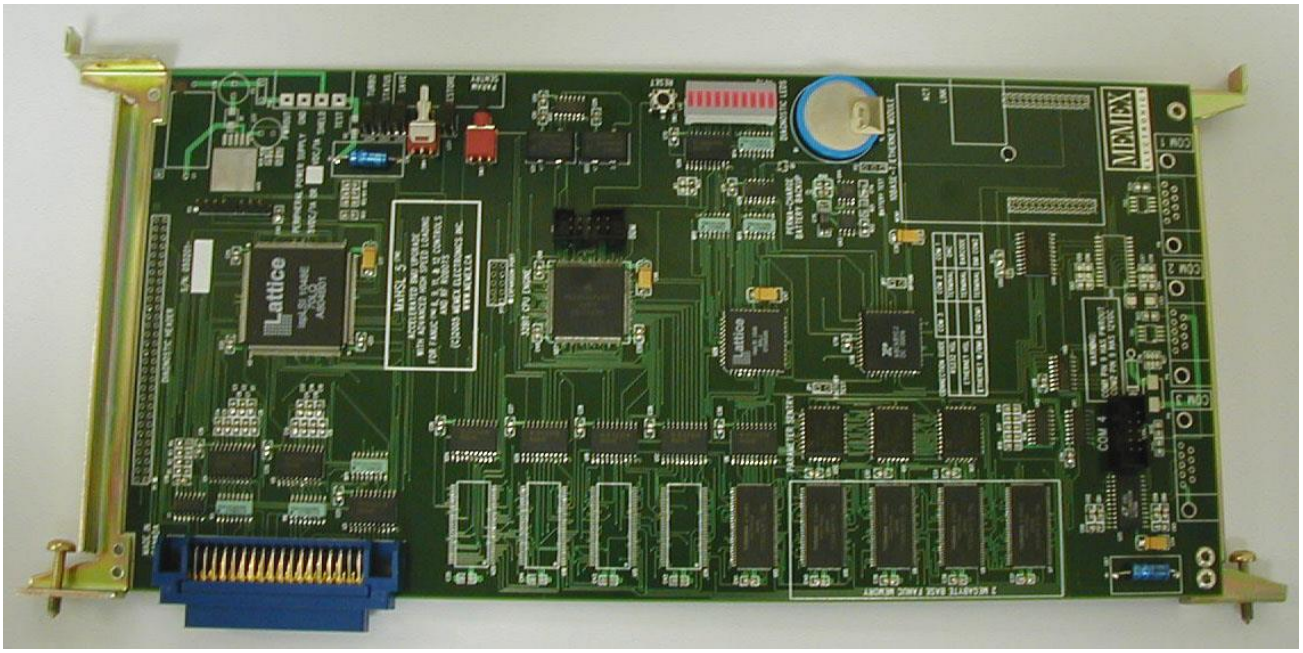
MEMEX FANUC®9 1280 METER (512K) HSL5/MME MEMORY UPGRADE INSTALLATION AND USER MANUAL

