Chapter 12
Troubleshooting

This chapter describes the methods and techniques used to isolate and correct common faults that may occur in a programmable control system.

Introduction

Effective use of the troubleshooting procedures and techniques described in this chapter will:

Reduce down time.

Improve maintenance personnel's understanding of the PLC system.

Provide repeatable standards of troubleshooting performance.

Modicon control systems are modular in design. That means that each piece of hardware has a specific task, or function, to perform. If you understand the various functions of the Modicon equipment, have a good working knowledge of the process being controlled, and are able to use an MMI as a diagnostic tool to work through the control logic, most problems can be isolated quickly.

Tools, Equipment, and the Troubleshooting Process

Although no special tools are needed to troubleshoot Modicon PLC's, these tools will make troubleshooting faster and more accurate:

A troubleshooting flow chart

An annotated listing of the system's ladder logic

A listing of the systems Traffic Copping

Standard and phillips head screwdrivers

Regular and needlenose pliers

Multimeter

Types of Faults

Three common types of faults that a programmable control system may have are:

Input/Output faults

Controller faults

Communication faults

Input/Output Faults These are the most common faults. These faults occur when an open, short, or electrical/mechanical malfunction occurs in the:

Field devices (switch, thumbwheel, lamp, solenoid, etc.).

Wiring between the field device and its I/O module.

Input or output module that interfaces with the field device.

Controller Faults These faults occur when the controller itself is faulty. Also, if the ladder logic in the controller has been changed or is not achieving the desired results, a controller fault is indicated. You need a ladder logic listing and the output of the STAT block to troubleshoot these faults quickly.

Communication Faults These faults occur when the communication signals between two pieces of hardware unexpectedly stop or become unintelligible. This may be caused by:

Hardware faults

Wiring faults

Electrical interference

Isolating Faults

The Troubleshooting Process This process uses a logical, step-by-step approach to troubleshooting the system. The troubleshooting process is shown below.

Step 1 Carefully analyze the problem - What is supposed to happen ? Knowledge of proper system operation is essential here. You cannot quickly analyze and fix a problem if you do not know what is supposed to happen when the system is operating properly. Observe and note what is and is not happening.

Step 2 Review the states of the indicators - The indicators on the hardware involved are valuable troubleshooting tools. After analyzing a problem, look at them next. Make whatever notes you need for reference while working on the problem.

Step 3 Review the states of the output module(s) effected - Are the output modules functioning ? Is the output indicator for the nonoperating device being turned ON by the controller, if so, measure the voltage at the output terminal and insure that it is present. Check the field wiring and the device itself if voltage is being provided by the module.

Step 4 Review the ladder logic that controls the output(s) effected - What controls the output(s). Are all the necessary conditions being met to activate the device ?

Step 5 Review the states of the input(s) that control the output(s) effected - Are the necessary signals being provided to the input modules from the field devices ? If so, does the PLC read these signals ?

Step 6 Document the problem, any changes you made, and the solution in a log book so that a history is developed on the process and so that others may see what has been done in the past.

The vast majority of problems in your system will be associated with the field devices connected to the control system. These steps will help you quickly isolate and correct most problems you will encounter.

The brief outline discussed so far identifies major groupings of system faults. The specific fault may be much harder to find. The troubleshooting flow chart in this chapter will help you:

Identify the possible cause(s)

Eliminate all but the most probable cause

Test the probable cause

Correct the problem

The system's operation must be validated before the repair can be called successful. System validation is insured by monitoring system status, (see "Monitoring System Status") followed by a careful power-up and monitoring of the application.

Flow Charts

➤➤ **WARNING Equipment under PLC control that has malfunctioned may be unpredictable. Loose connections, and grounds, intermittent signals, or faulty field wiring may cause machinery to suddenly start running again without warning. *Never* work on equipment or remove/replace modules until you have performed the power lockout procedures required by the equipment under control.**

The troubleshooting tools provided in this chapter are:

A flow chart for monitoring system status.

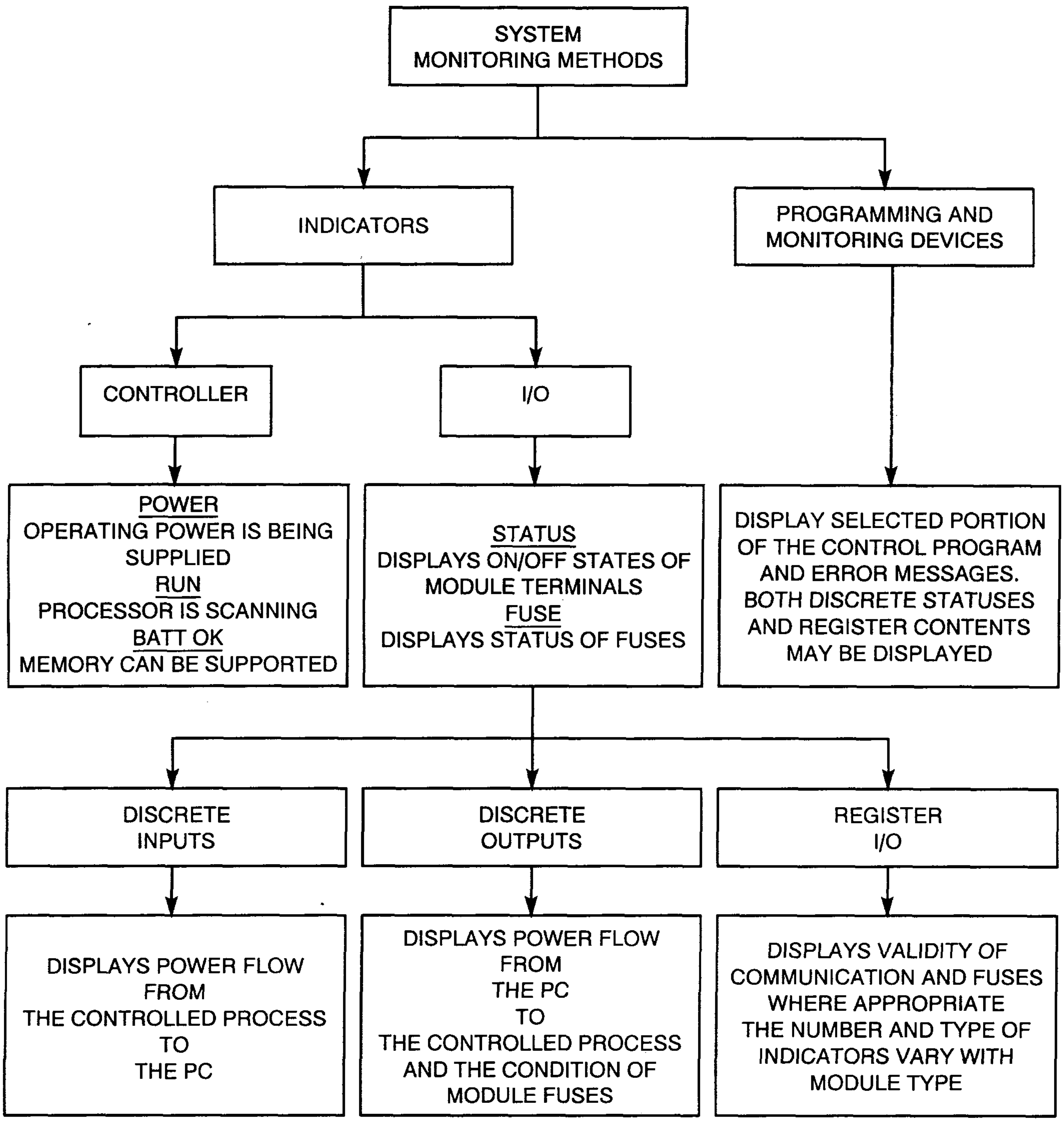
A Troubleshooting Flow chart showing the recommended step-by-step procedures for isolating and correcting system malfunctions.

Accessing methods and charts of the System Stop Status of all models of 984.

Monitoring System Status

The figure below shows a basic validation flow chart derived from the monitoring capabilities of the 984 controller family.

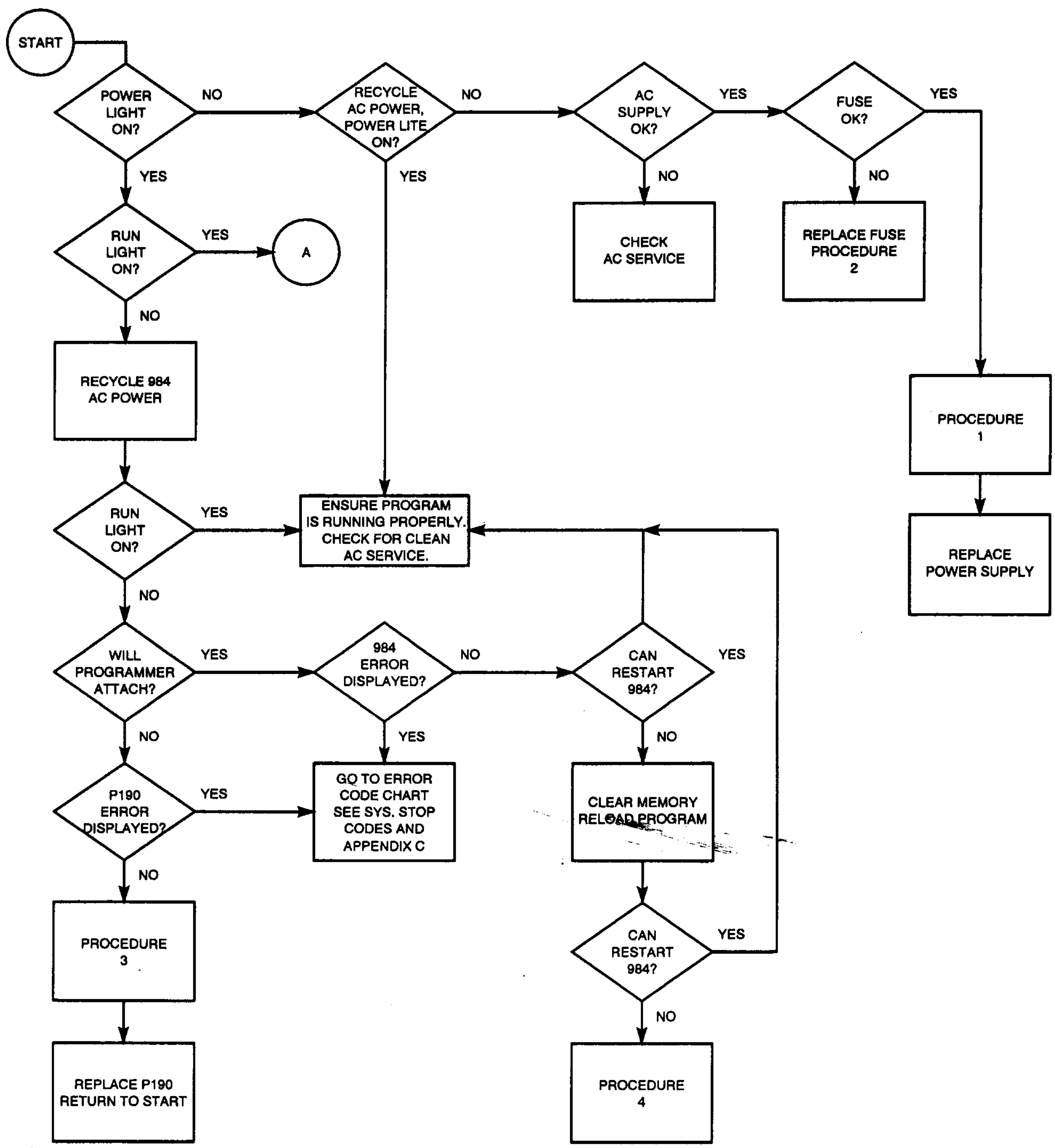
Figure 12-1 Flow Chart Based on 984 Monitoring Capabilities

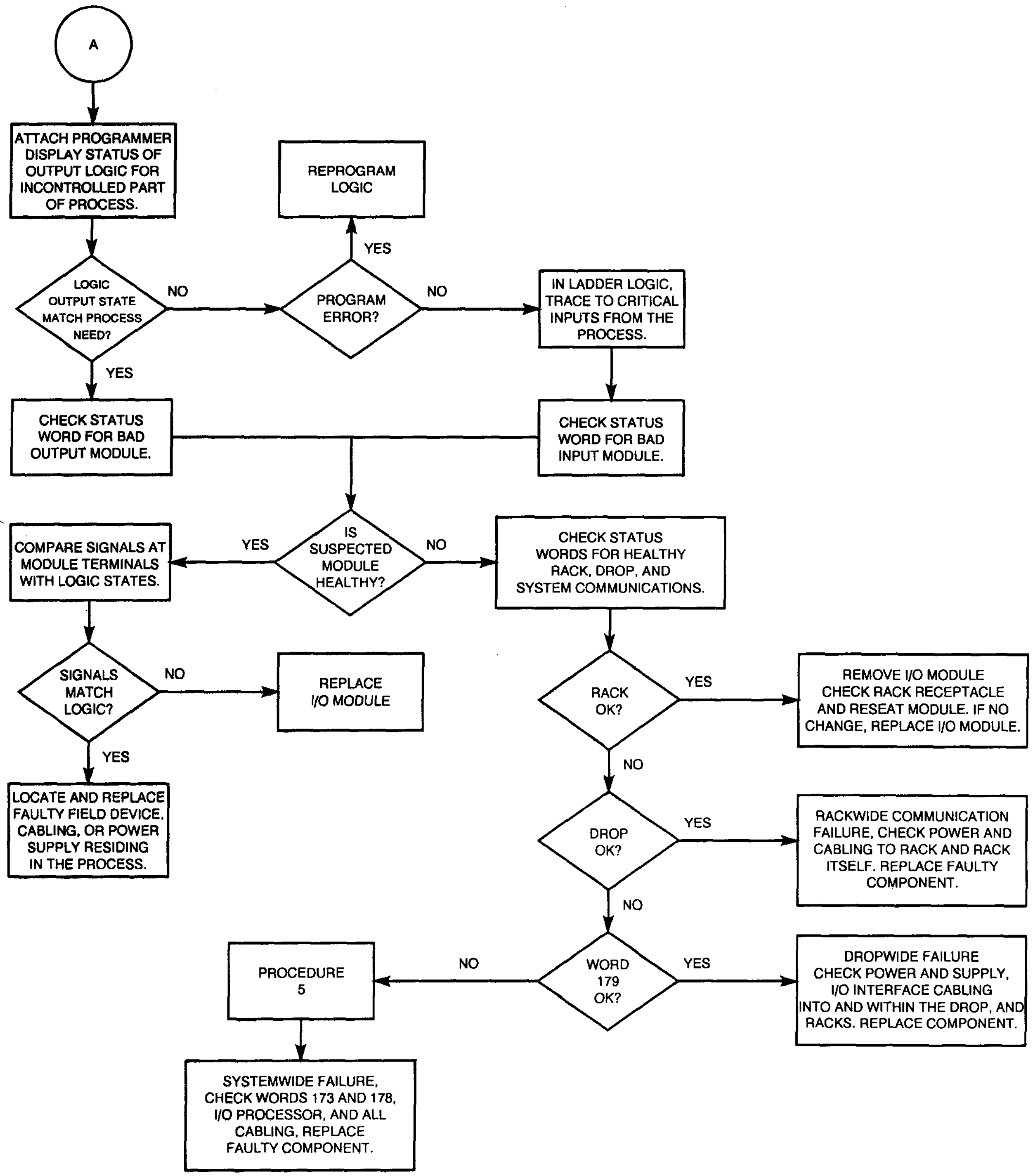


Troubleshooting Flow Chart

The flowchart in the figure below provides a step-by-step troubleshooting approach. Begin your search for the problem at the START position. Questions you must answer are asked in the diamond shapes. Actions you must perform are outlined in rectangles. Procedures 1 through 5 and System Stop Error Codes are listed immediately after the flow charts.

