

MELSEC FX series

Programmable Controller

User's Manual

FX-232AW

REVISIONS OF PROTOCOL
OF ACCESS TO THE PROGRAM
AND MEMORY ELEMENTS
OF THE FX

VERSION	CHANGES	PAGE	date
A to B	typing error : V1.22 to V1.21 f3f2f1f0=0 1 0 0 to 0 0 0 0 for D8000 to D8255. revised table: n14-n0 specification clearly added. addition : Format + example of C200-C255 as operand of FNC	32 55 55 56	15th/5/91

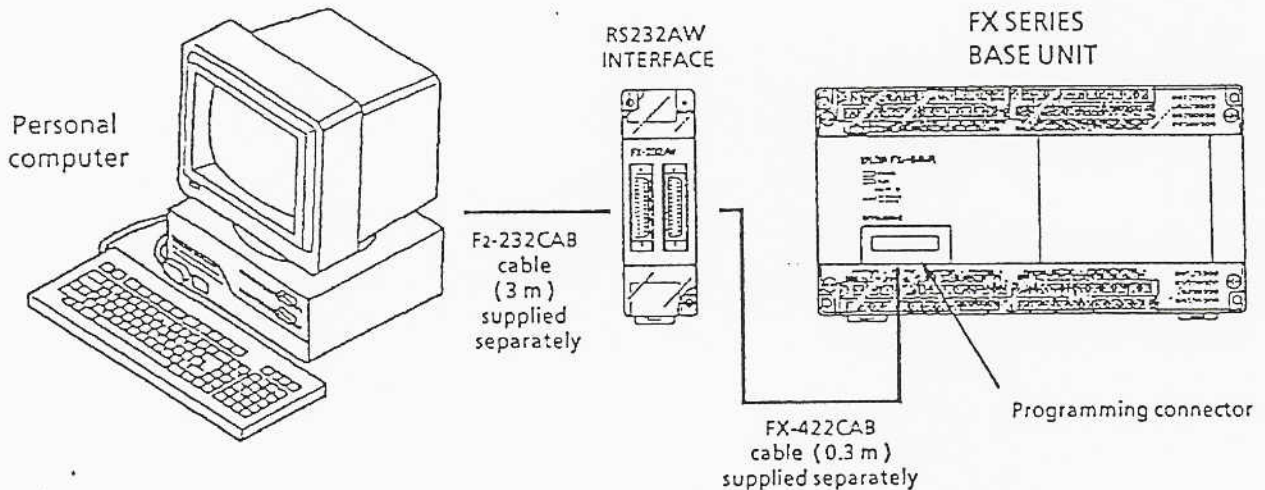
FOREWORD

Information on the sampling trace function is not included in this document.

INDEX

HARDWARE SPECIFICATION	
FORMAT AND COMMAND LIST	
n BYTE READ	
n BYTE WRITE	
ON/OFF FORCING OF SINGLE DEVICES	
MEMORY MAP OF THE FX	
GROUP ADDRESS AND DEVICE ADDRESS	
TABLE 1a XYMSTC Contact image address	
1b OUT T,C PLS Y,M PLF Y,M Coil image address	
1c RST T,C Coil image address	
TABLE 2 Group address of timer	
TABLE 3 Group address of 16-bit counter	
TABLE 4 Group address of 32-bit counter	
TABLE 5a/5b Group address of data register	
TABLE 6 Group address of special data register .	
TABLE 7a/7b Device address of individually addressed devices (used for forcing ON/OFF's) ...	
FORMAT OF REGISTERS	
BATCH MONITORING	
PROGRAM AND PARAMETER MEMORY MAP ...	
FORMAT OF THE PARAMETERS	
LOCATION OF THE FILE REGISTER AND COMMENT AREAS	

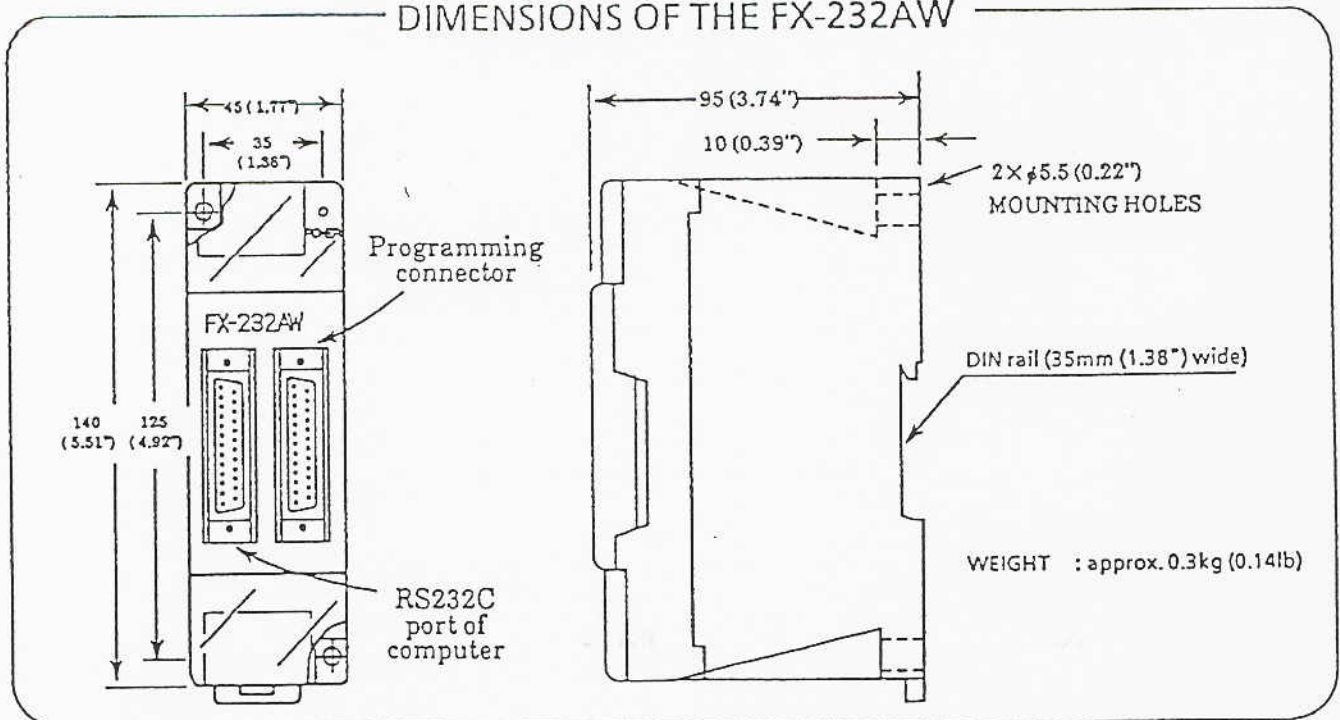
The programming port of the FX series PC is a RS422 connection. RS232C connection can be made via the FX-232AW RS422 to RS232C converter as shown below. The protocols are the same in both cases.



This interface unit does not include any cable nor any software. The cables may be bought separately or made by other means to the specification described on the next page.

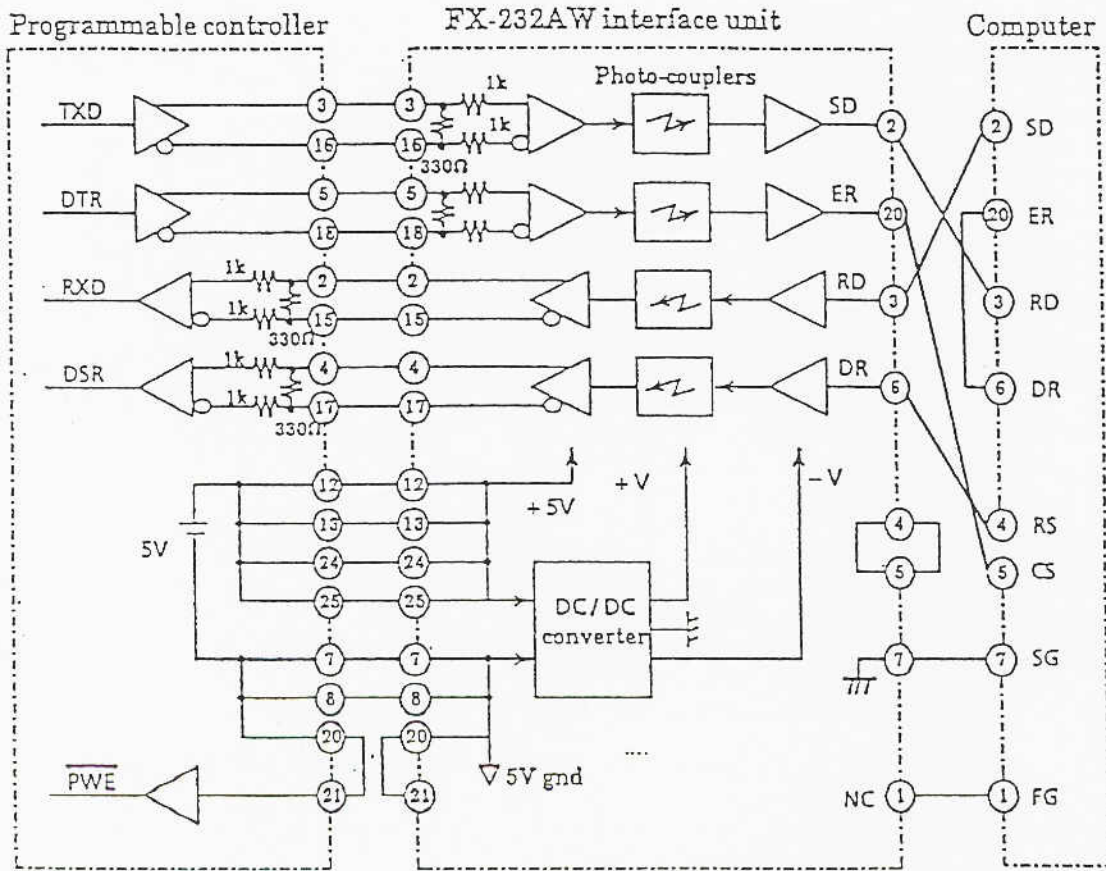
Software to be run on the personal computer may be written as desired to monitor the FX PC by using the protocols described by this technical document.