M100704A



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Introduction

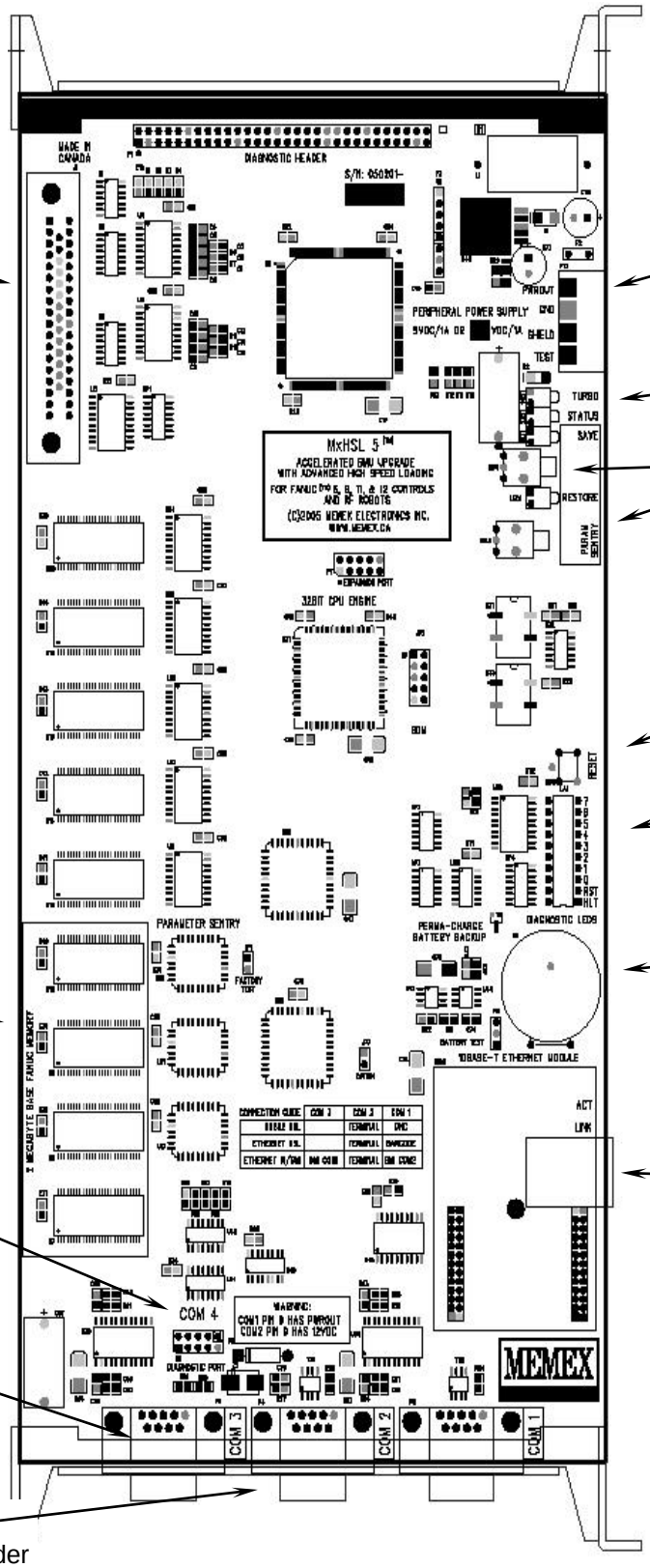
General

The MME (Memex Memory Engine) is a Static RAM based memory board, designed to replace the old BMU (Bubble Memory Unit) found in Fanuc Series 6, 9, 11 and 12 machine tool controls. Our leading edge technology has enabled us to create a high speed, low power alternative to conventional Fanuc® memory. Once the new MME has been proven (all parameters checked and the machine functionally tested), the “PARAMETER SENTRY” (PS) system can be used to backup the verified parameter settings. This useful feature will keep a copy of the machine’s critical parameters in a special on-board, non-volatile, memory location for safe keeping. Finally, the battery backup system is unique in that the battery is continuously conditioned and recharged when the power is on. New Lithium rechargeable technology has been implemented to keep your data safe for more than 10 years.

Features

- 16.6666 MHz on-board processor
- High speed, low power, SRAM
- Non-volatile EEPROM for “Parameter Sentry” backup
- Easy-to-use switches for parameter save and restore
- Rechargeable, long life, Lithium battery
- Compact 12.1” x 5.9” board size

HSL5/MME Board Layout:



Connector to Fanuc 6, 9, 11, 12 & RF Robot Master Board in BMU Slot

Power Out – Usually 5VDC for Wireless LAN Support

Turbo & Status LED's

Parameter Sentry Switch & Push Button

HSL5/MME Reset

HSL5/MME Status LED's

PermaCharge Rechargeable Lithium Battery

2 Megs of Fanuc Memory

10BaseT Ethernet UMI Connectivity Built-In

COM 4 Diagnostic Port

COM 3 for MxBMI

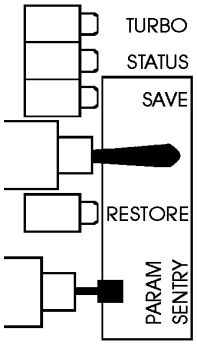
COM 2 for Handheld Terminal or Bar Code Reader

The Basics

USING THE HSL5/MME PARAMETER SENTRY SYSTEM

The Memex Memory Engine's Parameter Sentry System is unique and extremely simple to use. The system offers protection of your Fanuc's first 1280 meters (512K) of memory, thus protecting all of your NC system parameters, PC parameters, Tool Offset data, Pitch Error Compensation data and System data. Note that part programs are not included. All of these parameters are stored in Non-Volatile Flash ROM (EEPROM). This memory is Non-Volatile meaning that it does not require a backup power source of any kind and is a permanent and convenient form of storing your critical control parameters.

