MELSEC A/Q Series

Programmable Logic Controllers

User's Manual

High-Speed Counter Modules AJ65BT-D62, AJ65BT-D62D, AJ65BT-D62D-S1

Art. no.: 132281
01 03 2000
IB (NA)-66823-B

Precautions Regarding Safety

(Always read this instruction before using the equipment)

Before using this product, please read this manual and the relevant manuals introduced in this manual carefully and pay full attention to safety to handle the product correctly.
The instructions given in this manual are concerned with this product. For the safety instructions of the programmable controller system, please read the CPU module user's manual.
In this manual, the safety instructions are ranked as "WARNING" and "CAUTION".

DANGER	Improper handling could cause hazardous conditions resulting in severe injury or death.
CAUTION	Improper handling could cause hazardous conditions resulting in moderate or light injury, or in physical damage.

Items marked with an exclamation point in a triangle ⚠ could also cause severe consequences, depending on the circumstances, if not handled properly.
They indicate information that should be taken seriously and observed conscientiously.
Manuals supplied with the products should be stored carefully where they can be accessed whenever necessary, and should always be passed on to the end user along with the equipment.

[Precaution Regarding Design]

DANGER

- When a communication error occurs in data link, the faulty station will result in the following status. Using the communication status information, configure up an interlock circuit in the sequence program to make the system safe.
  Misoutput or misoperation may cause an accident.
  (1) General-purpose inputs from this module all switch off.
  (2) General-purpose outputs from this module all switch off.

- Some module failures may keep input/output on or off. Provide an external monitoring circuit for I/O signals which may lead to serious accidents.

CAUTION

- Do not bundle control lines or communication cables with main circuit or power lines or lay them near these lines.
  As a guideline, separate the cables at least 100mm(3.94inch).

[Precautions Regarding Assembly]

⚠ CAUTION

- Use the module in an environment that conforms to the general specifications in the manual.
  Otherwise, an electric shock, fire, misoperation or product damage or deterioration can occur.

- Securely fix the module using the DIN rail or mounting screws and fully tighten the mounting screws within the specified torque range.
  Undertightening can cause a drop or misoperation.
  Overtightening can cause a drop or misoperation due to damaged screws or module.

- Do not touch the conductive areas of the module directly.
  Otherwise, the module can misoperate or fail.

[Precautions Regarding Wiring]

⚠ DANGER

- Before starting mounting, wiring or other work, always switch power off externally in all phases.
  Otherwise, an electric shock, product damage or misoperation may occur.

- When switching power on or starting operation after mounting, wiring or other work, always install the supplied terminal cover to the product.
  Otherwise, you may get an electric shock.

⚠ CAUTION

- Always connect the FG terminal to the ground using class 3 or higher grounding exclusively designed for PC.
  Otherwise, an electric shock or misoperation may occur.

- Before wiring the module, confirm the rated voltage and terminal arrangement of the product.
  A fire or failure can occur if the power supply connected is different from the rating or wiring is incorrect.

- Tighten the terminal screws within the specified torque range.
  Undertightening can cause a short circuit or misoperation.
  Overtightening can cause a short circuit or misoperation due to damaged screws or module.

- Ensure that foreign matters such as chips and wire off-cuts do not enter the module.
  They can cause a fire, failure or misoperation.

[Precautions Regarding Wiring]

CAUTION

- Always secure the communication and power cables connected to the module, e.g. run them in conduits or clamp them.
  Otherwise, the module or cables can be damaged due to dangling, moved or accidentally pulled cables or misoperation can occur due to improper cable connection.

- Do not hold the cable part when unplugging the communication or power cable connected to the module.
  When the cable is fitted with a connector, hold the connector of the cable part connected to the module.
  When the cable is not fitted with a connector, loosen the screw in the cable part connected to the module. If you pull the cable connected to the module, the module or cable can be damaged or misoperation can occur due to improper cable connection.

[Precautions Regarding Startup and Maintenance]

DANGER

- Do not touch the terminals while power is on.
  This can cause misoperation.

- Before starting cleaning or terminal screw retightening, always switch power off externally in all phases.
  Otherwise, a module failure or misoperation can occur.
  Undertightening can cause a drop, short circuit or misoperation.
  Overtightening can cause a drop, short circuit or misoperation due to damaged screws or module.

CAUTION

- Do not disassemble or modify the module.
  This can cause a failure, misoperation, injury or fire.

- The module case is made of resin. Do not drop it or give it hard impact.
  This can damage the module.

- Before mounting or dismounting the module to or from an enclosure, always switch power off externally in all phases.
  Otherwise, the module can fail or misoperate.

- The pulse/external input voltage setting pins must be set after switching power off externally in all phases.
  Otherwise, the module can fail or misoperate.

[Precautions Regarding Product Disposal]

⚠ CAUTION
• When disposing of the product, handle it as industrial waste.

Revisions

*The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Oct.1997	IB(NA)-66823-A	First edition
Mar.2000	IB(NA)-66823-B	Contents of 3.4 greatly changed Output signal list in 3.7 (2) modified Partial correction made to POINT in 7.3 Partial addition made to contents of 10.2 Partial addition made to Appendix 1 Partial correction made to 4.2.1 (2) Partial correction made to 11.3 (4)

Introduction

Thank you for the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers.
Please read this manual carefully so that equipment is used to its optimum.
A copy of this manual should be forwarded to the end user.

CONTENTS

About the Manuals

The following product manuals are available. Please use this table as a reference to request the appropriate manual as necessary.

Related Manuals

Manual Name	Manual No. (Model Code)
High-Speed Counter Module type AJ65BT-D62/AJ65BT-D62D/AJ65BT-D62D-S1/ User's Manual(Hardware) Describes the module specifications, applicable systems, handling, wiring and other information for use of the module. (Option)	IB-66822 (13JL44)
CC-Link System Master · Local Module type AJ61BT11/A1SJ61BT11 User's Manual Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61BT11 and A1SJ61BT11. (Option)	IB-66721 (13J872)
CC-Link System Master · Local Module type AJ61QBT11/A1SJ61QBT11 User's Manual Describes the system configuration, performance specifications, functions, handling, wiring and troubleshooting of the AJ61QBT11 and A1SJ61QBT11. (Option)	IB-66722 (13J873)

1. INTRODUCTION

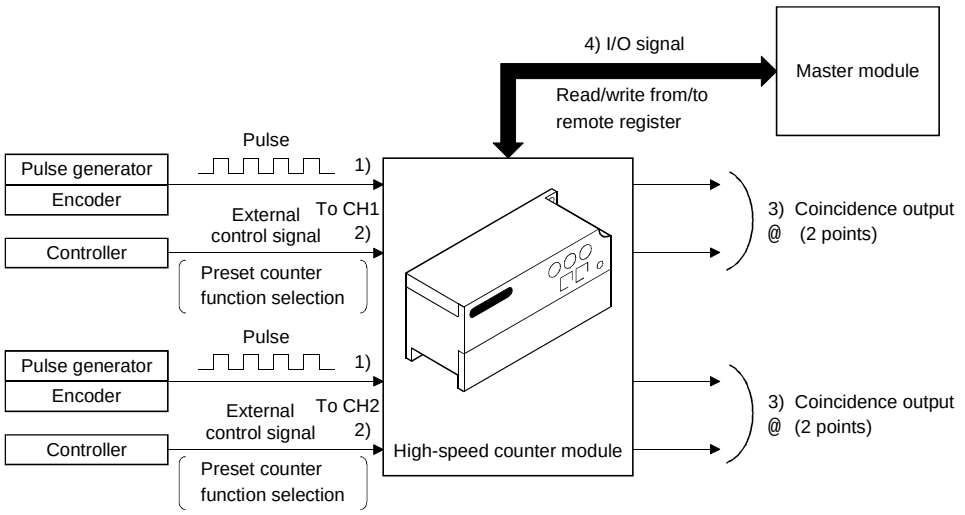
This user's manual describes the specifications, handling and programming of the AJ65BT-D62/D62D/D62D-S1 type high-speed counter module (hereinafter called the high-speed counter module) to be used in a Control Communication Link (hereinafter called CC-Link) system.
The high-speed counter module can import and count pulses of a pulse generator which cannot be imported by a programmable controller CPU.
The high-speed counter module can detect and count up to 400,000 pulses per second.
The high-speed counter module is available in the following three different types.

<table>
<tr><th colspan="2">Item</th><th>AJ65BT-D62</th><th>AJ65BT-D62D</th><th>AJ65BT-D62D-S1</th></tr>
<tr><td colspan="2">Type</td><td>DC input
sink output type</td><td colspan="2">Differential input sink output type</td></tr>
<tr><td rowspan="2">External input</td><td>Preset</td><td colspan="2" rowspan="2">5/12/24VDC 2 to 15mA</td><td>Differential input</td></tr>
<tr><td>Function start</td><td>5/12/24VDC
2 to 5mA</td></tr>
<tr><td colspan="2">Max. counting speed</td><td>Max. 200kPPS</td><td colspan="2">Max. 400kPPS</td></tr>
<tr><td colspan="2">CC-Link station type</td><td colspan="3">Remote device station</td></tr>
<tr><td colspan="2">Counting range</td><td colspan="3">24-bit binary (0 to 16777215)</td></tr>
<tr><td colspan="2">Counting switch-over</td><td>200k/10k</td><td colspan="2">1 phase:400k
2 phases:300k/10k</td></tr>
</table>

The high-speed counter module counts 1-phase and 2-phase pulse inputs as described below.

1-phase pulse input multiplied by one ..... Counts on the leading edge or trailing edge of a pulse.
1-phase pulse input multiplied by two ..... Counts on the leading edge and trailing edge of a pulse.
2-phase pulse input multiplied by one ..... Counts on the leading edge or trailing edge of a phase A pulse.
2-phase pulse input multiplied by two ..... Counts on the leading edge and trailing edge of a phase A pulse.
2-phase pulse input multiplied by four..... Counts on the leading edge and trailing edge of phase A and phase B pulses.

The following diagram outlines how the high-speed counter module operates.



* Only the AJ65BT-D62D-S1 accepts one input and provides one coincidence output. However, it can use two points for the counter value magnitude comparison (coincidence, greater, less) signals.

1) Pulses input to the high-speed counter module are counted.

2) The preset or counter function can be selected with an external control signal.

3) The pulse is compared as a coincidence output with the present count value and a signal is issued accordingly.

4) The sequence program can be used to confirm the I/O signals and remote register status of the high-speed counter module and to start, stop and preset the counter.

1.1 Features

The high-speed counter module has the following features.

(1) Pulses can be counted in a wide range from 0 to 16777215.
The count value is stored in 24-bit binary.

(2) Count value can be multiplied.
Multiplication by either one or two can be selected for 1-phase pulse inputs, or multiplication by one, two or four for 2-phase pulse inputs.

(3) Maximum counting speed can be switched.
Since the maximum counting speed of either 400k (200k for the D62) or 10k can be selected, pulses can be counted without errors on gentle leading and trailing edges.

(4) Coincidence output is available.
ON/OFF signals are issued according to the comparison between the preset output status of a selected channel and the present counter value.
One module can accept two inputs and issues two outputs to one input, which can serve as upper and lower limit signals.
The AJ65BT-D62D-S1 accepts one input and provides one coincidence output. Note that it can use two points for counter value (coincidence, greater, less) signals.

(5) Ring counter function is available.
Counting repeats between the preset value and the ring counter value, and this function is effective in controlling fixed-pitch feed.

(6) Four counter functions are available.
Any of the following functions can be selected and used.

(a) Latch counter function ..... Latches the present counter value in response to an input signal.

(b) Sampling counter function ..... Counts incoming pulses within the preset period of time starting from a signal input.

(c) Periodic pulse counter function..... Stores the present and previous counter values at preset intervals during a signal input.

(d) Count disable function ..... Stops pulse counting with an input signal entered while the count enable command is on.

(7) Preset or counter function can be selected with an external control signal.
By applying a voltage to the external PRESET (Preset) or F.START (Function start) terminal, the preset or counter function can be selected.
These functions are used to eliminate the influence of scantime.

1.2 Abbreviations, Generic Names and Terms Used in This Manual

In this manual, the following abbreviations and generic names are used to describe the high-speed counter module.

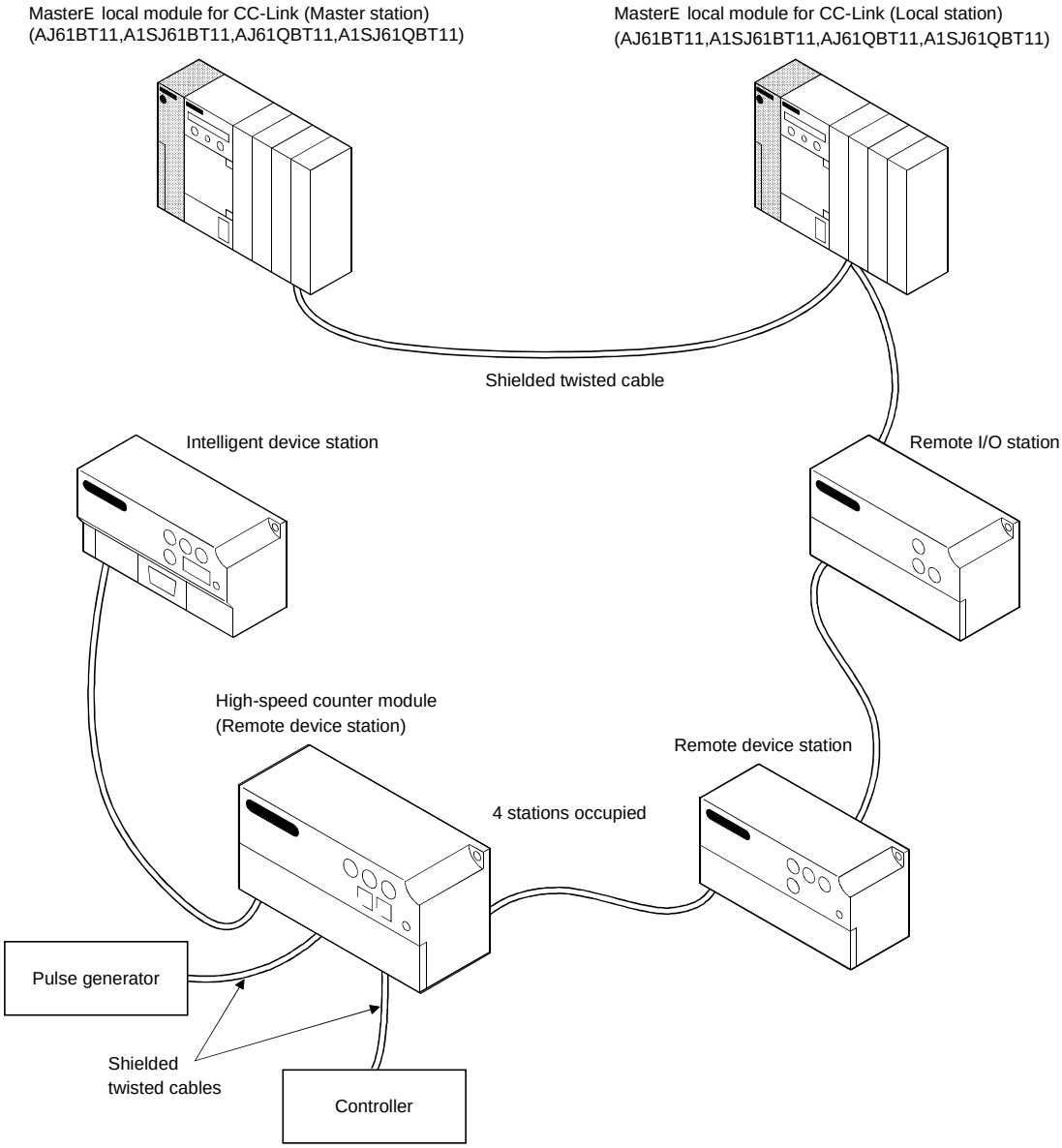
Abbreviation/ Generic Name	Description
AJ65BT-D62	Abbreviation for the AJ65BT-D62 type high-speed counter module.
AJ65BT-D62D	Abbreviation for the AJ65BT-D62D type high-speed counter module.
AJ65BT-D62D-S1	Abbreviation for the AJ65BT-D62D-S1 type high-speed counter module.
High-speed counter module	Generic name for the AJ65BT-D62, AJ65BT-D62D and AJ65BT-D62D-S1.
CC-Link	Abbreviation for the Control & Communication Link system.
Master station	Station which controls remote and local stations. 1 station is required for 1 system.
Local station	Station which has a CPU and can communicate with the master and other local stations.
Remote I/O station	Remote station which handles bit information only. (AJ65BTB□-□ □,AJ65BTC□-□ □)
Remote device station	Remote station which handles bit information and word information. (AJ65BT-64AD,AJ65BT-64DAV,AJ65BT-64DAI)
Intelligent device station	Station which can make transient transmission. (Including a local station) (AJ65BT-R2)
Master · local module	Generic name for the AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11
Master module	Generic name for the AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 when used as the master station
Local module	Generic name for the AJ61BT11, A1SJ61BT11, AJ61QBT11 and A1SJ61QBT11 when used as a local station
Remote module	Generic name for the AJ65BTB□-□ □, AJ65BTC□-□ □, AJ65BT-64AD, AJ65BT-64DAV and AJ65BT-64DAI.
RX	Remote input
RY	Remote output
RWw	Remote register (write area)
RWr	Remote register (read area)

