# Chapter 7 Hardware Reference

## MPC-684 Main CPU Board

This upward compatible board is two times faster in comparison with the MPC-68K. The following features are added to 68K:

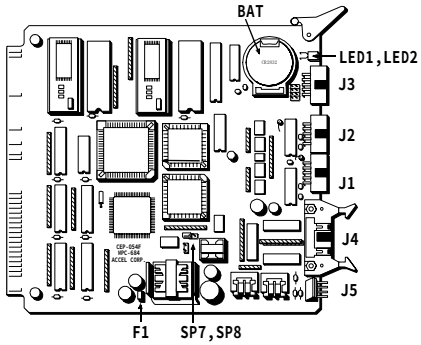
1. RTC cannot be installed. (In 68K, it is option.)
2. J3 pulse port is no longer available.
3. User interruption INT2 does not exit.
4. To use the functions registered in USERCOM area, a coprocessor is required.

The RS-232 port is activated by a DC 5V provided from J5 DC through a step down regulator J5 DC. Therefore, it is isolated from the internal circuit from the standpoint of noise. Program port (CH1) works at 19200 bps, which means a shorter time for loading the program.

### Specification

| | |
|---|---|
| Coprocessor | MC68882FN25 (option) |
| ROM | Two 29F040 (4Mx2) |
| RAM | Two HM628512 (4Mx2 battery backup) |
| RS-232 | Photo coupler isolate 3CH<br>CH0 for user<br>CH1 for program<br>(9600bps as a standard,ParityNone,data 8Bit,stop bit 1)<br>CH2 for user |
| I/O | Input 8 photo coupler isolate input (for origin sensor)<br>Output 4 photo coupler isolate output(auxiliary otput for I/F, DC24V 50mA(max)) |
| Interruption | INT1 |
| I/O bus | C BUS-compliant A0=LO, (BHE)=(UDS)<br>Memory access is not available.((IORD), (IOWR))<br>*Signal name () means “L”, which indicates active. |
| Power source | DC12~24V(I/O activation, consumption current, 100 mA or less) |
| Consumption current | DC5V 300mA<br>When providing DC 5V from J5, F1 short (factory setting)<br>When providing DC 5V from bus, F1 open<br>(F1 is 1 A fuse) |
| Bus power supply ability | 700 mA or less (loaded power source is 1 A) |
| Service temperature | 0~50ºC |
| Buttery maintenance | CR2032, maintenance period 5 years (1µA 22ºC storage) |
| Interpreter | ADVFSC 32 multi task loaded |

## Hardware Configuration




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | * 1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | * 4 | J5 |

Mounted connectors

| | | | |
|---|---|---|---|
| J1, J2, J3 | HIF-3FC10PA-2.54DS | | Hirose |
| J4 | HIF-3FC10PA-2.54DS | | Hirose |
| J5 | BS4P-SHF-1AA | JST | JST |

| | |
|---|---|
| J1 | RS-232C (CH1 and CH2) |
| J2 | RS-232C (CH0) |
| J4 | I/O |
| J5 | Internal 5V, I/O-driving power supply |
| JP1 | DC 5V 1A fuse |
| LED1 (Green) | Power supply display |
| LED2 (Red) | Error display |
| BAT | SRAM backup buttery CR2032 |
| SP7,8 | CH1 board rate selection |

## Pin Assignment and Example of Connection

(1)J1 RS-232C (CH1,H2)

| | | | | |
|---|---|---|---|---|
| 1 | SG | 2 | TXD1 | CH1 for Program |
| 3 | RXD1 | 4 | SG | ( 8 bit, 1 stop fixed) |
| 5 | MAN | 6 | [+5V] | CH2 for User |
| 7 | SG | 8 | TXD2 | (Initialized by cnfg#2 command) |
| 9 | RXD2 | 10 | NC | [+5V] is with a pull-up resister. |

(2) RS-232C (CH0)

| | | | | |
|---|---|---|---|---|
| 1 | FG | 2 | TXD | CH0 for User |
| 3 | RXD | 4 | RTS | (Initialized by cnfg#0 command) |
| 5 | CTS | 6 | NC | |
| 7 | SG | 8 | NC | |
| 9 | Key | 10 | DTR | |

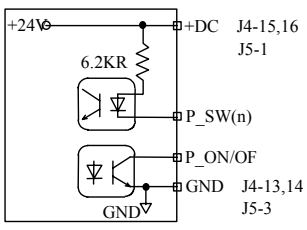
(3)RS-232CH1 Board Rate Selection

| | SP7 | SP8 |
|---|---|---|
| 9600 | OPEN | OPEN |
| 19200 | SHORT | OPEN |

* 9600 bps as default

(4)J4 I/O Port

| | | | |
|---|---|---|---|
| 1 | IN1.XS1 | 2 | IN2.XS2 |
| 3 | IN3.YS1 | 4 | IN.4.YS2 |
| 5 | IN5.US1 | 6 | IN6.US2 |
| 7 | IN7.ZS1 | 8 | IN8.ZS2 |
| 9 | OP1 | 10 | OP2 |
| 11 | OP3 | 12 | OP4 |
| 13 | GND | 14 | GND |
| 15 | +DC | 16 | +DC |




(5)J5 Power Connector

| | |
|---|---|
| 1 | +DC |
| 2 | |
| 3 | GND |
| 4 | FG |

Input/Output is the photo coupler type. Input is bringing over, while output is a photo coupler transistor open collector. The input current is adjustable with an SIP socket resistant array, 6.8KΩ as a standard implementation. The output transistor's volume is 50 mA. (For TLP627) The input/ouput board is not insulated from board's 5 V type. (DC is common, while AC cinludes L.)

When the power supply is provided from J5, set F1(1 A fuse) to short, when bus line, set open. When DC 5V power is provided from MPS-324 or other power supply board, set F1 to open.

(6) Bus Pins Assignment Table

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A1 | GND | A26 | | B1 | GND | B26 | |
| A2 | | A27 | | B2 | | B27 | |
| A3 | | A28 | | B3 | | B28 | (INT1) |
| A4 | A00 | A29 | | B4 | D00 | B29 | (INT2) |
| A5 | A01 | A30 | | B5 | D01 | B30 | |
| A6 | A02 | A31 | GND | B6 | D02 | B31 | GND |
| A7 | A03 | A32 | | B7 | D03 | B32 | *+12 |
| A8 | A04 | A33 | (IORD) | B8 | D04 | B33 | *+12 |
| A9 | A05 | A34 | | B9 | D05 | B34 | (RESET) |
| A10 | A06 | A35 | | B10 | D06 | B35 | |
| A11 | GND | A36 | | B11 | GND | B36 | |
| A12 | A07 | A37 | | B12 | D07 | B37 | |
| A13 | A08 | A38 | | B13 | D08 | B38 | |
| A14 | A09 | A39 | | B14 | D09 | B39 | |
| A15 | A10 | A40 | | B15 | D10 | B40 | |
| A16 | A11 | A41 | GND | B16 | D11 | B41 | GND |
| A17 | A12 | A42 | | B17 | D12 | B42 | |
| A18 | A13 | A43 | | B18 | D13 | B43 | |
| A19 | A14 | A44 | | B19 | D14 | B44 | |
| A20 | A15 | A45 | | B20 | D15 | B45 | |
| A21 | GND | A46 | | B21 | GND | B46 | |
| A22 | | A47 | | B22 | *+12 | B47 | |
| A23 | | A48 | | B23 | *+12 | B48 | |
| A24 | | A49 | +5 | B24 | | B49 | +5 |
| A25 | | A50 | +5 | B25 | | B50 | +5 |

- No entry indicates NC.
- *±12 indicates that power is supplied when PS1 is loaded on MPS-324.
- () in each signal name indicates “L” active.

## Improvement of MPC-684 Grammar (About improvements of grammar in comparison with MPC-68K)

### ■ Two-dimensional Array

In the MPC-684, a two-dimensional array declaration, such as DIM A(1,2), is possible. It is noted that a single dimensional reference is available under a two-dimensional array declaration. This does not return an error. In an MPC-684,the contents of parenthesis () is treated as an operator so that two-dimensional array becomes available. For this reason, the declaration “DIM a(i,j)” and “a(k)” are equivalent in this grammar.

```
10        DIM a(2,3)
20          a(2,1)=100
30        PRINT a(7)
40          a(7)=200
50        PRINT a(2,1)
#run
100
200
#
```

In above example, DIM a(2,3) is stored like shown below. So, a(7) and a(2,1) are the same position.

```
a(0,0),a(0,1),a(0,2),a(1,0),a(1,1),a(1,2),a(2,0),a(2,1),··
  ‖      ‖      ‖      ‖      ‖      ‖      ‖      ‖
a(0),  a(1),  a(2),  a(3),  a(4),  a(5),  a(6),  a(7), ··
```

■ **Operator ";" and ","**

"," Operator
In the parenthesis, "," operator is word swap operator, before "," is upper word. Without parenthesis, “,” is delimitter as usual.

```
#PRX 1,2
 1 2
#a=(1,2)
#prx a
 00010002
```

By using an operator, long composition of long in parallel input is easily realized. For example, since “WIR()” is for the loading I/O word, coding as “A=(WIR(&H80),WIR(&H82))” realize it as long.

";" Operator
";" operator shifts left part to MSB-side by 8 bits.

```
#a=1;2;3;4              /*1*&H1000000+2*&H10000+3*&H100+4
#prx a
 01020304
```

■ **Local Variables**

In the MPC-684, local variables are available. A local variable is described as a “label!”. Even the same “label!” is assigned to a different variable area according to each task. By using this variable, several tasks can share the same subroutine, which is otherwise impossible. In addition, it can be used for a variable in a program that has the same pattern like a FOR-NEXT counter. A Local variable can be set up to 26. It is noted that, after stopping the program, executing a “PR label!” can refer only the value of task1’s label!. In the following example, although task1 and task2 share a common variable, the operation of an I/O area in each task is realized without conflict.

```
10        FORK 1 *sub1
20        FORK 2 *sub1
30        END
47      *sub1
65        DO
100         FOR count!=0 TO 23
110             out!=count!+(TASKN-1)*24
115           ON out! : TIME 50 : OFF out!
120         NEXT count!
130       LOOP
```

■ **Delivery of Value to Subroutine and Reference of the Return ( REV-2.80t or later)**

The difficulty in using the “GOSUB~RETURN” is the difficulty of the delivery of arguments and the reference of the return. For this reason, MPC-684 expands GOSUB and RETURN so that the delivery of the argument and the reference of the return become easier.

GOSUB *label [arg1 arg2…]
The list after the label can be passed to a subroutine.
The receiver side executes “_VAR variable1, variable 2…. “ to receive the arguments.

```
10        GOSUB *SUB 1 2 3
20        END
30      *SUB
40        _VAR A B C     /*receive arguments
50        PRINT A B C
60        RETURN
#RUN
1 2 3
```

RETURN [arg1,arg2….]
To receive the return, execute "_RET_VAL variable1, variable 2….".

```
10        GOSUB *SUB
20        _RET_VAL A     /*receive the return
30        PRINT A
40        END
50      *SUB
60          C=123
70        RETURN C       /* C=return
RUN
123
```

With a combination of local variables, several tasks can share the same subroutine.

```
10        GOSUB *SUB 1 2
20        _RET_VAL a
30        PRINT a
40        END
50      *SUB
60        _VAR a! b!     /* In subroutine, loval variable is used.
70          c!=a!+b!
80        RETURN c!
#RUN
3
```

**■ BREAK Statement**

BREAK statement ends the control flow, such as IF, DO-LOOP, WHILE-WEND and FOR-NEXT.
BREAK in If-statement
In an IF-statement, conditional branching with nesting becomes complicated. The use of BREAK in the IF-statement makes immediate escape from the relevant loop. It is noted that the use of BREAK in the If-statement requires END_IF as shown below.

```
IF a==1 THEN
PRINT 777
ELSE
IF b==1 THEN : PRINT a b : BREAK : END_IF
IF b==2 THEN : PRINT "666" a b : BREAK : END_IF
PRINT "555"
END_IF
(Next Step)
```

BREAK out of the LOOP, such as DO-LOOP, WHILE-WEND and FOR-NEXT
In these loops, BREAK requires the termination command of the loop as the argument. BREAK ends a loop that is specified by the argument. In the following example, BREAK, in the loop of DO-LOOP, specifies to end the FOR-NEXT loop. Therefore, when the condition is met, it ends FOR-NEXTをBREAK, ignoring DO-LOOP. The arguments of BREAK-statement, such as LOOP, NEXT, and WEND, are defined as reserved constants, which means these constants must be written in upper case.

```
10        FOR i=1 TO 1000
15            j=0
20          DO UNTIL j==10
30              j=j+1
40            IF i==500 THEN : BREAK NEXT : END_IF
50          LOOP
60        NEXT i
70        PRINT i j
#run
500 1
#
```

■ **Improvement of I/O Operation**

@( ) function , ?( ) function
MPC's switch input returns bit value. This causes the unexpected error when operates logical negation with NOT(), like "&HFFFFFFFE". In such a case, use @() function to inverse "1" and "0".

```
#pr @(1)
0
```

In case of a complicated logical operation of the input port, the description "HSW(n)" becomes too long. It is likely to violate the 37-character-limit of the expression. To write shorter, ?() function is prepared. The following example is equivalent to the previous version's expression s1=&h1&NOT(HSW(-1)\HSW(-2)).

```
s1=@(?(-1)\?(-2))
```

4-byte bulk reading by Input function HIN()
This is valid to MIP, MOP and IOP in I/O and memory I/O.
Example in regular I/O

```
10 SETIO
20 ON 0 9 18 27
30 PRINT IN(24) IN(25) IN(26) IN(27)
40 a=HIN(&H80+24)  /*Add &H80 to read 4 bytes successively
50 b=HIN(&H100+24) /*Add &H100 to read twice 4 bytes successively, compare and return
60 PRX a b
#run
1 2 4 8
08040201 08040201
#
```

Example in memory I/O

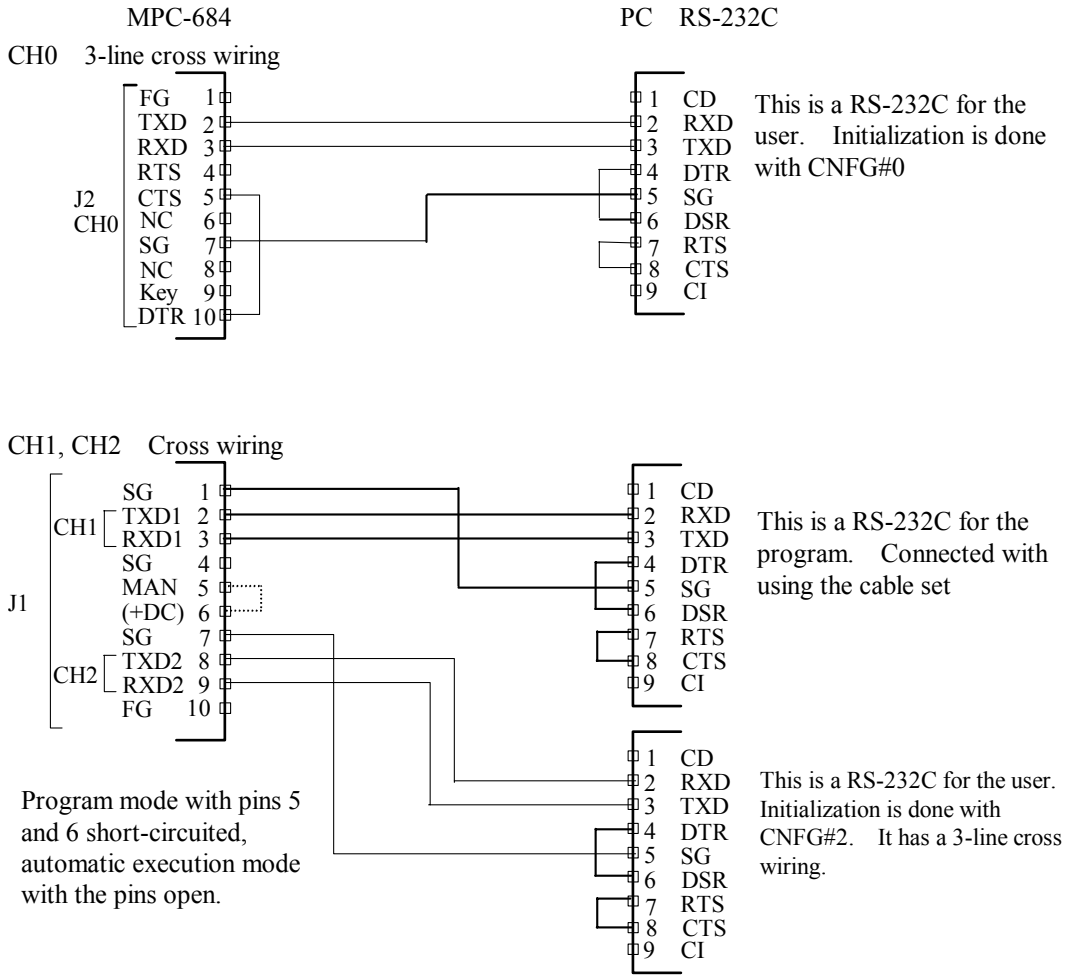
```
20 ON -1 -10 -19 -28
30 PRINT IN(-1) IN(-2) IN(-3) IN(-4)
40 a=HIN(-1-&H80)       /*Subtract &H80 to read 4 bytes successively
60 PRX a
run
1 2 4 8
08040201
#
```

■ **Support of Touch Panel (Digital GP series)**

RS-232 CH0 and touch panel display (GP series) can be directly connected without communication program. Refer to PROTCOL MEWNET in Command Reference.