DIMENSIONS OF THE FX-232AW



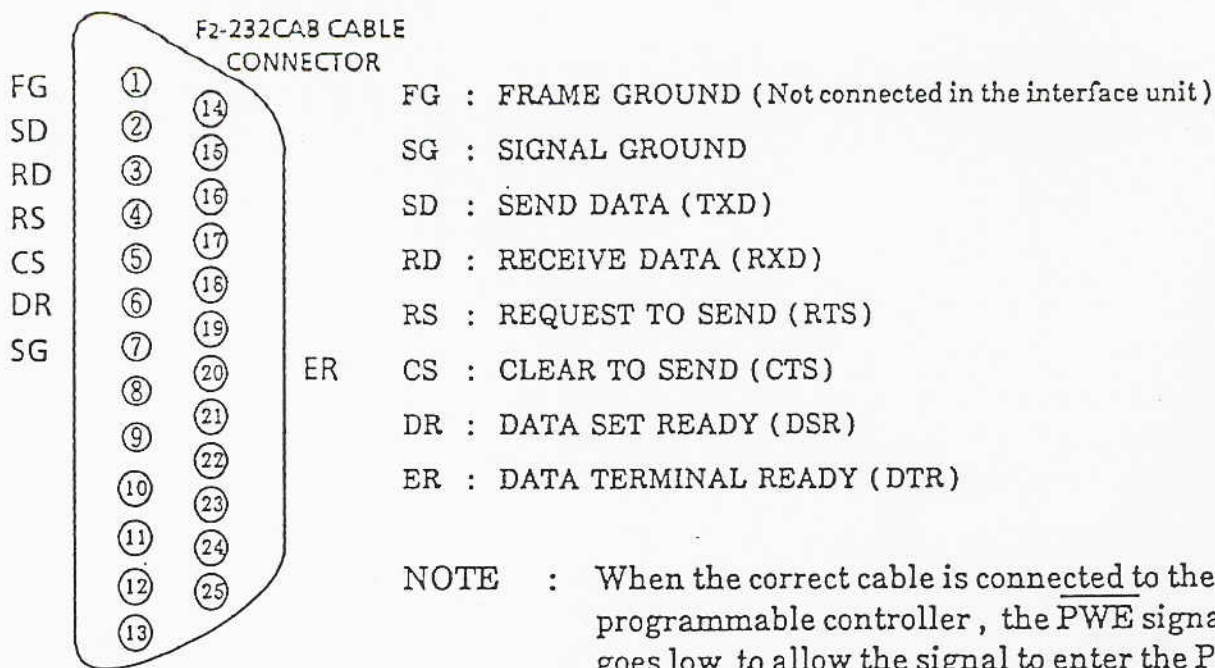
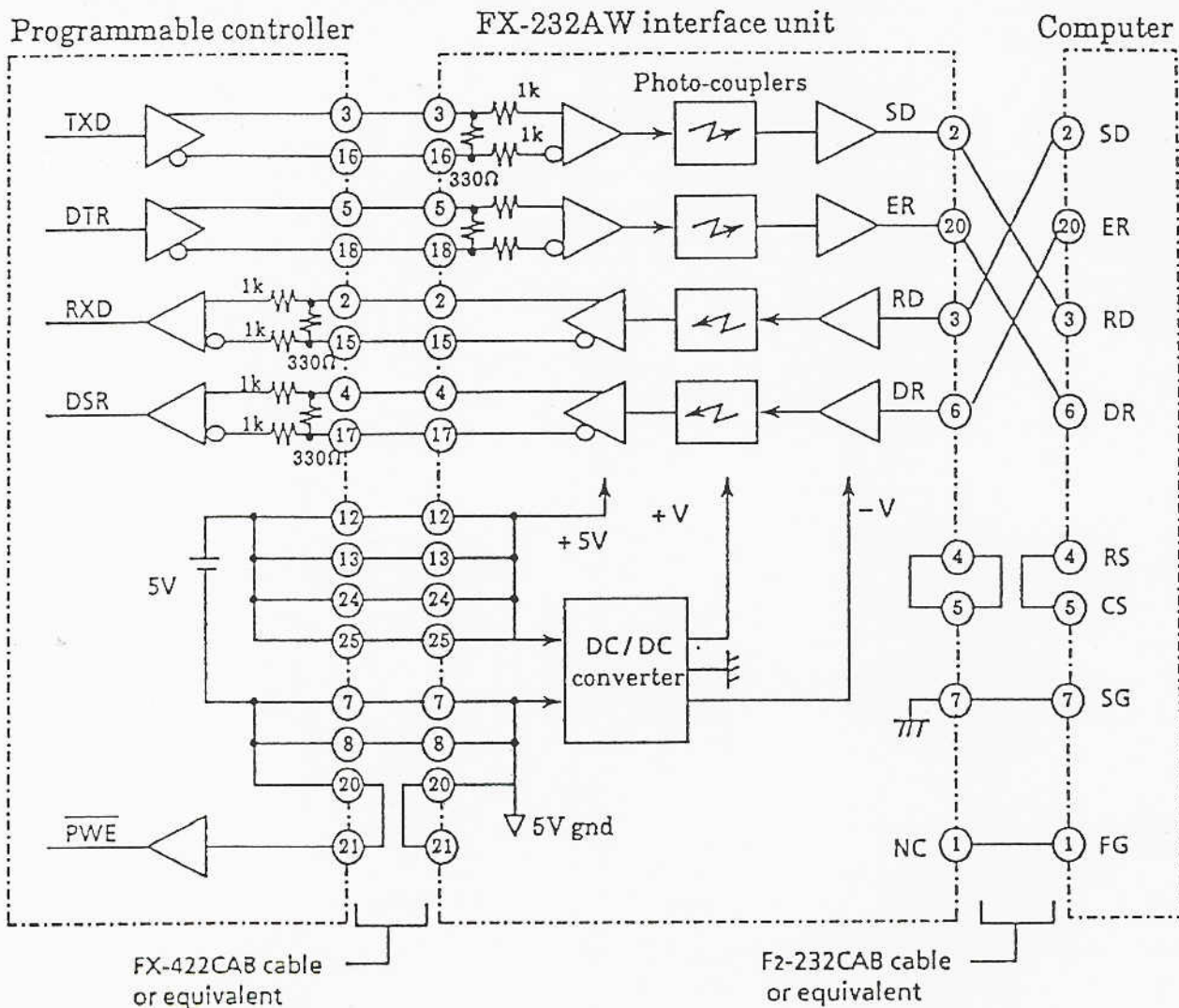


RS 232C CONFIGURATION FOR THE USE OF MELSEC MEDOC



RS232C CONFIGURATION

The schematic connections of the inside of the interface unit is shown below along with the cable connections required to connect the interface unit.



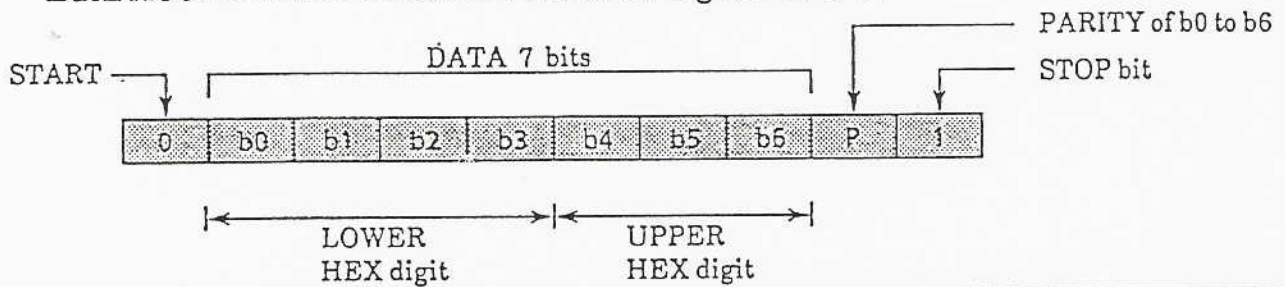
25 pin DSUB connector

NOTE : When the correct cable is connected to the programmable controller, the PWE signal goes low to allow the signal to enter the PC only when the cable is connected.

The following specification allows the status of the internal devices of the FX series programmable controller to be monitored and programmed by a computer. Communication format is as follows :

TRANSFER FORMAT : RS232C standard
 PROTOCOL : As described by this document
 TRANSFER FORMAT : Asynchronous bi-directional (not simultaneously)
 BAUD RATE : 9600bps
 PARITY : Even
 VERIFICATION : Sum check
 CHARACTERS : ASCII characters of the stated below only

Each ASCII character is sent in the following bit format :



Character	HEX code	COMMENTS
ENQ	05 H	ENQUIRY :Request from computer
ACK	06 H	ACKNOWLEDGE :Acknowledge reply to an ENQ
NAK	15 H	NAGATIVE ACK :Replied when not understood
STX	02 H	START OF TEXT :Start marker of message frame
ETX	03 H	END OF TEXT :End marker of message frame
'0'	30 H	<p>Bit format of STX</p> <p>Bit format of char 'F'</p>
'1'	31 H	
'2'	32 H	
'3'	33 H	
'4'	34 H	
'5'	35 H	
'6'	36 H	
'7'	37 H	
'8'	38 H	
'9'	39 H	
'A'	41 H	
'B'	42 H	
'C'	43 H	
'D'	44 H	
'E'	45 H	
'F'	46 H	

↑ The letter H represents that the number is a hexadecimal number.

