

Melec



Stepping & Servo Motor Controller

C-VX875

Instructions Manual

(For designers' use)

USER'S MANUAL

Please ensure to read and understand this Instructions Manual before using the Product. Please keep this Instructions Manual at hand so that it is always available for reference.

MN0203

Introduction

This instructions manual explains the handling of "Stepping Motor and Servo Motor Controller C-VX875" emphasizing the specifications to enable proper and safe use.

The manual is thus intended for designers of control systems using stepping motors or servo motors. Before using the product, read this manual carefully for better understanding.

Keep the manual handy so that you can read it whenever you want.

Wish and Notes

The product and product specification which are indicated in this manual may be changed without a preliminary announcement by improvement etc.

The technical information indicated in this manual is for explaining typical operation and application of a product, and does not perform consent of the guarantee to the intellectual property rights and other rights of our company and a third party, or an actual right on the occasion of the use.

When you use the circuit indicated in this manual, software, and the information relevant to these, please fully evaluate by a user's whole apparatus and system.

Moreover, please judge application propriety on a user's responsibility.

The product which uses a semiconductor and a semiconductor may malfunction depending on an operating condition, or a certain probability.

In order not to generate an accident resulting in injury or death, a fire accident, social damage, etc. by failure or malfunction of this product, please cope with a safety design required for the last equipment or a system, according to a user's responsibility.

This product is designed and manufactured as a general industrial-oriented general-purpose product. Therefore, please do not use aircraft instruments, an aerospace instrument, a submarine relay appliance, a nuclear control system, transport plane machines (vehicles, a vessel, etc.), the signal machine for traffic, disaster prevention / crime prevention apparatus, a safeguard, medical equipment, etc. for the use which can consider big influence by a human life or property.

Do not carry out reconstruction, change, and reproduction of this product.

Please observe export related statutes applied, such as "foreign exchange and Foreign Trade Law", when exporting, and perform required procedure by the place provided by this statute.

Please do not use the technical information indicated in this product or this manual for the purposes, such as development of mass-destruction weapons, the purpose of military use, and the other purpose of a military use.

Moreover, this product cannot be used for the apparatus to which manufacture, use, and sale are forbidden by a statute in and outside the country and regulation.

Please be sure to ask to window of our marketing department about details, such as the environmental suitability of this product.

When using it, content of a specific substance, RoHS Directive which regulates use, etc. should investigate the environmental related statute applied enough. And please suit this statute.

About the damage which arose by not observing the statute which requires to user, our company does not take any responsibility.

Description of Safety

This product must be handled correctly.

Handling the product incorrectly may cause unexpected accidents resulting in personal injuries or damage to your properties.

Many of those accidents can be avoided if you have advance information on dangerous situations.

This manual provides precautions where dangerous situations are predicted. The manual provides the following alert marking and messages for this purpose:



This indicates a hazardous situation that could result in death or serious personal injury if you do not perform the procedure correctly.



This indicates a potentially hazardous situation that could result in personal injury or physical damage if you do not perform the procedure correctly.

Before Use

Set up the product before operating it.

Refer to Section 3, "Setting."

This product is equipped with a LIMIT (overtravel) signal and an FSSTOP signal to prevent mechanical damage.

The initial values of these signals are set to ACTIVE OFF (B contact). Accordingly, even in a system configuration in which the FSSTOP and LIMIT signals are not used, pulses are not output unless NORMAL ON (GND connection) is enabled.

The C-VX875 allows axes to be controlled independently and therefore referred to each axis as follows:

1st axis	2nd axis	3rd axis	4th axis
X axis	Y axis	Z axis	A axis

- AL- I/O communication of C-VX875 explains C-VX875 as a master board.
- This manual basically explains only the X axis.

Please also read the device driver operation manual for Windows which suited this product.

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The main parts which revised by this manual

1 . OVERVIEW

1-1. Features

The C-VX875 is controller equipped with four independently functioning axes.

This controller supports servo and stepping motors that can directly be inserted into slots of a PCI bus system conforming to PCI bus specifications R2.2.

- From RJ-45 connector of a front panel, a maximum of four slave I/O units of AL- series are connectable by AL- I/O communication.

Moreover, an Extended I/O unit can also be extended to a slave I/O unit.

Thereby, 4 axes motor control and the I/O system of a maximum of 256 points/256 points can be built by one PCI slot.

- The board shape is the universal short card size (107 x 170) of the PCI bus standard.

The C-VX875 is equipped with our chip controller MCC07 to enable motor control using simple commands.

- C-VX875 enables four independently linear interpolation driving, 2-axis linear interpolation (fixed interpolation-axes) or 2-axis circular interpolation (fixed interpolation-axes) driving.

Moreover, the C-VX875 is enable to optional axes liner interpolation drive or Optional 2-axis circular interpolation drive. **(Applied function)**

- The 32-bit width address counter and the maximum output frequency of 6.5 MHz of the MCC07 enables high-precision, high-speed positioning.

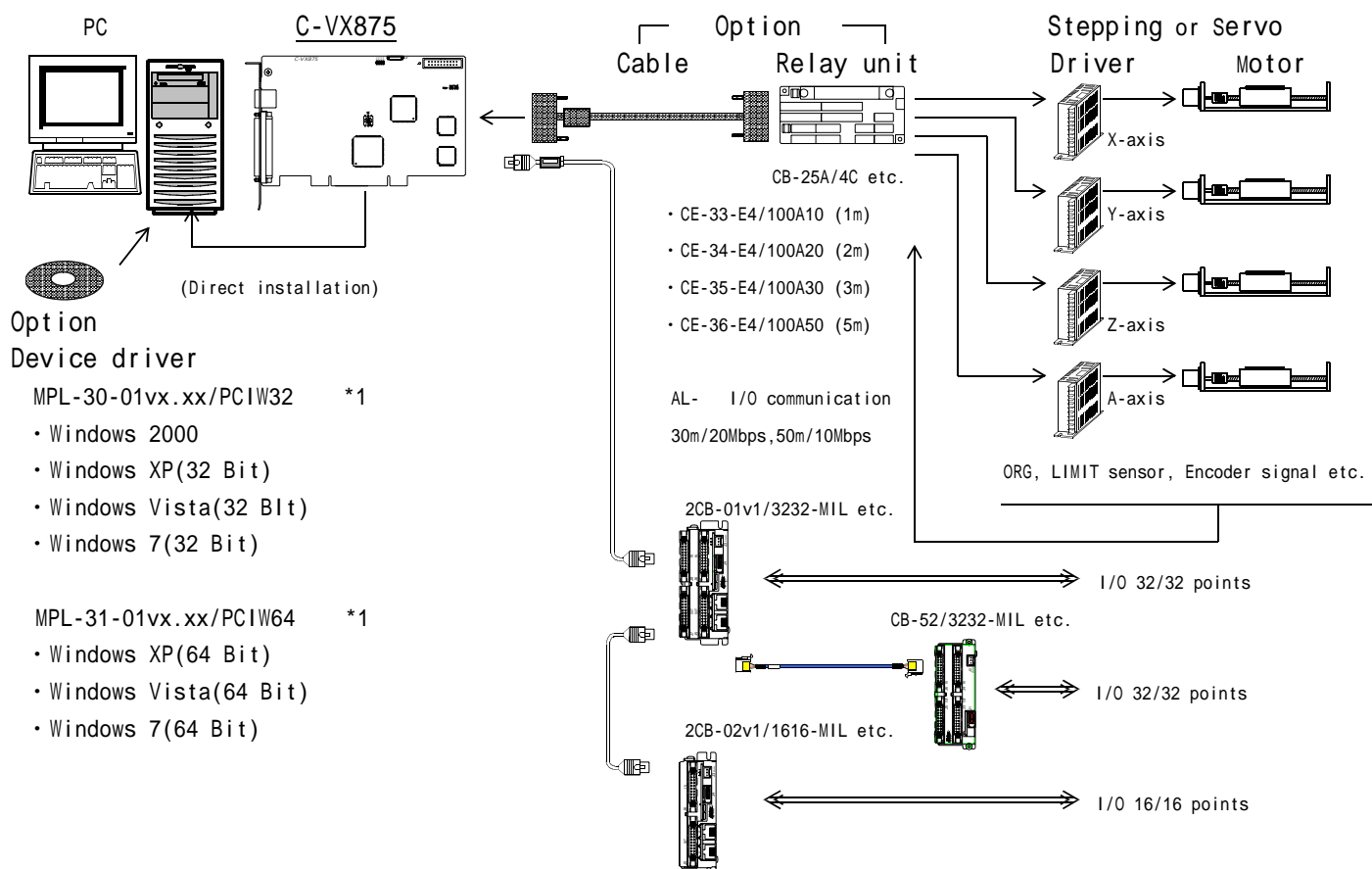
- Also equipped with a multi-functional 32-bit pulse counter, and 16-bit pulse differential counter, the C-VX875 has a variety of application such as counting feedback pulses from the servo driver, detecting step-out of the stepping motor with an encoder. The applications also include interrupt output and external signal output using the comparator function of each counter.

- After the command being executed is finished, the commands stored in the reservation register are executed sequentially. Then this function can be allowed continuous drive. **(Applied function)**

1-2. Product Configuration

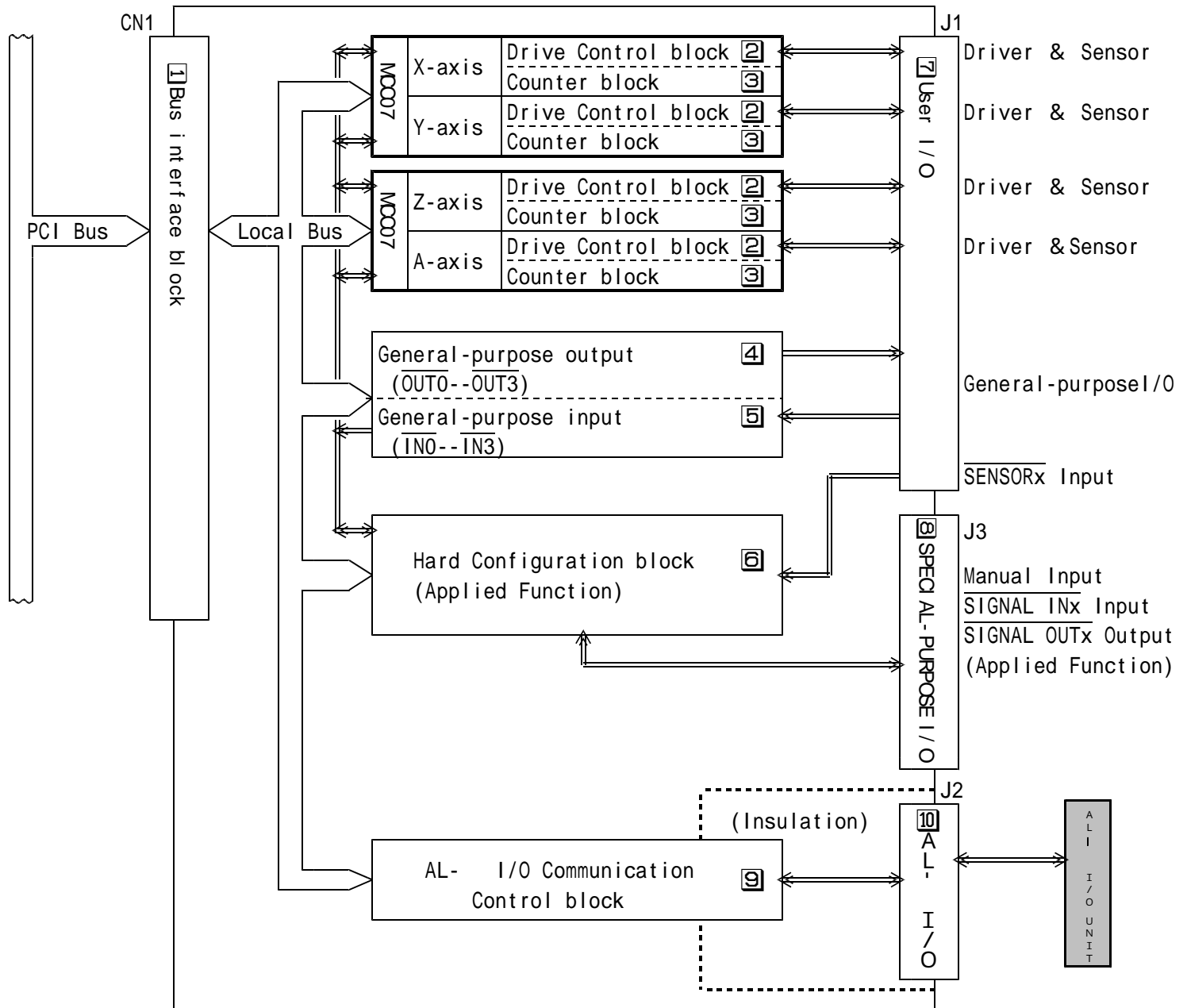
Product name	Rating	Maker	Quantity	Remarks
Controller	C-VX875	Melec Inc.	1	(Main unit)

1-3. Example of System Configuration



*1 Please check the latest version number of vx.xx by the operation manual of device driver.