Figure 12-2 Step-By-Step Troubleshooting Flow Chart




A
ATTACH PROGRAMMER DISPLAY STATUS OF OUTPUT LOGIC FOR INCONTROLLED PART OF PROCESS.
LOGIC OUTPUT STATE MATCH PROCESS NEED?
NO
YES
PROGRAM ERROR?
YES
NO
REPROGRAM LOGIC
IN LADDER LOGIC, TRACE TO CRITICAL INPUTS FROM THE PROCESS.
CHECK STATUS WORD FOR BAD OUTPUT MODULE.
CHECK STATUS WORD FOR BAD INPUT MODULE.
IS SUSPECTED MODULE HEALTHY?
YES
NO
COMPARE SIGNALS AT MODULE TERMINALS WITH LOGIC STATES.
CHECK STATUS WORDS FOR HEALTHY RACK, DROP, AND SYSTEM COMMUNICATIONS.
SIGNALS MATCH LOGIC?
NO
YES
REPLACE I/O MODULE
LOCATE AND REPLACE FAULTY FIELD DEVICE, CABLING, OR POWER SUPPLY RESIDING IN THE PROCESS.
RACK OK?
YES
NO
REMOVE I/O MODULE CHECK RACK RECEPTACLE AND RESEAT MODULE. IF NO CHANGE, REPLACE I/O MODULE.
DROP OK?
YES
NO
RACKWIDE COMMUNICATION FAILURE, CHECK POWER AND CABLING TO RACK AND RACK ITSELF. REPLACE FAULTY COMPONENT.
WORD 179 OK?
YES
NO
DROPWIDE FAILURE CHECK POWER AND SUPPLY, I/O INTERFACE CABLING INTO AND WITHIN THE DROP, AND RACKS. REPLACE COMPONENT.
PROCEDURE 5
SYSTEMWIDE FAILURE, CHECK WORDS 173 AND 178, I/O PROCESSOR, AND ALL CABLING, REPLACE FAULTY COMPONENT.

Flow Chart Procedures

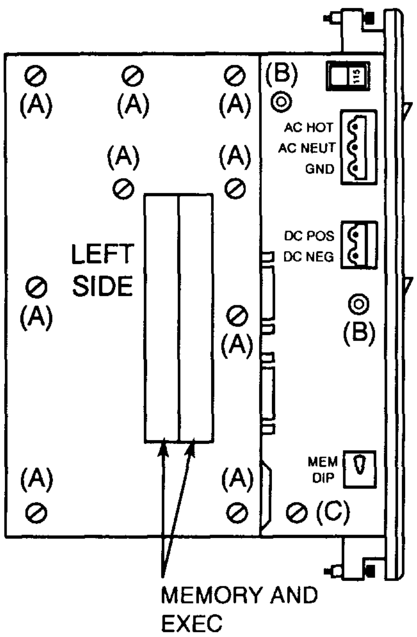
The boxes below refer to the previous two flow charts. They contain other things to check at the point indicated in the flow charts.

Procedure 1 Insure that the power supply jumper is correct on the slot mount PLCs (present for 115 VAC, absent for 220 VAC). Check the Input Power Select switch position. Check for loose crimps or screws at the Power Supply Terminal Strip.

Procedure 2 Fuse replacement procedures for the 984-38X and 48X, 68X and 78X, and 984A, 984B, and 984X are described in the following sections.

Fuse Replacement Procedure for the 984-38X and 48X The figure below describes the replacement procedure for the internal power supply fuse of the 38X and 48X controllers.

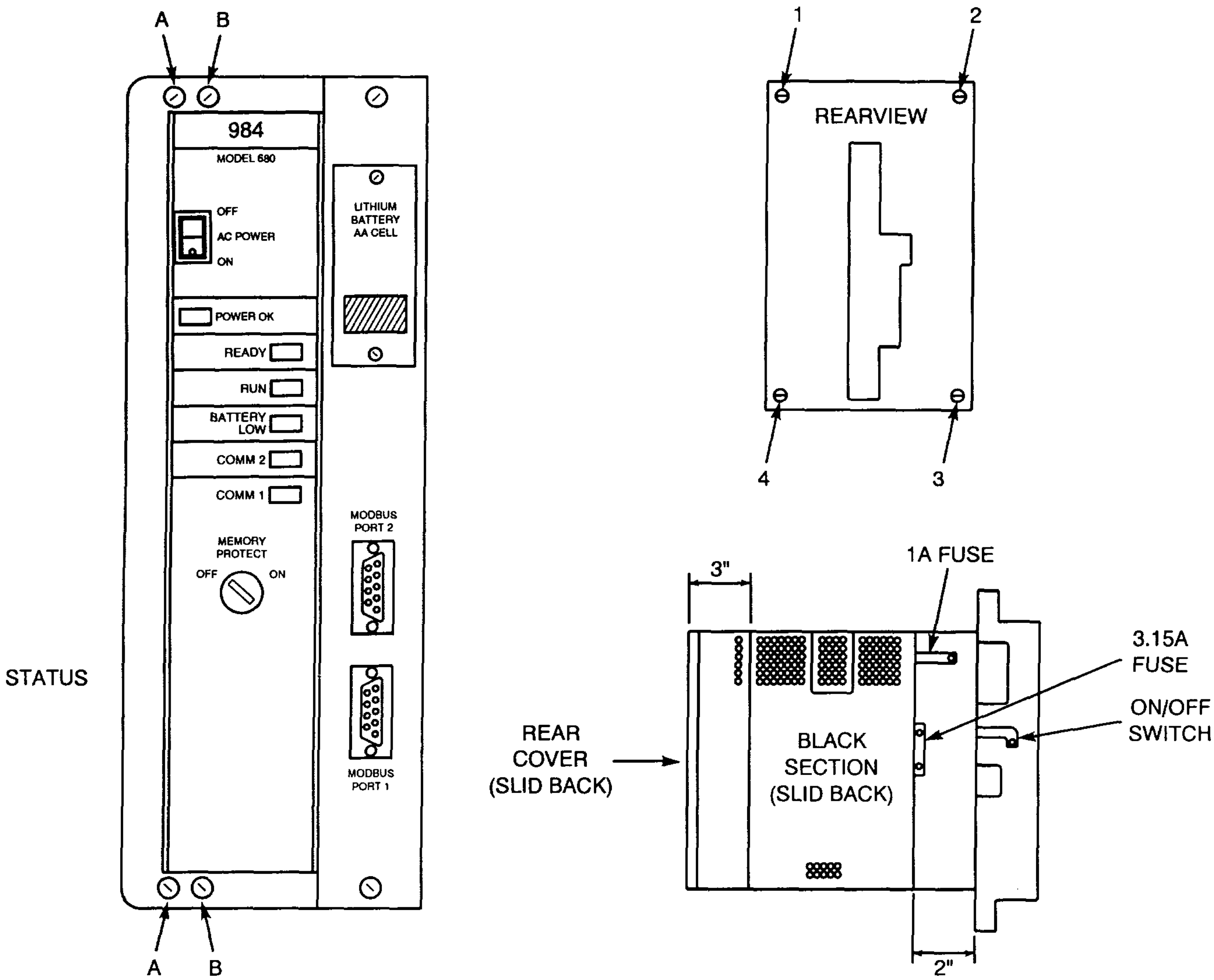
Figure 12-4 Fuse Replacement Procedure for the 984-38X and 48X



1. REMOVE MEMORY AND EXEC CARTRIDGES
2. REMOVE 9 SCREWS (A) THAT HOLD SIDE PANEL WITH 1/4 IN. NUT DRIVER.
3. REMOVE PLASTIC LINE CORD COVER, AND COVER MOUNTING SCREWS.
4. REMOVE 2 LINE CORD STANDOFFS (B) WITH 3/16 NUT DRIVER.
5. REMOVE REMAINING SCREW (C) NEAR BATTERY.
6. THE FRONT PART OF THE CONTROLLER SHOULD NOW SEPARATE FROM THE CIRCUIT BOARD, THE FUSE IS LOCATED NEAR THE AC POWER CONNECTOR.

Fuse Replacement Procedure for the 984-68X and 78X The figure below describes the replacement procedure for the internal power supply fuses of the 68X and 78X controllers.

Figure 12-5 Fuse Replacement Procedure for the 984-68X and 78X

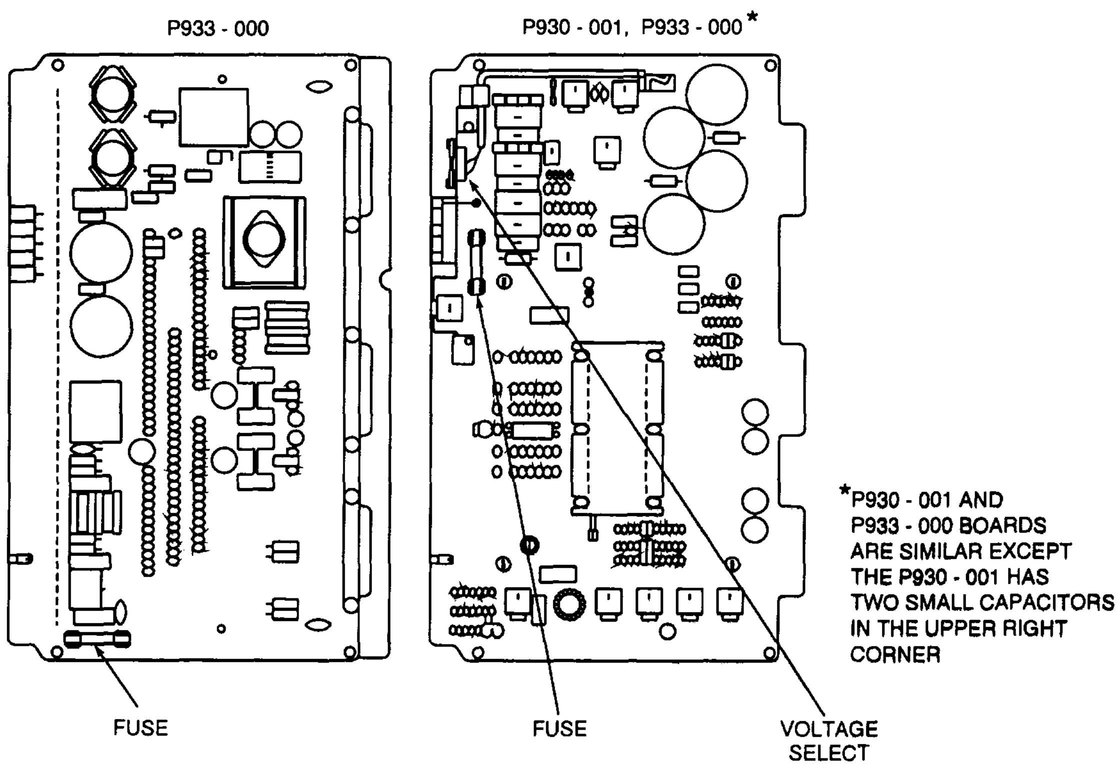


1. REMOVE TWO THUMBSCREWS (A), AND TWO MACHINE SCREWS (B) WITH STAR WASHERS FROM COVER AS SHOWN.
2. REMOVE COVER.
3. REMOVE 4 MACHINE SCREWS FROM THE REAR COVER. SLIDE REAR COVER BACK APPROXIMATELY 3 INCHES.
4. CAREFULLY SLIDE BACK BLACK SECTION TOWARDS THE REAR OF THE UNIT APPROXIMATELY 2 INCHES.
5. FUSES ARE NOW ACCESSABLE FOR REPLACEMENT.

Fuse Replacement Procedure for 984A, 984B, and 984X The chassis mount 984 family is powered by the either the P930 or P933 power supplies. Insure AC source is OFF before starting procedure. Remove the power supply from the chassis and check the fuse (upper right hand corner of PC board) with an ohmmeter. If fuse is open, replace. If the fuse blows again, replace the supply.

If there is still no PWR OK LED, remove all but the power supply from the chassis. Connect the AC line and turn on the power supply. If the fuse blows, inspect the backplane for foreign material that may be causing a short circuit. If the cause of the short is not visible, replace the backplane. If the fuse does not blow, turn off the power supply, plug in a board and turn on the power supply. If the fuse does not blow, repeat this procedure until the fuse blows. The last board added will be the bad board.

Figure 12-6 Fuse Replacement Procedure for P930/P933 Power Supplies



1. TURN OFF THE P930/P933 POWER SUPPLY.
2. TURN OFF SUPPLY POWER TO THE P930/P933 POWER SUPPLY.
3. DISCONNECT SUPPLY POWER LINE FROM POWER TERMINAL ON THE SUPPLY.
4. LOOSEN MOUNTING SCREWS ON THE SUPPLY AND SLIDE SUPPLY OUT OF THE CHASSIS.
5. FUSES ARE NEW ACCESSIBLE FOR REPLACEMENT. FUSE LOCATIONS ARE SHOWN ABOVE.

Procedure 3 Insure that the proper ports are being used. Are the communications parameters, both on the P190 and the controller correct? Check the programming device communications cable.

Procedure 4 Are the boards seated properly in the housing/chassis. Insure that the Exec S/W Cartridge is seated properly and is the correct version for the PLC

Procedure 5 Is the Remote I/O Processors READY LED's ON? The Communication LED(s) should be flashing. Are the Interface Modules READY and COMM ACTIVE LEDs active? Is the drop Traffic Copped correctly?

If the READY LEDs are ON but the Communication LEDs are not flashing; check the cabling, address switches, check taps, splitters, and terminators. Check the Retry Counters (System STAT words or STAT block) for communication problems.

If the Remote I/O Processor is functioning but a communication problem exists with the I/O; Is the Ourbus Error LED ON?, are any I/O module ACTIVE lights Off? (check Traffic Cop), Are the Module Health Bits OK or are they changing (from STAT block or System STAT words)?, if secondary housing auxiliary power supplies are present, are they functioning? Is the W929 cable OK?

System Stop Error Codes The tables below shows system error codes that may appear on your programming unit in the event of a system problem. Error codes displayed may be a combination of more than one error code. For example, a system error code of "8100" is a combination of system errors 8000 and 0100 and typically appears when a system is in a state of DIM AWARENESS.

