REGISTERS

Register Definition

A memory location where data can be stored. This data may be:

A decimal number from 0000 to 9999

A hexadecimal number from 0000 to FFFF

A binary bit pattern from 0000 0000 0000 0000 to
1111 1111 1111 1111

TWO ASCII CHARACTERS PER REGISTER

The 584 utilizes 2 types of registers:

1. Input registers whose contents are controlled by "real world" devices. Typical devices include thumbwheel switches which usually generate BCD numbers, and analog transmitters which generate binary numbers. The 584 is capable of supporting a maximum of 256 input registers. These registers are identified or "addressed" via reference numbers from 30001 to 39999. It is recommended, however, that input register reference numbers be limited to the range 30001 to 30256. This technique will ensure proper utilization of available memory locations.
2. Holding registers whose contents are controlled within the 584. Holding registers may drive output devices. Typical devices include L.E.D. displays which display BCD numbers and analog devices which are usually driven by a binary number.

The maximum combined number of 30XXX input registers and 4XXXX holding registers is 9999. The exact quantity of each reference available with a particular controller is variable and depends upon memory and system size.

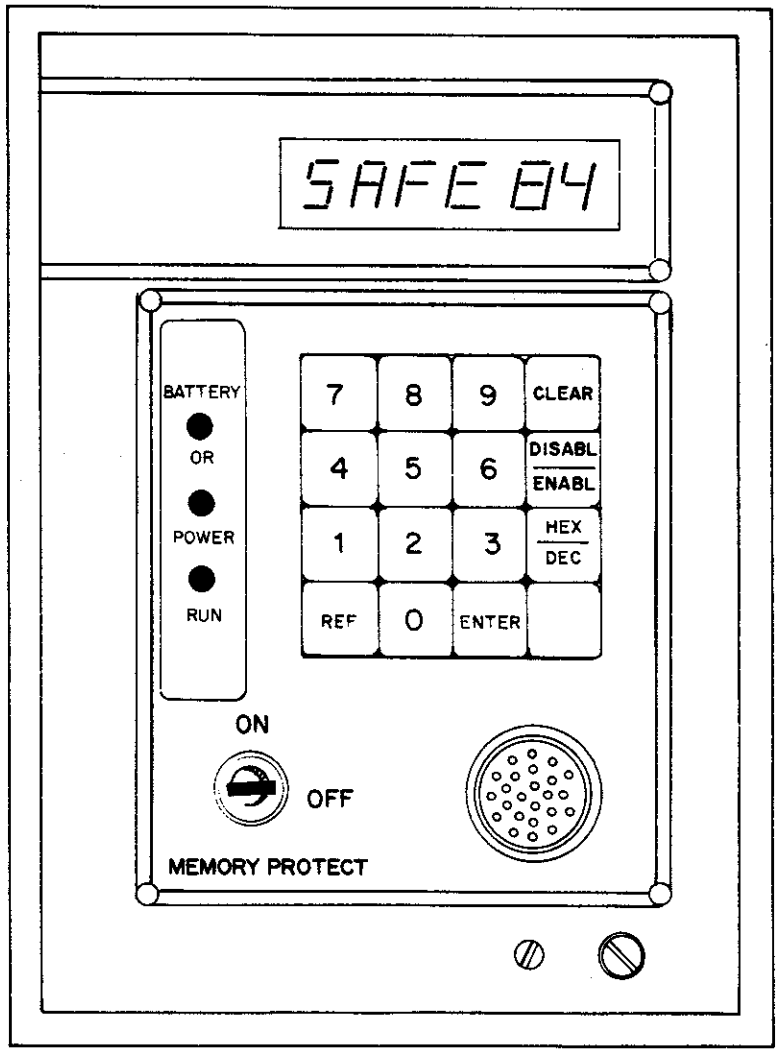
All registers can be displayed on either the 584 register access panel (RAP) or the P190 programmer. 4XXXX holding registers may be altered via the RAP or P190.

Registers are retentitive on power failure provided the memory is properly protected by batteries.

REGISTER ACCESS PANEL (RAP)

Used to display maintenance information and status of discretes and register content, as well as system data.

