FANUC

GE Fanuc Automation

Programmable Control Products

Series 90™-30
Demonstration Case

User's Manual

GFK–0485

February 1990

WARNINGS, CAUTIONS, AND NOTES AS USED IN THIS PUBLICATION

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WARNING
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Warning notices are used in this publication to emphasize that hazardous voltages, currents, temperatures, or other conditions that could cause personal injury exist in this equipment or may be associated with its use.

In situations where inattention could cause either personal injury or damage to equipment, a Warning notice is used.

```
CAUTION
```

Caution notices are used where equipment might be damaged if care is not taken.

NOTE

Notes merely call attention to information that is especially significant to understanding and operating the equipment.

The following are trademarks for products of GE Fanuc Automation North America, Inc.

Alarm Master	GEnet	Modelmaster	Series Three	Series 90
Cimplicity	Genius	ProLoop	Series Five	VuMaster
Cimstar	Logicmaster	Series One	Series Six	Workmaster

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1. Introduction

1.1 Basic Description

The GE Fanuc Series 90-30 demonstration case is a versatile, portable device that is designed to perform numerous control functions, either as an independent Programmable Logic Controller, or in conjunction with several external simulation or control devices. It is based on the new Series 90-30 Programmable Logic Controller, and consists of two racks, capable of accommodating up to seventeen plug in modules, including wide-range power supplies that operate on any voltage between 83 and 264 VAC, and powerful Central Processing Units (CPU) with Random Access Memory built in. One rack, which has its CPU built into the rack itself, can accommodate five plug in I/O modules, while the other rack, which uses a modular plug in CPU, can accommodate nine I/O modules. Each rack is a fully functional system, capable of operating independently, or together. An outline drawing of the case is shown below:

a43871
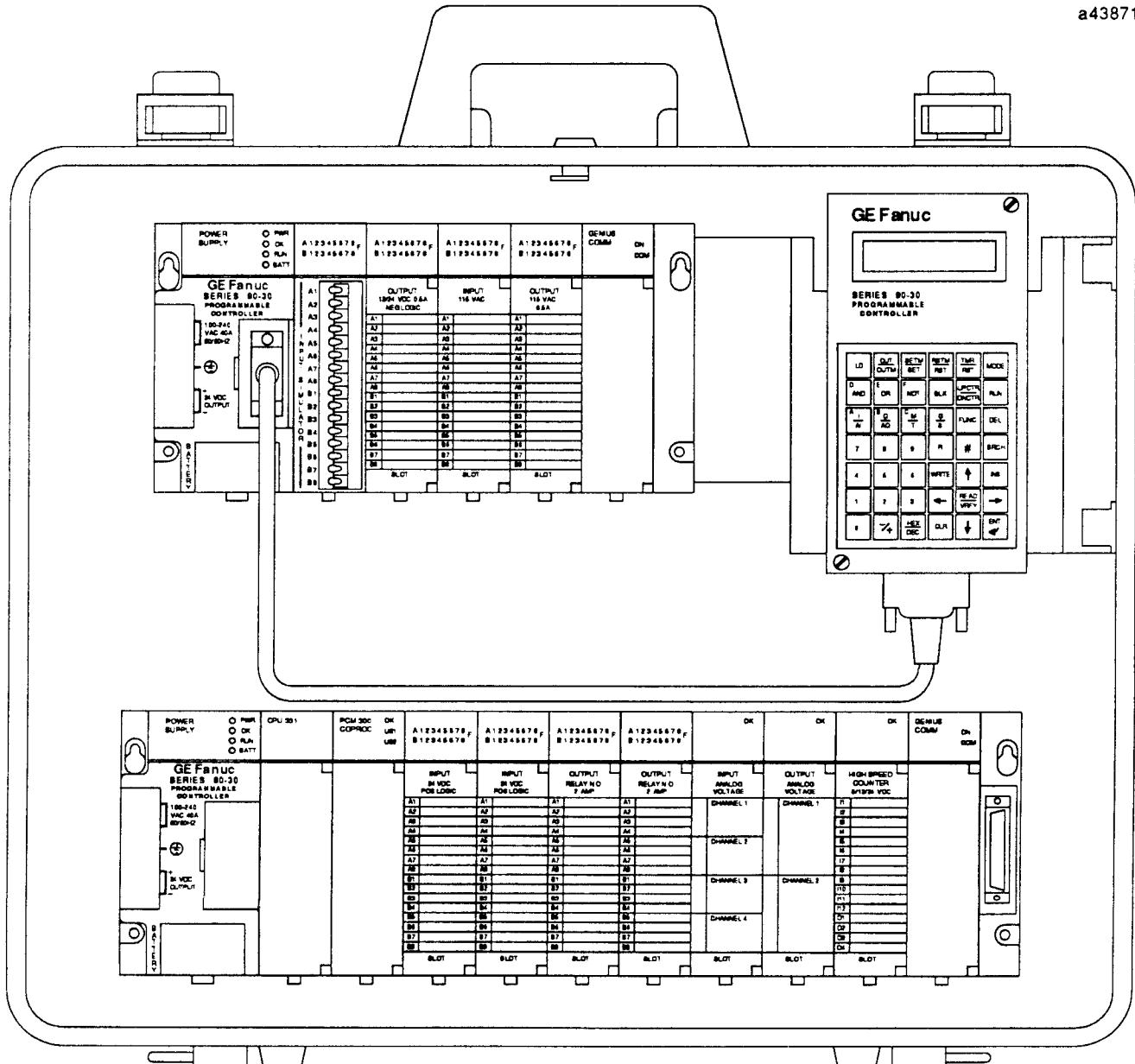
Modules included with the demonstration case allow interfacing to common Input and Output devices, such as thumbwheels, toggle switches, Light Emitting Diodes (LED's), and a Binary Coded Decimal (BCD) display. Additionally, the case contains several specialized modules which allow operations with more sophisticated control devices. For example, the High Speed Counter module allows interfacing to optical encoders, used primarily for position control applications. The same module can be used for parts production tracking, and high speed counting of digital input pulses from a variety of discrete input devices.

Another extremely versatile module, the Programmable Coprocessor Module (PCM), can be used for data acquisition, data storage and retrieval, and operator interface applications, through the use of a BASIC language interpreter called MegaBasic, and one of several user devices, such as barcode readers, displays, serial printers, or personal computers. Furthermore, the PCM can be used for communications to external Programmable Controllers in the Series 90 Family, or any device capable of utilizing the GE Fanuc Series Six™ CCM protocol. Additionally, Analog Input and Output modules are an integral part of the demonstration case, which can be used for simulation or control functions with devices such as temperature, pressure, and flow transducers, or motor drives, hydraulic actuators and signal meters.