## RS-232C Connection Examples

Here are examples of connecting with the RS-232C port of PC(DOS/V).

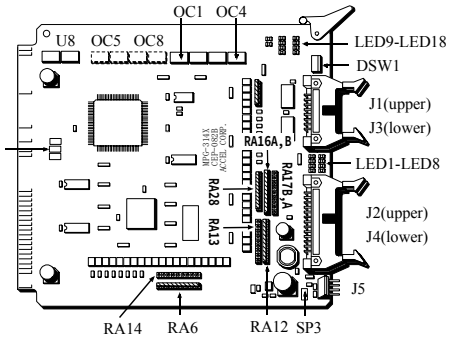


## Specification

| | |
|---|---|
| PGIC | MCX314 See note below. |
| Pulse generation | 4-axis maximum 4Mpps~1pps differential-mode drive output |
| Input/Output port | Input 7-point x 4-axis Output 3-point×4-axis |
| Support of MPC | 10 boards |
| Power Supply | DC12~24V |
| Consumption current | 200 mA (provided through bus) |
| Service temperature | 0~50 ºC |

Note) This is NOVA Electronics' general-use PGIC. Each axis generates pulse independently. It is equipped with the function of axis-selection-free linear/circular interpolation. The maximum pulse rate is 4 Mpps.
It supports S-curve acceleration/deceleration function.

## Hardware Configuration




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | * 1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | * 4 | J5 |

Mounted connectors

| | | | |
|---|---|---|---|
| J2, J4 | J3429-P302VE | | 3M |
| J1, J3 | J3408-P302VE | | 3M |
| J5 | BS4P-SHF-1AA | JST | JST |

| | |
|---|---|
| J1 | Encoder input (differential-mode input) |
| J3 | Pulse output (differential-mode output) |
| J2 | Each-axis limit, alarm input |
| J4 | Standard I/O (origin sensor input, imposition input, servo on output, etc.) |
| J5 | I/O startup and pulse output power supply, DC 12~24 V. |
| LED1~8 | Pulse output dispaly |
| LED9~15 | differential-mode input display |
| LED17 | Internal 5 V display |
| LED18 | IO power supply |
| DSW1 | Board address setting 0~9 |
| RA16A,B | Input pull-up resister for the origin sensor (6.8KΩ standard) |
| RA17A,B | Two-wire pull-up resistor for the origin sensor (2.7KΩ1/4W optional)<br>(Δ mark of SIP socket for resistance indicates Common.) |

## Board Address Setting

Board address is "the value of DSW1 x &H10 + &H400".
PG command of MPC is, responding to this address, something like "PG &H400" , "PG &H410 1" and etc.

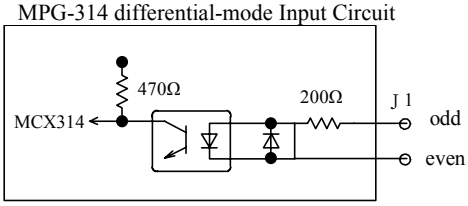
| DSW1 | Address |
|---|---|
| 0 | &H400 |
| 1 | &H410 |
| \| | \| |
| 9 | &H490 |

## Pin Assignment Table

**J1 Encoder Input**

| | | | |
|---|---|---|---|
| 1 | X-EA+ (X_AB+) | 2 | X-EA- (X_AB-) |
| 3 | X-EB+ (Y_AB+) | 4 | X-EB- (Y_AB-) |
| 5 | Y-EA+ (U_AB+) | 6 | Y-EA- (U_AB-) |
| 7 | Y-EB+ (Z_AB+) | 8 | Y-EB- (Z_AB-) |
| 9 | U-EA+ (U_IN2+) | 10 | U-EA- (U_IN2-) |
| 11 | U-EB+ (Z_IN2+) | 12 | U-EB- (Z_IN2-) |
| 13 | Z-EA+ (X_IN2+) | 14 | Z-EA- (X_IN2-) |
| 15 | Z-EB+ (Y_IN2+) | 16 | Z-EB- (Y_IN2-) |

MPG-314 differential-mode Input Circuit




Inside of the parenthesis, subfunction

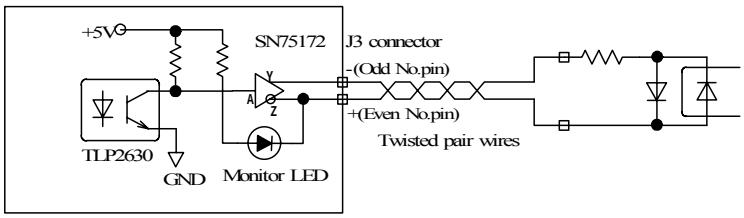
Note 1) X_AB~Z_AB is for absolute encoder input
Note 2) X_IN2~U_IN2 is differential-mode input port
*Insert TLP2630 in OC5~OC8 to validate this function.

J1 is a differential-mode input interface. The positive "+" side is connected to the anode side of an internal photo coupler via 200 Ω-resistance, while the "–" side is connected to a cathode. The LED9-16 is implemented as the polarity cancel diode of the photo coupler input. Therefore, lightning of LED signifies the signal OFF.

In principle, it is encoder input (90° phase difference 2 phase clock). As a subfunction, it is connected to X-AB~Z-AB and X-IN2~Z-IN2. X-AB~Z-AB is the absolute encoder input port. It is available after the installment of one chip CPU, which is an option. X-IN2~Z-IN2 is connected to IN2, which is for the use of a condition stop. This input is used to receive the external condition stop input as the differential-mode signal.

**J3 pulse output**

| | | | |
|---|---|---|---|
| 1 | X-CW+ | 2 | X-CW- |
| 3 | X-CCW+ | 4 | X-CCW- |
| 5 | Y-CW+ | 6 | Y-CW- |
| 7 | Y-CCW+ | 8 | Y-CCW- |
| 9 | U-CW+ | 10 | U-CW- |
| 11 | U-CCW+ | 12 | U-CCW- |
| 13 | Z-CW+ | 14 | Z-CW- |
| 15 | Z-CCW+ | 16 | Z-CCW- |




This is a differential-mode output pulse interface. The standard CW/CCW two-pulse method can be changed to PULSE/DIR method through internal register setting.

**J2 Each-axis Limit, alarm input**

| | | | |
|---|---|---|---|
| 1 | X-IN3 | 2 | X-LMTM |
| 3 | X-LMTP | 4 | X-ALM (EMGN)* |
| 5 | Y-IN3 | 6 | Y-LMTM |
| 7 | Y-LMTP | 8 | Y-ALM |
| 9 | U-IN3 | 10 | U-LMTM |
| 11 | U-LMTP | 12 | U-ALM |
| 13 | Z-IN3 | 14 | Z-LMTM |
| 15 | Z-LMTP | 16 | Z-ALM |
| 17 | X-OUT4 | 18 | X-OUT5 |
| 19 | Y-OUT4 | 20 | Y-OUT5 |
| 21 | Z-OUT4 | 22 | Z-OUT5 |
| 23 | X_IN1(A) | 24 | Y_IN1(A) |
| 25 | U_IN1(A) | 26 | Z_IN1(A) |

1~16 input: MCX314 to each input port
17~22 output: MCX314 to each Output Port (Includes J4-9,10)
23~26 origin sensor differential-mode input anode side
Note) When SP4 short, X-ALM becomes valid ALM to all axes.

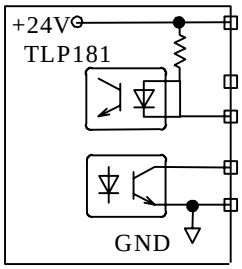
The IN3 of each axis is used for the conditon stop and general use input.
The LMTM, LMTP of each axis is for connecting with a limit sensor.(Always valid)
The ALM of each axis is to connect with a servo alarm. (Valid on settings)
The OUT4,OUT5 of each axis is a general output or the output of the result of counter comparison.

The signal of U-axis is displayed on J4.
IN1(A) of each axis is for the differential-mode drive input to connect eacj-axis-S2 with Z phase (C phase). While each axis-S2 of J4 is connected with the cathode side, it is connected with anode side through RA28. Remove the RA17B to use this input.

**J4 standard I/O(origin sensorinput, imposition input, servo on output )**

| | | | |
|---|---|---|---|
| 1 | X-INPOS | 2 | Y-INPOS |
| 3 | U-INPOS | 4 | Z-INPOS |
| 5 | X-SON (X-OUT0) | 6 | Y-SON (Y-OUT0) |
| 7 | U-SON (U-OUT0) | 8 | Z-SON (Z-OUT0) |
| 9 | U-OUT4 | 10 | U-OUT5 |
| 11 | IN1·XS1 (X-IN0) | 12 | IN2·XS2 (X-IN1)(K) |
| 13 | IN3·YS1 (Y-IN0) | 14 | IN4·YS2 (Y-IN1)(K) |
| 15 | IN5·US1 (U-IN0) | 16 | IN6·US2 (U-IN1)(K) |
| 17 | IN7·ZS1 (Z-IN0) | 18 | IN8·ZS2 (Z-IN1)(K) |
| 19 | OP1 (X-OUT1) | 20 | OP2 (Y-OUT1) |
| 21 | OP3 (U-OUT1) | 22 | OP4 (Z-OUT1) |
| 23 | GND connected to J5GND | 24 | GND connected to J5GND |
| 25 | +DC connected to J5+DC | 6 | +DC connected to J5+DC |

Input/OuputCircuit




+DC J4-25,26
J5-1
J2-23～26*
Each input terminal

P_ON/OFF
GND J4-23,24
J5-3

*In J1-12, 14, 16 and 18, anode side is drawn to J2side.

1~4 input: for driver・imposition signal
5~10 output: for driver・servo onsignal
11~18 input: for origin sensor (two-line sensor available *)
19~22 output: for general-use output port
23~26 power supply
*RA17's SIP socket is for the two-line sensor method compatible pull-up resistance.

Each axis-INPOS of each axis is for connecting with the imposition signal of the servo driver. In the register setting, the validation of this input makes MPG-314 wait automatically for the INPOSinput.

The SON of each axis, though with the assumption of under servo on, can be used as a general-use output.
OP1~4 is general-use output. SON,OP can be specified with an HOUT setting.
IN1~8 is for origin restore input. It is connected with MCX-314's IN0,IN1.
The origin sensor port uses S1 side of each axis as near origin, S2 side of each axis as servo Z phase. This is because the S1 side is dependent on software, while S2 side is high accuracy with the IC origin search function.
The S2 side, with a combination of "J2 IN1", supports the differential-mode drive input.

**J5 power supply**

| | |
|---|---|
| 1 | +DC |
| 2 | (VCC) |
| 3 | GND |
| 4 | FG |

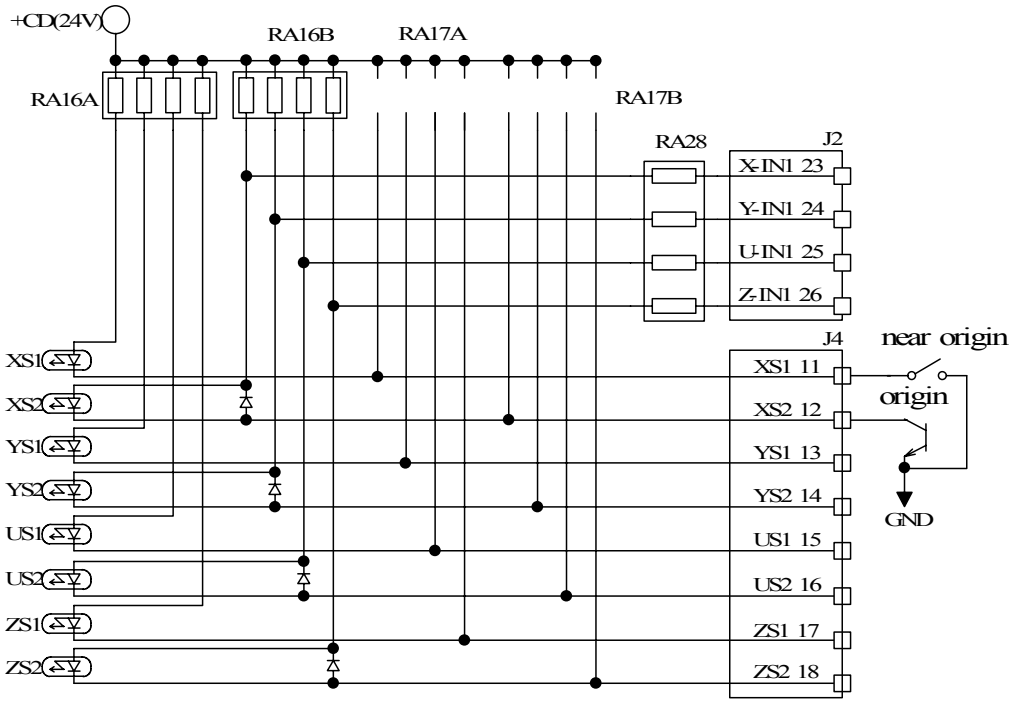
MPG's operation power supply is number 1 and 3 pin. (DC12~24V)
In case of putting SP3 short, 5 V for pulse output interface becomes available externally.(200 mA or less)

## Example of Origin Sensor Connection

Input current shunt resistance (RA16A/B), two-line sensor method no-contact-point-sensor pull-up resistance (RA17A/B), differential-mode input shunt resistance (RA28) are SIP socket and differently implemented according to the device. By using a4-element type resistance array, separate settings can be madeof the S1 side and S2 side.
RA16A/B(6.8KΩ) and RA28(470Ω) are standard implementation. RA17A/B(2.7KΩ 1/4W) is option.

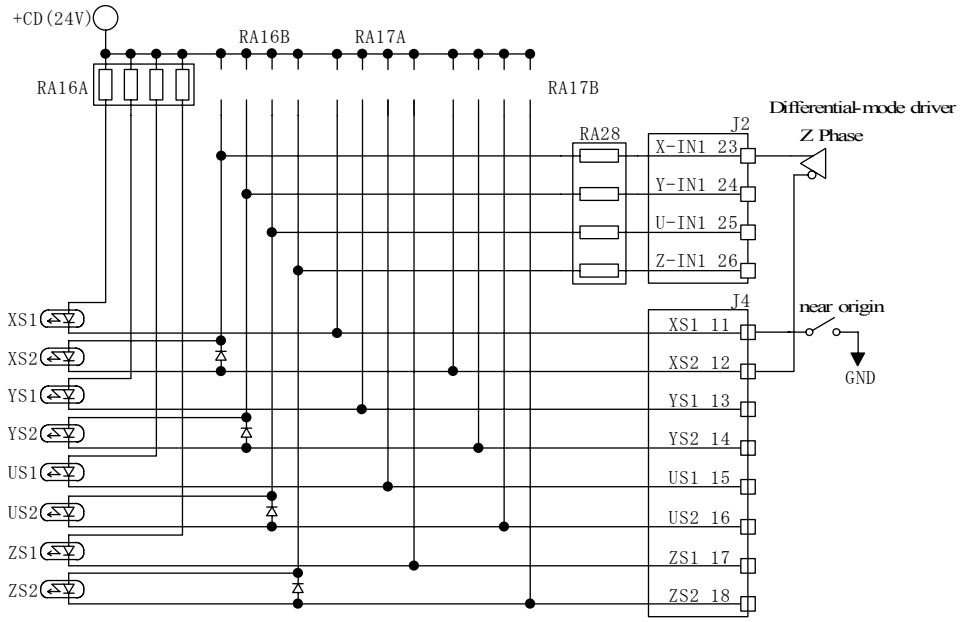
■ **LS Contact-point, Open Collector Output Sensor**

This is the default connection setting. Connect S1 side of each axis with near origin, and S2 side with origin.
RA16A and RA16B are implemented.