1-4. Function Block Diagram



① Bus interface block
 Interface block with the PCI bus

② Drive control block
 The drive control block outputs serial pulses to the motor driver.
 The 2-axis indicated by is interrelation.
 It enables 2-axis linear interpolation or 2-axis circular interpolation.

③ Counter block
 The counter block has three types of counters: ADDRESS COUNTER, PULSE COUNTER, and DFL COUNTER.
 (Can use as hard timer.)
 ADDRESS COUNTER, PULSE COUNTER has 32-bit counter, DFL COUNTER has 16-bit counter.
 These counters count pulses output by the controller or signals such as feedback signals from the encoder.
 Each counter equipped with three compare registers. These registers count optional count.

④ General-purpose OUTPUT block
 The block can control $\overline{OUT0} \sim \overline{OUT3}$

⑤ General-purpose INPUT block
 The block can control $\overline{IN0} \sim \overline{IN3}$

⑥ Hard Configuration block (Applied Function)

The Hard Configuration block is a control block that allows the user to connect User I/O and Special-purpose I/O to signals: Multipurpose sensor signal input to each axis, signal for synchronization control, status signal.

The control block is used for multipurpose sensor function, Synchronous drive function, Status output function.

⑦ User I/O block

The user I/O block interfaces with motor drivers, sensors, and general-purpose I/O equipment signals.

⑧ Special-purpose I/O block (Applied Function)

The block interfaces with input signals what motors can be operated manually, and what can output status signals to the outside.

⑨ AL- I/O Communication Control block

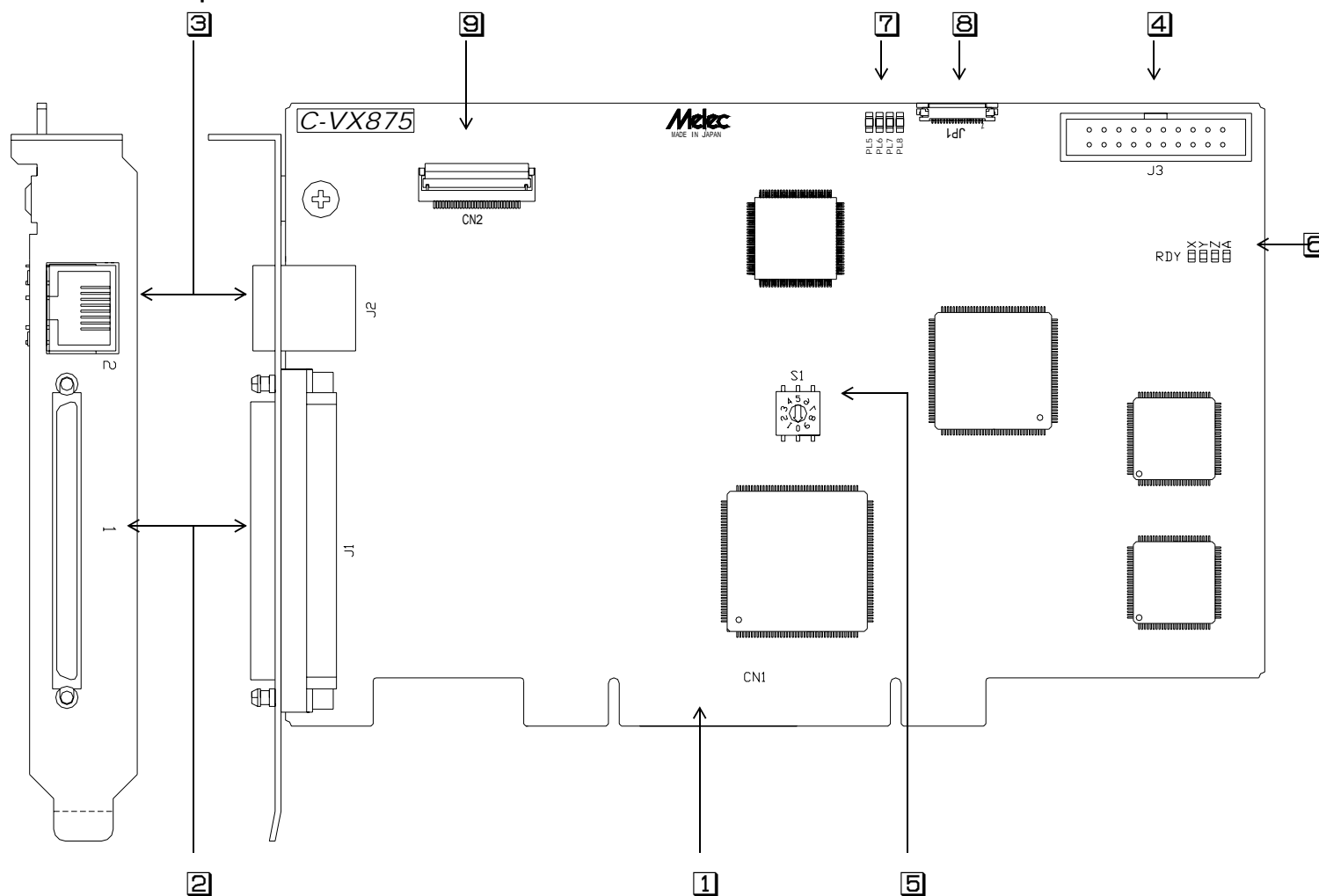
It is the circuit block which controls AL- I/O communication.

The interface part of AL- I/O communication is insulated with C-VX875 internal circuit (personal computer power supply).

⑩ AL- I/O Communication interface block

They are a slave I/O unit of AL- series, and an interface part which performs AL- I/O communication.

1-5. Externals of product



- ① CN1 ----- Universal (5V/3.3V) board edge connector inserted into a PCI bus.
- ② J1 ----- 100-pin half pitch connector that interfaces the motor driver, sensor signals, and equipment having +24V interface I/O.
Dedicated interface cables (1m, 2m, 3m, and 5m) and relay units are available.
- ③ J2 ----- This is a RJ-45 type shield connector which connects AL I/O communication.
The slave I/O unit of AL- series is connectable with AL- I/O communication.
- ④ J3 ----- Connector that interfaces with external signals at TTL level.
(APPLIED FUNCTION) Motors can be operated by manual operation through this connector.
External input signals can be assigned as input signals to signals for the SENSOR and signal for synchronization control.
Signals can be output to the outside by status signal of each axis.
A general-purpose standard MIL connector is used.
- ⑤ S1 ----- Rotary switch that is set so that PCI can recognize the board number.
If two or more boards are inserted into the PC simultaneously, set the switch properly so that every board number is unique.
- ⑥ RDY LED -- LEDs that allows the user to simply monitor the X, Y, Z, and A axes to check whether the axes are operating normally. The RDY LED corresponding to each axis is on while the axis is waiting for a command and is off during command processing.
- ⑦ PL5, PL6 ---- These are LED for a monitor of AL- I/O communication.
 - PL5(Red) ... This LED emits light, when the abnormalities or hard abnormalities of AL- I/O communication are detected.
 - PL6(Green) ... This LED emits light, when it can access from a PCI bus.
 - PL7, PL8 ... It is not used.
- ⑧ JP1 ----- It is a connector for adjustment. Nothing should connect.
- ⑨ CN2 ----- It is not used now. It is a connector for extension.
Nothing should connect.

2 . SPECIFICATIONS

2-1. General Specifications

No.	Item	Specifications
1	Supply voltage, power consumption	<ul style="list-style-type: none"> • +5V \pm5%, 1.0 A or less • +24Vdc \pm2V, 200 mA or less (for photocoupler interface)
2	Operating ambient temperature and humidity	<ul style="list-style-type: none"> • 0 ~ +45 • 80%RH or less (without dew condensation)
3	Storage temperature and humidity	<ul style="list-style-type: none"> • 0 ~ +55 • 80%RH or less (without dew condensation)
4	Installation environment	<ul style="list-style-type: none"> • Inside a well-ventilated cabinet installed indoor, free from direct sunlight • Not exposed to corrosive and flammable gasses, and not affected by oil mist, dust, salt, iron powder, water, and chemicals • Not subject to constant vibration or excessive shock • Not affected by electromagnetic noise caused by power equipment • Free of radioactive materials and magnetic fields, and not in vacuum
5	Dimensions	<ul style="list-style-type: none"> • Short card size (107mm \times 170mm \times 17mm)
6	Weight	<ul style="list-style-type: none"> • About 0.2 kg

2-2. PCI Specifications

No.	Item	Specifications
1	Applicable standard	PCI Local Bus Specification Rev2.2
2	Bus interface	<ul style="list-style-type: none"> • 32-bit bus, 33 MHz clock • 5V/3.3V Signal system (Universal) It is necessary +5V power supplied from the bus slot.
3	Interrupt	<ul style="list-style-type: none"> • INTA# However, there is no interrupt from AL- I/O communication.
4	System Resouce	<ul style="list-style-type: none"> • I/O : 128-byte + 256-byte