Another module, perhaps the most dynamic and multipurpose module in the system, is the Genius Communications Module. The module is used primarily as the central communication device of the Genius Global I/O system, a high speed, serial communications link used for transfer of digital information between Genius compatible systems, such as the Series 90-70, Series Six, or Series Five™ PLCs.

1.2 Modes of Operation

Because of the power built into the demonstration case, it is possible to use the system for much more than product or sales-oriented displays, although these items were central themes in the design of the case. The case can also be used quite effectively for control systems at local Programmable Controller shows, and for system mockups at sales or customer locations. Since the case is a fully functional operating system, it can be used for functional testing and simulation of actual processes at customer sites, and is an invaluable aid in areas of training on both the classroom and self-paced levels.

1.3 Interfacing Options

The demonstration case is capable of operating on its own, as an independent unit, without other devices attached. Although the system does not have "real-world" devices directly attached, it is useful in this stand-alone mode for program development, and basic familiarization and training. In this mode, a Workmaster™ II is used as the programming device, along with Logicmaster™ 90-30, to enter and edit programs, and to monitor the operation of the Series 90-30 PLC.

The demonstration case is, however, much more powerful when interfacing to the GE Fanuc Universal Simulator, a system which has all the devices necessary to demonstrate the functionality of the modules in the Series 90-30 demonstration case.

These devices include a gas plasma display for connection to the PCM, Analog I/O potentiometers and meter, discrete devices like thumbwheels, toggle switches, Light Emitting Diodes, and a BCD display. Additionally, a hand controlled encoder is attached for interfacing to the High Speed Counter. An added accessory of the Universal Simulator is a 101-key keyboard, used for configuring, controlling, and developing programs for the PCM in the Series 90-30 demonstration case. Furthermore, all cables for interfacing the Series 90-30 demonstration case to the Universal Simulator are included with the Series 90-30 demonstration case.

The Series 90-30 demonstration case can also be used in conjunction with the Series 90-70 demonstration case, to demonstrate the commonality of the Series 90 Family of PLCs, particularly in areas like Genius Global Data transfers, and communications, using the PCM, which is common to both PLCs. In the same area of communications, the PCM of either the Series 90-30 or the Series 90-70 demonstration case can be interfaced to other GE Fanuc PLCs, like the Series Six, Series Five, or Series One™, which all use a common communications protocol. The GE Fanuc Operator Interface Unit (OIT) can also be used as an operator interface device, for message display, operator control, or monitoring purposes with the PCM. For simple discrete input and output functions, the Series 90-30 I/O modules can also be wi_d to a smaller, more compact simulator, called the Series 90-70 I/O Simulator.

In summary, the Series 90-30 demonstration case is a superior, functional demonstration system, which can be interfaced to a wide variety of devices in order to accommodate the needs of the individual in a multitude of situations.

2. Unpack/Install

2.1 Packing List

- A fully assembled and tested Series 90-30 demonstration case containing:

  5 Slot 311 CPU/Rack
  30w Power Supply and Power Cord
  Input Simulator Module
  Relay Output 16 pt Module (Some early systems had 24V output here.)
  115 VAC Input 16 pt Module
  115 VAC Output 12 pt Module
  Genius Communications Module and Cable

  Hand Held Programmer and Cable

  10 Slot Rack
  30w Power Supply and Power Cord
  331 CPU and Programming Cable***
  PCM 'Y' Cable, and RS232 Cable*
  24V Input 16 pt Module and Cable**
  24V Input 16 pt Module and Cable**
  24V Output 16 pt Module and Cable** (Some early systems had Relay output here.)
  24V Output 16 pt Module and Cable** (Some early systems had Relay output here.)
  Analog Input Module and Cable*
  Analog Output Module and Cable*
  High Speed Counter and Cable*
  Genius Communications Module and Cable

      * Cable to be used with the Universal Simulator
     ** Cable to be used with the Universal Simulator or the Series 90-70 I/O Simulator
  *** Cable to be used with the Workmaster II

- A complete set of Series 90-30 Instruction Manuals.
- A 3.5 inch backup disk with DEMO30, DEMO31, TEST30 ladder programs and PCM Program and Text files.
- This Instruction Manual.

2.2 Minimum Requirements

The Series 90-30 demonstration case can be used alone or with almost any combination of other GE Fanuc equipment depending on the interests of the audience.

2.3 Physical Description

The Series 90-30 demonstration case is contained in an aluminum case for easy portability. In the case is a standard 5 slot 311 CPU/rack and a standard 10 slot 331 CPU rack populated with the modules listed above. It has been fully tested with the Universal Simulator and comes loaded with the standard ladder and PCM demonstration programs.

2.4 Pre Installation Setup/Checkout

- Check for shipping damage and make sure all the modules are seated in the racks.

2.5 Installation

- Connect the cables to any other equipment to be used, such as the Universal Simulator, and Workmaster II.

  The cables to the Universal Simulator are labeled as to which plug they connect to and are of the easy snap on/off variety that do not require a screw driver.

- Remove the keyboard from the lid of the Universal Simulator case and plug it into the keyboard connector.

- Make sure the 115 to 230 selector switch on the Universal Simulator is set to the proper position.

- Connect all equipment to an appropriate power source.

2.6 Power Up/Verification

When power is applied to the Series 90-30s, the top two lights on the Power Supplies should come on and the top light on the PCM, Analog Modules, High Speed Counter, and Genius Communications Modules should flash for a while and then stay on.

The Run light on the Power Supplies should reflect the state of the CPUs.

The User 1 light on the PCM should flash when the screen on the Universal Simulator is being updated.

The lights on the Input and Output modules may or may not be on depending on the state of the simulator switches and ladder program.

If a Universal Simulator is connected and turned on, the screen should show the main menu with 7 possible selections.