Figure 12-7 System Stop Status for 984-38X, 48X, 68X, and 78x

Error Code	Description
7FFF	Controller unhealthy
8000	Peripheral port stop
4000	Bad I/O traffic cop
2000	PLC in dim awareness
1000	Illegal peripheral port intervention
0800	Bad segment scheduler
0400	SON (Start of Network) Node did not start
0200	Bad power down checksum (State ram test failure)
0100	No EOL (End of Logic) detected or bad number of segments.
0080	Watch dog timer expired
0040	Real time clock error
0020	Bad coil used table (CPU diagnostic failure)
0010	Invalid traffic cop type
0008	Invalid node type
0004	User logic checksum error
0002	Discrete disables error
0001	Illegal configuration

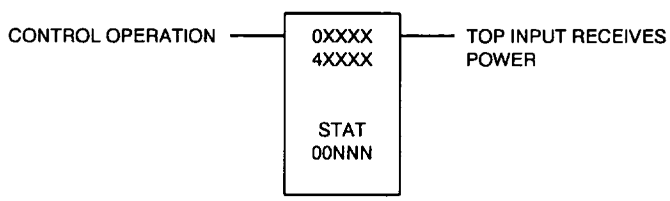
Figure 12-8 System Stop Status for 984A, 984B, and 984x

Error Code	Description
8000	Perpheral port stop
4000	X-MEM parity error
2000	PLC in dim awareness
1000	Illegal peripheral port intervention
0800	Bad segment scheduler
0400	SON (Start of Network) Node did not start
0200	Bad power down checksum (State ram test failure)
0100	No EOL (End of Logic) detected or bad number of segments.
0080	Watch dog timer expired
0040	Real time clock error
0020	Bad coil used table (CPU diagnostic failure)
0010	S908 failure
0008	Invalid node type
0004	User logic checksum error
0002	State ram checksum error
0001	Illegal configuration

The 984/S908 STAT Block

The 984 STAT block is a powerful troubleshooting tool that allows you to access detailed information on the system status. The STAT block obtains controller information such as; interface module status, memory protect status, battery status, I/O module status, and remote I/O communications status, and places this information in a table of user defined registers or discretes outputs. This information may then be used directly, or in conjunction with other user programming to monitor system status, detect intermittant problems or isolate remote I/O communications problems.

Figure 12-9 The S908 STAT Block



The S908 STAT Block

The top node is the destination node. It specifies the registers or discretes which will hold the status information. It can be either a 0XXXX discrete output or a 4XXXX holding register reference. The reference indicated is the first reference of a table of registers or groups of discretes. Each register has 16 bit locations, discretes are in groups of 16.

➤ **NOTE** The use of discrete outputs is not recommended for long table lengths since the number of registers used is large. Shorter table lengths may use discrete outputs if so desired.

The bottom node contains the symbol "STAT" and a numerical value that specifies the table length. This constant may range from 1 to 277. The maximum parameter allowed for 16 bit controllers (i.e., 984-38X, 48X, 68X, 984A, and 984X) is 255. The number of status words applicable depends on the controller type and the amount of remote I/O being used.

➤➤ **WARNING The STAT function overrides the disable state of a coil used in the destination node of the function block. This may cause personal injury if you assume a coil has disabled an operation and repairs are being made, as the coil's state can change as a result of the STAT function.**

Block Inputs The top input controls the STAT operation. When it receives power, the controller status is copied into the table of references specified in the top node. The bottom input is not used.

Block Outputs The top output passes power when the top input receives power. The bottom output is not used.

Status Information The status information retrieved by the STAT function block consists of the following three sections:

Section 1	System MainFrame Status
Section 2	I/0 Module Health Status.
Section 3	Drop Communications Status

The amount of status information available depends on the controller type. For example, the 984-380 does not have remote I/O capability, therefore, only system mainframe status and local I/O are applicable.

The maximum table length in the STAT instruction depends upon the controllers remote I/O drop capability. Registers from the table created by the STAT block are used to store module health information for all drops and drop communication error information. More remote I/O requires more table registers.

Table 12-1 Status Word Address Table

This table shows the relative addresses of information retrieved by the STAT block as well as the absolute system address of the same information.

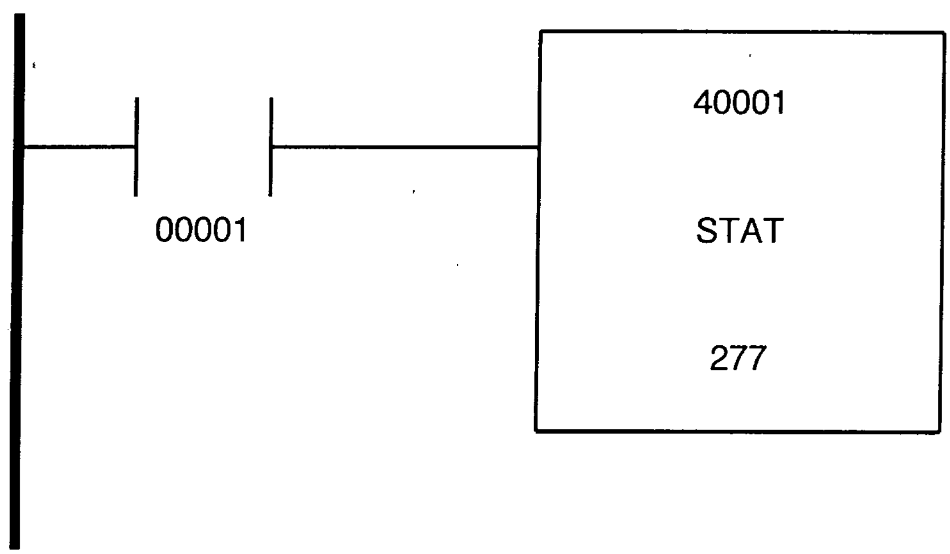
Relative STAT Block Address			System	Absolute Address	
Decimal		Hex	Mainframe Status	Hex	Decimal
Word	1	01	Controller Status	65	101
	2	02	S911 Hot Standby Status	66	102
	3	03	Controller Status	67	103
	4	04	Not Used	68	104
	5	05	Controller Stop State	69	105
	6	06	Number of Segments in User Logic	6A	106
	7	07	Address of End of Logic Pointer	6B	107
	8	08	RIO Redundancy and timeout	6C	108
	9	09	ASCII Message Status	6D	109
	10	0A	Run Load Debug Status	6E	110
	11	0B	Not Used	6F	111

			I/O Module Health Status	Memory Pointer	
				Hex	Decimal
Word	12	0C	Drop 1 Rack 1	46	70
	13	0D	Drop 1 Rack 2		
	14	0E	Drop 1 Rack 3		
	15	0F	Drop 1 Rack 4		
	16	10	Drop 1 Rack 5		
	17	11	Drop 2 Rack 1		
	18	12	Drop 2 Rack 2		
	//	//	////////////		
	170	AA	Drop 32 Rack 4		
	171	AB	Drop 32 Rack 5		

			Drop Communications Status	Communications Pointer	
				Hex	Decimal
Word	172	AC	S908 Startup Error Code	33	51
	173-175	AD-AF	Cable "A" Errors		
	176-178	B0-B2	Cable "B" Errors		
	179-181	B3-B5	Global Communications Errors		
	182-184	B6-B8	Drop 1 Errors		
	185-187	B9-BB	Drop 2 Errors		
	188-190	BC-BE	Drop 3 Errors		
	///-///	//-//	////////////		
	254-256	FE-100	Drop 25 Errors		
	///-///	//-///	////////////		
	272-274	110-112	Drop 31 Errors		
	275-277	113-115	Drop 32 Errors		

In the figure below, when coil 0001 is energized, 11 consecutive words of system memory (starting at location 65 hex) are copied into registers 4000l through 40011. The system then loads the I/O Health Information. This block of 160 words is kept in a different location in system memory. The location varies depending upon the controller model and/or prom level. In all 984 controllers, a pointer is stored at location 46 hex. This pointer points to the first word of the I/O Module Health Status Block. The address indicated by the pointer is copied into register 40012 and the following 159 words are copied into registers 40013 through 40171. The Remote I/O Communications Status consists of a block of 106 locations in system memory. A pointer stored at location 33 hex indicates the beginning of this block in a manner similar to the I/O health status pointer. These 106 words are copied into registers 40172 through 40277 by the system.

Figure 12-10 STAT Block for S908



The length of the Status Table in memory depends on the number of remote I/O drops the controller can support. A controller with 32 drops of I/O will have a STAT Table 277 words long.

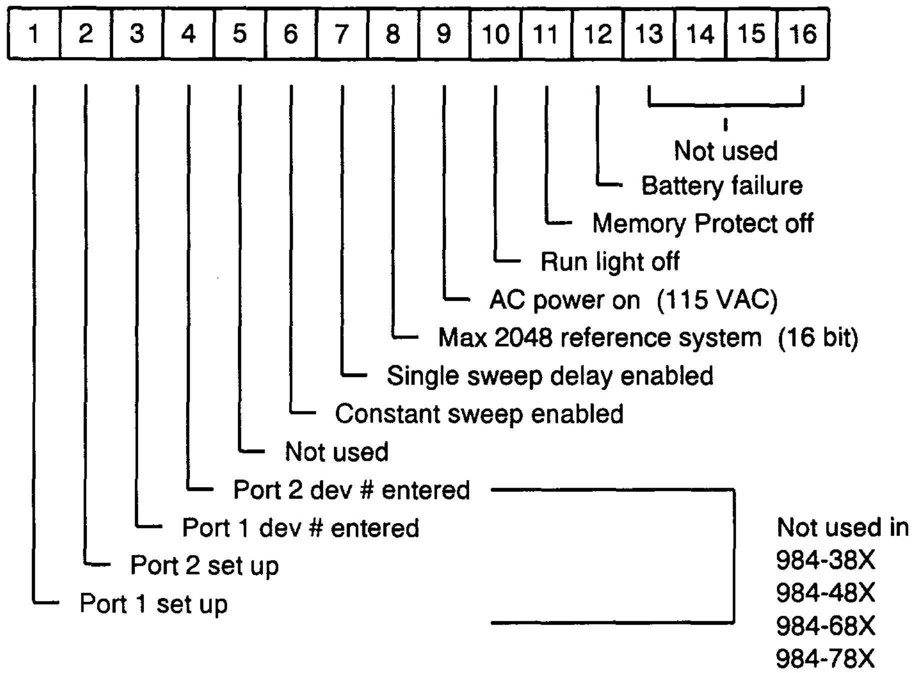
The length of the table created by the STAT Block Function depends on the addressing capability of the controller. A 16 bit controller has a maximum addressing capibility of 255 and can only access that many words from the STAT Table. STAT Word 255 contains the second I/O communications word of drop 25. A 24 bit controller can access all 277 words of status.

System Mainframe Status

The first eleven STAT words contain mainframe status information and the individual bits represent the conditions shown in the figure below. STAT words four and eleven are not used.

Figure 12-11 STAT Word 1, Mainframe Status

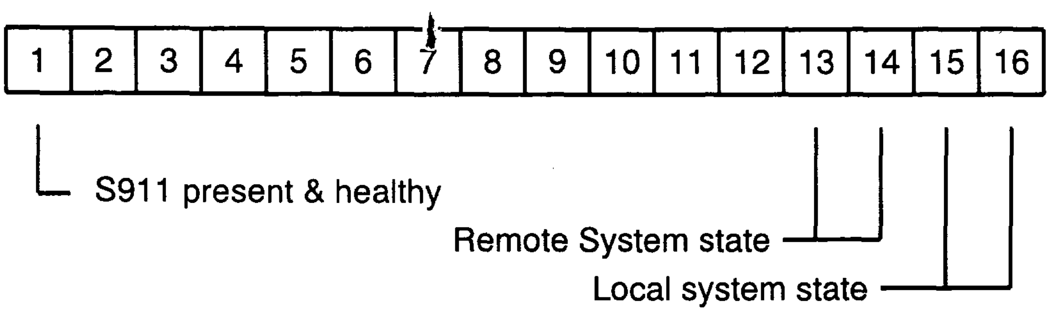
If the bit is a "1" then the condition indicated is TRUE or ON



Note: The AC power is only for 115 VAC, this does not operate for 220 VAC and 24 VDC

Figure 12-12 STAT Word 2, S911 Hot Standby Status

If the bit is a "1" then the condition indicated is TRUE or ON for bit position 1



System state 00 = Not used
01 = Off line
10 = Primary
11 = Standby

Figure 12-13 STAT Word 3, Controller Status

If the bit is a "1" then the condition indicated is TRUE or ON for bit positions 1 through 4

