Chapter 9 Hardware References

9-1 MPC-1000 (Main CPU Board)

Specification

CPU	R5F70835AN80FTV	SH2 80 MHz Built-in ROM 512K, RAM 32K
Program area	155 Kbytes	One 4M SRAM installed, about 6200 lines (as 25 byte/line)
Point data	7000 points	16 bytes = 1 point
RS-232C	CH1 & CH2 for user	4800~38400 bps
RS-485	CH1 for user	When RS-485 is used. RS-232 cannot be used.
Number of tasks	32 tasks	MEWNET occupies one task (when connected via CH1)
I/O	16 inputs (compatible with 2-line sensors)	SW(192)~SW(207) * Compatible with a leak current of up to 1 mA.
	16-point output	ON/OFF 0~15 100 mA
Power supply	DC 24V	Self consumption below 100 mA
Internal power supply	Internal DC 5V	Supply of up to 800 mA (up to 4 slots)

Outline

MPC-1000 is a CPU board compatible with MPC-2000 in language and basic performance. Although it is designed for stand-alone use, it can also be used as a system, and stored in a rack, in the same manner as MPC-2000. All the peripheral boards of MPC-2000 can be used.
Although its I/O and RS-232C are compatible with those of MPC-2000, there are the following differences.

Differences from MPC-2000/2200

- There is no array and point data battery backup function or calendar function.
- There is no LCD display.
- There is no large current output port which is prepared in MPC-2000.
- USB port is provided, wherein a USB memory may be used.
- Two channels of user RS-232 are provided. CH1 may be used as RS-485.
- Output ports 12~15 may be used as pulse output ports. (Up to 10 Kpps)
- Although all the peripheral boards of MPC-2000 series can be used, MRS-MCOM board cannot be set to DSW = 6 when it is used.

Battery backup substitution function

The same CPU and memory are used as in MPC-2000. However, in order to compensate for there being no battery backup, MPC-1000 has the following additional functions. When the clock is initialized with the SET_RTC command at startup, CPU performs the RTC function instead, so that time can be obtained for the day.
Point data over 100~299 are automatically saved on a flash ROM. Although the timing for saving them is at the time of RUN, they can also be saved forcibly with an FSP command.
Output ports 12~15 can be used as pulse generation ports. In that case, 192+12~192+15 of the input port is assigned for PG.
In the standard state, after powering on, all I/O are set to I/O control use, and LED 3 and 4 become monitor displays for outputs 12 and 14.

Power supply to RS-232C

The power supply for RS-232 (including 485) is generated separately from the power supply for control, and noise is separated by an isolator. Although SG is shorted to GND from the factory, the power supply can be separated by opening SP 6 and 7. In this case, DC 5V powder needs to be supplied from J5.
Communication power supply separation: Setting SP 6 and 7 to open, DC 5V power should be supplied to J5-SG and (+DC5).

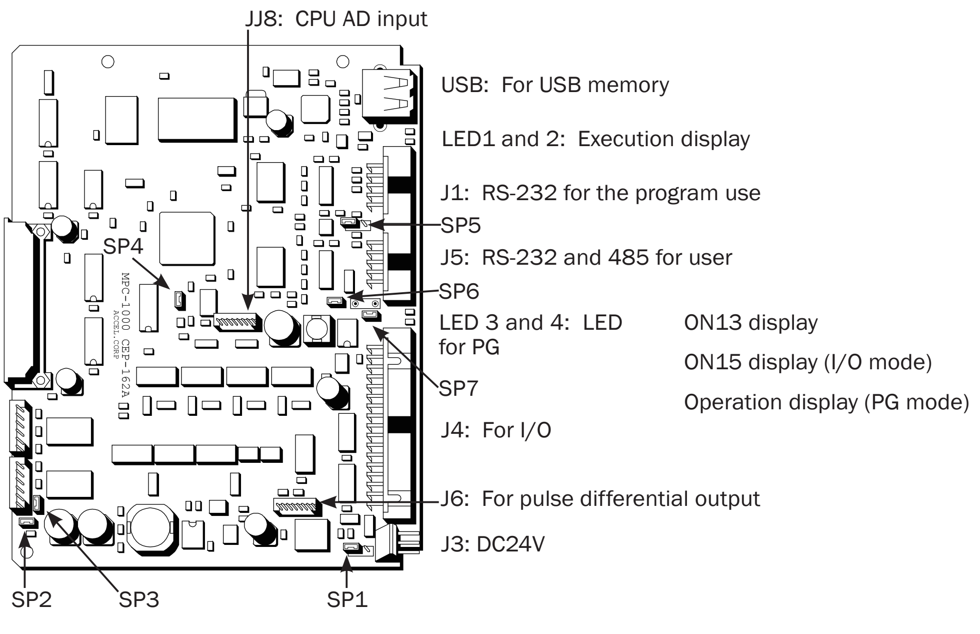
AD conversion function

J8 on the board is a 7CH AD conversion input port directly connected to the CPU. Although it can perform 5V input 10 bit conversion, SG becomes the same as the internal CPU. Therefore, it should be used in a device having a compact specification of one-board construction. Functions of AD(20)~AD(26) become available.
A portion 192~ of the input port is made unavailable by the number of channels used byAD.

USB memory function

MPC-1000 can access the USB memory by default. Although it is functionally identical to the USB support of MRS-MCOM, the following differences exist.
When the ON_USB command is executed, or an USB access (such as DIR and USB_PLOAD) is made, task 29 is automatically assigned to the USB control task.
Therefore, if USB memory is used, task 29 should not be used in the user program. To end the started USB control task, “OFF_USB” command should be executed.
Conversely, USB commands can be enabled by executing “ON_USB” command. Once the USB task is enabled, task 29 appears as occupied in the opening message.

Hardware configuration



Short pin	State as factory shipped	Note
SP1	Open	FG connected to J3-3 (when a rack is used)
SP2	Shorted	Internal DC 5V power supply
SP3	Shorted	Open when programming CPU for PG
SP4	Shorted	Open when updating MPC-1000
SP5	Open	RS-485 terminator
SP6,7	Shorted	DC 5V power supply for RS-232 and 485

1) J1: RS-232C CH0,CH1

J1			
1	SG	2	TXD
3	RXD	4	SG
5	MAN	6	P5
7	SG	8	TXD1
9	RXD1	10	FG

* J1-SG: J3-GND common
(SP 6 and 7 shorted)

2) J5: RS-232C CH2 and CH1

J5			
1	SG	2	TXD2
3	RXD2	4	NC
5	RS485B	6	RS485A
7	SG	8	TXD1
9	RXD1	10	(+DC5)

* J5-SG: J3-GND common
(when SP 6 and 7 are shorted)

3) J8: (10bitAD) SH2CPU AD

J8		
1	AD(20)	SW(192)
2	AD(21)	SW(193)
3	AD(22)	SW(194)
4	AD(23)	SW(195)
5	AD(24)	SW(196)
6	AD(25)	SW(197)
7	AD(26)	SW(198)
8	AD_SG	-

4) J3: POWER

1	DC24
2	GND
3	FG

5) J4: IN 16 points / OUT 16 points

J4			
1	SW(192)	2	SW(193)
3	SW(194)	4	SW(195)
5	SW(196)	6	SW(197)
7	SW(198)	8	SW(199)
9	SW(200)	10	SW(201)
11	SW(202)	12	SW(203)
13	SW(204)	14	SW(205)
15	SW(206)	16	SW(207)
17	ON 0	18	ON 1
19	ON 2	20	ON 3
21	ON 4	22	ON 5
23	ON 6	24	ON 7
25	ON 8	26	ON 9
27	ON 10	28	ON 11
29	ON 12	30	ON 13
31	ON 14	32	ON 15
33	GND	34	GND

* J4-GND: J3-GND common

6) J6: differential output AM26C31

J6				
1	P1CW_INV	2	P1CW_NI	ON 12
3	P1CCW_INV	4	P1CCW_NI	ON 13
5	P2CW_INV	6	P2CW_NI	ON 14
7	P2CCW_INV	8	P2CCW_NI	ON 15

9-2 MPC-N816 (Main CPU Board)

Specification

CPU	R5F70835AN80FTV	SH2 80 MHz Built-in ROM 512K, RAM 32K
Program area	155 Kbytes	One 4M RAM installed, about 6200 lines (as 25 byte/line)
Point data	7000 points	16 bytes = 1 point
RS-232C	CH1 for user	4800~38400 bps
RS-485	CH2 for user	Dedicated for RS-485
Number of tasks	32 tasks	MEWNET occupies one task (when connected via CH1)
I/O	16 inputs (compatible with 2-line sensors)	SW(192)~SW(207) * Compatible with a leak current of up to 1 mA.
	8-point output	ON/OFF 0~15 100 mA
Power supply	DC 24V	Self consumption below 100 mA
Internal power supply	Internal DC 5V	Supply of up to 800 mA (up to 4 slots)

Outline

MPC-N816 is a CPU boardcompatible with the MPC-1000 in terms of language and basic performance. Although designed as an I/O connector compatible with the old MPC-816, it can also be used in a system stored in a rack in a similar manner to MPC-2000. In addition, all peripheral boards of the 2000 Series can be used.

Differences from MPC-N816/1000

- The I/O connector is a 50-pin connector with a pin arrangement compatible with the old MPC-816.
- Outputs ON8~ON15 are output as TTL levels to J6.
- CH2 is dedicated to RS485.

Power supply to RS-232C

The power supply for RS-232 (including 485) communication is isolated from the interior of the CPU power supply.

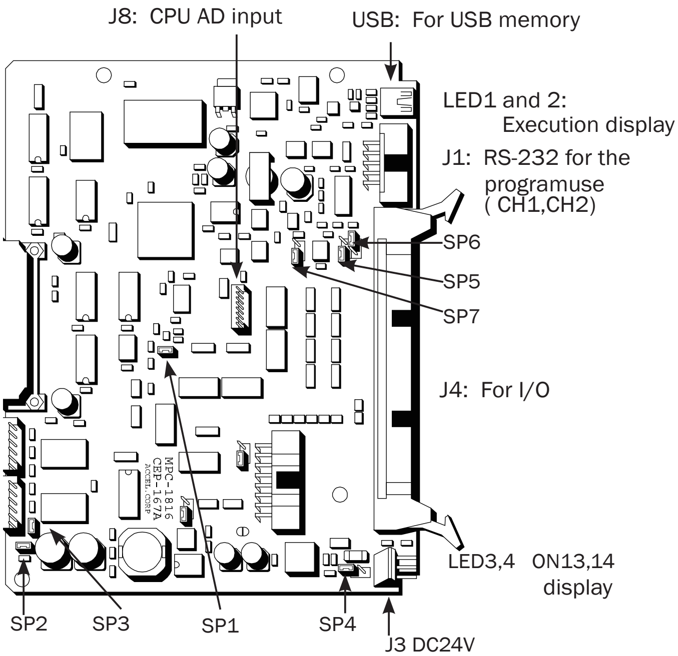
AD conversion function

J8 on the board is a 7CH AD conversion input port which is directly connected to the CPU. Although it can perform 5V input 10 bit conversion, SG becomes the same as the internal CPU. Therefore, it should be used in a device having a compact specification of one-board construction. Functions of AD(20)~AD(26) become available.
A portion 192~ of the input port is made unavailable by the number of channels used byAD.

USB memory function

The USB connector of MPC-N816 is a mini-A. USB memory is connected using a commercially-available A ↔ mini-A conversion cable. The usage directions are the same as those of the MPC-1000.

Hardware configuration



Short pin	State as factory shipped	Note
SP1	Shorted	Open when updating MPC-N816.
SP2	Shorted	Internal DC 5V power supply
SP3	Shorted	Open when CPU programming for PG.
SP4	Open	FG connection with J3-3 (when a rack is used)
SP5	Open	RS-485 terminator
SP6	1-2Shorted	2-3 side shorted when RS-485 is used.
SP7	Open	Shorted when RS-485 is used.
SP8	Open	VCC is supplied via J6 when shorted.
SP9	1-2Shorted	2-3 side for connecting J6 to GND.

5) J6 pulse output

J6			
1	(VCC)*	2	ON 8
3	(VCC)**	4	ON 9
5	(VCC)	6	ON 10
7	(VCC)	8	ON 11
9	(VCC)	10	ON 12
11	(VCC)	12	ON 13
13	(VCC)	14	ON 14
15	(VCC)	16	ON 15

(VCC) 100 Ω pull-up
* VCC if SP8 is shorted.
** Internal GND if SP9 (2-3) is shorted.

1) J1 RS-232C CH0,CH1

J1			
1	SG	2	TXD0
3	RXD0	4	SG
5	MAN	6	P5
7	SG/RS485B *	8	TXD1
9	RXD1	10	RS485A

* SP6(2-3): RS485B if shorted.

2) J8(10bitAD) SH2CPU AD

J8		
1	AD(20)	SW(192)
2	AD(21)	SW(193)
3	AD(22)	SW(194)
4	AD(23)	SW(195)
5	AD(24)	SW(196)
6	AD(25)	SW(197)
7	AD(26)	SW(198)
8	AD_SG	-

3) J4 IN 8-points / OUT 8-points

J4			
1	SW(192)	2	GND
3	SW(193)	4	GND
5	SW(194)	6	GND
7	SW(195)	8	GND
9	SW(196)	10	GND
11	SW(197)	12	GND
13	SW(198)	14	GND
15	SW(199)	16	GND
17	SW(200)	18	GND
19	SW(201)	20	GND
21	SW(202)	22	GND
23	SW(203)	24	GND
25	SW(204)	26	GND
27	SW(205)	28	GND
29	SW(206)	30	GND
31	SW(207)	32	GND
33	+DC	34	ON 0
35	+DC	36	ON 1
37	+DC	38	ON 2
39	+DC	40	ON 3
41	+DC	42	ON 4
43	+DC	44	ON 5
45	+DC	46	ON 6
47	+DC	48	ON 7
49	NC	50	NC

4) J3 POWER

1	DC24
2	GND
3	FG

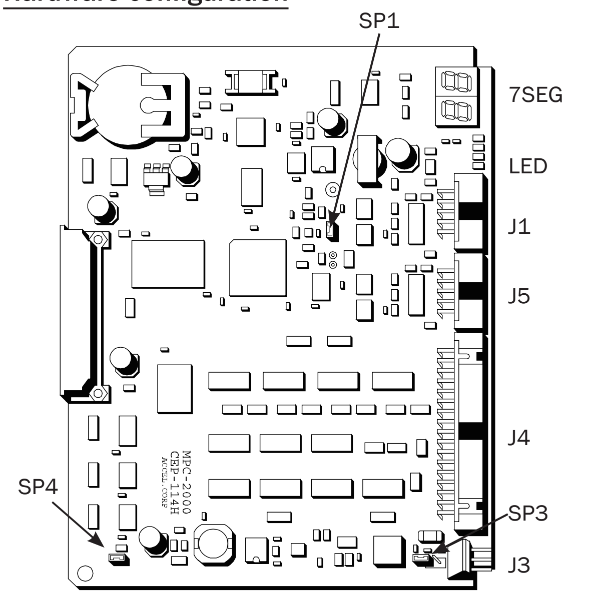
9-3 MPC-2000 (Main CPU Board)

Specification

CPU	R5F70835AN80FTV	SH2 80 MHz Built-in ROM 512K, RAM 32K
Program area	430kbyte	One 8M RAM installed, about 17200 lines (as 25 byte/line)
Point data	16000point	1 byte = 1 point
RS-232C	CH1 ,CH2 for user	4800~38400 bps
Number of tasks	32 tasks	MEWNET occupies one task (when connected via CH1)
RTC	RTC-7301SF	Compatible with calendar and clock functions
I/O	16-point input (compatible with 2-line sensors)	SW(192)~SW(207) * Compatible with a leak current of up to 1 mA.
	16-point output	ON/OFF 0~15 100 mA
7SEG	2 digits 7 seg	Compatible with PR_LCD command
Power supply	DC 24V	Self consumption below 100 mA
Internal power supply	Internal DC 5V	Supply of up to 2000 mA (Compatible with 16 slots)
Battery	CR2032	RTC driving and S-RAM backup (2.4 V or higher, typ 3 μA disclosed by the IC manufacturer)

* Although it can theoretically be held for five years with no power at room temperature based on the nominal capacity 200 mAH of CR2032, five years should be taken as a guideline.

Hardware configuration



* Having SP1 open enables sysld2k.
* Having SP3 shorted connects J3-3 with the rack metal.
* SP4 is for supplying power. It is always shorted.
* J1,J5 RS-232C is isolated from J4 or J3 (control system power supply).
* J4-GND and J3-GND common.