2. SYSTEM CONFIGURATION

This chapter describes a system configuration using the high-speed counter module.

2.1 Overall Configuration

The overall configuration using the high-speed counter module is shown below.



The maximum overall distance of the system is as follows (which depends on the transmission speed setting).

156kBPS:1200m(366feet) 5MBPS:150m(45.75feet)
625kBPS:600m(183feet) 10MBPS:100m(30.5feet)
2.5MBPS:200m(61feet)

2.2 Applicable System

This section explains the master module of the CC-Link system with which the high-speed counter module can be used and the programmable controller CPU with which the instructions dedicated to CC-Link can be used.

(1) Master module with which the high-speed counter module can be used

The master module with which the high-speed counter module can be used has a rating plate on which the code shown below (9707 B or later) is written in its DATE field.

If "9707 B" is not written in the DATE field, that master module cannot be used with the high-speed counter module.

POINT
The above restriction does not apply to the A series master module. (AJ61BT11, A1SJ61BT11)

(2) Programmable controller CPU with which the instructions dedicated to CC-Link can be used

(a) Master module condition

The master module with which the instructions dedicated to CC-Link can be used has a rating plate on which the code shown below (9707 B or later) is written in its DATE field.

If "9707 B" is not written in the DATE field, that master module cannot be used.

(b) PC CPU conditions

1) QnACPU

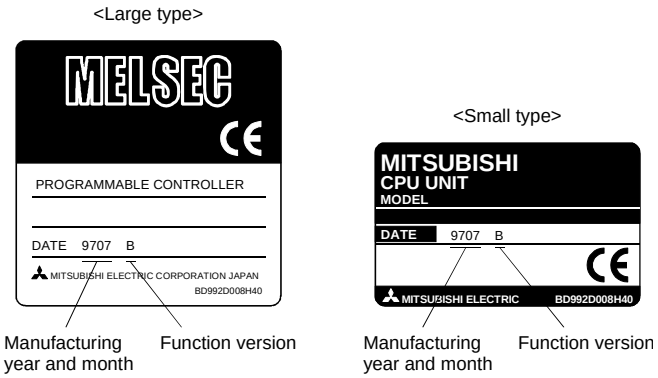
The QnACPU with which the instructions dedicated to CC-Link can be used has a rating plate on which the code shown below (9707 B or later) is written in its DATE field.1)

If "9707 B" is not written in the DATE field, that QnACPU cannot be used.

2) ACPU

Use the A1SJHCPU, A1SHCPU or A2SHCPU(-S1).

Any other ACPU cannot be used.



3. SPECIFICATIONS

3.1 General Specifications

The following table lists the general specifications of the high-speed counter module.(common to the AJ65BT-D62, AJ65BT-D62D and AJ65BT-D62D-S1)

<table>
<tr><th>Item</th><th colspan="6">Specifications</th></tr>
<tr><td>Operating ambient temperature</td><td colspan="6">0 to 55°C</td></tr>
<tr><td>Storage ambient temperature</td><td colspan="6">-20 to 75°C</td></tr>
<tr><td>Operating ambient humidity</td><td colspan="6">10 to 90%RH, non-condensing</td></tr>
<tr><td>Storage ambient humidity</td><td colspan="6">10 to 90%RH, non-condensing</td></tr>
<tr><td rowspan="5">Vibration resistance</td><td rowspan="5">Conforms to JIS B3501 and IEC 1131-2.</td><td></td><td>Frequency</td><td>Acceleration</td><td>Amplitude</td><td>Sweep Count</td></tr>
<tr><td rowspan="2">In case of intermittent vibration</td><td>10 to 57Hz</td><td>———</td><td>0.075mm (0.003in.)</td><td rowspan="4">10 times in each of X, Y and Z directions (for 80 minutes)</td></tr>
<tr><td>57 to 150Hz</td><td>9.8m/s^2</td><td>———</td></tr>
<tr><td rowspan="2">In case of continuous vibration</td><td>10 to 57Hz</td><td>———</td><td>0.035mm (0.001in.)</td></tr>
<tr><td>57 to 150Hz</td><td>4.9m/s^2</td><td>———</td></tr>
<tr><td>Shock resistance</td><td colspan="6">Conforms to JIS B3501 and IEC 1131-2 (147m/s^2, 3 times in each of three directions).</td></tr>
<tr><td>Operating atmosphere</td><td colspan="6">No corrosive gas</td></tr>
<tr><td>Operating altitude</td><td colspan="6">2000m(6557.38feet) or less</td></tr>
<tr><td>Installation site</td><td colspan="6">Inside control panel</td></tr>
<tr><td>Overvoltage category*1</td><td colspan="6">II or less</td></tr>
<tr><td>Contamination level*2</td><td colspan="6">2 or less</td></tr>
</table>

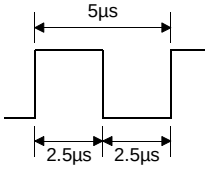
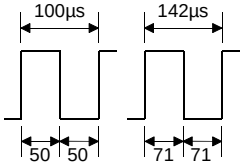
*1: Indicates the element in the distribution system between the public electricity grid and the mechanical equipment inside the premises that the relevant device is assumed to be connected to.
Category II applies to devices such as those that draw their power supply from fixed installations.
The surge voltage withstand capability of devices with ratings up to 300V is 2,500V.

*2: This index gives a measure of the incidence of conductive materials in the environment in which the device is used.
A contamination level of 2 indicates an environment in which there is only contamination by non-conducting materials, but due to occasional condensation, conductivity may occur.

3.2 Performance Specifications

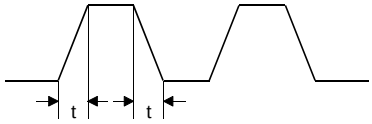
The following table gives the performance specifications of the high-speed counter module.

(1) Performance specifications of the AJ65BT-D62

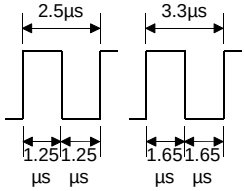
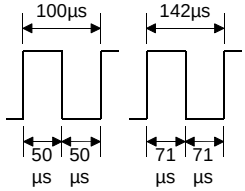
Item			Specifications	
Counting speed setting switch			HIGH position	LOW position
Number of channels			2 channels	
Count input signal	Phase		1-phase input, 2-phase input	
	Signal level (ϕ A, ϕ B)		5VDC / 12VDC / 24VDC } 2 to 5mA	
Counter	Counting speed (max.)*	1-phase input	200kPPS	10kPPS
		2-phase input	200kPPS	7kPPS
	Counting range		24-bit binary, 0 to 16777215	
	Type		UP/DOWN preset counter and ring counter functions	
	Minimum pulse width that can be counted (Adjust rise/fall time of input to 2.5µs or less. Duty ratio: 50%)		 (1, 2-phase input)	 (1-phase input) (2-phase input)
Coincidence output	Comparison range		24-bit binary	
	Comparison result		Set value < count value, set value = count value, set value > count value	
External input	Preset		5/12/24VDC 2 to 5mA	
	Function start			
	Response time		OFF→ON 0.5ms or less ON→OFF 3ms or less	
External output	Coincidence output		2A/1common	
	Response time		0.1ms or less	
CC-Link station type			Remote device station	
Number of stations occupied			4 stations	
Transmission speed/ max. transmission distance			Refer to Section 3.3	
Max. number of modules connected			16 modules	
Connection cable			Shielded twisted cable (refer to Section 3.4)	
Power supply voltage			18 to 28.8VDC	
Current consumption (24VDC)			70mA	
Noise immunity			Measure using a noise simulator of noise voltage 500Vp-p, noise width 1µs and noise frequency 25 to 60Hz.	
Withstanding voltage			500VAC for 1 minute across all DC external terminals and grounding terminal.	
Insulation resistance			10MΩ or more across all DC external terminals and grounding terminal using a 500VDC insulation resistance tester.	
Terminal block			27-pin terminal block (M3.5×7 screws)	
Applicable cable size			0.75 to 2.00mm^2	
Applicable crimping terminal			RAV1.25-3, RAV2-3.5 (conforming to JIS C2805)	
Permissible instantaneous power failure time			1ms	
Module mounting screws			Screws of M4×0.7mm(0.03inch)×16mm(0.63inch) or larger (tightening torque range: 78 to 118N·cm) DIN rail may also be used for mounting.	
Applicable DIN rails			TH35-7.5Fe, TH35-7.5Al, (conforming to JIS-C2B12)	
Weight			0.41kg(0.91lb)	

*Counting speed is influenced by pulse rise time and fall time.Countable speeds are as follows.
Note that counting of a pulse having long rise and fall times may result in miscounting.

Counting Speed Setting Switch	HIGH		LOW	
Rise/fall time	1-phase input	2-phase input	1-phase input	2-phase input
t=2μs or less	200kPPS	200kPPS	10kPPS	7kPPS
t=25μs or less	10kPPS	10kPPS	1kPPS	700PPS
t=500μs	——	——	500PPS	250PPS

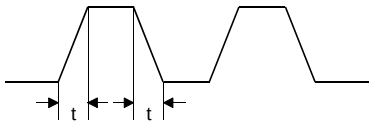


(2) Performance specifications of the AJ65BT-D62D

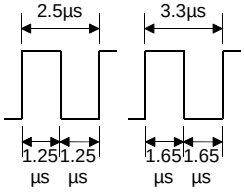
Item			Specifications	
Counting speed setting switch			HIGH position	LOW position
Number of channels			2 channels	
Count input signal	Phase		1-phase input, 2-phase input	
	Signal level (ϕA, ϕB)		EIA Standard RS-422-A differential type line driver level {equivalent to Am26LS31 (Japan Texas Instruments make)}	
Counter	Counting speed (max.)*	1-phase input	400kPPS	10kPPS
		2-phase input	300kPPS	7kPPS
	Counting range		24-bit binary, 0 to 16777215	
	Type		UP/DOWN preset counter and ring counter functions	
	Minimum pulse width that can be counted (Adjust rise/fall time of input to 0.1µs or less. Duty ratio: 50%)		 (1-phase input) (2-phase input)	 (1-phase input) (2-phase input)
Coincidence output	Comparison range		24-bit binary	
	Comparison result		Set value < count value, set value = count value, set value > count value	
External input	Preset		5/12/24VDC 2 to 5mA	
	Function start			
	Response time		OFF→ON 0.5ms or less ON→OFF 3ms or less	
External output	Coincidence output		2A/1common	
	Response time		0.1ms or less	
CC-Link station type			Remote device station	
Number of stations occupied			4 stations	
Transmission speed/ max. transmission distance			Refer to Section 3.3	
Max. number of modules connected			16 modules	
Connection cable			Shielded twisted cable (refer to Section 3.4)	
Power supply voltage			18 to 28.8VDC	
Current consumption (24VDC)			100mA	
Noise immunity			Measure using a noise simulator of noise voltage 500Vp-p, noise width 1µs and noise frequency 25 to 60Hz.	
Withstanding voltage			500VAC for 1 minute across all DC external terminals and grounding terminal.	
Insulation resistance			10MΩ or more across all DC external terminals and grounding terminal using a 500VDC insulation resistance tester.	
Terminal block			27-pin terminal block (M3.5×7 screws)	
Applicable cable size			0.75 to 2.00mm^2	
Applicable crimping terminal			RAV1.25-3, RAV2-3.5 (conforming to JIS C2805)	
Permissible instantaneous power failure time			1ms	
Module mounting screws			Screws of M4×0.7mm(0.03inch)×16mm(0.63inch) or larger (tightening torque range: 78 to 118N·cm) DIN rail may also be used for mounting.	
Applicable DIN rails			TH35-7.5Fe, TH35-7.5Al, (conforming to JIS-C2B12)	
Weight			0.42kg(0.93lb)	

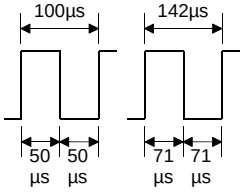
*Counting speed is influenced by pulse rise time and fall time.Countable speeds are as follows.
Note that counting of a pulse having long rise and fall times may result in miscounting.