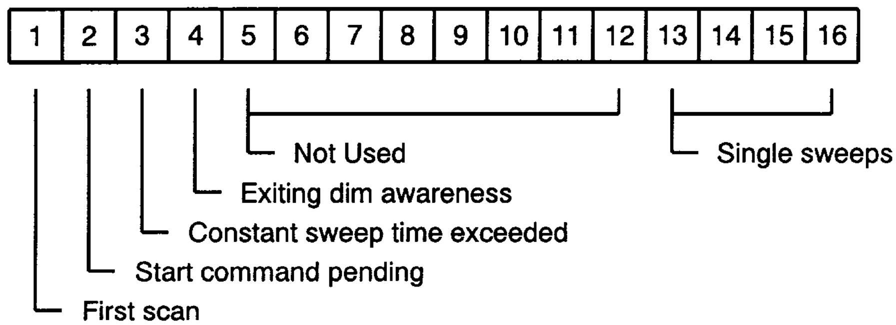


Figure 12-14 STAT Word 5, Controller Stop State

If the bit is a "1" then the condition indicated is TRUE or ON

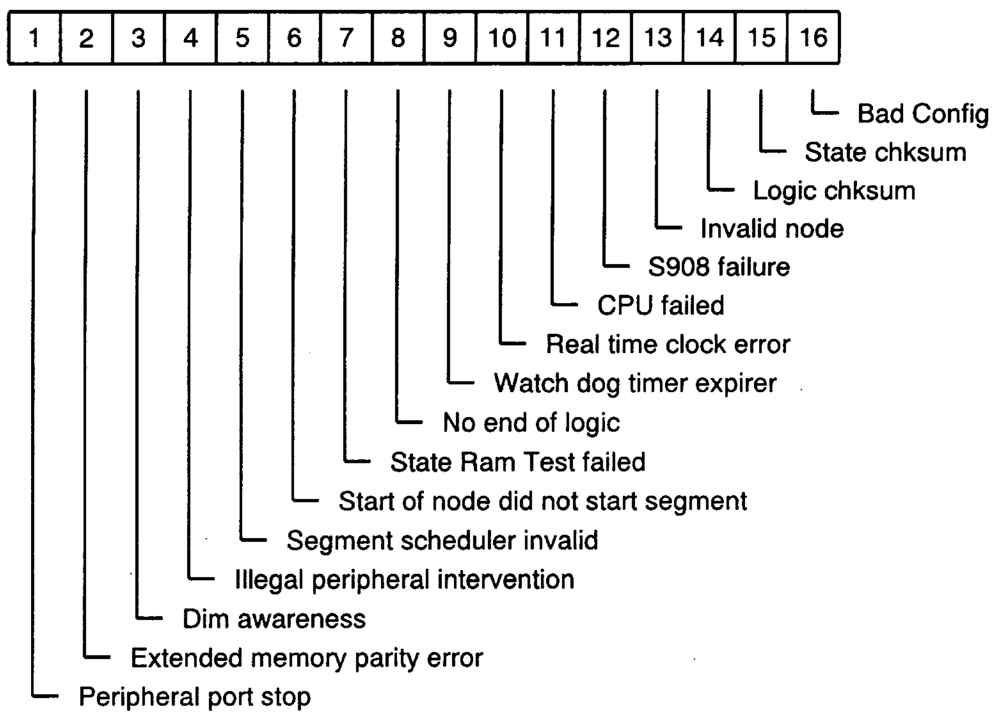


Figure 12-15 STAT Word 6, Number of Segments

Number of segments in binary format

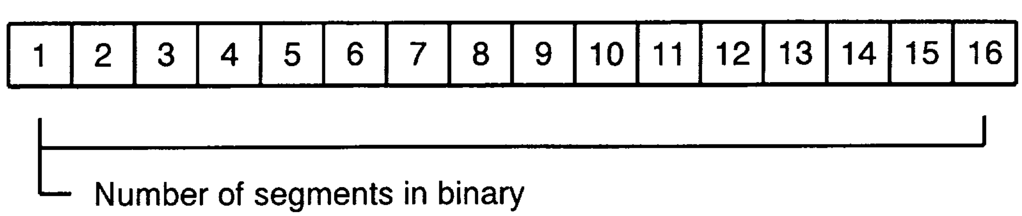


Figure 12-16 STAT Word 7, Address at End of Logic Pointer

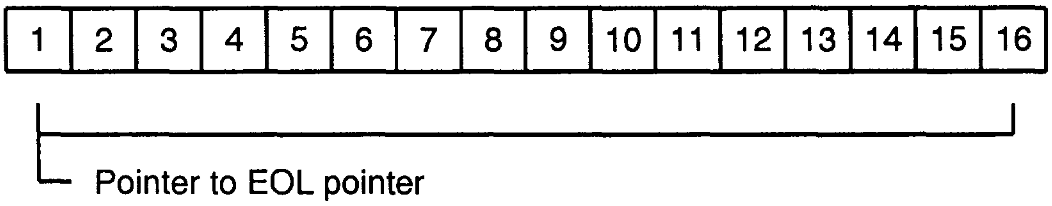


Figure 12-17 STAT Word 8, RIO Redundant Cables and Timeout

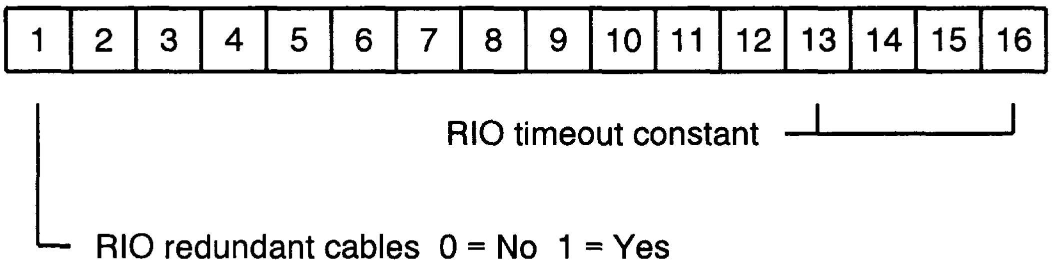


Figure 12-18 STAT Word 9, ASCII Message Status

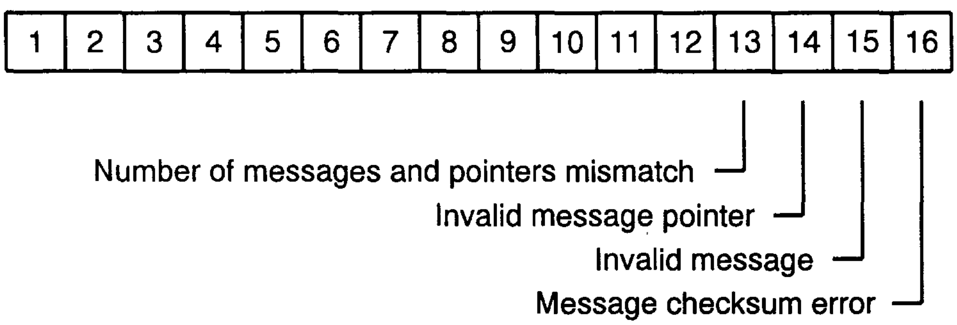
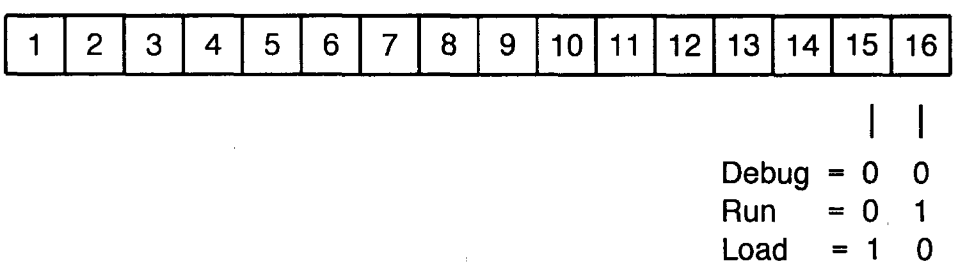


Figure 12-19 STAT Word 10, Run/Load/Debug Status



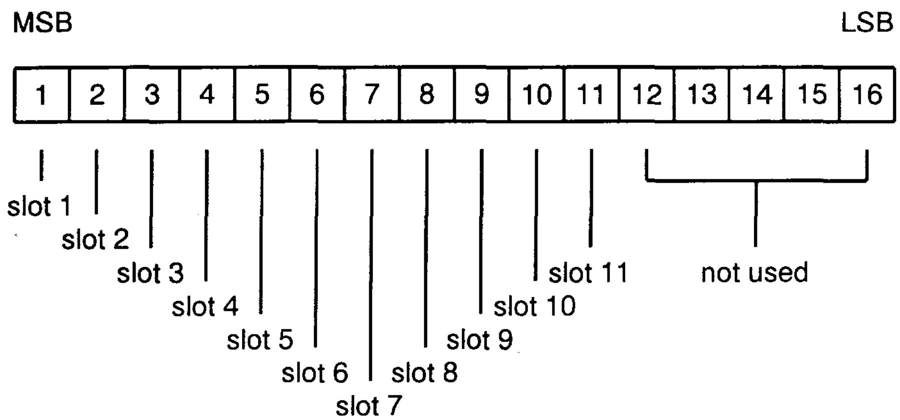
I/O Module Health Status

The I/O Module Health Status information consists of 160 words and is contained in STAT words 12 through 171. A single bit is used to represent the Health Status of a single module within the system such that a binary "1" means that the module is healthy.

Each drop in the system has five words allocated by the STAT block to contain I/O module status. Each of these five words contains the I/O module status of a single housing within the drop. The most signifigant bit (MSB) represents the status of the module in slot 1. Slot 2 module status is represented by the bit to the immediate right of the MSB.

Figure 12-20 Health Status Table Bit Organization for S908 Remote I/O Processors

Each word in this section of the table is organized as shown in the figure below. For H8l9-xxx housings - Bits 1-7 are used, 8-16 are not used. For H827-xxx housings - Bits 1-11 are used, 12-16 are not used. If a module is Traffic Copped and healthy, the bit will be a 1. If a module is not healthy or not Traffic Copped, the bit will be a 0. Empty slots, slots containing interface modules, and slots containing auxiliary power supplies status show a status of "0."



➤➤ **WARNING On systems using J890/J892s with PROM rev 1000, slot 1 will be the LSB. J890/J892s with PROM revs greater than 1000 will appear as previously described. The earlier J890/J892s should be upgraded as they will be incompatible with any user programming that assumes slot 1 status to be the MSB.**

A healthy I/O module must meet the following conditions:

The specified slot has been configured in the Traffic Cop.

The slot contains a module with the correct personality (i.e., correct module type).

Valid communication exists between the module and the interface module.

Valid communication exists between the interface module and the 984 controller.

STAT words 12 through 171 contain the I/O module health status information and are mapped as is shown in the table below.

Table 12-2 I/O Module Health Status

STAT Word	Drop No.	Housing No.
word 12	drop 1	housing 1
word 13	drop 1	housing 2
word 14	drop 1	housing 3
word 15	drop 1	housing 4
word 16	drop 1	housing 5
word 17	drop 2	housing 1
word 18	drop 2	housing 2
*		
*		
*		
word 170	drop 32	housing 4
word 171	drop 32	housing 5

STAT Word Calculations Application programming may access the above STAT words directly or use the following algorithms to calculate where errors have occured:

calculation of *drop* and *housing* number when *word number* is known may be done as shown.

perform this calculation first: (STAT word number - 12) / 5.

the drop number = quotient + 1 and the housing number = remainder + 1.

calculation of the *word number* when the *drop and housing number* are known may be done as shown.

word number = (5 x drop number) + housing number + 6

Drop Communication Status

The I/O Communication Status is contained in STAT words 172 through 277. The actual number of STAT words containing communication status depends upon the controller model and the amount of remote I/O. 16 bit controllers can only address STAT words 172 through 255. Depending upon the 984 controller model selected, drop 1 may be local I/O.

The I/O Communication Status area consists of two subgroups. The first group contains global communication status. The second group contains communication status for specific drops.

Global Communication Status This area consists of 10 words, STAT words 172 through 181, describing the global communications status. The STAT words of the Global Communication Status area may be interpreted as described below.

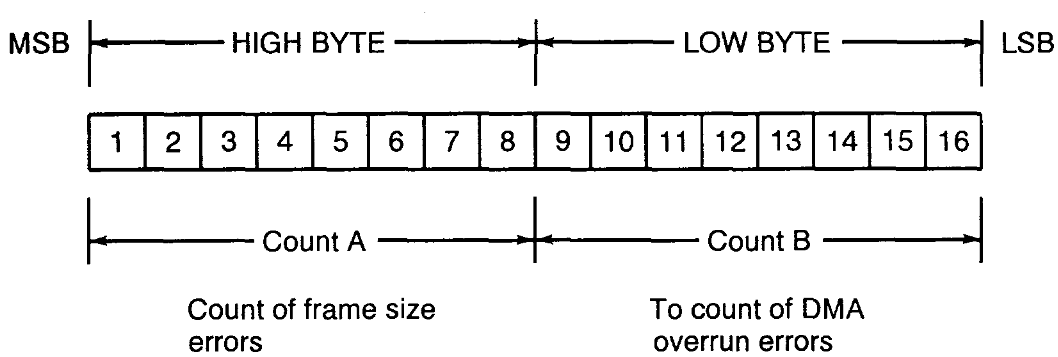
Word 172 S908 start error code. This word will always be 0000 in a running system. If an error does occur, the controller will not start and will generate a system error 0100 error code.

Words 173-175 Cable A error words. The following counts are located in words:

	High Byte Bits 1 to 8	**Low Byte** Bits 9 to 16
word 173	count "A"	count "B"
word 174	count "C"	count "D"

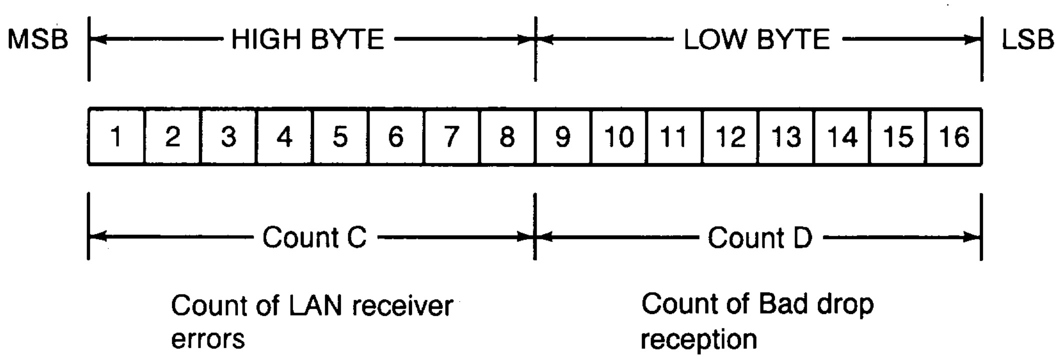
Word 173 The high order byte represents a count of Cable A frame size errors (count A). This indicates that the length of the data message was incorrect. The low order byte represents a count of DMA receiver overrun counts (count B). This indicates that the hardware had more data to send than was required.

Figure 12-21 STAT Word 173, Cable A Frame Size/DMA Overrun Error



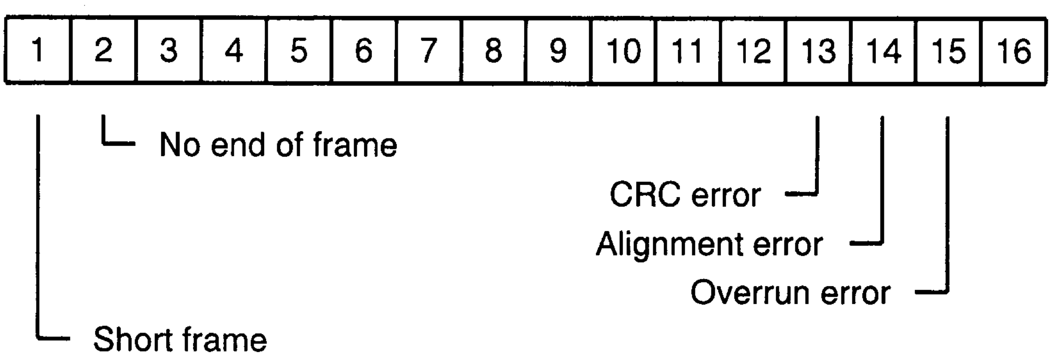
Word 174 Cable A LAN receiver error counter (count C), Bad drop reception on cable A counter (count D). This indicates a cable or noise problem to a drop. The drop table should be examined to determine which drop is having problems.

Figure 12-22 STAT Word 174, LAN Receiver Error Counter



Word 175 Last received LAN error code for cable A. The LAN hardware detected an error in recieving a message. The specific error is found in STAT word 175 (Cable A).

Figure 12-23 STAT Word 175, Last Received LAN Error Code
If bit is "l" then error is true

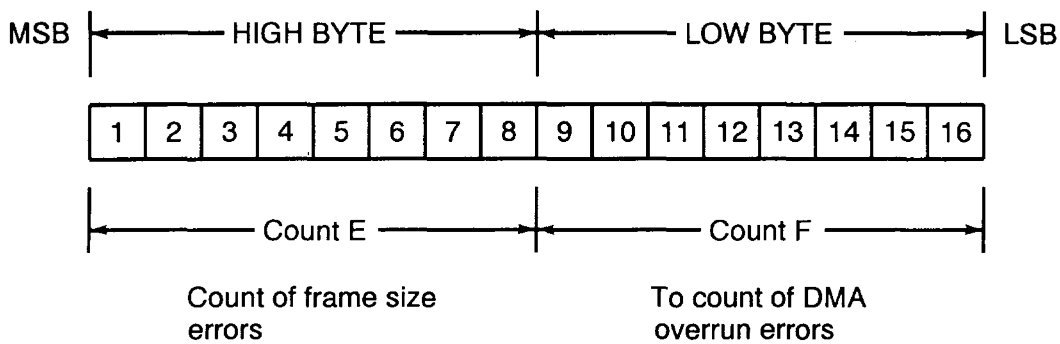


Words 176-178 Cable B error words. The following counts are located in words:

	High Byte Bits 1 to 8	**Low Byte** Bits 9 to 16
word 176	count "E"	count "F"
word 177	count "G"	count "H"

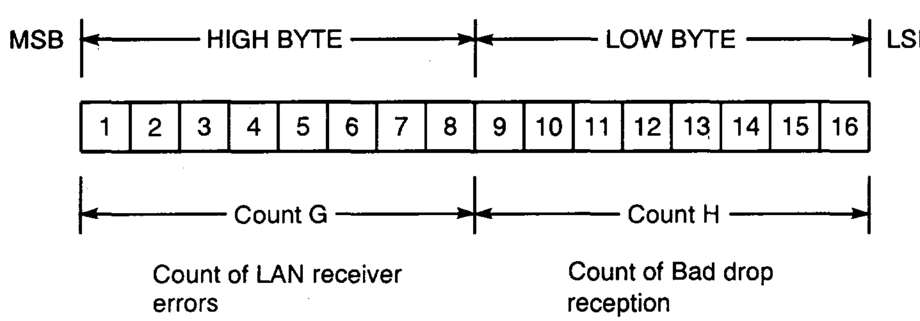
Word 176 The high order byte represents a count of Cable B frame size errors (count E). This indicates that the length of the data message was incorrect. The low order byte represents a count of DMA receiver overrun counts (count F). This indicates that the hardware had more data to send than was required.