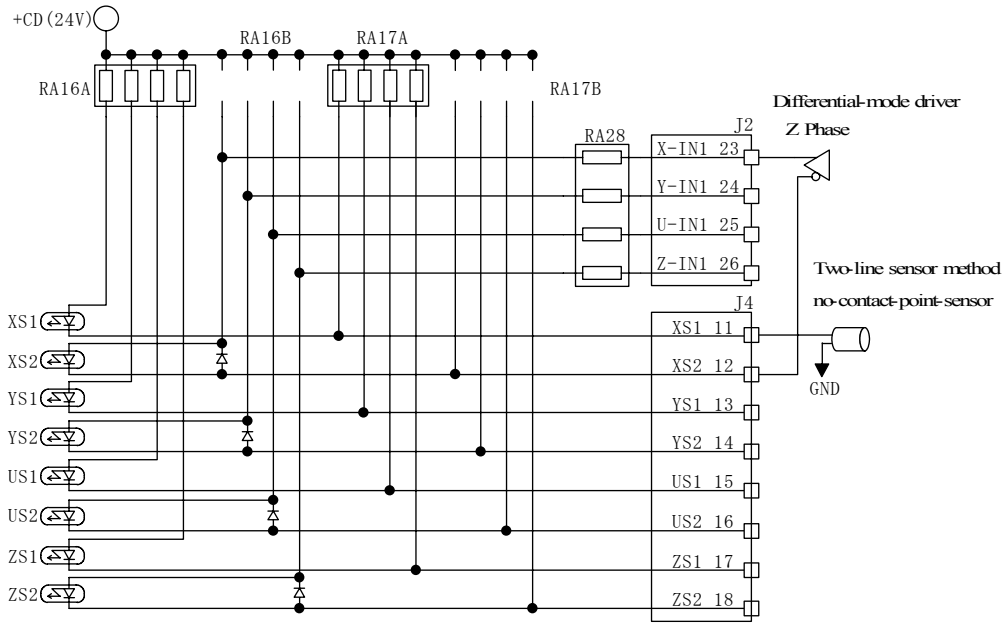
■ **Differential-mode Driver Z Phase Interface**

The differential-mode driver is to be connected with S2 side of J4 and J2 IN1.
RA16A and RA28 are implemented.




■ **Two-line Sensor Method No-Connection No-contact-point-sensor**

In the next example, the two-line sensor method no-contact-point-sensor is connected on the S1 side, while differential-mode Z phase is on the S2 side.
RA16A, RA17A and RA28 are implemented.
On S2 side, if two-line sensor method no-contact-point-sensor, RA16B and RA17B are implemented as well.

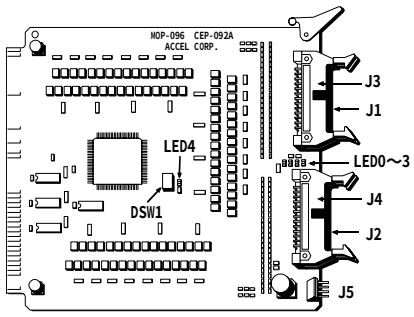


## MOP-096 96-point Output Board

### Specification

| | |
|---|---|
| I/O | 96-point photo-coupler isolated TR open collector output |
| Control current | Maximum 100 mA / 1 output |
| power supply | DC12~24V(I/O start up) (When DC 5V, 50 mA sink) |
| consumption current | DC5V 200mA(When all output is ON) (provided from bus) |
| Operating temperature | 0~50°C |

### Hardware Configuration




Accessories:

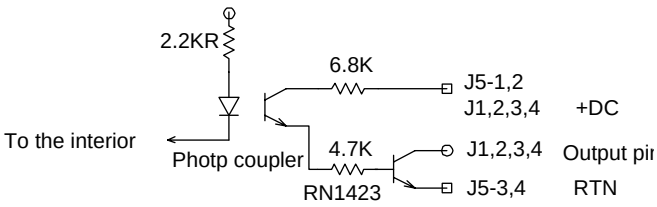
| | | | |
|---|---|---|---|
| Power connector (H4P-SHF-AA) | JST | * 1 | J5 |
| Contact (BHF-001T-0.8SS) | JST | *4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J1, 2 | HIF-3B-26PA-2.54DS | Hirose |
| J3, 4 | HIF-3B-26PA-2.54WB | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J1,2,3,4 | Output Port<br>In the case that DSW is 0, the port number allotted to J3 is 0~23, to J4 24~47, to J1 48~71 and to J2 72~95. |
| J5 | I/O start up power supply |
| DSW1 | board address setting (one of 0, 1, 4 and 5) |
| TR | RN1423 (Toshiba) is used. |
| LED0~3(Red) | At RESET time, LED0 and LED is lightning.<br>At operation, the lower 4-bit written most lately is displayed. (Only for verification of operation) |
| LED4(Green) | Power supply display LED. |

### Output Circuit Diagram




### Setting and Pin Assignment

**J5 power supply Connector**

| | |
|---|---|
| 1 | +DC |
| 2 | +DC |
| 3 | RTN |
| 4 | RTN |

On the RTN, sink current is gathered. Attention should be paid to the volume and be sure to use both two terminals.

**Address Setting and Output Port**

| DSW1 | IO | J3,J4 | J1,J2 |
|---|---|---|---|
| 0 | 0~95 | MOP-048 #1 | MOP-048 #2 |
| 1 | 96~191 | MOP-048 #3 | MOP-048 #4 |
| 4 | 384~479 | MOP-048 #5 | MOP-048 #6 |
| 5 | 480~575 | MOP-048 #7 | MOP-048 #8 |

*For details, refer the port number table of MOP-048.

**J3 Output Port(upper)**

| | | | |
|---|---|---|---|
| 1 | OFSET +0 | 2 | OFSET +1 |
| 3 | OFSET +2 | 4 | OFSET +3 |
| 5 | OFSET +4 | 6 | OFSET +5 |
| 7 | OFSET +6 | 8 | OFSET +7 |
| 9 | OFSET +8 | 10 | OFSET +9 |
| 11 | OFSET +10 | 12 | OFSET +11 |
| 13 | OFSET +12 | 14 | OFSET +13 |
| 15 | OFSET +14 | 16 | OFSET +15 |
| 17 | OFSET +16 | 18 | OFSET +17 |
| 19 | OFSET +18 | 20 | OFSET +19 |
| 21 | OFSET +20 | 22 | OFSET +21 |
| 23 | OFSET +22 | 24 | OFSET +23 |
| 25 | +DC | 26 | RTN |

**J1 Output Port(lower)**

| | | | |
|---|---|---|---|
| 1 | OFSET +48 | 2 | OFSET +49 |
| 3 | OFSET +50 | 4 | OFSET +51 |
| 5 | OFSET +52 | 6 | OFSET +53 |
| 7 | OFSET +54 | 8 | OFSET +55 |
| 9 | OFSET +56 | 10 | OFSET +57 |
| 11 | OFSET +58 | 12 | OFSET +59 |
| 13 | OFSET +60 | 14 | OFSET +61 |
| 15 | OFSET +62 | 16 | OFSET +63 |
| 17 | OFSET +64 | 18 | OFSET +65 |
| 19 | OFSET +66 | 20 | OFSET +67 |
| 21 | OFSET +68 | 22 | OFSET +69 |
| 23 | OFSET +70 | 24 | OFSET +71 |
| 25 | +DC | 26 | RTN |

For output connector, white triangle on the connector is number 1, while component side is odd numbers and solder side is even numbers.

Number 25 and 26 pin are equivalent of J5+DC and RTN respectively.

**J4 Output Port(upper)**

| | | | |
|---|---|---|---|
| 1 | OFSET +24 | 2 | OFSET +25 |
| 3 | OFSET +26 | 4 | OFSET +27 |
| 5 | OFSET +28 | 6 | OFSET +29 |
| 7 | OFSET +30 | 8 | OFSET +31 |
| 9 | OFSET +32 | 10 | OFSET +33 |
| 11 | OFSET +34 | 12 | OFSET +35 |
| 13 | OFSET +36 | 14 | OFSET +37 |
| 15 | OFSET +38 | 16 | OFSET +39 |
| 17 | OFSET +40 | 18 | OFSET +41 |
| 19 | OFSET +42 | 20 | OFSET +43 |
| 21 | OFSET +44 | 22 | OFSET +45 |
| 23 | OFSET +46 | 24 | OFSET +47 |
| 25 | +DC | 26 | RTN |

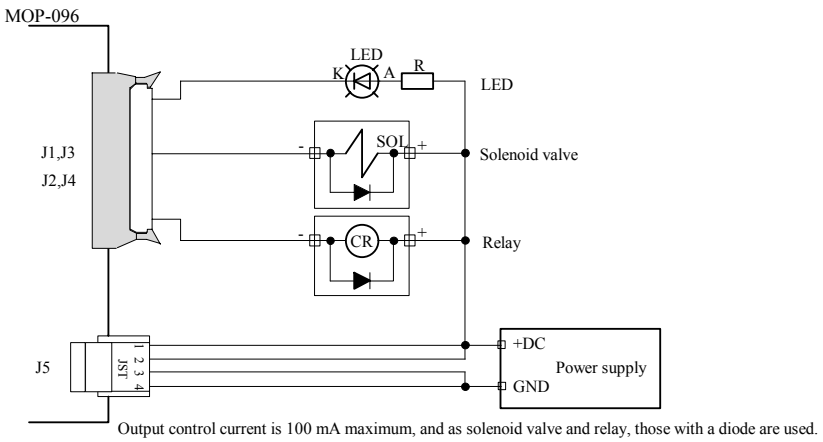
**J2 Output Port(lower)**

| | | | |
|---|---|---|---|
| 1 | OFSET +72 | 2 | OFSET +73 |
| 3 | OFSET +74 | 4 | OFSET +75 |
| 5 | OFSET +76 | 6 | OFSET +77 |
| 7 | OFSET +78 | 8 | OFSET +79 |
| 9 | OFSET +80 | 10 | OFSET +81 |
| 11 | OFSET +82 | 12 | OFSET +83 |
| 13 | OFSET +84 | 14 | OFSET +85 |
| 15 | OFSET +86 | 16 | OFSET +87 |
| 17 | OFSET +88 | 18 | OFSET +89 |
| 19 | OFSET +90 | 20 | OFSET +91 |
| 21 | OFSET +92 | 22 | OFSET +93 |
| 23 | OFSET +94 | 24 | OFSET +95 |
| 25 | +DC | 26 | RTN |

*OFSET compatibilty is shown as below.

DSW=0 OFSET=0
DSW=1 OFSET=96
DSW=4 OFSET=384
DSW=5 OFSET=480

## Output Equipment Connection Example



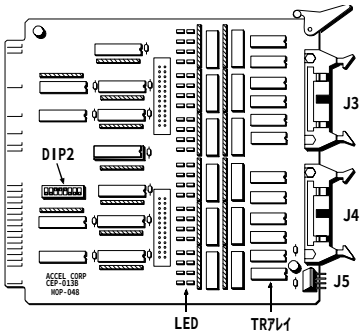

Output control current is 100 mA maximum, and as solenoid valve and relay, those with a diode are used.

## MOP-048 48-Point Output Board

### Specification

| | |
|---|---|
| I/O | 48-point photo-coupler isolated TR open collector output |
| Control current | Maximum 100 mA / 1 output |
| Power supply | DC 5~24 V (for driving the I/O) |
| Consumed current | DC 5V 80 mA (supplied from the bus) |
| Operating temperature | 0~50°C |

### Hardware Construction




Accessories:

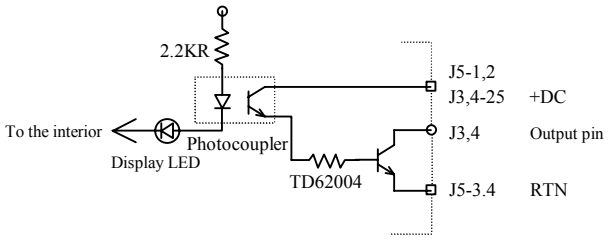
| | | | |
|---|---|---|---|
| Power connector (H4P-SHF-AA) | JST | * 1 | J5 |
| Contact (BHF-001T-0.8SS) | JST | * 4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J3, 4 | HIF-3BA-26PA-2.54DS | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J3, 4 | Output port<br>When the board is #1, the port numbers become 0~23 for J3 and 24~47 for J4. Also, boards #1~4 have 0~191, and boards #5~8 have 384~575. As solenoids and relays, please use those with a surge-killer diode. |
| J5 | I/O-driving power supply<br>Current is concentrated to RTN. Please pay attention to the capacity of wire material. |
| LED1~24 | Output monitor<br>Indicates ON/OFF of the primary side (bus side) of the photocoupler.<br>When the LED is on and the output does not operate, it is possible that the transistor array is damaged. |
| DIP2 | Board address setting<br>At ship-out time, A7~3 are ON. |
| TR array | Output stage is TD62004, using four chips each. |

### Output Circuit Diagram



## Setting, Pin Assignment

J3 Input Port

| | | | |
|---|---|---|---|
| 1 | OFSET+0 | 2 | OFSET+1 |
| 3 | +2 | 4 | +3 |
| 5 | +4 | 6 | +5 |
| 7 | +6 | 8 | +7 |
| 9 | +8 | 10 | +9 |
| 11 | +10 | 12 | +11 |
| 13 | +12 | 14 | +13 |
| 15 | +14 | 16 | +15 |
| 17 | +16 | 18 | +17 |
| 19 | +18 | 20 | +19 |
| 21 | +20 | 22 | +21 |
| 23 | +22 | 24 | +23 |
| 25 | +DC | 26 | RTN |

J4 Output Port

| | | | |
|---|---|---|---|
| 1 | OFSET+24 | 2 | OFSET+25 |
| 3 | +26 | 4 | +27 |
| 5 | +28 | 6 | +29 |
| 7 | +30 | 8 | +31 |
| 9 | +32 | 10 | +33 |
| 11 | +34 | 12 | +35 |
| 13 | +36 | 14 | +37 |
| 15 | +38 | 16 | +39 |
| 17 | +40 | 18 | +41 |
| 19 | +42 | 20 | +43 |
| 21 | +44 | 22 | +45 |
| 23 | +46 | 24 | +47 |
| 25 | +DC | 26 | RTN |

Pin numbers of J3 and J4 are assigned so that a white triangle mark on the connector indicates No. 1 having odd numbers on the chip surface side and even numbers on the solder surface side. Because indication of 1 and 2, and 25 and 26 are silk printed on the board, please check them carefully.

Board No. 1~4 OFSET = (Board No. - 1) * 48

Board No. 5~8 OFSET = (Board No. + 3) * 48

*Signal name () indicates “L” active.

J5 Power Connector

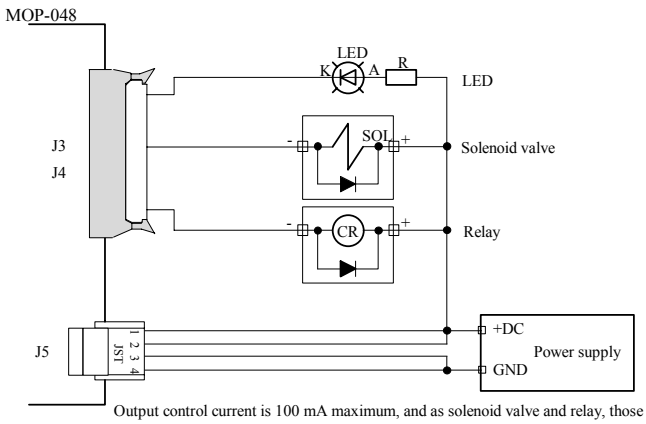
| | |
|---|---|
| 1 | +DC |
| 2 | +DC |
| 3 | RTN |
| 4 | RTN |

Address Setting and Output Port

| Board No. | DIP2 | | | | | | | | Output Port | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A7 | A6 | A5 | A4 | A3 | | IR2 | IR1 | J3 | J4 |
| MOP #1 | ON | ON | ON | ON | ON | - | - | - | 0~ 23 | 24~ 47 |
| #2 | ON | ON | ON | ON | - | - | - | - | 48~ 71 | 72~ 95 |
| #3 | ON | ON | ON | - | ON | - | - | - | 96~119 | 120~143 |
| #4 | ON | ON | ON | - | - | - | - | - | 144~167 | 168~191 |
| #5 | ON | - | ON | ON | ON | - | - | - | 384~407 | 408~431 |
| #6 | ON | - | ON | ON | - | - | - | - | 432~455 | 456~479 |
| #7 | ON | - | ON | - | ON | - | - | - | 480~503 | 504~527 |
| #8 | ON | - | ON | - | - | - | - | - | 528~551 | 552~575 |

(- indicates OFF.)