1) LED: Green LED blinks during program execution

2) J3: POWER

1	DC24
2	GND
3	FG

3) J1: RS-232C CH0 , CH1

J1			
1	SG	2	TXD
3	RXD	4	SG
5	MAN	6	P5
7	SG	8	TXD1
9	RXD1	10	FG

4) J5 RS-232C CH2

J5			
1	FG	2	TXD2
3	RXD2	4	RTS
5	NC	6	NC
7	SG	8	NC
9	NC	10	DTR

5) J4: IN 16 points / OUT 16 points

J4			
1	SW(192)	2	SW(193)
3	SW(194)	4	SW(195)
5	SW(196)	6	SW(197)
7	SW(198)	8	SW(199)
9	SW(200)	10	SW(201)
11	SW(202)	12	SW(203)
13	SW(204)	14	SW(205)
15	SW(206)	16	SW(207)
17	ON 0	18	ON 1
19	ON 2	20	ON 3
21	ON 4	22	ON 5
23	ON 6	24	ON 7
25	ON 8	26	ON 9
27	ON 10	28	ON 11
29	ON 12	30	ON 13
31	ON 14	32	ON 15
33	GND	34	GND

9-4 MPC-2100L (Main CPU Board) - obsolete-

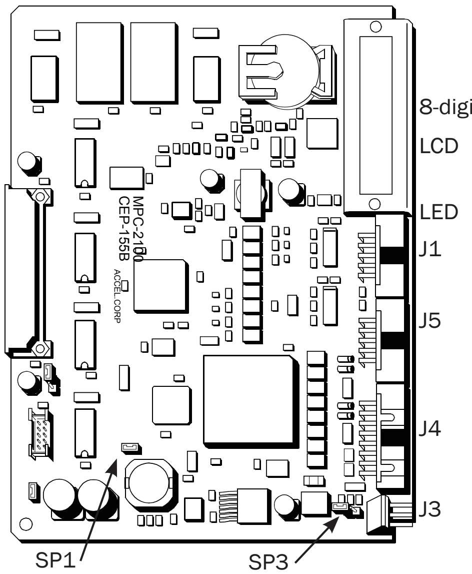
Specification

CPU	R5F70835AN80FTV	SH2 80 MHz Built-in ROM 512K, RAM 32K
Program area	470Kbyte	One 4M RAM installed, about 6200 lines (as 25 byte/line)
Point data	16000point	1 byte = 1 point
RS-232C	CH1 for user	4800~38400 bps
Number of tasks	32 tasks	MEWNET occupies one task (when connected via CH1)
RTC	RTC-7301SF	Compatible with calendar and clock functions
I/O	4 inputs (compatible with 2-line sensors)	SW(960)~SW(963),ON/OFF 768~711
	4-point output	* 770 and 711 can be driven with 500 mA
LCD	8 digits 15 seg	Compatible with PR_LCD command
Power supply	DC 24V	Self consumption below 200 mA
Internal power supply	Internal DC 5V	Supply of up to 2.2A (compatible with 16 slots)
Battery	CR2032	RTC driving and S-RAM backup (2.4 V or higher, typ 1.4 μA disclosed by the IC manufacturer)

* Although it can theoretically be held for ten years with no power at room temperature based on the nominal capacity 220 mAH of CR2032, five years should be taken as a guideline.

In order to maintainmaintain compatibility with MPC-2000, MPC-2100 can use MIO-1616 (DSW = F) as output 0-15 and input 192-207. Use of the other boards is the same as in MPC-2000.

Hardware configuration



* Having SP1 open enables sysld2k.
* Having SP4 shorted connects J3-3 with the rack metal.
* J1 and J5 RS-232C are isolated from J4 or J3 (control system power supply).
* TXD1 and RXD1 independently have the same signals from J1 and J4.

1) LED: Green LED blinks during program execution.

2) J1: RS-232C CH0 ,CH1

J1			
1	SG	2	TXD
3	RXD	4	SG
5	MAN	6	P5
7	SG	8	TXD1
9	RXD1	10	FG

3) J5: RS-232C CH2

J5			
1	FG	2	TXD2
3	RXD2	4	RTS
5	CTS	6	NC
7	SG	8	NC
9	NC	10	DTR

* At the time of powering on, DTR is HIGH.

4) J4: IN 4points/ OUT 4points

J4			
1	SG	2	TXD1
3	RXD1	4	NC
5	SW(960)	6	SW(961)
7	SW(962)	8	SW(963)
9	ON 768	10	ON 769
11	ON 770	12	ON 771
13	DC24	14	DC24
15	GND	16	GND

5) J3: POWER

1	DC24
2	GND
3	FG

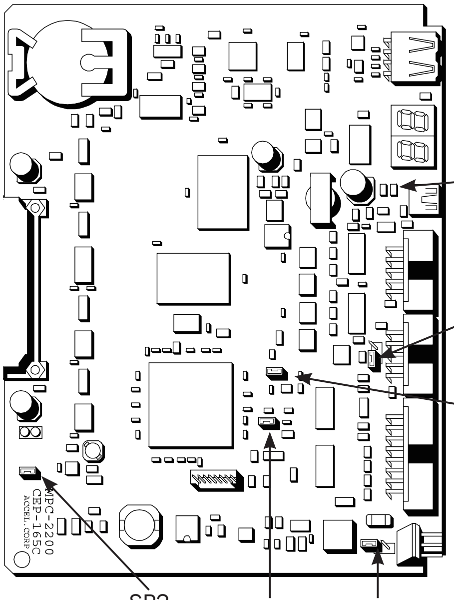
9-5 MPC-2200 (Main CPU Board)

Specification

CPU	R5F72115D160FPV	SH2A 160 MHz Built-in ROM 512K, RAM 32K
Program area	1Mbyte	One 16M RAM installed, about 40000 lines (as 25 byte/line)
Point data	16000point	1 byte = 1 point
RS-232C	CH1 for user	4800~38400 bps
Number of tasks	32 tasks	MEWNET occupies one task (when connected via CH1)
CO-Pro	MC68882EI25A	Compatible with floating-point arithmetic
RTC	RTC-7301SF	Compatible with calendar and clock functions
I/O	4 inputs (compatible with 2-line sensors)	SW(960)~SW(963),ON/OFF 768~711
	4-point output	* 770 and 711 can be driven with 500 mA
7SEG	2 digits 7seg	Compatible with PR_LCD command
Power supply	DC 24V	Self consumption below 200 mA
Internal power supply	Internal DC 5V	Supply of up to 2000mA
Battery	CR2032	RTC driving and S-RAM backup (2.4 V or higher, typ 3 μA disclosed by the IC manufacturer)

In order to maintain compatibility with MPC-2000, MPC-2200 can use MIO-1616 (DSW = F) as output 0-15 and input 192-207. Uses of the other boards are the same as in MPC-2000.

Hardware configuration



* LED1: If lit, USB port (J6) is enabled.
* Having SP1 open enables sysld2k.
* SP2: CPV power supplied, always shorted.
* SP3: If shorted, J3-3 contacts with the RACK metal.
* SP5: Shorted: USB program, Open: J1 program
* SP6 RS485 terminator
* J1 and J5 RS-232C are isolated from J4 or J3 (control system power supply).
* TXD1 and RXD1 have the same signals from J1 and J4 independently.

1) J1: RS-232C CH0 ,CH1

J1			
1	SG	2	TXD *2
3	RXD *2	4	SG
5	MAN	6	P5
7	SG	8	TXD1
9	RXD1	10	FG

*2: When the SP5 is shorted, it is used as Port 18.

2) J5: RS-232C CH2

J5			
1	FG	2	TXD2
3	RXD2	4	RTS
5	RX485	6	RX485
7	SG	8	NC
9	NC	10	DTR

* At the time of powering on, DTR is HIGH.
* RS485 functions as CH2.

3) J4: IN 4points/ OUT 4points

J4			
1	SG	2	TXD1
3	RXD1	4	NC
5	SW(960)	6	SW(961)
7	SW(962)	8	SW(963)
9	ON 768	10	ON 769
11	ON 770	12	ON 771
13	DC24	14	DC24
15	GND	16	GND

4) J3: POWER

1	DC24
2	GND
3	FG

9-6 MPG-2314 (4-Axis PG Board)

Specification

PG-IC	MCX-314As	Manufactured by NOVA Electronics
Maximum PPS	4 Mpps	Differential output using AM26C31. Rem 2)
Number of axes	4 axes of X, Y, U, and Z	
Interpolation function	Linear interpolation of up to 3 axes Circular interpolation of 2 axes	Asynchronous control is also possible. Arbitrary combination of axes is allowed.
Encoder input	1 Mpps, 2 axes standard	TLP-2108 photocoupler input
(Simple counter is also allowed)	Optional cable(DF13-C8), +2 axes can be added (Rem 1)	With a shunt resistor (220 Ω)
Emergency stop input	Limit, alarm	
Origin input	Two inputs of IN0 and IN1 for each axis	IN1 can take a differential input.
External sensor input	IN3	Output port is not available when IN3 is used.
Power supply	DC 24V	Differential driver for input/output port
Internal power supply	DC 5V (supplied from CPU board)	150 mA

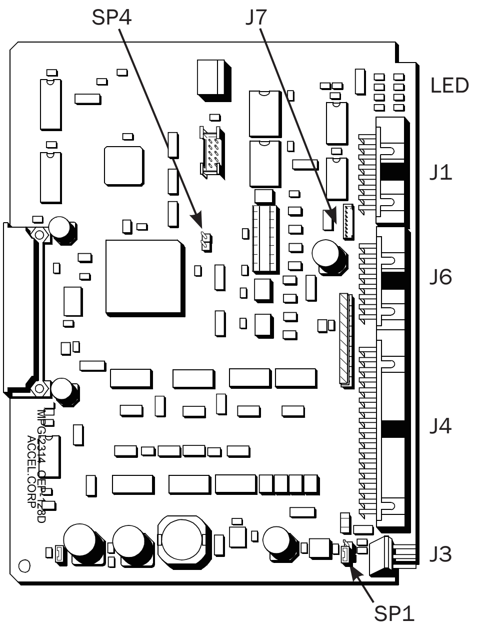
* To use IN1 as a differential input, the corresponding bit of DIP1 should be turned off, and the connection be made with J4-IN1 as the cathode side and J6-IN1A as the anode side.

* DC 5V of J4-9 is for feeding an external interface: 200 mA maximum.

Rem 1) Although the encoder input is expediently named as XYUZ, it can be handled independently from the operation axes XYUZ.

Rem 2) If the pulse output of 5V level is necessary, connection to a driver with J4-9 set as common (DC 5V) and J3-2, 4, 6, and 8 as negative logic output.

Hardware configuration



* SP1: FG cabinet-shorted

* SP4: X_ALM is shorted to EMG of MCX314.

* Shunt resistor when using RA19 J6 9-12 (INIA) (470 Ω already inserted).

1) J1: PULSE and AM26C31 driver

J1			
1	XCW	2	/XCW
3	XCCW	4	/XCCW
5	YCW	6	/YCW
7	YCCW	8	/YCCW
9	UCW	10	/UCW
11	UCCW	12	/UCCW
13	ZCW	14	/ZCW
15	ZCCW	16	/ZCCW

* In the case of a direction indication type driver, "MD_DPLS" is added to INSET command. In that case, CW becomes PULSE and CCW SIGN signals.

2) J6: Codes for various kinds of counters

J6			
1	EN_XA	2	/EN_XA
3	EN_XB	4	/EN_XB
5	EN_YA	6	/EN_YA
7	EN_YB	8	/EN_YB
9	X_IN1A	10	Y_IN1A
11	U_IN1A	12	Z_IN1A
13	X_ALM	14	Y_ALM
15	U_ALM	16	Z_ALM
17	X_INPS	18	Y_INPS
19	U_INPS	20	Z_INPS

3) J3: POWER

1	DC24
2	GND
3	FG

4) J4: LIMIT origin

J4			
1	+X_LMT	2	-X_LMT
3	+Y_LMT	4	-Y_LMT
5	+U_LMT	6	-U_LMT
7	+Z_LMT	8	-Z_LMT
9	5V	10	5V_GND
11	XIN0	12	XIN1
13	YIN0	14	YIN1
15	UIN0	16	UIN1
17	ZIN0	18	ZIN1
19	O0/XIN3	20	O1/YN3
21	O2/UIN3	22	O3/ZIN3
23	GND	24	GND
25	DC24	26	DC24

Rem) Because LMT input is enabled regardless of the setting, a caution must be made in connection.

5) J7

J7	
1	EN_UA
2	/EN_UA
3	EN_UA
4	/EN_UA
5	EN_ZA
6	/EN_ZA
7	EN_ZA
8	/EN_ZA

6) LED: PULSE display

LED	
X_CW	X_CCW
Y_CW	Y_CCW
U_CW	U_CCW
Z_CW	Z_CCW

7) Assigned to PG0~PG9 according to the set value of DSW

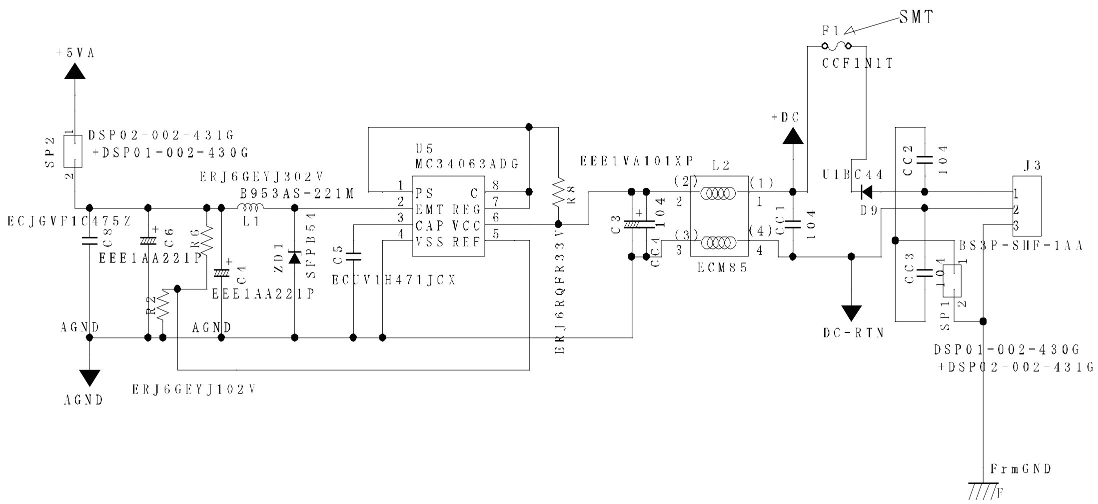
DSW1	
DSW = 0	PG 0
DSW = 1	PG 1
DSW = 2	PG 2
DSW = 3	PG 3
DSW = 4	PG 4
DSW = 5	PG 5
DSW = 6	PG 6
DSW = 7	PG 7
DSW = 8	PG 8
DSW = 9	PG 9

8) DIP1

DIP1-1	X
DIP1-2	Y
DIP1-3	U
DIP1-4	Z

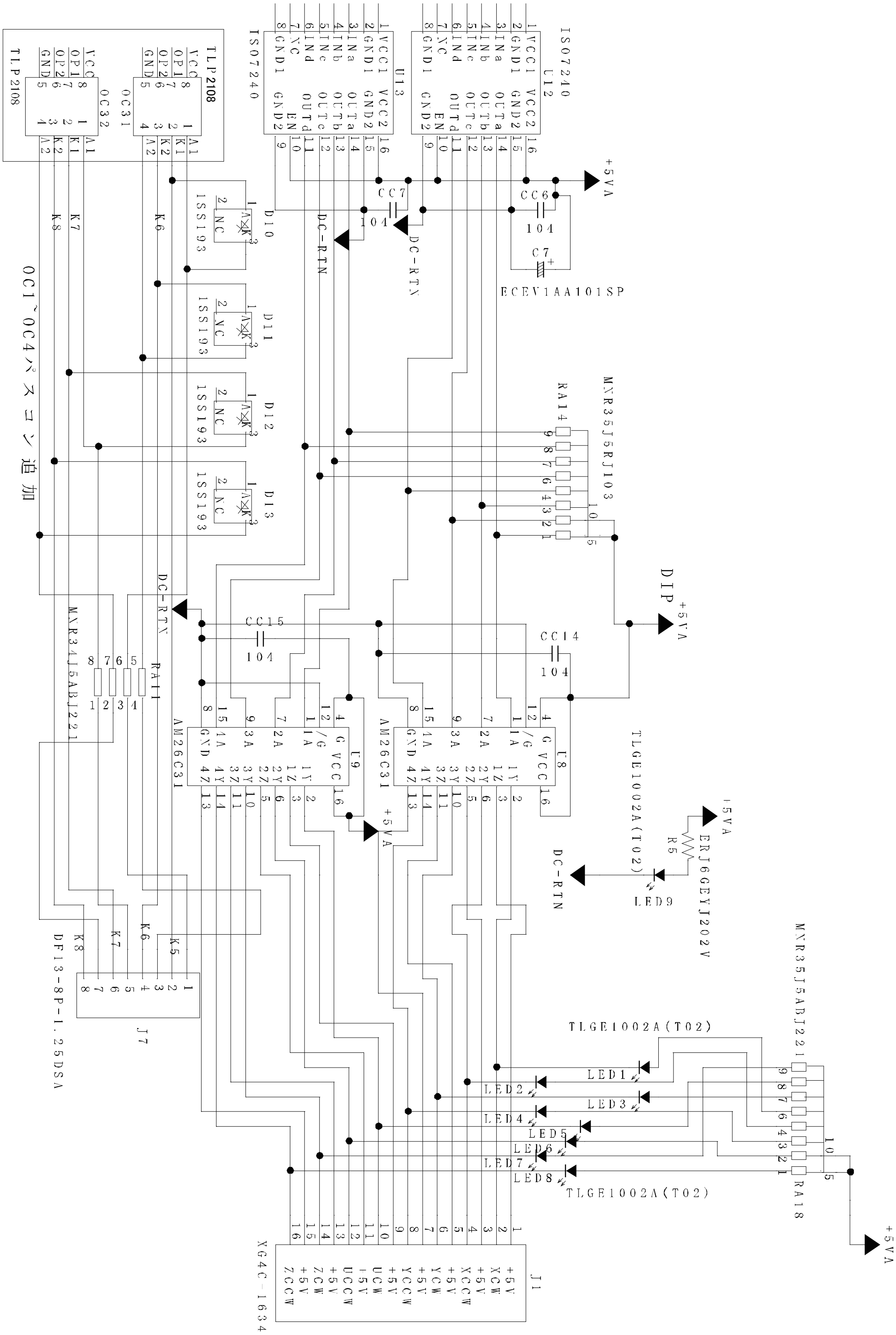
J3 circuit diagram

J3: DC 24V is connected. Power supply for pulse output is generated internally via L2. Because SG of pulse output is via DC 24V GND and EMIFIL, they are different to be strict. SG of pulse output is connected to J4-10.