Figure 12-24 STAT Word 176, Cable B Frame Size/DMA Overrun Error



Word 177 Cable B LAN receiver error counter (count G), Bad drop reception on cable B counter (count H). This indicates a cable or noise problem to a drop. The drop table should be examined to determine which drop is having problems.

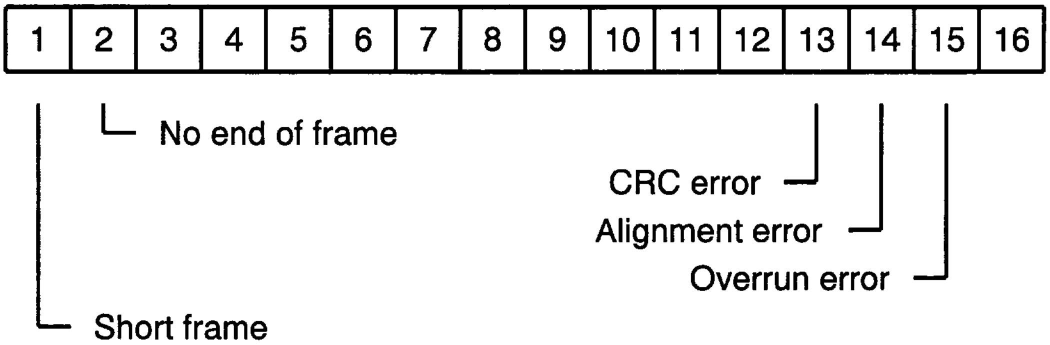
Figure 12-25 STAT Word 177, LAN Receiver Error Counter



Word 178 Last received LAN error code for cable B. The LAN hardware detected an error in recieving a message. The specific error is found in STAT word 178 (Cable B).

Figure 12-26 STAT Word 178, Last Received LAN Error Code

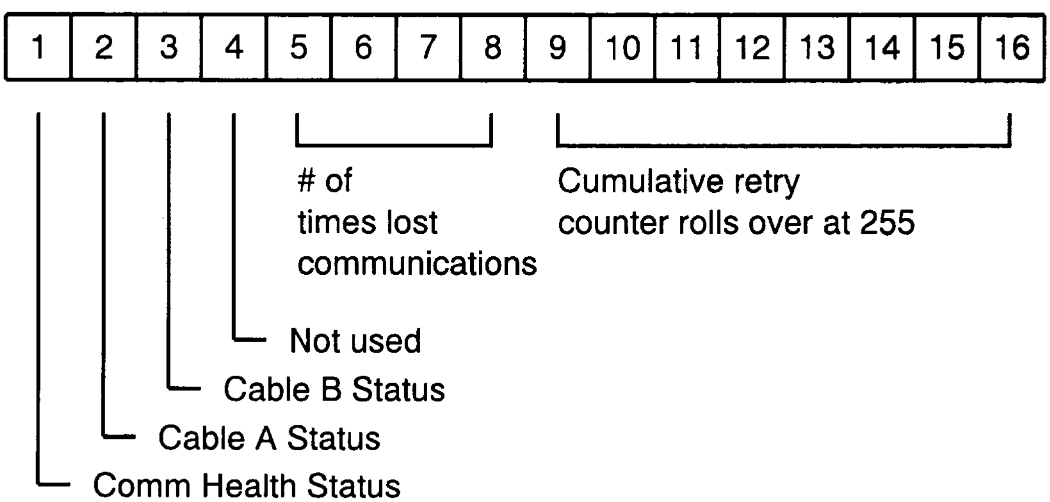
If bit is "1" then error is true



Word 179 Global Communication Status. This STAT word stores communications status for both cable A and cable B. The specific information stored is shown in the figure below.

Figure 12-27 STAT Word 179, Global Communications Status

Bits 1, 2 and 3 are "1" if both cables are healthy. Other bits indicate an error if "1"

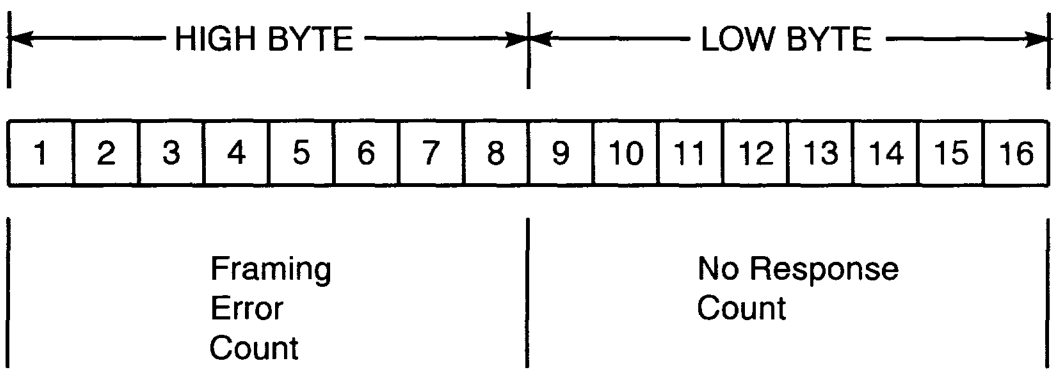


Word 180 Global Cumulative error counter for cable A.
High byte - bits 1 to 8 - Framing error count.
Low byte - bits 9 to 16 - No response count.

Word 181 Global Cumulative error counter for cable B.
High byte - bits 1 to 8 - Framing error count.
Low byte - bit 9 to 16 - No response count.

Words 180 and 181 contain the cumulative counts for no response conditions (low byte) and frame errors (high byte). Whenever one of these frame error counts is incremented, the specific error count in words 173 through 177 is incremented.

Figure 12-28 STAT Words 180 and 181, Global Cumulative Error Counters



Specific Drop Communication Status Words 182 through the end of the table are the status words for the individual drops. The first drop may or may not be a local drop depending upon the controller type being used. All drops after the first drop are remote drops. Each drop is allocated 3 STAT words. No counts are present until errors appear. Error counts remain in STAT words until power is cycled or cleared by user programming. The figure below describes the information stored in the STAT words.

Figure 12-29 Drop Communication Status

Bits 1, 2 and 3 are "1" if both cables are healthy. Other bits indicate an error if "1".

word 182	drop 1	1st word
word 183	drop 1	2nd word
word 184	drop 1	3rd word
word 185	drop 2	1st word
word 186	drop 2	2nd word
word 187	drop 2	3rd word
word 275	drop 32	1st word
word 276	drop 32	2nd word
word 277	drop 32	3rd word

1st Word

msb ... lsb

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

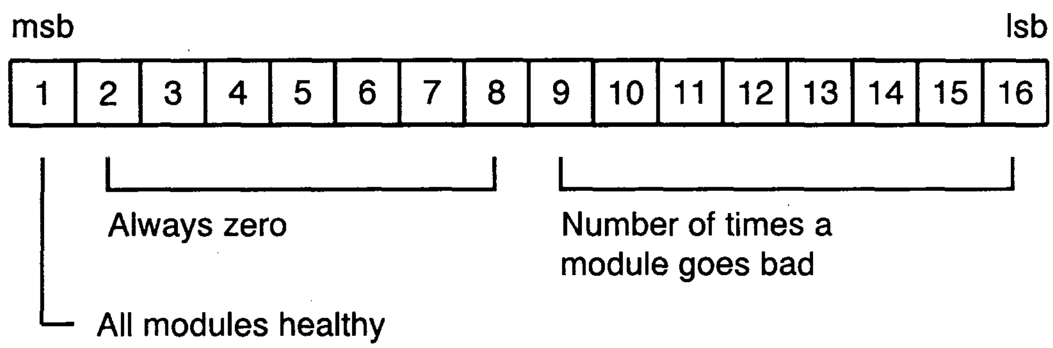
- 1: Comm Health Status
- 2: Cable A Status
- 3: Cable B Status
- 4: Not used
- 5–8: # of times lost communications
- 9–16: Cumulative retry counter

2d Word Cumulative frame error count (high byte) for Cable A. Cumulative no response error count (low byte) for cable A.

3d Word Cumulative frame error count (high byte) for cable B. Cumulative no response error count (low byte) for cable B.

➤ **NOTE** STAT Words 182, 183, and 184 are different when drop 1 is local I/O. STAT word 182 for local I/O is described below:

Figure 12-30 Word 182 for Local Drop



Word 183 Ourbus error count (continuous error count).

Word 184 Ourbus retry count (will max at 3).

STAT Word Calculations Application programming may access the above STAT words directly or use the following algorithms to calculate where errors have occured:

calculation of *drop* and *housing* number when *word number* is known may be done as shown.

perform this calculation first (STAT word number - 182) / 5.

the drop number = quotient + 1 and the housing number = remainder + 1.

calculation of the *word number* when the *drop and housing number* are known may be done as shown.

word number = (3 x drop number) + housing number + 178

STAT Block Applications

The following sections describe how the STAT block can be used, in conjunction with additional programming, to monitor your system's health.

I/O Module Health Status Application

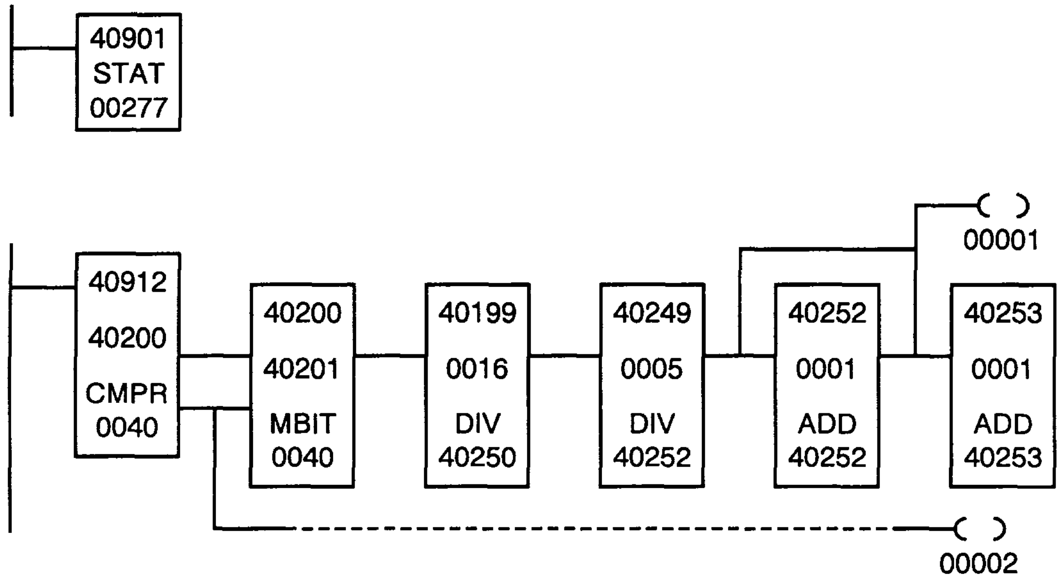
The second section of the STAT block table (words 12 - 171) contains one word for each housing that can be configured in the traffic cop. Since a drop may have a maximum of five housings, five words are used to contain a drops status. Even if only one housing in a drop is actually configured, 5 words will still be allocated for that drop. If a drop is not configured, 5 words are still allocated. Each word contains 11 bits of module status and five unused bits. A state of 1 indicates that the module is "healthy." That is, it is the correct type (i.e., type of module Traffic Copped for a given slot), it is communicating with the interface module, and the interface is communicating with the 984 controller. If the slot is not configured, has the wrong type module, is not communicating with the interface or the interface is not communicating with the 984 controller, the bit will be set to 0. This information is updated by the system, on a drop by drop basis, at the end of each drops scan.

The CMPR (compare) block checks the status of two tables, bit by bit, and indicates when a miscompare is found. By comparing the I/O module health section (from the STAT block) function against a I/O module health history table, you can determine when a change in module status occurs (i.e., status goes from good to bad or bad to good). The pointer of the CMPR function indicates which bit has changed.

To notify an operator of a module fault, the information provided by the CMPR function needs to be manipulated. Many operators will not understand if module status is presented to them as a bit number from within a table changing state. However, they could readily understand what is meant if your program tells them that a fault has occurred in drop X, housing Y, slot Z. The application described in the following pages presents module status information in an easily understandable form. Careful analysis and an in depth understanding of the function blocks involved is required in order to fully understand how the network works. A detailed explanation of the networks operation is given in the following pages.

Figure 12-31 STAT Block I/O Health Application

This network will indicate the drop #, housing # and slot # of any module that undergoes a change in I/O health bit status.



The CMPR block is checking two tables, bit by bit, searching for miscompares. The length of the two tables is determined by the number in the bottom node of the function block (in this case, 40 registers). The 40 registers, starting with 40201, form a health bit history table. The present health bit status (from STAT block) is checked against the last known health bit status (history table) each scan. Since a drop requires five words for status, a table length of 40 will monitor eight drops (drops 1-8). Larger systems may be monitored by expanding the numbers in the bottom nodes of the CMPR and MBIT blocks.

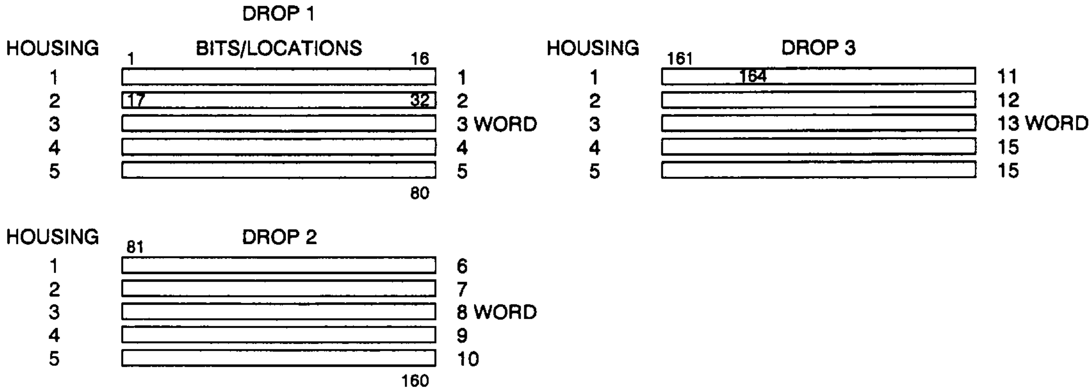
When a miscompare is detected, the location (bit number from within the table) is placed in the pointer (40200) register and the middle output (miscompare detected) goes ON. The nature of the miscompare (which bit of which table is 1 and which is zero) determines if the lower output is ON or OFF. In this example, 40 registers, starting with 40912, are checked against 40 registers starting with 40201.