2-3. Basic Specifications

No.	Item	Specifications	
1	Number of control axes	4 axes	
2	Pulse output function	Output type	<ul style="list-style-type: none"> • Independent direction output/Specified direction output/Phase-differential signal output • Line driver output
		Output frequency	<ul style="list-style-type: none"> • Independent drive : 0.1 Hz to 6.5 MHz • Interpolation drive : 0.1 Hz to 5 MHz
		Acceleration/deceleration time constant	5000 ms/kHz to 0.0025 ms/kHz (Trapezoid/S-curve)
		Acceleration/deceleration shape	Trapezoid/S-curve(This feature enables to set asymmetrical shape)
		Triangular drive prevention function	<ul style="list-style-type: none"> • During S-shaped acceleration/deceleration drive, INDEX drive may end before the maximum speed is reached. In this event, triangular drive can be automatically avoided.
		Number of output pulses	<ul style="list-style-type: none"> • JOG drive : -65,535 to +65,535 pulse • SCAN drive : Up to infinite pulses • INDEX drive : -2,147,483,647 to + 2,147,483,647 pulses
3	Encoder function	Input type	<ul style="list-style-type: none"> • Incremental • Line receiver input
		Input range	<ul style="list-style-type: none"> • ~ 5MHz
		External signal output	<ul style="list-style-type: none"> • External signals such as hand pulser signals that are input to the EA and EB signals can be output as CWP and CCWP signals.
4	Drive function	JOG drive	<ul style="list-style-type: none"> • Pulses are constantly output until the specified pulses.
		SCAN drive	<ul style="list-style-type: none"> • Pulses are continuously output until a stop command is detected.
		INDEX drive	<ul style="list-style-type: none"> • Pulses are output until the specified relative or absolute address is reached.
		ORIGIN drive	<ul style="list-style-type: none"> • The specified drive processes are performed. This drive is finished when the ORG signal specified edge is detected.
		2-axis linear interpolation drive	<ul style="list-style-type: none"> • Linear interpolation is performed toward the specified coordinates from the current coordinates. • Driving type is selected from INDEX drive or SCAN drive. • Max speed is 5MHz. • Positional errors for the specified straight line are ± 0.5 LSB. • The absolute and relative addresses that can be specified for coordinates range from -2,147,483,647 to +2,147,483,647 (32 bits).
		2-axis circular interpolation drive	<ul style="list-style-type: none"> • Circular interpolation is performed toward the specified coordinates from the current coordinates on the circular curve specified by the center-point or passing-point coordinates. • Driving type is selected from INDEX drive or SCAN drive. • Max speed is 5MHz. • Positional errors for the specified circuit curve are ± 1 LSB. • The relative addresses range from -8,388,607 to +8,388,607 (24 bits). • Short axis pulses range from -2,147,483,648 to +2,147,483,647 (32 bits).
		Linear speed constant control	<ul style="list-style-type: none"> • Control is performed to keep the synthesized speed of the two axes working for interpolation drive constant.

No.	Item	Specifications	
5	Stop function	Slow stop function	<ul style="list-style-type: none"> • SLOW STOP command • <u>Detection</u> of a match of the comparator of each counter. • $\overline{IN0}$--$\overline{IN3}$ signal setting the DALM input function, the DALM signal can be used as the slow stop signal. • Multipurpose sensor signal(SS0,SS1)
		Immediate stop function	<ul style="list-style-type: none"> • FAST STOP command • FSSTOP signal (User I/O) • \overline{FSSTOP} signal (Special-purpose I/O) • <u>Detection</u> of a match of the comparator of each counter. • $\overline{IN0}$--$\overline{IN3}$ signal setting the DALM input function, the DALM signal can be used as the immediate stop signal. • Multipurpose sensor signal(SS0,SS1)
		LIMIT signal	<ul style="list-style-type: none"> + direction stop • Immediate stop by CWLM signal and slow stop can be selected. • Slow stop or immediate stop can be performed for each axis upon detection of a match of the comparator(COMP2) of each counter. - direction stop • Immediate stop by CCWLM signal and slow stop can be selected. • Slow stop or immediate stop can be performed for each axis upon detection of a match of the comparator(COMP3) of each counter.
6	Counter function	Address counter	<ul style="list-style-type: none"> • 32-bit counter that manages absolute addresses by counting drive output pulses.
		Pulse counter	<ul style="list-style-type: none"> • 32-bit counter that counts external pulse signals or encoder feedback pulses.
		Pulse differential counter	<ul style="list-style-type: none"> • 16-bit counter that detects differences in the number of pulses by counting external pulse signals and encoder feedback pulses. • It can also be used as a 16-bit timer.
		Comparator function	<ul style="list-style-type: none"> • Detection of a match of the three comparators of each counter. • Upon detection of a match by the comparator, pulse output can be decelerated and then stopped, or stopped immediately. • Upon detection of a match by the comparator, output external status signal.
		AUTO CLEAR function	<ul style="list-style-type: none"> • The comparator of each counter: The counter can automatically be cleared upon detection of a match of COMP1 of each counter.
		AUTO ADD function	<ul style="list-style-type: none"> • The comparator of each counter: If the counter value reaches the COMP1, a value that is set by the data add to COMPARE REGISTER1.
7	Other functions	Servo driver support function	<ul style="list-style-type: none"> • The signals are specially prepared as servo driver support signals. • Servo positioning completion input/phase ($\overline{DEND}/\overline{P0}$) signal input • Servo reset output (\overline{DRST}) • General-purpose input signal(DALM .etc) ($\overline{IN0}$--$\overline{IN3}$) • General-purpose output signal(S.ON .etc) ($\overline{OUT0}$--$\overline{OUT3}$)
		Data reading function	<ul style="list-style-type: none"> • Current status information can be read in real time. • Current status information includes status data, count data of a counter etc.

2-4. Applied Functions

No.	Item	Description of specifications	
1	Drive function	UP/DOWN/CONST drive CHANGE function	<ul style="list-style-type: none"> • Drive change for acceleration, deceleration, or constant speed can be performed upon detection of signal at an arbitrary change operation point.
		SPEED CHANGE function	<ul style="list-style-type: none"> • The drive pulse speed is changed upon detection of signal at an arbitrary change operation point.
		RATE CHANGE function	<ul style="list-style-type: none"> • The rate is changed upon detection of signal at an arbitrary change to the specified rate.
		INDEX CHANGE function	<ul style="list-style-type: none"> • Upon detection of signal at an arbitrary change operation point, the stop position at which drive is to be finished is changed. • Upon detection of the INC INDEX CHANGE command, the system performs INC INDEX drive by setting the specified data at the stop position of the relative address for which the start position is the origin. • Upon detection of the ABS INDEX CHANGE command, the system performs ABS INDEX drive by setting the specified data at the stop position of the absolute address managed with the address counter.
		Optional axes liner interpolation drive	<ul style="list-style-type: none"> • Linear interpolation is performed toward the specified coordinates from the current coordinates. Then long axis outputs pulses.
		Optional 2-axis circular interpolation drive	<ul style="list-style-type: none"> • Circular interpolation is performed toward the specified coordinates from the current coordinates on the circular curve.
		INDEX drive controll the start point at auto deceleration	<ul style="list-style-type: none"> • This function is allowed to set OFFSET of the start point at auto deceleration. This function can be used When INDEX drive, liner interpolation INDEX drive, and circular interpolation INDEX drive.
		MANUAL SCAN drive	<ul style="list-style-type: none"> • MANUAL SCAN/JOG drive in the + or - direction is performed by operation of SELA to D, \overline{MAN}, \overline{CWMS}, \overline{CCWMS} signal input through the J3 connector.
2	Count function	Ring counter function	<ul style="list-style-type: none"> • The address counter, pulse counter each are a ring counter in which any maximum count can be set.
		Count data latch/clearance function	<ul style="list-style-type: none"> • This function latches count data of a counter at a specific latch timing and holds it till the next latch timing. • Each counter can latch counter value at arbitrary timing. It is possible to clear a counter value at the latch timing.
3	Other functions	Interrupt function	<ul style="list-style-type: none"> • Each axis can output interrupt signals to the CPU. • Each interrupt signal is output when an interrupt is caused by drive end, state of a reservation register, and detection of a match by the counter.
		Command reservation function	<ul style="list-style-type: none"> • Each axis has a reservation register that can store data commands for ten instructions. • General-purpose commands of Drive commands can be reserved in the reservation register. • After the command being executed is finished, the commands stored in the reservation register are executed sequentially. Then this function can be allowed continuous drive.

No.	Item	Description of specifications	
3	Other functions	Input signal logical switch function	<ul style="list-style-type: none"> • The input signal can be changed to logic as follows: • CWLM • CCWLM • DALM (\overline{INx} is used for DALM function)
		Input signal time constant function	<ul style="list-style-type: none"> • The input signal can be set time constant as follows: • CWLM • CCWLM • DALM (\overline{INx} is used for DALM function) • DEND/PO • \overline{ORG} • NORG • \pm ZORG • \pm EA,EB
		Multipurpose sensor signal input	<p>Each axis has multipurpose sensor signal input used as stop signal, trigger signal of a counter latch data and drive CHANGE operating signal.</p> <p>The signal can be used as multipurpose sensor as follows:</p> <ul style="list-style-type: none"> • $\overline{SENSORx}$ input signal • SIGNAL INx input signal • A status in any axis
		Status external signal output function	<ul style="list-style-type: none"> • The compare register value, STATUS, output signal of each counter can output as SIGNAL OUTx output signal.
		Synchronized start function	<ul style="list-style-type: none"> • You can perform synchronized start with any axis. • A condition of start can be set by the condition as follows: • $\overline{SENSORx}$ input signal • SIGNAL INx input signal • A status in any axis • PAUSE command
		Status read Data reading	<ul style="list-style-type: none"> • Current status information can be read in real time. • Current status information includes setting data any axis, latch data of a counter etc.

Applied function.

Refer to the separate manual of the Windows device driver corresponding to C-VX875 Applied Functions Part.

2-5. AL- I/O Communication specifications

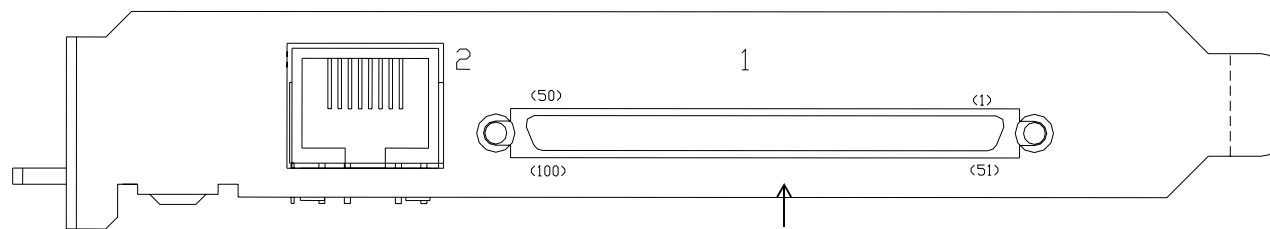
No.	Item	Description of specifications	
1	AL- I/O interface	Conformity standard	RS485 (Insulation type)
		Transmission protocol	Protocol for AL- I/O communication
		Application slave	<ul style="list-style-type: none"> • 2CB-01v1/3232-MIL (32/32 points) • 2CB-02v1/1616-MIL (16/16 points)
		Slave connection number	A maximum of 4 slave <ul style="list-style-type: none"> • C-VX875 address of AL- I/O communication : H'0 fixation • Slave address setting range : Within the limits of H' 1~H' F
		Wiring distance/ baud rate	<ul style="list-style-type: none"> • 50 m/10 Mbps • 30 m/20 Mbps
2	Connected confirmation of slave	Reading of slave information	The slave type connected now can be read.
3	Error detection of AL- I/O communication	Reading of error total number	<ul style="list-style-type: none"> • The error total number detected in the AL- I/O communication after the power supply is turned on can be read. • It is possible to use it for the evaluation of the communication environment. • When retrying is detected, it counts as an error. • The error total number can be counted 65535 times or less. More than it do not update a count.
		Clear of error total number	The value in which the error total number is counted can be cleared to 0.
		Retry	<ul style="list-style-type: none"> • It is a function to evade the stagnation of the entire system by retrying it when the influence of the noise etc. is given to AL- I/O communications. • The number of retrying is set by an Environment-set-function. When retrying is made effective and the communication abnormality is detected, retrying is automatically executed. <ul style="list-style-type: none"> • The setting of retrying is possible by the range from 0 (non-retry) to 3.
4	Initialize	Auto transmission of initialization	The master carries out initialization for all slaves automatically when user carries out an Environment-set-function to a master.
		Interlock	<ul style="list-style-type: none"> • When an Environment-set-function is executed from the application, master executes initialization (a request) to each slave. • The slave product of the AL- series doesn't accept other requests until the initial-request sent from master is received after the power supply is turned on. • When other requests are received, an initial error is returned. As a result, master notifies the application the answer back. • When the internal logic on the slave side was reset by the power failure etc. momentarily, operation by the improper data can be stopped. Please execute to master an Environment-set-function, after turning on slave's power supply.