- 6 digit LED readout
- Numeric keyboard
- 3 LED status lights
- Modbus communications connector
- Memory Protect Key Switch



REGISTER ACCESS PANEL (RAP)

General Capabilities

The RAP allows you to:

1. Monitor the state of any discrete input or output.
2. Monitor the value of any register.
3. If memory protect is off, disable any discrete input or output and "force" it on or off.
4. If memory protect is off, enter values into holding (4XXXX) registers.
5. Monitor the value of various diagnostic memory locations.
6. Examine and alter Modbus port communication parameters.

The RAP, additionally, provides:

1. Indicators for battery status, DC power, and controller running (scanning).
2. Memory protect keyswitch.
3. Modbus port #2 connector.

Indicators

Battery OK — Indicates that the battery pack voltage is sufficient to maintain the CMOS memroy if AC power is lost (see page 4-3 for details)

Power — Indicates that the power supply is functioning properly.

Run — Indicates that the controller is solving logic or "scanning".

LED Display

The six character LED display is capable of displaying a full complement of hexadecimal numbers as follows:

0 1 2 3 4 5 6 7 8 9 A b C d E F

Note the difference between a "b" and a "B".

Keypad

The keypad contains 16 keys: 0 through 9
CLEAR
DISABL/ENABL
HEX/DEC
REF
ENTER
SPARE

NOTE: The keypad does not have enough keys to enter the full complement of hexadecimal digits, yet the LED display has the ability to display all 16 hex digits. Therefore, all entries to the key pad are made in decimal.

Memory Protect Keyswitch

Used to prevent unauthorized alteration of the user memory. Key is the same as those used on the P190 programming panel, and 184, 384, and 484 controllers.

Modbus Port #2

Connects 584 to Modbus local area network. Normally used to connect the P190 programming panel to the 584.

REGISTER ACCESS PANEL OPERATION

REF Key

The Reference key is used to display the value in a register or the on/off state of a coil or input as held in the user ladder logic program.

The numerical reference number must first be keyed in. Program elements are coded as below.

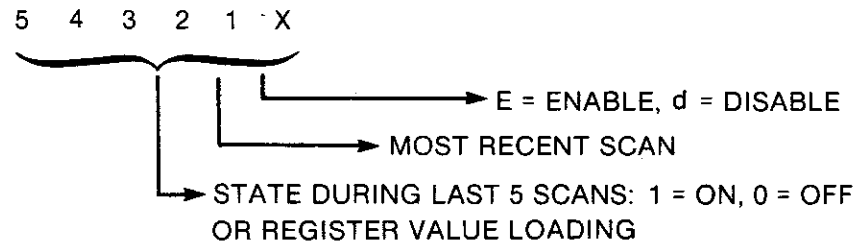
5 Digit Ref. No.	Kind of Element
0XXXX	Discrete Output
1XXXX	Discrete Input
3XXXX	Input Register
4XXXX	Holding and Output Register

- To reference an element, key in

NXXXX, [REF]

Where:
N = Kind of Element (0-4)
XXXX = Element Number
REF = Reference Key

- Display will show discrete state.



NOTE: Continued operation of the REF key will display elements in numerical sequence.

Enter Key

The Enter key is used to enter a new register value or change the state of a disabled discrete element (memory protect must be off).

To enter a value, first "reference" the element to be entered into. Then, key in

00XXXX, ENTER

Where X is any number in the new value.
Leading zeros need not be keyed in.

REGISTER ACCESS PANEL OPERATION

Clear Key

The Clear key is used to clear the display and assembly register.

If the Clear key is operated while "entering" to a previously "referenced" register, the assembly register and display will default to the present register loading. Because of this, it is sometimes necessary to operate the Clear key twice to completely clear the display.

Disabl/Enabl Key

Memory protect switch must be off.

The Disable/Enable key is used to disconnect an input (1XXXX) or coil (0XXXX) from its controlling circuitry.

To disable an element, first "reference" the element to be disabled. Then, key in

DISABL
ENABL

The display will change

From: XXXXXE — Where X = 1 (on, energized) or 0 (off, de-energized), depending on element state during last five scans.

To: 00000d or 11111d — depending on element state during last scan.