3. Setup

3.1 Possible Configurations

There are many possible system configurations. The standard demonstration programs assume the following configuration:

```
 _____        _____
|                |      |                                   |
|   UNIVERSAL    |      |         SERIES   90 - 30          |
|   SIMULATOR    |      |       DEMONSTRATION   CASE        |
|                |      |     CPU 331           CPU 311     |
|_____|      |_____|
   |_____|  |   |    |_____|
                          |__|                  |
                  _____|_____           ___|___
                 |  WORKMASTER    |         |       |
                 |      II        |         |  HHP  |
                 |_____|         |_____|
```
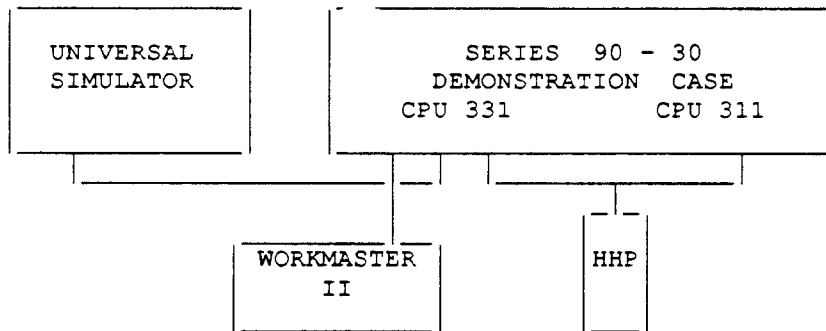
Suggested Configuration

The Universal Simulator is used to show the power of the PCM and digital and analog inputs and outputs.

The Hand Held Programmer (HHP) shows a convenient tool for monitoring and programming.

The Workmaster II is used to show LM90 and the Series 90-30 instruction set.

3.2 Other Possibilities

The Workmaster II screen or a Monochrome OIT could be used in place of the Universal Simulator screen. Using a Workmaster II screen also allows use of an overhead projector for larger audiences using a VGA display device.

A Series 90-70 I/O Simulator could be used in place of the Universal Simulator switches and lights if the audience does not require the screen or analog I/O.

A Series 90-70 demonstration case could be connected to the Genius Bus to show Genius Global Communication. If this is done, some configuration and ladder changes will have to be made in the Series 90-70.

4. Operation

4.1 PCM Demonstration

The PCM Demonstration contains a Main Menu with several possible selections. There are two selections, one for the Series 90-30 and one for the Series 90-70, that contain a scrolling window of many of the significant features of each control. These can be used as the basis for many product presentations. There is a screen that lists many of the Logicmaster 90 programming and configuration features. Next there is a set of three application screens showing Manufacturing, Process, and Material Handling. There is a Fault Table screen that shows the I/O Fault Table from Logicmaster 90. Also there is a PCM animation screen that shows the speed of processing and screen update capability of the PCM. Lastly there is a selection to allow the customizing of the feature screens with the audience name.

The PCM Demonstration can be operated without further instructions by just reading the prompts on the screen. But here are some hints that will make things go smoother:

1. The first thing to do to prepare for a demonstration is to go to number 7 on the main menu and enter the audience name. This is not required but it adds a nice touch. You can put in anything you want up to 30 characters. Some samples are:

```
                    TO  R  P  COLLINS  and  STAFF

                          JOE'S  CAR  WASH

                            ACME  AND  CO.

                         TO  ALL  OUR  FRIENDS

                     TO  THE  PODUNK  INDUSTRIAL  SHOW
```

   Whatever you put in will then show up centered on the upper part of the two features screens. This field is cleared whenever item 7 is selected.

2. Select the Series 90-30 Features screen. Every 5 seconds a new feature scrolls into the scroll window. To pause on a feature, hit the space bar. This allows a discussion of any topic for as long as required. A second hit of the space bar advances to the next feature. The space bar can also be used to skip a feature that is of little interest. The scrolling feature list will repeat continuously if left undisturbed.

   The Escape or Enter keys will always bring you back to the Main Menu.

3. The Logicmaster Features screen is a static screen showing a list of logicmaster programming and configuration features.

4. The Application Demonstration screen shows a sub menu of sample industry applications. All of these screens show screen animation and screen update speed, PCM to CPU communication and the graphics possibilities of the PCM and MegaBasic. A description of each application follows:

   A. Manufacturing - Shows a simulated Paint Shop with cars moving along the conveyor, going through one of two paint booths and then through the baking oven. The speed of the cars is controlled by the number in the Universal Simulator thumbwheel switches. The smaller the number, the faster the cars move. Turning on switch 9 on the Universal Simulator simulates a fan failure, shuts the line down, and displays an error message.

B. Process - Shows a line of simulated Wine Presses with various valves that can be controlled by switches 1 through 6 on the Universal Simulator. Switch 1 is the master control and must be on in order to get any wine. Then switches 2, 3, 4, and 5 will control the number of presses that receive grapes to be crushed. With switch 1 and a combination of switches 2 - 5 on you will see the wine dribble out the lower pipe.

C. Material Handling - Shows a Tank Farm with 8 tanks that you can use to hold your wine. Each tank has an inlet/discharge valve that you can control using switches 1 through 16 on the Universal Simulator. Each valve can be closed, half open, or full open. Each tank has a level indicator and when any tank reaches an overflow condition, an error message is displayed. If any tank is left unattended with its valve open, it will cycle from empty to full and back to empty.

5. The Fault Table screen shows a simulation of the Logicmaster I/O Fault Table. A future project is to update this screen from the CPU.

6. The PCM Animation screen shows 8 bar graphs all being updated in a random manor from 8 independent timed interrupts in the PCM. This screen shows the tremendous speed of the PCM, and its ability to keep screen information current.

7. The structure of the PCM demonstration program is shown below:

```
                    ┌─────────────┐              
                    │ BASIC.PGM   │        ┌──────────────┐
                    └──────┬──────┘        │ VT100_5.CRN* │
                    ┌──────┴──────┐        └──────────────┘
                    │ S90_DEMO.CRN│         *Accessed from
                    └──────┬──────┘           each file.
          ┌───────────┬────┴────┬────────────┐
   ┌──────┴─────┐ ┌───┴────────┐ ┌──┴───────┐ ┌──┴───────┐
   │FEATUR30.CRN│ │FEATUR70.CRN│ │LM90TU.CRN│ │FLTTBL.CRN│
   └────────────┘ └────────────┘ └──────────┘ └──────────┘
                    ┌──────┴──────┐        ┌──────┴──────┐
                    │ SYSDEMO.CRN │        │ GRAPH1.CRN  │
                    └──────┬──────┘        └─────────────┘
          ┌───────────┬────┴────────┐
   ┌──────┴─────┐ ┌───┴───────┐ ┌───┴───────┐
   │MANUFACT.CRN│ │PROCESS.CRN│ │MAT_HAND.CRN│
   └────────────┘ └───────────┘ └───────────┘
```
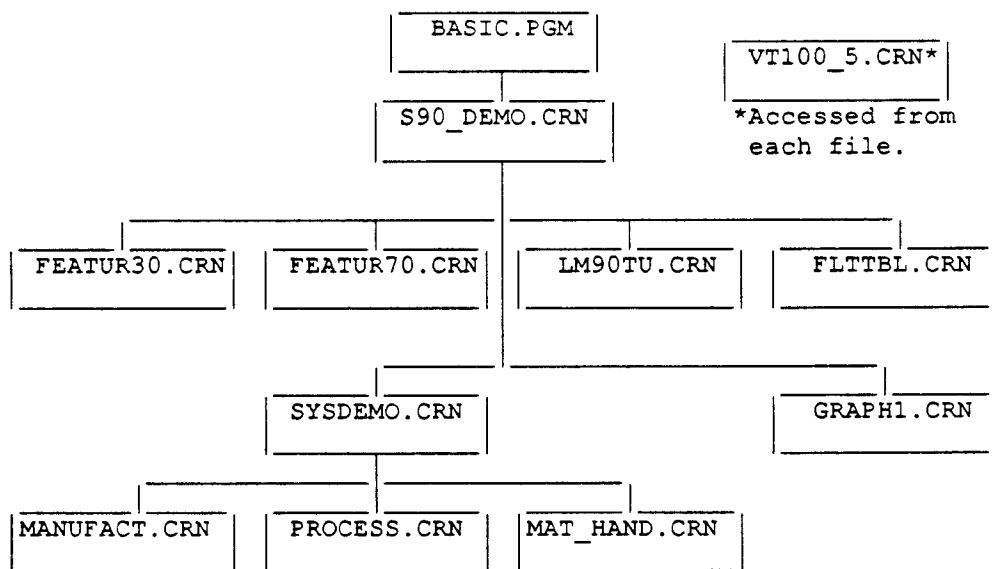
4.2 DEMO30 Ladder