Counting Speed Setting Switch	HIGH		LOW	
Rise/fall time	1-phase input	2-phase input	1-phase input	2-phase input
t=0.1μs or less	400kPPS	300kPPS	——	——
t=1.25μs or less	200kPPS	200kPPS	10kPPS	7kPPS
t=12.5μs or less	20kPPS	20kPPS	1kPPS	700PPS
t=250μs	——	——	500PPS	250PPS



(3) Performance specifications of the AJ65BT-D62D-S1

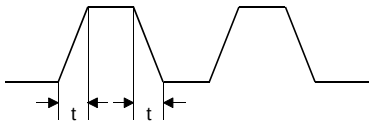
<table>
<tr><td colspan="3">Item</td><td colspan="2">Specifications</td></tr>
<tr><td colspan="3">Counting speed setting switch</td><td>HIGH position</td><td>LOW position</td></tr>
<tr><td colspan="3">Number of channels</td><td colspan="2">2 channels</td></tr>
<tr><td rowspan="2">Count input signal</td><td colspan="2">Phase</td><td colspan="2">1-phase input, 2-phase input</td></tr>
<tr><td colspan="2">Signal level (ϕ A, ϕ B)</td><td colspan="2">EIA Standard RS-422-A differential type line driver level
{equivalent to Am26LS31 (Japan Texas Instruments make)}</td></tr>
<tr><td rowspan="5">Counter</td><td rowspan="2">Counting speed (max.)*</td><td>1-phase input</td><td>400kPPS</td><td>10kPPS</td></tr>
<tr><td>2-phase input</td><td>300kPPS</td><td>7kPPS</td></tr>
<tr><td colspan="2">Counting range</td><td colspan="2">24-bit binary, 0 to 16777215</td></tr>
<tr><td colspan="2">Type</td><td colspan="2">UP/DOWN preset counter and ring counter functions</td></tr>
<tr><td colspan="2">Minimum pulse width that can be counted
(Adjust rise/fall time of input to 0.1µs or less. Duty ratio: 50%)</td><td> 

(1-phase input) (2-phase input)</td><td> 

(1-phase input) (2-phase input)</td></tr>
<tr><td rowspan="2">Coincidence output</td><td colspan="2">Comparison range</td><td colspan="2">24-bit binary</td></tr>
<tr><td colspan="2">Comparison result</td><td colspan="2">Set value < count value, set value = count value, set value > count value</td></tr>
<tr><td rowspan="3">External input</td><td colspan="2">Preset</td><td colspan="2">EIA Standard RS-422-A differential type line driver level
{equivalent to Am26LS31 (Japan Texas Instruments make)}</td></tr>
<tr><td colspan="2">Function start</td><td colspan="2">5/12/24VDC 2 to 5mA</td></tr>
<tr><td colspan="2">Response time</td><td colspan="2">OFF→ON 0.5ms or less
ON→OFF 3ms or less</td></tr>
<tr><td rowspan="2">External output</td><td colspan="2">Coincidence output</td><td colspan="2">2A/1common</td></tr>
<tr><td colspan="2">Response time</td><td colspan="2">0.1ms or less</td></tr>
<tr><td colspan="3">CC-Link station type</td><td colspan="2">Remote device station</td></tr>
<tr><td colspan="3">Number of stations occupied</td><td colspan="2">4 stations</td></tr>
<tr><td colspan="3">Transmission speed/
max. transmission distance</td><td colspan="2">Refer to Section 3.3</td></tr>
<tr><td colspan="3">Max. number of modules connected</td><td colspan="2">16 modules</td></tr>
<tr><td colspan="3">Connection cable</td><td colspan="2">Shielded twisted cable (refer to Section 3.4)</td></tr>
<tr><td colspan="3">Power supply voltage</td><td colspan="2">18 to 28.8VDC</td></tr>
<tr><td colspan="3">Current consumption (24VDC)</td><td colspan="2">120mA</td></tr>
<tr><td colspan="3">Noise immunity</td><td colspan="2">Measure using a noise simulator of noise voltage 500Vp-p, noise width 1µs and noise frequency 25 to 60Hz.</td></tr>
<tr><td colspan="3">Withstanding voltage</td><td colspan="2">500VAC for 1 minute across all DC external terminals and grounding terminal.</td></tr>
<tr><td colspan="3">Insulation resistance</td><td colspan="2">10MΩ or more across all DC external terminals and grounding terminal using a 500VDC insulation resistance tester.</td></tr>
<tr><td colspan="3">Terminal block</td><td colspan="2">27-pin terminal block (M3.5×7 screws)</td></tr>
<tr><td colspan="3">Applicable cable size</td><td colspan="2">0.75 to 2.00mm^2</td></tr>
<tr><td colspan="3">Applicable crimping terminal</td><td colspan="2">RAV1.25-3, RAV2-3.5 (conforming to JIS C2805)</td></tr>
<tr><td colspan="3">Permissible instantaneous power failure time</td><td colspan="2">1ms</td></tr>
<tr><td colspan="3">Module mounting screws</td><td colspan="2">Screws of M4×0.7mm(0.03inch)×16mm(0.63inch) or larger
(tightening torque range: 78 to 118N·cm)
DIN rail may also be used for mounting.</td></tr>
<tr><td colspan="3">Applicable DIN rails</td><td colspan="2">TH35-7.5Fe, TH35-7.5Al, (conforming to JIS-C2B12)</td></tr>
<tr><td colspan="3">Weight</td><td colspan="2">0.42kg(0.93lb)</td></tr>
</table>

*Counting speed is influenced by pulse rise time and fall time.Countable speeds are as follows.
Note that counting of a pulse having long rise and fall times may result in miscounting.

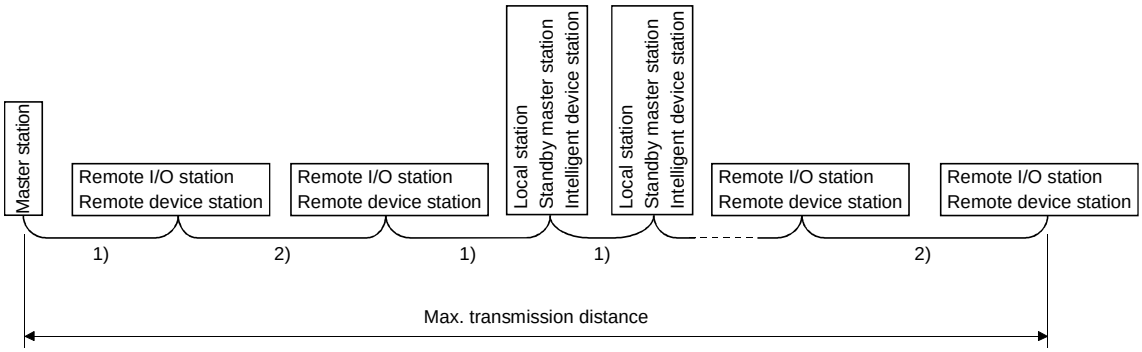
Counting Speed Setting Switch	HIGH		LOW	
Rise/fall time	1-phase input	2-phase input	1-phase input	2-phase input
t=0.1μs or less	400kPPS	300kPPS	——	——
t=1.25μs or less	200kPPS	200kPPS	10kPPS	7kPPS
t=12.5μs or less	20kPPS	20kPPS	1kPPS	700PPS
t=250μs	——	——	500PPS	250PPS



3.3 Maximum Transmission Distance in CC-Link System

The maximum transmission distances in a CC-Link system are as follows.

1) Independently of the transmission speed setting, the interstation cable length of "2m(0.61feet) or more" is required between the master/local/intelligent device station and a station before or after the master·local/intelligent device station.
2) At the transmission speeds of 5Mbps and 10Mbps, care must be exercised because the maximum transmission distance changes with the interstation cable length between the remote I/O stations, remote I/O station and remote device station, or remote device stations.



Transmission Speed	1)	2)	Max. Transmission Distance
156kbps	2m(0.61feet) or more	30cm(11.82inch) or more	1200m(366feet)
625kbps		30cm(11.82inch) or more	600m(183feet)
2.5kbps		30cm(11.82inch) or more	200m(61feet)
5Mbps		60cm(23.64inch) or more	150m(45.75feet)
		30(11.82inch) to 59cm(23.25inch)	110m(33.55feet)
10Mbps		1m(0.31feet) or more	100m(30.5feet)
		60(23.64inch) to 99cm(39.01inch)	80m(24.4feet)
		30(11.82inch) to 59cm(23.25inch)	50m(15.25feet)

3.4 CC-Link Dedicated Cable

Use the CC-Link dedicated cable for the CC-Link system. If a cable other than the CC-Link dedicated cable is used, the performance of the CC-Link system cannot be guaranteed.

If you have any questions regarding the CC-Link dedicated cable, or if you wish to see its specifications, see the CC-Link Catalog L (NA) 74108143E.

3.5 Functions

The following table lists the high-speed counter module functions.

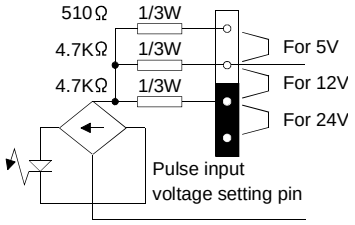
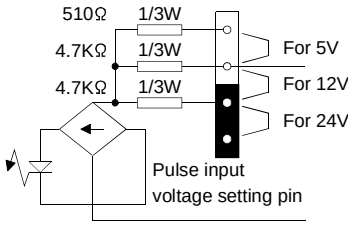
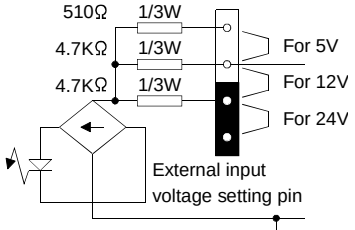
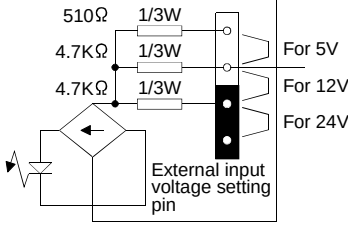
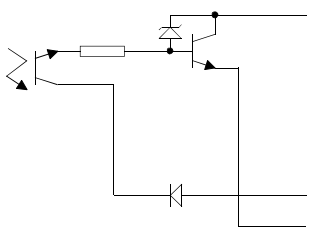
Name		Description	Refer To
Coincidence output function		Outputs an ON/OFF signal in a specified output status, comparing it with the present value.	Section 6.1
Preset function		Counting alternates between the preset value and the ring counter value. The preset operation can be done either by a sequence program or by an external preset input.	Section 7.1
Ring counter function		Counting alternates between the preset value and the ring counter.	Section 8.1
Counter function selection	Count disable function	Stops counting pulses while the count enable command is ON.	Section 9.2
	Latch counter function	Stores the present value of the counter into the remote registers when the signal of the counter function selection start command is input.	Section 9.3
	Sampling counter function	After the signal of the counter function selection start command is input, input pulses are counted during a preset sampling period and stored into the remote registers.	Section 9.4
	Periodic pulse counter function	While the signal of the counter function selection start command is input, input pulses are stored into the remote registers at preset intervals.	Section 9.5

*These functions may be used together. However, only one function may be selected from among the four counter function selection functions.

3.6 Interfaces with External Devices

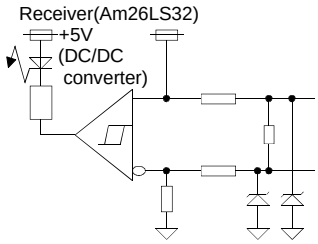
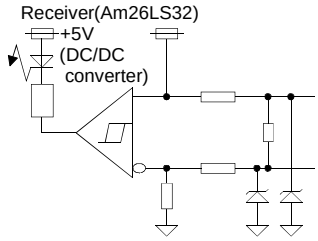
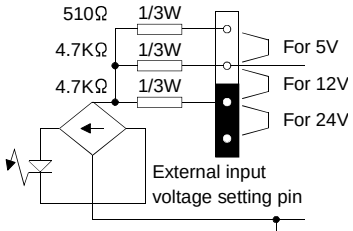
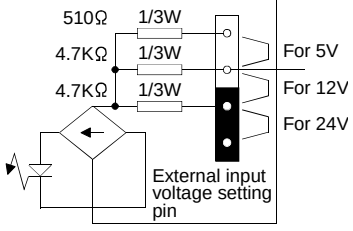
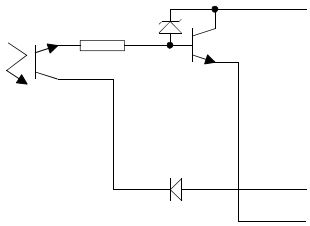
The following tables give lists of the interfaces of the high-speed counter module with external devices.

(1) Interfaces of the AJ65BT-D62 with external devices

Input/ Output	Internal Circuit	Terminal Number *1	Signal Name	ON/OFF	Input Voltage (Guaranteed)	Operating Current (Guaranteed)
Input		8 (15)	Phase A pulse input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Phase A pulse input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Phase A pulse input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
		9 (16)	Phase A pulse input COM			
		10 (17)	Phase B pulse input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Phase B pulse input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Phase B pulse input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
		11 (18)	Phase B pulse input COM			
Input		12 (19)	Preset input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Preset input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Preset input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
		13 (20)	COM	Respon-se time	OFF→ON 0.5ms or less	ON→OFF 3ms or less
Input		14 (21)	Function start input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Function start input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Function start input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
				Respon-se time	OFF→ON 0.5ms or less	ON→OFF 3ms or less
Output		22 (24)	EQU1	Operating voltage 10.2 to 30V Rated current 0.5A/point Max. inrush current 4A 10ms Max. voltage drop at ON 1.5V Response time OFF→ON 0.1ms or less ON→OFF 0.1ms or less		
		23 (25)	EQU2			
		26	12/24V	Input voltage 10.2 to 30V Current consumption 8mA(TYP 24VDC)		
		27	0V			

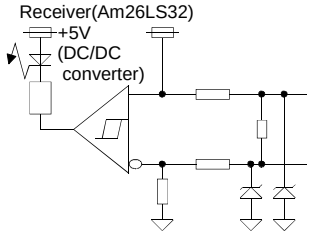
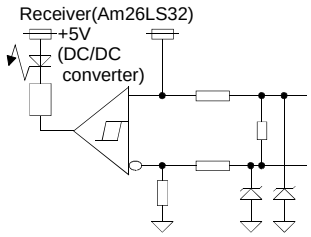
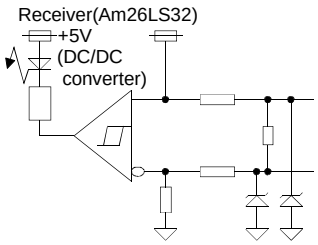
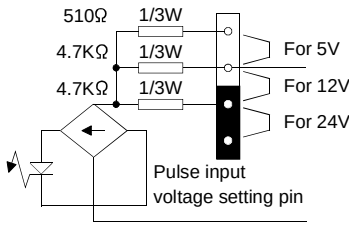
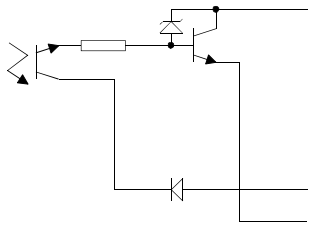
*1···The number within parentheses represents the terminal number of channel 2.