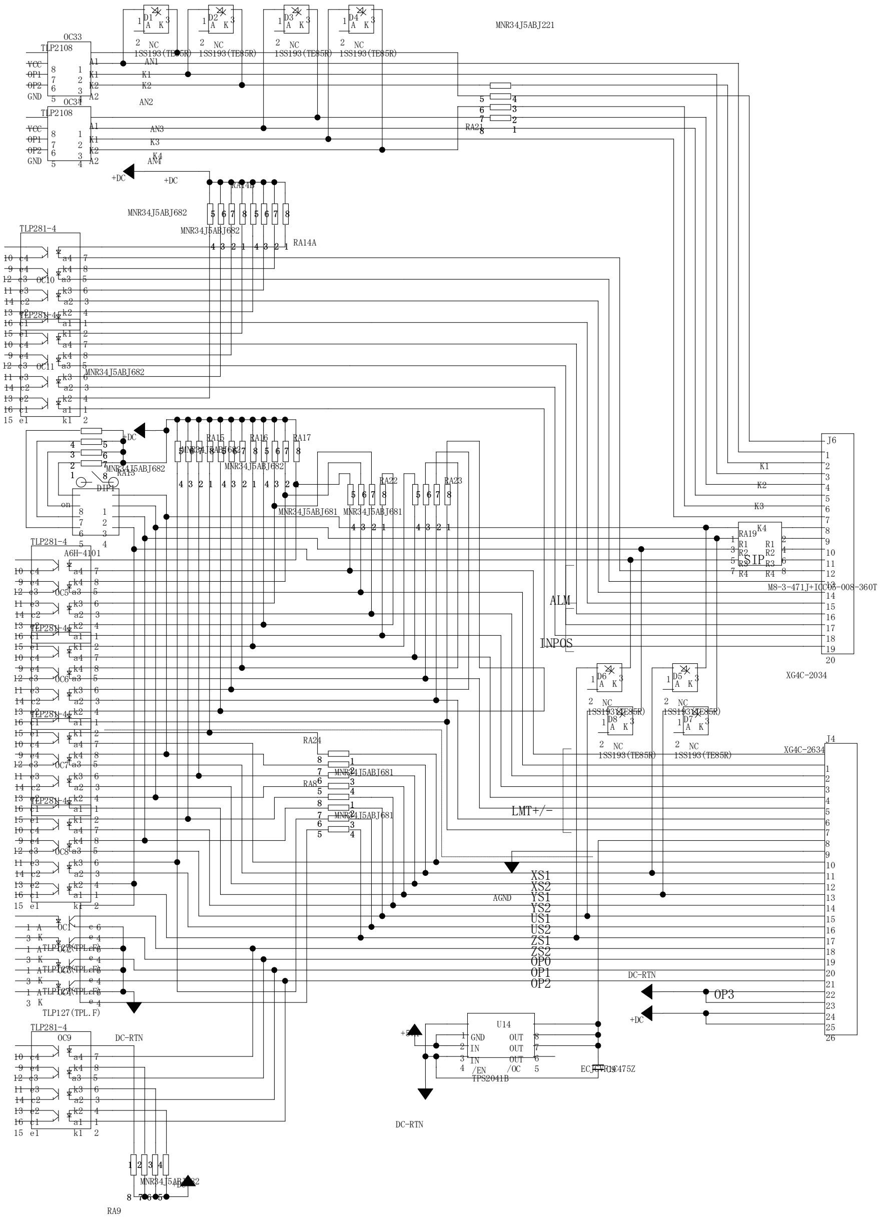
J1 circuit diagram

J1: Pulse output IC is AM26C31. Monitor LED is connected to the invertible side.
J7: Optional counter input.



J4 and J6 circuit diagram

J6: 1-8 Encoder/counter input (also usable for pulse counter) X(-1), Y(-1)
J6: 9-12 Anode side for applying differential signals to XI1~ZIN1. (via SIP resister RA19)
J6: 13-16 ALM input. Connected to the driver alarm output. Set up using INSET command.
J6: 17-20 INPOS input. Connected to the driver in-position output. Set up using INSET command.
J4: 1-8 Connected to the overrun limit of the device. It is an input having a pull-up. A two-line sensor can be connected.
J4: 9-10 DC 5V of about 100 mA for pulse signals, which can supply power to the exterior. (with a surge current protection circuit)
J4: 11-18 For the origin-return input. The near origin is connected to the odd-numbers of J4-11~17, and the Z phase (C phase) to the even numbers of J4-12~18. Refer to HOME command. Because they are connected to XIN0, XIN1 ~ ZIN0, ZIN1, they can be set up and used with STOP command.
J4: 19-22 Can be used as output ports OP0~OP3. In addition, they can also be used as XIN3~ZIN3. IN3 can be used for stopping pulse generation. In this case, it cannot be used as an output port.



9-7 MPG-2541 (4-Axis PG Board) -obsolete-

Outline

MPC-2541 is a simple pulse generation board compatible with S-curve acceleration and deceleration. Although it has no current position counter[Rem 1)] or interpolation function[Rem 2)], pulse generation of up to four axes and 400 kpps. The output interface is an open collector of 5V level. The control input accepts only limit, slow down, and origin.[Rem3)]

Rem 1) Because there is no current position counter, the current position becomes unstable after executing a move command such as RMVCn which the destination is not determined. In addition, current position during cannot read out while moving. After finishing or stopping with STOP, correct position can be read out.

Rem 2) Because there is no interpolating function, linear interpolation commands such as MOVL and RMVL and continuation commands such as MOVT and RMVT are invalid.

Rem 3) Although the logic of origin and slow down can be set using SHOM command, limit input is a fixed logic. As factory shipped, LMT is set to ground-fault detection. If LMT is set to disconnection-fault detection, SP3 2-3 should be shorted, a resister array of 10~6 K be attached to RA13, and an NC-type limit switch be connected between DC24 and LMT input.

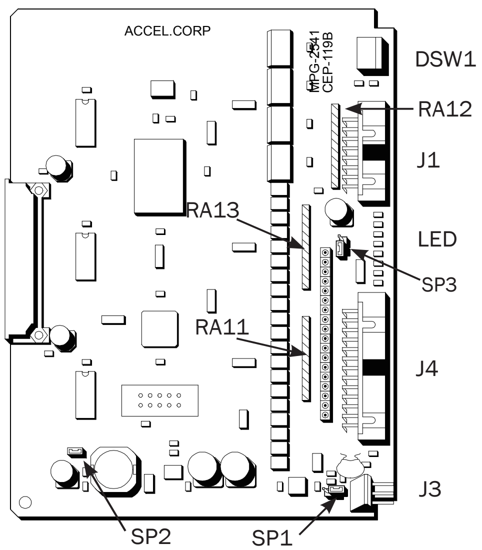
Because MPG-2541 has many restrictions in comparison with MPG-2314, and precaution must be taken. Useable commands are as follows. Even if the command is the same, the specification may be different from that for MPG-2314. Therefore, it should be checked using Command Reference.

Command : **HOME,SHOM,MOVS,RMVS,STOP,JUMP,RMVC,FEED,SPEED,HPT(),LMT(),HOUT,H_ON,H_OFF,INCHK**

Specification

PG-IC	PCD4541	Japan Pulse Motor
Maximum PPS	400 Kpps	DC 5V level (100 Ω shunt resistor)
Number of axes	4 axes of X, Y, U, Z	TLP2630 open collector
Interpolation function	None	Dedicated for asynchronous control
Emergency stop input	+/- limit input (negative logic only)	
Origin input	Each axis SD (slow down)	ORG origin detection logic setting allowed
Power supply	DC24V	For pulse port and input port

Hardware configuration



* SP1: FG cabinet-shorted
* SP2: Always shorted (Interface 5V)
* SP3: 1-2 shorted: LMT pull-up
* 2-3 shorted: LMT pull-down
* RA12: Pulse output, shunt resistor
* RA13: J4-1~8 Pull-up/pull-down for LMT
* RA11: J4-11~18 for pull-up

1) Assigned to PG10~PG17 according to the set values of DSW.

DSW1	
DSW = 0	PG 10
DSW = 1	PG 11
DSW = 2	PG 12
DSW = 3	PG 13
DSW = 4	PG 14
DSW = 5	PG 15
DSW = 6	PG 16
DSW = 7	PG 17

2) J1 PULSE

J1			
1	(DC5V)	2	/XCW
3	(DC5V)	4	/XCCW
5	(DC5V)	6	/YCW
7	(DC5V)	8	/YCCW
9	(DC5V)	10	/UCW
11	(DC5V)	12	/UCCW
13	(DC5V)	14	/ZCW
15	(DC5V)	16	/ZCCW

* (DC 5V) is via RA12 (100 Ω)

* Even-number: TLP2630 open collector

3)LED display

LED1	X_CW	LED2	X_CCW
LED3	Y_CW	LED4	Y_CCW
LED5	U_CW	LED6	U_CCW
LED7	Z_CW	LED8	Z_CCW

4) J3 POWER

1	DC24
2	GND
3	FG

5) J4 LIMIT origin

J4			
1	+X_LMT	2	-X_LMT
3	+Y_LMT	4	-Y_LMT
5	+U_LMT	6	-U_LMT
7	+Z_LMT	8	-Z_LMT
9	5V	10	5V_GND
11	XSD	12	X_ORG
13	YSD	14	Y_ORG
15	USD	16	U_ORG
17	ZSD	18	Z_ORG
19	O0	20	O1
21	O2	22	O3
23	GND	24	GND
25	DC24	26	DC24

* O0~O3 output ports cannot be changed during pulse generation.

* If a two-line sensor is connected to J4, pull-up according to necessity.

* DC 5V of J4-9 is for supplying power to an external interface, 200 mA at maximum.

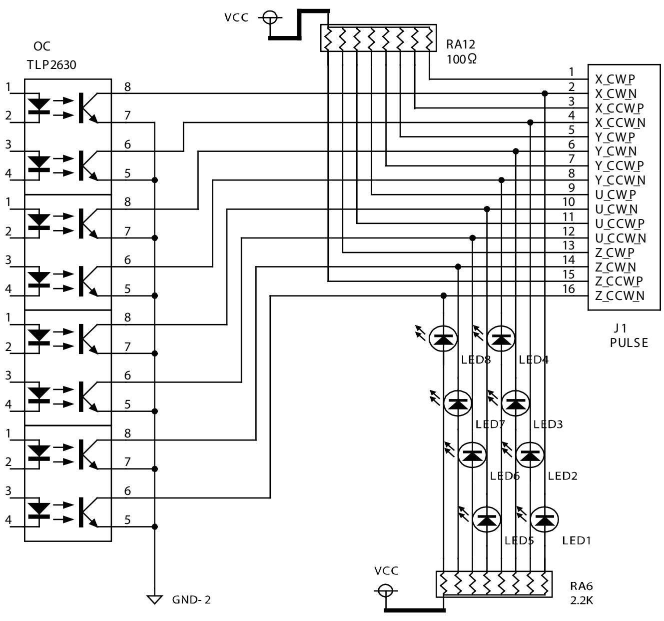
PULSE output

Pulse output is an open collector output of photocoupler TLP2630 as shown in the following circuit diagram. If the pulse input of a driver is a photocoupler, J1 odd numbers should be set to the anode side, and J1 even numbers to the cathode side.

Although the shunt resistor RA12 has 100 Ω built in, it is an SIP socket and can be replaced. The resistance value may be appropriately adjusted with the driver interface.

The open collector output is pulled-up to an internal 5V via LED and can also handle logic level output. In that case, the pulse signal line should be connected to J1 odd numbers and SG to J4-10.

J1 circuit diagram

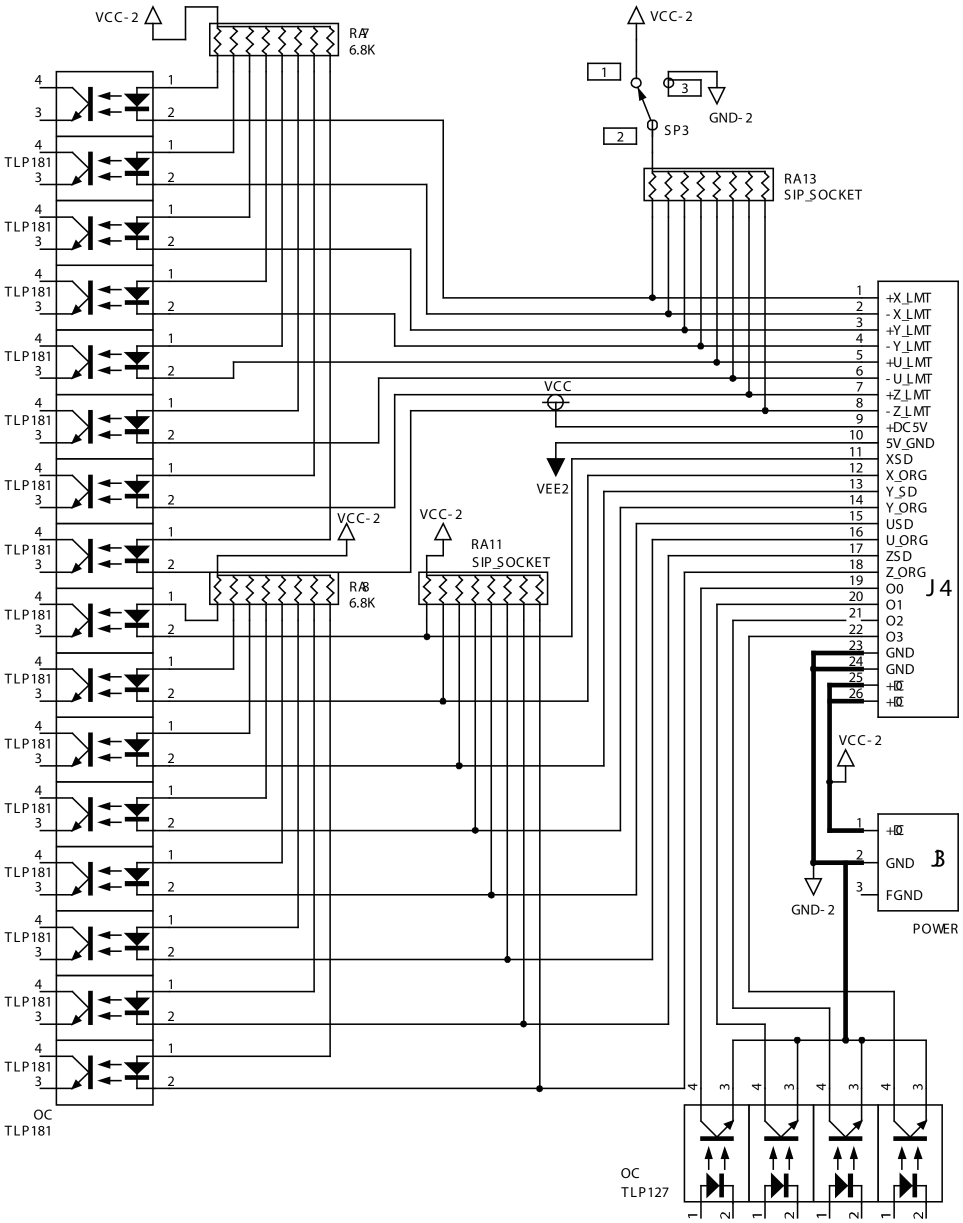


I/O interface

Each input is shunted with 6.8 K and becomes active by shorting the input terminal to GND. SD and ORG inputs of each axis are logic invertible with SHOM & HFF. When the corresponding bit in the following table becomes 1, logic inversion occurs.

Relationship between BIT and input							
7	6	5	4	3	2	1	0
Z_ORG	ZSD	U_ORG	USD	Y_ORG	YSD	X_ORG	XSD

J4 circuit diagram

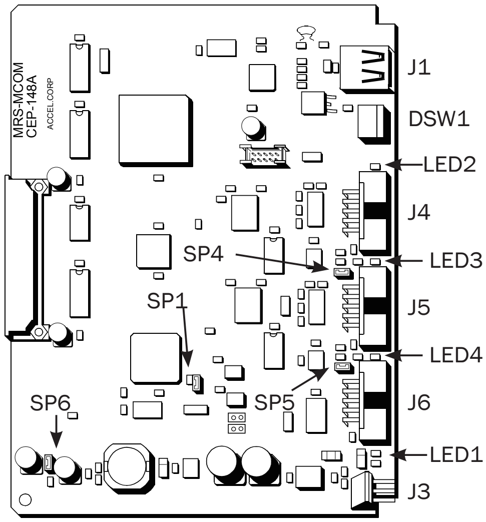


9-8 MRS-MCOM (Multi-Communication Board)

Specification

USB	USB memory supported (USB 1.1)
RS-232C dedicated	1 CH (up to 38400 bps)
RS-232/422/485 shared	2 CHs (up to 38400 bps)
Power supply	DC 12V~24V (for RS-232C)
Internal power supply	DC 5V (supplied from CPU board) 150 mA

Hardware configuration



* SP6 is a short.
* OMRON XG4M-1030-T and the like should be used for the 10P connector. XG4Z-0002 locking lever can be attached.