## Output Equipment Connection Example




Output control current is 100 mA maximum, and as solenoid valve and relay, those with a diode are used.

## MOP-048 Port Number Table

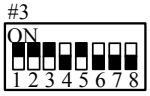
| Connector | | Board Number / Bank Number / Port Number | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pin | #1 | | #2 | | #3 | | #4 | | #5 | | #6 | | #7 | | #8 | |
| J3 Output | 1 | 0 | 0 | 6 | 48 | 12 | 96 | 18 | 144 | 48 | 384 | 54 | 432 | 60 | 480 | 66 | 528 |
| | 2 | | 1 | | 49 | | 97 | | 145 | | 385 | | 433 | | 481 | | 529 |
| | 3 | | 2 | | 50 | | 98 | | 146 | | 386 | | 434 | | 482 | | 530 |
| | 4 | | 3 | | 51 | | 99 | | 147 | | 387 | | 435 | | 483 | | 531 |
| | 5 | | 4 | | 52 | | 100 | | 148 | | 388 | | 436 | | 484 | | 532 |
| | 6 | | 5 | | 53 | | 101 | | 149 | | 389 | | 437 | | 485 | | 533 |
| | 7 | | 6 | | 54 | | 102 | | 150 | | 390 | | 438 | | 486 | | 534 |
| | 8 | | 7 | | 55 | | 103 | | 151 | | 391 | | 439 | | 487 | | 535 |
| | 9 | 1 | 8 | 7 | 56 | 13 | 104 | 19 | 152 | 49 | 392 | 55 | 440 | 61 | 488 | 67 | 536 |
| | 10 | | 9 | | 57 | | 105 | | 153 | | 393 | | 441 | | 489 | | 537 |
| | 11 | | 10 | | 58 | | 106 | | 154 | | 394 | | 442 | | 490 | | 538 |
| | 12 | | 11 | | 59 | | 107 | | 155 | | 395 | | 443 | | 491 | | 539 |
| | 13 | | 12 | | 60 | | 108 | | 156 | | 396 | | 444 | | 492 | | 540 |
| | 14 | | 13 | | 61 | | 109 | | 157 | | 397 | | 445 | | 493 | | 541 |
| | 15 | | 14 | | 62 | | 110 | | 158 | | 398 | | 446 | | 494 | | 542 |
| | 16 | | 15 | | 63 | | 111 | | 159 | | 399 | | 447 | | 495 | | 543 |
| | 17 | 2 | 16 | 8 | 64 | 14 | 112 | 20 | 160 | 50 | 400 | 56 | 448 | 62 | 496 | 68 | 544 |
| | 18 | | 17 | | 65 | | 113 | | 161 | | 401 | | 449 | | 497 | | 545 |
| | 19 | | 18 | | 66 | | 114 | | 162 | | 402 | | 450 | | 498 | | 546 |
| | 20 | | 19 | | 67 | | 115 | | 163 | | 403 | | 451 | | 499 | | 547 |
| | 21 | | 20 | | 68 | | 116 | | 164 | | 404 | | 452 | | 500 | | 548 |
| | 22 | | 21 | | 69 | | 117 | | 165 | | 405 | | 453 | | 501 | | 549 |
| | 23 | | 22 | | 70 | | 118 | | 166 | | 406 | | 454 | | 502 | | 550 |
| | 24 | | 23 | | 71 | | 119 | | 167 | | 407 | | 455 | | 503 | | 551 |
| J4 Input | 1 | 3 | 24 | 9 | 72 | 15 | 120 | 21 | 168 | 51 | 408 | 57 | 456 | 63 | 504 | 69 | 552 |
| | 2 | | 25 | | 73 | | 121 | | 169 | | 409 | | 457 | | 505 | | 553 |
| | 3 | | 26 | | 74 | | 122 | | 170 | | 410 | | 458 | | 506 | | 554 |
| | 4 | | 27 | | 75 | | 123 | | 171 | | 411 | | 459 | | 507 | | 555 |
| | 5 | | 28 | | 76 | | 124 | | 172 | | 412 | | 460 | | 508 | | 556 |
| | 6 | | 29 | | 77 | | 125 | | 173 | | 413 | | 461 | | 509 | | 557 |
| | 7 | | 30 | | 78 | | 126 | | 174 | | 414 | | 462 | | 510 | | 558 |
| | 8 | | 31 | | 79 | | 127 | | 175 | | 415 | | 463 | | 511 | | 559 |
| | 9 | 4 | 32 | 10 | 80 | 16 | 128 | 22 | 176 | 52 | 416 | 58 | 464 | 64 | 512 | 70 | 560 |
| | 10 | | 33 | | 81 | | 129 | | 177 | | 417 | | 465 | | 513 | | 561 |
| | 11 | | 34 | | 82 | | 130 | | 178 | | 418 | | 466 | | 514 | | 562 |
| | 12 | | 35 | | 83 | | 131 | | 179 | | 419 | | 467 | | 515 | | 563 |
| | 13 | | 36 | | 84 | | 132 | | 180 | | 420 | | 468 | | 516 | | 564 |
| | 14 | | 37 | | 85 | | 133 | | 181 | | 421 | | 469 | | 517 | | 565 |
| | 15 | | 38 | | 86 | | 134 | | 182 | | 422 | | 470 | | 518 | | 566 |
| | 16 | | 39 | | 87 | | 135 | | 183 | | 423 | | 471 | | 519 | | 567 |
| | 17 | 5 | 40 | 11 | 88 | 17 | 136 | 23 | 184 | 53 | 424 | 59 | 472 | 65 | 520 | 71 | 568 |
| | 18 | | 41 | | 89 | | 137 | | 185 | | 425 | | 473 | | 521 | | 569 |
| | 19 | | 42 | | 90 | | 138 | | 186 | | 426 | | 474 | | 522 | | 570 |
| | 20 | | 43 | | 91 | | 139 | | 187 | | 427 | | 475 | | 523 | | 571 |
| | 21 | | 44 | | 92 | | 140 | | 188 | | 428 | | 476 | | 524 | | 572 |
| | 22 | | 45 | | 93 | | 141 | | 189 | | 429 | | 477 | | 525 | | 573 |
| | 23 | | 46 | | 94 | | 142 | | 190 | | 430 | | 478 | | 526 | | 574 |
| | 24 | | 47 | | 95 | | 143 | | 191 | | 431 | | 479 | | 527 | | 575 |

DIP2 setting

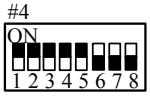
#1


#2

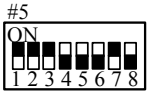

#3



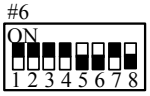

#4



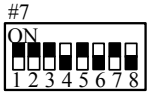

#5



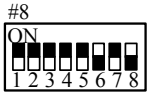

#6




#7




#8

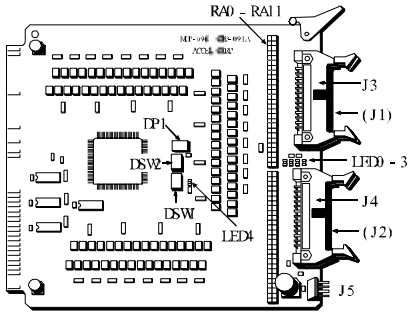



Port numbers are expressed in 1 bit unit and bank numbers in 8 bit unit.
In the ON/OFF command, ON/OFF of 1 bit at a time is done by specifying a port number as a parameter.
In the OUT command, ON/OFF of 8 bits at a time is done by specifying a bank number.

## Specification

| | |
|---|---|
| I/O | 96-point photo-coupler isolated TR open collector input |
| Control current | About 3.5 mA / 1 input |
| Power supply | DC (5)12~24 V (for driving the I/O) |
| Consumed current | DC 5V 100 mA (supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Configuration




Accessories:

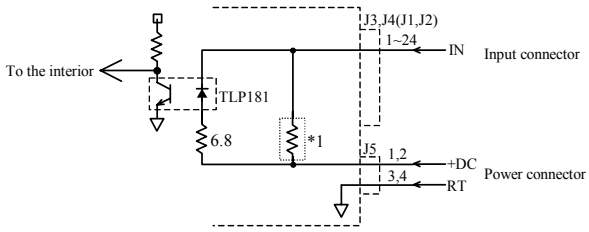
| | | | |
|---|---|---|---|
| Power connector (H4P-SHF-AA) | JST | * 1 | J5 |
| Contact (BHF-001T-0.8SS) | JST | * 4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J3, 4 | J3429-P302VE | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J3, 4 | Input port<br>In the case that DSW is 2, the port number allotted to J3 is 192~215, to J4 216~239, to J1 240~263 and to J2 264~287. |
| J5 | I/O-driving power supply |
| LED0~3(green) | Input port display |
| LED4(Green) | Power supply display LED. |
| RA0~11 | Two-line sensor method sensor compatible SIP socket array |
| DSW1 | Selector of board. Choose one of 2, 3, 6 and 7. |
| DSW2,DP1 | Selector of Input port display. Port display selector. |

## Input Circuit Diagram




socket for a two-line contactless sensor pull-up resister

| Connector / Pin | Socket | Connector / Pin | Socket |
|---|---|---|---|
| J3 1~8 | RA0 | (J1) 1~8 | RA6 |
| J3 9~16 | RA1 | (J1) 9~16 | RA7 |
| J3 17~24 | RA2 | (J1) 17~24 | RA8 |
| J4 1~8 | RA3 | (J2) 1~8 | RA9 |
| J4 9~16 | RA4 | (J2) 9~16 | RA10 |
| J4 17~24 | RA5 | (J2 )17~24 | RA11 |

*At the ship-out time, only a socket for a two-line contactless sensor pull-up resister is mounted.
When using a two-line contactless sensor, please mount a BH9-1-272G equivalent one.

## Setting and Pin Assignment

**J3 Input Port (upper)**

| | | | |
|---|---|---|---|
| 1 | OFSET +0 | 2 | OFSET +1 |
| 3 | OFSET +2 | 4 | OFSET +3 |
| 5 | OFSET +4 | 6 | OFSET +5 |
| 7 | OFSET +6 | 8 | OFSET +7 |
| 9 | OFSET +8 | 10 | OFSET +9 |
| 11 | OFSET +10 | 12 | OFSET +11 |
| 13 | OFSET +12 | 14 | OFSET +13 |
| 15 | OFSET +14 | 16 | OFSET +15 |
| 17 | OFSET +16 | 18 | OFSET +17 |
| 19 | OFSET +18 | 20 | OFSET +19 |
| 21 | OFSET +20 | 22 | OFSET +21 |
| 23 | OFSET +22 | 24 | OFSET +23 |
| 25 | +DC | 26 | RTN |

**J1 Input Port (lower)**

| | | | |
|---|---|---|---|
| 1 | OFSET +48 | 2 | OFSET +49 |
| 3 | OFSET +50 | 4 | OFSET +51 |
| 5 | OFSET +52 | 6 | OFSET +53 |
| 7 | OFSET +54 | 8 | OFSET +55 |
| 9 | OFSET +56 | 10 | OFSET +57 |
| 11 | OFSET +58 | 12 | OFSET +59 |
| 13 | OFSET +60 | 14 | OFSET +61 |
| 15 | OFSET +62 | 16 | OFSET +63 |
| 17 | OFSET +64 | 18 | OFSET +65 |
| 19 | OFSET +66 | 20 | OFSET +67 |
| 21 | OFSET +68 | 22 | OFSET +69 |
| 23 | OFSET +70 | 24 | OFSET +71 |
| 25 | +DC | 26 | RTN |

For the input connector, the white triangle on the connector is number 1, while component side is odd numbers and solder side is even numbers.

Number 25 and 26 pin are equivalent of J5+DC and RTN respectively.

**J4 Input Port (upper)**

| | | | |
|---|---|---|---|
| 1 | OFSET +24 | 2 | OFSET +25 |
| 3 | OFSET +26 | 4 | OFSET +27 |
| 5 | OFSET +28 | 6 | OFSET +29 |
| 7 | OFSET +30 | 8 | OFSET +31 |
| 9 | OFSET +32 | 10 | OFSET +33 |
| 11 | OFSET +34 | 12 | OFSET +35 |
| 13 | OFSET +36 | 14 | OFSET +37 |
| 15 | OFSET +38 | 16 | OFSET +39 |
| 17 | OFSET +40 | 18 | OFSET +41 |
| 19 | OFSET +42 | 20 | OFSET +43 |
| 21 | OFSET +44 | 22 | OFSET +45 |
| 23 | OFSET +46 | 24 | OFSET +47 |
| 25 | +DC | 26 | RTN |

**J2 Input Port (lower)**

| | | | |
|---|---|---|---|
| 1 | OFSET +72 | 2 | OFSET +73 |
| 3 | OFSET +74 | 4 | OFSET +75 |
| 5 | OFSET +76 | 6 | OFSET +77 |
| 7 | OFSET +78 | 8 | OFSET +79 |
| 9 | OFSET +80 | 10 | OFSET +81 |
| 11 | OFSET +82 | 12 | OFSET +83 |
| 13 | OFSET +84 | 14 | OFSET +85 |
| 15 | OFSET +86 | 16 | OFSET +87 |
| 17 | OFSET +88 | 18 | OFSET +89 |
| 19 | OFSET +90 | 20 | OFSET +91 |
| 21 | OFSET +92 | 22 | OFSET +93 |
| 23 | OFSET +94 | 24 | OFSET +95 |
| 25 | +DC | 26 | RTN |

*OFSET compatibility is shown as below.

*According to the settings of DSW2 and DP1, LED1~3 are set to following port display.
DSW2 select bank (every 8 bits) and DP1-1 selects lower 4-bit and upper 4-bit.

| DSW2 | Connector | DP1-1 ON | DP1-1 OFF |
|---|---|---|---|
| 0 | J3 | 1~4 | 5~8 |
| 1 | J3 | 9~12 | 13~16 |
| 2 | J3 | 17~20 | 21~24 |
| 3 | J4 | 1~4 | 5~8 |
| 4 | J4 | 9~12 | 13~16 |
| 5 | J4 | 17~20 | 21~24 |
| 6 | (J1) | 1~4 | 5~8 |
| 7 | (J1) | 9~12 | 13~16 |
| 8 | (J1) | 17~20 | 21~24 |
| 9 | (J2) | 1~4 | 5~8 |
| A | (J2) | 9~12 | 13~16 |
| B | (J2) | 17~20 | 21~24 |

**J5 Power Supply Connector**

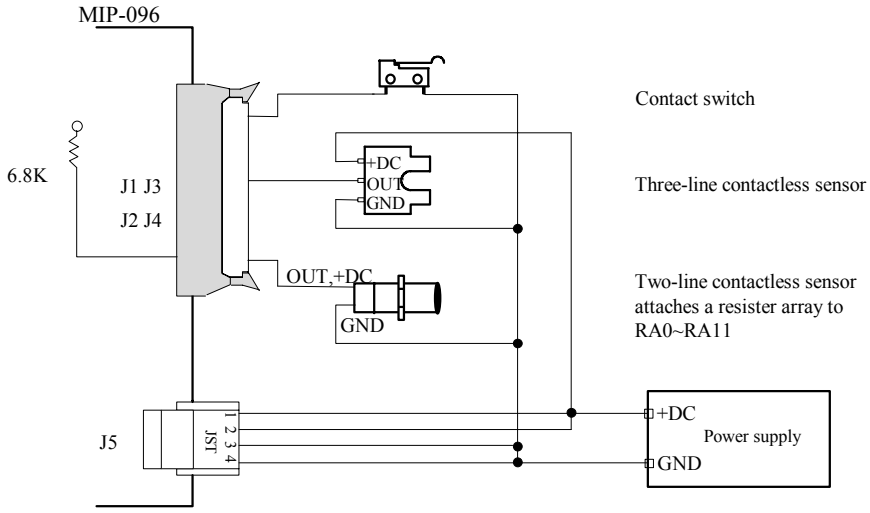
| | |
|---|---|
| 1 | +DC |
| 2 | +DC |
| 3 | RTN |
| 4 | RTN |

**Address Setting(DSW1) and Input Port**

| DSW1 | IO | J3,J4 | (J1,J2) |
|---|---|---|---|
| 2 | 192~287 | MIP-048 #1 | MIP-048 #2 |
| 3 | 288~383 | MIP-048 #3 | MIP-048 #4 |
| 6 | 576~671 | MIP-048 #5 | MIP-048 #6 |
| 7 | 672~767 | MIP-048 #7 | MIP-048 #8 |

*For pin assignment and input numbers, refer to “MIP-048 Port Number Table”.