COMMAND LIST

R : O.K during RUN
S : O.K during STOP

* OUT T, C constants are
changeable in RUN however

Devices

COMMAND	CMD no	Prog.	Para.	bit	word	other	DATA FORMAT					
n byte READ	'0'	R,S	R,S	R,S	R,S	R,S	CMD	TOP ADR	n byte			
n byte WRITE	'1'	S*	S	R,S	R,S	R,S	CMD	TOP ADR	n byte	DATA n		
n byte INSERT *1	'2'	S					CMD	TOP ADR	n byte	DATA n		
m byte DELETE *1	'3'	S					CMD	TOP ADR	m byte			
COMMAND SEARCH	'4'	R,S					CMD	TOP ADR	command			
DEVICE SEARCH	'5'	R,S					CMD	TOP ADR	device			
BATCH CLEAR	'6'	S	S	S	S		CMD	area code				
FORCE ON	'7'			R,S			CMD	device				
FORCE OFF	'8'			R,S			CMD	device				
BATCH TRANSFER	'9'	S	S				CMD	direction				
donot use	'A'											
Prog. SUM CHECK	'B'	S					CMD					
PROG. CHECK	'C'	S					CMD					

Due to the nature of the the process, some instructions may require a much longer processing time than others. In particular are the batch process when using the EEPROM cassette :

Batch transfer may take 120sec.
n byte insert/delete 120sec.
Batch clear 60sec.

Memory data from the PC is read in units of bytes. n number of bytes are read starting from the top address.

«COMMAND FROM COMPUTER»

STX	CMD	TOP ADDRESS				BYTES		ETX	SUM	
		16 ³	16 ²	16 ¹	16 ⁰	16 ¹	16 ⁰		16 ¹	16 ⁰
02 H	0 30 H							03 H		

- ① Command CMD '0' reads n bytes of data starting from the TOP address. (1 character)
- ② Top address is the address of the 1st byte of data to be read. e.g. device images.
(see tables 1 to 6). (4 characters)
- ③ BYTES is the n number of bytes of data to be read. Range is 01H to 40H (1 to 64 bytes).
(2 characters)

EX. 1 Reading 2 bytes of data starting from Y0 (Y0 to Y7, Y10 to Y17).....table 1a

STX	CMD	TOP ADDRESS				BYTES		ETX	SUM	
		16 ³	16 ²	16 ¹	16 ⁰	16 ¹	16 ⁰		16 ¹	16 ⁰
02 H	0 30 H	0 30 H	0 30 H	A 41 H	0 30 H	0 30 H	2 32 H	03 H	6 36 H	6 36 H

EX. 2 Reading 4 bytes of data starting from D123 (D123,D124)table 1b

STX	CMD	TOP ADDRESS				BYTES		ETX	SUM	
		16 ³	16 ²	16 ¹	16 ⁰	16 ¹	16 ⁰		16 ¹	16 ⁰
02 H	0 30 H	1 31 H	0 30 H	F 46 H	5 35 H	0 30 H	4 34 H	03 H	7 37 H	4 34 H

ERROR RESPONSE

The host computer may use the ENQ command to check if the PC is ready to communicate. A 5 second time out should be given before determining that the PC has not been connected.

Also a retry of 3 times is recommended before determining that there is no ACK response from the PC.

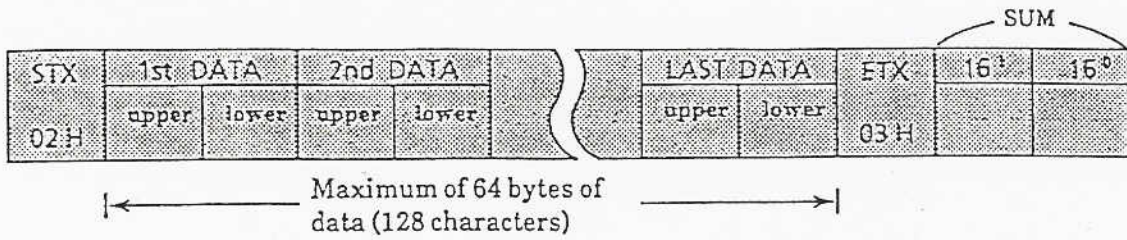
If the PC does not recognize any signal, it will reply with a NAK (negative acknowledge) code.

Host computer

Programmable controller

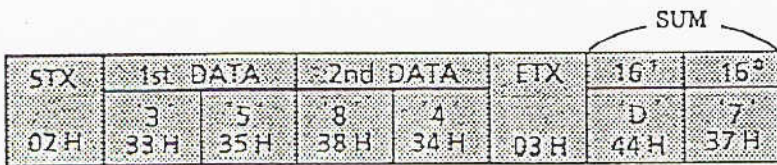
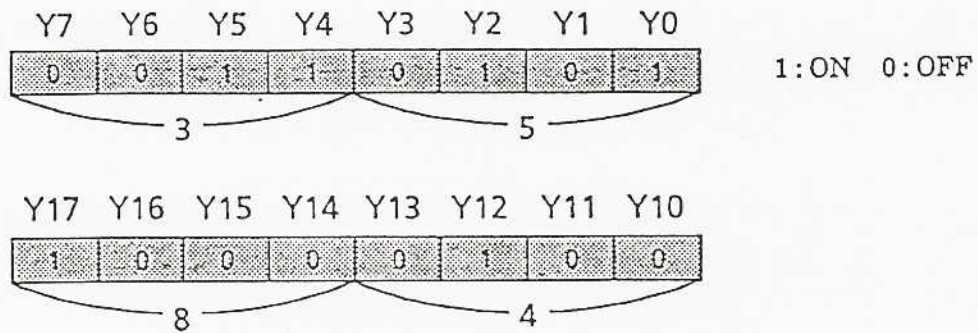


« RESPONSE FROM PC »

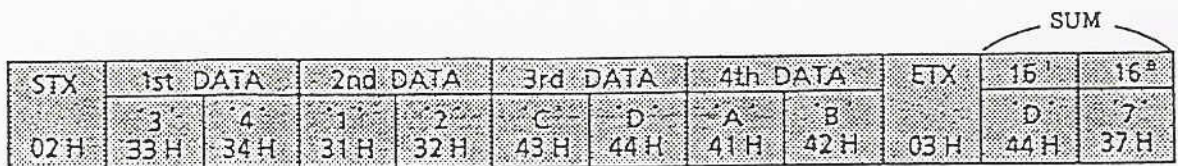
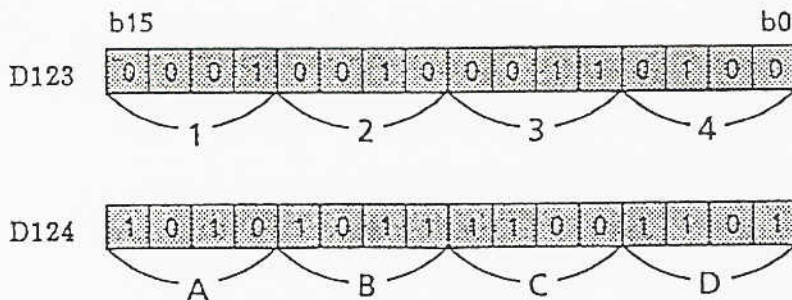


- ① Each byte of device data from the PC is divided into upper 4 bits and lower 4 bits. The hexadecimal value of each 4 bits is taken as an ASCII character and its ASCII HEX value is then sent.
- ② After receiving the command from the computer, the PC makes the response at the next execution of the END statement.
- ③ If the command from the computer is not understood by the PC, control code NAK is then sent.

EX. 1

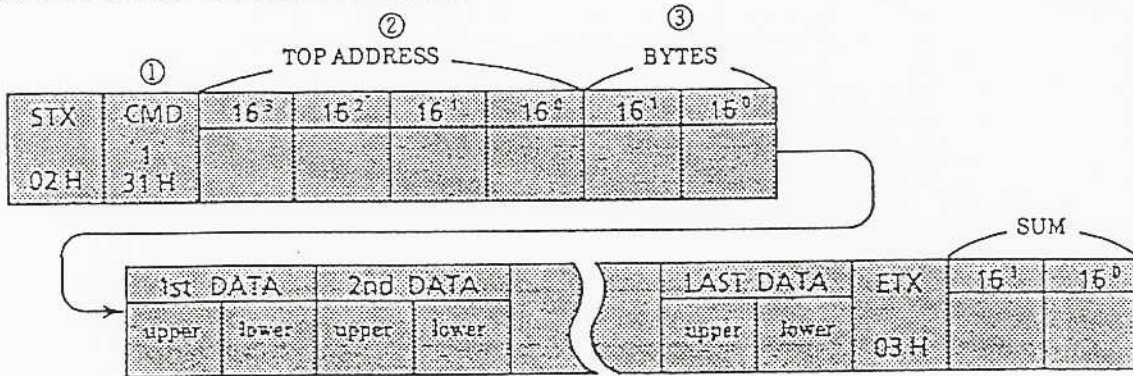


EX. 2



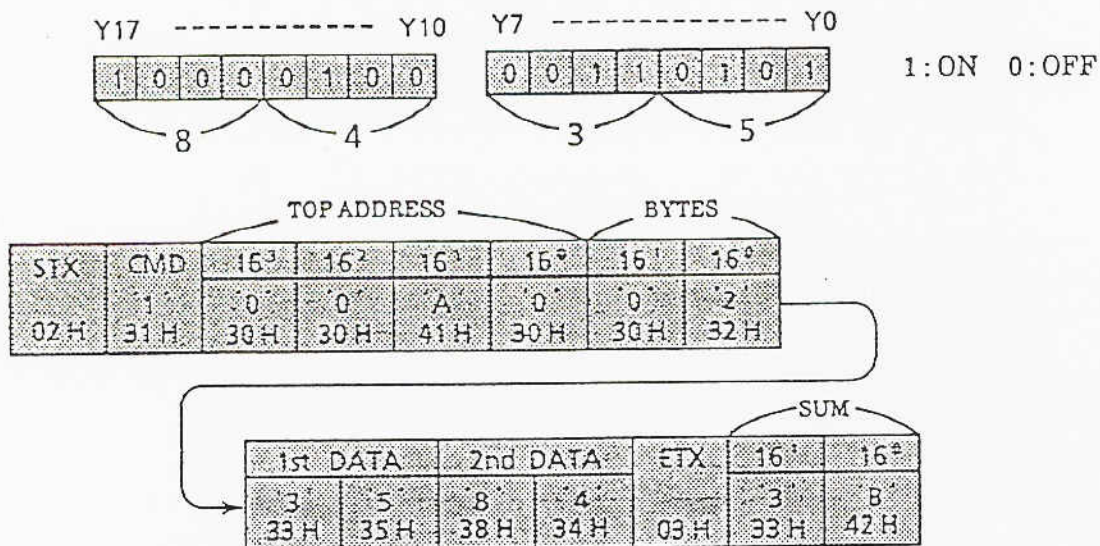
Data can be written to the PC memory with n number of bytes starting at the top address.