* Refer to the operation manual of 2CB-01v1/3232-MIL or 2CB-02v1/1616-MIL, about the slave I/O unit specification of AL- I/O communication connectable with C-VX875.

2-6. Input and Output Signal Table

(1) User I/O connector (J1)

Pin assignments



(J1)

- Connector type name : HDRA-E100LFDT-SL+ (HONDA TSUSHIN KOGYO)
- Adaptable socket : HDRA-E100MA1+ ,HDRA-E100M1+ etc.
 (HONDA TSUSHIN KOGYO, not included in attached accessories)
 (Adaptable socket is 100-pin)
- Adaptable cable : CE-33-E4/100A10 (1 m in length)
 CE-34-E4/100A20 (2 m in length)
 CE-35/E4-100A30 (3 m in length)
 CE-36/E4-100A50 (5 m in length)

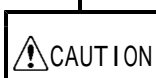
* The above-mentioned conformity cables are not accessories.

Although C-VX875 is a 4 axis controller, the suiting cable becomes "8 axes and 12 axis controllers."

Reference

For more information about a cable preparing in the C-VX870 series, refer to the instruction manual of "The connecting cable for board controllers" .

Signal table



This product may be damaged.

Do not connect +24V to any pin other than EXTV.

After wiring, be sure to confirm the wiring before power-on.

A signal indicated by is photocoupler-insulated.

A signal is enable to set time constants marked with .(Applied function)

Logic switching is enabled for an input signal marked with .(Applied function)

Logic switching is enabled for general-purpose input signal \overline{INx} , when this signal is used for DALM function

(Note 1)

An external power supply is required for a signal that is photocoupler-insulated.

The specified input voltage range is +24V \pm 2V.

Current consumption at +24V is up to 200mA.

The initial values of the CWLM and CCWLM signals of each axis and the FSSTOP signal are ACTIVE OFF input (B contact).

An external power supply must be connected even if these signals are not used.

The default contact B is recommended for the CWLM and CCWLM signals.

However, A-contact signal input can also be used by switching logic.

(Note 2)

$\overline{SENSORx}$ input signals are used for multipurpose sensor function, synchronization control function. These input signals is used by any functions setting.(Applied function)

The initial value after resetting is as follows:

$\overline{SENSOR0}$ signal is SS0 of Z-axis, $\overline{SENSOR1}$ signal is SS0 of A-axis.

When $\overline{SENSORx}$ input signal is used for multipurpose sensor function, this signal can not use in MANUAL mode.

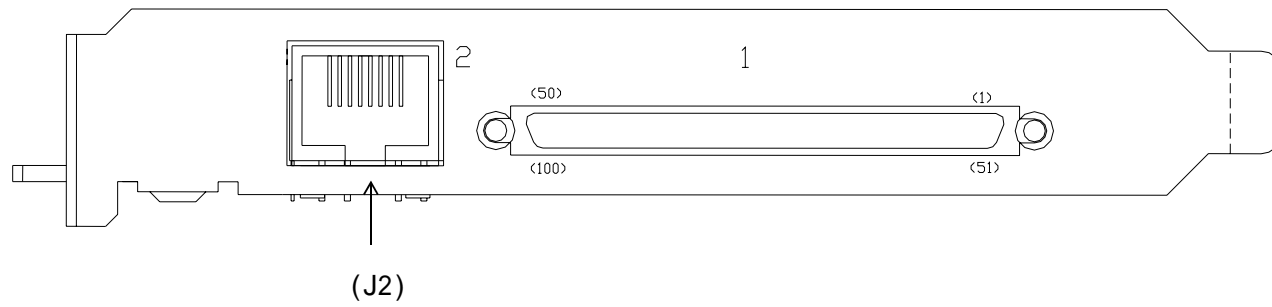
When MANUAL mode, the functions of multipurpose sensor assigned to the $\overline{SENSORx}$ input signal are invalid.

When BUS mode, this function are valid.

Pin No.	Dir	Signal name	Description	Pin No.	Dir	Signal name	Description
1	In	XCWLM	X axis + (CW) direction limit signal	51	In	ZCWLM	Z axis + (CW) direction limit signal
2	In	XCCWLM	X axis - (CCW) direction limit signal	52	In	ZCCWLM	Z axis - (CCW) direction limit signal
3	In	$\overline{\text{XNORG}}$	X axis machine origin proximity signal	53	In	$\overline{\text{ZNORG}}$	Z axis machine origin proximity signal
4	In	XORG	X axis machine origin signal	54	In	ZORG	Z axis machine origin signal
5	In	YCWLM	Y axis + (CW) direction limit signal	55	In	ACWLM	A axis + (CW) direction limit signal
6	In	YCCWLM	Y axis - (CCW) direction limit signal	56	In	ACCWLM	A axis - (CCW) direction limit signal
7	In	$\overline{\text{YNORG}}$	Y axis machine origin proximity signal	57	In	$\overline{\text{ANORG}}$	A axis machine origin proximity signal
8	In	YORG	Y axis machine origin signal	58	In	AORG	A axis machine origin signal
9	In	$\overline{\text{SENSOR0}}$	Multipurpose sensor, synchronous start signal (Note 2)	59	In	$\overline{\text{SENSOR1}}$	Multipurpose sensor, synchronous start signal (Note 2)
10	In	$\overline{\text{IN0}}$	General-purpose input 0 signal (This signal allows X axis driver error signal)	60	Out	$\overline{\text{OUT0}}$	General-purpose output 0 signal
11	In	$\overline{\text{IN1}}$	General-purpose input 1 signal (This signal allows Y axis driver error signal)	61	Out	$\overline{\text{OUT1}}$	General-purpose output 1 signal
12	In	$\overline{\text{IN2}}$	General-purpose input 2 signal (This signal allows Z axis driver error signal)	62	Out	$\overline{\text{OUT2}}$	General-purpose output 2 signal
13	In	$\overline{\text{IN3}}$	General-purpose input 3 signal (This signal allows A axis driver error signal)	63	Out	$\overline{\text{OUT3}}$	General-purpose output 3 signal
14	-	EXTV	External power supply for coupler (Note 1)	64	-	EXTVGND	External power supply for coupler GND (Note 1)
15	-	EXTV		65	-	EXTVGND	
16	Out	+COM	$\overline{\text{XCWP}}, \overline{\text{XCCWP}}$ +common (+5V)	66	Out	+COM	$\overline{\text{ZCWP}}, \overline{\text{ZCCWP}}$ +common (+5V)
17	Out	XCWP	X axis + (CW) direction positive logic pulse output	67	Out	ZCWP	Z axis + (CW) direction positive logic pulse output
18	Out	$\overline{\text{XCWP}}$	X axis + (CW) direction negative logic pulse output	68	Out	$\overline{\text{ZCWP}}$	Z axis + (CW) direction negative logic pulse output
19	Out	XCCWP	X axis - (CCW) direction positive logic pulse output	69	Out	ZCCWP	Z axis - (CCW) direction positive logic pulse output
20	Out	$\overline{\text{XCCWP}}$	X axis - (CCW) direction negative logic pulse output	70	Out	$\overline{\text{ZCCWP}}$	Z axis - (CCW) direction negative logic pulse output
21	Out	XDRSTCOM	XDRST current output (+24V)	71	Out	ZDRSTCOM	ZDRST current output (+24V)
22	Out	$\overline{\text{XDRST}}$	X axis servo reset signal (This signal is used for general purpose output)	72	Out	$\overline{\text{ZDRST}}$	Z axis servo reset signal (This signal is used for general purpose output)
23	In	$\overline{\text{XDEND}}/\overline{\text{XPO}}$	X axis positioning completion signal /X axis PO signal	73	In	$\overline{\text{ZDEND}}/\overline{\text{ZPO}}$	Z axis positioning completion signal /Z axis PO signal
24	-	N.C	Reserved	74	-	N.C	Reserved
25	In	+XEA	X axis encoder +A phase signal	75	In	+ZEA	Z axis encoder +A phase signal
26	In	-XEA	X axis encoder -A phase signal	76	In	-ZEA	Z axis encoder -A phase signal
27	In	+XEB	X axis encoder +B phase signal	77	In	+ZEB	Z axis encoder +B phase signal
28	In	-XEB	X axis encoder -B phase signal	78	In	-ZEB	Z axis encoder -B phase signal
29	In	+XZORG	X axis encoder +Z phase signal	79	In	+ZZORG	Z axis encoder +Z phase signal
30	In	-XZORG	X axis encoder -Z phase signal	80	In	-ZZORG	Z axis encoder -Z phase signal
31	Out	N.C	Reserved(No connecting)	81	-	N.C	Reserved
32	Out	+COM	$\overline{\text{YCWP}}, \overline{\text{YCCWP}}$ +common (+5V)	82	Out	+COM	$\overline{\text{ACWP}}, \overline{\text{ACCWP}}$ +common (+5V)
33	Out	YCWP	Y axis + (CW) direction positive logic pulse output	83	Out	ACWP	A axis + (CW) direction positive logic pulse output
34	Out	$\overline{\text{YCWP}}$	Y axis + (CW) direction negative logic pulse output	84	Out	$\overline{\text{ACWP}}$	A axis + (CW) direction negative logic pulse output
35	Out	YCCWP	Y axis - (CCW) direction positive logic pulse output	85	Out	ACCWP	A axis - (CCW) direction positive logic pulse output
36	Out	$\overline{\text{YCCWP}}$	Y axis - (CCW) direction negative logic pulse output	86	Out	$\overline{\text{ACCWP}}$	A axis - (CCW) direction negative logic pulse output
37	Out	YDRSTCOM	YDRST current output (+24V)	87	Out	ADRSTCOM	ADRST current output (+24V)
38	Out	$\overline{\text{YDRST}}$	Y axis servo reset signal (This signal is used for general purpose output)	88	Out	$\overline{\text{ADRST}}$	A axis servo reset signal (This signal is used for general purpose output)
39	In	$\overline{\text{YDEND}}/\overline{\text{YPO}}$	Y axis positioning completion signal /Y axis PO signal	89	In	$\overline{\text{ADEND}}/\overline{\text{APO}}$	A axis positioning completion signal /A axis PO signal
40	-	N.C	Reserved	90	-	N.C	Reserved
41	In	+YEA	Y axis encoder +A phase signal	91	In	+AEA	A axis encoder +A phase signal
42	In	-YEA	Y axis encoder -A phase signal	92	In	-AEA	A axis encoder -A phase signal
43	In	+YEB	Y axis encoder +B phase signal	93	In	+AEB	A axis encoder +B phase signal
44	In	-YEB	Y axis encoder -B phase signal	94	In	-AEB	A axis encoder -B phase signal
45	In	+YZORG	Y axis encoder +Z phase signal	95	In	+AZORG	A axis encoder +Z phase signal
46	In	-YZORG	Y axis encoder -Z phase signal	96	In	-AZORG	A axis encoder -Z phase signal
47	Out	N.C	Reserved(No connecting)	97	-	N.C	Reserved
48	In	FSSTOP	All axes immediate stop signal	98	In	RESET	All-axis reset signal
49	-	N.C	Reserved	99	-	N.C	Reserved
50	-	D.GND	Internal +5V digital GND	100	-	D.GND	Internal +5V digital GND

(2) AL- I/O communication connector (J2)

Pin assignments



- Connector type : RJ-45 (Shield type)
- Adaptable cable : KB-STP- L : length (~ 30 m or less)
(Made by Sanwa Supply: It is not an accessory.)