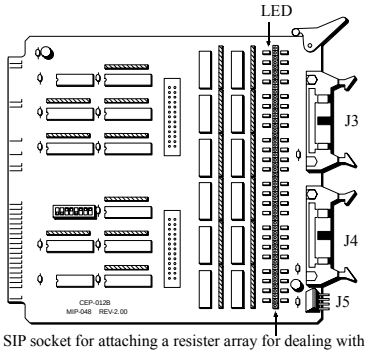
## Output Equipment Connection Example



## Specification

| | |
|---|---|
| I/O | 48-point photo-coupler isolated input |
| Input current | About 2 mA / 1 input |
| Power supply | DC (5)12~24 V (for driving the I/O) |
| Consumed current | DC 5V 30 mA (supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Construction



SIP socket for attaching a resister array for dealing with a sensor

Accessories:

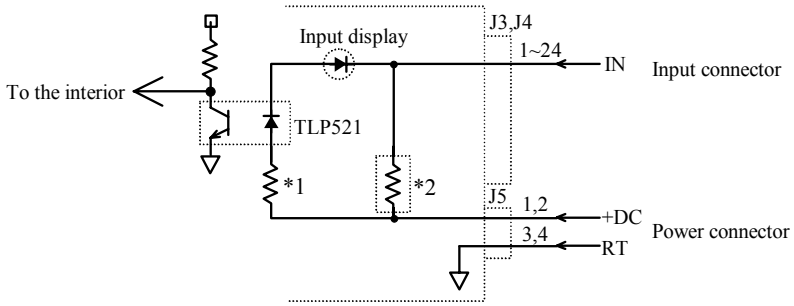
| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J3, 4 | HIF-3BA-26PA-2.54DS | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J3, 4 | Input port<br>When the board is #1, the port numbers become 192~215 for J3 and 216~239 for J4. Also, boards #1~4 have 192~383, and boards #5~8 have 576~767. |
| J5 | I/O-driving power supply |
| LED1~24 | Input monitor<br>Indicates ON/OFF of the secondary side (connector side) of the photocoupler. |
| DIP2 | Board address setting<br>IR1 Hands over an interrupt input to the CPU board (J4-1 input).<br>IR2 Hands over an interrupt input to the CPU board (J4-2 input). |
| RA9~20 | Input current limiting resister array<br>When using the I/O interface power supply at 5 V, the resister array should be replaced (6.8 kΩ standard). |
| RA21~26 | An SIP socket for mounting a resister array to deal with two-line contactless sensor. |

## Input Circuit Diagram




*1 RAD is replaceable with the SIP socket (6.8 KΩ standard).

*2 At the ship-out time, only a socket for a two-line contactless sensor pull-up resister is mounted.
When using a two-line contactless sensor, please mount a BH9-1-272G equivalent one.

## Setting, Pin Assignment

J3 Input Port

| | | | |
|---|---|---|---|
| 1 | OFSET+0 | 2 | OFSET+1 |
| 3 | +2 | 4 | +3 |
| 5 | +4 | 6 | +5 |
| 7 | +6 | 8 | +7 |
| 9 | +8 | 10 | +9 |
| 11 | +10 | 12 | +11 |
| 13 | +12 | 14 | +13 |
| 15 | +14 | 16 | +15 |
| 17 | +16 | 18 | +17 |
| 19 | +18 | 20 | +19 |
| 21 | +20 | 22 | +21 |
| 23 | +22 | 24 | +23 |
| 25 | +DC | 26 | RTN |

J4 Output Port

| | | | |
|---|---|---|---|
| 1 | OFSET+24 | 2 | OFSET+25 |
| 3 | +26 | 4 | +27 |
| 5 | +28 | 6 | +29 |
| 7 | +30 | 8 | +31 |
| 9 | +32 | 10 | +33 |
| 11 | +34 | 12 | +35 |
| 13 | +36 | 14 | +37 |
| 15 | +38 | 16 | +39 |
| 17 | +40 | 18 | +41 |
| 19 | +42 | 20 | +43 |
| 21 | +44 | 22 | +45 |
| 23 | +46 | 24 | +47 |
| 25 | +DC | 26 | RTN |

Pin numbers of J3 and J4 are assigned so that a white triangle mark on the connector indicates No. 1 having odd numbers on the chip surface side and even numbers on the solder surface side. Because indication of 1 and 2, and 25 and 26 are silk printed on the board, please check them carefully.

Board No. 1~4 OFSET = (Board No. - 1) * 48
Board No. 5~8 OFSET = (Board No. + 3) * 48

J5 Power Connector

| | |
|---|---|
| 1 | +DC |
| 2 | +DC |
| 3 | RTN |
| 4 | RTN |

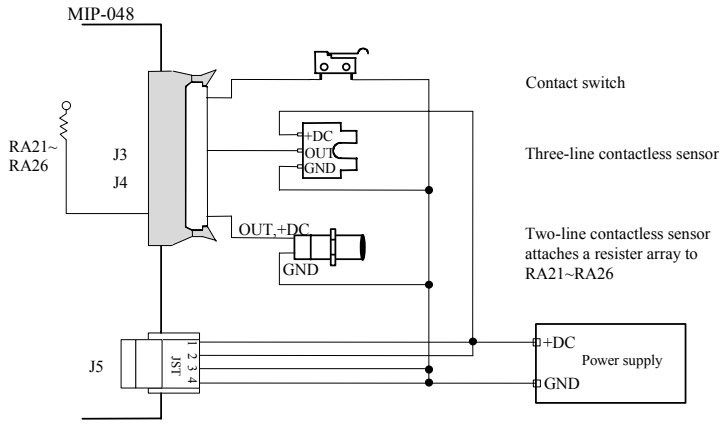
*Signal name () indicates “L” active.

Address Setting and Input Port

| Board No. | DIP2 | | | | | | | | Input Port | |
|---|---|---|---|---|---|---|---|---|---|---|
| | A7 | A6 | A5 | A4 | A3 | | IR2 | IR1 | J3 | J4 |
| MIP #1 | ON | ON | - | ON | ON | - | - | - | 192~215 | 216~239 |
| #2 | ON | ON | - | ON | - | - | - | - | 240~263 | 264~287 |
| #3 | ON | ON | - | - | ON | - | - | - | 288~311 | 312~335 |
| #4 | ON | ON | - | - | - | - | - | - | 336~359 | 360~383 |
| #5 | ON | - | - | ON | ON | - | - | - | 576~599 | 600~623 |
| #6 | ON | - | - | ON | - | - | - | - | 624~647 | 648~671 |
| #7 | ON | - | - | - | ON | - | - | - | 672~695 | 696~719 |
| #8 | ON | - | - | - | - | - | - | - | 720~743 | 744~767 |

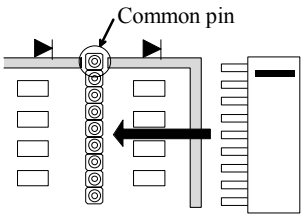
(- indicates OFF.)

## Input Equipment Connection Example



## Connection of Two-Line Contactless Sensor

Direction of resister array




Resister Array Comparison

| Socket | Pin No. | Connector |
|---|---|---|
| RA21 | 1~8 | J3 |
| RA22 | 9~16 | |
| RA23 | 17~24 | |
| RA24 | 1~8 | J4 |
| RA25 | 9~16 | |
| RA26 | 17~24 | |

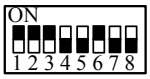
The SIP socket mounted between input display LEDs corresponds to a two-line sensor, where a pull-up resister can be attached. There are six resister array sockets prepared, and each resister array is inserted to the socket corresponding to a port connected to a two-line sensor. For the relationship between port and sockets, see the table below. Even if a pull-up resister is connected, three-line sensor has no problem. As the resister array for pull-up, a 1/4W-type of about 3K (Toshiba Beckman BH9-1-272G etc.) should be used. If obtaining such a resister array is difficult, please order it at our business department. By the way, when inserting an resister array, please pay attention to the position of the common pin. The common pin should be inserted to the position on the PCB power pattern.

## MIP-048 Port Number Table

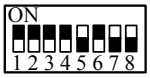
| Connector | Pin | Board Number / Bank Number / Port Number | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | #1 | #2 | #3 | #4 | #5 | #6 | #7 | #8 |
| J3 | 1 | 192 | 240 | 288 | 336 | 576 | 624 | 672 | 720 |
| | 2 | 193 | 241 | 289 | 337 | 577 | 625 | 673 | 721 |
| | 3 | 194 | 242 | 290 | 338 | 578 | 626 | 674 | 722 |
| | 4 | 24 195 | 30 243 | 36 291 | 42 339 | 72 579 | 78 627 | 84 675 | 90 723 |
| | 5 | 196 | 244 | 292 | 340 | 580 | 628 | 676 | 724 |
| | 6 | 197 | 245 | 293 | 341 | 581 | 629 | 677 | 725 |
| | 7 | 198 | 246 | 294 | 342 | 582 | 630 | 678 | 726 |
| | 8 | 199 | 247 | 295 | 343 | 583 | 631 | 679 | 727 |
| | 9 | 200 | 248 | 296 | 344 | 584 | 632 | 680 | 728 |
| | 10 | 201 | 249 | 297 | 345 | 585 | 633 | 681 | 729 |
| | 11 | 202 | 250 | 298 | 346 | 586 | 634 | 682 | 730 |
| | 12 | 25 203 | 31 251 | 37 299 | 43 347 | 73 587 | 79 635 | 85 683 | 91 731 |
| | 13 | 204 | 252 | 300 | 348 | 588 | 636 | 684 | 732 |
| | 14 | 205 | 253 | 301 | 349 | 589 | 637 | 685 | 733 |
| | 15 | 206 | 254 | 302 | 350 | 590 | 638 | 686 | 734 |
| | 16 | 207 | 255 | 303 | 351 | 591 | 639 | 687 | 735 |
| | 17 | 208 | 256 | 304 | 352 | 592 | 640 | 688 | 736 |
| | 18 | 209 | 257 | 305 | 353 | 593 | 641 | 689 | 737 |
| | 19 | 210 | 258 | 306 | 354 | 594 | 642 | 690 | 738 |
| | 20 | 26 211 | 32 259 | 38 307 | 44 355 | 74 595 | 80 643 | 86 691 | 92 739 |
| | 21 | 212 | 260 | 308 | 356 | 596 | 644 | 692 | 740 |
| | 22 | 213 | 261 | 309 | 357 | 597 | 645 | 693 | 741 |
| | 23 | 214 | 262 | 310 | 358 | 598 | 646 | 694 | 742 |
| | 24 | 215 | 263 | 311 | 359 | 599 | 647 | 695 | 743 |
| J4 | 1 | 216 | 264 | 312 | 360 | 600 | 648 | 696 | 744 |
| | 2 | 217 | 265 | 313 | 361 | 601 | 649 | 697 | 745 |
| | 3 | 218 | 266 | 314 | 362 | 602 | 650 | 698 | 746 |
| | 4 | 27 219 | 33 267 | 39 315 | 45 363 | 75 603 | 81 651 | 87 699 | 93 747 |
| | 5 | 220 | 268 | 316 | 364 | 604 | 652 | 700 | 748 |
| | 6 | 221 | 269 | 317 | 365 | 605 | 653 | 701 | 749 |
| | 7 | 222 | 270 | 318 | 366 | 606 | 654 | 702 | 750 |
| | 8 | 223 | 271 | 319 | 367 | 607 | 655 | 703 | 751 |
| | 9 | 224 | 272 | 320 | 368 | 608 | 656 | 704 | 752 |
| | 10 | 225 | 273 | 321 | 369 | 609 | 657 | 705 | 753 |
| | 11 | 226 | 274 | 322 | 370 | 610 | 658 | 706 | 754 |
| | 12 | 28 227 | 34 275 | 40 323 | 46 371 | 76 611 | 82 659 | 88 707 | 94 755 |
| | 13 | 228 | 276 | 324 | 372 | 612 | 660 | 708 | 756 |
| | 14 | 229 | 277 | 325 | 373 | 613 | 661 | 709 | 757 |
| | 15 | 230 | 278 | 326 | 374 | 614 | 662 | 710 | 758 |
| | 16 | 231 | 279 | 327 | 375 | 615 | 663 | 711 | 759 |
| | 17 | 232 | 280 | 328 | 376 | 616 | 664 | 712 | 760 |
| | 18 | 233 | 281 | 329 | 377 | 617 | 665 | 713 | 761 |
| | 19 | 234 | 282 | 330 | 378 | 618 | 666 | 714 | 762 |
| | 20 | 29 235 | 35 283 | 41 331 | 47 379 | 77 619 | 83 667 | 89 715 | 95 763 |
| | 21 | 236 | 284 | 332 | 380 | 620 | 668 | 716 | 764 |
| | 22 | 237 | 285 | 333 | 381 | 621 | 669 | 717 | 765 |
| | 23 | 238 | 286 | 334 | 382 | 622 | 670 | 718 | 766 |
| | 24 | 239 | 287 | 335 | 383 | 623 | 671 | 719 | 767 |

DIP2 setting

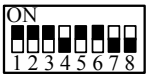
#1



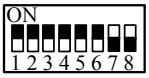

#2



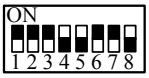

#3



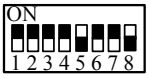

#4



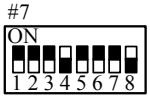

#5



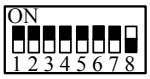

#6




#7




#8

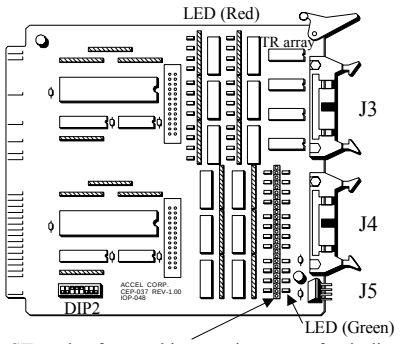



Port numbers are expressed in 1 bit unit and bank numbers in 8 bit unit.
In the SW() function, input is done by 1 bit at a time by specifying a port number as a parameter.
In the IN() command, 8 bits are input at once by specifying a bank number.

## Specification

| | |
|---|---|
| I/O | 24-point photo-coupler isolated input |
| | 24-point photo-coupler isolated TR open collector output |
| Output control current | Maximum 100 mA / 1 output |
| Input current | About 2 mA / 1 input |
| Power supply | DC (5)12~24 V (for driving the I/O) |
| Consumed current | DC 5V 50 mA (supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Construction




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J3, 4 | HIF-3BA-26PA-2.54DS | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J3 | Output port |
| J4 | Input port |
| | IOP-048 inherits MOP-048. |
| | The port numbers are in the same arrangement with MOP, the first 24 ports being output, the latter 24 ports being input. |
| J5 | I/O-driving power supply |
| LED1~24 (Red) | Output monitor |
| | Indicates ON/OFF of the primary side (bus side) of the photocoupler. |
| | If LED is on and output does not function, it is possible that the transistor array is damaged. |
| LED1~24 (Green) | Input monitor |
| | Indicates ON/OFF of the secondary side (connector side) of the photocoupler. |
| DIP2 | Board address setting |
| | The same address with MOP. Please set it so that it does not overlap with MOP. |
| | A7~3 are ON when shipped out. |
| RA15~20 | Input current limiting resister array |
| | When using the I/O interface power supply at 5 V, the resister array should be replaced (6.8 kΩ standard). |
| RA24~26 | An SIP socket for mounting a resister array to deal with two-line contactless sensor. |
| TR array | Output stage is TD62004, using four chips each. |

## Input Circuit Diagram

Input circuit is equivalent with MIP-048, and output circuit with MIP-048.