« COMMAND FROM COMPUTER »



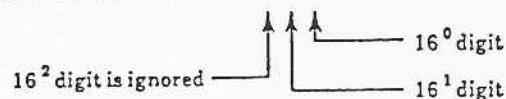
- ① Command CMD '1' writes n bytes of data starting from the Top address. (1 character)
- ② Top address is the address of the 1st byte of data to be written into the PC (see tables 1 to 6). (4 characters)
- ③ BYTES is the n number of bytes of data to be written. Range is 01H to 40H (1 to 64 bytes). (2 characters)

EX. 1 Forcing 2 bytes of output bits (Y0 to Y7, Y10 to Y17) to the following status :
(see table 1c for the top address)



« NOTE » OVERFLOW OF SUM CHECK DATA

$$\text{SUM} = 31\text{H} + 30\text{H} + 30\text{H} + 41\text{H} + 30\text{H} + 30\text{H} + 32\text{H} \\ + 33\text{H} + 35\text{H} + 38\text{H} + 34\text{H} + 03\text{H} = 23\text{BH}$$



The following two commands allow individual bit images of the X,Y,M,S,T,C bit devices to be forced ON or OFF. The PC may be in STOP or in the RUN mode.

« COMMANDS FROM THE COMPUTER »

FORCE ON

STX	CMD	DEVICE ADDRESS				ETX	SUM	
		16 ¹	16 ²	16 ³	16 ²		16 ¹	16 ⁰
02 H	7 37 H	A4-A1	AC-E2-B0	0H	AB-A5	03 H	H	L

FORCE OFF

STX	CMD	DEVICE ADDRESS				ETX	SUM	
		16 ¹	16 ²	16 ³	16 ²		16 ¹	16 ⁰
02 H	8 38 H	A4-A1	AD-E2-B0	0H	AB-A5	03 H	H	L

EX. Forcing output Y23 to ON

Device address is in a different format to that of the TOP address of n byte read/write commands. The end effect is listed in separate tables such as table 7a, 7b.

STX	CMD	DEVICE ADDRESS				ETX	SUM	
		16 ¹	16 ²	16 ³	16 ²		16 ¹	16 ⁰
02 H	7 37 H	1 31 H	3 33 H	0 30 H	5 35 H	03 H	0 30 H	3 33 H

« RESPONSE FROM THE PC »

ACK

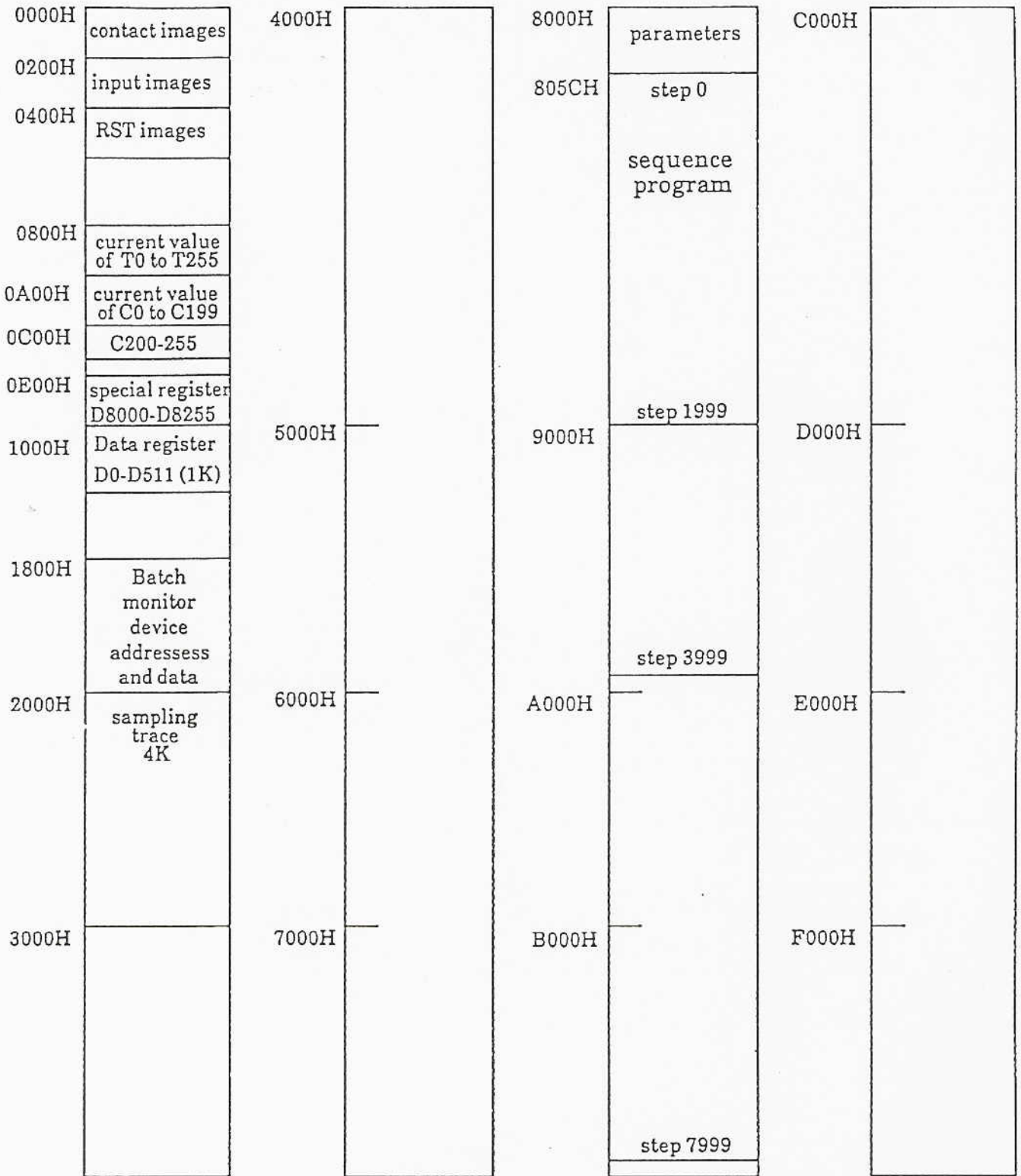
06H

After receiving the command from the computer, the PC executes the forcing at the point when the END instruction is executed. The PC then replies with an ACK code.

NAK


15H

When a command is not understood or if there is a SUM check error, the PC replies with a negative acknowledge NAK.



The multiple object device commands such as CMD '0' and CMD '1' uses the TOP addresses which are addresses for 8-bit groups. They cannot be used for the single device instructions CMD '7' and CMD '8' as they are not in the same format. These instructions must use the format of the device address as listed in tables 7a and 7b.

« TOP ADDRESSES »

Devices	CONTACT	COILS				Current values (T,C) Data registers
	XYMS TC	SET YMS RST YMS OUT YMS	OUT T OUT C	PLS Y, M PLF Y, M	RST T RST C	
X	table 1a	—	—	—	—	—
Y	“	as left	—	table 1b	—	—
M	“	as left	—	“	—	—
Special M	“	as left	—	—	—	—
S	“	as left	—	—	—	—
T	“	—	table 1b	—	table 1c	table 2
C 16-bit	“	—	“	—	“	table 3
C 32-bit	“	—	“	—	“	table 4
D	—	—	—	—	—	table 5a, 5b
special D	—	—	—	—	—	table 6
Remarks	 <p>The images of these coils are the same images of their contacts.</p>		These coils are different to their contact images.	The image read will show the status of the last scan.	Image of reset coils	

« BIT DEVICE ADDRESSES »

Table 7a ---- S, X, Y, T devices.

Table 7b ---- M, special M, C devices.

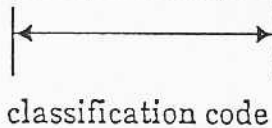
Format of bit device address :

0000	⋮	A8 - A5	⋮	A4 - A1	⋮	A0, B2 - B0
------	---	---------	---	---------	---	-------------

CALCULATION OF DEVICE ADDRESS

The bit device address tables for the images of bit devices following this page are all derived from the device address format shown below :

	BIT DEVICE ADDRESS												DEVICE AREA
	A8	A7	A6	A5	A4	A3	A2	A1	A0	B2	B1	B0	
S	0	0	×	×	×	×	×	×	×	×	×	×	S0-S999
X	0	1	0	0	0	×	×	×	×	×	×	×	X0-X127
Y	0	1	0	1	0	×	×	×	×	×	×	×	Y0-Y127
T (contacts)	0	1	1	0	×	×	×	×	×	×	×	×	T0-T255
M	1	0	×	×	×	×	×	×	×	×	×	×	M0-M1023
C (contacts)	1	1	1	0	×	×	×	×	×	×	×	×	C0-C255
SPECIAL M	1	1	1	1	×	×	×	×	×	×	×	×	M8000- M8255

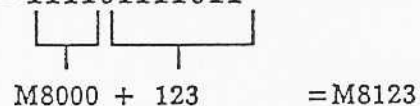


- A8 to A0 : Address of a byte location in the PC memory map. Contact images require only the address bits up to A8. A9 to A12 are either not used or are filled with zeros..
- B2 to B0 : Bit address for accessing the individual bits of a byte location in the PC memory in order to access information on bit devices.

××××××× : DEVICE number in absolute binary
example S100 = 000001100100

SPECIAL M : M8000-M8255 are addressed by the last 3 digits at the bits indicated by ××××...××. 8000 is automatically added when coding by the recognition of the classification code.