Reference

For more information about a cable preparing in the AL- series and a recommended cable, refer to the instruction manual of "connection / others" .

Signal table

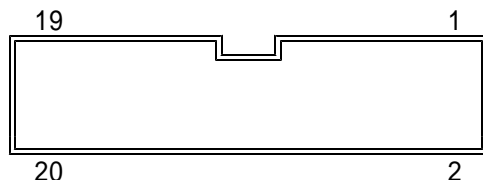
No.	Direction	Signal name	Description
1	-	N.C	Connection is prohibited.
2	-	N.C	Connection is prohibited.
3	I/O	+AL	+ side input/output signal of the serial data (line driver positive logic)
4	I	+V	Power supply for AL- I/O communication (+6 V)
5	I	-V	GND for AL- I/O communication (0 V)
6	I/O	-AL	- side input/output signal of the serial data (line driver negative logic)
7	-	N.C	Connection is prohibited.
8	-	N.C	Connection is prohibited.

(3) Special-purpose I/O connector (J3)

The conector of the applied function.

Pin assignment

- Connector type name : XG4C-2031 (OMRON)
- Adaptable connector socket : XG4M-2030 (OMRON, Not accessories.)
- Adaptable cable : CE-13 (MIL 20P 1.5 m flat cable. Not accessories.)



Signal table

- All input signal is not able to set time constants, to switch logic.

- (Note 1) When the $\overline{\text{MAN}}$ signal goes low, this board is MANUAL mode.
 When the $\overline{\text{MAN}}$ signal goes high, this board return to BUS mode.
 The $\overline{\text{MAN RDY}}$ signal is enable to go high by MAN MASK command.
 When the $\overline{\text{MAN}}$ signal is low level, this board is not MANUAL mode by setting $\overline{\text{MAN}}$ signal low level.
- (Note 2) $\overline{\text{SIGNAL INx}}$ input signal can be use general-purpose sensor function and synchronous start function. If these signal is used, set the functions that need to be changed from their values.
 The initial value after the relevant signal is reset is "No function" .
 If this board is MANUAL mode, You can not use $\overline{\text{SIGNAL INx}}$ input signal.
 When this board is MANUAL mode, this signal(SEL A-D) enable to select an axis that perfoms MANUAL SCAN drive.
 The functions assigned to the $\overline{\text{SIGNAL INx}}$ input signal are invalid. And when this board returns to BUS mode, the functions assigned to this signal are valid.
- (Note 3) $\overline{\text{SIGNAL OUTn}}$ output signal can be output status signals of any axes by setting status output function. The initial values after the relevant signal is reset are as follows:
 $\overline{\text{SIGNAL OUTn0}}$ is CNTINT signal of Xn axis. $\overline{\text{SIGNAL OUTn1}}$ is CNTINT signal of Yn axis.
- (Note 4) When this board is MANUAL mode, $\overline{\text{SS0}}, \overline{\text{SS1}}$ input signal(SEL A-D) enables general-purpose sensor that MANUAL SCAN drive specified axis.
 When general-purpose sensor function is set as "UP/DOWN/CONST command", this input signal enable acceleration/deceleration command signal of MANUAL SCAN drive.

Pin No	Dir	Signal name	Description	
			BUS mode	MANUAL mode
1	-	D.GND	GND(internal +5V GND)	
2	In	$\overline{\text{MAN}}$	MANUAL mode select signal (Note 1)	
3	In	$\overline{\text{FSSTOP}}$	All axes immediate stop signal	
4	In	$\overline{\text{CWMS}}$	Invalid	CW direction MANUAL SCAN drive command signal
5	In	$\overline{\text{CCWMS}}$		CCW direction MANUAL SCAN drive command signal
6	-	D.GND	GND(internal +5V GND)	
7	In	$\overline{\text{SIGNAL IN0}} / \text{SEL A}$	General-purpose, synchronous start signal (Note 2)	The signals can be combined to select the axis used for manual operation.
8	In	$\overline{\text{SIGNAL IN1}} / \text{SEL B}$		
9	In	SEL C		
10	In	SEL D		
11	Out	$\overline{\text{SIGNAL OUT0}}$	Staus output signal	(The initial value after resetting : XCNTINT)
12	Out	$\overline{\text{SIGNAL OUT1}}$		(The initial value after resetting : YCNTINT)
13	Out	NC	Reserved	
14	Out	NC		
15	-	D.GND	GND(internal +5V GND)	
16	Out	+5V	Internal +5V	
17	In	$\overline{\text{SS0}}$	Invalid	MANUAL SCAN drive acceleration/ deceleration command signal (General-purpse sensor signal) (Note 4)
18	In	$\overline{\text{SS1}}$		
19	Out	$\overline{\text{MAN RDY}}$	Permission signal switching MANUAL mode (Note 1)	
20	-	D.GND	GND(internal +5V GND)	

2-7. Input and Output Specifications

(1) Output specifications

●Output specifications 1

Circuit	Description	
<p style="text-align: center;">Common for all axes</p>	Signal name	CWP, $\overline{\text{CWP}}$, CCWP, $\overline{\text{CCWP}}$
	Output method	Line driver (differential) output (Equivalent to 26C31: Compliant with RS422A)
	Output current	$\pm 20\text{mA}$
	Output frequency	Maximum 6.5MHz (Independent drive)
	Insulation	Non-insulated

●Output specifications 2

Circuit	Description	
<p style="text-align: center;">Common for $\overline{\text{OUT0}}$ to $\overline{\text{OUT3}}$</p>	Signal name	$\overline{\text{OUT0}}$ -- $\overline{\text{OUT3}}$
	Interface voltage	+24V
	Output method	Nch transistor Open collector output
	Output current	ON : 30mA (Vce=1V or less) 50mA (Vce=2V or less) OFF : 0.1mA or less
	Output response time	1ms or less (ON→OFF、OFF→ON)
Insulation	Photocoupler insulation (between internal circuits and external circuits)	

●Output specifications 3

Circuit	Description	
<p style="text-align: center;">Common for all axes</p>	Signal name	$\overline{\text{DRST}}$ (Can be connected from DRSTCOM to the +5V current limiting circuit: up to 15 mA)
	Interface voltage	+24V
	Output method	Nch transistor Open collector output
	Output current	ON : 30mA (Vce=1V or less) 50mA (Vce=2V or less) OFF : 0.1mA or less
	Output response time	1ms or less (ON→OFF、OFF→ON)
Insulation	Photocoupler insulation (between internal circuits and external circuits)	

●Output specifications 4 (Applied function)

Circuit	Description	
<p style="text-align: center;">J3 connector signal</p>	Signal name	SIGNAL $\overline{\text{OUT0}}$, $\overline{\text{SIGNAL OUT1}}$
	Interface voltage	+30V or less
	Output method	Open collector output
	Output current	ON : 10mA (Vce=0.6V or less) OFF : 0.3mA or less
	Output response time	1μs or less (A latch and output time width can be set for output.) (ON→OFF、OFF→ON)
Insulation	Non-insulated	

(2) Input specifications

● Input specifications 1

Circuit	Description	
<p>Common for all axes (Excluding \overline{INx}, $\overline{SENSORx}$, FSSTOP, RESET)</p>	Signal name	\overline{ORG} , \overline{NORG} , $\overline{DEND/PO}$, $\overline{IN0--IN3}$ $\overline{SENSOR0}$, $\overline{SENSOR1}$, RESET (A contact) FSSTOP, CWLM, CCWLM (B contact)
	Interface voltage	+24V
	Input impedance	6.8KΩ
	ON/OFF level	ON : 2.5mA or more OFF : 0.8mA or less
	Input response time	1ms or less (a signal other than the RESET) 5ms or less (RESET) (ON→OFF、OFF→ON)
	Insulation	Photocopler insulation (between internal circuits and external circuits)

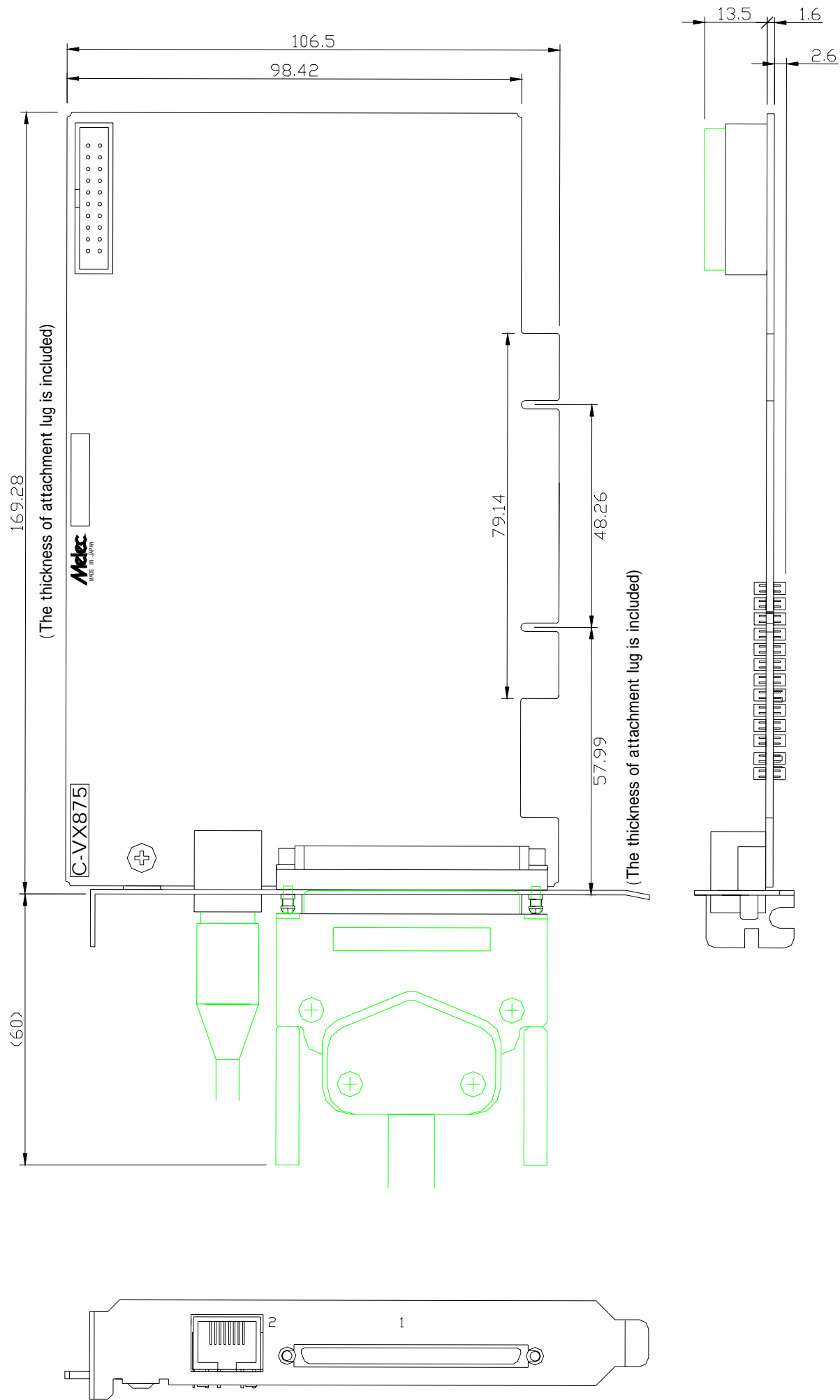
● Input specifications 2

Circuit	Description	
<p>Common for all axes</p>	Signal name	$\pm EA$, $\pm EB$, $\pm ZORG$
	Interface specifications	Line receiver input (should be connected to an RS422-compliant line driver)
	Input terminating resistor	220Ω
	Response frequency	$\pm EA$, EB : 5MHz $\pm ZORG$: 100KHz
	Insulation	Non-insulated