The DEMO30 and DEMO31 ladder programs show many of the features and capabilities of the Series 90-30 PLC. First, it contains a working sample of each ladder instruction and function block. These samples are grouped according to their logicmaster function key groups. And second, you can use the Workmaster II and Logicmaster 90-30 to show the programming and configuration software and the on line monitoring of the program and status tables.

The DEMO30 resides in the 90-30 plc model 331. The program consists of blocks of code defined by JUMP statements. There are 2 main sections, AUTO and MANUAL. Within the MANUAL section are 16 subsections. Upon power up of the 90-30 PLC model 331, the FIRST SCAN contact forces it into MANUAL. When in manual, setting the thumbwheel switches to a number between 0 and including 15, then toggling switch 16 will activate a subsection of the program. Each

subsection has a heading (label). Search for that heading and then follow the instructions in the comment following the heading. The subsection headings and there corresponding thumbwheel index number are as follows:

```
0) SETUP,   1) RELAYS,   2) TMR,        3) CNTR,    4) MATH,     5) RELATN,
6) BITOP,   7) DATAMV,   8) reserved,   9) CONVRT, 10) CONTRL, 11) SYSREFS,
12) CCM,    13) HSC,     14) reserved, 15) reserved.
```

The SETUP section is for housekeeping and some simple checkout of the system. It connects all 16 switches to the corresponding lights. If switch 1 is on and 2 is off the -10 to +10 pot is connected to the meter. If switch 1 is off and 2 is on the 0 to +10 pot is connected to the meter. If switch 3 is on and switch 4 is off the -10 to +10 pot is connected to the BCD display. If switch 3 is off and switch 4 is on the encoder is connected to the BCD display.

Sections 1 through 11 demonstrate all the instructions in the 90-30. Section 12 demonstrates CCM communications and section 13 shows how to configure the HSC.

The AUTO section cleverly bounces around the Universal Simulator lights. Using the Genius Communication feature, a bit is sent to the 90-30 PLC model 311 to count how many times the lights have shifted back and forth. The 90-30 PLC model 311 then sends the count back to the 90-30 PLC model 331 to show on the BCD display.

If you have the 90-30 PLC model 311 connect through Genius Communications to the 90-30 PLC model 331, then use the I/O simulator module in the 90-30 PLC model 311 to go in and out of AUTO and MANUAL. Toggle switch 1 to go into MANUAL. Toggle switch 2 to go into AUTO. If you only have the model 331 then turn the 2 pots all the way up (full scale +10) to go into MANUAL. Set the thumbwheels to 9999 and toggle switch 16 to go into AUTO.

4.3 DEMO31 Ladder

This program resides in the 90-30 PLC model 311. As mentioned above, it communicates with the 90-30 PLC model 331 over Genius Communications. It receives a bit from the other controller indicating the lights shifted back and forth which it uses for an up counter. It then send the accumulated count back to the other controller. The only other code in there is a timer and counter sequence for turning on the outputs of the 120V module.

5. In Case of Trouble

5.1 I/O Map

This I/O Map has been used for all standard demonstration programs. It should be used as a base for all future developments.

311 CPU - 5 Slot Rack

```
              %I            %Q           %G
      0
            ┌─────────┐              ┌─────────┐
     16     │ INPUT   │              │ GENIUS  │
            │ SIMULATR│              │ COMM 16 │
            │ 1-16    │              │ 1-32    │
     32     │         │  ┌─────────┐ │         │
            │         │  │ OUTPUT  │ └─────────┘
     48     │         │  │ RELAY   │
            │         │  │ 33-64   │
     64     ┌─────────┐  │         │
            │ INPUT   │  │         │
     80     │ 115 AC  │  │         │
            │ 65-96   │  │         │
     96     │         │  ┌─────────┐
            │         │  │ OUTPUT  │
    112     └─────────┘  │ 115 AC  │
                         │ 97-128  │
    128                  └─────────┘
```

331 CPU - 10 Slot Rack

	%I	%Q	%AI	%AQ	%G
0			INPUT		
4	INPUT	OUTPUT		OUTPUT	
			ANALOG	ANALOG	
8	DC 16	DC 16	1-4	1-2	
12	1-16	1-16			
16					
20	INPUT	OUTPUT			
24	DC 16	DC 16			
28	17-32	17-32			
32					
36	HIGH SPEED	HIGH SPEED	HIGH SPEED		GENIUS
40	COUNTER	COUNTER	COUNTER		COMM 17
44	33-48	33-48	33-47		33-64
48					
52					
56					
60					
64					

5.2 Series 90-30 Configuration

```
***** 02-04-90  12:48   GE-FANUC SERIES 90-30 DOCUMENTATION (v1.00)
                                    demo30
(*******************************************************************************)
(                                                                               )
(            TOTAL DISCRETE I/O (%I + %Q):      96                              )
(                                                                               )
(            HIGHEST CONFIGURED REFERENCES                                      )
(            ----------------------------------                                 )
(            DISCRETE INPUT          (%I) :     48                              )
(            DISCRETE OUTPUT         (%Q) :     48                              )
(                                                                               )
(            ANALOG INPUT            (%AI) :    47                              )
(            ANALOG OUTPUT           (%AQ) :     2                              )
(                                                                               )
(            REGISTER MEMORY         (%R) :      0                              )
(*******************************************************************************)
```