Note: Be sure there are no programs loaded into memory above 512K as the parameter sentry system may accidentally same portions of a program if there is one resident in high memory when the save is performed.



To use the Parameter Sentry System, power on your Fanuc control and bring the CRT to the Position screen. Open the control cabinet of the Fanuc control. Make sure that the power remains ON when you open the door to the cabinet. While holding the toggle switch at the bottom of the Memex HSL5/MME board toward the "SAVE" position, momentarily PUSH the "PARAM SENTRY" button, then release the toggle switch. You should notice the LED adjacent to the toggle switch light up for approximately 1 second. This will save your Fanuc system parameters.

To RESTORE your parameters, reverse the above procedure. Make sure that your Fanuc CNC is turned on and that you have access to the Memex HSL5/MME. While holding the toggle switch toward "RESTORE", momentarily PUSH the "PARAM SENTRY" button, then release the toggle switch. Again, you should notice the "Restore" LED light up for 1 second. Power off your control, then power on again for the saved parameters to take effect.

If an error relating to part programs occurs at this point after powering on the control, you may also need to Delete All Part Programs by powering on the control while holding the

DELET & RESET keys.

Installation Considerations

The installation of the HSL5/MME should be conducted with care. Never install or remove a board with the control power on (the main power can be on, but not the control). Take care with the handling of the HSL5/MME and BMU as they are static sensitive. Keep the boards in the anti-static bags provided. Take care not to place the circuit boards on a metal surface as the backup battery could suffer damage if shorted. Do not place the HSL5/MME in any other slot on the Fanuc master-board, other than the one, labeled BMU. Do not force, drop or otherwise mishandle the boards during the installation procedure. Always check the functionality of the machine at the end of the installation (i.e. move the axes, perform a tool change, run a program, etc.).

Backup Critical Parameters

Although the HSL5/MME has the ability to transfer the relevant NC parameters, it is a good idea to make a manual backup of all information in the BMU before proceeding (if possible). The HSL5/MME will contain no useful information when shipped, and as such the following data must be reloaded: NC parameters, PC parameters, tool offsets, part programs, macro variables and names (if applicable), etc. Follow your Fanuc manual for the appropriate procedure.

Verify Your Control

Once the HSL5/MME has been installed either manually or by the Quick-Load method, satisfy yourself that the control is working properly and that all of your parameters have been restored.

Test the machine by the following procedure through either MDI or program:

- Home all axes, tool-changers and pallets.
- Check spindle functionality through all speeds and gear ranges.
- Check also Clockwise and Counter-clockwise rotation with M3 and M4 commands.
- Check the tool changer. Be sure that the tool you received was the tool requested and that the carousel rotates in the proper direction.
- Check the pallet changer (if applicable). If your machine requires special custom macros for a pallet changer or tool changer, be sure that they have been loaded.

Once your machine has been proven with the HSL5/MME, you have successfully upgraded your control.

Installation for Fanuc® 9

Backup Your Control

Before starting the installation, power on the control and verify that the machine tool is in good working order. If the control has a system error, or the BMU is inoperable, you will have to replace your memory board with the HSL5/MME, and restore the information from existing backup sources.

Important!

Backup the following BMU memory contents: NC parameters, PC Parameters (if parameter 3.7 = 1), Tool Offsets, Pitch Error Compensation, and Part Programs (if applicable). All of this information is contained in the Bubble Memory Unit (BMU) and must be restored, therefore all of this information must either be written down or punched out of the control via the RS-232 serial port. Use the "Fanuc System 9 Machine Parameter Worksheet" provided at the end of this document to record the important parameter data. Use the following procedures to save the data on a computer. If in doubt, consult your Fanuc manuals, as they are your ultimate authority on your particular version of control.

Very Important!

You MUST have a current set of Fanuc 9 System Tapes if you are going to replace the 1st BMU board in your control! The entirety of your control's operating system is stored in the first BMU in your machine. Do NOT proceed to replace this BMU unless you have your System Tapes available, since the operating system will have to be restored from these tapes.

1. Set up your computer to receive data through its COM port and connect it to your Fanuc control. Set the communication parameters on your PC for 7 data bits, and the stop bits and baud rate as determined by the applicable parameters for your control. Please refer to the "Fanuc 9 Technical Summary" in the Appendix for the appropriate parameters.