● Input specifications 3 (Applied function)

Circuit	Description	
<p>J3 connector signal</p>	Signal name	\overline{MAN} , \overline{CWMS} , \overline{CCWMS} , $\overline{SS0}$, $\overline{SS1}$, \overline{FSSTOP} $\overline{SIGNAL IN0}$, $\overline{SIGNAL IN1}$ /SEL_A, B, C, D
	Interface specifications	TTL level CMOS schmitt input
	Input level	High level open Low level 0.8V or less
	Input response time	5ms or less : \overline{MAN} , \overline{CWMS} , \overline{CCWMS} 1ms or less : $\overline{SS0}$, $\overline{SS1}$, \overline{FSSTOP} 10us or less : $\overline{SIGNAL IN0}$, $\overline{SIGNAL IN1}$ /SEL_A, B, C, D (ON→OFF、OFF→ON)
	Insulation	Non-insulated

2-8. Outside Dimensions



3 . SETTING

Before integrating the C-VX875 into the PC, set the switches on the board.

3-1. Installation of device driver for Windows

Device driver for Windows is necessary to operate this product.

- Please refer to the installation manual attachment to a exclusive use device driver 「MPL-30-01vx.xx/PCIW32 or MPL-31-01vx.xx/PCIW64」 for details of the installation method.

* Version No. ...Please confirm the latest version of vx.xx at the manual of the device driver.

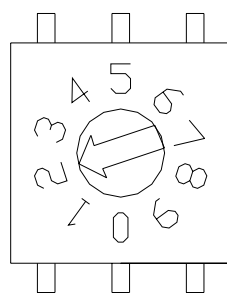
3-2. Setting the Board Number(S1)

Assign a board number to the C-VX870 series using the rotary switch S1 on the board.

(By default (before shipment from the factory), the rotary switch is board number 1)

When two or more C-VX870 series boards are used, assign board numbers to the second and any subsequent boards in such a way that no numbers are duplicated.

The following figure shows an example in which board number 2 is assigned.



The S1 setting is validated after power-on.

Set the switch with power off, and turn it on after changing the setting.

3-3. Setting of the AL- I/O communications

The C-VX875 does the following setting of AL- I/O communications by executing Environment-set-function unlike the switch setting done with other slave units.

(1) Address setting of the AL- I/O series

The C-VX875 address is H' 0 fixation.

And, please set not to overlap the address of each slave I/O unit.

(2) Baud rate setting of the AL- I/O series

As for the AL- I/O communication baud rate, 10 Mbps/50 m or 20 Mbps/30 m can be selected.

To transmission rate to set in C-VX875, please set the transmission rate of all slave I/O units connected on AL- I/O communication.

(3) Retry number setting of the AL- I/O series

The setting of retrying is possible by the range from 0 (non retry) to 3.

- The address of the slave I/O unit, the transmission rate setting become effective at the time of power supply injection.

Please turn on the power supply again without fail.

And to the master execute an Environment-set-function after these setting changes.

Please refer to the device driver manual for Windows for details of function specification.

3-4. Setting of Extend communications

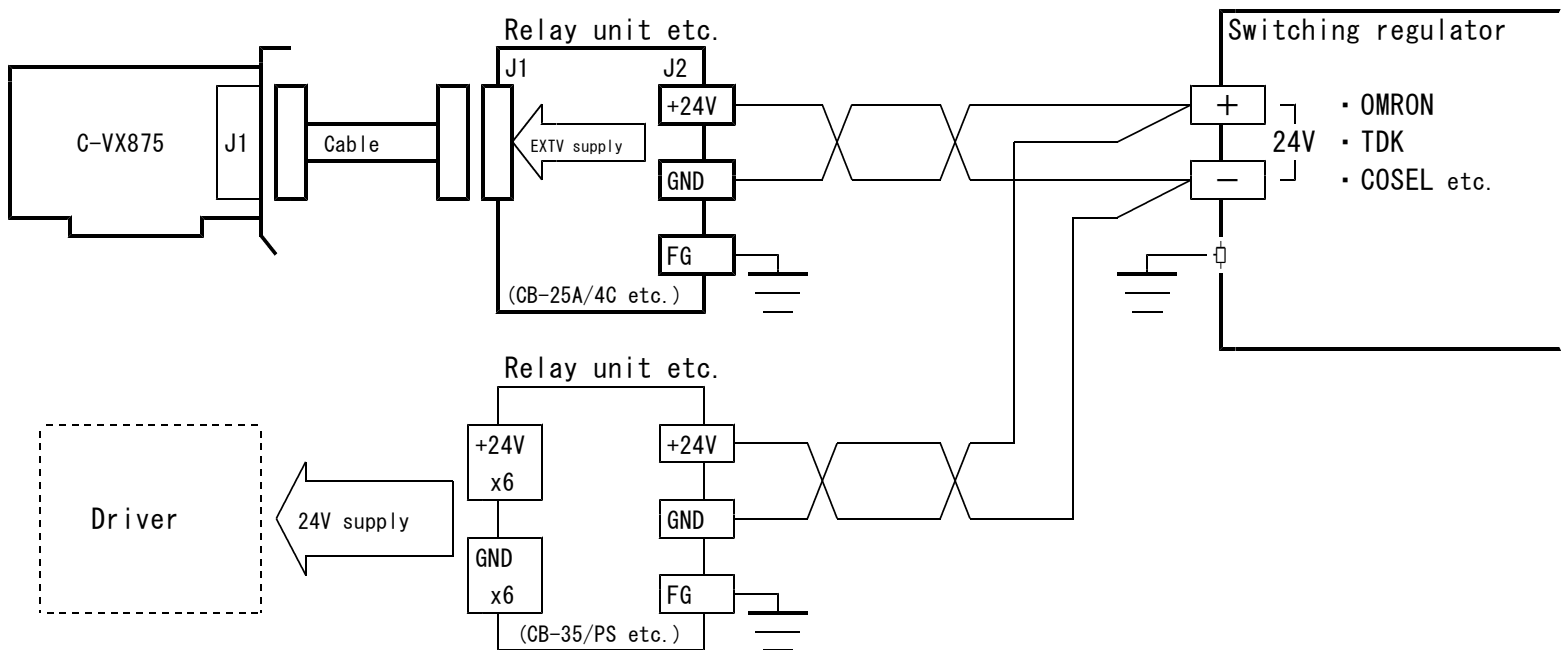
When the Extend-unit is used, the address setting of the Extend-unit and the hard setting of the baud rate setting etc. are unnecessary.

- The Extend-unit is controlled by an Extend-unit-communication-set-function and an Extend-unit-communication-control-function.

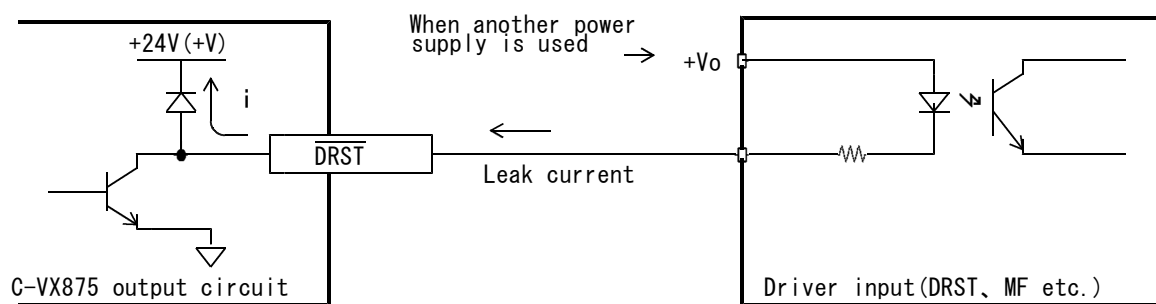
Please refer to the details of function specifications at a device driver instruction manual for Windows.

4. CONNECTION

4-1. Example of user I/O Interface Power Supply Connection



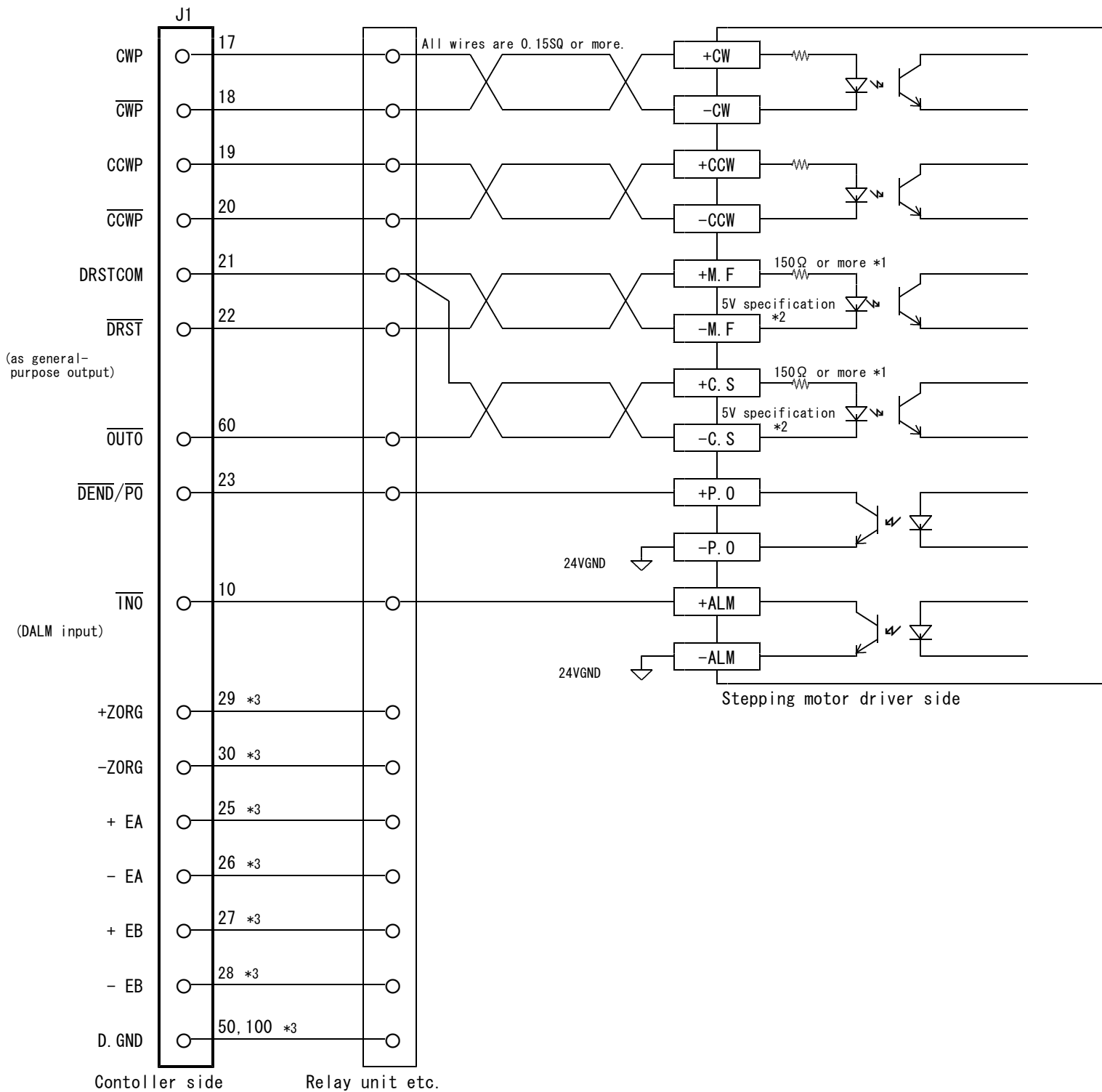
- For the user interface power supply (EXTV) of controller C-VX875, connect +24Vdc from the common power supply so that it turns on and off in synchronization with externally connected equipment. For easy connection, use the optional relay unit.
- For the power supply used for the driver interface ($\overline{\text{OUTx}}$ signal, $\overline{\text{DRST}}$ signal), use one prepared by the controller, such as DRSTCOM.
 For details, refer to Section 4-2, "Examples of Connection to Drivers."
- ◆ Power may be supplied to the driver from a power supply different from the C-VX875 such as by connecting to the $\overline{\text{OUTx}}$ or $\overline{\text{DRST}}$ signal of the servo driver or motor free (MF) signal of the stepping driver. If so and power supply to the driver (+Vo) is greater than power supply to the C-VX875 (+V), leak current *i* flows through the protection diode of the output circuit and the input circuit of the connection destination may be put in the ON state.