The MBIT block uses the CMPR pointer (miscompare detected) to alter the history table bit such that a given error is only detected once each time it changes status. The arithmetic blocks calculate the drop, housing, and slot the error occurred in. Coil 00001 indicates a change in status of an I/O module. Coil 00002 is ON if the status change indicates the module is now good (i.e., health bit = "1"). Since the MBIT block changes the health bit history table as soon as a error is detected, coils 00001 and 00002 will only be ON for one scan. You should seal-in their status if you desire to use them to drive annunciators.

To understand the arithmetic calculation of the error location, you must first have a thorough understanding of the number provided by the CMPR block pointer. The table length of the CMPR block is 40. 40 registers equals 640 bits (40 x 16). The figure below shows the history table arrangement of three of the eight drops as they apply to the current example.

Figure 12-32 CMPR Block History Table

A drop may have a maximum of 5 racks. Words 1 - 5 (bits 1-80) store the status of the first drop. Words 6-10 (bits 81-160) contain drop 2 status.



Assume that the CMPR block detects a miscompare at location 164. The figure above shows that the error is in drop 3, housing 1, slot 4. The arithmetic calculations described below calculate this information from the CMPR block pointer.

The first DIV block takes the error pointer, (40200) which is the bit number of the first two bits from the tables that miscompare, and divides it by 16. The quotient equals the number of good words (10, see figure above) and the remainder (40251) equals the slot number of the miscompare. In this example, there are 10 good words or housings and the error is in the fourth slot of the 11th word.

The second DIV block takes the quotient and divides it by five. Since there are five words per drop, this calculation determines the number of *good* drops. The quotient of this operation, plus one, equals the bad drop. In this example, 10 (the quotient) / 5 = 2 (good drops). The first ADD block gives you 2 + 1 or 3, this is the bad drop. The remainder plus one equals the bad housing and is calculated in the same way the bad drop calculation was performed.

The faulty module location information is stored in registers 40252, 40253, and 40251 in the following format:

Drop #40252
Housing #40253
Slot # 40251

➤ **NOTE** The previous example provides runtime information only. Additional logic is needed to load the history table with data regarding what modules are present should be active on power-up. If this is not done, then any modules that failed on power-up or are missing, will not be detected.

Communication Status

The Communication Status area of the STAT table is subdivided into two areas, Global Communication Status and Drop Communication status. This section describes how communications information is obtained and how the information from the two groups, interelates to each other.

Cable Status Cable status is provided in both the Global Communication area (words 173 - 181) and the Drop Communication area (words 182 - 277). By evaluating the information in both sections, the status of both cables (if redundant cable topology is used) to all drops can be determined.

Global cable status may be monitored by examining STAT word 179. The 3 most significant bits (MSB) indicate the communication status and are updated each scan. If the MSB (bit 1) is set, then communications to all drops was successful. If any configured drop could not be communicated with, then this bit will be zero. If Bit 2 is set to "1", then all drops communicated successfully on cable 'A'. If this bit is not set, then one or more drops could not communicate on cable "A". Bit 3 indicates the same information for cable "B".

It is possible, though unlikely, with redundant cable systems for BOTH bits 2 and 3 to be zero and still have had successful communications to ALL drops. A scenario describing this is as follows:

If one drop receives a message on cable "A" but not on cable "B", then it sends, as part of its response packet, bad health for cable "B." This causes bit 3 to be set to "0." When the drop transmits its response, it does so on both cables. If the S908 receives the message on cable "B" but not on cable "A", it will clear bit 2. This results in the communications health bits for *both* to be set to "0" and both cables are declared BAD. This could happen when there is noise induced on cable "A" near the S908 and noise induced on cable "B" near the drop. The S908 can drive a good signal through the noise on cable "A" but due to the losses of the cable, taps, and splitters, the response signal is lost on cable "A." The same condition exists on cable "B" , the S908 message is lost but the drop is able to drive its signal through the noise on cable B to be received by the S908.

If any of three bits described above are set to "0", then an error condition exists. The Drop Communications table (words 172 - 277) should be examined to determine which drop had communications or cable failures. By examining the first word for each drop, the communications and cable status can be determined. The message format is the same as the global information message format but the information is drop specific. The MSB indicates that communication was successful to that drop on either cable. Bit 2 indicates that the transaction was successful on cable "A" and bit 3 indicates the same for cable "B". If either bit 2 or 3 is set to "0", then one of the following conditions exists:

The drop does not support redundant cables and only cable "A" status is returned.

The drop did not receive a valid message for six consecutive transactions. This prevents transient noise from showing up as a bad cable.

The S908 did not receive a valid message for six consecutive transactions.

These transactions do not include retries. Retries are handled in the following manner.

Step 1 If a drop does not respond within 1 msec (if redundant cable system, on either cable), then the communications status for that drop is examined.

Step 2

If on the previous scan the communications was good, then a retry is performed and a drop counter is set to 5 and decremented.

Step 3 If this retry is not successful, the counters are again decremented and another retry is performed.

Step 4 If either counter (one for each cable) reaches zero without successful communications, the drop is declared bad.

If the communications to the drop was previously good, the drop counters are set to 5 to allow a maximum of 6 tries per drop. If a drop has previously been declared "BAD" then an initial communication, each time the controller wishes to communicate with the drop (no re-trys), is attempted. This initial communication is to determine if the drop will now communicate properly.

Error Logging Included in the communications status table are error counts which allow a user to determine the status of his network. These counters will reset to zero when the maximum count is reached. In the Global Communications section (words 173 - 181) specific errors are counted, while in the Drop Communication section maintains a summary of *frame errors* and *no response errors*.

Drop Counters There are three status words (starting at STAT words 182-184) containing a total of six counts kept for each drop. When a *framing error* occurs (message received but in error), the high byte of word 2 (cable "A") or the high byte of word 3 (cable "B") is incremented. Whenever a *no response error* occurs, the low byte is incremented(word 2 for cable "A", word 3 for cable "B"). The first word contains *cable status* information that consists of a count of the number of times the communications health bit went to zero (bits 5 through 8) and the number of retries performed at that drop (bits 9 through 16). This information allows you to determine the number of errors that occurred at a drop and whether these errors involved bad communications (framing errors) or no responses. You may also determine how many retries are being attempted to a drop in order to maintain communications.

To determine if the framing errors involved bad messages being received (bad/noisy cables) or were hardware faults, the Global Communications section of the table must be examined.

P190 or Personal Computer Direct Access to S908 STAT Data

The STAT function block retrieves controller status information from the controllers memory and places it in a user defined (registers or discrete outputs) area for easy access. Sometimes it may be necessary to access controller status information directly (without the STAT block). Controller Status (words 1 through 11) can always be found at absolute memory locations 65 hex through 6F hex.

The absolute memory locations that hold the I/O Module Health and the Communication Status varies with different 984 modules. The I/O health (STAT Block words 12 - 171) is kept in *160* sequential memory locations. The communication status table (STAT block words 172 through 277) is kept in *106* sequential locations. Pointers are used to locate the first word of each table. The pointers are *always* at the same absolute memory location in any 984. The absolute memory locations are:

Memory Pointer	Absolute Memory Location
I/O Module Health pointer	46 Hex
I/O Communication pointer	33 Hex

Procedure for Retrieving 984 Register Information Using the P190

Step 1 Load the P190 Utilities tape and attach to the controller.

Step 2 Press the <EXIT> key, the Function Keys should read CONTROLLER OPERATIONS, LADDER LISTER, EXAMINE MEMORY. Press, EXAMINE MEMORY. The P190 displays a full reference screen.

Step 3 Enter the absolute memory address, in Hex, into the AR and press the <GET> key.

Step 4 The system displays the contents of the address requested.

If the most significant hex digit of either pointer is an 8 or greater, E8000 hex must be added to the pointer. The table below assists you with this address correction. The pointer MSB is dropped.

Table 12-3 P190/Personal Computer Address Correction Table for Addresses Greater Than 8000

If the MSB of the pointer is an 8 or greater, E8000 hex must be added to the pointer. The table below will help with this address correction.

STAT Pointer Retrieved	Corrected Address	
8XXX	F0XXX	xxx= The last three digits of the pointer become the last three digits of the address.
9XXX	FIXXX	
AXXX	F2XXX	
BXXX	F3XXX	
CXXX	F4XXX	
DXXX	F5XXX	
EXXX	F6XXX	
FXXX	F7XXX	

For example, if the P190 retrieved a pointer of B984, the corrected address would be F3000 + 0984 or F3984. Note, the pointer MSB is dropped.

To find the address of an I/O Health Status Word:

Address = (STAT word number - 000C) + I/O Health Pointer
(hex) (hex) (hex) (corrected)

The pointer indicates the first word of the I/O Health Status Table, this is actually STAT word 12 if the STAT block was being used. Be careful when you perform the addition as the Health Pointer and the end result will be in Hex.

To find the address of a Communication Status Word:

Address = (STAT word No.- 00AC) + I/O Communications Pointer
(Hex) (Hex) (Hex) (corrected)

The pointer indicates the first word of the Communications Table, this is actually STAT word 172 if the STAT block was being used. Be careful when you perform the addition as the Communications Pointer and the end result will be in Hex.

P965 Direct Access to S908 STAT Data

The STAT function block retrieves controller status information from the controllers memory and places it in a user defined (registers or discrete outputs) area for easy access. Sometimes it may be necessary to access controller status information directly (without the STAT block). Controller Status (words 1 through 11) can always be found at absolute memory locations 300101 through 300111 decimal. Unlike the P190, the P965 only allows memory addresses to be entered in decimal.

The absolute memory locations that hold the I/O Module Health and the Communication Status varies with different 984 modules. The I/O health (STAT Block words 12 - 171) is kept in *160* sequential memory locations. The communication status table (STAT block words 172 through 277) is kept in *106* sequential locations. Pointers are used to locate the first word of each table. The pointers are *always* at the same absolute memory location in any 984. The absolute memory locations are:

Memory Pointer	Absolute Memory Location
I/O Module Health pointer	300070 decimal
I/O Communication pointer	300051 decimal

Procedure for Retrieving 984 Register Information Using the P965

Step 1 Connect the P965 to the controller MODBUS Port, turn ON the P965. If used in the 984A, B ASCII/DAP port, it is not required to turn the P965 on.

Step 2 Press the <MDAP> function key (<F2>), followed by the <SELECT FUNCTION> function key (<F4>).

Step 3 From the "MDAP FUNCTIONS" menu select the RAP function by pressing function key <F1>.

Step 4 From the "MDAP RAP MENU", select the MEM operation by pressing function key <F3>.

Step 5 The LCD display should read "ENTER ADDRESS."

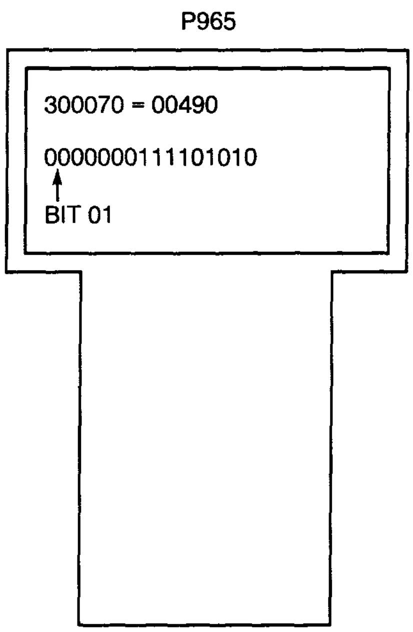
Step 6 Key in the memory address desired (in decimal) and press the <ENTER> key. The value stored at the memory address requested is displayed in binary and decimal.

Step 7 The LCD screen may be cleared for the next request by pressing the <NEW REF> key.

The absolute memory address indicated by either pointer must be corrected by adding 300000 to the address at the pointer location. The figure below illustrates this correction.

Figure 12-33 P965 Absolute Memory Address Correction

Add 300000 to the address indicated by the pointers



$$\begin{array}{r} 300000 \\ + \quad 490 \\ \hline = \boxed{300490} \end{array}$$

300490 = START OF I/O MODULE HEALTH TABLE

To find the address of an I/O Health Status Word (all numbers in decimal):

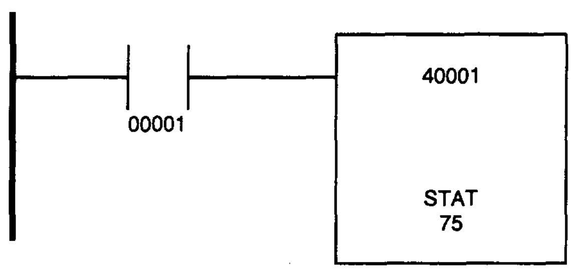
Address = (STAT word number - 12) + I/O Health Pointer (corrected)

To find the address of a Communication Status Word (all numbers in decimal):

Address = (STAT word number - 172) + I/O Communications Pointer (corrected)

The 984 STAT block is a powerful troubleshooting tool that allows you to access detailed information on the system status. The S901 STAT block obtains detailed controller information such as; interface module status, memory protect status, battery status, I/O module status, and remote I/O communications status, and places this information in a table of user defined registers or discrete outputs. This information may then be used directly, or in conjunction with other user programming to monitor system status, detect intermittent problems or isolate remote I/O communications problems.

Figure 12-34 The S901 STAT Block



The S901 STAT Block

The top node is the destination node. It specifies the registers or discretes which will hold the status information. It can be either a 0XXXX discrete output or a 4XXXX holding register reference. The reference indicated is the first reference of a table of registers or groups of discretes. Each register has 16 bit locations, discretes are in groups of 16.

➤ **NOTE** The use of discrete outputs is not recommended for long table lengths since the number of registers used is large. Shorter table lengths may use discrete outputs if so desired.

The bottom node contains the symbol "STAT" and a numerical value that specifies the table length. This constant may range from 1 to 75. The number of status words applicable depends on the controller type and the amount of remote I/O being used.

➤➤ **WARNING The STAT function overrides the disable state of a coil used in the destination node of the function block. This may cause personal injury if you assume a coil has disabled an operation and repairs are being made, as the coil's state can change as a result of the STAT function.**

Block Inputs The top input controls the STAT operation. When it receives power, the controller status is copied into the table of references specified in the top node. The bottom input is not used.

Block Outputs The top output passes power when the top input receives power. The bottom output is not used.

Status Information The status information retrieved by the STAT function block consists of the following three sections:

Section 1	Controller Status
Section 2	I/0 Module Health Status.
Section 3	Remote I/O Communications Status

The maximum table length in the STAT instruction depends upon the controllers remote I/O. Registers from the table created by the STAT block are used to store module health information for all drops and drop communication error information. More remote I/O requires more table registers.

The procedure for extracting, analyzing and incorporating STAT information into user programming is virtually the same for the S901 STAT block and the S908 STAT block. The S901 STAT block does provide some different information and is organized differently but its use is still similar to the S908 STAT block. Since the S908 section is detailed and the two STAT blocks are very similar, this section will concentrate on items unique to the S901 STAT block.

Table 12-4 S901 STAT Block Table

This table shows the relative addresses of information retrieved by the STAT block as well as the absolute system addresses of the same information.