NC Parameters

2. Make the computer ready to receive the data.
   - Select EDIT Mode.
   - Press the [PARAM] key to display the Parameter Screen.
   - Press [P] [-] [9] [9] [9] [9] [PUNCH]

   The Parameters will be punched out.

Pitch Error Compensation

3. Make the computer ready to receive the Pitch Error data.
   - Confirm that EDIT Mode is selected.
   - Confirm the Parameters are displayed on the screen.
   - Press [P] [-] [9] [9] [9] [8] [PUNCH]

   The Pitch Error data will be punched out.

Part Programs

4. **NOTE:** Any macro programs in the range of O8000-O9999 that have been protected from editing will not be transferred. Release the parameter bits that are protecting them. On a Fanuc 9, one would go through the following steps:

   To release the Macro Program "Edit Protect" on a Fanuc 6-B2:
   - Select MDI Mode.
   - Switch the Parameter Write switch to the ON position (ignore the PW100 alarm).
   - Press the [PARAM] key to display the Parameter Screen.
   - Set parameter 319 bit 7 and 318 bit 7 (left most digit) to a 0 (zero).
   - Switch PWE to the OFF position.
   - Press [RESET] to clear the PW100 alarm.

   - Make the computer ready to receive the programs.
   - Select EDIT Mode.
   - Press [PRGRM] to display the Program Screen.
   - Press [O] [-] [9] [9] [9] [9] [PUNCH]

   All of the programs will be punched out.

Tool Offsets

5. Make the computer ready to receive the Tool Offset data.
   - Confirm that EDIT Mode is selected.
   - Press [OFSET] to display the Tool Offset Screen.
   - Press [P] [-] [9] [9] [9] [9] [PUNCH]

     The Tool Offsets will be punched out.

Work Offsets

6. Press [OFSET] again to display the Work Offset Screen. If it does not appear, you do not have any Work Offsets in your machine—proceed to the next step.

If you have a Work Offset screen, record the Offsets in the following chart:

Relative	00	01	02	03
X				
Y				
Z				

Relative		04	05	06
X				
Y				
Z				

PC Parameters

7. Check Parameter 3, bit 7. If this is a 0, go to step #8 (System Parameters) as you have no PC Parameters. Write down the PC Parameters between, and including the following parameters: N600-619, N1001-1040, N2001-2010 and N3001-3036.
   - Press the [PARAM] key twice to display the PC Parameter Screen.
   - Type [N] [6] [0] [0] [INPUT] to select PC Parameter 600.

     You can use the [↓] (cursor) key to advance the PC Parameter number.
   - Write down the PC Parameter values in the Appendix.
   - Repeat the last two lines to record the remaining PC Parameters.

System Parameters

8. Press the [PARAM] key once again to display the Parameter Screen.
   - Type [N] [0] [INPUT] to select Parameter 0. You can use the [↓] (cursor) key to advance the Parameter number.
   - Write down the System Parameter values on the Machine Parameter Worksheet found at the end of this manual.
   - Repeat the last two lines to record the remaining Parameters.

Setting Data

9. Press the [SET] key to display the Setting Data Screen.
   - Record all of the Setting Data on the Parameter Worksheet found in the Appendix of this manual.

Installation Procedures for Fanuc® 9

Time Needed:	2 hour (approx.)
Tools Needed:	1 Philips Screwdriver
Components:	1 HSL5/MME memory board, this manual
Controls:	Fanuc 9A

Before starting the installation, power on the control and verify that the machine tool is in good working order.

The Fanuc 9 control can use up to 4 memory boards simultaneously. The four boards are located to the left of the main master board. The first board, in Slot 1, is the right-most board of the four. This board is a special memory board and deserves a little more attention.

Attention!

The memory board in Slot 1 is not just used for part-program memory. It also contains the Fanuc control's operating system, NC parameters, PC Parameters, Tool Offsets, Pitch Error Compensation, and other system information. If you intend to replace this BMU with a Memex memory, you will be required to reinstall all of this information from the CNC's system tapes.

Outlined below, are the two different procedures for installing a new memory board. If you intend to replace the BMU in Slot 1, continue with Part I here. If you only intend to upgrade the part-program memory on your control by adding or replacing a BMU in Slots 2, 3 or 4, you can proceed directly to Part II below.