Locking Lever

* SP4 and SP5 RS-422/485 terminators
* SG of J4, J5, and J6 are common.
* Connection between SG and GND is made via an EMI filter (direct current at the same potential).
* With SP1 open, version upgrade (H8W.EXE) is enabled.
* J3-3, J4, J5, and J6-FG terminals are connected with RACK metal.

1) J1 USBport (dedicated for USB memory)

2) DSW1

DSW	PORT#
6	CH3~
7	CH6~
5	CH9~
3,4	For maintenance

* 3 and 4 are dedicated for the recovery function by USB memory.

3) LED2 RTS status

4) J4 RS-232C

J4			
1	FG	2	TXD0
3	RXD0	4	RTS
5	CTS	6	NC
7	SG	8	NC
9	NC	10	DTR

* RTS/CTS control can be sent with RTS_ON and CTS_ON at the time of transmission.

5) LED3 RS422 status display

6) J5 RS-232C/422/485

J5			
1	FG	2	TXD1
3	RXD1	4	NC
5	SDB	6	SDA
7	SG	8	RDB
9	RDA	10	(DC5)

7) LED4 RS422 status display
* Always lit when it is RS422, extinguished when waiting for RS485 communication input

8) J6 RS-232C/422/485

J6			
1	FG	2	TXD2
3	RXD2	4	NC
5	SDB	6	SDA
7	SG	8	RDB
9	RDA	10	(DC5)

9) LED1 Power supply display

10) J3 POWER

1	DC24
2	GND
3	FG

* Power supply of MRS-MCOM is for serial communication. In a complex apparatus having high noise, use of a power supply isolated from the control system is recommended.

Functions of individual ports

	Use	MPC-2000 related commands
USB	USB memory dedicated board. USB hub is not supported. In addition, no other USB device than USB memory can be connected. An extension cable can be used. File management is compatible with MS-DOS, where only alphanumeric characters are used. Text files created in the Windows FAT(32) format can be read/written from MPC. There may be low-quality items among commercially-sold USB memories, and degradation may occur due to long-time use. Therefore, a sufficient reliability testing is required for using one in a device. ▪ The number of files in a single USB memory should be 10~20. ▪ If used for data logging, it should be used after formatting by a PC.	LOF() USB_PLOAD, USB_PSAVE USB_WRITE USB_READ and others
J4	RS-232C dedicated board. If RTS option is added when CNFG# is executed, RTS/CTS control is enabled.	CNFG# 3 “—--“,PRINT# INPUT# CNFG# 3 RTS “---“
J5 J6	RS-232/RS-422/RS-485 shared board. ▪ When used as RS-232, 5, 6, 8, 9, and 10 should be set to NC. ▪ When used as RS-422, 2 and 3 should be set to NC, and SDA, SDB, RDA, and RDB be used. (See next page.) ▪ When used as RS-485, 2, 3, 8, and 9 should be set to NC, and 6-SDA and 5-SDB be used. (RS-485 support is provided with version “281110” or later.) ▪ The A/B identification of RS-485 has two systems, and the specification by IC manufacturers (and instruments manufacturers) and IEEE RS-485 standard have opposite specifications. The display of MRS-MCOM is the former. Therefore, although A to A and B to B connections are made in many cases, A to B and B to A connections are made in temperature adjustors manufactured by OMRON. If communication cannot be made as a result, revering A and B should be tried.	When used as RS485, RS485 option should be added. RS-485 line FAIL SAFE processing made (A side 2k 5V pull.U and B side 2k SG pull.D) Rem) MRS-MCOM is set as TXD+ and RXD+ to A, TXD- and RXD- to B.

MRS-MCOM RS-422 connection example

MRS-MCOM J5 and J6 are shared by RS422 and RS485. J4 is dedicated to RS-232C. If J5 and J6 are used, RS-422 connection with a touch panel GP-3000

■ When no isolator is used

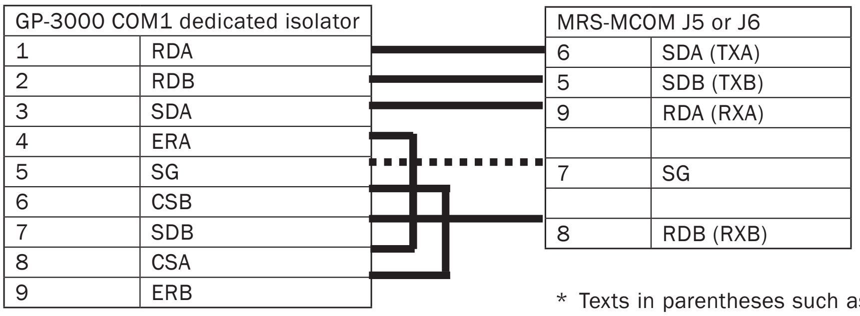
If connected directly to COM1 of the panel, SG of MRS-MCOM and FG of the touch panel will be directly connected. This is because SG and FG of GP3000 are internally shorted.
It should be noted that thereby a ground loop may occur depending on the wiring condition.

For example, when the touch panel and MRS-MCOM are connected to the same DC power supply and the GND of the power supply is not connected to the device FG, if the + side of the DC is accidentally/mistakenly brought into contact with the device FG, a large amount of current will flow into the SG of MRS-MCOM via the touch panel FG. In order to prevent this, either the power supply of MRS-MCOM should be isolated from the control system, or a GP genuine isolator be attached to GP.

■ When an isolator is used (CSA-IS0232-01)

The COM1 isolator of GP is used for both RS232 and 422. If the isolator switch is set to RS-422 with the touch panel set to RS-232, it becomes an isolated RS-422. The pin assignment is the same as in the case of COM1 direct connection.

Below is the wiring diagram. Although SG connection between 5 and 7 is not necessary if the power supplies to MRS-MCOM and the touch panel are common, if the power suppare separated, or if an isolator is used, connection is required. (If the connection dis- tance is as short as about 50 cm and the noise level is low, SG connection is not necessary for operation.)



GP-3000 COM1 dedicated isolator	
1	RDA
2	RDB
3	SDA
4	ERA
5	SG
6	CSB
7	SDB
8	CSA
9	ERB

MRS-MCOM J5 or J6	
6	SDA (TXA)
5	SDB (TXB)
9	RDA (RXA)
7	SG
8	RDB (RXB)

* Texts in parentheses such as (TXA) are expressions in the old material.

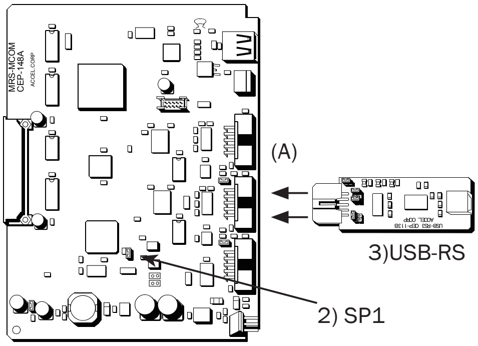
How to update MRS-MCOM

1) Execute prx LOF(-1) on MPC to check the version of MRS-MCOM.

#prx LOF(-1)
20090324 ← Check if it is the latest.
#...

2) Remove MRS-MCOM from the rack, set SP1 to open, and return it to the rack.

3) Connect USB-RS to MRS-MCOM J5. (A)



If there is no USB-RS, connect to a PC with a dedicated cable. (B)
Be aware that FTM cable and GND have different numbers.

(B)

J5			PC	
2	TXD	←→	2	RXD
3	RXD	←→	3	TXD
7	SG	←→	5	SG
		↳	4	DTR
		↳	6	DSR

4) Turn the power on and start H8W. Power supplies are needed for both MPC and MRS.

Set the program conditions and specify a file to be written.

Specify the COM port number according to conditions.

Press the Start Write button to start the program.

Rem) H8W is a freeware of “Yamasan”.

5) When complete, turn the power off, extract MRS-MCOM, restore SP1 to shorted, and insert it to the rack.

6) Execute prx LOF(-1) with MPC and confirm again that the version of MRS-MCOM is updated.

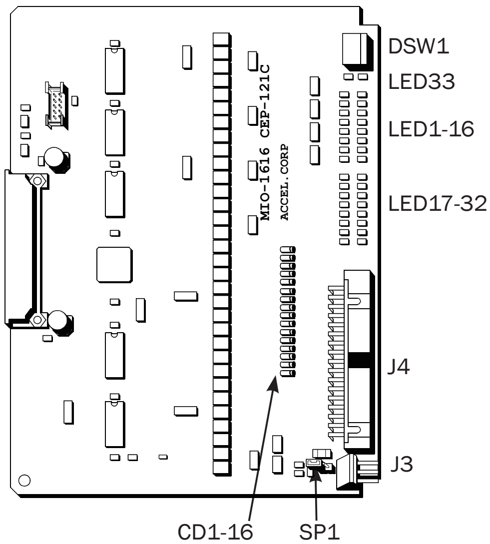
#prx LOF(-1)
20090514 ←Check if it has been updated.
#...

9-9 MIO-1616 (I/O Board)

Specification

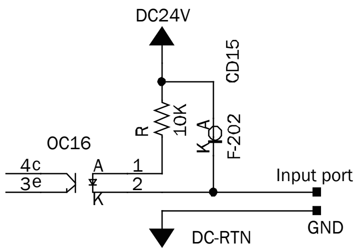
Operating voltage	DC24V	For I/O control, isolated from the CPU internal power supply.
Number of input points	16 points	Constant current diode pull-up (Sink current of about 4 mA)
Number of output points	16 points	Control current 100 mA * Two points of 31 and 32 only: 600 mA (FET open drain) * Total sink current to GND should not exceed J3-3 (2A), J4-33, or 34 (2A).

Hardware configuration



* SP1 is cabinet-shorted with FG.
* I/O connector is XG4C-3434 (34 pin standard MIL connector)

1) CD1-16 constant-current diode
Each input port is pulled-up with a constant current diode of 2 mA and also supports a two-line sensor.



2) LED33: Green, normal when lit.

3) LED1-16: Red, output indicator.

4) LED17-32: Green, input indicator.

5) Relationship between DSW1 and I/O numbers

DSW	IN	OUT
#0	208-223	16-31
#1	224-239	32-47
#2	240-255	48-63
#3	256-271	64-79
#4	272-287	80-95
#5	288-303	96-111
#6	304-319	112-127
#7	320-335	128-143
#8	336-351	144-159
#9	352-367	160-175
#A	368-383	176-191
#F	192-207	0-15

* IN/OUT bank numbers are values divided by 8.
* #F is enabled only when MPC-2100 is used.

6) J4 I/O

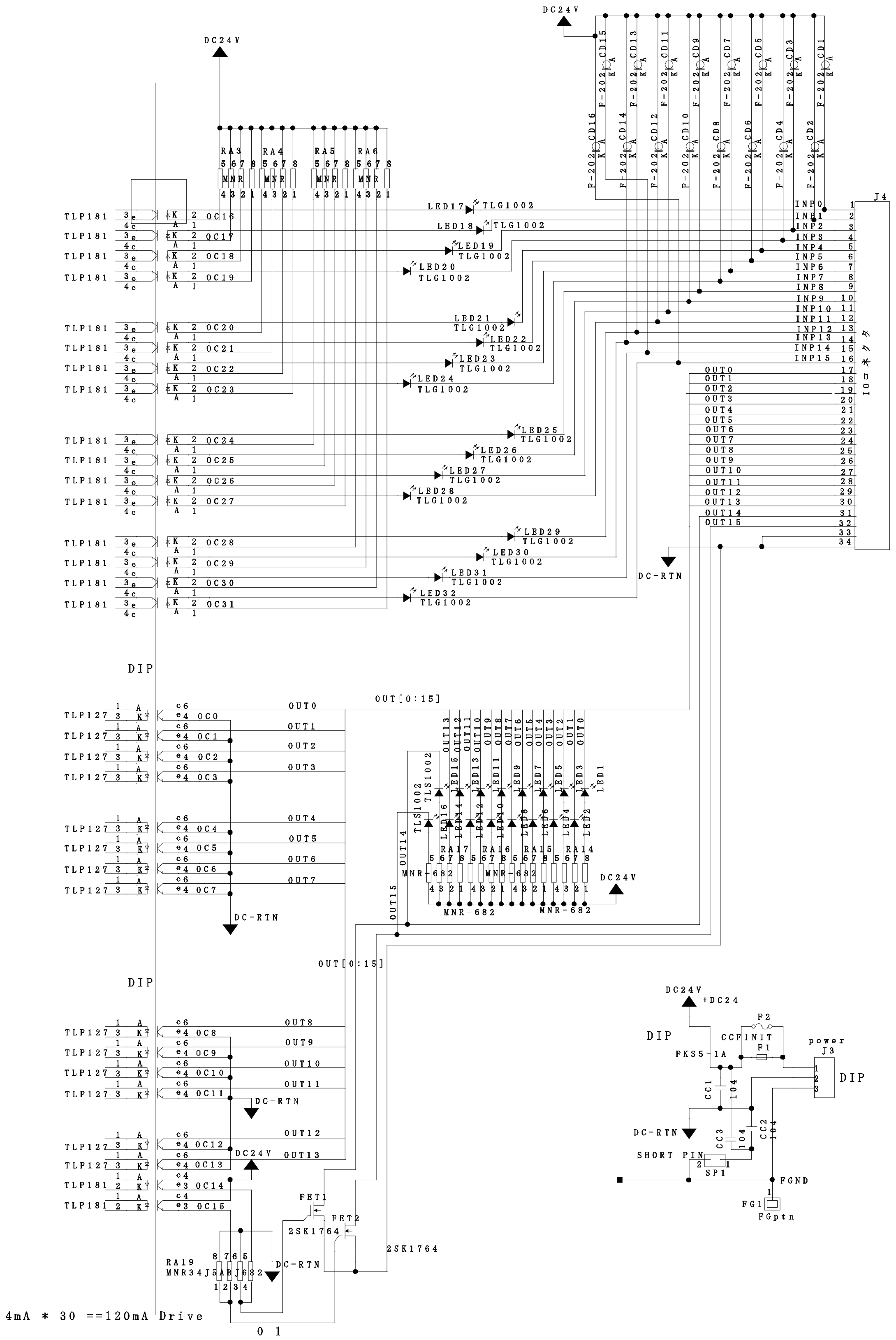
J4			
1	OFS_I+00	2	OFS_I+01
3	OFS_I+02	4	OFS_I+02
5	OFS_I+04	6	OFS_I+05
7	OFS_I+06	8	OFS_I+07
9	OFS_I+08	10	OFS_I+09
11	OFS_I+10	12	OFS_I+11
13	OFS_I+12	14	OFS_I+13
15	OFS_I+14	16	OFS_I+15
17	OFS_O+00	18	OFS_O+01
19	OFS_O+02	20	OFS_O+03
21	OFS_O+04	22	OFS_O+05
23	OFS_O+06	24	OFS_O+07
25	OFS_O+08	26	OFS_O+09
27	OFS_O+10	28	OFS_O+11
29	OFS_O+12	30	OFS_O+13
31	OFS_O+14	32	OFS_O+15
33	GND	34	GND

OFS_I=DSW×16+208, OFS_O=DSW×16+16
DSW=0~B
* In MPC-2100, F is enabled, and output 0-15 and input 192-207.

7) J3 POWER

1	DC24
2	GND
3	FG

MIO-1616 I/O circuit diagram

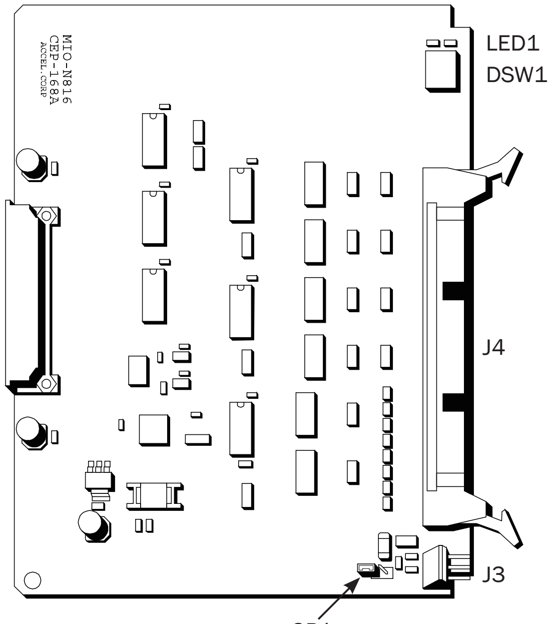


9-10 MIO-N816 (I/O Board)

Specification

Operating voltage	DC24V	For I/O control, isolated from the CPU internal power supply.
Number of input points	16 points	Compatible with a leak current of up to 1 mA.
Number of output points	8 points	Control current 100 mA、RN1423 open collector

Hardware configuration



* SP1 is cabinet-shorted with FG.
* I/O connector is HIF3BA-50PA-2.54DS(71)
(50 pin connector)

1) LED1 Green, lit when normal.

2) Relationship between DSW1 and I/O numbers

DSW	IN	OUT
#0	208-223	16-23
#1	224-239	24-31
#2	240-255	32-39
#3	256-271	40-47
#4	272-287	48-55
#5	288-303	56-63
#6	304-319	64-71
#7	320-335	72-79
#8	336-351	80-87
#9	352-367	88-95

*IN/OUT bank numbers are values divided by 8.