To change or "FORCE" a disabled element's state, "enter" a 1 (on) or a 0 (off). This function can provide manual control over inputs and outputs.

To enable a disabled element, "reference" the element to be enabled. Then, key in

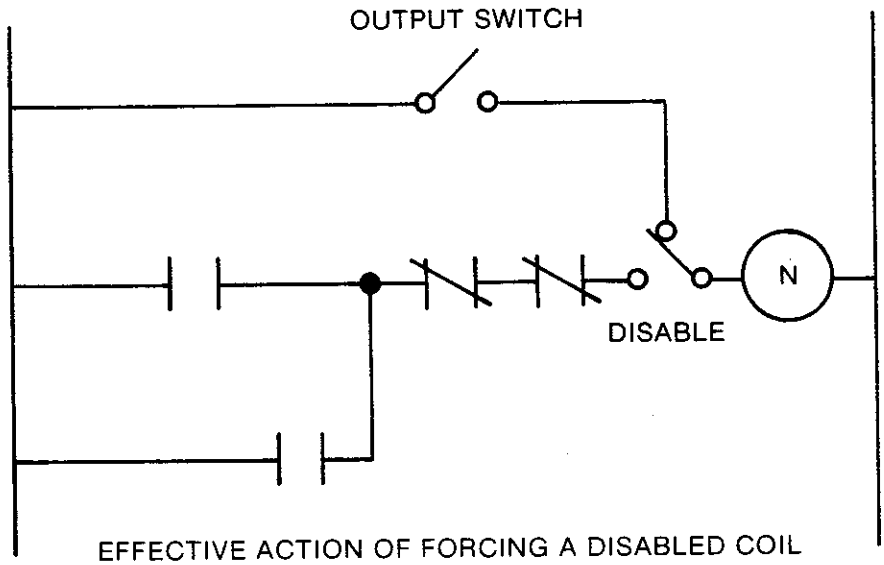
DISABL
ENABL

WARNING: Elements will remain disabled unless the operator intervenes.

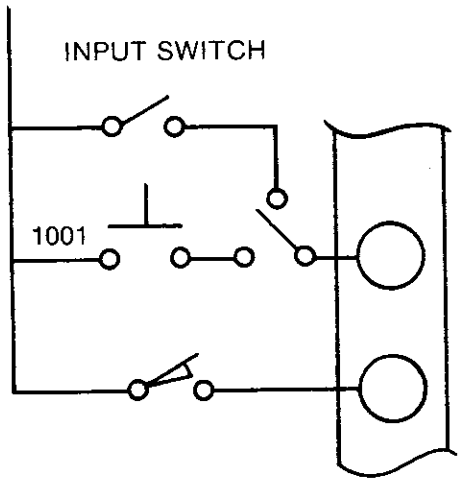
Hex/Dec Key

Will toggle display to show hex value for a "referenced" register. Value keying for register loading, while in the hex mode, remains decimal.

DISABLE FEATURE



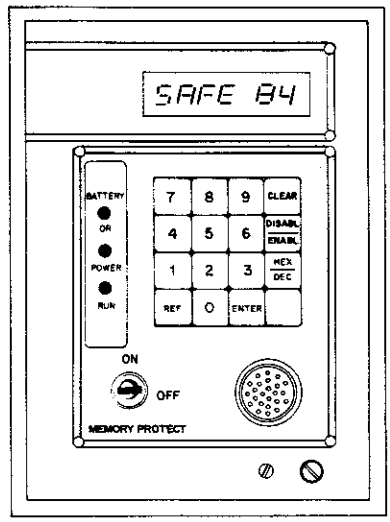
EFFECTIVE ACTION OF FORCING A DISABLED COIL



EFFECTIVE ACTION OF FORCING A DISABLED INPUT

RAP DIM AWARENESS CODES

The RAP "Dim Awareness" codes are shown directly above the RAP keypad on a six-digit, alpha/numeric display. The codes are a maintenance and diagnostic device that show the state of the 584 prior to configuration on power-up.