## Setting, Pin Assignment

J3 Output Port

| | | | |
|---|---|---|---|
| 1 | OFSET +0 | 2 | OFSET +1 |
| 3 | +2 | 4 | +3 |
| 5 | +4 | 6 | +5 |
| 7 | +6 | 8 | +7 |
| 9 | +8 | 10 | +9 |
| 11 | +10 | 12 | +11 |
| 13 | +12 | 14 | +13 |
| 15 | +14 | 16 | +15 |
| 17 | +16 | 18 | +17 |
| 19 | +18 | 20 | +19 |
| 21 | +20 | 22 | +21 |
| 23 | +22 | 24 | +23 |
| 25 | +DC | 26 | RTN |

J4 Input Port

| | | | |
|---|---|---|---|
| 1 | OFSET+24 | 2 | OFSET+25 |
| 3 | +26 | 4 | +27 |
| 5 | +28 | 6 | +29 |
| 7 | +30 | 8 | +31 |
| 9 | +32 | 10 | +33 |
| 11 | +34 | 12 | +35 |
| 13 | +36 | 14 | +37 |
| 15 | +38 | 16 | +39 |
| 17 | +40 | 18 | +41 |
| 19 | +42 | 20 | +43 |
| 21 | +44 | 22 | +45 |
| 23 | +46 | 24 | +47 |
| 25 | +DC | 26 | RTN |

Pin numbers of J3 and J4 are assigned so that a white triangle mark on the connector indicates No. 1 having odd numbers on the chip surface side and even numbers on the solder surface side. Because indication of 1 and 2, and 25 and 26 are silk printed on the board, please check them carefully.

Board No. 1~4 OFSET = (Board No. - 1) * 48
Board No. 5~8 OFSET = (Board No. + 3) * 48

J5 Power Connector

*Signal name () indicates “L” active.

| | |
|---|---|
| 1 | +DC |
| 2 | +DC |
| 3 | RTN |
| 4 | RTN |

Address Setting and Input Port

| Board No. | DIP2 | | | | | | | | J3 | J4 |
|---|---|---|---|---|---|---|---|---|---|---|
| | A7 | A6 | A5 | A4 | A3 | | IR2 | IR1 | Output | Input |
| MOP #1 | ON | ON | ON | ON | ON | - | - | - | 0~ 23 | 24~ 47 |
| #2 | ON | ON | ON | ON | - | - | - | - | 48~ 71 | 72~ 95 |
| #3 | ON | ON | ON | - | ON | - | - | - | 96~119 | 120~143 |
| #4 | ON | ON | ON | - | - | - | - | - | 144~167 | 168~191 |
| #5 | ON | - | ON | ON | ON | - | - | - | 384~407 | 408~431 |
| #6 | ON | - | ON | ON | - | - | - | - | 432~455 | 456~479 |
| #7 | ON | - | ON | - | ON | - | - | - | 480~503 | 504~527 |
| #8 | ON | - | ON | - | - | - | - | - | 528~551 | 552~575 |

(- indicates OFF.)

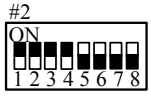
## IOP-048 Port Number Table

| Connector | | Board Number / Bank Number / Port Number | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pin | #1 | | #2 | | #3 | | #4 | | #5 | | #6 | | #7 | | #8 | |
| J3 Output | 1 | 0 | 0 | 6 | 48 | 12 | 96 | 18 | 144 | 48 | 384 | 54 | 432 | 60 | 480 | 66 | 528 |
| | 2 | | 1 | | 49 | | 97 | | 145 | | 385 | | 433 | | 481 | | 529 |
| | 3 | | 2 | | 50 | | 98 | | 146 | | 386 | | 434 | | 482 | | 530 |
| | 4 | | 3 | | 51 | | 99 | | 147 | | 387 | | 435 | | 483 | | 531 |
| | 5 | | 4 | | 52 | | 100 | | 148 | | 388 | | 436 | | 484 | | 532 |
| | 6 | | 5 | | 53 | | 101 | | 149 | | 389 | | 437 | | 485 | | 533 |
| | 7 | | 6 | | 54 | | 102 | | 150 | | 390 | | 438 | | 486 | | 534 |
| | 8 | | 7 | | 55 | | 103 | | 151 | | 391 | | 439 | | 487 | | 535 |
| | 9 | 1 | 8 | 7 | 56 | 13 | 104 | 19 | 152 | 49 | 392 | 55 | 440 | 61 | 488 | 67 | 536 |
| | 10 | | 9 | | 57 | | 105 | | 153 | | 393 | | 441 | | 489 | | 537 |
| | 11 | | 10 | | 58 | | 106 | | 154 | | 394 | | 442 | | 490 | | 538 |
| | 12 | | 11 | | 59 | | 107 | | 155 | | 395 | | 443 | | 491 | | 539 |
| | 13 | | 12 | | 60 | | 108 | | 156 | | 396 | | 444 | | 492 | | 540 |
| | 14 | | 13 | | 61 | | 109 | | 157 | | 397 | | 445 | | 493 | | 541 |
| | 15 | | 14 | | 62 | | 110 | | 158 | | 398 | | 446 | | 494 | | 542 |
| | 16 | | 15 | | 63 | | 111 | | 159 | | 399 | | 447 | | 495 | | 543 |
| | 17 | 2 | 16 | 8 | 64 | 14 | 112 | 20 | 160 | 50 | 400 | 56 | 448 | 62 | 496 | 68 | 544 |
| | 18 | | 17 | | 65 | | 113 | | 161 | | 401 | | 449 | | 497 | | 545 |
| | 19 | | 18 | | 66 | | 114 | | 162 | | 402 | | 450 | | 498 | | 546 |
| | 20 | | 19 | | 67 | | 115 | | 163 | | 403 | | 451 | | 499 | | 547 |
| | 21 | | 20 | | 68 | | 116 | | 164 | | 404 | | 452 | | 500 | | 548 |
| | 22 | | 21 | | 69 | | 117 | | 165 | | 405 | | 453 | | 501 | | 549 |
| | 23 | | 22 | | 70 | | 118 | | 166 | | 406 | | 454 | | 502 | | 550 |
| | 24 | | 23 | | 71 | | 119 | | 167 | | 407 | | 455 | | 503 | | 551 |
| J4 Input | 1 | 3 | 24 | 9 | 72 | 15 | 120 | 21 | 168 | 51 | 408 | 57 | 456 | 63 | 504 | 69 | 552 |
| | 2 | | 25 | | 73 | | 121 | | 169 | | 409 | | 457 | | 505 | | 553 |
| | 3 | | 26 | | 74 | | 122 | | 170 | | 410 | | 458 | | 506 | | 554 |
| | 4 | | 27 | | 75 | | 123 | | 171 | | 411 | | 459 | | 507 | | 555 |
| | 5 | | 28 | | 76 | | 124 | | 172 | | 412 | | 460 | | 508 | | 556 |
| | 6 | | 29 | | 77 | | 125 | | 173 | | 413 | | 461 | | 509 | | 557 |
| | 7 | | 30 | | 78 | | 126 | | 174 | | 414 | | 462 | | 510 | | 558 |
| | 8 | | 31 | | 79 | | 127 | | 175 | | 415 | | 463 | | 511 | | 559 |
| | 9 | 4 | 32 | 10 | 80 | 16 | 128 | 22 | 176 | 52 | 416 | 58 | 464 | 64 | 512 | 70 | 560 |
| | 10 | | 33 | | 81 | | 129 | | 177 | | 417 | | 465 | | 513 | | 561 |
| | 11 | | 34 | | 82 | | 130 | | 178 | | 418 | | 466 | | 514 | | 562 |
| | 12 | | 35 | | 83 | | 131 | | 179 | | 419 | | 467 | | 515 | | 563 |
| | 13 | | 36 | | 84 | | 132 | | 180 | | 420 | | 468 | | 516 | | 564 |
| | 14 | | 37 | | 85 | | 133 | | 181 | | 421 | | 469 | | 517 | | 565 |
| | 15 | | 38 | | 86 | | 134 | | 182 | | 422 | | 470 | | 518 | | 566 |
| | 16 | | 39 | | 87 | | 135 | | 183 | | 423 | | 471 | | 519 | | 567 |
| | 17 | 5 | 40 | 11 | 88 | 17 | 136 | 23 | 184 | 53 | 424 | 59 | 472 | 65 | 520 | 71 | 568 |
| | 18 | | 41 | | 89 | | 137 | | 185 | | 425 | | 473 | | 521 | | 569 |
| | 19 | | 42 | | 90 | | 138 | | 186 | | 426 | | 474 | | 522 | | 570 |
| | 20 | | 43 | | 91 | | 139 | | 187 | | 427 | | 475 | | 523 | | 571 |
| | 21 | | 44 | | 92 | | 140 | | 188 | | 428 | | 476 | | 524 | | 572 |
| | 22 | | 45 | | 93 | | 141 | | 189 | | 429 | | 477 | | 525 | | 573 |
| | 23 | | 46 | | 94 | | 142 | | 190 | | 430 | | 478 | | 526 | | 574 |
| | 24 | | 47 | | 95 | | 143 | | 191 | | 431 | | 479 | | 527 | | 575 |

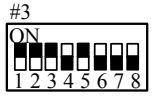
DIP2 setting

#1

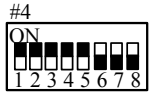

#2




#3

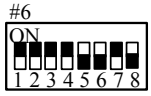



#4

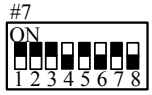



#5

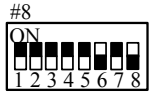

#6




#7



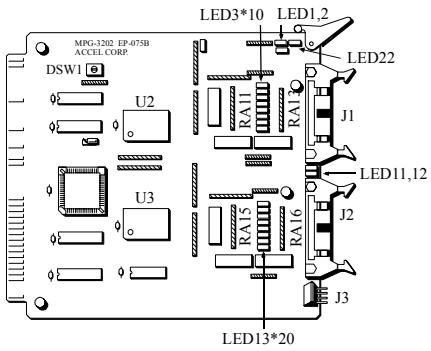

#8



## Specification (* indicates per one X3202)

| | |
|---|---|
| PG IC | X3202: 2 pieces |
| Pulse generation* | 1-axis differential output Maximum 1 Mpps ~ Minimum 0.1 pps |
| Z-phase input* | 1 channel |
| Encoder input* | 1 channel 2 clock, 90° phase difference 2-phase clock 1,2,4 times |
| Input* | Origin sensor, driver alarm, etc. (Total 8 points) |
| Output* | Servo on, servo driver variation counter clear, etc. (Total 4 points) |
| Number of supported MPCs | 8 pieces (16 axes) |
| Power supply | DC 12~24 V (for driving the I/O) |
| Consumed current | DC 5V 200 mA.(supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Construction




Accessories:

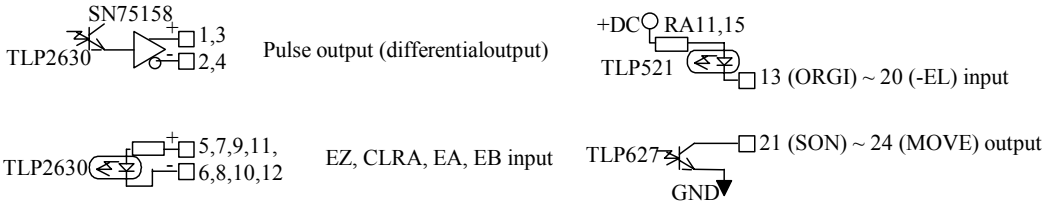
| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J3 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J3 |

Mounted connectors

| | | |
|---|---|---|
| J1, J2 | HIF-3BA-26PA-2.54DS | Hirose |
| J3 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J1, 2 | Pulse output, Z-phase input, encoder input, other I/Os |
| J3 | I/O driving power |
| RA11, RA15 | Shunt resister for sensor input. Please change upon necessity. At factory ship-out, 6.8 KΩ is inserted. |
| RA13, RA16 | An SIP socket compatible with a two-line sensor containing an amplifier. When using it, please insert a resister array of about 2.7 KΩ 1/4 W. |
| LED22 | Power supply monitor |
| LED1,2,11,12 | Pulse output monitor |
| LED3~10,13~20 | Input monitor |
| | LED3,13 ORGI LED4,14 ALM LED5,15 +SLD LED6,16 -SLD |
| | LED7,17 INP LED8,18 MARK LED9,19 +EL LED10,20 -EL |
| DSW1 | Board address setting (Odd numbers only from 1) |

## Pulse and I/O Circuits




(1) J1, J2: Pulse Output/Input

| | | | |
|---|---|---|---|
| 1 | CW(+) | 2 | CW(-) |
| 3 | CCW(+) | 4 | CCW(-) |
| 5 | EZ(+) | 6 | EZ(-) |
| 7 | CLRA(+) | 8 | CLRA(-) |
| 9 | EA(+) | 10 | EA(-) |
| 11 | EB(+) | 12 | EB(-) |
| 13 | ORGI | 14 | ALM |
| 15 | +SLD | 16 | -SLD |
| 17 | INP | 18 | MARK |
| 19 | +EL | 20 | -EL |
| 21 | SON | 22 | CLR |
| 23 | ERR | 24 | MOVE |
| 25 | SG | 26 | +DC |

(2) J3 : Power Connector

| | | | |
|---|---|---|---|
| 1 | +VCC | 2 | +VCC |
| 3 | GND | 4 | GND |

## Pin Assignment, Connection Example

(3) X3202 Address

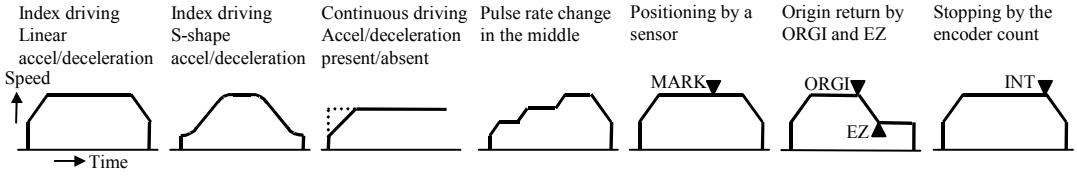
X3202 addresses are set by DSW1.
Please set them so that there is no duplicate.

| DSW1 | X3202 address | Status register address |
|---|---|---|
| 1 | &H100,&H200 | -1,-2 |
| 3 | &H300,&H400 | -3,-4 |
| 5 | &H500,&H600 | -5,-6 |
| 7 | &H700,&H800 | -7,-8 |
| 9 | &H900,&HA00 | -9,-10 |
| B | &HB00,&HC00 | -11,-12 |
| D | &HD00,&HE00 | -13,-14 |
| F | &HF00,&H1000 | -15,-16 |

## Concerning X3202 (from “Introduction” in X3202 User’s Manual)

X3202 is a pulse-generation LSI having objectives of speed control and positioning control of pulse-array input type servo motors and stepping motors. In its internal structure, it is equipped with an S-shape or linear acceleration/deceleration pulse generator, an automatic deceleration point calculator for quadrilateral or triangular driving, a two-phase clock converter for input from a multi-counter usable as a current-position counter or a deviation counter, an origin-return sensor interface, a limit sensor interface, a servo driver interface, an 8-bit general input, and an 8-bit general output.
(General input/output cannot be used in MPG-3202.)