PS	1	2	3	4	RACK 0 5	6	7	8	9	10
		P R O G R A M M E D			C O N F I G U R A T I O N					
PWR311	CPU331	PCM300	MDL640	MDL640	MDL740	MDL740	ALG220	ALG390	APU300	CMM301
	8 MHZ	PCM	I DC16	I DC16	Q DC16	Q DC16	IALGV4	QALGV2	HSC	GENCOM
			RefAdr	RefAdr	RefAdr	RefAdr	RefAdr	RefAdr		
			%I0001	%I0017	%Q0001	%Q0017	%AI001	%AQ001		

Folder: C:\LM90\FOLDERS\DEMO30   Rack

```
          SERIES 90-30 MODULE IN RACK 0 SLOT   0
+-------+------------------ SOFTWARE   CONFIGURATION ------------------------
|  SLOT | Catalog #: IC693PWR311              POWER SUPPLY 120/240 VAC 15 W
|    0  |
|       |
|PWR311 | ------------------------------------------------------------------
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+


          SERIES 90-30 MODULE IN RACK 0 SLOT   1
+-------+------------------ SOFTWARE   CONFIGURATION ------------------------
|  SLOT | Catalog #: IC693CPU331              SERIES 90-30 CPU, MODEL 331
|    1  |
|       |
|CPU331 | ------------------------------------------------------------------
|       |
|       | IOScan-Stop: NO       Baud Rate  : 19200
| 8 MHZ | Pwr Up Mode: LAST     Parity     : ODD
|       | Logic From : RAM      Stop Bits  : 1
|       | Registers  : RAM      Data Bits  : 8
|       | Passwords  : ENABLED  Noisy Chan : NO
|       |                       Modem TT   :       0     1/100 Second / Count
|       |                       Idle Time  :      10     Seconds
|       |
|       |
+-------+


          SERIES 90-30 MODULE IN RACK 0 SLOT   2
+-------+------------------ SOFTWARE   CONFIGURATION ------------------------
|  SLOT | Catalog #: IC693PCM300              PROGRAMMABLE COPROCESSOR MDL
|    2  |
|       |
|PCM300 | ------------------------------------------------------------------
|       | Config Mode: PCM CFG
| PCM   |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
Folder: C:\LM90\FOLDERS\DEMO30                                    Slot
```

```
            SERIES 90-30 MODULE IN RACK 0 SLOT   3
+-------+------------------- SOFTWARE   CONFIGURATION -----------------------
|  SLOT | Catalog #: IC693MDL640            INPUT 24 VDC 16PT POS LOGIC
|   3   | Ref Addr :    %I0001              Size  : 16
|       |
|MDL640 | --------------------------------------------------------------------
|       |
|I DC16 |
|       |
|RefAdr |
|%I0001 |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
            SERIES 90-30 MODULE IN RACK 0 SLOT   4
+-------+------------------- SOFTWARE   CONFIGURATION -----------------------
|  SLOT | Catalog #: IC693MDL640            INPUT 24 VDC 16PT POS LOGIC
|   4   | Ref Addr :    %I0017              Size  : 16
|       |
|MDL640 | --------------------------------------------------------------------
|       |
|I DC16 |
|       |
|RefAdr |
|%I0017 |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
            SERIES 90-30 MODULE IN RACK 0 SLOT   5
+-------+------------------- SOFTWARE   CONFIGURATION -----------------------
|  SLOT | Catalog #: IC693MDL740            OUTPUT 12/24 VDC 0.5A 16PT POS
|   5   | Ref Addr :    %Q0001              Size  : 16
|       |
|MDL740 | --------------------------------------------------------------------
|       |
|Q DC16 |
|       |
|RefAdr |
|%Q0001 |
|       |
|       |
|       |
|       |
|       |
+-------+
```