EXAMPLE, M8123 = 111101111011



*1 : code S1023 is an RET instruction code. (001111111111)

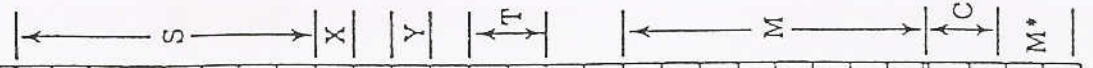
TABLE 1a TOP ADDRESSES OF BIT IMAGES (A12 - A0)

Example: Y10 ——— Y17

● X, Y, M, S, T, C CONTACTS ● OUT Y, M, S SET Y, M, S RST Y, M, S COILS

M* : special M devices

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
0010	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
0020	256-263	264-271	272-279	280-287	288-295	296-303	304-311	312-319	320-327	328-335	336-343	344-351	352-359	360-367	368-375	376-383
0030	384-391	392-399	400-407	408-415	416-423	424-431	432-439	440-447	448-455	456-463	464-471	472-479	480-487	488-495	496-503	504-511
0040	512-519	520-527	528-535	536-543	544-551	552-559	560-567	568-575	576-583	584-591	592-599	600-607	608-615	616-623	624-631	632-639
0050	640-647	648-655	656-663	664-671	672-679	680-687	688-695	696-703	704-711	712-719	720-727	728-735	736-743	744-751	752-759	760-767
0060	768-775	776-783	784-791	792-799	800-807	808-815	816-823	824-831	832-839	840-847	848-855	856-863	864-871	872-879	880-887	888-895
0070	896-903	904-911	912-919	920-927	928-935	936-943	944-951	952-959	960-967	968-975	976-983	984-991	992-999			
0080	0-7	10-17	20-27	30-37	40-47	50-57	60-67	70-77	100-107	110-117	120-127	130-137	140-147	150-157	160-167	170-177
0090																
00A0	0-7	10-17	20-27	30-37	40-47	50-57	60-67	70-77	100-107	110-117	120-127	130-137	140-147	150-157	160-167	170-177
00B0																
00C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
00D0	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
00E0																
00F0																
0100	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
0110	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
0120	256-263	264-271	272-279	280-287	288-295	296-303	304-311	312-319	320-327	328-335	336-343	344-351	352-359	360-367	368-375	376-383
0130	384-391	392-399	400-407	408-415	416-423	424-431	432-439	440-447	448-455	456-463	464-471	472-479	480-487	488-495	496-503	504-511
0140	512-519	520-527	528-535	536-543	544-551	552-559	560-567	568-575	576-583	584-591	592-599	600-607	608-615	616-623	624-631	632-639
0150	640-647	648-655	656-663	664-671	672-679	680-687	688-695	696-703	704-711	712-719	720-727	728-735	736-743	744-751	752-759	760-767
0160	768-775	776-783	784-791	792-799	800-807	808-815	816-823	824-831	832-839	840-847	848-855	856-863	864-871	872-879	880-887	888-895
0170	896-903	904-911	912-919	920-927	928-935	936-943	944-951	952-959	960-967	968-975	976-983	984-991	992-999	1000-1007	1008-1015	1016-1023
01C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
01D0	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
01E0	8000-8007	8008-8015	8016-8023	8024-8031	8032-8039	8040-8047	8048-8055	8056-8063	8064-8071	8072-8079	8080-8087	8088-8095	8096-8103	8104-8111	8112-8119	8120-8127
01F0	8128-8135	8136-8143	8144-8151	8152-8159	8160-8167	8168-8175	8176-8183	8184-8191	8192-8199	8200-8207	8208-8215	8216-8223	8224-8231	8232-8239	8240-8247	8248-8255



02C0 ← TOP ADDRESS

Example: T7 ——— TO

TABLE 1b TOP ADDRESSES OF BIT IMAGES (A12 - A0)

● OUTT,C COIL ● PLS Y,M PLF Y,M COIL (status of previous scan)

+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0200																
02A0	0-7	10-17	20-27	30-37	40-47	50-57	60-67	70-77	100-107	110-117	120-127	130-137	140-147	150-157	160-167	170-177
02B0																
02C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
02D0	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
02E0																
02F0																
0300	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
0310	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
0320	256-263	264-271	272-279	280-287	288-295	296-303	304-311	312-319	320-327	328-335	336-343	344-351	352-359	360-367	368-375	376-383
0330	384-391	392-399	400-407	408-416	416-423	424-431	432-439	440-447	448-455	456-463	464-471	472-479	480-487	488-495	496-503	504-511
0340	512-519	520-527	528-535	536-543	544-551	552-559	560-567	568-575	576-583	584-591	592-599	600-607	608-615	616-623	624-631	632-639
0350	640-647	648-655	656-663	664-671	672-679	680-687	688-695	696-703	704-711	712-719	720-727	728-735	736-743	744-751	752-759	760-767
0360	768-775	776-783	784-791	792-799	800-807	808-815	816-823	824-831	832-839	840-847	848-855	856-863	864-871	872-879	880-887	888-895
0370	896-903	904-911	912-919	920-927	928-935	936-943	944-951	952-959	960-967	968-975	976-983	984-991	992-999	1000-1007	1008-1015	1016-1023
03C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
03D0	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255

TABLE 1c GROUP ADDRESSES OF BIT IMAGES ● RST,T, RST C COIL

+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0400																
04C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
04D0	128-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255
05C0	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95	96-103	104-111	112-119	120-127
05D0	120-135	136-143	144-151	152-159	160-167	168-175	176-183	184-191	192-199	200-207	208-215	216-223	224-231	232-239	240-247	248-255

Example: 08C9 ← 08C8 ← TOP ADDRESS

TABLE 2 TOP ADDRESS OF TIMER CURRENT VALUE

T100 upper 8-bits lower 8-bits

	+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0800		T0	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1	T1
0810		T8	9	10	10	11	11	11	11	12	12	13	13	14	14	15	15
0820		16	17	18	18	19	19	19	19	20	20	21	21	22	22	23	23
0830		24	25	26	26	27	27	27	27	28	28	29	29	30	30	31	31
0840		32	33	34	34	35	35	35	35	36	36	37	37	38	38	39	39
0850		40	41	42	42	43	43	43	43	44	44	45	45	46	46	47	47
0860		48	49	50	50	51	51	51	51	52	52	53	53	54	54	55	55
0870		56	57	58	58	59	59	59	59	60	60	61	61	62	62	63	63
0880		64	65	66	66	67	67	67	67	68	68	69	69	70	70	71	71
0890		72	73	74	74	75	75	75	75	76	76	77	77	78	78	79	79
08A0		80	81	82	82	83	83	83	83	84	84	85	85	86	86	87	87
08B0		88	89	90	90	91	91	91	91	92	92	93	93	94	94	95	95
08C0		96	97	98	98	99	99	99	99	100	100	101	101	102	102	103	103
08D0		104	105	106	106	107	107	107	107	108	108	109	109	110	110	111	111
08E0		112	113	114	114	115	115	115	115	116	116	117	117	118	118	119	119
08F0		120	121	122	122	123	123	123	123	124	124	125	125	126	126	127	127
0900		128	129	130	130	131	131	131	131	132	132	133	133	134	134	135	135
0910		136	137	138	138	139	139	139	139	140	140	141	141	142	142	143	143
0920		144	145	146	146	147	147	147	147	148	148	149	149	150	150	151	151
0930		152	153	154	154	155	155	155	155	156	156	157	157	158	158	159	159
0940		160	161	162	162	163	163	163	163	164	164	165	165	166	166	167	167
0950		168	169	170	170	171	171	171	171	172	172	173	173	174	174	175	175
0960		176	177	178	178	179	179	179	179	180	180	181	181	182	182	183	183
0970		184	185	186	186	187	187	187	187	188	188	189	189	190	190	191	191
0980		192	193	194	194	195	195	195	195	196	196	197	197	198	198	199	199
0990		200	201	202	202	203	203	203	203	204	204	205	205	206	206	207	207
09A0		208	209	210	210	211	211	211	211	212	212	213	213	214	214	215	215
09B0		216	217	218	218	219	219	219	219	220	220	221	221	222	222	223	223
09C0		224	225	226	226	227	227	227	227	228	228	229	229	230	230	231	231
09D0		232	233	234	234	235	235	235	235	236	236	237	237	238	238	239	239
09E0		240	241	242	242	243	243	243	243	244	244	245	245	246	246	247	247
09F0		248	249	250	250	251	251	251	251	252	252	253	253	254	254	255	255

TABLE 4 TOP ADDRESSES OF 32-BIT COUNTERS

0C00 ← TOP ADDRESS

0C01

0C02

0C03

Example: C200

b31	b24	b23	b16	b15	b8	b7	b0
-----	-----	-----	-----	-----	----	----	----

	+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0C00												202			203		
0C10												206			207		
0C20												210			211		
0C30												214			215		
0C40												218			219		
0C50												222			223		
0C60												226			227		
0C70												230			231		
0C80												234			235		
0C90												238			239		
0CA0												242			243		
0CB0												246			247		
0CC0												250			251		
0CD0												254			255		

TABLE 5a. TOP ADDRESSES OF DATA REGISTERS

10F7 10F6 ← TOP ADDRESS

Example: D123 upper 8-bits lower 8-bits

	+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1000		D0	1			2		3		4		5		6		7	
1010		8	9			10		11		12		13		14		15	
1020		16	17			18		19		20		21		22		23	
1030		24	25			26		27		28		29		30		31	
1040		32	33			34		35		36		37		38		39	
1050		40	41			42		43		44		45		46		47	
1060		48	49			50		51		52		53		54		55	
1070		56	57			58		59		60		61		62		63	
1080		64	65			66		67		68		69		70		71	
1090		72	73			74		75		76		77		78		79	
10A0		80	81			82		83		84		85		86		87	
10B0		88	89			90		91		92		93		94		95	
10C0		96	97			98		99		100		101		102		103	
10D0		104	105			106		107		108		109		110		111	
10E0		112	113			114		115		116		117		118		119	
10F0		120	121			122		123		124		125		126		127	
1100		128	129			130		131		132		133		134		135	
1110		136	137			138		139		140		141		142		143	
1120		144	145			146		147		148		149		150		151	
1130		152	153			154		155		156		157		158		159	
1140		160	161			162		163		164		165		166		167	
1150		168	169			170		171		172		173		174		175	
1160		176	177			178		179		180		181		182		183	
1170		184	185			186		187		188		189		190		191	
1180		192	193			194		195		196		197		198		199	
1190		200	201			202		203		204		205		206		207	
11A0		208	209			210		211		212		213		214		215	
11B0		216	217			218		219		220		221		222		223	
11C0		224	225			226		227		228		229		230		231	
11D0		232	233			234		235		236		237		238		239	
11E0		240	241			242		243		244		245		246		247	
11F0		248	249			250		251		252		253		254		255	