(2) Interfaces of the AJ65BT-D62D with external devices

Input/ Output	Internal Circuit	Terminal Number *1	Signal Name	ON/OFF	Input Voltage (Guaranteed)	Operating Current (Guaranteed)
Input		8 (15)	Phase A pulse input	EIA Standard RS-422-A line driver level {Am26LS31 (Japan TexasInstruments make or equivalent)}		
		9 (16)	Phase $\overline{A}$ pulse input			
		10 (17)	Phase B pulse input			
		11 (18)	Phase $\overline{B}$ pulse input			
Input		12 (19)	Preset input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5Vor less	0.1mA or less
			Preset input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Preset input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
		13 (20)	COM	Respon-se time	OFF→ON 0.5ms or less	ON→OFF 3ms or less
Input		14 (21)	Function start input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Function start input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Function start input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
				Respon-se time	OFF→ON 0.5ms or less	ON→OFF 3ms or less
Output		22 (24)	EQU1	Operating voltage 10.2 to 30V Rated current 0.5A/point Max. inrush current 4A 10ms Max. voltage drop at ON 1.5V Response time OFF→ON 0.1ms or less ON→OFF 0.1ms or less		
		23 (25)	EQU2			
		26	12/24V	Input voltage 10.2 to 30V Current consumption 8mA(TYP 24VDC)		
		27	0V			

*1···The number within parentheses represents the terminal number of channel 2.

(3) Interfaces of the AJ65BT-D62D-S1 with external devices

Input/ Output	Internal Circuit	Terminal Number *1	Signal Name	ON/OFF	Input Voltage (Guaranteed)	Operating Current (Guaranteed)
Input		8 (16)	Phase A pulse input	EIA Standard RS-422-A line driver level {Am26LS31 (Japan Texas Instruments make or equivalent)}		
		9 (17)	Phase $\overline{A}$ pulse input			
		10 (18)	Phase B pulse input			
		11 (19)	Phase $\overline{B}$ pulse input			
Input		12 (20)	Preset input			
		13 (21)	$\overline{\text{Preset}}$ input			
Input		14 (22)	Function start input 24V	ON	21.6 to 26.4V	2 to 5mA
				OFF	5V or less	0.1mA or less
			Function start input 12V	ON	10.8 to 13.2V	2 to 5mA
				OFF	4V or less	0.1mA or less
			Function start input 5V	ON	4.5 to 5.5V	2 to 5mA
				OFF	2V or less	0.1mA or less
		15 (23)	Function start input COM	Respon-se time	OFF→ON 0.5ms or less	ON→OFF 3ms or less
Output		24 (25)	EQU1	Operating voltage 10.2 to 30V Rated current 0.5A/point Max. inrush current 4A 10ms Max. voltage drop at ON 1.5V Response time OFF→ON 0.1ms or less ON→OFF 0.1ms or less		
		26	12/24V	Input voltage 10.2 to 30V		
		27	0V	Current consumption 8mA(TYP 24VDC)		

*1···The number within parentheses represents the terminal number of channel 2.

3.7 I/O Signals Transferred to/from the Master Module

This section explains the input/output signals (RX, RY) of the high-speed counter module transferred to/from the master module.

(1) Input signals

The following table lists the input signals of the high-speed counter module transmitted to the master module.

Input Signals		Signal Name High-speed counter module → master module	Description	Refer To
CH1	CH2			
RXn0	RXn4	Counter value greater (point No. 1)	Turned on if the counter value is greater than the set value No. 1.	Section 6.1
RXn1	RXn5	Counter value coincidence (point No. 1)	Latched on if the counter value is equal to the set value No. 1 turned off by the coincidence signal reset command.	Section 6.1 Section 8.1
RXn2	RXn6	Counter value less (point No. 1)	Turned on when the counter value is less than the set value No. 1.	Section 6.1
RXn3	RXn7	External preset command detection	Latched on when the preset request is given from external input.Turned off by the external preset detection reset command.	Section 7.3
RXn8	RXnB	Counter value greater (point No. 2)	Turned on if the counter value is greater than the set value No. 2.	Section 6.1
RXn9	RXnC	Counter value coincidence (point No. 2)	Latched on if the counter value is equal to the set value No. 2 turned off by the coincidence signal reset command.	
RXnA	RXnD	Counter value less (point No. 2)	Turned on when the counter value is less than the set value No. 2.	
RXnE	RXnF	———	Unusable	———
RX(n+1)0	RX(n+1)2	Preset completion	Turned on on completion of the preset function executed when the preset command (RY(n+1)1/RY(n+1)8) turns on. Turned off when the preset command switches from ON to OFF.	Section 7.2
RX(n+1)1	RX(n+1)3	Counter function detection	Turned on at counter function start (execution) when the counter function selection start command (RY(n+1)6/RY(n+1)D) turns on. Turned off when the counter function selection start command switches from ON to OFF.	Section 9.2 Section 9.3 Section 9.4 Section 9.5
RX(n+1)4 to RX(n+7)7		———	Unusable	———
RX(n+7)8		Initial data processing request flag	Turned on by the high-speed counter module to request initial data setting after power-on or hardware reset. Turned off on initial data processing completion (when initial data processing completion flag (RY(N+7)8) turns on).	
RX(n+7)9 to RX(n+7)A		———	Unusable	
RX(n+7)B		Remote ready	Turned on when the high-speed counter module is in the ready state on completion of initial data setting after power-on or hardware reset.	
RX(n+7)C to RX(n+7)F		———	Unusable	

n: Address assigned to the master station by station number setting.

POINT

The unusable devices are used in the system and should not be used by the user.

If any of them is used by the user, normal operation cannot be guaranteed.

(2) Output signals

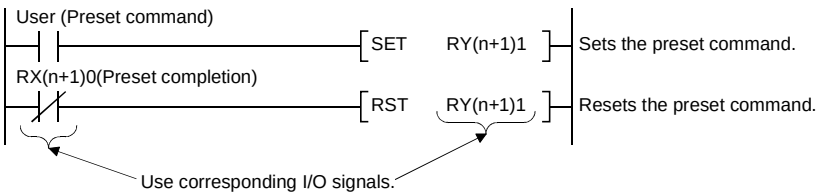
The following table lists the output signals transmitted by the master module to the high-speed counter module.

Input Signals		Signal Name Master module → high-speed counter module	Operation Timing*	Description	Refer To
CH1	CH2				
RYn0 to RYnF		———	———	Unusable	———
RY(n+1)0	RY(n+1)7	Point No. 1 coincidence signal reset command		Resets the ring counter value coincidence signal (latch) and the coincidence output No. 1 signal to the external device.	Section 6.1 Section 8.1
RY(n+1)1	RY(n+1)8	Preset command		Performs preset value write.	Section 7.2
RY(n+1)2	RY(n+1)9	Coincidence signal enable		Turn on this signal to output the counter value coincidence signal.	Section 6.1
RY(n+1)3	RY(n+1)A	Down count command		Down count is performed when this signal is on in the 1-phase mode.	Chapter 5
RY(n+1)4	RY(n+1)B	Count enable		Turn on this signal to enable count operation.	Chapters 6 to 9
RY(n+1)5	RY(n+1)C	———	———	Unusable	———
RY(n+1)6	RY(n+1)D	Counter function selection start command		Starts (executes) counter function selection.	Chapter 9
RY(n+1)E to RY(n+1)F		———	———	Unusable	———
RY(n+2)0	RY(n+2)2	External preset detection reset command		Resets external preset detection.	Section 7.3
RY(n+2)1	RY(n+2)3	Point No. 2 coincidence signal reset command		Resets the point No. 2 coincidence signal.	Section 6.1 Section 8.1
RY(n+2)4 to RY(n+7)7		———	———	Unusable	———
RY(n+7)8		Initial data processing completion flag		Turned on after completion of initial data processing performed after power-on or hardware reset.	
RY(n+7)9 to RY(n+7)F		———		Unusable	

n: Address assigned to the master station by station number setting.

*For the output signal whose operation timing is "  ", use the corresponding input signal as an interlock for turning off that output signal.

(Example) Preset command operation



POINT
The unusable devices are used in the system and should not be used by the user. If any of them is used by the user, normal operation cannot be guaranteed.

3.8 Remote Register Allocation

The following table gives the assignment of the remote registers in the high-speed counter module.
The initial values of the remote registers are set when power is switched on or the PC CPU is reset.

Transmission Direction	Addresses CH1	Addresses CH2	Description	Initial Value	Read/Write	Refer To
Write area of master station ↓ High-speed counter module	RWwm	RWwm+8	Preset value setting area (L)	0	Write only	Section 7.2 Section 7.3
	RWwm+1	RWwm+9	Preset value setting area (H)			
	RWwm+2	RWwm+A	Pulse input mode/function selection register/ external output hold or clear setting area*1			Chapter 5 Chapter 9
	RWwm+3	RWwm+B	Coincidence output point No. 1 setting area (L)			Chapter 6
	RWwm+4	RWwm+C	Coincidence output point No. 1 setting area (H)			
	RWwm+5	RWwm+D	Sampling/cycle time setting area			Section 9.4 Section 9.5
	RWwm+6	RWwm+E	Coincidence output point No. 2 setting area *2 (L)			Chapter 6
	RWwm+7	RWwm+F	Coincidence output point No. 2 setting area *2 (H)			
High-speed counter module ↓ Read area of master station	RWrn	RWrn+8	Present value storage area (L)		Read only	Section 5.3
	RWrn+1	RWrn+9	Present value storage area (H)			
	RWrn+2	RWrn+A	Latch count value/sampling count value/periodic pulse count previous value storage area (L)			Section 9.3 Section 9.4 Section 9.5
	RWrn+3	RWrn+B	Latch count value/sampling count value/periodic pulse count previous value storage area (H)			
	RWrn+4	RWrn+C	Periodic pulse count present value storage area (L)			Section 9.5
	RWrn+5	RWrn+D	Periodic pulse count present value storage area (H)			
	RWrn+6		Sampling/periodic counter flag storage area (for both CH1 and CH2)			Section 9.4 Section 9.5
	RWrn+7 RWrn+E RWrn+F		Unusable			———

m, n: Addresses assigned to the master station by station number setting.

*1 External output hold or clear setting is used for both CH1 and CH2.
The value set to the remote register of CH1 is valid.

*2 In the AJ65BT-D62D-S1, external output (coincidence output) does not switch on-off if coincidence output No. 2 is set. However, the counter value magnitude comparison (coincidence, greater, less) output signals (X signals) switch on-off as ordinarily.

POINT

The unusable remote registers are used in the system and should not be used by the user.
If any of them is used by the user, normal operation cannot be guaranteed.

3.9 Applicable Encoders

The following encoders may be connected to the high-speed counter module.

(1) Encoders connectable to the AJ65BT-D62

(a) Open collector type encoder

(b) CMOS output type encoder
(Make sure that the output voltage of the encoder complies with the specifications of the module.)

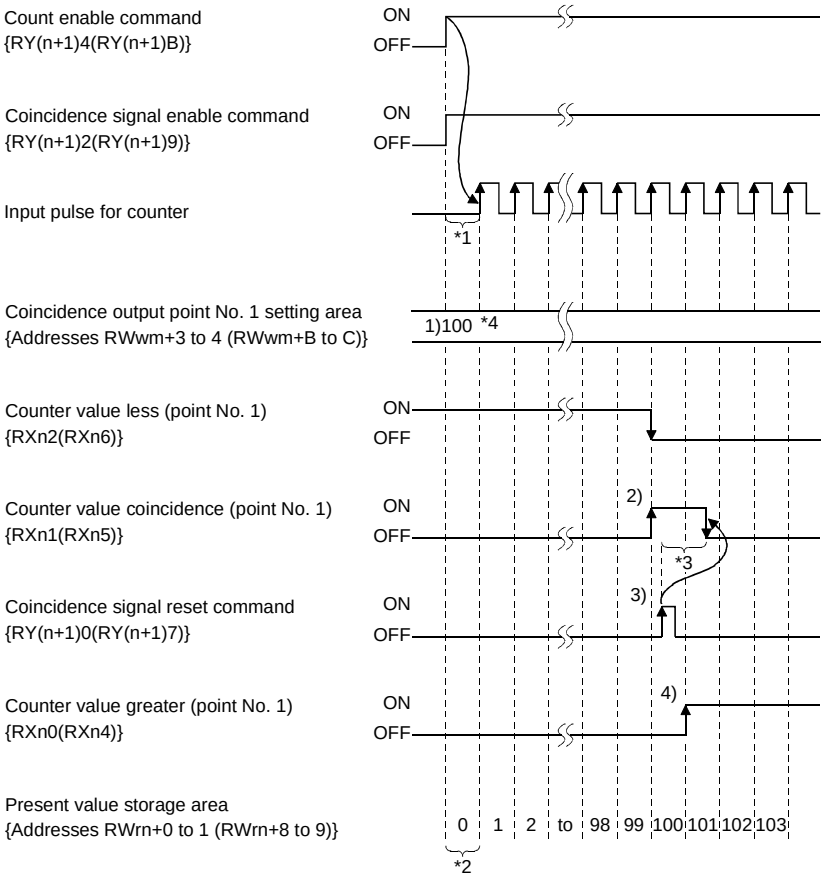
(2) Encoder connectable to the AJ65BT-D62D and AJ65BT-D62D-S1

(a) Line driver output type encoder
(Make sure that the output voltage of the encoder complies with the specifications of the module.)

POINT
The following type of encoder cannot be used. · TTL output type encoder

3.10 Data Link Processing Times

In the high-speed counter module, the following data link processing times are required to execute the corresponding function. The following example shows processing times *1 to *4 in coincidence output operation.



*1 Master station (RY) → remote device station (RY) processing time
The following processing time is required until the remote device station starts pulse input when the count enable signal {RY(n+1)4 (RY(n+1)B)} turns on.

[Formula]

SM+LS×3+remote device station processing time(1ms) [ms]
high-speed counter module

SM:Scantime of master station sequence program
LS :Link scantime

The link scan time of CC-Link is found by the following formula.

LS=BT{29.4+(NI×4.8)+(NW×9.6)+(N×32.4)+(NI×4.8)+(NW×9.6)}+ST[μs]
+{number of stations in communication error×48×BT×number of retries}*

BT:Constant (transmission speed)

Transmission speed	156kbps	625kbps	2.5Mbps	5Mbps	10Mbps
BT	51.2	12.8	3.2	1.6	0.8

NI:Last station number in a, b, c (including the number of stations occupied)
NW:Last station number in b, c (including the number of stations occupied)
} The number should be a multiple of 8.

Last station No.	1 to 8	9 to 16	17 to 24	25 to 32	33 to 40	41 to 48	49 to 56	57 to 64
NI,NW	8	16	24	32	40	48	56	64

N:Number of modules connected
NI:a+b+c (except reserved stations)
NW:b+c (except reserved stations)
ST:Constant (the greatest value among 1) to 3))
1) 800+(a×15)
2) 900+(b×50)
3) If c≤26, 1200+(c×100)
If c>26, 3700+{(c-26)×25}
a:Total number of remote I/O stations occupied
b:Total number of remote device stations occupied
c:Total number of intelligent device stations (including local stations) occupied
*:Only when there is a station in communication error

*2 Master station (RWr) ← remote device station (RWr) processing time

The following processing time is required by the master station to read the counter value counted by the remote device station.