Relative STAT Block Address			Controller Status	Absolute Address	
Decimal		Hex		Hex	Decimal
Word	1	01	Controller Status	65	101
	2	02	Unused	66	102
	3	03	Controller Status	67	103
	4	04	S901 Status	68	104
	5	05	Controller Stop State	69	105
	6	06	Number of Segments in User Logic	6A	106
	7	07	Address of End of Logic Pointer	6B	107
	8	08	RIO Redundancy and timeout	6C	108
	9	09	ASCII Message Status	6D	109
	10	0A	Run Load Debug Status	6E	110
	11	0B	Address of Status Word Pointer Table	6F	111

I/O Module Health Status

Word	12	0C	Channel 1 Input	Channel 2 Input
	13	0D	Channel 3 Input	Channel 4 Input
	14	0E	Channel 5 Input	Channel 6 Input
	//	//	/////////////	/////////////
	27	1B	Channel 29 Input	Channel 30 Input
	28	1C	Channel 31 Input	Channel 32 Input
	29	1D	Channel 1 Output	Channel 2 Output
	30	1E	Channel 3 Output	Channel 4 Output
	31	1F	Channel 5 Output	Channel 6 Output
	//	//	//////////////	//////////////
	42	2A	Channel 29 Output	Channel 30 Output
	43	2B	Channel 31 Output	Channel 32 Output

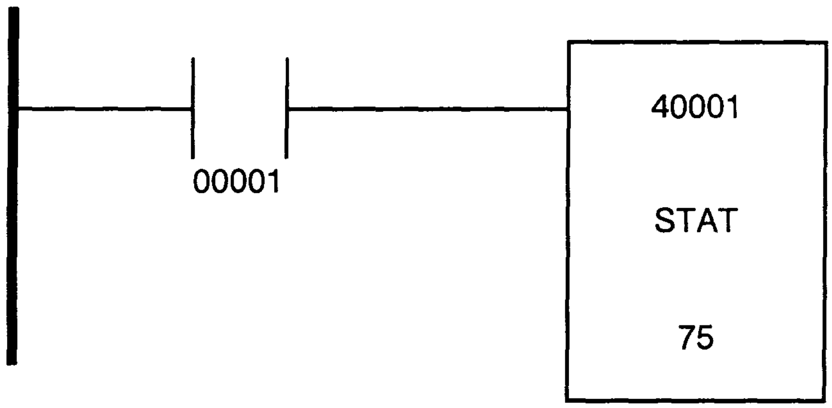
Remote I/O Communication Status

Word	44	2C	Remote I/O	Ch 5 & 6	1st word
	45	2D	Remote I/O	Ch 5 & 6	2nd word
	46	2E	Remote I/O	Ch 7 & 8	1st word
	//	//	/////////////////////////////////////		
	71	47	Remote I/O	Ch 31 & 32	2nd word
	72	48	Remote I/O	Ch 1 & 2	1st word
	73	49	Remote I/O	Ch 1 & 2	2nd word
	74	4A	Remote I/O	Ch 3 & 4	1st word
	75	4B	Remote I/O	Ch 3 & 4	2nd word

➤ **NOTE** Like S908 systems, the first 11 STAT words are always found at absolute memory address 65-6F hex. The absolute memory locations of the remaining STAT words are determined by pointers. A pointer for the start of the STAT information is always located at address 6F hex and the exact procedure for using these pointers is covered at the end of this chapter.

In the figure below, when coil 0001 is energized, 75 consecutive words of system memory are copied into registers 4000l through 40075. Section 1 contains 11 STAT words (STAT words 1 - 11) and contains the controller status information. Section 2 contains 32 STAT words and contains I/O module health status. Section 3 contains an additional 32 STAT words and contains remote I/O communications information.

Figure 12-35 STAT Block for the S901



The length of the Status Table in memory depends on the amount of remote I/O the system has. A fully configured system requires 75 STAT words. Smaller systems may use a smaller number in the bottom node of the STAT block, thus conserving registers.

Controller Status

The 984 Controller Status is contained in status words 1 through 11. This section describes the information contained in these 11 STAT words. STAT word 2 is unused.

Figure 12-36 STAT Word 1, Controller Status

If the bit is a "1", then the condition is TRUE or ON.

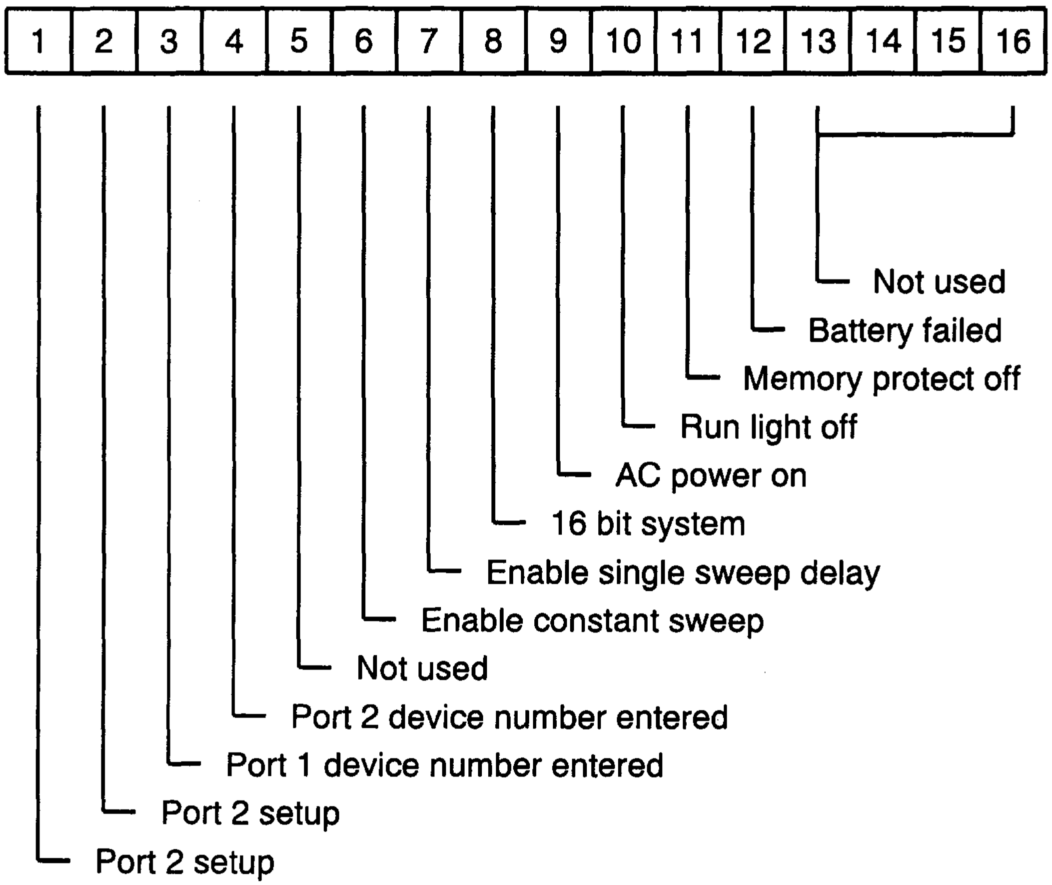


Figure 12-37 STAT Word 3, Controller Status

If the bit is a "1", then the condition is TRUE or ON for bit positions 1 through 4

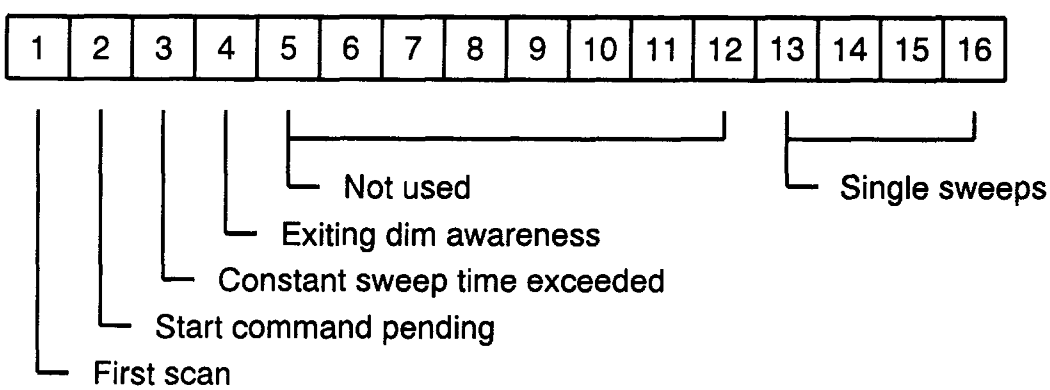


Figure 12-38 STAT Word 4, S901 Status

If bit is a "1", then the condition is TRUE or ON for bit positions 1 through 4

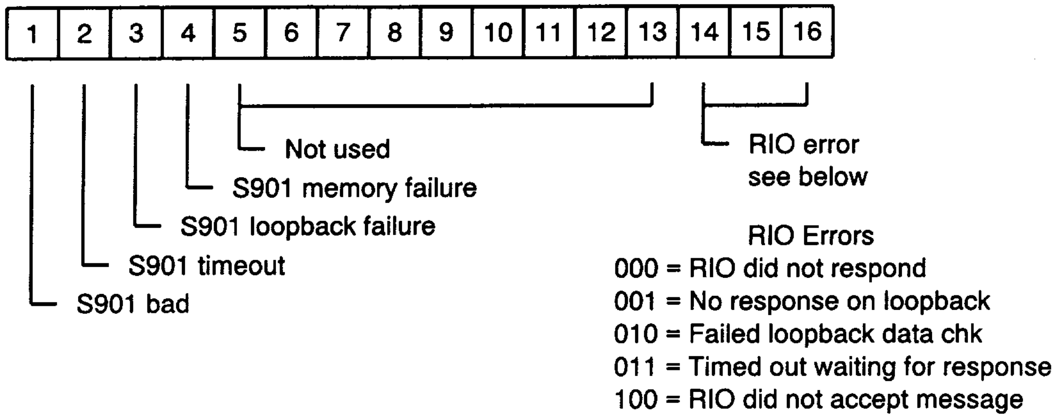


Figure 12-39 STAT Word 5, Controller Stop State

If bit is a "1", then the condition is TRUE or ON

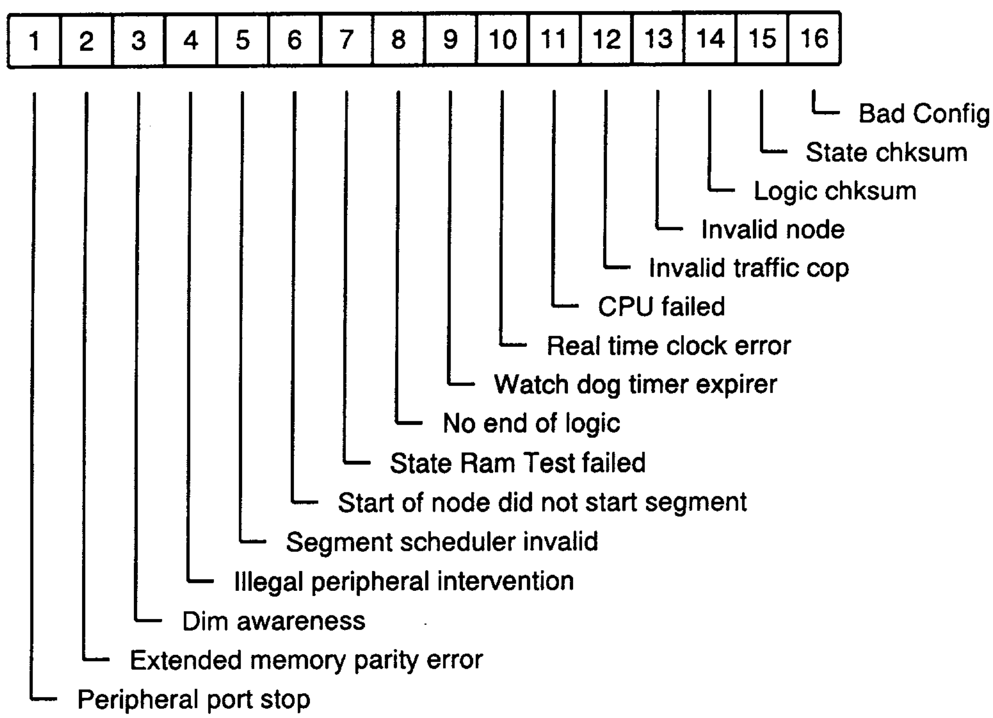


Figure 12-40 STAT Word 6, Number of Segments

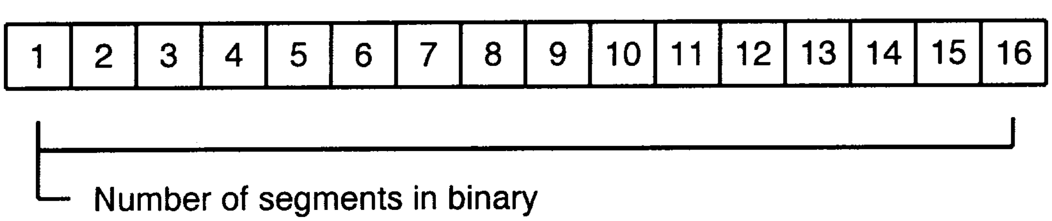


Figure 12-41 STAT Word 7, Address at End of Logic Pointer

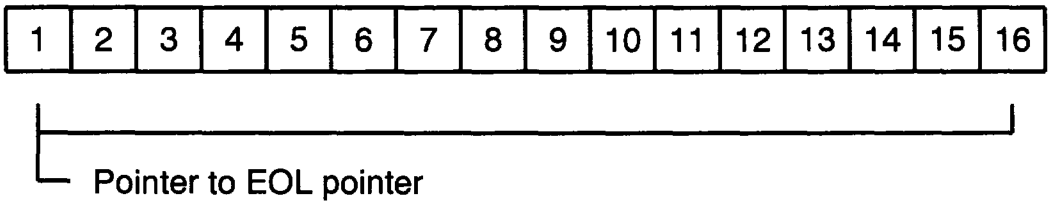


Figure 12-42 STAT Word 8, RIO Redundancy and Timeout

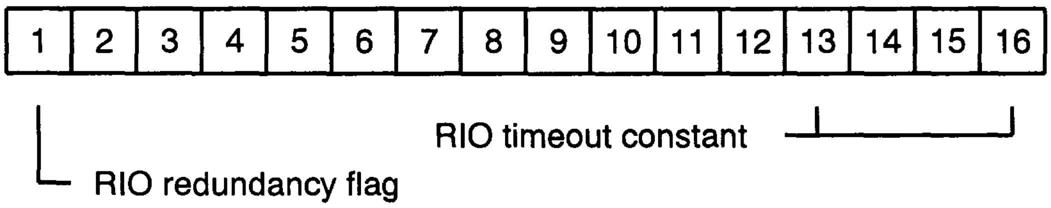


Figure 12-43 STAT Word 9, ASCII Message Status

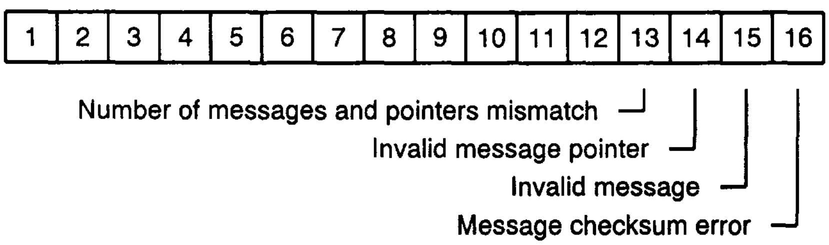


Figure 12-44 STAT Word 10, Run/Load/Debug Status

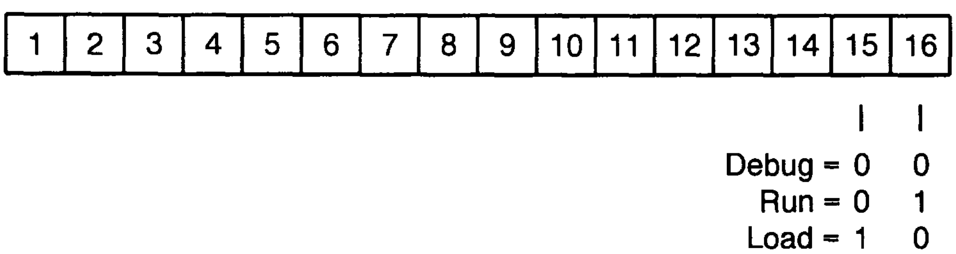
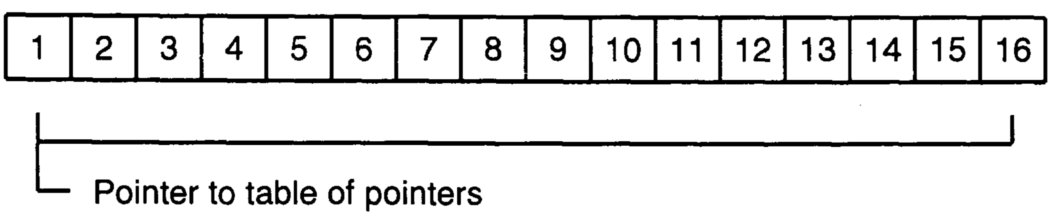


Figure 12-45 STAT Word 11, Starting Address of Table of Pointers



I/O Module Health Status

Figure 12-46 Health Status STAT Table Organization

There are 32 words in this section of the table. See the figure below for the organization of each word.