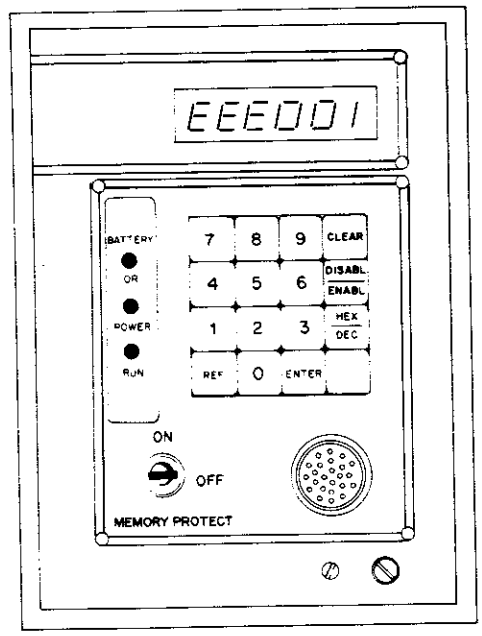
RAP DIM AWARENESS CODES

Code	Description	Action
Safe84 (Dead84)	This message appears on power up of an unconfigured 584 (e.g. straight from the shipping crate). May also indicate that the memory was scrambled on power down or that there is a problem with the battery circuit. Dead84 appears on older 584A's.	Configure the 584
Dead05	Executive checksum test failure. The integrity of the executive PROMs on the IOP board can no longer be guaranteed.	Replace the IOP board
Dead10	Failure of the system memory board. The executive cannot detect any page "0" memory.	1. Check memory board cable interconnections. Retry. 2. Replace memory board.
Dead20	Executive cannot detect any state RAM or scratch pad memory.	1. Check IOP board cable interconnections. Retry. 2. Replace the IOP board.
Dead30	Micro-code fatal error is caused by a number of system conditions detected by the CPU board, including improper user logic data base, overflow of the micro-code stack area, and erroneous data in the micro-code stack.	1. Replace CPU board. Retry. 2. Replace IOP board. Retry. 3. Replace memory board. Retry.
Dead40	Illegal minicode instruction.	1. Replace IOP board. Retry. 2. Replace CPU board. Retry. 3. Replace memory board. Retry.
Dead50	Peripheral port parameters were illegally modified while the 584 was active. Usually caused by illegally modifying memory via one of the two Modbus ports or the RAP.	1. Cycle power, set proper baud rate, reset configuration parameters. Retry. 2. Replace memory board. Retry. 3. Replace CPU board. Retry. 4. Replace IOP board. Retry.
When Dim Awareness is entered because of one of the above causes, the Modbus port reverts to default parameters as follows: 584A Device I.D. = 1, 1200 baud, even parity, 1 stop bit, RTU mode 584 & L Device I.D. = 1, 9600 baud, even parity, 1 stop bit, RTU mode		

RAP KEYPAD ERROR CODES

The RAP Keypad Error Codes are shown directly above the RAP keypad on a six-digit, alpha/numeric display. The codes are a maintenance and diagnostic device that show errors when information is incorrectly entered through the keypad by the operator.

584 RAP Keypad and Indicators



RAP KEYPAD ERROR CODES

Code	Description
EEE001	Function Not Allowed (Must push "CLEAR", then re-enter "REF.")
EEE002	Bad Sub-Function Field (Must push "CLEAR", then re-enter "REF.")
EEE003	Reference Out of Range (Must push "CLEAR", then re-enter "REF.")
EEE004	Invalid Data for Entry ("CLEAR" brings back display.)
EEE005	Coil Not Disabled ("CLEAR" brings back display.)
EEE006	Entry Prohibited by Definition of Function ("CLEAR" brings back display.)
EEE007	Memory Protect On ("CLEAR" brings back display.)
EEE008	Trying to Disable a Register ("CLEAR" brings back display.)

MODBUS PORT PARAMETERS

Examine/Changing Port Parameters

The following is a guide for examining and changing Modbus port parameters.