[Formula]

$$SM+LS\times 2+\frac{\text{remote device station processing time(1ms)}}{\text{high-speed counter module}}\ [ms]$$

SM:Scantime of master station sequence program
LS :Link scantime

*3 Master station (RX) ← remote device station (RX) processing time

The following processing time is required from when the remote device station receives the coincidence signal reset command until when the coincidence signal {RXn1 (RXn5)} turned off at the remote device station is transmitted to the master station.

* The processing time required to transmit the coincidence signal reset command to the remote device station is not included.

[Formula]

$$SM+LS\times 2+\frac{\text{remote device station processing time(1ms)}}{\text{high-speed counter module}}\ [ms]$$

SM:Scantime of master station sequence program
LS :Link scantime

*4 Master station (RWw) → remote device station (RWw) processing time

The following is the transmission time in which the coincidence output point No. 1 set value written by the TO instruction is set to the remote device station.

[Formula]

$$SM+LS\times 3+\frac{\text{remote device station processing time(1ms)}}{\text{high-speed counter module}}\ [ms]$$

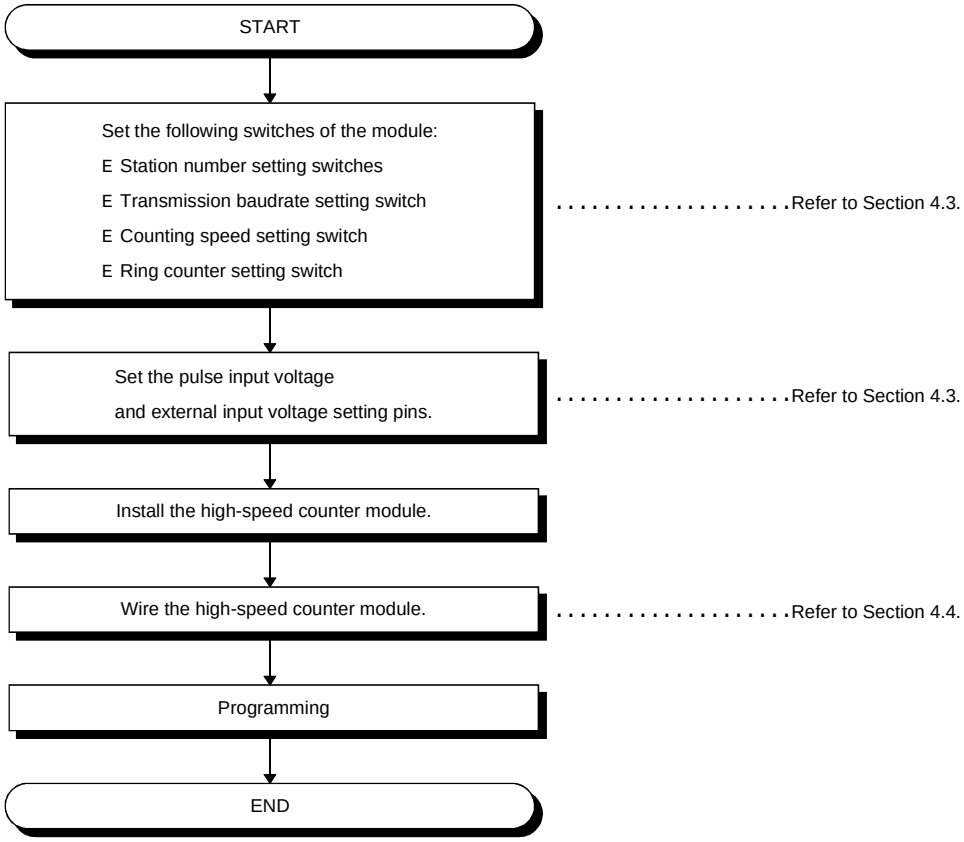
SM:Scantime of master station sequence program
LS :Link scantime

4. INSTALLATION AND PRE-OPERATION SETTING PROCEDURE

This chapter describes the pre-operation procedure of the high-speed counter module, the names and settings of each part, and the wiring method.

4.1 Pre-Operation Setting Procedure

Use the following procedure to make pre-operation setting for the high-speed counter module.



4.2 Installation

This section gives the handling instructions to be followed from unpacking to installation of the high-speed counter module and its installation environment.

4.2.1 Handling instructions

This section gives the handling instructions of the high-speed counter module.

⚠WARNING

- Do not touch the terminals and connectors while power is on.
- This can cause an electric shock or misoperation.

⚠CAUTION

- Securely fix the module using the DIN rail or mounting screws and fully tighten the mounting screws within the specified torque range.
  Undertightening can cause a drop or misoperation.
  Overtightening can cause a drop or misoperation due to damaged screws or module.
- Do not touch the conductive areas of the module directly.
  Otherwise, the module can misoperate or fail.
- Tighten the terminal screws within the specified torque range.
  Undertightening can cause a short circuit or misoperation.
  Overtightening can cause a short circuit or misoperation due to damaged screws or module.
- Ensure that foreign matters such as chips and wire off-cuts do not enter the module.
  They can cause a fire, failure or misoperation.
- Do not disassemble or modify the module.
  This can cause a failure, misoperation, injury or fire.
- The module case is made of resin. Do not drop it or give it hard impact.
  This can damage the module.
- Before mounting or dismounting the module to or from an enclosure, always switch power off externally in all phases.
  Otherwise, the module can fail or misoperate.
- When disposing of the product, handle it as industrial waste.

(1) Tighten the terminal screws and fixing screws of the module within the following ranges

Screw Location	Tightening Torque Range
Module mounting screw (M4 screw)	78 to 118N·cm
Terminal block terminal screw (M3.5 screw)	59 to 88N·cm
Terminal block mounting screw (M3.5 screw)	98 to 137N·cm

(2) When using the DIN rail adapter, note the following in mounting the DIN rail.

(a) Applicable DIN rail type (conforming to JIS-C2B12)

TH35-7.5Fe

TH35-7.5Al

(b) DIN rail mounting screw pitch

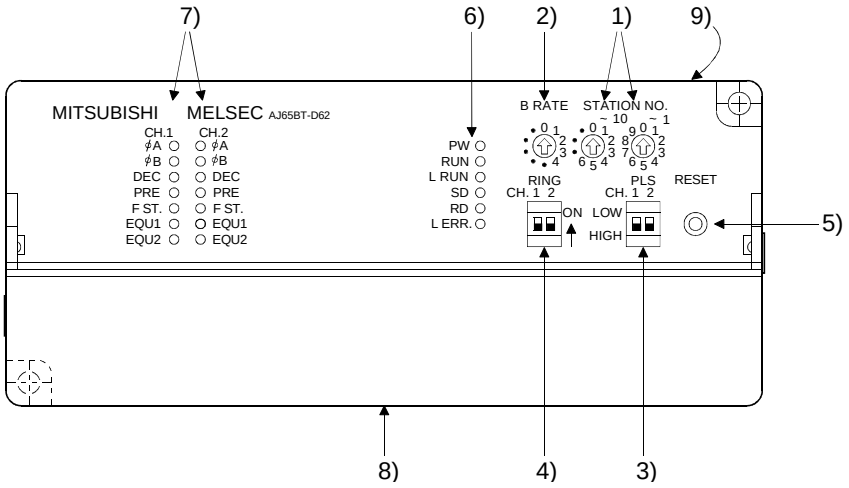
When mounting the DIN rail, tighten screws in 200mm(7.88inch) or less pitch.

4.2.2 Installation environment

⚠CAUTION	When installing the module, avoid the following environment. If the environment of the module used is outside the range of general specifications, an electric shock, fire, misoperation or product damage or deterioration can occur • Ambient temperature outside the range 0 to 55°C • Ambient humidity outside the range 10 to 90%RH • Condensation due to sudden temperature changes • Corrosive or combustible gasses • Dust, conductive powder (e.g. metal filings), oil mist, salt and organic solvent • Direct sunlight • Strong power and magnetic fields • Vibration and impact

4.3 Part Names and Settings

This section gives the names and settings of the high-speed counter module controls.

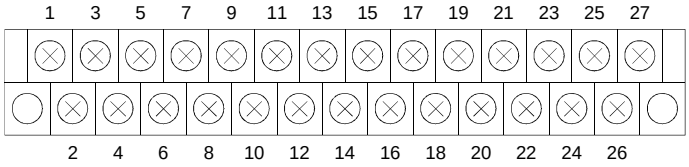


Number	Name	Description
1)	Station number setting switches STATION NO. ~ 10 ~ 1 0 1 9 0 1 2 8 2 3 7 3 6 5 4 6 5 4	Used to set the station number of the high-speed counter module between 1 and 61. Use "×10" to set the tens. Use "×1" to set the modules. (Factory setting: 0)
2)	Transmission baudrate setting switch B RATE 0 1 2 3 4	Used to set the transmission speed of the high-speed counter module. (For data link)
3)	Counting speed setting switch PLS CH. 1 2 LOW HIGH	LOW position:Up to 10kPPS can be counted for 1-phase input or up to 7kPPS for 2-phase input. HIGH position:Up to 400k(200)PPS can be counted for 1-phase input or up to 300k(200)PPS for 2-phase input. Values in parentheses are those for use of the AJ65BT-D62. (Factory setting: HIGH position)
4)	Ring counter setting switch RING CH. 1 2 ON	Used to select whether the ring counter function is used or not. When using the ring counter:ON When not using the ring counter:OFF (Factory setting: OFF position)
5)	Reset switch RESET	Hardware reset Used to initialize the remote registers in the high-speed counter module. By turning this switch on, the initial data processing flag switches on.

Number to Be Set	Transmission Baudrate
0	156kBPS (factory setting)
1	625kBPS
2	2.5MBPS
3	5MBPS
4	10MBPS
Other than 0 to 4	Unused (If the value set is other than 0 to 4, the L ERR. LED lights up to indicate a communication error.)

<table>
<tr><th>Number</th><th colspan="2">Name</th><th>Description</th></tr>
<tr><td rowspan="7">6)</td><td rowspan="7">LED indicators

PW ○
RUN ○
L RUN ○
SD ○
RD ○
L ERR. ○</td><td>PW</td><td>On: Power on
Off: Power off</td></tr>
<tr><td>RUN</td><td>On: Normal operation
Off: 24VDC power off or WDT error</td></tr>
<tr><td>L RUN</td><td>On: Normal communication
Off: Communication break (time excess error)</td></tr>
<tr><td>SD</td><td>Lit to indicate data transmission</td></tr>
<tr><td>RD</td><td>Lit to indicate data receive</td></tr>
<tr><td>L ERR.</td><td>On: Communication data error (CRC error)
Flicker: Station number or baudrate switch setting error
Off: Normal communication</td></tr>
<tr><td rowspan="8">7)</td><td rowspan="8">LED indicators

CH.1 CH.2
ϕA ○ ○ ϕA
ϕB ○ ○ ϕB
DEC ○ ○ DEC
PRE ○ ○ PRE
F ST. ○ ○ F ST.
EQU1 ○ ○ EQU1
EQU2 ○ ○ EQU2</td><td>ϕ A</td><td>Lit to indicate that voltage is being applied to the phase A pulse input terminal.</td></tr>
<tr><td>ϕ B</td><td>Lit to indicate that voltage is being applied to the phase B pulse input terminal.</td></tr>
<tr><td>DEC</td><td>Lit to indicate down count.</td></tr>
<tr><td>PRE</td><td>Lit to indicate that voltage is applied to the PRESET terminal, and remains lit.
Turns off on the trailing edge of the external preset detection reset command.</td></tr>
<tr><td>F ST.</td><td>Lit to indicate that voltage is being applied to the F.START terminal.</td></tr>
<tr><td>EQU1</td><td>Lit to indicate that the coincidence output setting No. 1 is equal to the counter value.</td></tr>
<tr><td>EQU2</td><td>Lit to indicate that the coincidence output setting No. 2 is equal to the counter value.
(The AJ65BT-D62D-S1 does not have this LED.)</td></tr>
<tr><td>8)</td><td colspan="2">Terminal block</td><td>


Pin-to-signal correspondences are indicated below.

For the AJ65BT-D62
<table>
<tr><th>Pin Number</th><th colspan="2">Signal name</th><th>Pin Number</th><th colspan="2">Signal name</th></tr>
<tr><td>1</td><td colspan="2">DA</td><td>15</td><td rowspan="7">CH2</td><td rowspan="2">ϕ A</td></tr>
<tr><td>2</td><td colspan="2">DB</td><td>16</td></tr>
<tr><td>3</td><td colspan="2">DG</td><td>17</td><td rowspan="2">ϕ B</td></tr>
<tr><td>4</td><td colspan="2">SLD</td><td>18</td></tr>
<tr><td>5</td><td colspan="2">24V</td><td>19</td><td>PRESET</td></tr>
<tr><td>6</td><td colspan="2">F.G.</td><td>20</td><td>COM</td></tr>
<tr><td>7</td><td colspan="2">24G</td><td>21</td><td>F.START</td></tr>
<tr><td>8</td><td rowspan="7">CH1</td><td rowspan="2">ϕ A</td><td>22</td><td rowspan="2">CH1</td><td>EQU1</td></tr>
<tr><td>9</td><td>23</td><td>EQU2</td></tr>
<tr><td>10</td><td rowspan="2">ϕ B</td><td>24</td><td rowspan="2">CH2</td><td>EQU1</td></tr>
<tr><td>11</td><td>25</td><td>EQU2</td></tr>
<tr><td>12</td><td>PRESET</td><td>26</td><td colspan="2">12/24V</td></tr>
<tr><td>13</td><td>COM</td><td>27</td><td colspan="2">COM</td></tr>
<tr><td>14</td><td>F.START</td><td colspan="3"></td></tr>
</table>
</td></tr>
</table>

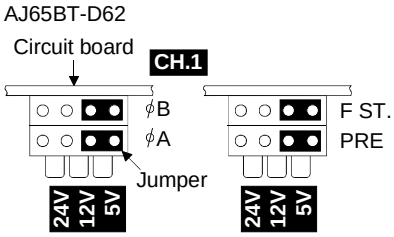
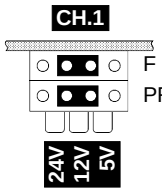
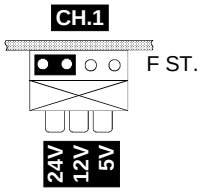
Number	Name	Description
8)	Terminal block	For the AJ65BT-D62D For the AJ65BT-D62D-S1

For the AJ65BT-D62D

Pin Number	Signal name			Pin Number	Signal name		
1	DA			15	CH2	ϕ A	A
2	DB			16			$\overline{A}$
3	DG			17		ϕ B	B
4	SLD			18			$\overline{B}$
5	24V			19		PRESET	
6	F.G.			20		COM	
7	24G			21		F.START	
8	CH1	ϕ A	A	22	CH1	EQU1	
9			$\overline{A}$	23		EQU2	
10		ϕ B	B	24	CH2	EQU1	
11			$\overline{B}$	25		EQU2	
12		PRESET		26	12/24V		
13		COM		27	COM		
14		F.START					

For the AJ65BT-D62D-S1

Pin Number	Signal name			Pin Number	Signal name		
1	DA			16	CH2	ϕ A	A
2	DB			17			$\overline{A}$
3	DG			18		ϕ B	B
4	SLD			19			$\overline{B}$
5	24V			20		PRESET	
6	F.G.			21		$\overline{\text{PRESET}}$	
7	24G			22		F.START	
8	CH1	ϕ A	A	23			
9			$\overline{A}$	24	CH1	EQU1	
10		ϕ B	B	25	CH2	EQU1	
11			$\overline{B}$	26	12/24V		
12		PRESET		27	COM		
13		PRESET					
14		F.START					
15							

Number	Name	Description
9)	Pulse/external input voltage setting pins	The also applies to CH2. AJ65BT-D62  (Jumper connected to 5V) AJ65BT-D62D  (Jumper connected to 12V) AJ65BT-D62D-S1  (Jumper connected to 24V)

4.4 Wiring

4.4.1 Twisted cable handling instructions

If twisted cables are handled roughly, they will be damaged. Therefore.