Word		
12	Channel 1 Input	Channel 2 Input
13	Channel 3 Input	Channel 4 Input
14	Channel 5 Input	Channel 6 Input
//	/////////////	/////////////
26	Channel 29 Input	Channel 30 Input
27	Channel 31 Input	Channel 32 Input
28	Channel 1 Output	Channel 2 Output
29	Channel 3 Output	Channel 4 Output
30	Channel 5 Output	Channel 6 Output
//	//////////////	//////////////
42	Channel 29 Output	Channel 30 Output
43	Channel 31 Output	Channel 32 Output

Figure 12-47 Health Status STAT Word Organization

Each of the 32 words in this area is organized as shown bleow.

	ODD CHANNELS								EVEN CHANNELS							
Word N	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8

If the slot is inhibited in the Traffic Cop the bit will be 0.
If the slot contains an Input Module the bit will be 1.
If the slot contains an Input/Output Module the bit will be 1.
If the slot contains an Output Module: if the active lite is ON the bit will be 1 and
if the active lite is OFF the bit will be 0.

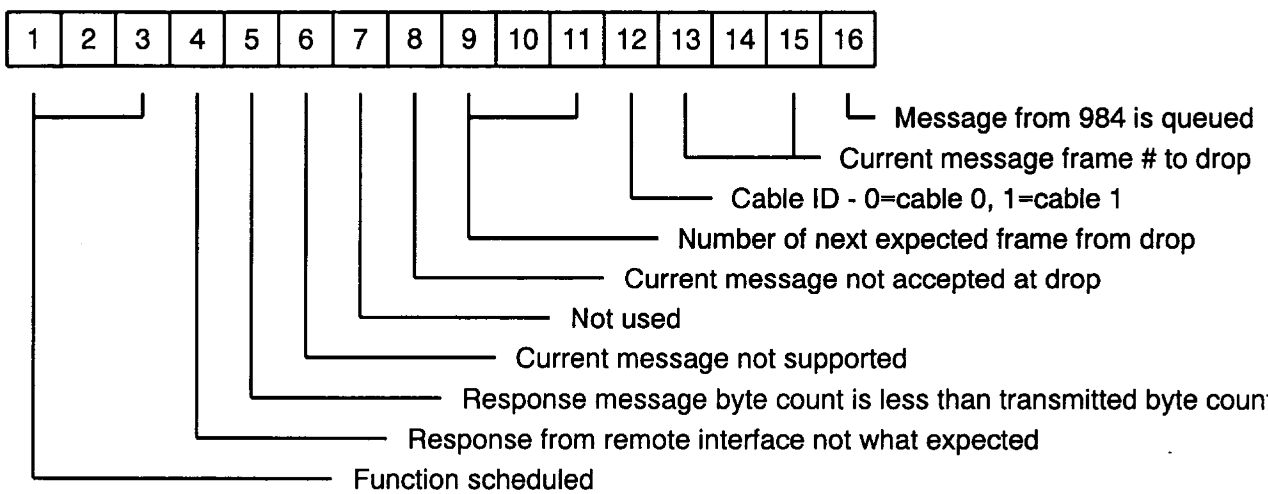
NOTE: Only valid for scan times greater than about 30 mS

Remote I/O Communication Status

The 32 STAT words of I/O Communication Status is contained in STAT words 44 - 75. There are two STAT words allocated for each I/O drop (maximum of 16 drops).

Figure 12-48 Health Status Table Organization

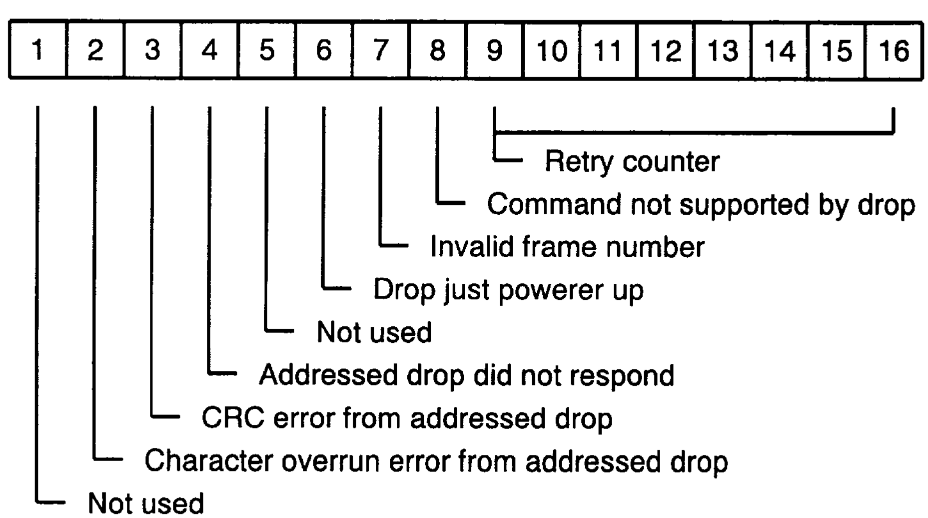
If the bit is a "1", then the condition is TRUE or ON.



000 = Normal I/O	100 = Inhibit
001 = Restart (Comm Reset)	101 = Unassigned
010 = Restart (Application Reset)	110 = Unassigned
011 = Unassigned	111 = Unassigned

Figure 12-49 Health Status STAT Word Organization

If the bit is a "1", then the condition is TRUE or ON.



P190 or Personal Computer Direct Access to S901 STAT Data

The STAT function block retrieves controller status information from the controllers memory and places it in a user defined (registers or discrete outputs) area for easy access. Sometimes it may be necessary to access controller status information directly (without the STAT block). Controller Status (words 1 through 11) can always be retrieved from absolute memory locations 65 hex through 6F hex.

Address 6F always contains a pointer. This pointer indicates the absolute address of a table of *pointers* that is 76 words long. This address may need to be corrected using the procedure outlined in the figure below before the P190/computer can use it.

Figure 12-50 P190/Personal Computer Address Correction Table for Addresses Greater than 8000

If the MSB of the pointer is an 8 or greater, E8000 hex must be added to the pointer. The table below will help with this address correction.

STAT Pointer Retrieved	Corrected Address	
8XXX	F0XXX	xxx= The last three digits of the pointer become the last three digits of the address.
9XXX	FIXXX	
AXXX	F2XXX	
BXXX	F3XXX	
CXXX	F4XXX	
DXXX	F5XXX	
EXXX	F6XXX	
FXXX	F7XXX	

For example, if the pointer located at absolute address 6F was FA0E, then the corrected address would be F7A0E. The MSB of the pointer addressed is dropped under these conditions.

The address in 6F points to a table of pointers 76 words long. However, the 1st register contains data that is the size of the STAT table multiplied by eight. The next 11 pointers hold the absolute address of the first 11 STAT words, i.e., addresses 65 - 6F. It is important to remember that this 76 word long table is a table of address *pointers* for the 75 word long system STAT area. The figure below shows how the starting location for the table of pointers is located as well as is a partial listing of the table of pointers from a 984A controller.

Figure 12-51 Partial Listing, 984A Table of Pointers

The listing below shows how the starting address of the table of pointers is obtained as well as parts of the table of pointers from each of the three status areas. The starting address of the table is always at address 6F. The address stored at that location is FA0E hex. Since "F" is the first hex digit, it must be corrected as described in the preceding figure.

Starting Address		Address to be Corrected	Description
0006F	=	FA0E HEXADECIMAL	Location of STAT block size pointer address must be corrected

Corrected Address		Pointer Address	Description
F7A0E	=	0600 DECIMAL	Corrected address and STAT block size x 8, 600/8 = 75 STAT words *
F7A0F	=	0065 HEXADECIMAL	Points to STAT word 1
F7A10	=	0066 HEXADECIMAL	Points to STAT word 2
F7A11	=	0067 HEXADECIMAL	Points to STAT word 3
F7A12	=	0068 HEXADECIMAL	Points to STAT word 4
F7A19	=	006F HEXADECIMAL	Points to STAT word 11
F7A1A	=	006B HEXADECIMAL	Points to channel 1,2 I/O health
F7A1B	=	006C HEXADECIMAL	Points to channel 3,4 I/O health
F7A3A	=	2000 HEXADECIMAL	Points to remote I/O, Ch. 5,6, 1st word
F7A3B	=	0000 HEXADECIMAL	Points to remote I/O, Ch. 5,6, 2d word

* Not a pointer

Procedure for Retrieving 984 Register Information Using the P190

Step 1 Load the P190 Utilities tape and attach to the controller.

Step 2 Press the <EXIT> key, the Function Keys should read <CONTROLLER OPERATIONS>, <LADDER LISTER>, <EXAMINE MEMORY>. Press EXAMINE MEMORY. The P190 displays a full reference screen.

Step 3 Enter the absolute memory address, in Hex, into the AR and press the <GET> key.

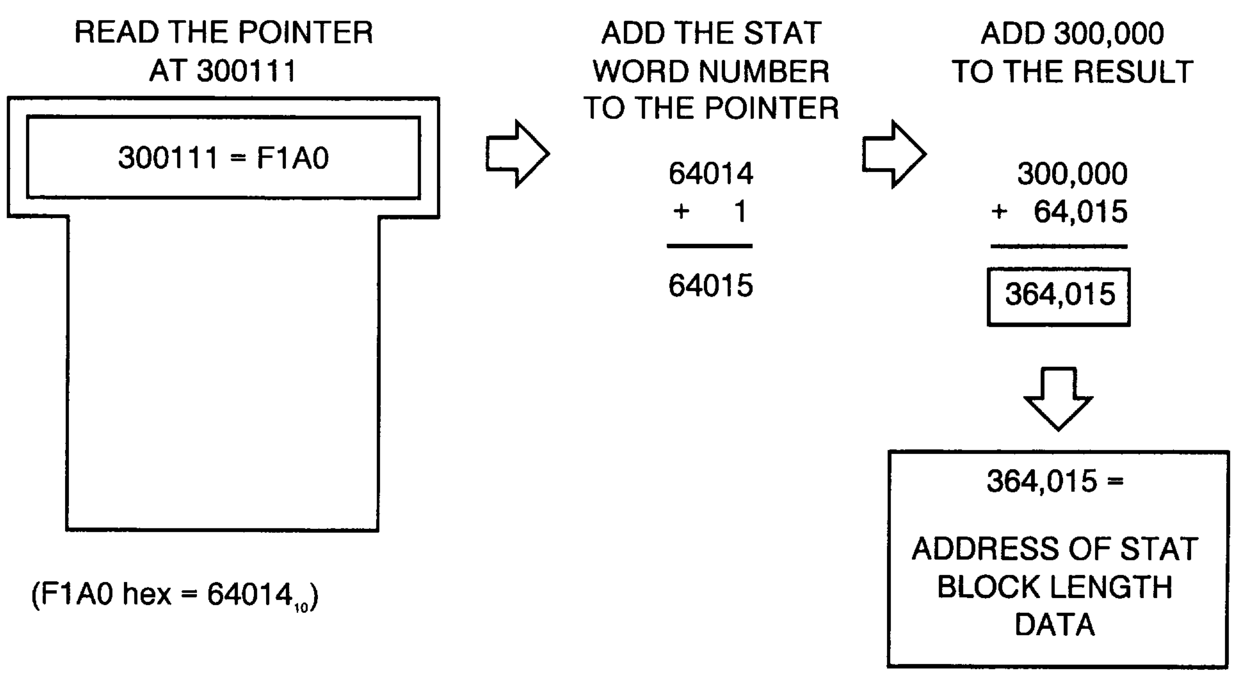
Step 4 The system displays the contents of the address requested.

The STAT function block retrieves controller status information from the controllers memory and places it in a user defined (registers or discrete outputs) area for easy access. Sometimes it may be necessary to access controller status information directly (without the STAT block). Controller Status (words 1 through 11) can always be found at absolute memory locations 300101 through 300111 decimal. Unlike the P190, the P965 only allows memory addresses to be entered in decimal.

Address 300111 always contains a pointer. This pointer indicates the absolute address of a table of *pointers* that is 76 words long. This address must be corrected using the procedure outlined in the figure below, before the P965 can use it.

Figure 12-52 Address Correction Procedure for P965

To correct the pointer address; read the pointer at location 300111, add the number of the STAT word desired to the pointer, and then add 300000 to the result as described below.



Procedure for Retrieving 984 Register Information Using the P965

Step 1 Connect the P965 to a controller MODBUS Port, turn ON the P965.

Step 2 Press the <MDAP> function key <F2>, followed by the <SELECT FUNCTION> function key <F4>.

Step 3 From the "MDAP FUNCTIONS" menu select the <RAP> function by pressing function key <F1>.

Step 4 From the "MDAP RAP MENU", select the <MEM> operation by pressing function key <F3>.

Step 5 The LCD display should read "ENTER ADDRESS."

Step 6 Key in the memory address desired (in decimal) and press the <ENTER> key. The value stored at the memory address requested is displayed in binary and decimal.

Step 7 The LCD screen may be cleared for the next request by pressing the <NEW REF> key.

Modicon telephone numbers are shown below. To call from anywhere in North America except from within Massachusetts, dial:

1 - (800) 468-5342

To call from outside North America, dial:

1 - (508) 794-0800

When calling, a recording will ask you to enter a one digit code for the type of service that you want. If you are using a touch tone phone, press the correct button. If you are using a pulse phone, an operator will assist you.