Port #1 — 2nd Port from Rear on Bottom

610001, REF	584 PORT 1 ID # (1 to 247)
610002, REF	584 PORT 1 BAUD RATE (50,75,110,134.5,150,300,600,1200,1600,3600, 4800,7200,9600,19200.)
610003, REF	584 PORT 1 PARITY ENABLED (E) OR DISABLED (d)
610004, REF	584 PORT 1 PARITY EVEN (EEEEEE) OR ODD (000000)
610005, REF	584 PORT 1 NUMBER OF STOP BITS (1 OR 2)
610006, REF	584 PORT 1 RTU (bbbbbb) OR ASCII (ASCII)
610007, REF	MODBUS DELAY (1 = 10 msec)

Port #2 — RAP Port

620001, REF	584 PORT 2 ID # (1 to 247)
620002, REF	584 PORT 2 BAUD RATE (50,75,110,134.5,150,300,600,1200,1600,3600, 4800,7200,9600,19200.)
620003, REF	584 PORT 2 PARITY ENABLED (E) OR DISABLED (d)
620004, REF	584 PORT 2 PARITY EVEN (EEEEEE) OR ODD (000000)
620005, REF	584 PORT 2 NUMBER OF STOP BITS (1 OR 2)
620006, REF	584 PORT 2 RTU (bbbbbb) OR ASCII (ASCII)
620007, REF	MODBUS DELAY (1 = 10 msec)

To change a parameter:

Parameter to be Changed	RAP Panel Keystrokes	Default Parameter
ID #	KEY IN DESIRED ID # THEN PRESS "ENTER".	1
BAUD RATE	KEY IN DESIRED BAUD RATE THEN PRESS "ENTER".	1200 (584A) 9600 (584 M&L)
PARITY YES/NO	E = ENABLED d = DISABLED To change press "ENTER".	E
PARITY EVEN/ODD	EEEEEE = EVEN 000000 = ODD To change press "ENTER".	EEEEEE
# OF STOP BITS	1 or 2 To change press "ENTER".	1
RTU OR ASCII	bbbbbb = RTU ASCII != ASCII To change press "ENTER".	bbbbbb
MODBUS DELAY	Key in number and press "ENTER". 1 = 10 msec, 2 = 20 msec, etc.	1

Login Status

Word 142 (300142) is the peripheral port login status. This indicates which port is logged in. (Actual address is 008E Hex.)

0 = neither port logged in
1 = port number 1 logged in
2 = port number 2 logged in

Active Port Status

Word 143 (300143) indicates which port is active in the command handler. (Actual address is 008F Hex.)

0 = no commands active
1 = command from port number 1 active
2 = command from port number 2 active

Buffer Addresses

Port #1

Word 134 (300134) contains the address of the buffer for peripheral port number 1's messages, both in and out. (Actual address is 0086 Hex.)

Port #2

Word 136 (300136) contains the address of the buffer for peripheral port number 2's messages, both in and out. (Actual address is 0088 Hex.)

Port Length

Word 135 (300135) contains the length of each peripheral port's buffer. (Actual address is 0087 Hex.)

Event Logs and Communication Counters

The locations listed below contain information that may be useful when checking the operation of a Modbus communication system.

COMMUNICATIONS COUNTERS

Decimal Value	Actual Address (Hex)	Modbus Port Number	Description
347848	BAE8	1	Bus Message Counter
347849	BAE9	1	Communications Event Counter
347850	BAEA	2	Bus Message Counter
347851	BAEB	2	Communications Event Counter
347852	BAEC	1	Busy Counter
347853	BAED	1	CRC Error Counter
347854	BAEE	2	Busy Counter
347855	BAEF	2	CRC Error Counter
347856	BAF0	1	Exception Counter
347857	BAF1	1	Negative Acknowledgement Counter
347858	BAF2	2	Exception Counter
347859	BAF3	2	Negative Acknowledgement Counter
347860	BAF4	1	Overrun Counter
347861	BAF5	1	Spare
347862	BAF6	2	Overrun Counter
347263	BAF7	2	Spare
347264	BAF8	1	Communications Event Log
347928	BB38	2	Communications Event Log

EXAMINE SYSTEM CONFIGURATION

Hardware Information

The Configuration Table contains status, pointer, and other information words. These words reference other parts of memory and/or hardware. These words are not changed when a load is performed using the relocate logic function.

The 128 word Configuration Table can be accessed from the RAP. This table contains information and pointers to information that were fixed at configuration time (using AS-T584-004 Configuration Tape).