TABLE 5b TOP ADDRESSES OF DATA REGISTERS

12E1

12E0

← TOP ADDRESS

Example: D368

upper 8-bits	lower 8-bits
--------------	--------------

	+	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
1200		D256		257		258		259		260		261		262		263	
1210		264		265		266		267		268		269		270		271	
1220		272		273		274		275		276		277		278		279	
1230		280		281		282		283		284		285		286		287	
1240		288		289		290		291		292		293		294		295	
1250		296		297		298		299		300		301		302		303	
1260		304		305		306		307		308		309		310		311	
1270		312		313		314		315		316		317		318		319	
1280		320		321		322		323		324		325		326		327	
1290		328		329		330		331		332		333		334		335	
12A0		336		337		338		339		340		341		342		343	
12B0		344		345		346		347		348		349		350		351	
12C0		352		353		354		355		356		357		358		359	
12D0		360		361		362		363		364		365		366		367	
12E0		368		369		370		371		372		373		374		375	
12F0		376		377		378		379		380		381		382		383	
1300		384		385		386		387		388		389		390		391	
1310		392		393		394		395		396		397		398		399	
1320		400		401		402		403		404		405		406		407	
1330		408		409		410		411		412		413		414		415	
1340		416		417		418		419		420		421		422		423	
1350		424		425		426		427		428		429		430		431	
1360		432		433		434		435		436		437		438		439	
1370		440		441		442		443		444		445		446		447	
1380		448		449		450		451		452		453		454		455	
1390		456		457		458		459		460		461		462		463	
13A0		464		465		466		467		468		469		470		471	
13B0		472		473		474		475		476		477		478		479	
13C0		480		481		482		483		484		485		486		487	
13D0		488		489		490		491		492		493		494		495	
13E0		496		497		498		499		500		501		502		503	
13F0		504		505		506		507		508		509		510		511	

TABLE 6 TOP ADDRESSES OF SPECIAL REGISTERS

Example: 0E01 0E00 ← TOP ADDRESS
 D8000 upper 8-bits lower 8-bits

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0E00	D8000		8001	8002	8003	8004	8005	8006	8007							
0E10	8008		8009	8010	8011	8012	8013	8014	8015							
0E20	8016		8017	8018	8019	8020	8021	8022	8023							
0E30	8024		8025	8026	8027	8028	8029	8030	8031							
0E40	8032		8033	8034	8035	8036	8037	8038	8039							
0E50	8040		8041	8042	8043	8044	8045	8046	8047							
0E60	8048		8049	8050	8051	8052	8053	8054	8055							
0E70	8056		8057	8058	8059	8060	8061	8062	8063							
0E80	8064		8065	8066	8067	8068	8069	8070	8071							
0E90	8072		8073	8074	8075	8076	8077	8078	8079							
0EA0	8080		8081	8082	8083	8084	8085	8086	8087							
0EB0	8088		8089	8090	8091	8092	8093	8094	8095							
0EC0	8096		8097	8098	8099	8100	8101	8102	8103							
0ED0	8104		8105	8106	8107	8108	8109	8110	8111							
0EE0	8112		8113	8114	8115	8116	8117	8118	8119							
0EF0	8120		8121	8122	8123	8124	8125	8126	8127							
0F00	8128		8129	8130	8131	8132	8133	8134	8135							
0F10	8136		8137	8138	8139	8140	8141	8142	8143							
0F20	8144		8145	8146	8147	8148	8149	8150	8151							
0F30	8152		8153	8154	8155	8156	8157	8158	8159							
0F40	8160		8161	8162	8163	8164	8165	8166	8167							
0F50	8168		8169	8170	8171	8172	8173	8174	8175							
0F60	8176		8177	8178	8179	8180	8181	8182	8183							
0F70	8184		8185	8186	8187	8188	8189	8190	8191							
0F80	8192		8193	8194	8195	8196	8197	8198	8199							
0F90	8200		8201	8202	8203	8204	8205	8206	8207							
0FA0	8208		8209	8210	8211	8212	8213	8214	8215							
0FB0	8216		8217	8218	8219	8220	8221	8222	8223							
0FC0	8224		8225	8226	8227	8228	8229	8230	8231							
0FD0	8232		8233	8234	8235	8236	8237	8238	8239							
0FE0	8240		8241	8242	8243	8244	8245	8246	8247							
0FF0	8248		8249	8250	8251	8252	8253	8254	8255							

TABLE 7a BIT DEVICE ADDRESSES OF (S,X,Y,T)

0000 A8-A5 A4-A1 A0,B2-B0

0 6 F F = T255

DEVICE ADDRESS	DEVICE NUMBER	DEVICE ADDRESS	DEVICE NUMBER	DEVICE ADDRESS	DEVICE NUMBER
0000	S 0	~	S 15	0230	S 560
0010	S 16	~	S 31	~	S 575
0020	S 32	~	S 47	~	S 591
0030	S 48	~	S 63	~	S 607
0040	S 64	~	S 79	~	S 623
0050	S 80	~	S 95	~	S 639
0060	S 96	~	S 111	~	S 655
0070	S 112	~	S 127	~	S 671
0080	S 128	~	S 143	~	S 687
0090	S 144	~	S 159	~	S 703
00A0	S 160	~	S 175	~	S 719
00B0	S 176	~	S 191	~	S 735
00C0	S 192	~	S 207	~	S 751
00D0	S 208	~	S 223	~	S 767
00E0	S 224	~	S 239	~	S 783
00F0	S 240	~	S 255	~	S 799
0100	S 256	~	S 271	~	S 815
0110	S 272	~	S 287	~	S 831
0120	S 288	~	S 303	~	S 847
0130	S 304	~	S 319	~	S 863
0140	S 320	~	S 335	~	S 879
0150	S 336	~	S 351	~	S 895
0160	S 352	~	S 367	~	S 911
0170	S 368	~	S 383	~	S 927
0180	S 384	~	S 399	~	S 943
0190	S 400	~	S 415	~	S 959
01A0	S 416	~	S 431	~	S 975
01B0	S 432	~	S 447	~	S 991
01C0	S 448	~	S 463	~	S 992
01D0	S 464	~	S 479	~	S 999
01E0	S 480	~	S 495	~	
01F0	S 496	~	S 511	~	
0200	S 512	~	S 527	~	
0210	S 528	~	S 543	~	
0220	S 544	~	S 559	~	
0400	~	040F	~	0600	T 0
0410	~	041F	~	0610	T 16
0420	~	042F	~	0620	T 32
0430	~	043F	~	0630	T 48
0440	~	044F	~	0640	T 64
0450	~	045F	~	0650	T 80
0460	~	046F	~	0660	T 96
0470	~	047F	~	0670	T 112
0500	~	050F	~	0680	T 128
0510	~	051F	~	0690	T 144
0520	~	052F	~	06A0	T 160
0530	~	053F	~	06B0	T 176
0540	~	054F	~	06C0	T 192
0550	~	055F	~	06D0	T 208
0560	~	056F	~	06E0	T 224
0570	~	057F	~	06F0	T 240
0600	~	060F	~	0600	T 0
0610	~	061F	~	0610	T 16
0620	~	062F	~	0620	T 32
0630	~	063F	~	0630	T 48
0640	~	064F	~	0640	T 64
0650	~	065F	~	0650	T 80
0660	~	066F	~	0660	T 96
0670	~	067F	~	0670	T 112
0680	~	068F	~	0680	T 128
0690	~	069F	~	0690	T 144
06A0	~	06AF	~	06A0	T 160
06B0	~	06BF	~	06B0	T 176
06C0	~	06CF	~	06C0	T 192
06D0	~	06DF	~	06D0	T 208
06E0	~	06EF	~	06E0	T 224
06F0	~	06FF	~	06F0	T 240

Examples: address of S561 is 0231H
address of S574 is 023EH

TABLE 7b BIT DEVICE ADDRESS OF (M, C, SPECIAL M) 0000 A8-A5 A4-A1 A0, B2-B0

F F F F = M8255

0

DEVICE ADDRESS	DEVICE NUMBER
0800	M 0
0810	M 15
0820	M 31
0830	M 47
0840	M 63
0850	M 79
0860	M 95
0870	M 111
0880	M 127
0890	M 143
08A0	M 159
08B0	M 175
08C0	M 191
08D0	M 207
08E0	M 223
08F0	M 239
0900	M 255
0910	M 271
0920	M 287
0930	M 303
0940	M 319
0950	M 335
0960	M 351
0970	M 367
0980	M 383
0990	M 399
09A0	M 415
09B0	M 431
09C0	M 447
09D0	M 463
09E0	M 479
09F0	M 495
0A09	M 511
0A10	M 527
0A20	M 543
	M 559

DEVICE ADDRESS	DEVICE NUMBER
0A30	M 560
0A40	M 576
0A50	M 592
0A60	M 608
0A70	M 624
0A80	M 640
0A90	M 656
0AA0	M 672
0AB0	M 688
0AC0	M 704
0AD0	M 720
0AE0	M 736
0AF0	M 752
0B00	M 768
0B10	M 784
0B20	M 800
0B30	M 816
0B40	M 832
0B50	M 848
0B60	M 864
0B70	M 880
0B80	M 896
0B90	M 912
0BA0	M 928
0BB0	M 944
0BC0	M 960
0BD0	M 976
0BE0	M 992
0BF0	M 1008
	M 1023

DEVICE ADDRESS	DEVICE NUMBER
0E00	C 0
0E10	C 16
0E20	C 32
0E30	C 48
0E40	C 64
0E50	C 80
0E60	C 96
0E70	C 112
0E80	C 128
0E90	C 144
0EA0	C 160
0EB0	C 176
0EC0	C 192
0ED0	C 208
0EE0	C 224
0EF0	C 240
	M 8000
	M 8016
	M 8032
	M 8048
	M 8064
	M 8080
	M 8096
	M 8112
	M 8128
	M 8144
	M 8160
	M 8176
	M 8192
	M 8208
	M 8224
	M 8240
	M 8015
	M 8031
	M 8047
	M 8063
	M 8079
	M 8095
	M 8111
	M 8127
	M 8143
	M 8159
	M 8175
	M 8191
	M 8207
	M 8223
	M 8239
	M 8255

Examples: address of M160 is 08A0H
 address of M161 is 08A1H
 address of M174 is 08AEH
 address of M175 is 08AFH

16 | FORMAT OF REGISTERS

All the data, in the registers, unless otherwise specified, are stored in two's complement integer form. This includes :

DATA REGISTERS

SPECIAL REGISTERS

FILE REGISTERS

COUNTER, TIMER CURRENT VALUE REGISTERS

Remember that some of the above are 16-bit registers and some are 32-bit registers.