3) J4 I/O

J4			
1	SW208	2	GND
3	SW209	4	GND
5	SW210	6	GND
7	SW211	8	GND
9	SW212	10	GND
11	SW213	12	GND
13	SW214	14	GND
15	SW215	16	GND
17	SW216	18	GND
19	SW217	20	GND
21	SW218	22	GND
23	SW219	24	GND
25	SW220	26	GND
27	SW221	28	GND
29	SW222	30	GND
31	SW223	32	GND
33	+DC	34	ON 16
35	+DC	36	ON 17
37	+DC	38	ON 18
39	+DC	40	ON 19
41	+DC	42	ON 20
43	+DC	44	ON 21
45	+DC	46	ON 22
47	+DC	48	ON 23
49	NC	50	NC

4) J3 POWER

1	DC24
2	GND
3	FG

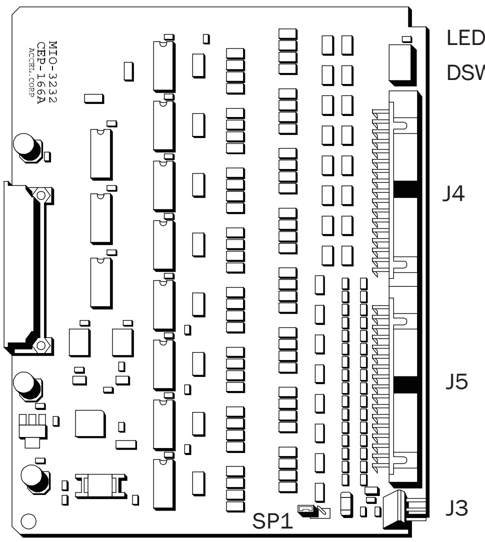
9-11 MIO-3232 (I/O Board)

Specification

Internal power supply	DC 5V (supplied from CPU board)	130 mA (at the time of all ON output)
Operating voltage	DC 24V	For I/O control, isolated from the CPU internal power supply.
Number of output points	32 points	RN1423 open collector (Sink at the time of ON)
Number of input points	32 points	1 mA constant-current diode pull-up

Rem 1) • RN1423 withstand voltage 50V max, maximum current 600 mA.
• Output sink total current should not exceed 2A (J3-2), 1A (J4-33, 34), or 1A (J5-33, 34).

Hardware configuration



* SP1 is cabinet-shorted with FG.
* I/O connector is XG4C-3434 (Standard MIL connector).

1) LED1 Green, lit when normal.

2) DSW1

DSW	J4 (OFS4)	J5 (OFS5)
#0	208~239	16~47
#1	240~271	48~79
#2	272~303	80~111
#3	304~335	112~143
#4	336~367	144~175
#5	640~671	448~479
#6	224~255	32~63
#7	256~287	64~95
#8	576~607	384~415
#9	608~639	416~447

* #5,6,7 Note the I/Onumber.

3) J4

1	OFS4+00	2	OFS4+01
3	OFS4+02	4	OFS4+02
5	OFS4+04	6	OFS4+05
7	OFS4+06	8	OFS4+07
9	OFS4+08	10	OFS4+09
11	OFS4+10	12	OFS4+11
13	OFS4+12	14	OFS4+13
15	OFS4+14	16	OFS4+15
17	OFS4+16	18	OFS4+17
19	OFS4+18	20	OFS4+19
21	OFS4+20	22	OFS4+21
23	OFS4+22	24	OFS4+23
25	OFS4+24	26	OFS4+25
27	OFS4+26	28	OFS4+27
29	OFS4+28	30	OFS4+29
31	OFS4+30	30	OFS4+31
33	GND	34	GND

4) J5

1	OFS5+00	2	OFS5+01
3	OFS5+02	4	OFS5+02
5	OFS5+04	6	OFS5+05
7	OFS5+06	8	OFS5+07
9	OFS5+08	10	OFS5+09
11	OFS5+10	12	OFS5+11
13	OFS5+12	14	OFS5+13
15	OFS5+14	16	OFS5+15
17	OFS5+16	18	OFS5+17
19	OFS5+18	20	OFS5+19
21	OFS5+20	22	OFS5+21
23	OFS5+22	24	OFS5+23
25	OFS5+24	26	OFS5+25
27	OFS5+26	28	OFS5+27
29	OFS5+28	30	OFS5+29
31	OFS5+30	32	OFS5+31
33	GND	34	GND

5) J3

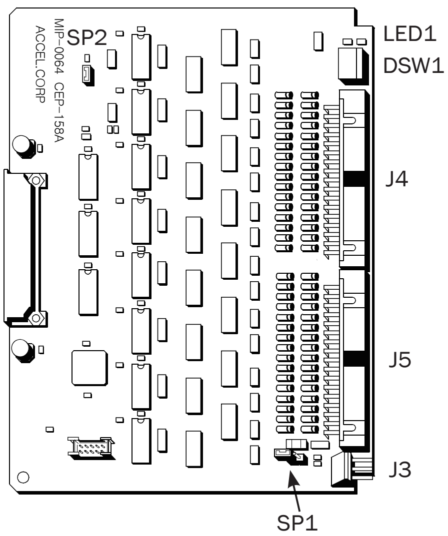
1	DC24
2	GND
3	FG

9-12 MIP-0064 (64-Point Input Board)

Specification

Internal power supply	DC 5V (supplied from CPU board)	130 mA (at the time of all ON input)
Operating voltage	DC 24V	For I/O control, isolated from the CPU internal power supply.
Number of input points	64 points	2 mA constant-current diode pull-up
Input specification	ON when shorted to GND	ON current of about 5 mA
Two-line sensor	All points compatible	Leak current should be below 1.5 mA.

Hardware configuration



* SP1 is cabinet-shorted with FG.
* SP2 is always shorted.
* I/O connector is XG4C-3434 (Standard MIL connector).

1) LED1 Green, lit when normal.

2) DSW1

DSW	J4~(OFS4)	J5(OFS5)
#0	208~239	240~271
#1	272~303	304~335
#2	*336~367	*368~383
#3	-	-
#4	576~607	608~639
#5	640~671	672~703
#6	704~735	736~767

* IN/OUT bank numbers are values divided by 8.
* mark indicates 16 ports missing.

3) J3 POWER

1	DC24
2	GND
3	FG

4) J4

J4			
1	OFS4+00	2	OFS4+01
3	OFS4+02	4	OFS4+02
5	OFS4+04	6	OFS4+05
7	OFS4+06	8	OFS4+07
9	OFS4+08	10	OFS4+09
11	OFS4+10	12	OFS4+11
13	OFS4+12	14	OFS4+13
15	OFS4+14	16	OFS4+15
17	OFS4+16	18	OFS4+17
19	OFS4+18	20	OFS4+19
21	OFS4+20	22	OFS4+21
23	OFS4+22	24	OFS4+23
25	OFS4+24	26	OFS4+25
27	OFS4+26	28	OFS4+27
29	OFS4+28	30	OFS4+29
31	OFS4+30	30	OFS4+31
33	GND	34	GND

5) J5

J5			
1	OFS5+00	2	OFS5+01
3	OFS5+02	4	OFS5+02
5	OFS5+04	6	OFS5+05
7	OFS5+06	8	OFS5+07
9	OFS5+08	10	OFS5+09
11	OFS5+10	12	OFS5+11
13	OFS5+12	14	OFS5+13
15	OFS5+14	16	OFS5+15
17	OFS5+16	18	OFS5+17
19	OFS5+18	20	OFS5+19
21	OFS5+20	22	OFS5+21
23	OFS5+22	24	OFS5+23
25	OFS5+24	26	OFS5+25
27	OFS5+26	28	OFS5+27
29	OFS5+28	30	OFS5+29
31	OFS5+30	30	OFS5+31
31	GND	32	GND

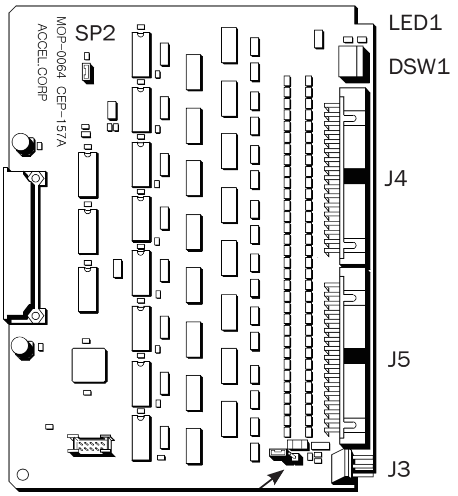
9-13 MOP-0064 (64-Point Output Board)

Specification

Internal power supply	DC 5V (supplied from CPU board)	130 mA (at the time of all ON output)
Operating voltage	DC 24V	For I/O control, isolated from the CPU internal power supply.
Number of output points	64 points	RN1423 open collector (Sink at the time of ON)

Rem 1) • RN1423 withstand voltage 50V max, maximum current 600 mA.
• Output sink total current should not exceed 2A (J3-2), 1A (J4-33, 34), or 1A (J5-33, 34).

Hardware configuration



* SP1 is cabinet-shorted with FG.
* SP2 is always shorted.
* I/O connector is XG4C-3434 (Standard MIL connector).

1) LED1 Green, lit when normal.

2) DSW1

DSW	J4	J5
#0	16~47	48~79
#1	80~111	112~143
#2	144~175	*176~191
#3	-	-
#4	384~415	416~447
#5	448~479	480~511
#6	512~543	544~575

* IN/OUT bank numbers are values divided by 8.
* mark indicates 16 ports missing.

3) J3 POWER

1	DC24
2	GND
3	FG

4) J4

J4			
1	OFS4+00	2	OFS4+01
3	OFS4+02	4	OFS4+02
5	OFS4+04	6	OFS4+05
7	OFS4+06	8	OFS4+07
9	OFS4+08	10	OFS4+09
11	OFS4+10	12	OFS4+11
13	OFS4+12	14	OFS4+13
15	OFS4+14	16	OFS4+15
17	OFS4+16	18	OFS4+17
19	OFS4+18	20	OFS4+19
21	OFS4+20	22	OFS4+21
23	OFS4+22	24	OFS4+23
25	OFS4+24	26	OFS4+25
27	OFS4+26	28	OFS4+27
29	OFS4+28	30	OFS4+29
31	OFS4+30	30	OFS4+31
33	GND	34	GND

5) J5

J5			
1	OFS5+00	2	OFS5+01
3	OFS5+02	4	OFS5+02
5	OFS5+04	6	OFS5+05
7	OFS5+06	8	OFS5+07
9	OFS5+08	10	OFS5+09
11	OFS5+10	12	OFS5+11
13	OFS5+12	14	OFS5+13
15	OFS5+14	16	OFS5+15
17	OFS5+16	18	OFS5+17
19	OFS5+18	20	OFS5+19
21	OFS5+20	22	OFS5+21
23	OFS5+22	24	OFS5+23
25	OFS5+24	26	OFS5+25
27	OFS5+26	28	OFS5+27
29	OFS5+28	30	OFS5+29
31	OFS5+30	30	OFS5+31
31	GND	32	GND

9-14 MPC-AD12 (AD/DA Board)

Outline

MPC-AD12 is a 12-bit AD/DA board. The power supply of the AD/DA analog unit is generated by an on-board insulated inverter, and communication with CPU is performed using an isolated coupler. Thereby, it can be used as an isolated A/D or D/A which is isolated from the control system in the factory-shipped condition.
The input/output ranges are 0~4.095V with AD 8 channels and DA 4 channels.
The AD input range can be changed to +/-10V (AD7890-10) or 0~2.5V (AD7890-2) by replacing the mounted ADIC (AD7890). The DA output can be changed to 0~8.19V by supplying an external power supply of 10~12V and selecting magnification with DIP switches.
Each AD channel is sampled every 1 msec and constantly computes an average value. Concerning this, MPC-2000 AD() function should be referred to. Both the raw data and the average data can be obtained from the MPC side. In addition, a function of continuously obtaining 100 data (100 msec) is also built in, so that rapidly-changing signals can be dynamically obtained.

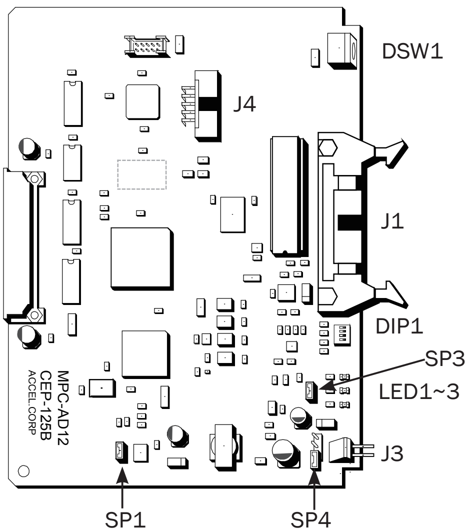
Related commands

AD(), DA, SET_AD, GET_AD

Specification

AD/DA unit operation voltage	DC5V	Generated by an internal isolated inverter
AD input	8 points 12 bit	AD789-4 built-in as standard. 0~4095 mV
DA output	4 points 12 bit	AD5624+ TLC2264 0~4095mV
Internal power supply	DC 5V (supplied from the CPU board)	200mA

Specification



* SP1 is for the internal AD/DA power supply (OFF if unnecessary).
* J4 is for modifying the firmware (FTM cable).

1)DSW1

DSW	AD	DA
#0	0 ~ 7	0 ~ 3
#1	8 ~ 15	8 ~ 11

2) J1

J1			
1	AD(0)	2	SG
3	AD(1)	4	SG
5	AD(2)	6	SG
7	AD(3)	8	SG
9	AD(4)	10	SG
11	AD(5)	12	SG
13	AD(6)	14	SG
15	AD(7)	16	SG
17	DA0	18	SG
19	DA1	20	SG
21	DA2	22	SG
23	DA3	24	SG
25	*(DC5V)	26	SG

* (DC5V) is for supplying the internal power supply to the exterior or supplying DC 5V from the exterior by setting SP3 open.
(Thermocouple amplifier and the like, 15 mA or lower)

3) DIP1 DA output magnification specification

		ON	OFF
CH0	1	2	1
CH1	2	2	1
CH2	3	2	1
CH3	4	2	1

4) LED

LED1	AD/DA POWER
LED2	AD is working
LED3	DA is working

5) J3 POWER operational amplifier power supply

1	DC12
2	SG

6) SP3 AD/DA power supply selection

Shorted	Internal 5V
Open	Power (5V) supplied from J1-25

* Selecting an external power supply with SP3 is used when a stable power supply environment is necessary by making it common with 5V of the analog system of an external circuit. In this case, SP1 should also be set open and the operation of the on-board power supply should be stopped.

7) SP4 Operational amplifier power supply selection

1-2	2-3
Internal 5V	J3 power supply

* Selecting J3 power supply with SP4 is for the case wherein the output is set to a double voltage. Rem) Used with DIP1 set on.

Precision and resolution of AD converter (AD7890)

	Range	Resolution	Numerical values	Remarks
AD7890-4	0~4.095V	1mV	0~4095	Built-in as standard
AD7890-10	-10V~+10V	4.88mV	-2048~2047	SET_AD 1 command required
AD7890-2	0~2.5V	0.61mV	0~4095	

* Each AD converter uses a reference voltage inside the IC. 2.5V+/-0.4% (25 ppm/°C)

Precision and resolution of DA converter (AD5624)

	Numerical values	Resolution	Internal power supply SP4 1-2	External power supply SP4 2-3
DIP-OFF	0~4095	1mV	0~4.095V Rem)	Not required. However, if several mA or more of the source out is necessary, SP4 should be 2-3 shorted, and J3 be given 5~15V or lower.
DIP-ON	0~4095	2mV	0~4.9V	0~8.19V (J3, 10V~15V or lower)

* Reference voltage of DA converter is 4.096V+/-0.1% (120 ppm/°C). DA converter has 1% FSR error.
* The OP amplifier of the DA output buffer is TLC2264.

Securing precision

Securing precision is a difficult issue in AD/DA conversion. This is because even in a 12-bit AD/DA converter, a voltage difference of 1 mV needs to be distinguished. Therefore, there are many cautionary issues such as signal run handling, connector selection, grounding, and power supply selection.

[Placement of the board]

It should be placed in the right end if possible. Because the soldered face of the board has an advantageous noise environment due to the shielding of a metallic chassis.

[Signal lines]

Twist-shielding is used. Although FG one-side grounding is the basic in shielding, SG grounding is better in some cases.

[Grounding]
SG of MPC-AD12 should be grounded to FG as far as allowed. If direct grounding is difficult, grounding via a ceramic capacitor of 0.01 uF or higher is also effective. Although AD converter as factory shipped operates with an internal power supply, due to floating, the internal SG tends to vary easily, influencing conversion precision. Grounding is performed using SG of J1 or J3.

[Power supply]
For high-precision AD conversion, a low-noise external power supply is used. Because thereby the influence of the switching noise of an internal power supply is reduced, and noise risk is reduced by making an external circuit and a power supply common. In this case, SP1 and SP3 should be set open, and the internal power supply be stopped. Power is supplied from J1-25 (DC 5V) and J1-26 (SG) (about 40 mA).

[Checking method]
Actual operations are often troubled with unexpected noise. Issues such as how to secure grounding and select a power supply exert an influence , and there is no set formula. This is because influences come from uncertain elements such as radiation noise from power supplies and other units attached to the device and leak voltage due to capacitive coupling.
First, a basic setting should be performed, a stable input be given to AD, and errors in the obtained values should be measured.
If the errors are within +/-3 digits, it is regarded to be mostly a good condition.