Folder: C:\LM90\FOLDERS\DEMO30   Slot

```
              SERIES 90-30 MODULE IN RACK 0 SLOT  6
+-------+------------------- SOFTWARE  CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693MDL740          OUTPUT 12/24 VDC 0.5A 16PT POS
|   6   | Ref Addr :    %Q0017            Size   : 16
|       |
|MDL740 | -----------------------------------------------------------------
|       |
|Q DC16 |
|       |
|RefAdr |
|%Q0017 |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
              SERIES 90-30 MODULE IN RACK 0 SLOT  7
+-------+------------------- SOFTWARE  CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693ALG220          INPUT ANALOG 4PT VOLTAGE
|   7   | Ref Addr :    %AI001            Size   :  4
|       |
|ALG220 | -----------------------------------------------------------------
|       |
|IALGV4 |
|       |
|RefAdr |
|%AI001 |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
              SERIES 90-30 MODULE IN RACK 0 SLOT  8
+-------+------------------- SOFTWARE  CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693ALG390          OUTPUT ANALOG 2PT VOLTAGE
|   8   | Ref Addr :    %AQ001            Size   :  2
|       |
|ALG390 | -----------------------------------------------------------------
|       |
|QALGV2 |
|       |
|RefAdr |
|%AQ001 |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
         SERIES 90-30 MODULE IN RACK 0 SLOT  9
+------+------------------- SOFTWARE   CONFIGURATION -------------------------
| SLOT |  Catalog #: IC693APU300           HIGH SPEED COUNTER MODULE
|   9  |
|      |
|APU300| --------------------------------------------------------------------
|      |   Counter Typ: B         Cnt Filt 1 : HIFREQ
| HSC  |   Ctrl/Status:  %QI0033  Cnt Filt 2 : HIFREQ
|      |   HSC Data   :   %AI033  Pld Filt1&2: HIFREQ
|      |   Failure Mde: NORMAL    Disbl Filt1: HIFREQ
|      |   Osc Input  : OFF       Disbl Filt2: HIFREQ
|      |   Osc Divider:    4
|      |
|      |
|      |
|      |
|      |
+------+


         SERIES 90-30 MODULE IN RACK 0 SLOT  9
+------+------------------- SOFTWARE   CONFIGURATION -------------------------
| SLOT |  Catalog #: IC693APU300           HIGH SPEED COUNTER MODULE
|   9  |
|      |
|APU300| --------------------------------------------------------------------
|      |             --- Type  B  Counter   1 ---
| HSC  |   Strobe1 Edg: POS
|      |   Strobe2 Edg: POS
|      |   Count Mode : CONTINU
|      |   Cnt Sig    : PULS/DIR
|      |
|      |
|      |
|      |
|      |
+------+


         SERIES 90-30 MODULE IN RACK 0 SLOT  9
+------+------------------- SOFTWARE   CONFIGURATION -------------------------
| SLOT |  Catalog #: IC693APU300           HIGH SPEED COUNTER MODULE
|   9  |
|      |
|APU300| --------------------------------------------------------------------
|      |             --- Type  B  Counter   2 ---
| HSC  |   Strobe1 Edg: POS
|      |   Strobe2 Edg: POS
|      |   Count Mode : CONTINU
|      |   Cnt Sig    : PULS/DIR
|      |
|      |
|      |
|      |
|      |
+------+

Folder: C:\LM90\FOLDERS\DEMO30                              Slot
```

```
                SERIES 90-30 MODULE IN RACK 0 SLOT 10
+-------+------------------- SOFTWARE  CONFIGURATION ---------------------------
| SLOT  | Catalog #: IC693CMM301          GENIUS COMMUNICATIONS MODULE
|  10   |
|       |
|CMM301 | ---------------------------------------------------------------------
|       |
|GENCOM | From Addr  :     17      Baud Rate  : 153K STD
|       |
|       | Bus Addr 16: %G001      Length     :    32
|       | Bus Addr 17: %G033      Length     :    32
|       | Bus Addr 18: %G065      Length     :    32
|       | Bus Addr 19: %G097      Length     :     0
|       | Bus Addr 20: %G129      Length     :     0
|       | Bus Addr 21: %G161      Length     :     0
|       | Bus Addr 22: %G193      Length     :     0
|       | Bus Addr 23: %G225      Length     :     0
+-------+
```

```
        -------------------    DISCRETE  INPUTS    (%I)   ------------------
TOTAL  I+Q:  96                              HIGHEST REF CONFIGURED:   48
   REFERENCE  PHYSICAL           IO     MODULE
  START - END  ADDRESS          TYPE     TYPE          DESCRIPTION
  ----------- --------          ------  -------   ------------------------------
  00001-00016 0.3               90-30   I DC16     INPUT 24 VDC 16PT POS LOGIC
  00017-00032 0.4               90-30   I DC16     INPUT 24 VDC 16PT POS LOGIC
  00033-00048 0.9               90-30   HSC        HIGH SPEED COUNTER MODULE

        -------------------    DISCRETE  OUTPUTS   (%Q)   ------------------
TOTAL  I+Q:  96                              HIGHEST REF CONFIGURED:   48
   REFERENCE  PHYSICAL           IO     MODULE
  START - END  ADDRESS          TYPE     TYPE          DESCRIPTION
  ----------- --------          ------  -------   ------------------------------
  00001-00016 0.5               90-30   Q DC16     OUTPUT 12/24 VDC 0.5A 16PT POS
  00017-00032 0.6               90-30   Q DC16     OUTPUT 12/24 VDC 0.5A 16PT POS
  00033-00048 0.9               90-30   HSC        HIGH SPEED COUNTER MODULE

        -------------------    ANALOG  INPUTS      (%AI)  ------------------
TOTAL USED:  19                              HIGHEST REF CONFIGURED:   47
   REFERENCE  PHYSICAL           IO     MODULE
  START - END  ADDRESS          TYPE     TYPE          DESCRIPTION
  ----------- --------          ------  -------   ------------------------------
  00001-00004 0.7               90-30   IALGV4     INPUT ANALOG 4PT VOLTAGE
  00033-00047 0.9               90-30   HSC        HIGH SPEED COUNTER MODULE

        -------------------    ANALOG  OUTPUTS     (%AQ)  ------------------
TOTAL USED:   2                              HIGHEST REF CONFIGURED:    2
   REFERENCE  PHYSICAL           IO     MODULE
  START - END  ADDRESS          TYPE     TYPE          DESCRIPTION
  ----------- --------          ------  -------   ------------------------------
  00001-00002 0.8               90-30   QALGV2     OUTPUT ANALOG 2PT VOLTAGE
```

```
----------------------   REGISTER MEMORY    (%R)  -------------------
TOTAL USED:   0                       HIGHEST REF CONFIGURED:   0
 REFERENCE   PHYSICAL        IO    MODULE
START - END  ADDRESS         TYPE   TYPE         DESCRIPTION
-----------  --------       ------ -------  ------------------------------------

               No Entries for this Reference Type

------------------ SEAMLESS GLOBAL MEMORY   (%G)  -------------------
TOTAL USED:   96                      HIGHEST REF CONFIGURED:   96
 REFERENCE   PHYSICAL        IO    MODULE
START - END  ADDRESS         TYPE   TYPE         DESCRIPTION
-----------  --------       ------ -------  ------------------------------------
00001-00032  0.10.0.16       90-30  GENCOM   GENIUS COMMUNICATIONS MODULE
00033-00064  0.10.0.17       90-30  GENCOM   GENIUS COMMUNICATIONS MODULE
00065-00096  0.10.0.18       90-30  GENCOM   GENIUS COMMUNICATIONS MODULE

   CPU MEMORY CONFIGURATION FOR Model 331 CPU:

      Discrete Input     (%I)    512   Points
      Discrete Output    (%Q)    512   Points
      Internal Discrete  (%M)   1024   Points
      System Use         (%S)    128   Points
      Temporary Status   (%T)    256   Points
      GENIUS Global      (%G)   1280   Points
                                ----   -----
      TOTAL DISCRETE MEMORY:    3712   Points

      Analog Input       (%AI)   128   Words
      Analog Output      (%AQ)    64   Words
      Register Memory    (%R)    2048   Words

      TOTAL LOGIC MEMORY        11904  Bytes

      CPU MEMORY TOTAL          16384  Bytes

   POINT FAULT REFERENCE           DISABLED

   FAULT CATEGORY CONFIGURATION:
      Loss of or Missing Rack                F
      Loss of or Missing IOC                 F
      Loss of or Missing I/O Module          F
      Loss of or Missing Option Module       F
      System Bus Failure                     F
      IOC Fault (I/O Bus Fault)              F
      System Config Mismatch                 F
Folder:  C:\LM90\FOLDERS\DEMO30                                      CPU
```

```
***** 02-04-90  12:47    GE-FANUC SERIES 90-30 DOCUMENTATION (v1.00)
                                  demo31
(**********************************************************************)
(                                                                      )
(              TOTAL DISCRETE I/O (%I + %Q):       60                  )
(                                                                      )
(              HIGHEST CONFIGURED REFERENCES                           )
(              ------------------------------                          )
(              DISCRETE INPUT          (%I) :      32                  )
(              DISCRETE OUTPUT         (%Q) :      28                  )
(                                                                      )
(              ANALOG INPUT            (%AI) :      0                  )
(              ANALOG OUTPUT           (%AQ) :      0                  )
(                                                                      )
(              REGISTER MEMORY         (%R) :       0                  )
(**********************************************************************)

+-------------------------------------------------+
|------+------+--- RACK 0 --+------+------         |
|PS/CPU|  1   |  2   |  3   |  4   |  5            |
|====== PROGRAMMED  CONFIGURATION ======           |
|                                                  |
|PWR321|ACC300|MDL940|MDL240|MDL310|CMM301         |
|                                                  |
|CPU 30|IN SIM|QRLY16|I AC16|Q AC12|GENCOM         |
|                                                  |
|      |RefAdr|RefAdr|RefAdr|RefAdr|               |
|      |%I0001|%Q0001|%I0017|%Q0017|               |
|                                                  |
|====================================              |
|      |      |      |      |      |               |
|      |      |      |      |      |               |
|      |      |      |      |      |               |
+------+------+------+------+------+------+         
```