Part I – Slot 1 Replacement:

Additional Equipment Necessary to Complete the Installation on a FS-9:

8 Tapes:	#1: A02B-0055-H501-023	Vol. 1 (Edit 2)
	#2: A02B-0055-H501-023	Vol. 2
	#3: A02B-0055-H501-023	Vol. 3
	#4: A02B-0055-H510 FS-9	System Parameters
	#5: A02B-0055-J547 #001	PC Control Software
	#6:	PC Parameters (PC Software)
	#7:	NC Parameters
	#8:	Pitch Error Compensation

You need the PC Parameters written down, including Timers, Counters, Keep Relays and Data Tables.

NOTE: All tapes must be rewound manually.

1. Before starting the installation, power on the control and verify that the machine tool is in good working order.

Important!

2. Make sure that you have a current backup of the NC parameters, including PC Parameters, Tool Offsets, Pitch Error Compensation, and Part Programs. For instructions on downloading your control's information, refer to previous section entitled "Backup Your Control". **It is also very important that you have a complete set of Fanuc 9 system tapes for your control, as the entire operating system will have to be replaced!**

3. Inspect the HSL5/MME board for any damage during shipping. Also check that the "Option" and "Factory Test" jumpers have been removed.

Remove the Bubble memory.

4. With the Fanuc control powered off and the Emergency Stop (E-STOP) button depressed, gain access to the main master board. Locate the *right-most* Bubble Memory Unit (BMU) board on the *left-hand* side of the masterboard. Carefully remove it with a Philips screwdriver. Place the BMU in the anti-static box supplied, and set it aside.

Install the MME memory.

5. Install the HSL5/MME in the slot where the BMU was removed once again using the Philips screwdriver.

6. Activate E-Stop by pushing it in.

7. Start the Control by holding down [.] and [-] on the MDI Panel. The CRT will display the message "COMMAND? =" (You will be in the IPL, Initial Program Load screen).

8. Set first software tape in the tape reader and move the switch to Auto. Depress the [L] key on the MDI panel. The control should begin loading the tape.

9. At the end of the first volume, the CRT will flash "COMMAND? = ". Rewind the first tape and replace it with the second tape. Press [L] to continue.

10. Repeat the last step to finish loading of the 5 system tapes.

11. When all the system tapes have been loaded, press [G] . Wait for the system to boot up to the "Position" screen.

12. Turn ON the control panel. Turn ON the "PWE" (Parameter Write Enable) switch on the edge of the control's system board, and push the

Emergency Stop button in.

13. Load Tape 6: PC PROGRAM in the tape reader.

14. Select MDI Mode.

15. Select the Parameter Screen.

16. Change parameter 41 to enable bit 7. Type “P41 = 10000000” then press INPUT.

17. Press the “P.C.” button and page down to the “PGM” page.

18. Look for #RT from the Menu and type “#RT” then push INPUT (Read Tape =#RT). The tape should start loading. The CRT flashing the word “EXEC” can confirm this.

19. When the tape finishes, press PAGE DOWN and type in “#SP” then, INPUT. This will Save the Program. The CRT will display “END” when the operation has completed.

20. Push “PC” to display the PC Parameter screen. Manually enter the PC Parameters by using the cursors to select the parameter, press “P”, the value, then INPUT. The PC Parameters are located at parameter 1000 for the Timers, 2000 for the Counters, 3000 for the Keep Relays and 4000 for the Data Tables.

    Be sure to enter Parameter 3320, bit 0 (right-most bit) = 1. If this parameter is not installed, when the control is turned ON, you could get an alarm reset light.

21. Go to the Parameter Screen. Set parameter 41, bit 7 (left-most digit) to a 0.

22. Turn the power OFF, then ON.

23. Select MDI mode.

24. Load tape #7: NC Parameter Tape on the tape reader.

25. Type “PARAM”, then push READ.

26. The NC Parameter tape should now be loading.

27. When the tape has finished loading, rewind the tape manually and load in Tape #8: Pitch Error Compensation.

28. Once again, enter “PARAM”, then READ. The Pitch Error Compensation tape should now be loading.

29. When the tape finishes loading, power off the control. Disable the PWE switch on the main control masterboard.

Check the Parameters

30. Turn on the control with the Emergency Stop button pressed in. Check that the parameters have been entered correctly. If the Pitch Error Compensation parameters did not load in at parameter 7000, go back to step 28 try again. Check all your parameters, tool offsets etc., carefully. At the program screen, in EDIT mode, view the directory by pressing CAN then ORIGIN . This will verify the available memory in the new HSL5/MME.