(1) Do not compress the cable with a sharp edge.

(2) Do not twist the cable roughly.

(3) Do not pull the cable roughly (more than allowable tension).

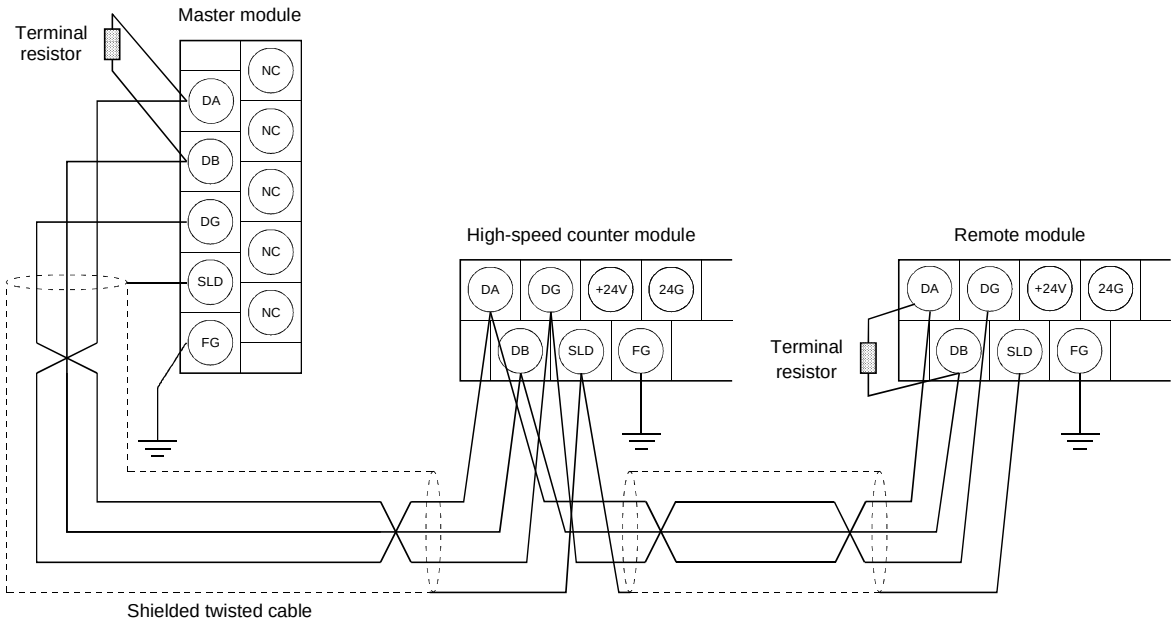
(4) Do not stamp on the cable.

(5) Do not put anything on the cable.

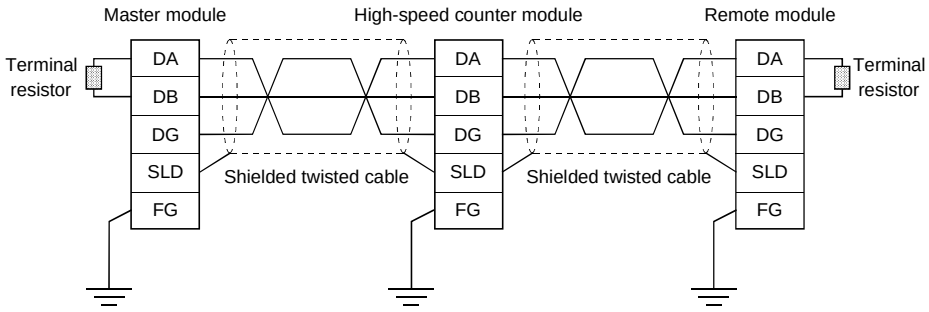
(6) Do not scratch the cable sheath.

4.4.2 Connection of cables with the modules

The following diagram shows the wiring of the master module, remote module and high-speed counter module with twisted cables.



[Sketch]



POINT
The "terminal resistors" supplied with the master module must be connected to the modules at both ends of data link. (Connect them across DA-DB.)

4.4.3 Instructions for wiring pulse generator

When connecting a pulse generator to the high-speed counter module, take the following precautions.

(1) When using high speed pulse inputs, take the following precautions against noise

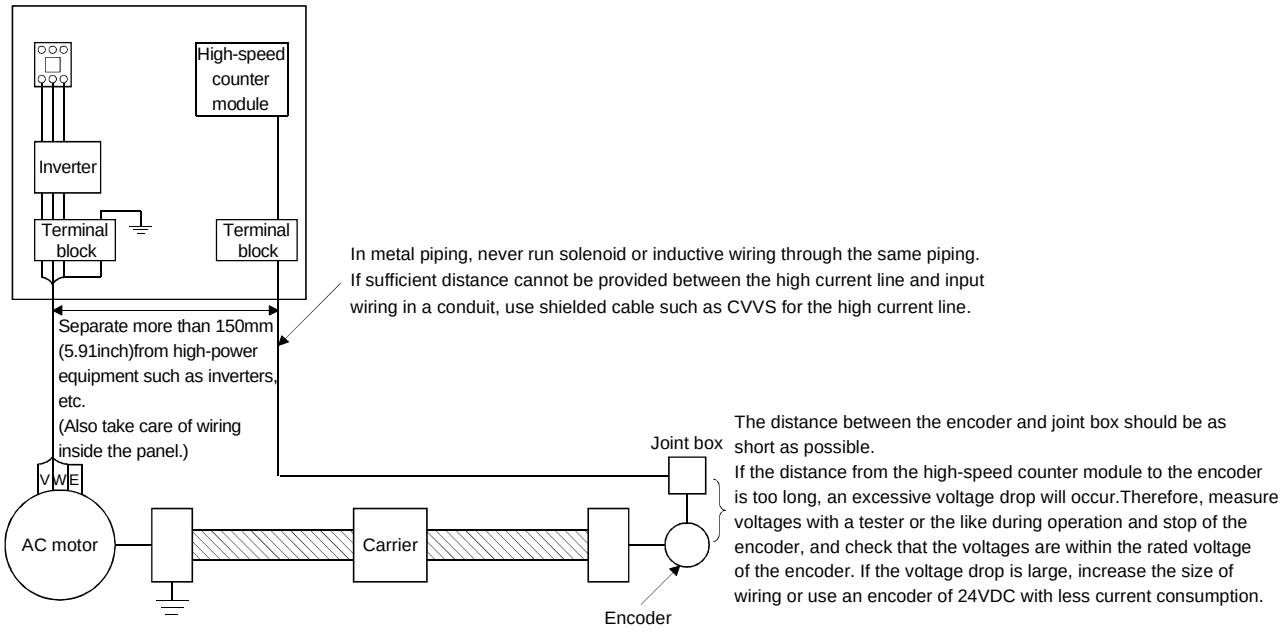
(a) Always use shielded twisted cables. Also provide Class 3 grounding.

(b) Do not run a twisted pair cable in parallel with any power line, I/O line, etc. which may generate noise. It is necessary to run the twisted pair cable at least 150mm(5.91inch) away from the above lines and over the shortest possible distance

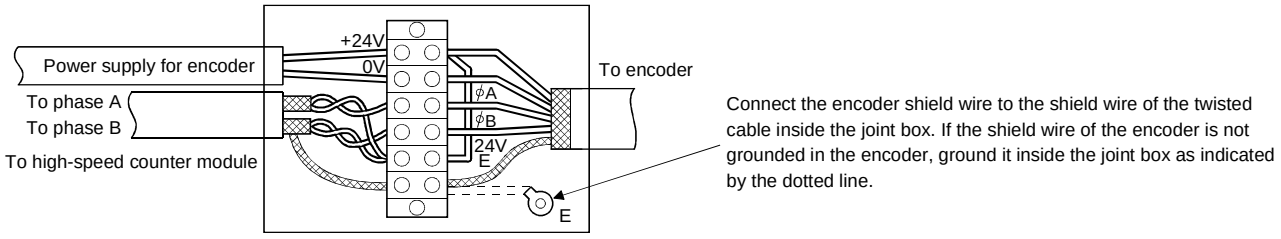
(2) For a 1-phase input, always connect the count input pulse to phase A.

(3) If the high-speed counter module picks up noise, it will count incorrectly.

(4) The diagram below indicates the type of precautions required to prevent the wiring from picking up noise.

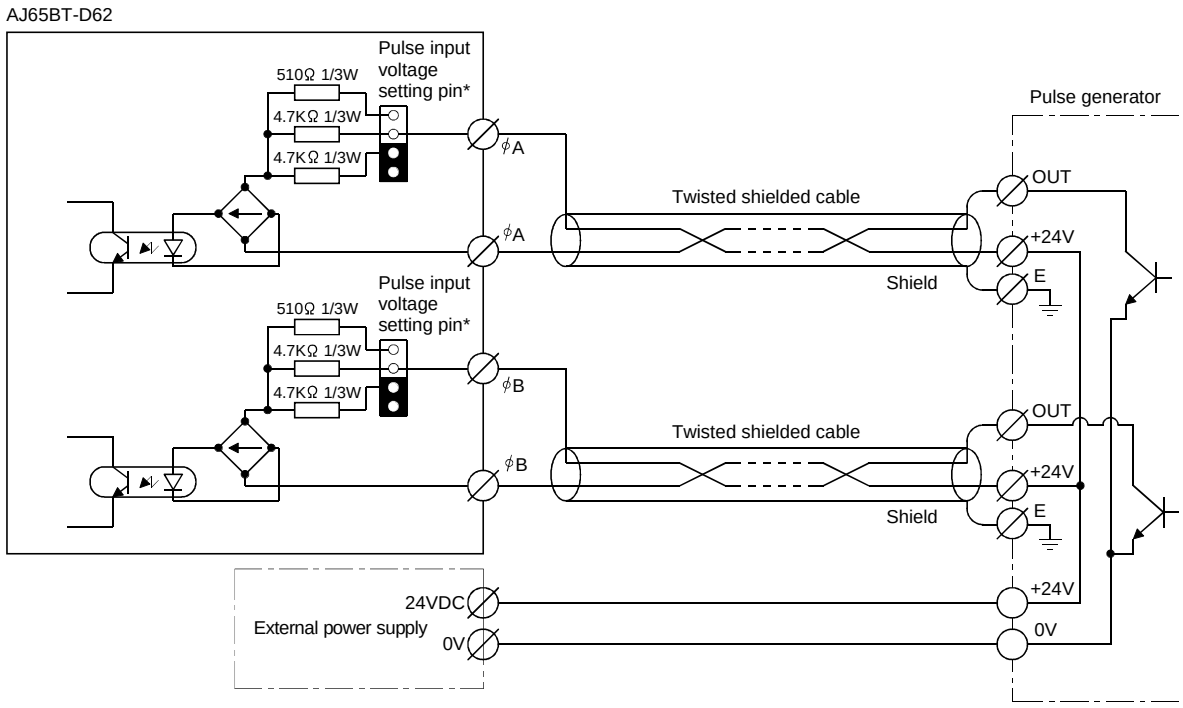


· Ground the twisted shield cable on the encoder side (joint box). (This is a connection example for 24V sink load.)



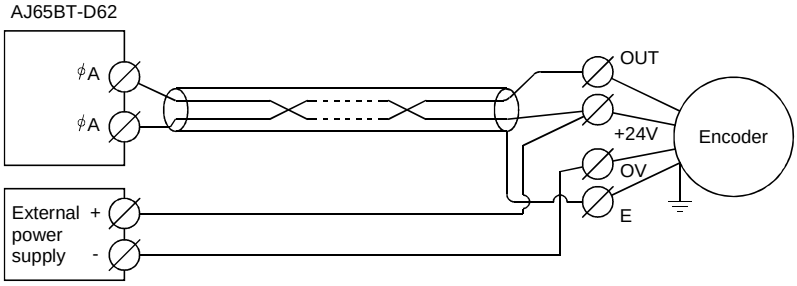
4.4.4 Wiring examples of pulse generators

(1) Pulse generator is open collector output type (24VDC)

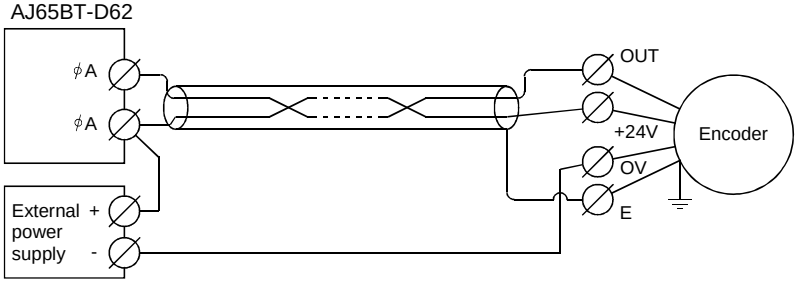


POINT

When wiring the AJ65BT-D62 and encoder, separate the power supply and signal lines as shown below.