Folder: C:\LM90\FOLDERS\DEMO31   Rack

```
         SERIES 90-30 MODULE IN RACK 0 SLOT   0
+-------+----------------- SOFTWARE  CONFIGURATION ----------------------------
| SLOT  |  Catalog #: IC693PWR321          POWER SUPPLY 120/240 VAC 30 W
|   0   |
|       |
|PWR321 | -----------------------------------------------------------------------
|       |
|CPU 30 |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
         SERIES 90-30 MODULE IN RACK 0 SLOT   0
+-------+----------------- SOFTWARE  CONFIGURATION ----------------------------
| SLOT  |  Catalog #: IC693CPU311          BASE 5-SLOT WITH CPU 311
|   0   |
|       |
|CPU311 | -----------------------------------------------------------------------
|       |  IOScan-Stop: NO        Baud Rate  : 19200
| 8 MHZ |  Pwr Up Mode: LAST      Parity     : ODD
|       |  Logic From : RAM       Stop Bits  : 1
|       |  Registers  : RAM       Data Bits  : 8
|       |  Passwords  : ENABLED   Noisy Chan : NO
|       |                         Modem TT   :     0     1/100 Second / Count
|       |                         Idle Time  :    10     Seconds
|       |
|       |
|       |
+-------+
```

```
         SERIES 90-30 MODULE IN RACK 0 SLOT   1
+-------+----------------- SOFTWARE  CONFIGURATION ----------------------------
| SLOT  |  Catalog #: IC693ACC300          INPUT SIMULATOR MODULE
|   1   |
|       |
|ACC300 | -----------------------------------------------------------------------
|       |  Ref Adr    :   %I0001
| IN SIM|  Length     :    16
|       |
|RefAdr |
|%I0001 |
|       |
|       |
|       |
|       |
|       |
|       |
+-------+
```

Folder: C:\LM90\FOLDERS\DEMO31   Slot

```
              SERIES 90-30 MODULE IN RACK 0 SLOT   2
+-------+------------------ SOFTWARE   CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693MDL940          OUTPUT RELAY 2A 16PT
|   2   | Ref Addr :    %Q0001            Size  : 16
|       |
|MDL940 | --------------------------------------------------------------------
|       |
|QRLY16 |
|       |
|RefAdr |
|%Q0001 |
|       |
|       |
|       |
|       |
|       |
+-------+

              SERIES 90-30 MODULE IN RACK 0 SLOT   3
+-------+------------------ SOFTWARE   CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693MDL240          INPUT 120 VAC 16PT
|   3   | Ref Addr :    %I0017            Size  : 16
|       |
|MDL240 | --------------------------------------------------------------------
|       |
|I AC16 |
|       |
|RefAdr |
|%I0017 |
|       |
|       |
|       |
|       |
|       |
+-------+

              SERIES 90-30 MODULE IN RACK 0 SLOT   4
+-------+------------------ SOFTWARE   CONFIGURATION -------------------------
| SLOT  | Catalog #: IC693MDL310          OUTPUT 120 VAC 0.5A 12PT
|   4   | Ref Addr :    %Q0017            Size  : 12
|       |
|MDL310 | --------------------------------------------------------------------
|       |
|Q AC12 |
|       |
|RefAdr |
|%Q0017 |
|       |
|       |
|       |
|       |
|       |
+-------+
```

```
              SERIES 90-30 MODULE IN RACK 0 SLOT  5
+------+------------------- SOFTWARE  CONFIGURATION -------------------------
| SLOT | Catalog #: IC693CMM301           GENIUS COMMUNICATIONS MODULE
|  5   |
|      |
|CMM301| -----------------------------------------------------------------------
|      |   From Addr  :    16     Baud Rate  : 153K STD
|GENCOM|
|      |   Bus Addr 16: %G001      Length     :    32
|      |   Bus Addr 17: %G033      Length     :    32
|      |   Bus Addr 18: %G065      Length     :    32
|      |   Bus Addr 19: %G097      Length     :     0
|      |   Bus Addr 20: %G129      Length     :     0
|      |   Bus Addr 21: %G161      Length     :     0
|      |   Bus Addr 22: %G193      Length     :     0
|      |   Bus Addr 23: %G225      Length     :     0
+------+
```

```
       --------------------  DISCRETE INPUTS   (%I)  -------------------
TOTAL  I+Q:  60                            HIGHEST REF CONFIGURED:   32
 REFERENCE  PHYSICAL         IO     MODULE
 START - END  ADDRESS        TYPE   TYPE         DESCRIPTION
 ----------- --------        ------ -------   -----------------------------------
 00001-00016 0.2             90-30  IN SIM    INPUT SIMULATOR MODULE
 00017-00032 0.4             90-30  I AC16    INPUT 120 VAC 16PT
```

```
       --------------------  DISCRETE OUTPUTS  (%Q)  -------------------
TOTAL  I+Q:  60                            HIGHEST REF CONFIGURED:   28
 REFERENCE  PHYSICAL         IO     MODULE
 START - END  ADDRESS        TYPE   TYPE         DESCRIPTION
 ----------- --------        ------ -------   -----------------------------------
 00001-00016 0.3             90-30  QRLY16    OUTPUT RELAY 2A 16PT
 00017-00028 0.5             90-30  Q AC12    OUTPUT 120 VAC 0.5A 12PT
```

```
       --------------------  ANALOG INPUTS    (%AI) -------------------
TOTAL USED:   0                            HIGHEST REF CONFIGURED:    0
 REFERENCE  PHYSICAL         IO     MODULE
 START - END  ADDRESS        TYPE   TYPE         DESCRIPTION
 ----------- --------        ------ -------   -----------------------------------
```