## Driving Examples




## Program Examples

Index driving Linear accel/deceleration

```
ST_REG &H100 250        /* Frequency magnification
ST_REG &H101 1000       /* Number of output pulses
ST_REG &H103 100        /* Starting frequency
ST_REG &H104 2000       /* Maximum frequency
ST_REG &H105 100        /* Acceleration rate
ST_REG &H106 100        /* Deceleration rate
CMND &H1A0              /* Operation complete flag reset
CMND &H100              /* Index driving (+) execution
WAIT REG(-1)=&H20
```

Index driving S-shape accel/deceleration

```
ST_REG &H100 250        /* Frequency magnification
ST_REG &H101 1000       /* Number of output pulses
ST_REG &H103 100        /* Starting frequency
ST_REG &H104 2000       /* Acceleration rate
ST_REG &H105 100        /* Deceleration rate
ST_REG &H106 100        /* S-shape accel/deceleration section
ST_REG &H107 2000       /* Operation mode = S-shape accel/deceration mode
ST_REG &H160 &H10       /* Operation complete flag reset
CMND &H1A0              /* Index driving (+) execution
CMND &H100
WAIT REG(-1)=&H20
```

Continuous driving  Pulse rate change in the middle

```
ST_REG &H100 250        /* Frequency magnification
ST_REG &H103 100        /* Starting frequency
ST_REG &H104 1000       /* Maximum frequency
ST_REG &H105 100        /* Acceleration rate
ST_REG &H106 100        /* Deceleration rate
CMND &H1A0              /* Operation complete flag reset
CMND &H106              /* Continuous driving (+) execution
INPUT A                 /* FTM waiting for the Enter key
ST_REG &H104 2000       /* Changing the maximum frequency
INPUT A
CMND &H131              /* Stop deceleration
```

Rotary encoder count

```
ST_REG &H151 &H03       /* Two-phase clock 1 multiplication
ST_REG &H152 &H02       /* Counter A = Channel 1
CMND &H150              /* Operation complete flag reset
DO
  E0=REG(&H121)         */ Reading counter A
  IF E0&&H800000<>0 THEN
    E0=E0-&HFFFFFF
  END_IF
  PRINT E0
  TIME 500
LOOP
```

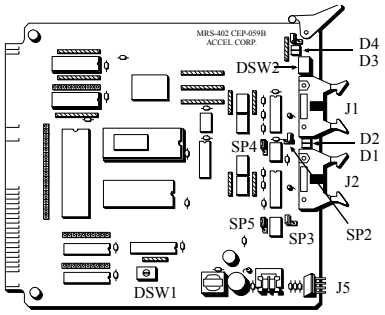
[Cited references]  Kyopal X3202 User's Manual was referred to in making this document.

[Detailed materials]  Please see "MPG-3202 Detailed Manual" for connection examples, sample programs, and X3202 commands/registers.

## Specification

| | |
|---|---|
| CPU | KL5C80A |
| ROM | FR4M: 1 piece |
| RAM | HM62256PL-12 equivalent: 1 piece |
| RS-232C | Photo-coupler isolated 2 CH. RS-485 switchable. |
| Input buffer | 1K byte / 1CH |
| Power supply | DC 12~24 V |
| Consumed current | DC 5V, 50 mA.(supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Construction




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J5 |

Mounted connectors

| | | |
|---|---|---|
| J1, J2 | HIF-3BD-10PA-2.54DS | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J1, J2 | RS-232C ports |
| J5 | I/F power supply |
| D1, 3 (Red) | Input buffer with characters |
| D2 (Green) | Power supply display |
| D4 (Green) | Operation display |
| DSW1 | Rotary switch for setting addresses |
| DSW2 | Rotary switch for maintenance |
| SP2~5 | Short pin for switching RS-232C/485 |

## Setting

(1) Board Address Setting and Channel Numbers

| Board address | DSW1 setting | J1 channel | J2 channel |
|---|---|---|---|
| 1 | 9 | 3 | 4 |
| 2 | 8 | 5 | 6 |
| 3 | 7 | 7 | 8 |

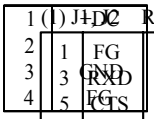
(2) RS-232C/485 Switching
Short pin setting

| | RS-232C *1 | RS-485 |
|---|---|---|
| J1 | SP4: 1-2 shorted<br>SP2: Open | SP4: 1-3 shorted *2<br>SP2: Terminator *3 |
| J2 | SP5: 1-2 shorted<br>SP3: Open | SP5: 1-3 shorted<br>SP3: Terminator |

*1 indicates the condition when shipped out of factory.
*2 SP4,5: 1-3 short is done by breaking the pin 2 and using the short pin of SP2, 3.
*3 Terminator ON of SP2, 3 is done using the 2P short pin of SP4, 5.

## Pin Assignment

(2) J5 Power Connector




(1) J1 DC RS-232C Port

| | | | |
|---|---|---|---|
| 1 | FG | 2 | TXD |
| 3 | RXD | 4 | RTS |
| 5 | CTS | 6 | NC |
| 7 | SG | 8 | DA |
| 9 | DB | 10 | DTR |

* DB, DA indicate the case of SR-485.

*When 485 is used, 5-10 shorted.

## Command Support

Commands of MRS-402 are expanded commands of the standard port.
Please specify the channel number set by DSW1 at the number portion of each command.

CNFG#n, INPUT#n, PRINT#n, INP$#n()¥, PUT#n, LOF(n), RSE(n) , RS n

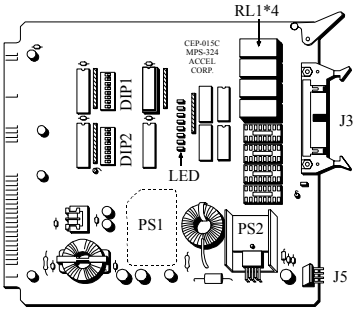
n = Channel number

## MPS-324 DC 5V 3A Power Supply Board

### Specification

| | |
|---|---|
| Power supply | DC 24V ± 10% |
| 5V supply capability | 3A |
| Relay output | 4 points (Maximum 8 points) Mounted product Omron G5V-2 |
| Operating temperature | 0~50°C |

### Hardware Construction




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J5 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J5 |
| (3) Connector (HIF-3BA-34D-2.54R) | Hirose | *1 | J3 |

Mounted connectors

| | | |
|---|---|---|
| J3 | HIF-3BA-34PA-2.54DS | Hirose |
| J5 | BS4P-SHF-1AA | JST |

| | |
|---|---|
| J3 | Relay output |
| J5 | Power supply |
| PS1 | ±12V DC-DC converter (User mounting) |
| PS2 | 5V 3A switching regulator |
| LED | Indicates status of relays RL1~RL8 |
| RL1~4 | Relays already mounted as standard (Omron G5V-2) |
| RL5~8 | Relays mounted by user (Omron G5V-2, Matsushita AG2024) |
| DIP1 | Determines the upper side of the board address.<br>* A15~A8 are all ON when shipped. |
| DIP2 | Determines the lower side of the board address.<br>* CPUENB and A3~A6 are ON and all others are OFF when shipped. |

## Pin Assignment Table

J3 Relay Output Connector

| | | | |
|---|---|---|---|
| 1 | RL1-C1 | 2 | RL1-NO1 |
| 3 | RL1-C2 | 4 | RL1-NO2 |
| 5 | RL2-C1 | 6 | RL2-NO1 |
| 7 | RL2-C2 | 8 | RL2-NO2 |
| 9 | RL3-C1 | 10 | RL3-NO1 |
| 11 | RL3-C2 | 12 | RL3-NO2 |
| 13 | RL4-C1 | 14 | RL4-NO1 |
| 15 | RL4-C2 | 16 | RL4-NO2 |
| 17 | RL5-C1 | 18 | RL5-NO1 |
| 19 | RL5-C2 | 20 | RL5-NC2 |
| 21 | RL6-C1 | 22 | RL6-NO1 |
| 23 | RL6-C2 | 24 | RL6-NC2 |
| 25 | RL7-C1 | 26 | RL7-NO1 |
| 27 | RL7-C2 | 28 | RL7-NC2 |
| 29 | RL8-C1 | 30 | RL8-NO1 |
| 31 | RL8-C2 | 32 | RL8-NC2 |
| 33 | NC | 34 | NC |

* NO1, NO2 = Normal open contact.
NC1, NC2 = Normal closed contact.
C1, C2 = Common

J5 Power Connector

| | |
|---|---|
| 1 | +DC |
| 2 | |
| 3 | RTN |
| 4 | FG |

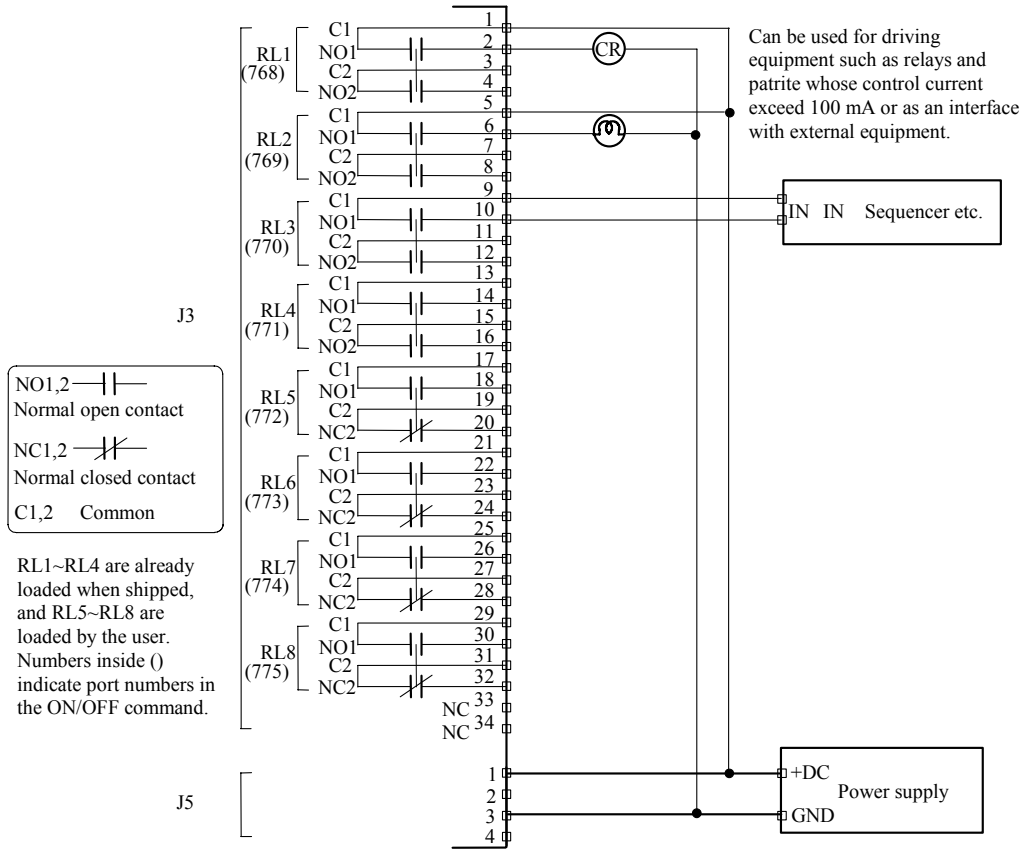
## MPS-324 I/O Support

RL1~8 correspond to I/O numbers 768~775, respectively.

## Concerning PS1

PS1 is the mounting part for a ±12V DC-DC converter. Out company leaves this unmounted.
Only the case where PS1 is necessary iswhen supplying ±12V to the rack. The compatible DC-DC converter is ZW32412 from Elcoh.

## MPS-324 Connection Example



## MBK-SH Touch Panel Interface

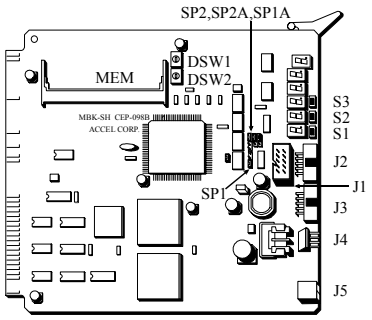
### Specification

| | |
|---|---|
| CPU | HITACH SH-2(HD64F7051F20) |
| ROM | FR8M(29F40*2) option |
| RAM | HM628128*2 |
| DPM | CY7C144-55JC*2 |
| Communication Port | User port RS-422/232 selection x 2 (one maintenance port) |
| Display | 7 segment x 6 |
| Power supply | DC 12~24 V |
| Consumed current | 300 mA.( DC 5V) |
| Operating temperature | 0~50°C |
| Communication Protocol | Panasonic MEWNET-FP Protocol-compliant, other sequencer upper link protocol (partial) |
| User Memory | Data area 7900 words, I/O area 100 words |

### Features

·Digital's touch panel, GP series, can be connected with direct access method.
·Taking personal computer as upper order, MEWNET-FP protocol-compliant communication is available. (*1)
·With Omron sequencer and Mitsubishi sequencer, link connection can be established. (MBK is host.)(*1)
·It displays real time steps of execution process of the program.
(*1) signifies the exclusive use.

### Hardware Configuration




Accessories:

| | | | |
|---|---|---|---|
| (1) Power connector (H4P-SHF-AA) | JST | *1 | J3 |
| (2) Contact (BHF-001T-0.8SS) | JST | *4 | J3 |

Mounted connectors

| | | |
|---|---|---|
| J1 | HIF-3FC-10PA-2.54DSA | Hirose |
| J2 | HIF-3FC-10PA-2.54DS | Hirose |
| J4 | BS4P-SHF-1AA | JST |
| J5 | XW4A-02B1-H1 | Omron |

| | |
|---|---|
| J1 | Communication port for maintenance |
| J2 | Communication port. RS-422/232-selection. Protocol-selection. Connection with PC or sequencer. |
| J3 | Communication port. RS-422/232-selection. MEWNET-FP protocol 38400 bps fixed. For Digital touch panel connection. |
| J4 | For interface. Power supply (DC 12~24V). |
| J5 | External DC 5V supply. (Stop 5 V of MPC-684 to provide power from here.) |
| SP1,SP1A | J2 connector RS-422/232 switch |
| SP2,SP2A | J3 connector RS-422/232 switch |
| DSW1 | System selection. (9=internal ROM/A=FR8M(Optional feature.)) |
| DSW2 | System reservation. |
| S1,S2 | Switch of display task. With S1, Up, while with S2, Down |
| S3 | Display fixed. |
| MEM | For FROM-use socket |

## Setting, Pin Assignment

J2,J3 Communication port

| | | | |
|---|---|---|---|
| 1 | SG | 2 | TXD(RS-232) |
| 3 | RXD(RS-232) | 4 | SG |
| 5 | | 6 | RD+(RS-422) |
| 7 | SG | 8 | SD-(RS-422) |
| 9 | RD-(RS-422) | 10 | SD+(RS-422) |

J5 Power Connector

| | |
|---|---|
| 1 | +DC |
| 2 | |
| 3 | RTN |
| 4 | FG |

J5 DC5V Power Connector

| | |
|---|---|
| 1 | +DC5V |
| 2 | GND |

## Communication with Touch Panel

MBK-SH is implemented with a “MEWTOCOL-COM”-compliant protocol and a inter-PC two-way communication protocol, of Panasonic’s MEWNET-FP series. It also supports the direct access method of the Digital touch panel GP series. It can read and write 7900 words in a data area and 100 words in an I/O. With exclusive commands, such as “MBK” and “S_MBK” for the data area, and “ON” and “SW” for an I/O area, it reads and writes.