Incorrect Wiring Example

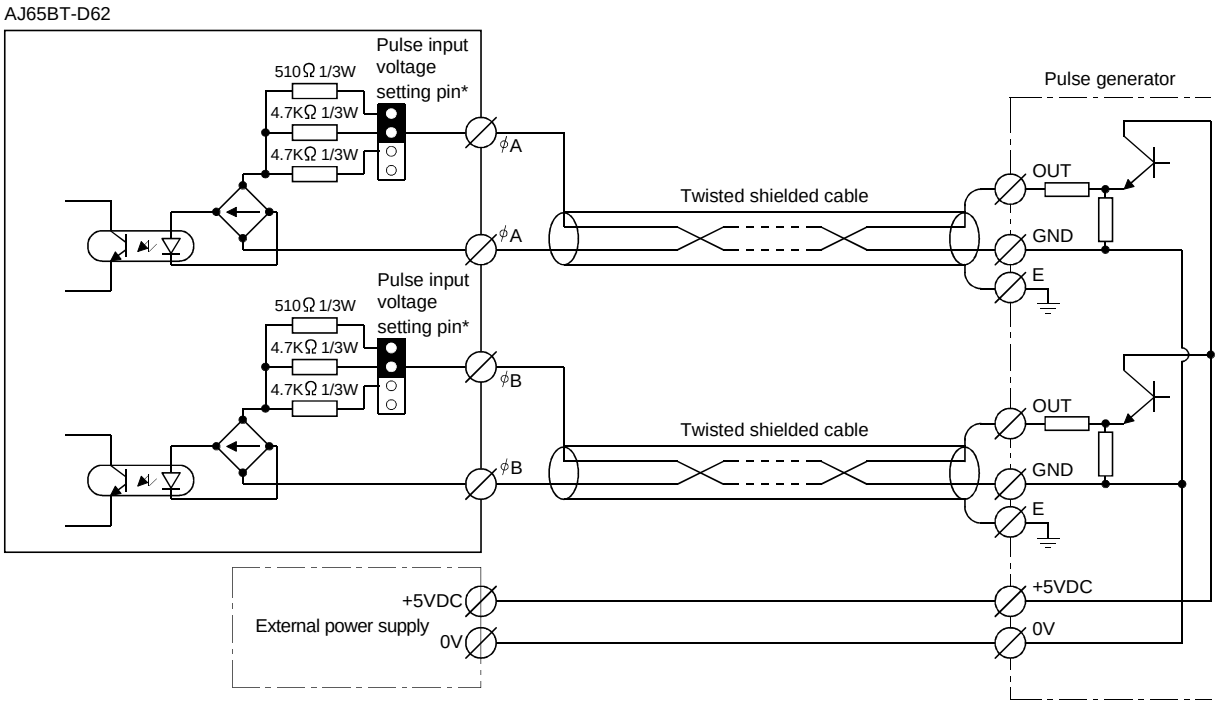


Since the same twisted wire is used for both the encoder signal and power supply, the canceling effect will reduce and electro-magnetic induction may occur.

REMARKS

*.....Set the pulse input voltage setting pins in the position.

(2) Pulse generator is voltage output type (5VDC)

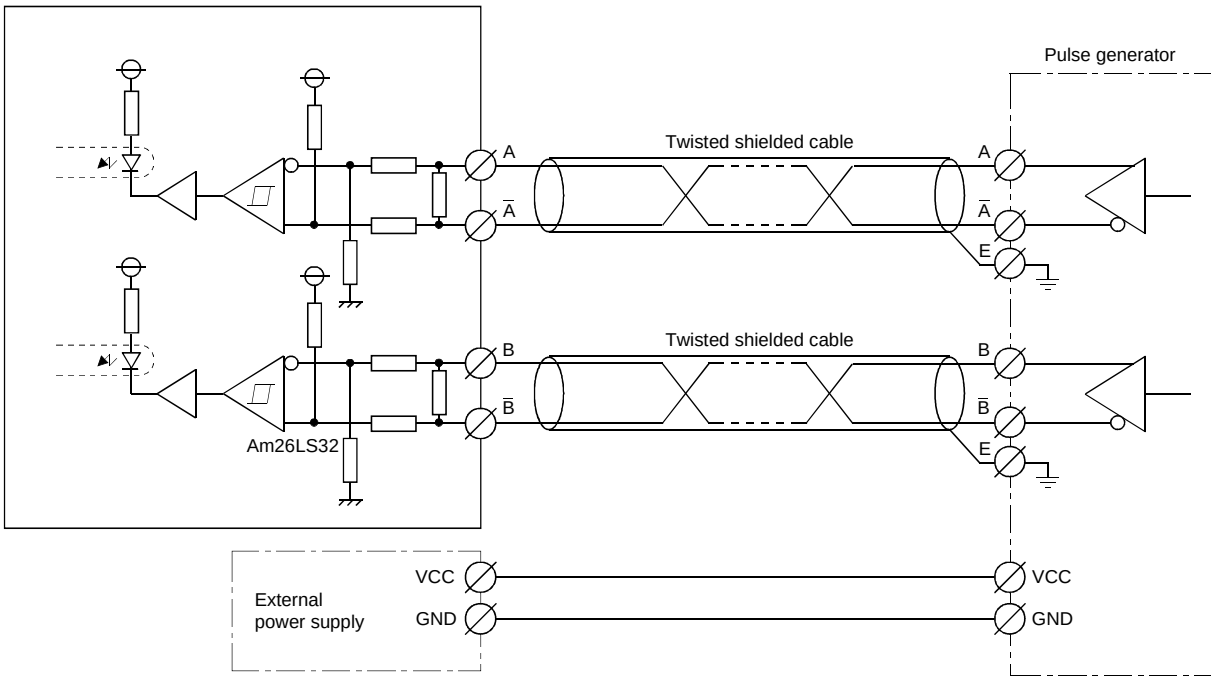


REMARKS

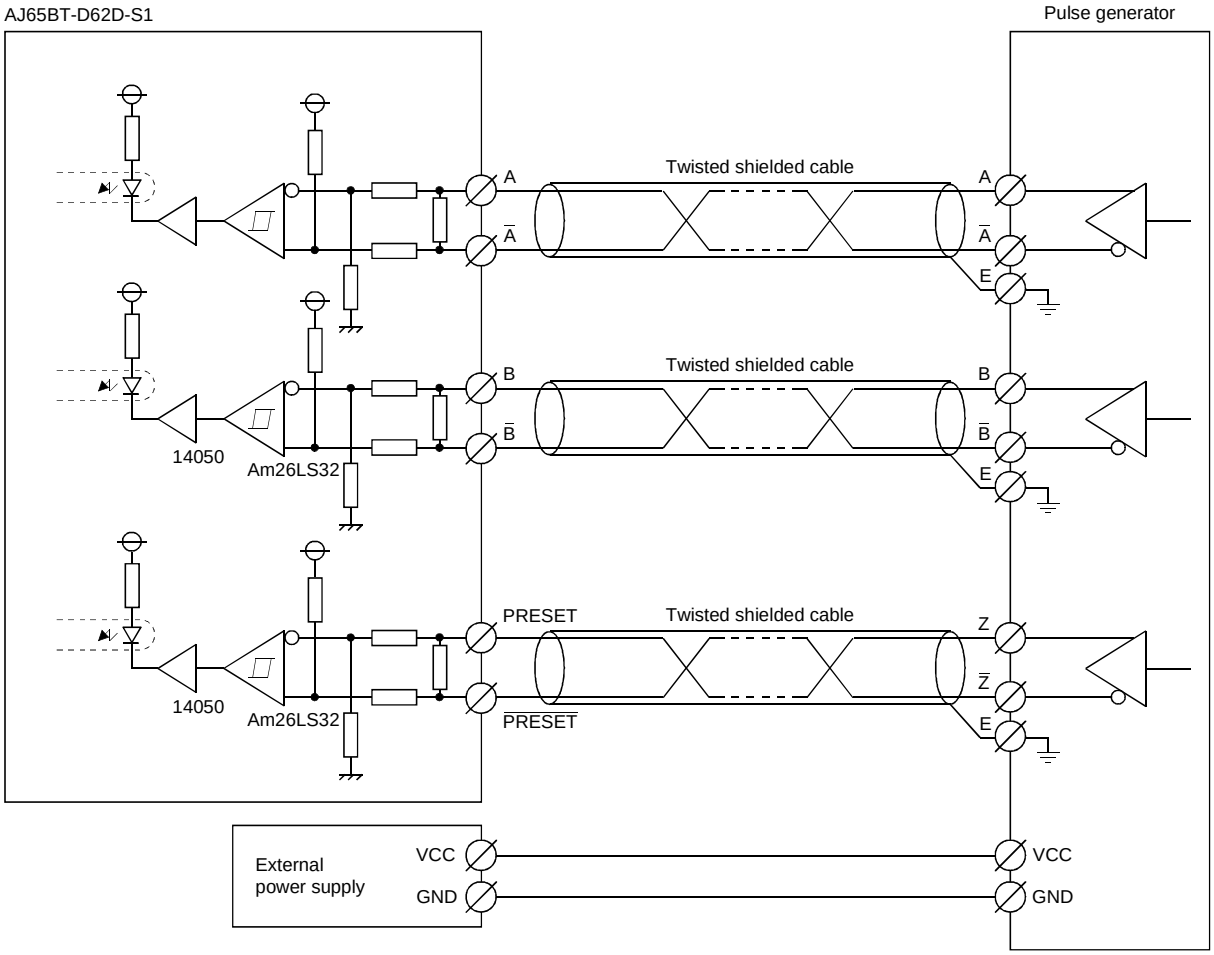
*.....Set the pulse input voltage setting pins in the ⚫ position.

(3) Pulse generator is line driver (equivalent to Am26LS31)

AJ65BT-D62D



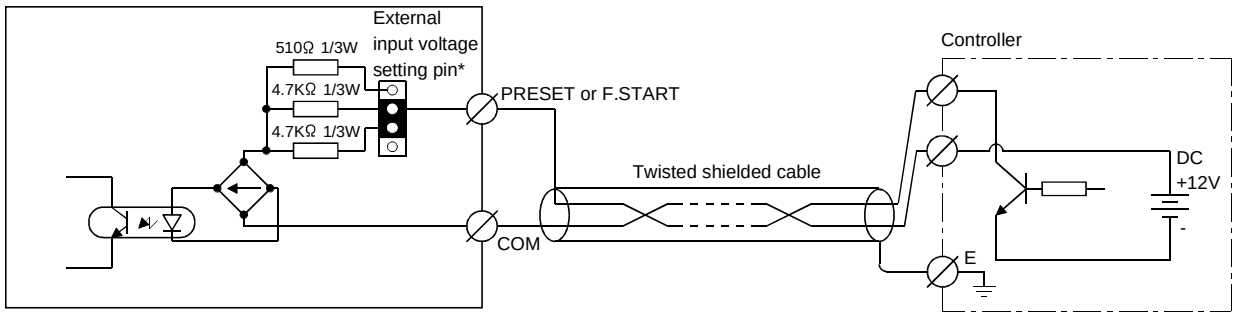
AJ65BT-D62D-S1



4.4.5 Wiring examples of controller and external input (PRESET, F.START) terminals

(1) Controller (sink load type) is 12V

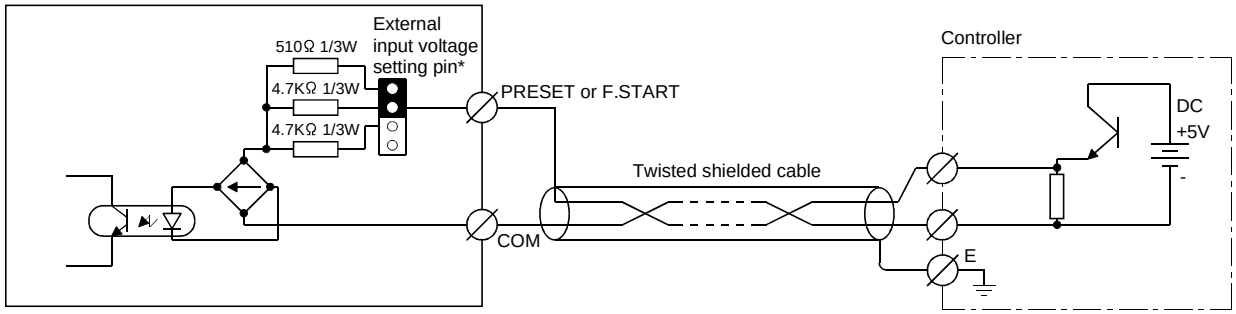
AJ65BT-D62,AJ65BT-D62D,AJ65BT-D62D-S1



E Internal circuit is set to PRESET.
E AJ65BT-D62D-S1 has F.START only.

(2) Controller (source load type) is 5V

AJ65BT-D62,AJ65BT-D62D,AJ65BT-D62D-S1



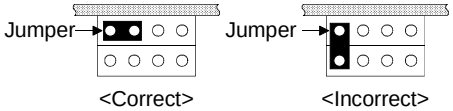
E Internal circuit is set to PRESET.
E AJ65BT-D62D-S1 has F.START only.

REMARKS

*.....Set the external input voltage setting pins in the ■ position.

⚠CAUTION

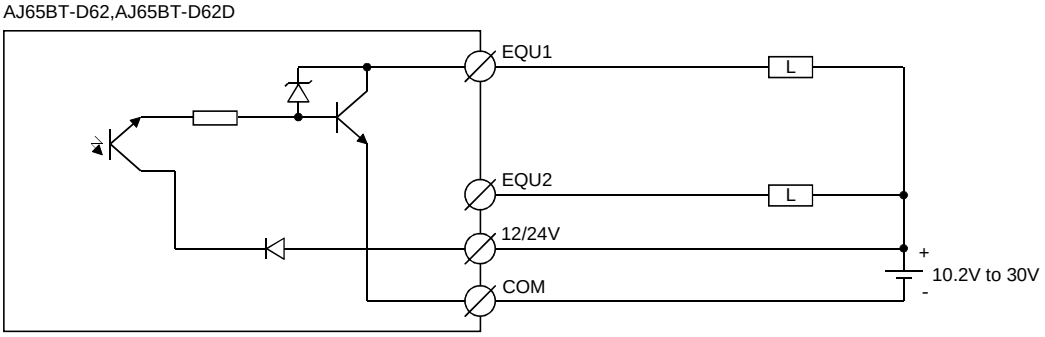
- Set the pulse/external input voltage setting pins correctly after confirming the rated voltage of the external power supply.
  Miss-wiring (wrong setting) can cause a fire or failure.
- The pulse/external input voltage setting pins must be set after switching power off externally in all phases.
  Otherwise, the module can fail or misoperate.
- Set the jumper to the pulse/external input voltage setting pins in the correct inserting orientation.
  Otherwise, a failure can occur.



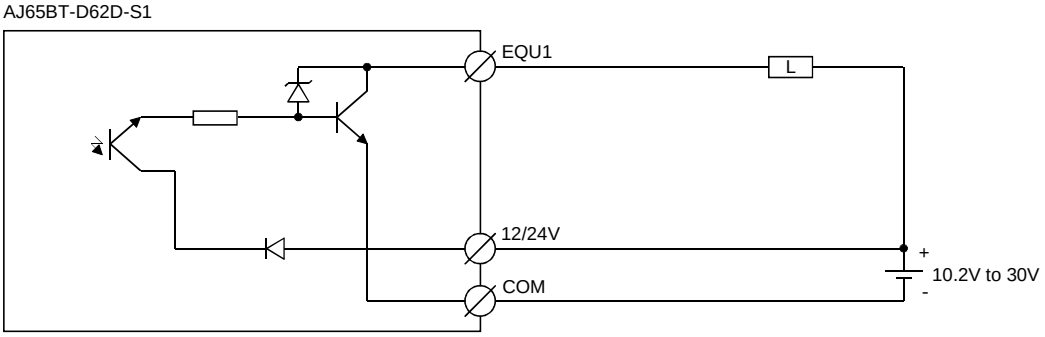
4.4.6 Wiring examples of external output (EQU1, EQU2) terminals

When using the EQU terminals, a 10.2VDC to 30VDC external power supply is required to activate the internal photocoupler. Connection methods are as follows.