Executive ID

By keying in 350048, the ID number will appear. Also key in 349168 and receive the same information. The meaning of the numbers are:

0 - 9	Pre-production non RI/O
A	REV. B - non RI/O
B - 34	Pre-production RI/O
35	REV. D
37	REV. E
42	REV. G (ASCII)
44	REV. H

Memory Size

Size of controller memory (multiply value shown by 4K) can be found at location 300099. Actual address is 0063 Hex.

SOFTWARE CONFIGURATION

Discrete Coils

The total number of coils configured in the machine can be found by keying in 300053 (actual address is 0035 Hex). The number in this location is the hexadecimal number of coils, (external and internal), and must be converted into decimal to obtain true quantity.

Address of Output State Table is held at 300054 (actual address is 0036 Hex). The contents of this location should be 008000 hex which is 32768 decimal, the beginning of the last page (page F) of memory for all 584's.

The output or Coil History Table address is contained at 300055 (actual address is 0037 Hex). This table can be used to confirm the operation of a transitional contact.

NOTE: The value displayed on the RAP for Discrete Coils, Discrete Inputs, Input Registers, and Output Registers is in hexidecimal notation.

Output Disable Table address is held at 300056. (0 = enabled, 1 = disabled). (Actual address is 0038 Hex.)

Address of Coil is Used Table is located at 300095. Each word = 16 coils. One (1) indicates coil is used.

Discrete Inputs

The total number of input discretes may be found by keying in 300058. (Actual address is 003A Hex.)

The address of the Input State Table can be found by keying in 300059. (Actual address is 003B Hex.)

The address of the input history table may be found by keying in 300060. (Actual address is 003C Hex.)

The address of the input disable/enable table can be found by keying in 300061. (Actual address is 003D Hex.)

There is no use table for 1XXXX, inputs.

Input Registers

The total number of input registers can be found by keying in 300062. (Actual address is 003E Hex.)

The hex address of the first input register can be found by keying in 300063. (Actual address is 003F Hex.)

Output Registers

Total number of output registers can be found by keying in 300064. (Actual address is 0040 Hex.)

Address of first output register can be found by keying in 300065. (Actual address is 0041 Hex.)

Number of Segments Configured

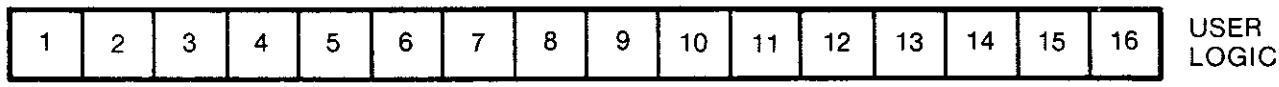
Word 106 (enter 300106) contains the number of segments. (Actual address is 006A Hex.) Twice this number indicates the number of I/O channels. These values are set when configuring the system.

Traffic Cop

		Actual Address is:
Address of Traffic Cop input table:	300089	0059 Hex
Address of Traffic Cop output table:	300090	005A Hex
Length of each Traffic Cop:	300091	005B Hex

Each word in the Traffic Cop tables (input and output) refers to a module position in sequential order. The first eight words of the input table refer to the eight slot locations of channel 1 which have input modules. For example, the twelfth word of the Traffic Cop Output Table refers to the output module of slot number 4 of channel 2.

8 channel positions = 8 words = 1 channel



Relative address into State RAM.
Bits 1, 2, and 3 have the following meaning:

BIT PATTERN 000 through 011 unassigned

BIT PATTERN 100 INHIBITED
This disallows the transaction of data to take place with the State RAM. The presence of INHIBITS is the 'seed' for the module inhibit words, loaded before each 'STRTIO' instruction is executed.

BIT PATTERN 101 DISCRETES
For output, discrete is merely a move of 16 bits of data. No modifying is done.
For input, before the data is stored in the State RAM, the 'old' State RAM data is moved to the input coil history table, then the 'NEW' data is qualified through the enable/disable table so that disabled coils are not changed via the I/O.

BIT PATTERN 110 REGISTER BINARY
This is a straight through 16-bit move. No conversion, no modification.

