an output from the ACR CARD to ultimately energize CR1. This will ensure that the only way that CR1 can be energized is the concurrence of the machine operator pushing down on the RESET push-button and the Builder/VAR PLC going alone with this request as the appropriate thing to do.

The following ladder will illustrate the situation a little better.



Note that the above circuit is 24 Volt DC ladder logic.
Some designs call for overtravels to be 110VAC. In that case, the above circuit can be implemented in 110VAC if Out32 Out33 are first fed into a 24V Control Solid State (or 24V DC) relay and its 110VAC contacts wired into the above circuit.

In either case, note that the ACR CARD can energize CR1 if the Operator is pushing the RESET switch. The ACR CARD can also de-energize CR1 relay if it wants to. Additionally the Overtravels or the Emergency Stop switch can de-energize the CR1 relay.

Note that the above circuit allows bypassing the overtravels if the RESET switch is depressed. If this is a problem, the ACR CARD can be setup up to LIMIT the MOTOR speed or POWER (If using current mode amplifiers) and/ or only allow the motor to go in the correct direction to get off the overtravels (this does require additional overtravel switches).

STEP 3.

Make sure that the state of CR1 is correctly being reported to the ACROMILL Software. This is done easily be entering the number of the input being used to report the state of CR1 (ESTOP INPUT) in the SYSTEM PARAMETERS. To check that the mechanism is working, if any axis moves are attempted to be made with the machine in the EMERGENCY STOP state, the ACROMILL software will give an “MACHINE POWER OFF” error.

STEP 4.

Make sure that the PLC0 is set up to issue a “REN Request” to all axes in use as long as CR1 is in the de-energized state. Assuming Input 0 is the E.STOP input and 3 axes are in use, the following PLC code inserted in PLC0 at the beginning or the end of the Machine Builder/VAR PLC program will suffice.

```
LD 0
Out 787
Out 819
Out 851
```

This PLC will ensure that if the operator turns the motor power off and manual moves the machine about, the axes will not “JUMP” and try to go to their original position when he turns the motor power on again. If the PLC is working properly, as the machine is moved around manually, the current position will be automatically updated so as to keep the DAC’s at ZERO volts.