Examples of use

1) When both AD and DA support 0~4095 mV and no external power supply is used

DIP (DA magnification)	All-OFF	State as shipped 1 digit = 1 mV
SP1 (Internal power supply primary side)	Shorted	State as shipped
SP3 (Internal power supply secondary side)	Shorted	State as shipped
SP4 (Output amplifier power supply)	Shorted 1-2	State as shipped

* For CHs wherein DA output is limited to 0~4095 mV, DIP1 should be left as OFF.

2) DA 0~8191 mV output

DIP (DA magnification)	All-ON	1 digit = 2 mV
SP1 (Internal power supply primary side)	Shorted	State as shipped
SP3 (Internal power supply secondary side)	Shorted	State as shipped
SP4 (Output amplifier power supply)	Shorted 3-4	DC 12V to J3

3) DA 0~8191 mV output, an analog-system power externally supplied

DIP (DA magnification)	All-ON	1 digit = 2 mV
SP1 (Internal power supply primary side)	Open	Internal power supply OFF
SP3 (Internal power supply secondary side)	Open	DC 5V to J1-25
SP4 (Output amplifier power supply)	Shorted 3-4	DC 12V to J3

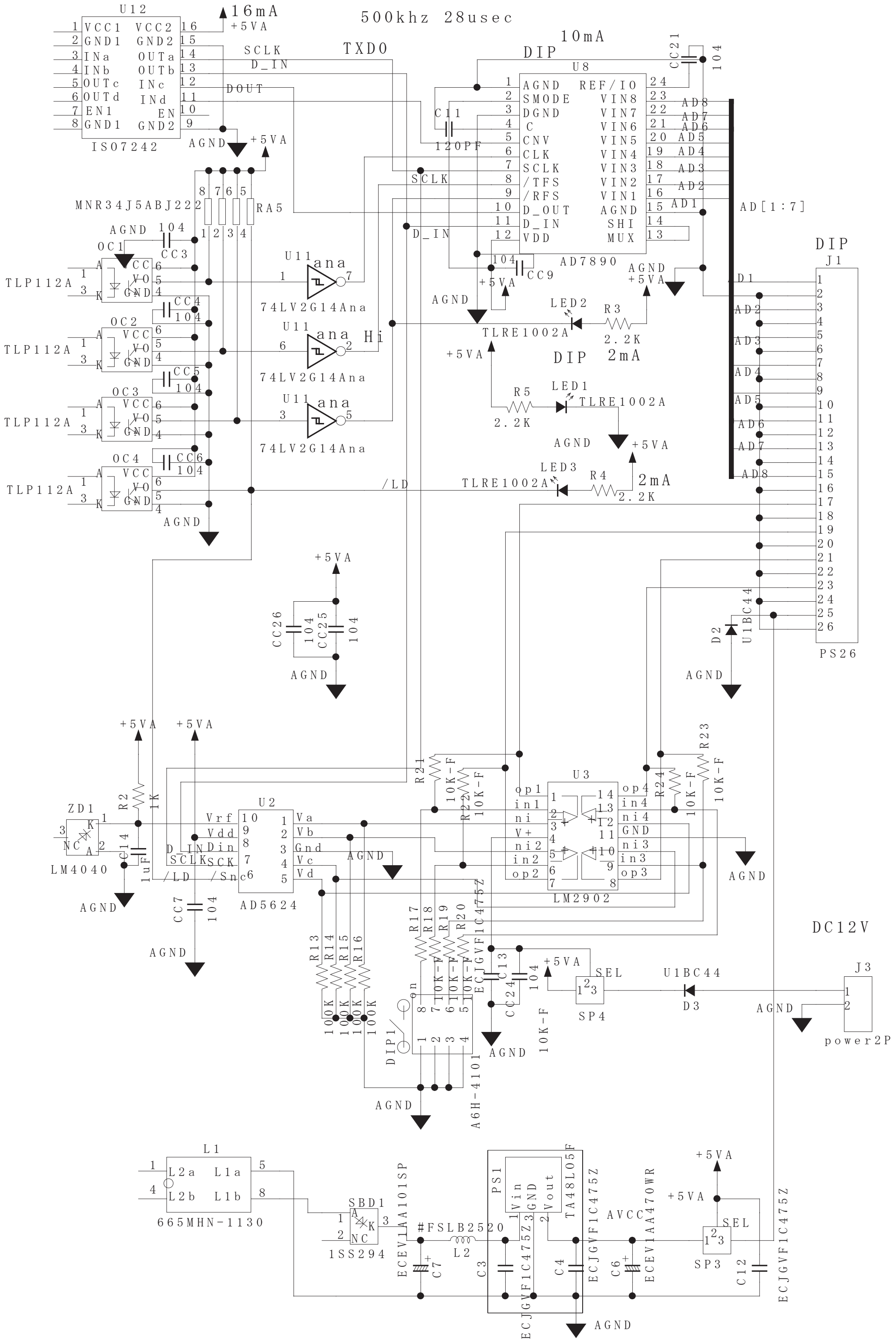
* For CHs wherein DA output is limited to 0~4095 mV, DIP1 should be left as OFF.

4) Input 10V is supported for AD.
AD7890-4 should be replaced with AD7890-10. (IC socket), SET_AD -10 command should be executed on the MPC side. If the input is in the positive voltage range of 10 mV ~ 10 V, SET_AD command is not required.

5) When the input impedance of the DA-controlled equipment is 2 kΩ or lower and a large source current is required.

SP4 (Output amplifier power supply)	Shorted 3-4	DC 5V ~ DC 12V to J3 according to necessity

MPC-AD12 AD/DA parts circuit diagram



9-15 MPC-CUnet2 (High-Speed Network Board)

Outline

MPC-CUnet2 is a network board which supports CUnet (manufactured by Step Technica) in an MPC-2000 system. CUnet can share 512 bytes of memory in real time (within 2.5 msec). In addition, because a mail communication function is also provided, various kinds of data can be exchanged through the network.

Command support

Command/function support with MPC-2000 is as follows. See Command Reference for the details.

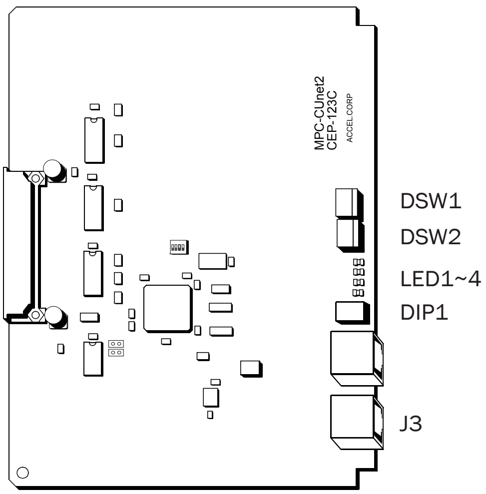
CUNET	Initialization command (SA assignment)
CU_POST	Mail support command
MKY(n)	CunetIC status acquisition
POST	Mail output
SA	SA number, IN/OUT bank
SA_B	SA number, ON/OFF number
IN()/OUT/ON/OFF/SW()	Memory IO operation on CUnet at 2000~

* CUnet is a trademark of Step Technica Corp.

Specification

Internal power supply	DC 5V (supplied from CPU board)	120mA
Communication	CUnet communication, 12 Mbps, 2-line type	Pulse transfer isolation
Communication connector	RJ-45	Commercially-sold 45 Ethernet cables (100baseT or higher) recommended*
Terminator	100Ω	Both DIP1 switches ON (One of them ON is allowed depending on the communication status)
Number of connections	Maximum 64 units	See Step Technica CUnet Specification

Hardware configuration



1) DSW

DSW1	Higher order SA number
DSW2	Lower order SA number

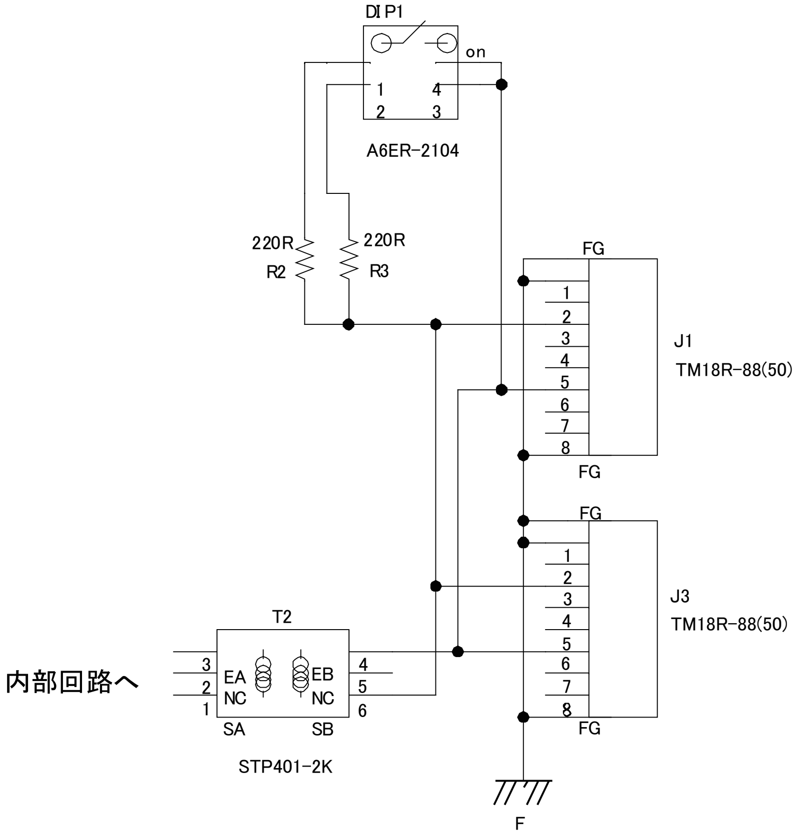
* Values of DSW1 and 2 can be read by MKY(1) immediately after powering on.

2) LED

LED4	Green	MON	Link establishment indication
LED3	Green	/STB	Cycle start notification
LED2	Red	/MCARE	Member decrease indication
LED1	Red	/LCARE	Link cut-off indication

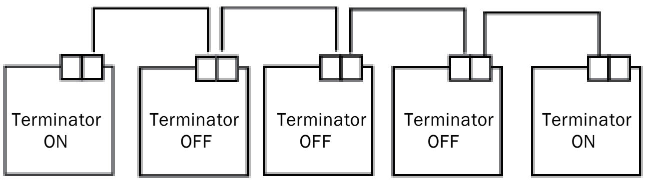
3) DIP1 Terminator setting (ON when DOWN)

J1,J3 communication unit circuit diagram



*Communication line is isolated from the internal circuit with a pulse transformer (T2).

Cascade connection example and terminator treatment

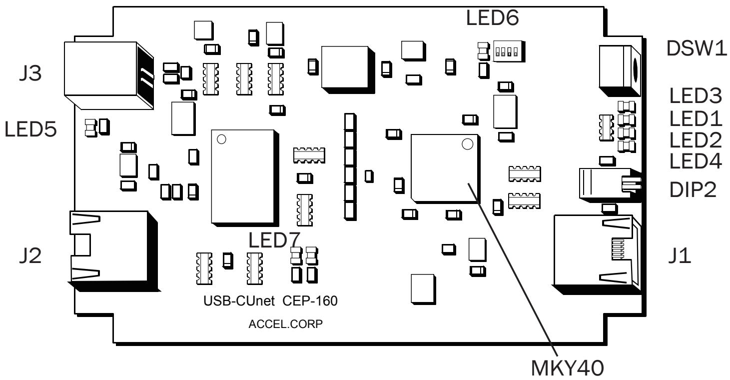


9-16 USB-CUnet (USB Interface)

Communication specification

Between CUnet stations	RS-485 (SN75LBC176D, pulse transformer isolation)
Transfer rate	12Mbps
Ethernet communication cable	Use of 10BASE-T, Cat3 or higher, and bundle-shielded cable recommended * Reference: “CUnet Technical Guide (for Network)”, Selection of communication cables, and others.
Between PC and USB-Cunet	USB2.0

Hardware configuration

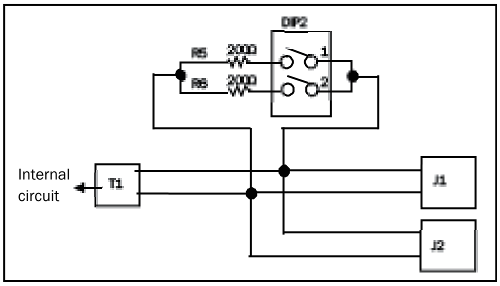


J1,J2	Modular connector	RJ-45 8 electrodes. CUnet connection between stations.
J3	USB connector	USB-B type 4 core female. USB connection between PCs.
DIP2	Dip switch	Terminal resister setting. No resister / 220Ω / 110Ω.
LED1(R)	Member decrease indicator (MKY40 #MCARE)	Lit for about 50 ms when the member status has decreased. When one cycle is within 5 ms, one pulse is output over several cycles. Possible cause of lighting up: Communication trouble due to external noise.
LED2(G)	Link cut-off indication (MKY40 #LCARE)	Lit for about 50 ms when it has been detected that a device which once had a link established lost the link. When one cycle is within 50 ms, one pulse is output over several cycles. Possible cause of lighting up: (Lit at stations continuing shared operations normally) Communication cable cut-off, connector disconnection, device leave, device power cut-off, driver/receiver parts trouble. Inadequateness of initialization (CUNET, init_cunet).
LED3(G)	Cycle start notification (MKY40 #STB)	Notified with pulse every time at the start of a cycle. (* Cannot be recognized with LED because the pulse is short.)
LED4(G)	Link establishment indication (MKY40 #MON)	Lit when a station (device) having a member status exists. (Indicating that memory sharing with other devices is constantly maintained.)
LED5(G)	USB power supply	Lit while USB is powered
LED6(G)	MKY40 power supply	Lit while MKY40 is powered
LED7(G)	CPU (CY7C68013) operation	Extinguished while the firmware is operating.
LED8(G)	USB access	Lit while PC is USB-accessing.

* LED 1~4 reference: “Let’s Try! CUnet for Field Engineers”
- What if an abnormality has occurred in the network?
- MEM mode MKY40 connection outline diagram and others

Terminal resisters

Stations at both ends should have terminal resisters set. (DIP2 has both 1 and 2 set OFF (no resister) as shipped.)
If LED1 and 2 are lit during operation, a communication abnormality has occurred, and needs to be normalized with the setting of terminal resisters.



* Reference: “CUnet Technical Guide (for Network)”
- Principle of terminator treatment in communication cables.
- Specific connections of terminator resisters and others.

Software

■ MPC-2000 site
USB-CUnet device driver, tools, and documents are published on the company’s home page MPC-2000 site http://departonline.jp/mpc2000/.

■ Installation of the device driver
(Supported OSs are the 32-bit versions of Windows 2000 or later only.)
Without connecting USB-CUnet, “USB-CUnet Device Driver, DLL” should be downloaded from the MPC-2000 site.
Published place: MPC-2000 site > DOWNLOAD button > Category [TOOL]
Downloaded file example) usbcunet_fw1012_dll1020.zip

Once the zip file is extracted, the following files are expanded into a folder.
Folder example) C:\usbcunet_fw1012_dll1020

Cyload1.spt	Firmware script file
cyusb.inf	Setup file
CYUSB.SYS	Device driver
USB-CUnet_readme.txt	Revision information
usbcunet.dll	Library

When USB-CUnet is connected to an USB port of a PC, Wizard starts. The above-mentioned folder should be specified (see next page).
When installation has finished normally, Cyload1.spt and CYUSB.SYS are placed in the system folder of Windows.
For Windows 2000: C:\WINNT\system32\drivers
For Windows XP: C:\WINDOWS\system32\drivers

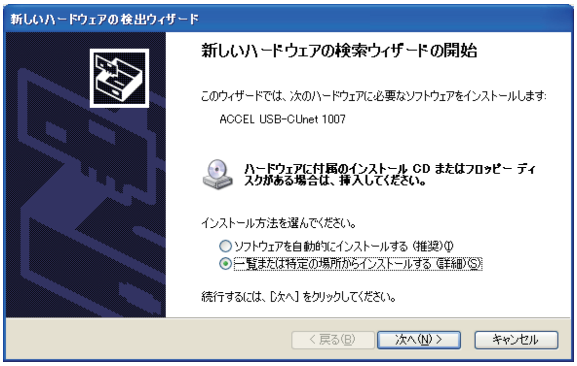
usbcunet.dll should be copied to either the same folder as the executed application (EXE) or the above-mentioned system folder of Windows. (In general, DLL is placed in \system32.)
As to library commands, see USB-CUnet_readme.txt, and sample programs and application notebook published on the web site.

■ Updating the firmware and DLL
Updating the firmware of USB-CUnet is performed by replacing Cyload1.spt. With USB-CUnet disconnected, Cyload1.spt in the system folder should be replaced.
For the library, with USB-CUnet disconnected, usbcunet.dll should be replaced in the same manner.
The version can be checked using CUMON.EXE or DLL command.

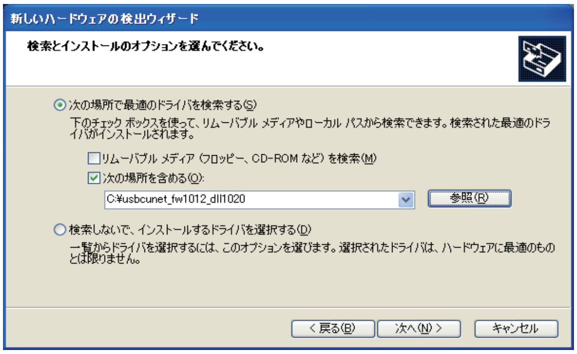
■ **Example of installation with XP**

The installation work is performed twice.