4-2. Examples of Connection to Drivers

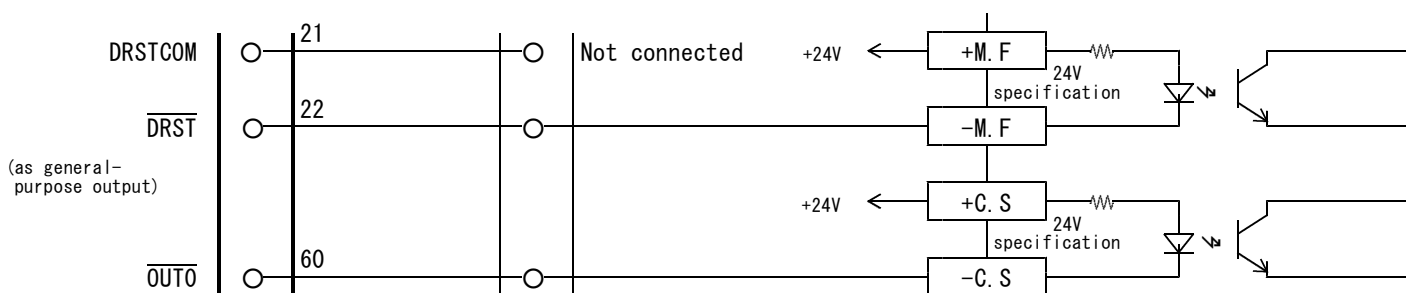
(1) Example of connection to the stepping motor driver

(x axis pin numbers are used in this example.)



*1 If the current limiting resistor on the driver side is less than 150Ω, externally add resistor so that the total resistor value becomes 150Ω or more.

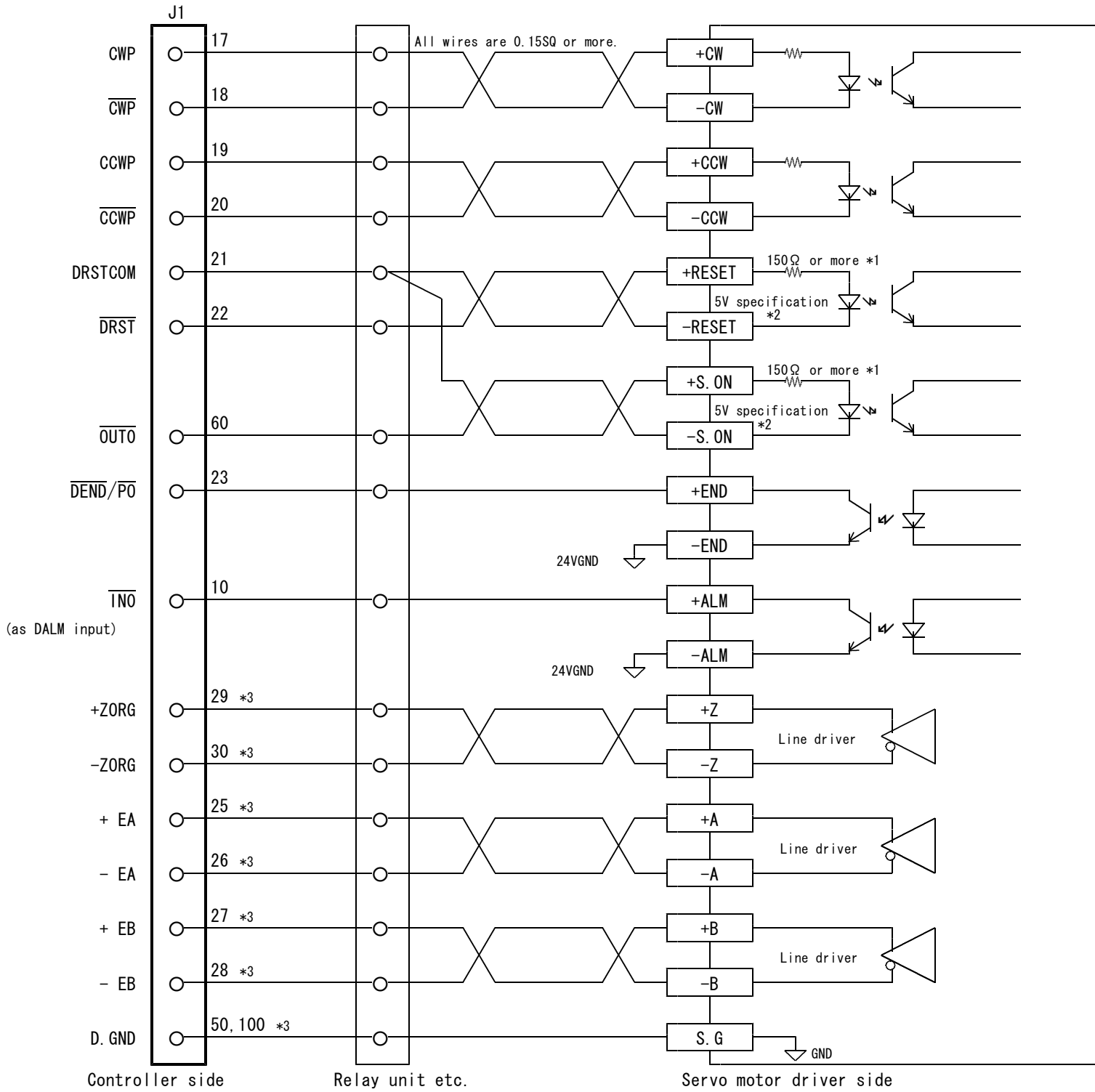
*2 When the input circuit uses a +24V interface, the connection is as follows:



*3 The signal is connected when the encorder is used.

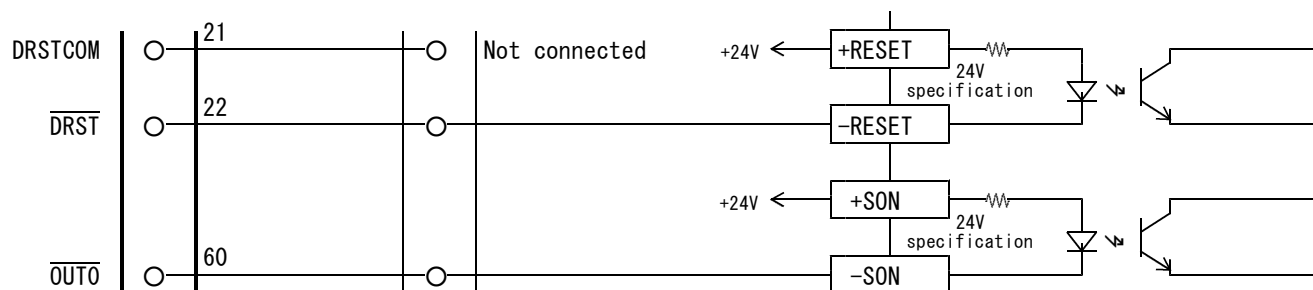
Example of connection refers to "Example of connection to the servo motor driver".

(2) Examples of Connection to the servo motor driver
 (X axis pin numbers are used in this sample.)



*1 If the current limiting resistor on the driver side is less than 150 Ω, externally add resistor so that the total resistor value becomes 150 Ω or more.

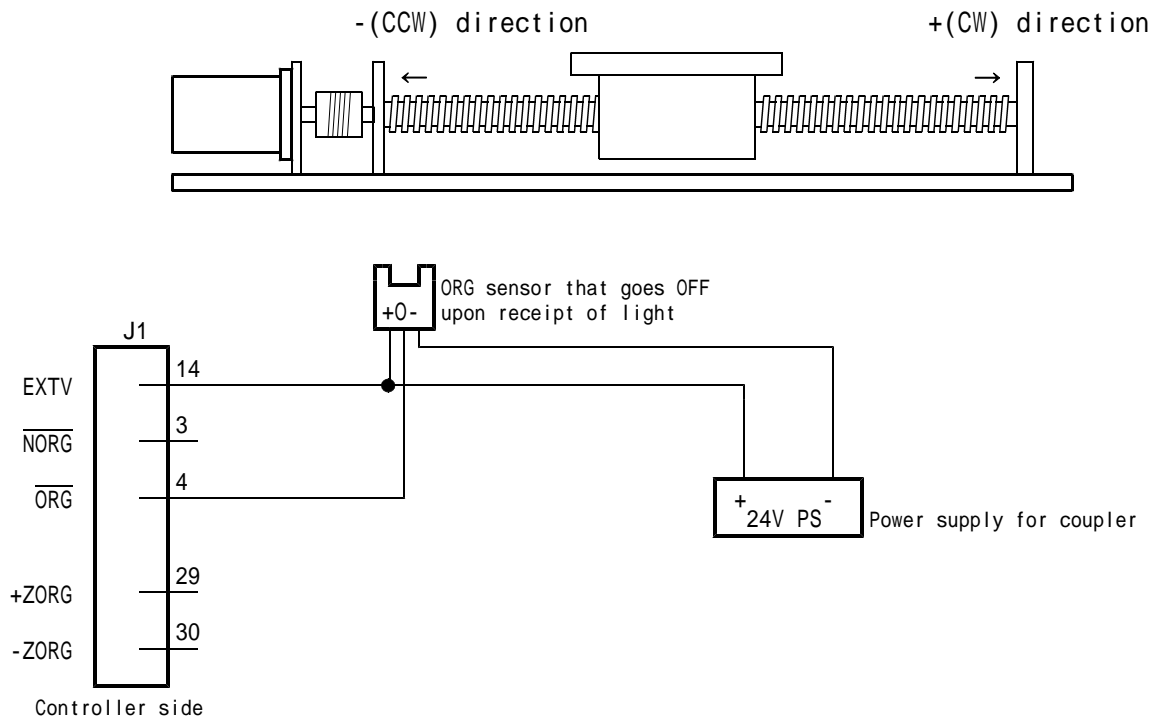
*2 When input circuit of the servo driver uses a +24V interface, the connection is as follows:



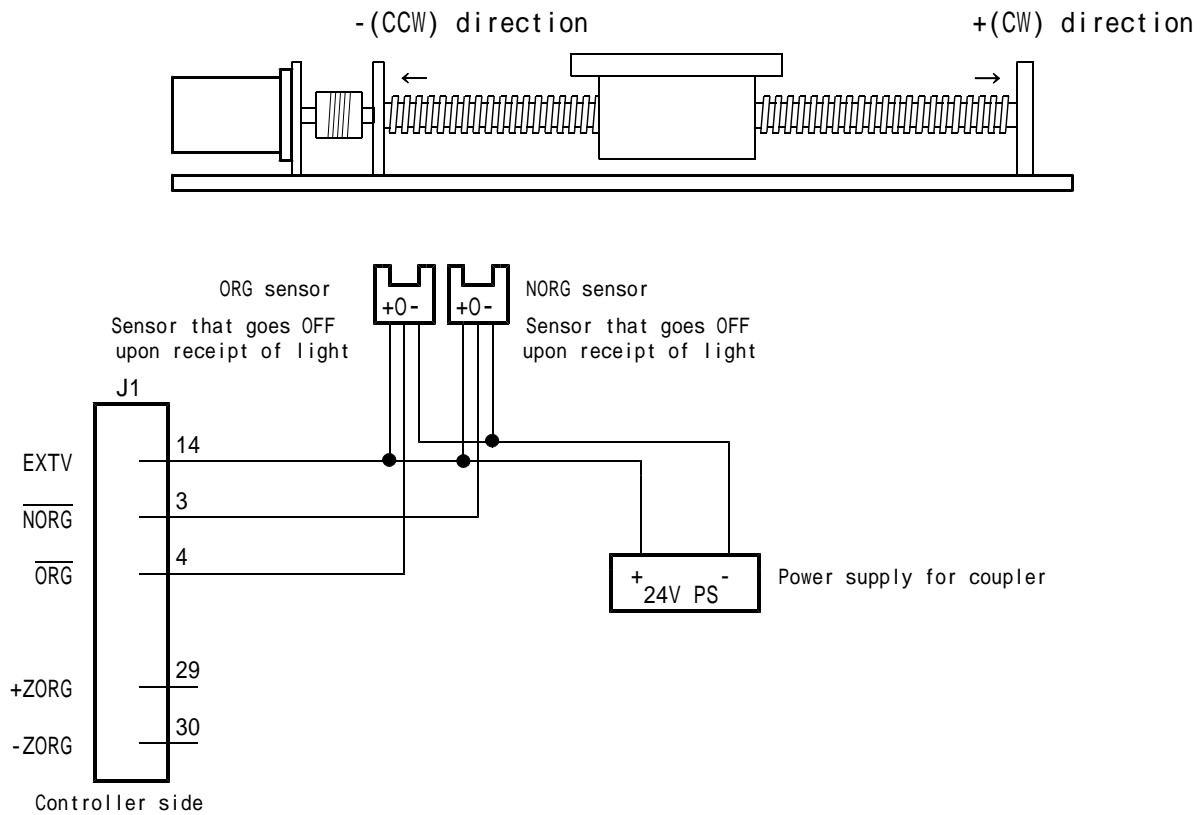
*3 The signal is connected when the encorder signal is used.
 Connect the encorder signal to the line driver output circuit.

(3) Example of connection to an origin sensor
 X axis pin numbers are used in this example.

When using the origin sensor only



When using the origin sensor+origin proximity signal



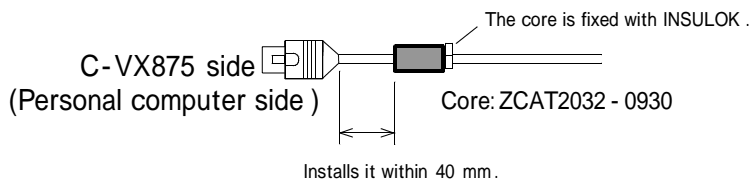
4-4. Connection of AL- communication system

CAUTION

Operation not anticipated may cause damage of the machine and the product.
To prevent the malfunction by the noise, the AL- I/O communications cable recommends recommended cable.

(1) Core connection of AL- I/O communications cable

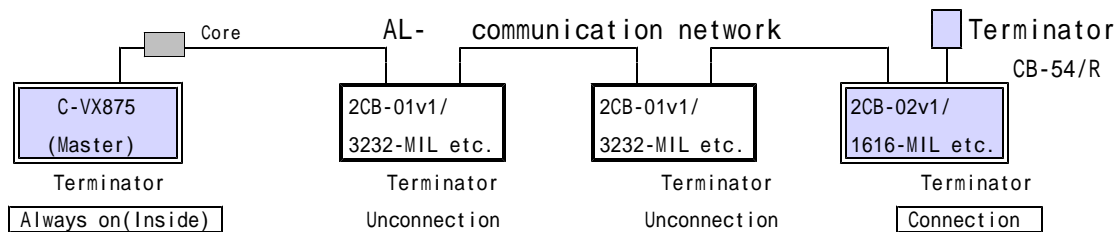
Please install the core in the master side. And, the personal computer system including the AL- I/O communication is made to operated with stability.



The core is prepared by our company.
Please refer to the "connection/other" manual.

(2) Connection of terminator

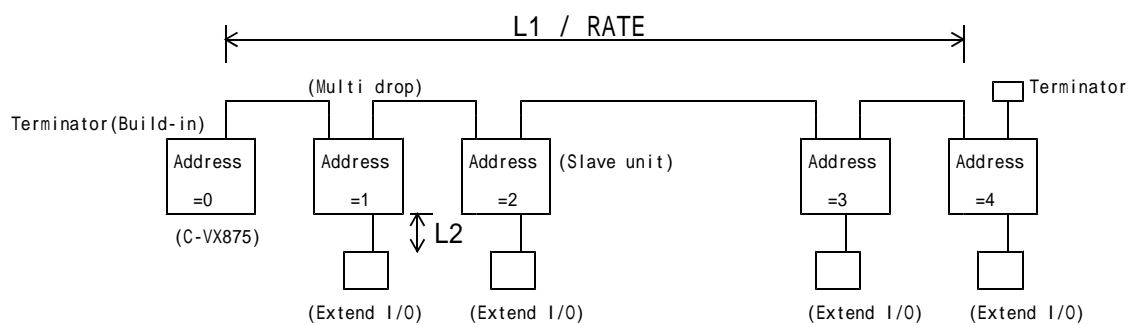
C-VX875 mounts the terminator of the AL- I/O communication, is connected, and the setting is unnecessary. It is necessary to install C-VX875 to the AL- I/O communication network edge. Connect terminator (CB-54/R) with the slave I/O unit arranged on the AL- I/O communication network edge. Do not connect the terminator with other equipment.



(3) Wiring distance of AL- communication

The total wiring distance of the AL- I/O communications cable is the following range including the multidrop wiring.

- The wiring distance of Extend I/O doesn't relate to AL- I/O communication baud rate (RATE).
- The wiring distance of Extend I/O from each slave is within 1 m.



AL- communication baud rate and wiring distance

	RATE	
	10 Mbps	20 Mbps
Wiring distance		
L1 (AL- I/O communication)	50 m or less	30 m or less
L2 (Extend I/O communication)	1 m or less	


The number of slaves that can be connected directly with the AL- I/O communication are 4 units or less. Extend I/O that can be extended directly from the slave unit is not included in the number of slaves.


(4) Power supply and slave power supply for communication

The AL- I/O communication power supply of each slave I/O unit is supplied from C-VX875 through the communications cable so that the entire AL- I/O communication network should not become unstable when the power supply on each slave unit side is intercepted.

The reconnection of communications can be done by executing Environment-Function to the master when the power supply of the main unit on the slave I/O unit side is obstructed.

5 . Maintenance

 CAUTION	<p>Incorrect handling may lead to an electric shock.</p> <p>Inspection and maintenance need to be conducted by an expert engineer only. Before inspecting and maintaining this product, turn off the power.</p>
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 CAUTION	<p>An electric shock, injuries, and fire may be caused.</p> <p>Do not make repair and modification such as product disassembly and parts replacement.</p>
---	---

5-1. Maintenance and Inspection

(1) Cleaning method

To use the product in a favorable condition, conduct cyclic cleaning as follows.

- During the cleaning of the terminal plating part, wipe it with a dry, soft cloth.
- If stain is not removed by the dry wiping, soak a cloth in a solution in which neutral detergent is diluted, wring it out, and wipe off the stain with it.
- Do not use a high-volatile solvent such as benzene and thinner, and a wipe. This may deteriorate gold plating by transformation and oxidation.

(2) Inspection method

To use the product in a favorable condition, conduct periodic inspection.

Usually conduct the inspection every six months or every year.

To use the product in an extremely hot and humid or dusty environment, shorten the inspection interval.

Inspection item	Inspection details	Criteria	Inspection method
Environment state	Check whether ambient and intra-device temperatures are appropriate.	0 ~ + 45	Thermometer
	Check whether ambient and intra-device humidities are appropriate.	10% ~ 80%RH(without dew condensation)	Hygrometer
	Check whether dust is deposited.	No dust	Visual check
Installation state	Check whether the product is firmly secured.	Not loose(6kg·cm)	Torque wrench
	Check whether connectors are completely inserted.	Not loose and removed	Visual check
	Check whether cables are to be removed.	Not loose and removed	Visual check
	Check whether connecting cables are to be broken.	Appearance is normal.	Visual check

(3) Replacement method

If the product becomes faulty, repair it immediately because the entire device system may be affected.

To make the repair smoothly, a spare product should be prepared.

- To prevent an accident such as an electric shock during replacement, stop the device and turn off the power.
- If poor contacting is assumed, wipe contacts with a clean cotton cloth that is wet with industrial alcohol.
- Take a record of switch settings during replacement and return them to their state before the replacement.
- After the replacement, confirm that the new product is normal.
- For the faulty product replaced, have it repaired by returning it to the company with a report indicating as much details on the failure as possible.

5-2. Saving and Disposal

(1) Saving method

Save the product in the following environment.

- Indoor (place in which the product is not in the path of direct sunlight)
- Place at ambient temperature and humidity within the specifications
- Place free of corrosive and inflammable gases
- Place free of dust, dirt, salt, and iron powder
- Place free of direct vibration and shock to the product body
- Place free of water, oil, and chemicals droplets
- Place where a person cannot ride or put objects on the product

(2) Disposal method

Handle the product as industrial waste.

The main parts which revised by this manual

Parts	Content
None	

Technical Service

TEL.(042)664-5382 FAX.(042)666-5664
E-mail s-support@melec-inc.com

Sales and Service

TEL.(042)664-5384 FAX.(042)666-2031
URL:<http://www.melec-inc.com>

Melec Inc. Control equipment marketing department
516-10,Higashiasakawa-cho,Hachioji-shi,Tokyo 193-0834,Japan