EXCEPTIONS :

DEVICE TYPE	DEVICE NUMBER	FORMAT
Special register	D8001	<pre> Version V1.21 ┌───────────┐ │ 2 │ 0 │ 1 │ 2 │ 1 │ └───────────┘ └──┬──┬──┬──┬──┬──┘ PC type code (FX=2) </pre>
Special register	D8003	000AH : EEPROM protect SW = ON 0002H : EEPROM protect SW = OFF 0001H : ROM cassette 0000H : RAM cassette 0010H : Internal 2K RAM

The CPU of the FX has a batch monitor function that it performs when executing the END statement or during STOP mode when the appropriate conditions have been set. First, the absolute addresses of the images of the devices to be monitored must be stored in the batch monitor device table starting at address 1802H.

The contents of the locations 1800H and 1801H provide the necessary control bits. The result of the monitor is stored in data tables starting at 1958H for word devices and 19A0H for bit devices.

ADDRESS FORMAT:

The absolute address of the image of the device is as specified in section 15 "TOP AND DEVICE ADDRESSES".

EXAMPLES :

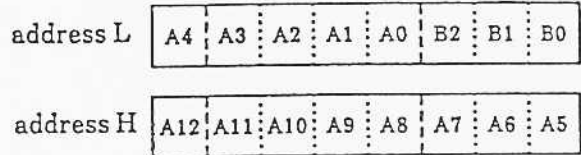
Word device addresses

T0 = 0800H
 □ □
 H L

1802H	00H	L
1803H	08H	H

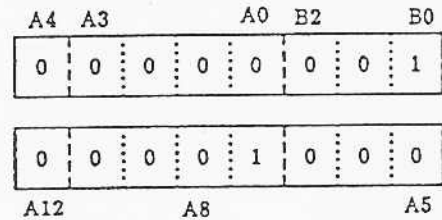
Bit device addresses

FORMAT:

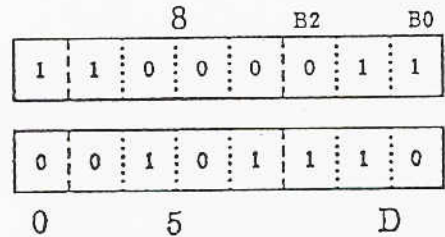


EXAMPLES:

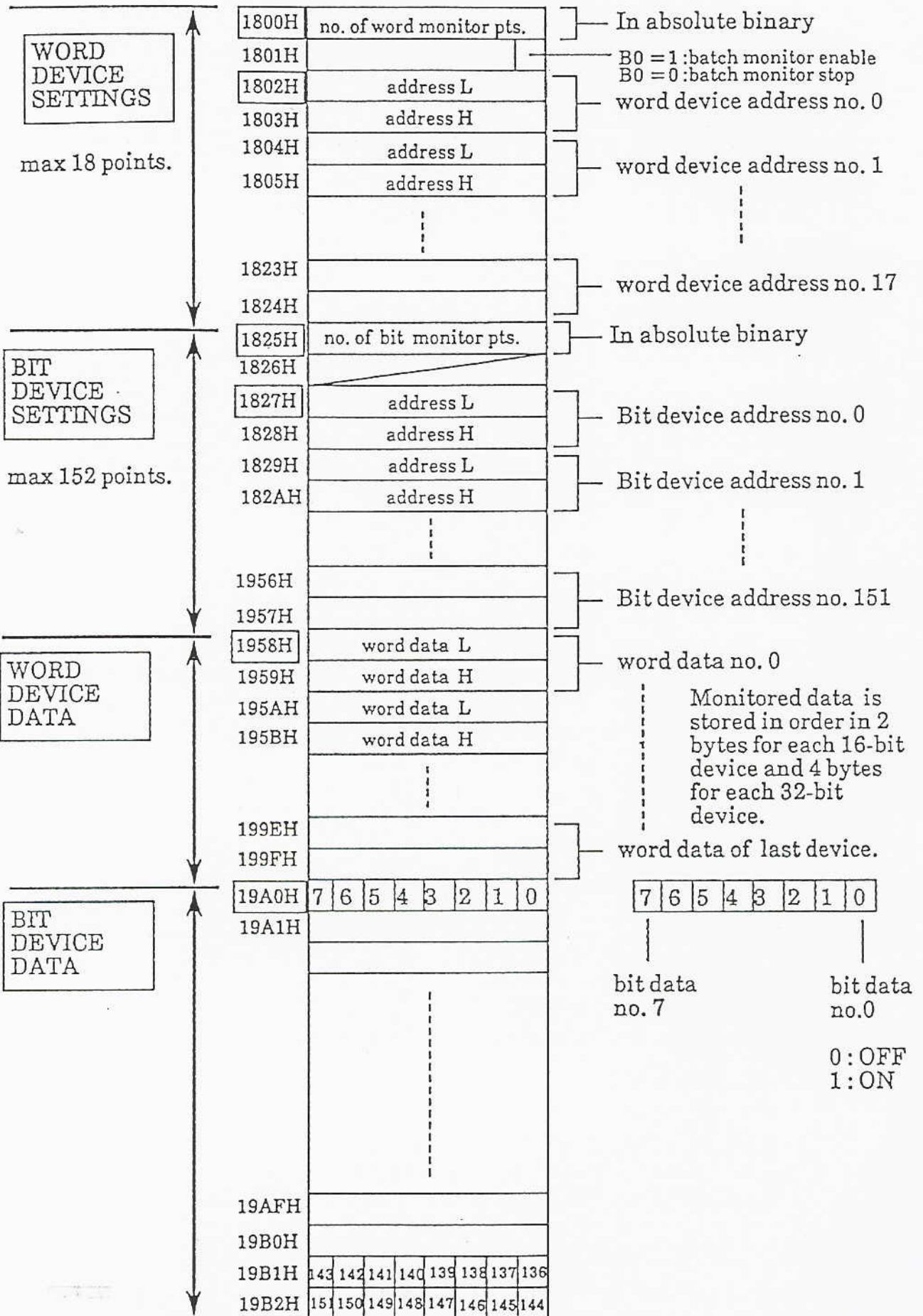
Contact image of:
 M001
 A12-A0 = 0100H
 B2-B0 = 0012



Coil image of:
 RST C195
 A12-A0 = 05D8H
 B2-B0 = 0112



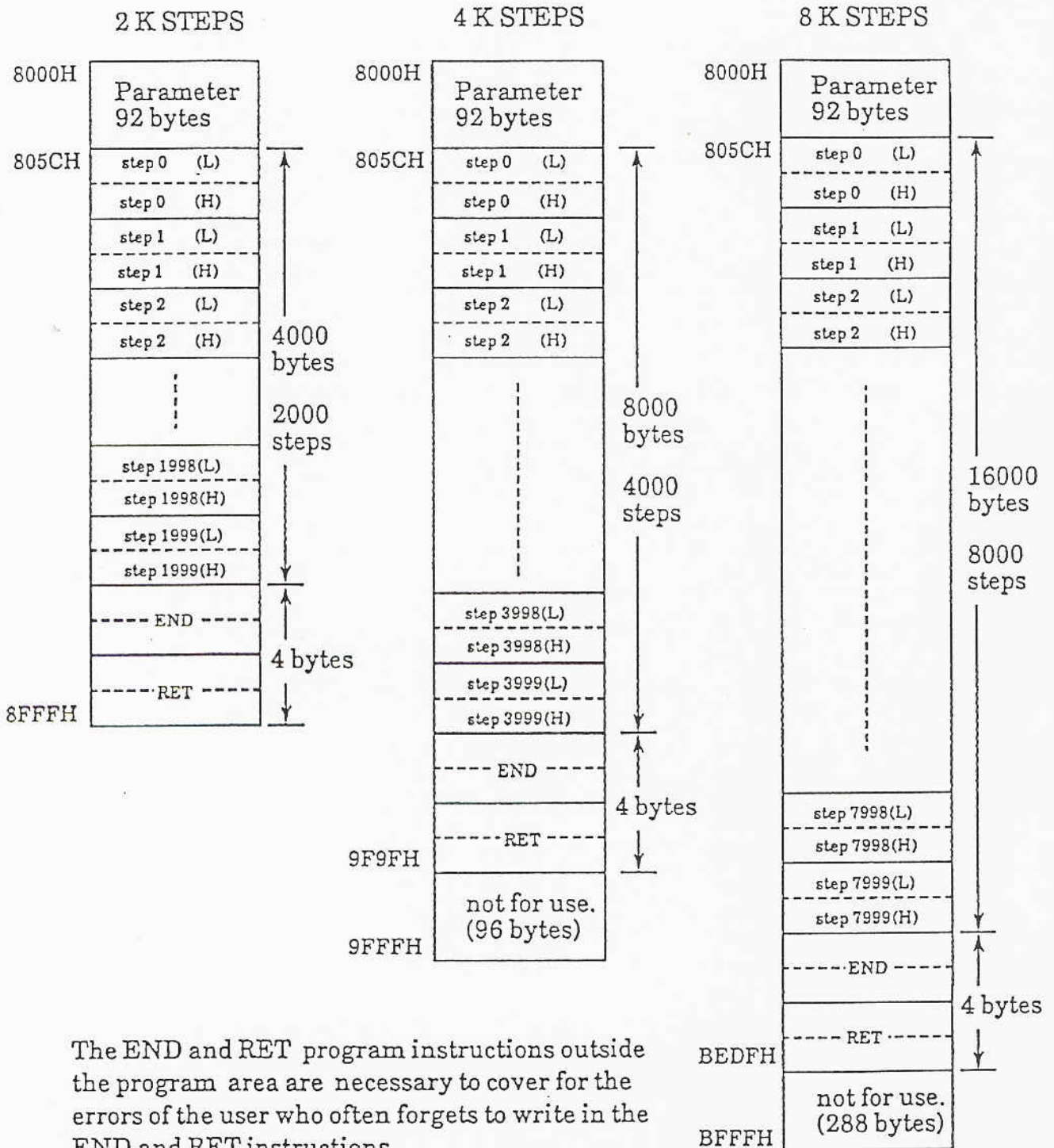
BATCH MONITOR LOCATION MAP



18 PROGRAM MEMORY MAP

Each step of the users's sequence program occupies 2 bytes of program memory. Step 0 begins at location address 805CH. The addresses are the same for PC RAM and cassette memory RAM, EPROM, EEPROM. Selection between these memories is automatically decided by the hardware arrangement. (Memory cassette has priority)