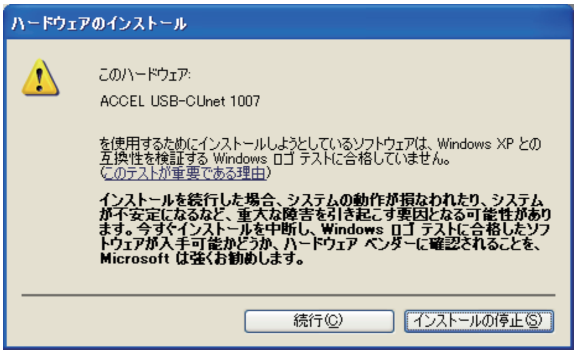
1) Once USB-CUnet is inserted, “ACCL USB-CUnet 1007” wizard starts. Select “List or …”.



2) Specify the device driver file folder in the “Include the following location” column.

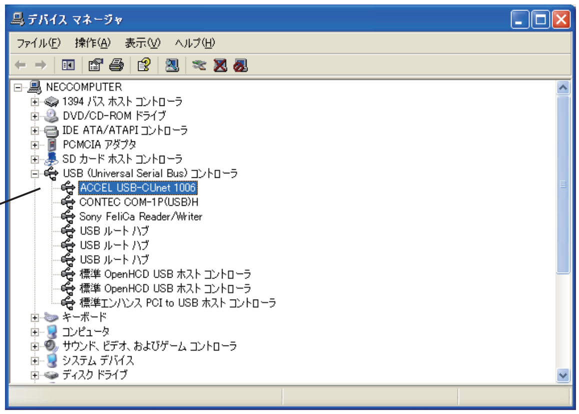


3) Press “Continue” in this dialogue box.



4) Because “ACCL USB-CUnet 1006” wizard starts immediately after completing the installation of “ACCL USB-CUnet 1007”, repeat the same procedure from 1).

Device manager after completing the installation →



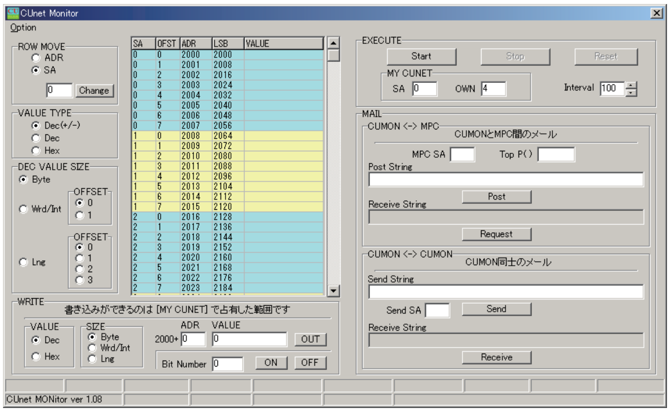
Related documents and tools

* Main text and related documents have duplicated contents.

Tool: CUnetMonitor (CUMON.EXE)

▪Published location: MPC-2000 site > DOWNLOAD button > Category [TOOL]

CUMON is a tool for monitoring global memory read/write, mail send/receive, and operation status of USB-CUnet.
Operation check after setup and status inquiry can be performed.
The zip file should be extracted in an arbitrary folder, and CUMON.EXE be executed.
See enclosed “How to Use CUnet Monitor (CUMON)” (cunetmonitor.pdf) for the usage.



Document: How to use CUnet

▪ Published location: MPC-2000 site > Information [Technical information]

Included are outline explanation of CUnet, examples of using usbcunet.dll, interaction with MPC and the like.

Document: [an2k-002] RS-485 connected thermometer/hygrometer recording and extraction (1)

▪ Published location: MPC-2000 site > Information [Application notebook]

This is an example of Excel VBA. Data written in global memory by MPC are read to an Excel worksheet and time plotted .

Document: [an2k-003] RS-485 connected thermometer/hygrometer recording and extraction (2)

▪ Published location: MPC-2000 site > Information [Application notebook]

This is an example of VB6. A log of the point data area of MPC is read via an e-mail of CUnet, and a plot is made with an MS Chart.

Document: USB-CUnet mail data send/receive example (VB6)

▪ Published location: MPC-2000 site > DOWNLOAD button > Category [TOOL]

Sending and receiving of point data area, MBK data area, and character strings with MPC using the global memory and e-mails.

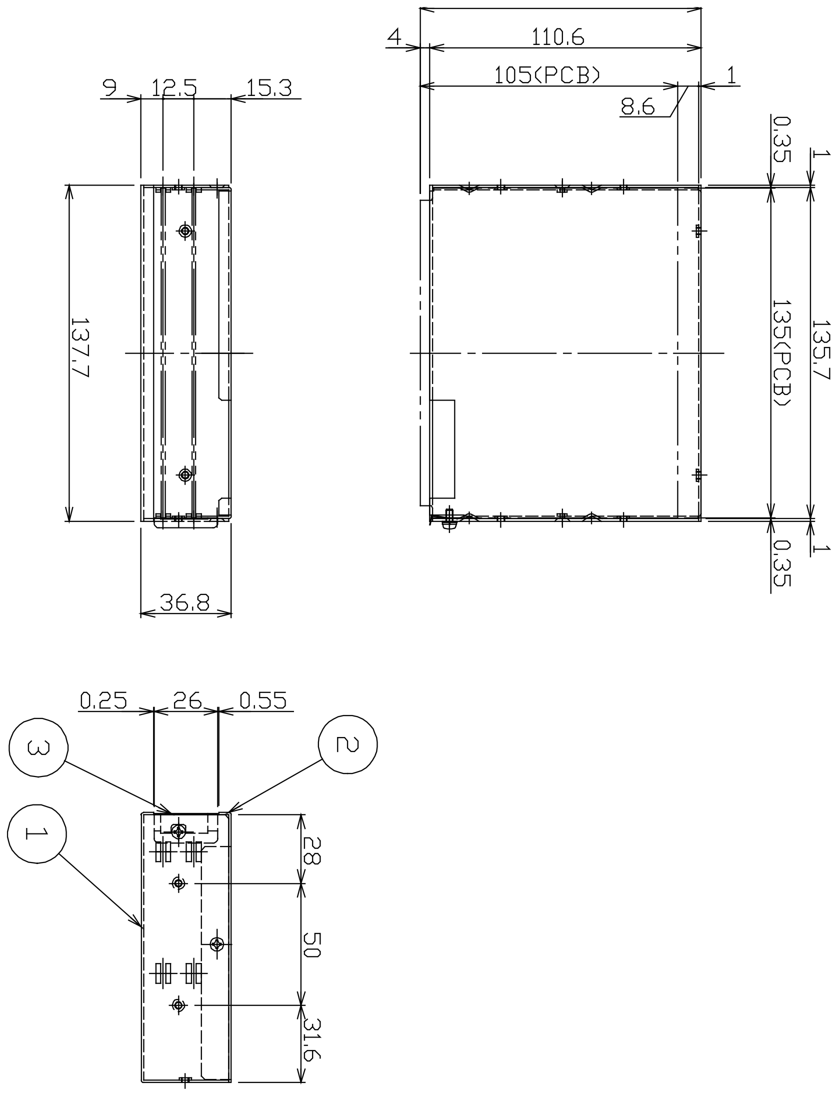
References and Citations

“CUnet” is a trademark of Step Technica Corporation.
Step Technica Corp.: http://www.steptechnica.com/
“CUnet User’s Manual” Version 2
“Let’s Try! CUnet for Beginners / Field Engineers”
“CUnet Introduction Guide (CUnet Protocol Basics Guide)”
“CUnet Technical Guide (for Network)”

Citations or quotes are made from these documents.

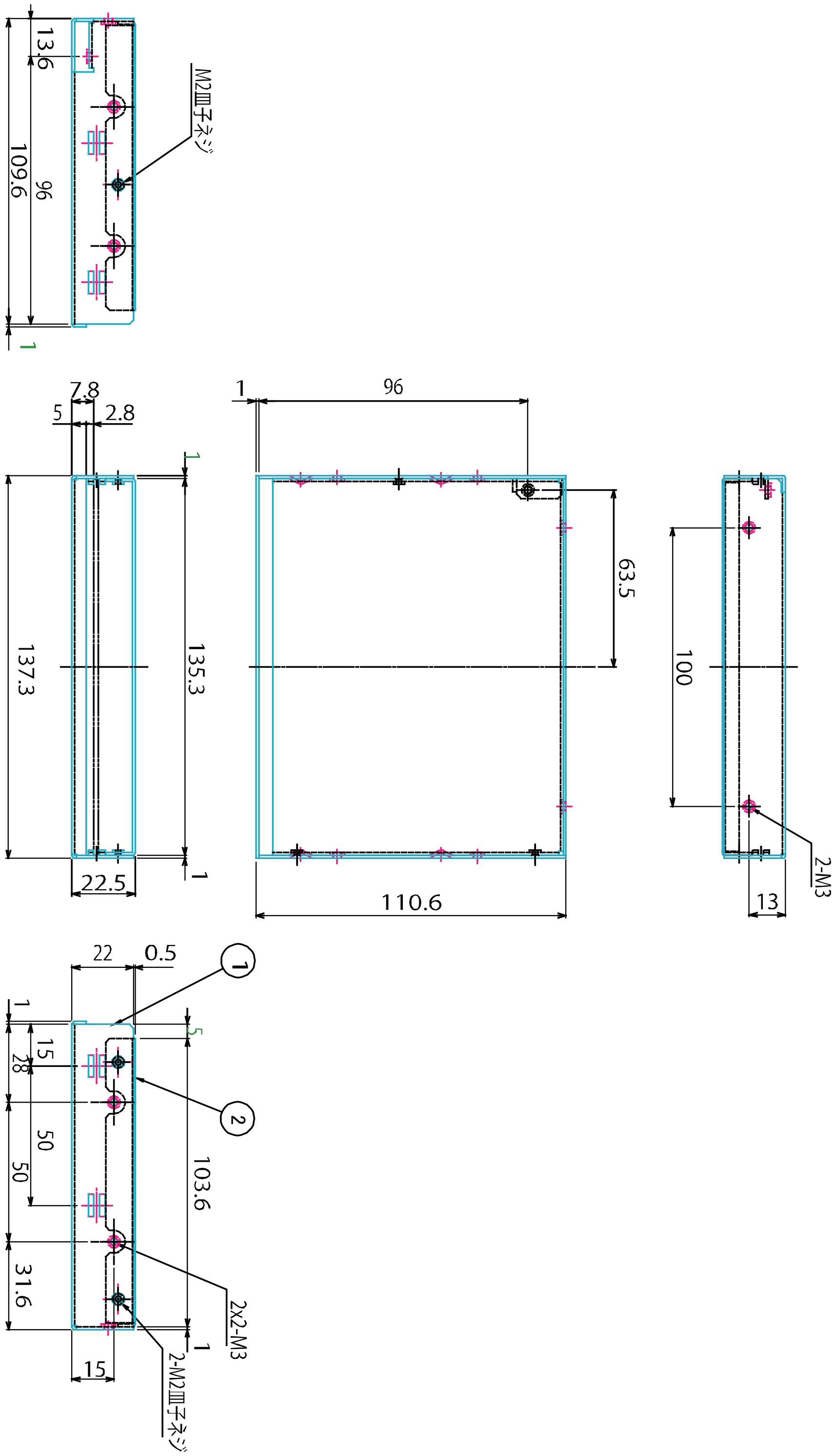
9-17 Drawings of Rack, Case, and the Like

CASE-2S

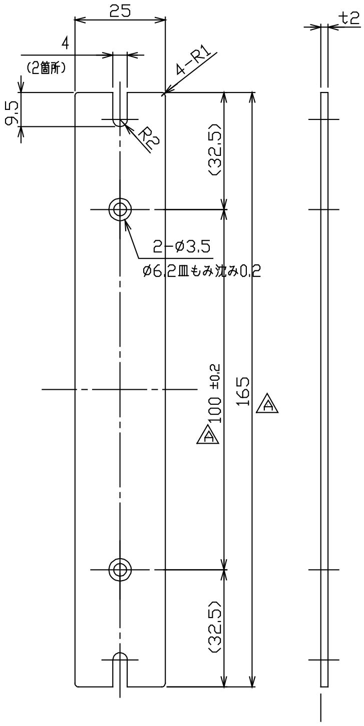


Code	Drawing or Part No.	Drawing or Part Name	Qty	Material / Dimension	Processing / Treatment	Notes
1	CASE-2S-101C	Case	1	A5052P T=1.0	Barrel processing / Silver-Alumite	
2	CASE-2S-102D	Cover	1	A5052P T=1.0	Barrel processing / Silver-Alumite	
3	CASE-2S-103D	PCB pressing plate	1	SUS304CSP T=0.3	Barrel processing	

CASE-1S

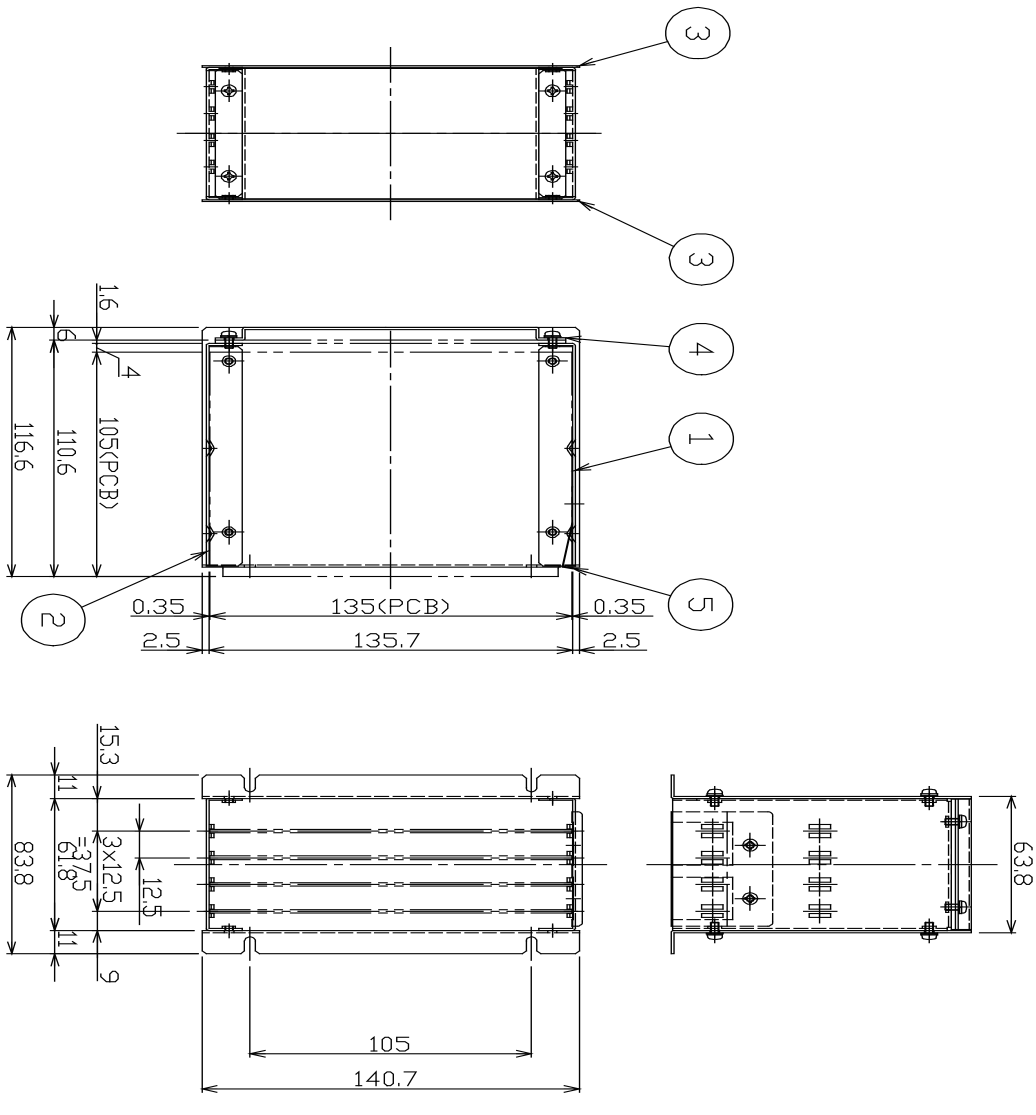

13.6
109.6
96
1
M2皿子ネジ
7.8
5
2.8
1
137.3
135.3
22.5
1
96
63.5
110.6
100
2-M3
13
22
0.5
1
1
15
28
5
2
50
50
103.6
31.6
2x2-M3
1
15
2-M2皿子ネジ