                    No Entries for this Reference Type

```
       --------------------  ANALOG OUTPUTS   (%AQ) -------------------
TOTAL USED:   0                            HIGHEST REF CONFIGURED:    0
 REFERENCE  PHYSICAL         IO     MODULE
 START - END  ADDRESS        TYPE   TYPE         DESCRIPTION
 ----------- --------        ------ -------   -----------------------------------
```

                    No Entries for this Reference Type

Folder: C:\LM90\FOLDERS\DEMO31   Ref View

```
------------------- REGISTER MEMORY      (%R) -------------------
TOTAL USED:   0                          HIGHEST REF CONFIGURED:   0
  REFERENCE  PHYSICAL       IO     MODULE
START - END  ADDRESS        TYPE   TYPE       DESCRIPTION
-----------  --------       ------ -------    ------------------------------

               No Entries for this Reference Type

------------------- SEAMLESS GLOBAL MEMORY   (%G) -------------------
TOTAL USED:  96                          HIGHEST REF CONFIGURED:  96
  REFERENCE  PHYSICAL       IO     MODULE
START - END  ADDRESS        TYPE   TYPE       DESCRIPTION
-----------  --------       ------ -------    ------------------------------
00001-00032 0.6.0.16        90-30  GENCOM     GENIUS COMMUNICATIONS MODULE
00033-00064 0.6.0.17        90-30  GENCOM     GENIUS COMMUNICATIONS MODULE
00065-00096 0.6.0.18        90-30  GENCOM     GENIUS COMMUNICATIONS MODULE


   CPU MEMORY CONFIGURATION FOR Model 311 CPU:

      Discrete Input    (%I)    512  Points
      Discrete Output   (%Q)    512  Points
      Internal Discrete (%M)   1024  Points
      System Use        (%S)    128  Points
      Temporary Status  (%T)    256  Points
      GENIUS Global     (%G)   1280  Points
                               ----  -----
      TOTAL DISCRETE MEMORY:   3712  Points

      Analog Input      (%AI)    64  Words
      Analog Output     (%AQ)    32  Words
      Register Memory   (%R)    512  Words

      TOTAL LOGIC MEMORY       4928  Bytes

      CPU MEMORY TOTAL         6144  Bytes

   POINT FAULT REFERENCE            DISABLED

   FAULT CATEGORY CONFIGURATION:
      Loss of or Missing Rack           D
      Loss of or Missing IOC            D
      Loss of or Missing I/O Module     D
      Loss of or Missing Option Module  D
      System Bus Failure                F
      IOC Fault (I/O Bus Fault)         D
      System Config Mismatch            D

Folder: C:\LM90\FOLDERS\DEMO31                          CPU
```

5.3 PCM Configuration

EDIT MEGABASIC CONFIGURATION DATA

Enable Megabasic:	YES
Start MB on Soft Reset:	YES
Program to Run at Reset:	RAM:BASIC.PGM
User Program I/O	Input: NULL
	Output: NULL
	Error: COM1
Interpreter Ver to Use:	DEV
Priority:	6
MegaBasic Command Line:	blank
Allocated Data Size:	90

EDIT SERIAL PORT 1 (COM1:)

Interface:	RS232
Data Rate:	19200
Parity:	NONE
Flow Control:	SOFTWARE
Stop Bits:	1
Bits/Char:	8

EDIT SERIAL PORT 2 (COM2:)

This Data is IGNORED because CCM is Enabled on This Port.

EDIT CCM CONFIGURATION DATA FOR PORT 1

Enable CCM on Port:	NO

EDIT CCM CONFIGURATION DATA FOR PORT 2

Enable CCM on Port:	YES
CCM CPU ID:	1
Mode:	MASTER
Turnaround Delay:	100ms
Timeout:	LONG
Retry Count:	NORMAL
Interface:	RS485
Data Rate:	9600 bps
Parity:	NONE
Flow Control:	NONE
Priority:	5

All other settings are set to the Default values.

5.4 Program Files

A 3.5 inch disk is included with each Series 90-30 demonstration case that includes the following directories:

DEMO30*   Logicmaster files with the demonstration ladder for the CPU 331 10 slot rack.

DEMO31   Logicmaster files with the demonstration ladder for the CPU 311 5 slot rack.

TEST30   Logicmaster files used to test the cables between the Series 90-30 demonstration case and the Universal Simulator.

PCM   MegaBasic files for the PCM. The .TXT files in PCM30 can be used for a listing of the programs.

The files that are loaded on the PCM are in DEM30.PCM:

```
BASIC.PGM
S90_DEMO.CRN
FEATUR30.CRN
FEATUR70.CRN
LM90TU.CRN
SYSDEMO.CRN
MANUFACT.CRN
PROCESS.CRN
MAT_HAND.CRN
FLTTBL.CRN
GRAPH1.CRN
VT100_5.CRN
UCDF.CDF          Configuration
```

*Directories with an R suffix are used with early systems containing Relay outputs in the CPU 331 rack.

5.5 Cable Diagrams

```
DISPLAY

25 Pin Female                   25 Pin Male
      2 ------------------------------ 3
      3 ------------------------------ 2
      4 ------------------------------ 5
      5 ------------------------------ 4
      7 shield                  shield 7


ENCODER

9 Pin Male                      High Speed Counter
      1 ------------------------------ 1 Channel A
      2 ------------------------------ 2 Channel B
      7 shield                  shield 13, 15


METER

9 Pin Female                    Analog Output
      3 ------------------------------ 3
      5 ------------------------------ 5
      7 shield


POTS

9 Pin Male                      Analog Input
      3 ------------------------------ 3
      5 ------------------------------ 5
      7 shield
      4 ------------------------------ 4
      6 ------------------------------ 6
      8 shield


INPUT

37 Pin Male                     24V Input
  1 thru 8 --------------------- 2 thru 9   slot 3
  9 thru 16 -------------------- 12 thru 19 slot 3
 17 thru 24 -------------------- 2 thru 9   slot 4
 25 thru 32 -------------------- 12 thru 19 slot 4
 35 --------------------------- 20,10 both slots


OUTPUT

37 Pin Male                     24V Output
  1 thru 8 --------------------- 2 thru 9   slot 5
  9 thru 16 -------------------- 12 thru 19 slot 5
 17 thru 24 -------------------- 2 thru 9   slot 6
 25 thru 32 -------------------- 12 thru 19 slot 6
 33 --------------------------- 11,01 both slots
 36 --------------------------- 20,10 both slots
```