BIT PATTERN 111 REGISTER BD/BIN CONVERSION
For output, the data from the STATE RAM (assumed to be modulo 10000) is converted from binary into BCD, then stored in the STATE RAM, and so on. Each word is divided into two fields, control and relative address. The control field defines the type of data transaction. The relative address portion points to the State RAM address which the data is GOING TO/COMING FROM.

Battery Coil

The battery OK coil is found in location 300057. (Actual address is 0039 Hex.)

Timer Registers

Single sweep time target in milliseconds is contained at location 300092. (Actual address is 005C Hex.)

Word 157 (300157) contains the address of 4XXXX register that will be a free running timer. (Actual address is 9d Hex.)

Constant Sweep

Word 156 (300156) contains the address of a 4XXXX register that will hold the target time when constant sweep is invoked. The sweep or scan time will equal the larger of either the target time or actual scan time. (Actual address is 9C Hex.)

Order of Solve

The order of segment solution table indicates the order in which the 584 will solve logic and service I/O channels. Solution of segment I results in reading channel I & II inputs, solving all user logic in segment 1, and writing channel I & II outputs.

The number of segments configured in a 584 is stored in word 106(A). The pointer to the start of the order of segment solution is stored at word 093 (5D Hex). The contents of this word is the address of the order of segment solution table. If called from the RAP panel, the contents will automatically be displayed in hexadecimal notation.

For example, key in 300093 and press REF. The value displayed is 000913. This indicates that the starting address for the order of solution table is 002323 (decimal). Key in 302323 and press REF on the RAP panel. This shows the first segment to be solved by the 584 (should be 000001). Pressing REF again should display the 2nd segment to be solved (should be segment 2).

Referencing the next location will show the next segment that is solved, etc., until the end of the table is indicated by FFFF. A zero entry in the table forces a dummy "END OF LOGIC" to be solved to keep the run light on. If the M.S.B. for an entry in the table is set (1), the I/O for that segment is serviced but the logic is not solved.

Number of RS-232 Ports

Word number 124 (300124) contains the number of RS-232 ports on remote inputs/outputs (RI/O), P453's. (Actual address is 007C Hex.)

RS-232 Port Parameters

Word number 126 (300126) contains the address of the RS-232 port parameter table. This table's length is determined by the number contained in word number 124 (number of RS-232 ports.) This table contains 1 word (16 bits) for every RS-232 port (in sequential order) configured in the 584. The pattern (or mask) of set and cleared bits is used to determine the parity, number of stop bits, number of data bits, non/keyboard, etc. (Actual address is 007E Hex.)

The word number or offset into the table is the same as the RS-232 port number. The address pointed to by word number 126 of the configuration table is the first word which contains the parameters for port number 1. The following is a bit breakdown for each word:

Bit	Condition
(Bits 16 thru 13)	These four bits indicate 16 possible baud rates, one for each of 16 hexadecimal numbers

Hex #	Baud Rate
0 =	50
1 =	75
2 =	110
3 =	134.5
4 =	150
5 =	300
6 =	600
7 =	1200
8 =	1800
9 =	2000
A =	2400
B =	3600
C =	4800
D =	7200
E =	9600
F =	19200

Bit 12	Set = 1 = keyboard Cleared = 0 = non-keyboard
Bit 4 & 5	00 = 5 data bits 01 = 6 data bits 10 = 7 data bits 11 = 8 data bits
Bit 3	Set = 1 = partiy enabled Cleared = 0 = parity disabled
Bit 2	Set = 1 = even parity Cleared = 0 = odd parity
Bit 1	Set = 1 = 2 stop bits Cleared = 0 = 1 stop bit

For example, to find the port parameters for port #4: key in 300126. This location shows $2F0_{16} = 752_{10}$. Then key in 300752 and press the "REF" key four times. Displayed now is the mask for port #4's parameters (381A). This means that port #4 is set for 2400 baud, keyboard mode, 8 data bits, parity enabled, odd parity, and 1 stop bit.

Number of Words in ASCII Message Area

Word 145 (300145) contains the number of words in the ASCII message area. (Actual address is 0091 Hex.)

Word 146 (300146) contains the address of the ASCII message area. (Actual address is 0092 Hex.)

The address of the start of the total number of ASCII messages (in hex) is contained at location 300078. (Actual addres is 004E Hex.) The address of the start of the ASCII message pointer table is located at 300079. (Actual address is 004F Hex.)