31. Initiate a Parameter Sentry *"SAVE"* operation to save your parameters to non-volatile memory. It is best to do this when there are no part programs present as the directory that is saved should be clear of entries.

    Test your machine thoroughly. You can proceed to the section of this manual entitled "Verify Your Control" for assistance.

Part II – Slot 2, 3, 4 Replacement or Add-in

1. Before starting the installation, power on the control and verify that the machine tool is in good working order.

Important!

2. Make sure that you have a current backup of the NC parameters, including PC Parameters, Tool Offsets, Pitch Error Compensation, and Part Programs. For instructions on downloading your control's information, refer to previous section entitled "Backup Your Control".

3. Inspect the Memex memory board (MME) for any damage during shipping. Also check that the "Option" and "Factory Test" jumpers have been removed.

Remove the Bubble memory.

4. With the Fanuc control powered off and the Emergency Stop (E-STOP) button depressed, gain access to the main masterboard. Find the Bubble Memory Unit (BMU) board you want to replace on the left-hand side of the masterboard. If you intend to add this memory board to the control, locate a spare slot to the left of Slot 1 (Slot 1 is the right-most BMU position at the left side of the masterboard). Carefully remove it with a Philips screwdriver. Place the BMU in the anti-static box supplied, and set it aside.

Install the MME Memory.

5. Install the HSL5/MME in the slot where the BMU was removed once again using the Philips screwdriver.

CAUTION!

6. With the RESET "Reset" and PRGRM "Program" keys depressed on the front MDI panel, power on the control. This action will cause the control to start-up and immediately clear the entire program memory of the HSL5/MME. If the control will not power on at this point, check that the cabinet door interlock is bypassed. The control may take a few seconds to clear the entire memory.

Check the Parameters

7. The control should display the position screen. Check all your parameters, tool offsets etc., carefully. At the program screen, in EDIT mode, view the directory by pressing PGM twice. This will verify the available memory in the new HSL5/MME.

8. Test your machine thoroughly. You can proceed to the section of this manual entitled "Verify Your Control" for assistance.

Restoring your Fanuc® 9

Loading Part Programs

1. Any macro programs that have been protected from editing will not be loaded. On a Fanuc 9, check that parameters 3 and 25 have bit 0 = 0.
   - To release the Macro Program "Edit Protect" on a Fanuc 9:
     - Select MDI Mode.
     - Switch PWE to the ON position (ignore the PW100 alarm).
     - Press the [PARAM] key to display the Parameter Screen.
     - Set parameter 3 bit 0 and 25 bit 0 (right most digit) to a 0 (zero).
     - Switch PWE to the OFF position.
     - Press [RESET] to clear the PW100 alarm.
   - Make the computer ready to send the program file.
   - Press [PRGRM] to display the Program Screen.
   - Press [O] [-] [9] [9] [9] [9] [READ]
   - Send the programs to the control from your computer.

2. If the programs were protected, restore parameters 3 and 25 to their original values.

Appendix

Technical Summary for Fanuc 9

PUNCHING:

Punch NC Parameters	-	EDIT mode, PARAM screen, key "P-9999", Punch
Punch Pitch Error Compensation	-	EDIT mode, PARAM screen, key "P-9998", Punch
Punch All Programs	-	EDIT mode, PGRM screen, key "O-9999", Punch
Tool Offsets	-	EDIT mode, OFSET screen, key "P-9999", Punch

READING:

Load NC Parameters	-	EDIT, E-Stop, PWE, PARAM screen, key "P-9999", Read
Load Pitch Error Compensation	-	EDIT, E-Stop, PWE, PARAM screen, key "P-9998", Read
Load All Programs	-	EDIT mode, PGRM screen, Mem. Protect Key, key "O-9999", Read

CLEARING:

Delete Directory and Programs - Power On holding "RESET" + "PRGRM"
(Programs O8000 – O9999 will be protected/not deleted, if Parameter 46.7 = 1 during all delete operation)

Fanuc 9A
Maximum Memory: 3840 Meters (max BMU size = 1280M)