PROGRAM MEMORY MAP (no file registers, no comment allocations)



The END and RET program instructions outside the program area are necessary to cover for the errors of the user who often forgets to write in the END and RET instructions.

Not for use areas are recommended to be written with the code FFH. These areas are not managed.

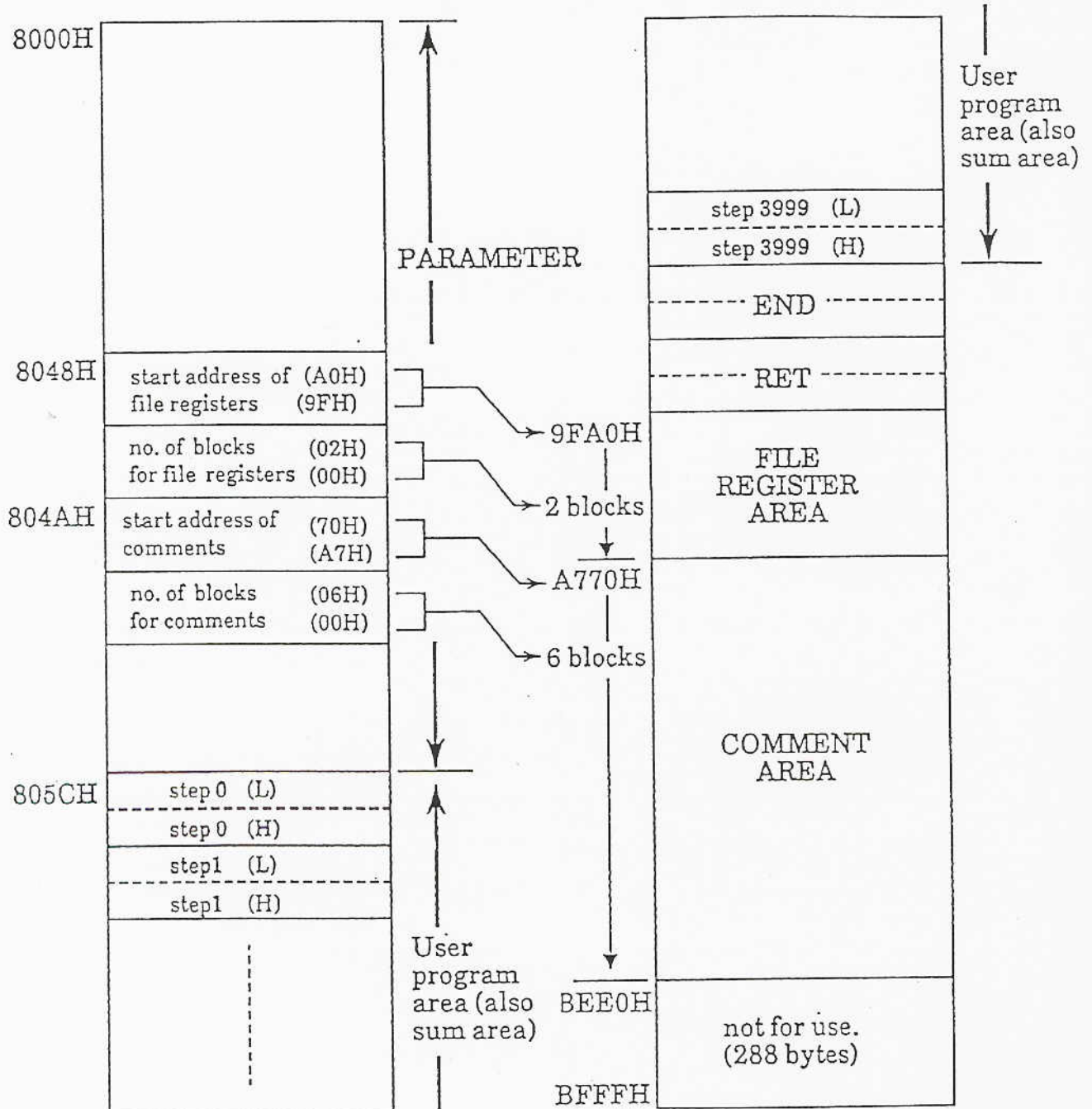
PARAMETER MEMORY MAP

8000H	memory setting
8002H	sum data
8004H	RESERVED
8008H	ENTRY CODE
8010H	PROGRAM TITLE
8020H	
8030H	latch range of M
8034H	latch range of S
8038H	latch range of C (16-bit)
803CH	latch range of C (32-bit)
8040H	latch range of D
8044H	reserved
8048H	File register memory setting
804CH	comment area memory setting
8050H	RESERVED
805BH	

Parameter area is
in total 92 bytes.

From the setting of the parameter data, the position of the file register and comment in the program memory is determined.

EXAMPLE: 8K step mode File register : 2 blocks (2000 bytes)
 (1 block=500 steps) Comment : 6 blocks (6000 bytes)



Headquarters
European Representatives

EUROPE

MITSUBISHI ELECTRIC EUROPE B.V., German Branch
 Gothaer Str. 8
 D-40880 Ratingen
GERMANY
 Phone: +49 (0) 2102 / 486 0
 Fax: +49 (0) 2102 / 486 112

JAPAN

MITSUBISHI ELECTRIC CORPORATION
 2-2-3 Marunouchi Chiyoda-Ku
 Tokyo 100-8310
JAPAN
 Phone: +81 (0) 3 / 32 18 31 76
 Fax: +81 (0) 3 / 32 18 24 22

UK

MITSUBISHI ELECTRIC EUROPE B.V., UK Branch
 Travellers Lane
 GB-Hatfield Herts. AL10 8 XB
UK
 Phone: +44 (0) 1707 / 27 61 00
 Fax: +44 (0) 1707 / 27 86 95

USA

MITSUBISHI ELECTRIC AUTOMATION, INC.
 500 Corporate Woods Parkway
 Vernon Hills, Illinois 60061
USA
 Phone: +1 / 847 / 478 21 00
 Fax: +1 / 847 / 478 22 83

AUSTRIA

GEVA
 Wiener Straße 89
A-2500 Baden
 Phone: +43 (0) 2252 / 85 55 20
 Fax: +43 (0) 2252 / 488 60

BELGIUM

GETRONICS NV/SA
 Pontbeeklaan 43
B-1731 Zellik
 Phone: +32 (0) 2 / 467 17 51
 Fax: +32 (0) 2 / 467 17 45

CROATIA

INEA CR d.o.o.
 Drvinje bb
HR-10000 Zagreb
 Phone: +385 (0) 1 / 366 71 40
 Fax: +385 (0) 1 / 366 71 40

CZECHIA

AutoCont Control Systems s.r.o.
 Nemocnicni 12
CZ-70100 Ostrava 1
 Phone: +420 (0) 69 / 615 21 11
 Fax: +420 (0) 69 / 61 52 562

DENMARK

louis poulsen
 Geminivej 32
DK-2670 Greve
 Phone: +45 (0) 43 / 95 95 95
 Fax: +45 (0) 43 / 95 95 90

ESTONIA

UTU ELEKTROTEHNIKA AS
 P.O. Box 4180
EE-0090 Tallinn
 Phone: +372 6 / 56 31 94
 Fax: +372 6 / 56 38 36

FINLAND

Beijer Electronics OY
 Elannonantie 5
FIN-01510 Vantaa
 Phone: +358 (0) 9 / 615 20 11
 Fax: +358 (0) 9 / 615 20 500

FRANCE

IP Systemes
 8, Rue du Colonel Chambonnet
F-69672 Lyon Bron Cedex
 Phone: +33 (0) 4 / 72 14 18 00
 Fax: +33 (0) 4 / 72 14 18 01

HUNGARY

SANDSOFT
 5 Róppentyü Köz
H-1139 Budapest
 Phone: +36 (0) 1 / 375 38 98
 Fax: +36 (0) 1 / 375 06 88

IRELAND

MITSUBISHI ELECTRIC EUROPE B.V.
 Westgate Business Park, Ballymount
IRL-Dublin 22
 Phone: +353 (0) 1 / 450 50 07
 Fax: +353 (0) 1 / 456 13 37

ISRAEL

TEXEL Electronics Ltd.
 P.O. Box 6272
IL-Netanya 42160
 Phone: +972 (0) 9 / 863 08 94
 Fax: +972 (0) 9 / 885 24 30

ITALY

CARPANETO & C. S.p.A.
 Via Ferrero 10
I-10090 Cascine Vica-Rivoli (TO)
 Phone: +39 011 / 959 01 11
 Fax: +39 011 / 959 02 50

NETHERLANDS

Getronics Industrial Automation bv
 Donauweg 10
NL-1043 AJ-Amsterdam
 Phone: +31 (0) 20 / 586 15 92
 Fax: +31 (0) 20 / 586 19 27