Each word contains the offset from the beginning of the message area. For example, for the total number of ASCII messages, key in 300078 (the display indicates 200 $C8_{16} = 200_{10}$). To find the second message and read it, key in 300079. The display reads $31D6_{16} = 12758_{10}$ which is the start of the message pointer area. 12759 = offset to second message. Key in 312759 and get ($84_{16} = 132_{10}$). 132 + 200 (one word pointer for every message) = 332 which is the offset from the start of message pointer area. 12758 + 332 = 13090. Key in 313090. The display shows the actual message, word by word, at two ASCII characters per word (displayed as two hex digits per ASCII character). The initial ASCII characters in the message are displayed as the most significant two hex characters.

Highest Message Number Used

Word 158 (300158) contains the end of message address. This is the highest message area address currently used. (Actual address is 9E Hex.)

Word 159 (300159) contains the highest message number used. (Actual address is 9F Hex.)

Word 109 (enter 300109) contains the ASCII message status. (If set) (Actual address is 6d Hex.)

Bits 1 thru 12	Not assigned
Bit 13	Number of message pointers set and number of messages in data base do not match.
Bit 14	Invalid message pointer
Bit 15	Invalid message
Bit 16	Message checksum failure

Port Status

Two words are used to describe the status of each port. The 64 words for the 32 possible ports start at locations 47668 and 47669. (Key-in 347668 or 347669.)

The bit breakdown is as follows:

RAP Bit	Port Status Word One	User Logic Bit
0-2	Send sequence number	16-14
3	Cable used	13
4-6	Receive sequence number	12-10
7	Spare	9
8	Busy	8
9	Spare	7
10	Illegal Command	6
11	Character Underrun	5
12	Sequence Error	4
13-15	State number for 584	3-1
0-2	Retry count	16-14
3	IOR (P453) not active	13
4	IOR in use	12
5	Paused node found	11
6	Pause state	10
7	IOR used while in pause state	9
8	Illegal command	8
9	Sequence error	7
10	AC power	6
11	IOR used in current scan	5
12	No response	4
13	CRC error	3
14	Overrun error	2
15	Communications error	1

ASCII Node Status Word

The ASCII node status word is located at location 47766 (347766) and the description is as follows:

Bit		Bit	
16	Bit Run	10	Bit Abort
15	Bit Pause	9	Retrying Pause
14	Bit Error	8	Bit Pending
13	Bit Done	7	Bit Start
12	Bit Skip	6-1	Spare
11	Bit Retry		

SYSTEM STATUS WORDS

The following memory locations hold system status information and are explained in detail in Chapter 22 — Troubleshooting.

Rap Address	Description
300101 & 300103	Machine status
300104	J200 status
300105	Machine stop states
300106	# segments in machine
347128 - 347143	Input module status
347160 - 347175	Output module status
347628 - 347655	P451 or P453 status

MISCELLANEOUS INFORMATION

Percentage of Sweep Time

Word 133 (300133) contains a decimal number which is equal to the percentage of sweep time allocated to multisweep functions such as "DELETE", "INSERT", and "SEARCH". (Actual address is 0085 Hex.)

Counter Power History Tables

Address of up counter power history 300066. (Actual address is 0042 Hex.)

NOTE: The number displayed is in hexadecimal.

Address of down counter power history 300067. (Actual address is 0043 Hex.)

NOTE: The number displayed is in hexadecimal.

Each bit of the above two tables is associated with one 4XXXX register. The number of bits in each table is a multiple of 16 higher than the number of 4XXXX registers. While this bit is set, the counter will not count.

Beginning of Logic

Word 75 (enter 300075) contains the address of the beginning of logic location (e.g., if word 75 is 13B2 hexadecimal, the decimal equivalent is 5042). Following this example, enter 305042 to get the word at the beginning of logic. Press the REF key to display successive user logic words.

End of Logic

Word 107 (enter 300107) contains the address of the end of logic (e.g., the word contained in 107 reads B78A = 46986). (Actual address is 6b Hex.) If 346986 is entered, the number that appears is the address of the end of logic in hexadecimal.