Parameter	Function		Description
0.0	0=No TV check	1 = TV check	Tape Vertical Parity checking
0.3	0=Tape Reader	1=1st Port	Input Device. If 0.3=1, also see Parameter 2000
1.0	0=ISO	1=EIA	Output Format (choose ISO)
1.4	0=RS-232	1=FDD	Output Device.
7.0-3	9600 = xxxx 1010 4800 = xxxx 1001 2400 = xxxx 1000 1200 = xxxx 0111 600 = xxxx 0110 300 = xxxx 0101		Baud Rate for Serial Port for Fanuc 9A
7.4	0=1	1=2	Stop Bits (leave at 0 - for standard Fanuc E-7-1)
7.5	0=DC Codes	1=Not Used	Software handshaking (leave at 0 for serial)
7.6	0=Not Used	1=Used	Bubble Cassette used for I/O device?
7.7	0=Tape Feed	1=No Feed	Punches tape feed at start of file
21.0	0=LF, CR, CR	1=LF	End of line (EOB) code on punch
2000	0=ASR33 1=RS232C 2=RS232C 3=RS232C		Specify the first Input Device (Set to 1)
2001	0=ASR33 1=RS232C 2=RS232C 3=RS232C		Specify the first Output Device (Set to 1)
3.0	0=Editable	1=No Edit	Are programs O8000 – O8999 protected?
25.0	0=Editable	1=No Edit	Are programs O9000 – O9999 protected?

Standard Fanuc Serial Port: (DB-25 Female)

1 = Frame Ground	6 = Data Set Ready
2 = Transmit Data	7 = Signal Ground
3 = Receive Data	8 = Carrier Detect
4 = Ready To Send	20= Error (Data Terminal Ready)
5 = Clear To Send	25= +24 Volts

The usual software handshaking cable configuration has 2,3 & 7 connected through, with 4&5 jumpered (hardware handshake lines) and pins 6,8 & 20 jumpered on the Fanuc side only.

Bubble Memory Board Sizes (for all):

A87L-0001-0018	320 M	128 K
A87L-0001-0084	320 M	128 K
A87L-0001-0085	640 M	256 K
A87L-0001-0086	1280 M	512 K

Remember to check SETTING Screen Data. Tool Offsets can be downloaded but the G10/G11 option must be enabled to reload them. They are loaded serially into program memory, then executed like a regular Part Program.

Fanuc System 9 Machine Parameter Worksheet

Company:_____ Machine No.:_____ Date:_____

Fanuc 9A Software Version: _____ Masterboard No.:_____

Setting Data Screen

X Mirror Image		Punch Code	
Y Mirror Image		Input Unit	
A Mirror Image		Input Device 1	
TV Check		Input Device 2	

NC-Service Parameters

Par.#	Value	Par.#	Value	Par.#	Value	Par.#	Value	Par.#	Value
0		24				2000			
1		25				2001			
2		74				3202			
3		75				3000			
4		76							
5		77							

PC-Parameters

		Timers				Counters		Keep Relays	
No.	Data	No.	Data	No.	Data	No.	Data	No.	Data
600		1001		1021		2001		3013	
601		1002		1022		2002		3014	
602		1003		1023		2003		3015	
603		1004		1024		2004		3016	
604		1005		1025		2005		3017	
605		1006		1026		2006		3018	
606		1007		1027		2007		3019	
607		1008		1028		2008		3020	
608		1009		1029		2009		3021	
609		1010		1030		2010		3022	
610		1011		1031		Keep Relays		3023	
611		1012		1032		3000		3024	
612		1013		1033		3001		3025	
613		1014		1034		3002		3026	
614		1015		1035		3003		3027	
615		1016		1036		3004		3028	
616		1017		1037		3005		3029	
617		1018		1038		3006		3030	
618		1019		1039		3007		3031	
619		1020		1040		3008		3032	
						3009		3033	
						3010		3034	
						3011		3035	
						3012		3036	

Par.# = Parameter Number

SPECIFICATIONS

Electrical:	Input Power Voltage:	5 VDC +/- 5%
	5V Power Consumption:	3.75 Watts (750 mA) Maximum
	Battery Life:	Over 3,000 Discharge Cycles or 10 Years
	No-Power Data Retention:	1 Year @ 24 °C (Typical)
Physical:	Temperature (Operating):	-20 to +60 °C
	Temperature (Storage):	10 to 30 °C
	Humidity (Operating):	10 to 90% (non-condensing)
	Humidity (Storage):	10 to 60% (non-condensing)
	Dimensions:	12.1” L x 5.9” W
Processors:	HSL:	16.6666 MHz 32 Bit CPU Engine

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