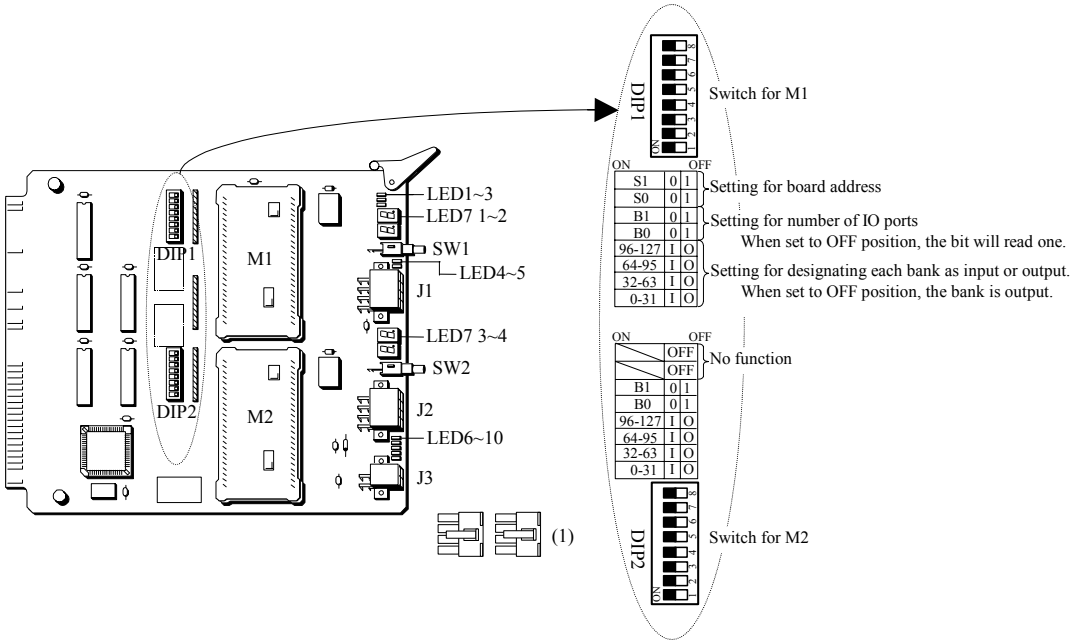
■ **Communication method with GP**

Communication method RS-422(4-line method)
Communication speed 38400 bps, data length: 8-bit, stop bit: one, parity bit: none
Communication protocol Panasonic MEWNET-FP series

## Specification

| | |
|---|---|
| S-LINK module | SL-MC2 (made by Sanks): 2 pieces |
| I/O | 128 points / 1 module |
| Number of supported MPCs | 4 pieces (I/O 1024 points) |
| Power supply | DC 24V (for driving I/O) |
| Consumed current | DC 5V 200 mA./ board (supplied from the bus) |
| Operating temperature | 0~50°C |

## Hardware Construction




Accessories:

(1) Housing (5557-08R) Molex *2 J1, 2

Mounted connector

| | | |
|---|---|---|
| J1, 2 | 5569-08A1 | Molex |
| J3 | 5569-04A1 | Molex |

| | |
|---|---|
| M1, 2 | S-LINK host module |
| J1 | M1-side S-LINK port |
| J2 | M2-side S-LINK port |
| J3 | I/O-driving power |
| LED1~4 (Red) | M1-side error display |
| LED~9 (Red) | M2-side error display |
| LED5 (Green) | M1-side in operation (blinking) |
| LED10 (Green) | M2-side in operation (blinking) |
| DIP1 | Setting board address and M1-side I/O |
| DIP2 | Setting M2-side I/O |
| SW1, 2 | Reset button |

## Board Address

As the board address, assigned are S0 and S1 of DIP1.
The I/O numbers assigned by the board address change according to the following table.
Also, MPC-SLINK is loaded with two S-LINK modules. J1 side is smaller number side and J2 side is larger number side, where each controls 28 points, totaling 256 points. If the J2-side module is not loaded, the corresponding I/O area becomes without numbers.

| DIP-SW | I/O number | 2000~2255 | 2256~2511 | 2512~2767 | 2768~3023 |
|---|---|---|---|---|---|
| DIP1~7 | S0 | OFF | ON | OFF | ON |
| DIP1~8 | S1 | OFF | OFF | ON | ON |

(ON=0, OFF=1) * All OFF when shipped out of factory

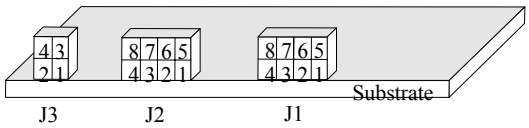
## Setting, Pin Assignment

(1) J1, J2 Communication Port

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | GND |
| 4 | GND |
| 5 | +24 |
| 6 | D |
| 7 | +24 |
| 8 | LOOP |

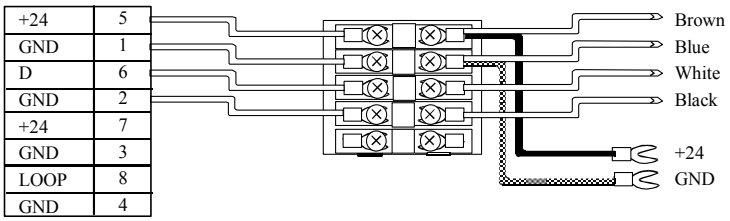
(2) J3 Power Connector

| | |
|---|---|
| 1 | GND |
| 2 | GND |
| 3 | +24 |
| 4 | +24 |




## Connection Example

Please refer to Sanks S-LINK Instruction Manual for wiring. Next, shown are pin assignment and basic connection of each connector.




· Although it is possible to connect power from the J3 side, current would be concentrated. For this reason, please use it only when the total is 3 A or less.
· In the case of the LOOP connection, the 7 and 8 side of J1 and J2 are used.
· J1 and J2 are independent S-LINKs.
· Each of +24 and GND of J1, J2, and J3 is internally shorted.

## Concerning Display and Switches

Setting the Dip Switches

DIP1~4

| DIP-SW | I/O No. | I (ON side) | O (OFF side) |
|---|---|---|---|
| 1 | 0~31 | Input | Output |
| 2 | 32~63 | | |
| 3 | 64~95 | | |
| 4 | 96~127 | | |

Attention) When setting by a program, please set all Low.

Rem) Input/output of the S-LINK system is set.
· I/O number can be switched between input and output by the unit of 32 points.
· Setting is taken in only once when the CPU-side power is turned on or releasing RESET.
· Please be careful because it is invalid even if changed during operation.

DIP5~6

| No. of I/Os | B1(6) | B0(5) |
|---|---|---|
| 32 | ON | ON |
| 64 | ON | OFF |
| 96 | OFF | ON |
| 128 | OFF | OFF |

(ON=0,OFF=1)

Rem) Number of I/Os of the S-LINK system is set.
· System address length can be changed by the unit of 32 points.
· Setting is taken in only once when the CPU-side power is turned on or releasing RESET.
· Please be careful because it is invalid even if changed during operation.

**Display**

LED5,10(green) blinks during the S-LINK operation. Red LED signifies the error display. (Refer to Statis Acquisition.)
For 7 seg display, refer to "S-LINK Instruction Manual".

## Status Acquisition

Use IN function to acquire the status of S-LINK module.

■ Form

```
IN(1999)          /* Acquire the status of SLNK#1
IN(1998)          /* Acquire the status of SLNK#2
IN(1997)          /* Acquire the status of SLNK#3
IN(1996)          /* Acquire the status of SLNK#4
```

■ Description
The return value is displayed in hexadecimal form.

| &H | n | 0A | 0B |
|---|---|---|---|

n: hardware status
2: bug of J1 side, 1: bug of J2 side module 3: both side bug, with infufficient power supply
0A: bug of J1 side module
0B: bug of J2 side module

**Contents of 0A and 0B, and the Corresponding LED**

| bit | features | J1 side module Red LED | J2 side module Red LED |
|---|---|---|---|
| 7~4 | (system) | | |
| 3 | ERR4(1: Disconnection or error input/output unit) | LED4 | LED9 |
| 2 | ERR3(1: Abnormal level of power voltage of D-G) | LED3 | LED8 |
| 1 | ERR2(1: No setting of I/O point numbers) | LED2 | LED7 |
| 0 | ERR1(1: Short-circuit between D and G) | LED1 | LED6 |

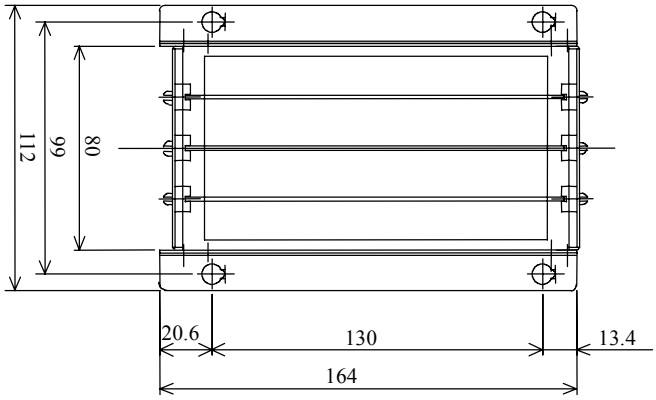
・ERR1 and ERR3 occurs on S-LINK side at the time of disconnection of the power supply. They are cancelled after the restoraton of power.
・ERR4 stays until it is manually cancelled. To cancel, turn off the power supply or input RESET after fixing the disconnection of the S-LINK system.

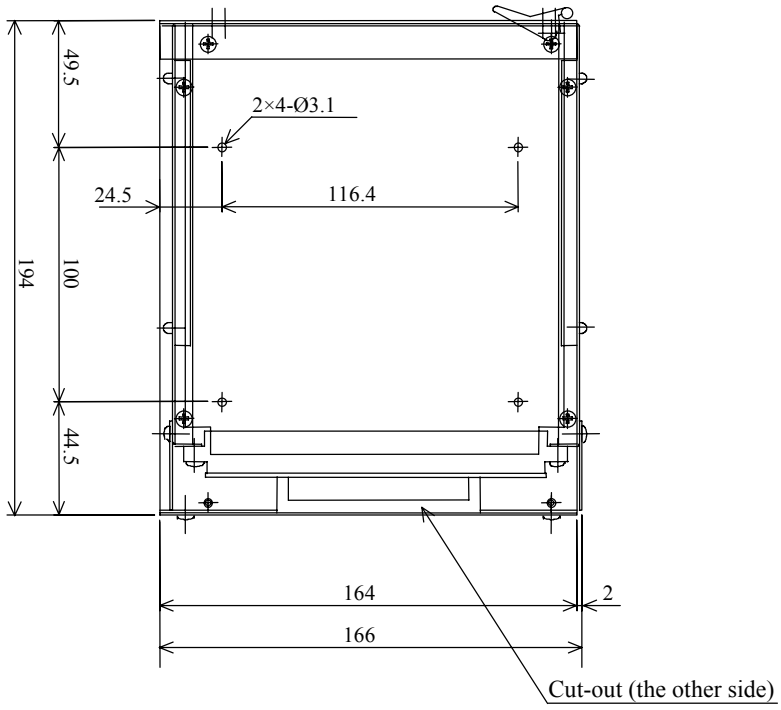
```
#PRX IN(1999)
 00030505            /* 3= power supply is out. 05=ERR1,ERR3
```

Supprt: MPC-684 REV-3.82n or later

## Rack 68K (3)

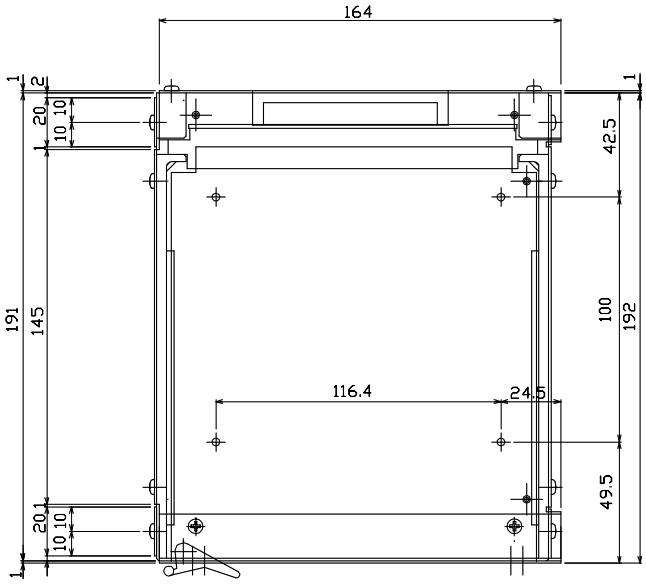
Please insert the board by paying attention to the top and bottom of the bus board and matching the pin numbers on the card edge and the silk-printed numbers of the bus board.

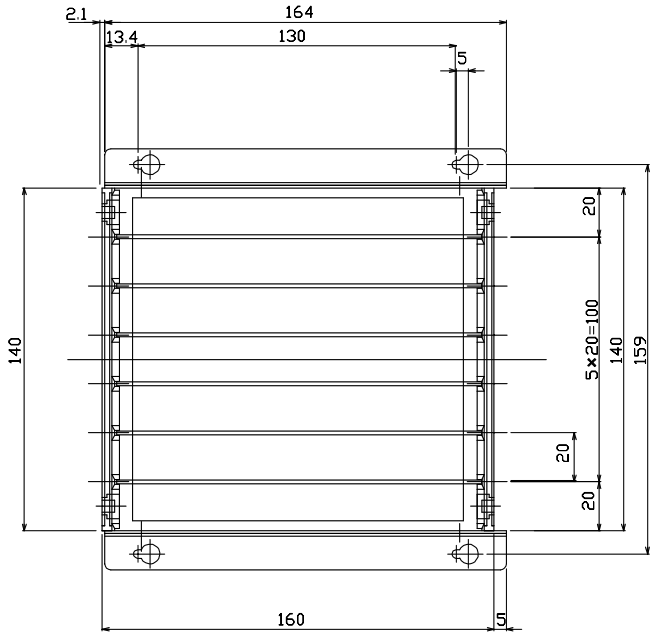


## RACK-N6

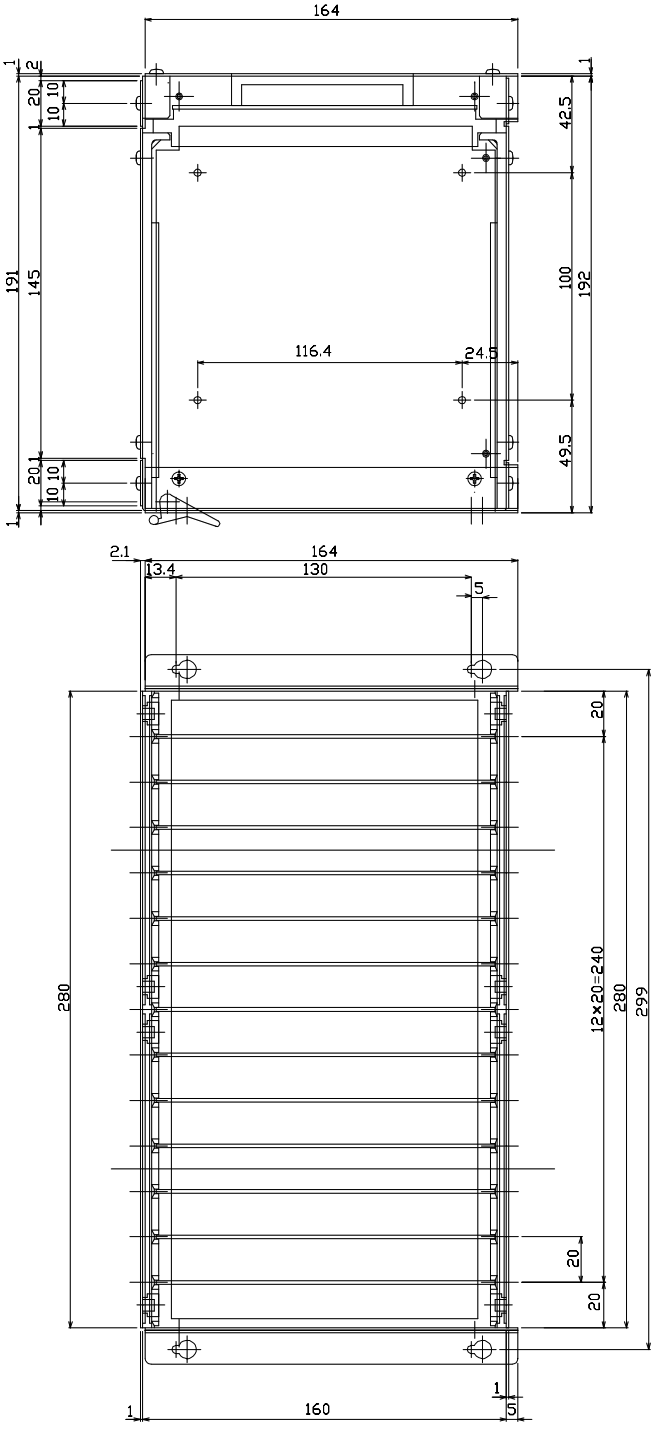
Please insert the board by paying attention to the top and bottom of the bus board and matching the pin numbers on the card edge and the silk-printed numbers of the bus board.



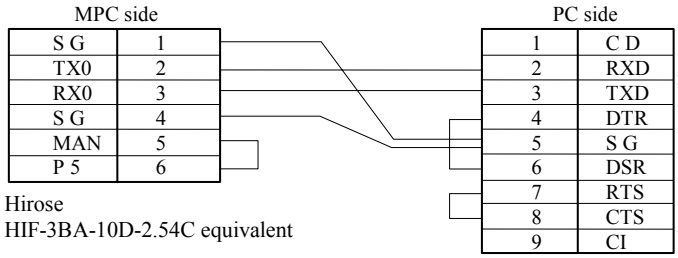



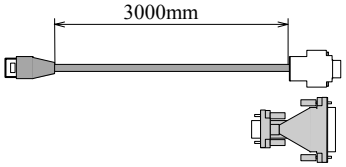
## RACK-N13

Please insert the board by paying attention to the top and bottom of the bus board and matching the pin numbers on the card edge and the silk-printed numbers of the bus board.



## Cable Diagram




This is a manufacturer-original cable to connect an MPC and a PC. Although the basic cable is for DOS/V, a 25-pin conversion connector is attached, which allows use with a PC98 as it is.

## Board External Form Illustration