Flange H



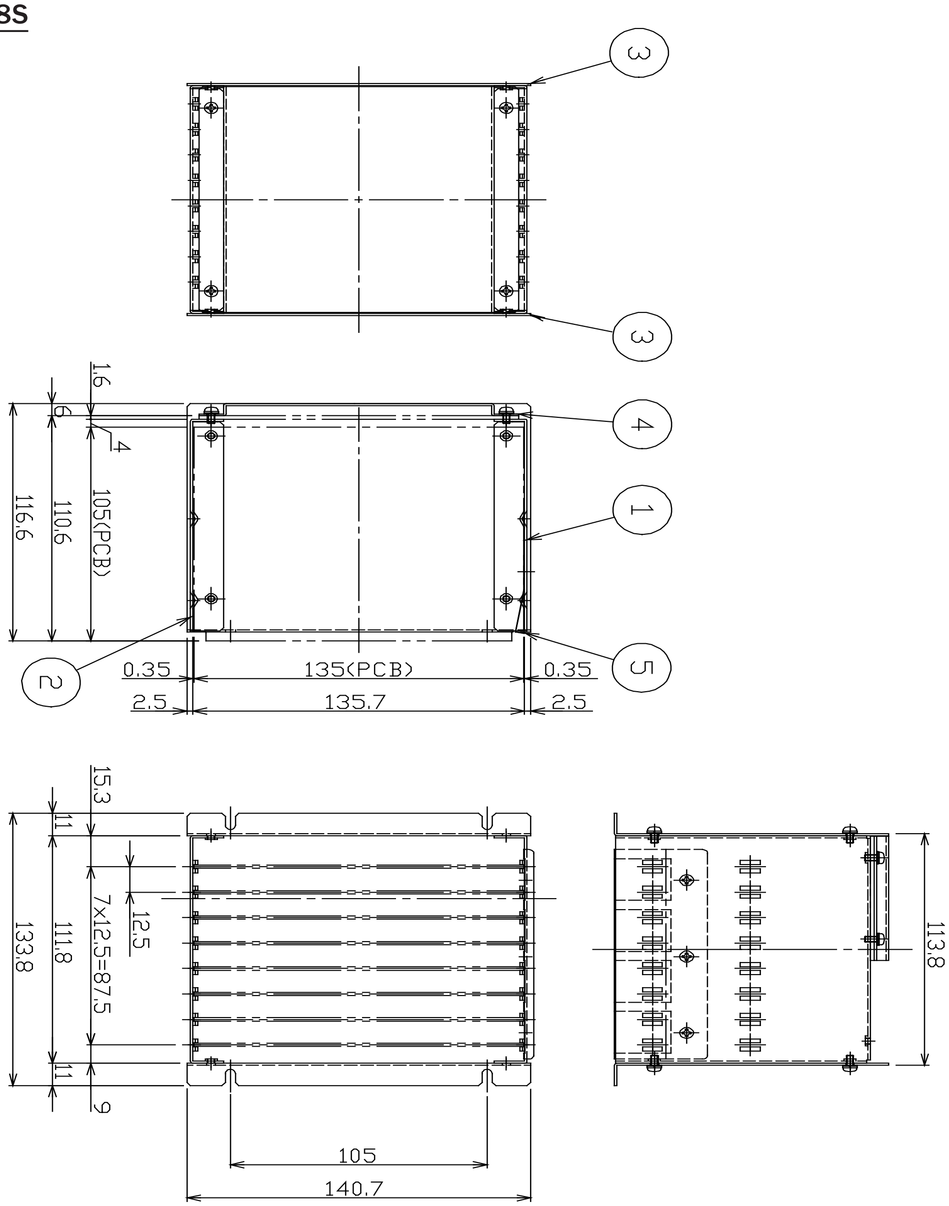
A5052P t2	Alumite Silver	-	Flange H
Material / Dimension	Processing / Treatment	Notes	Drawing Name

RACK-V4S



Code	Drawing or Part No.	Drawing or Part Name	Qty	Material / Dimension	Processing / Treatment	Notes
1	RACK-H4S-101D	Top plate	1	SUS430 t=1.0	Barrel processing	
2	RACK-H4S-102A	Bottom plate	1	SUS430 t=1.0	Barrel processing	
3	RACK-V8S-101A	Side plates	2	SUS430 t=1.0	Barrel processing	Same part for right and left
4	RACK-H4S-105A	Rear plate	1	SUS430 t=1.0	Barrel processing	
5	RACK-H4S-106E	PCB pressing plate	1	SUS304CSP t=1.0	Barrel processing	

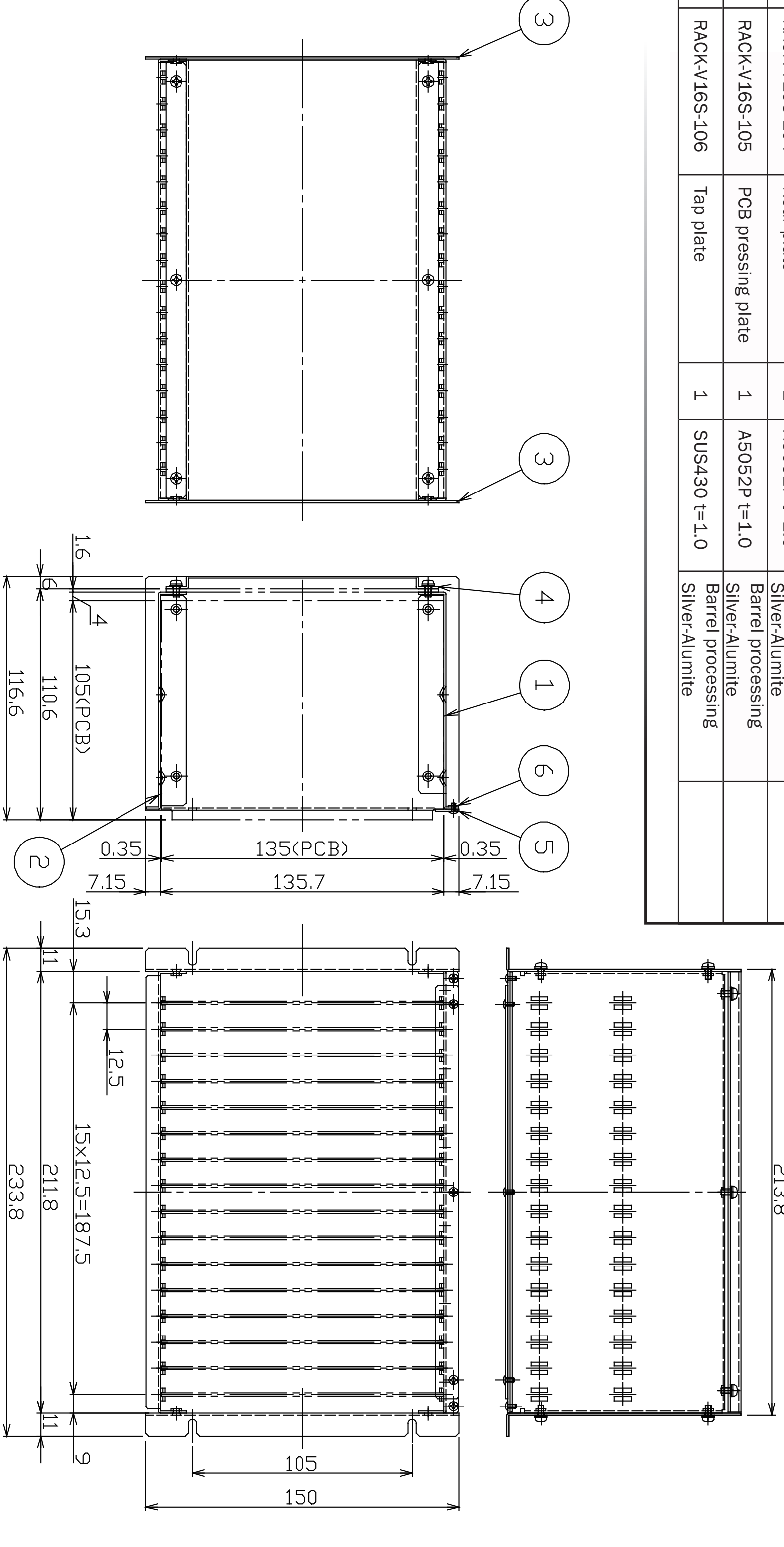
RACK-V8S



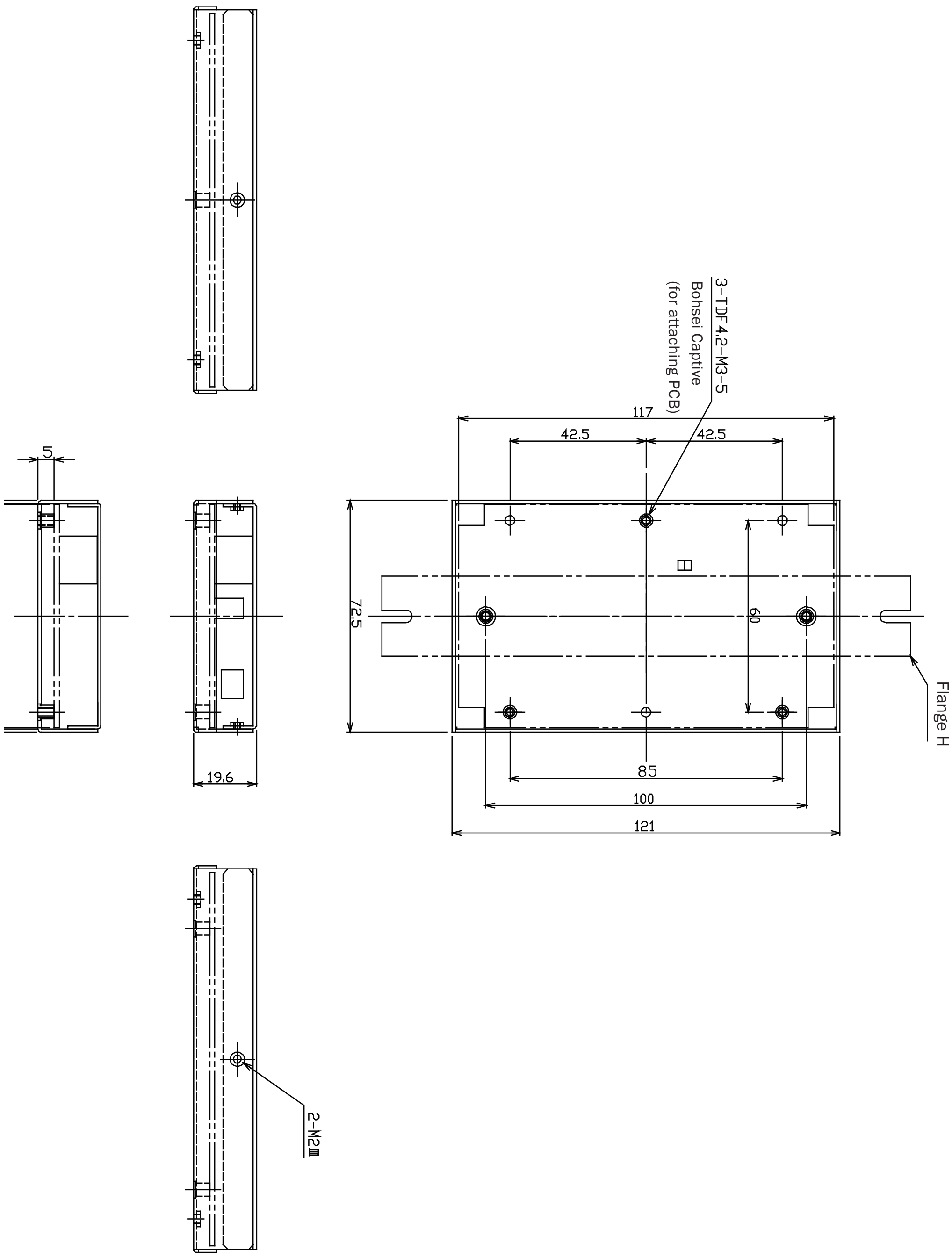
Code	Drawing or Part No.	Drawing or Part Name	Qty	Material / Dimension	Processing / Treatment	Notes
1	RACK-H8S-101D	Top plate	1	SUS430 t=1.0	Barrel processing	
2	RACK-H8S-102A	Bottom plate	1	SUS430 t=1.0	Barrel processing	
3	RACK-V8S-101A	Side plates	2	SUS430 t=1.0	Barrel processing	Same part for right and left
4	RACK-H8S-105A	Rear plate	1	SUS430 t=1.0	Barrel processing	
5	RACK-H8S-106D	PCB pressing plate	1	SUS304CSP t=1.0	Barrel processing	

RACK-V16S

Code	Drawing or Part No.	Drawing or Part Name	Qty	Material / Dimension	Processing / Treatment	Notes
1	RACK-V16S-101	Top plate	1	A5052P t=1.0	Barrel processing Silver-Alumite	
2	RACK-V16S-102	Bottom plate	1	A5052P t=1.0	Barrel processing Silver-Alumite	
3	RACK-V16S-103	Side plates	2	A5052P t=1.0	Barrel processing Silver-Alumite	Same part for right and left
4	RACK-V16S-104	Rear plate	1	A5052P t=1.0	Barrel processing Silver-Alumite	
5	RACK-V16S-105	PCB pressing plate	1	A5052P t=1.0	Barrel processing Silver-Alumite	
6	RACK-V16S-106	Tap plate	1	SUS430 t=1.0	Barrel processing Silver-Alumite	



USB-CUnet CASE



Cable DOS/V

MPC side

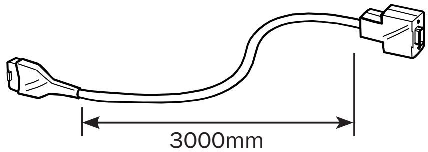
SG	1
TX1	2
RX1	3
SG	4
MAN	5
P5	6

Hirose
Equivalent with
HIF-3BA-10D-2.54C

PC side

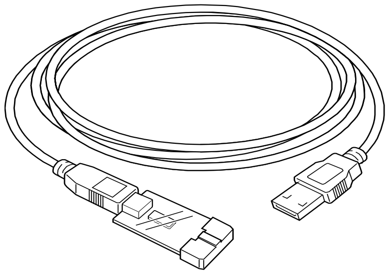
1	CD
2	RXD
3	TXD
4	DTR
5	SG
6	DSR
7	RTS
8	CTS
9	CI

Hirose
Equivalent with
HDEB-9S



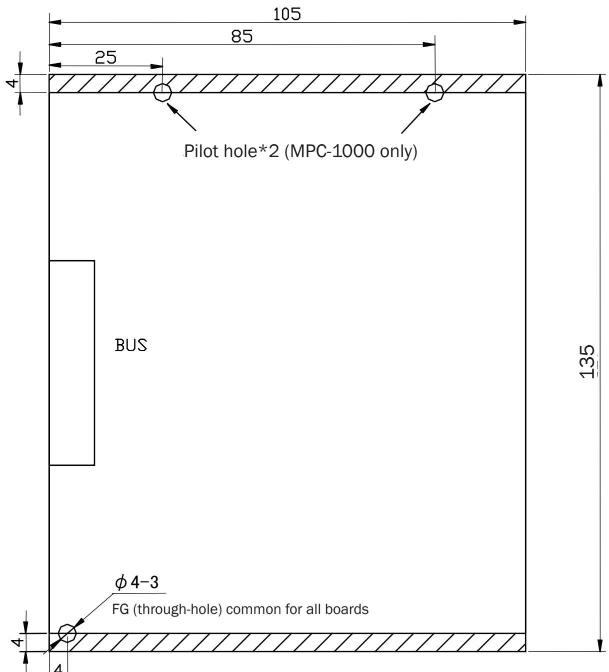
A genuine cable which connects MPC with a PC. For DOS/V.

USB-RS



A genuine USB serial interface for MPC.
This should be used with Windows 2000/XP/Win7.
(Its operation may be unstable with Win 98/Me and the like.) Supported by FTMW 6.36 or later.

Board external shape diagram



Hatched sections: Parts/pattern prohibited areas

List of matching connectors

Flat cable connectors

Item name	Model	Number of electrodes	Manufacturer
Connector	XG4M-1030-T	10	OMRON
Connector	XG4M-1630-T	16	OMRON
Connector	XG4M-2030-T	20	OMRON
Connector	XG4M-2630-T	26	OMRON
Connector	XG4M-3430-T	34	OMRON

Flat cable connectors

Item name	Model	Number of electrodes	Manufacturer
Connector	HIF3BA-10D-2.54R	10	Hirose
Connector	HIF3BA-16D-2.54R	16	Hirose
Connector	HIF3BA-20D-2.54R	20	Hirose
Connector	HIF3BA-26D-2.54R	26	Hirose
Connector	HIF3BA-34D-2.54R	34	Hirose

Discrete wire crimp connectors (for electric wire AWG24~28)

Item name	Model	Number of electrodes	Manufacturer
Connector	XG5N-101	10	OMRON
Connector	XG5N-161	16	OMRON
Connector	XG5N-201	20	OMRON
Connector	XG5N-261	26	OMRON
Connector	XG5N-341	34	OMRON
Connector	XG5W-0232(Individual model No.)		OMRON

Discrete wire crimp connectors (for electric wire AWG28~26)

Item name	Model	Number of electrodes	Manufacturer
Connector	XG5M-1035-N	10	OMRON
Connector	XG5M-1635-N	16	OMRON
Connector	XG5M-2035-N	20	OMRON
Connector	XG5M-2635-N	26	OMRON
Connector	XG5M-3435-N	34	OMRON

Discrete wire crimp connectors (for electric wire AWG28~24)

Item name	Model	Number of electrodes	Manufacturer
Connector	PS-D4C10	10	JAE
Connector	PS-D4C16	16	JAE
Connector	PS-D4C20	20	JAE
Connector	PS-D4C26	26	JAE
Connector	PS-D4C34	34	JAE
Connector	030-51304-001		JAE

Connector locks

Item name	Model	Number of electrodes	Manufacturer
Lock (dedicated for OMRON)	XG4Z-0002		OMRON

Attention! XG4M-****-U and XG5N-***-U cannot be used.