(1) AJ65BT-D62, AJ65BT-D62D



(2) AJ65BT-D62D-S1

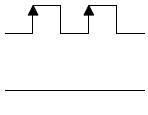
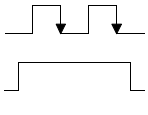
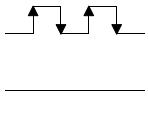
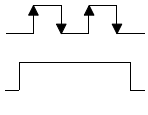
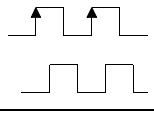
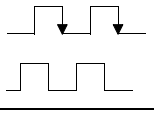
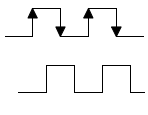
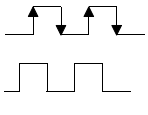
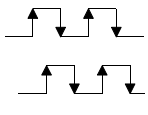
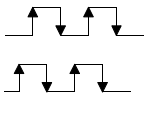


5. PULSE INPUT AND COUNTING METHOD

This chapter describes the pulse input and counting modes of the high-speed counter module.

(1) The pulse input mode is classified into 1-phase pulse input and 2-phase pulse input. 1-phase pulse input is subdivided into multiplication by one and multiplication by two, whereas 2-phase pulse input covers multiplication by one, two and four.

The following table indicates the pulse input modes and count timing.

Pulse Input Mode	Count Timing		
1-phase, multiplied by one	Up counting		Counts a pulse on leading edge of phase ϕA. Phase ϕB and RY(n+1)3 (RY(n+1)A) are off.
	Down counting		Counts a pulse on trailing edge of phase ϕA. Phase ϕB or RY(n+1)3 (RY(n+1)A) is on.
1-phase, multiplied by two	Up counting		Counts a pulse on leading and trailing edges of phase ϕA. Phase ϕB and RY(n+1)3 (RY(n+1)A) are off.
	Down counting		Counts a pulse on leading and trailing edges of phase ϕA. Phase ϕB or RY(n+1)3 (RY(n+1)A) is on.
2-phase, multiplied by one	Up counting		Counts a pulse on leading edge of phase ϕA. Count increases in response to phase difference between phases ϕA and ϕB.
	Down counting		Counts a pulse on trailing edge of phase ϕA. Count decreases in response to phase difference between phases ϕA and ϕB.
2-phase, multiplied by two	Up counting		Counts a pulse on leading and trailing edges of phase ϕA. Count increases in response to phase difference between phases ϕA and ϕB.
	Down counting		Counts a pulse on leading and trailing edges of phase ϕA. Count decreases in response to phase difference between phases ϕA and ϕB.
2-phase, multiplied by four	Up counting		Counts a pulse on leading and trailing edges of phases ϕA and ϕB. Count increases in response to phase difference between phases ϕA and ϕB.
	Down counting		Counts a pulse on leading and trailing edges of phases ϕA and ϕB. Count decreases in response to phase difference between phases ϕA and ϕB.

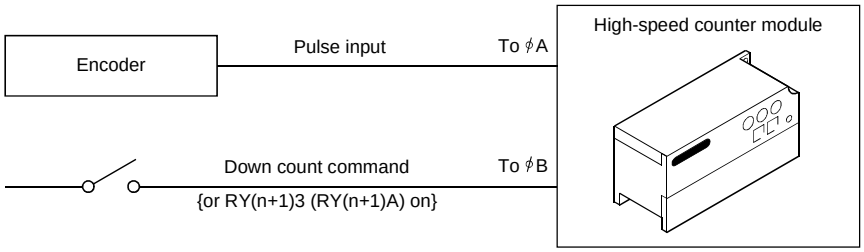
(2) Even if the pulse input mode is changed, counting will start from the value at the time the mode is changed.

5.1 1-phase pulse input

In 1-phase pulse input, multiplication by one or two can be selected for counting.

(1) Relationship between phase A pulse input and down count command

The following diagram shows the relationship between phase A pulse input and down count command.

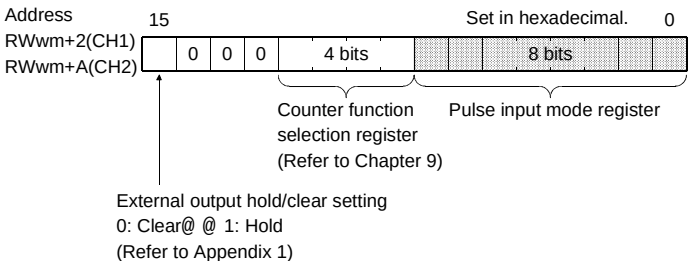


(2) Counting mode setting

To use this counting mode, set the following value to the lower 8 bits of the remote register {RWwm+2 (RWwm+A)} using the sequence program.

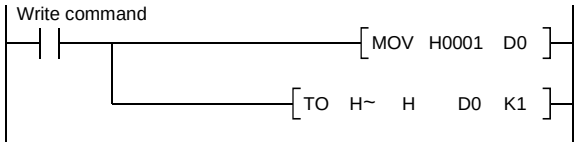
When the value set is not the following set value, the initial value (1-phase multiplication by one) is set.

Counting Mode	Set Value
1-phase multiplication by one	00H
1-phase multiplication by two	01H



[Sequence program example]

·Counting in 1-phase, multiplied-by-two mode



~ : First I/O number of master module

: Corresponding station register address of master module buffer memory

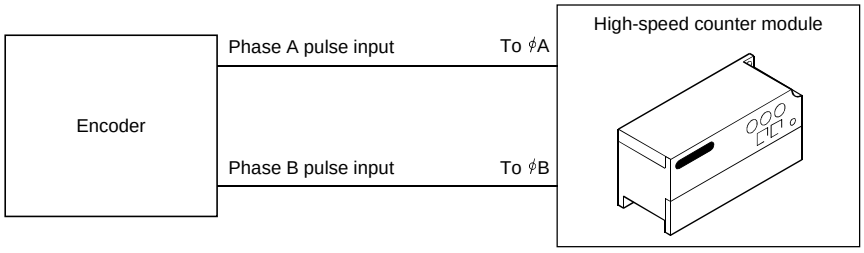
POINT
Exercise care when setting the pulse input mode, since the upper 8 bits are used for the counter function selection register and external output hold/clear setting.

5.2 2-phase pulse input

In 2-phase pulse input, the counting mode can be selected from multiplication by one, two and four.

(1) Relationship between phase A pulse input and phase B pulse input

The following diagram shows the relationship between phase A pulse input and phase B pulse input.

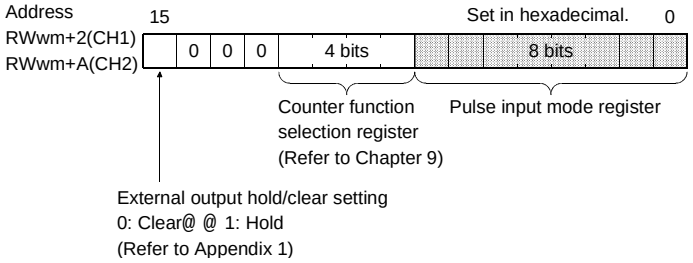


(2) Counting mode setting

To use this counting mode, set the following value to the lower 8 bits of the remote register {RWwm+2 (RWwm+A)} using the sequence program.

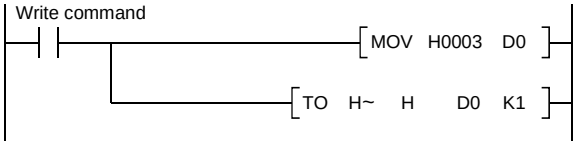
When the value set is not the following set value, the initial value (1-phase multiplication by one) is set.

Counting Mode	Setting
2-phase multiplication by one	02H
2-phase multiplication by two	03H
2-phase multiplication by four	04H



[Sequence program example]

·Counting in 1-phase, multiplied-by-two mode



~ : First I/O number of master module
: Corresponding station register address of master module buffer memory

POINT

Exercise care when setting the pulse input mode, since the upper 8 bits are used for the counter function selection register and external output hold/clear setting.

5.3 Reading the Present Value

This section gives details on the present value stored in the present value storage area {addresses RWrn+0 to 1 (RWrn+8 to 9)} and how to read it.

(1) The present value storage area stores the count value at a time when the following are in effect: pulse input, preset, ring counter function execution or count disable (counter function selection).
However, the count value at a time when the latch counter, sampling counter or periodic pulse counter function is executed will be stored in the remote registers indicated below.

Description		Latch Count Value/ Sampling Count Value/Periodic Pulse Count Previous Value	Periodic Pulse Count Present Value
Remote register addresses	CH1	RWrn+2 to 3	RWrn+4 to 5
	CH2	RWrn+A to B	RWrn+C to D

(2) The present value (0 to 16777215) is stored in 24-bit binary in the present value storage area.

(3) In up counting, the present value storage area returns to 0 when the count value exceeds 16777215.
In down counting, the present value storage area returns to 16777215 when the count value exceeds 0.

6. EXECUTING THE COINCIDENCE OUTPUT FUNCTION

This chapter describes the coincidence output function.

6.1 Coincidence Output Function

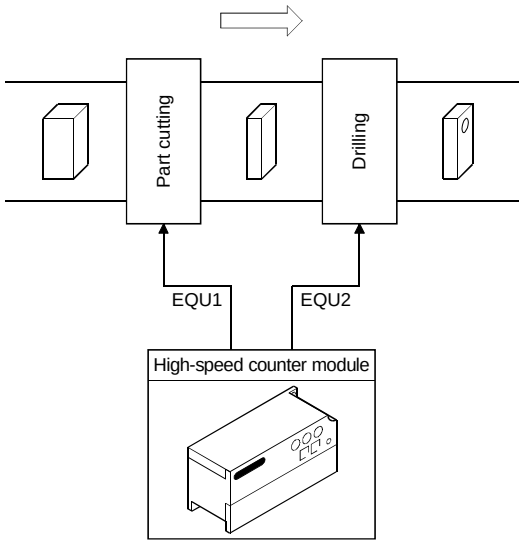
The coincidence output function issues a signal when a preset count value is compared with and matches the present counter value.
You can set two coincidence output points.
To use the coincidence output function, set the coincidence signal enable command {RY(n+1)2 (RYn+1)9)} to ON.

[Remote registers used]

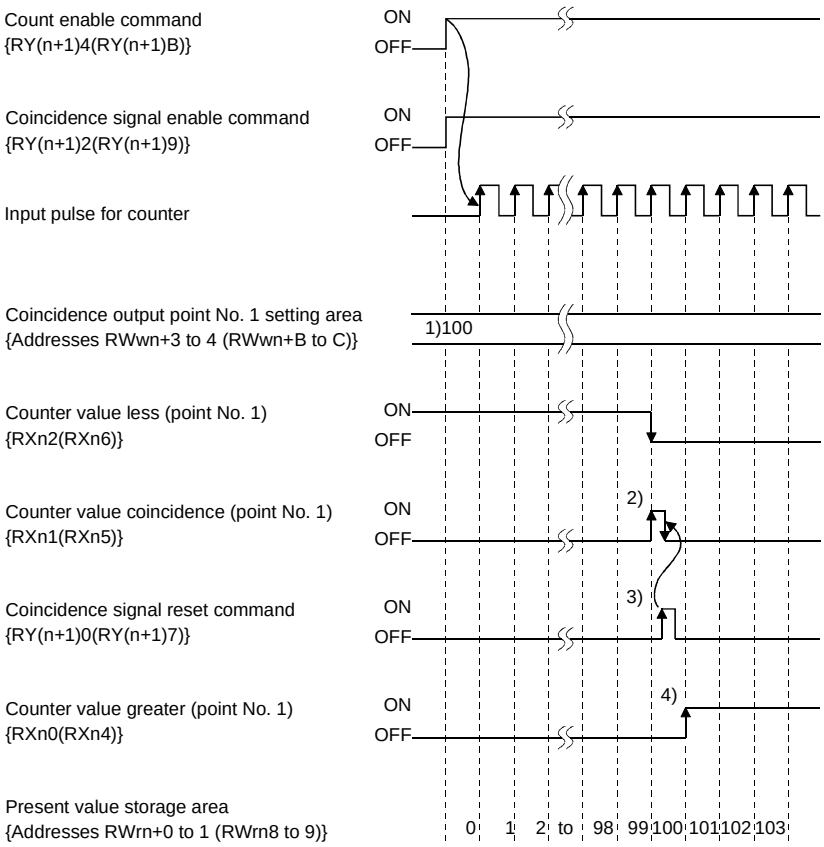
Address	Description
RWwm+3	CH1 coincidence output point No. 1 setting (L)
RWwm+4	(H)
RWwm+6	CH1 coincidence output point No. 2 setting (L)
RWwm+7	(H)
RWwm+B	CH2 coincidence output point No. 1 setting (L)
RWwm+C	(H)
RWwm+E	CH2 coincidence output point No. 2 setting (L)
RWwm+F	(H)

*In the AJ65BT-D62D-S1, its external output (coincidence output) does not switch on-off if the coincidence output No. 2 is set. However, the counter value comparison (coincidence, greater, less) output signals (X signals) switch on-off as ordinarily.

[Example of using the coincidence output function]
In a machining line system, machining operations are performed in response to the corresponding coincidence outputs to turn out products.
1) Materials are carried on a belt conveyor.
2) Material positions are identified as the present count values determined by the pulses sent to the high-speed module.
3) As soon as the materials reach the specified positions, the relevant machining operations are performed in response to the coincidence outputs (EQU1, EQU2) from the high-speed counter module.



6.1.1 Coincidence output function operation



1).....Write a value in advance in 24-bit binary to the coincidence output point No. 1 setting area {addresses RWwm+3 to 4 (RWwm+B to C)}.

2).....When the counter value reaches the set coincidence output point value, the counter value less signal switches off and the counter value coincidence signal switches on.

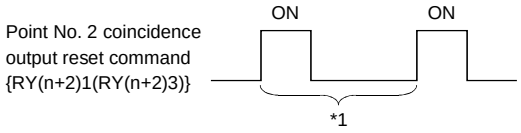
3).....The coincidence signal reset command is switched on to reset the counter value coincidence signal.
If the counter value coincidence signal remains on, the next coincident signal cannot be issued.

4).....When the counter value becomes greater than the set coincidence signal output point value, the counter value greater signal switches on.

POINT

·For the coincidence output function, preset the coincidence output point and reset the coincidence output before switching on the coincidence signal enable. If the coincidence signal enable is switched on without the above operation being performed, the coincidence output is provided since the coincidence output point and count value matches in the initial state.

·If the following time is not satisfied for the execution of the point No.2 coincidence output reset command, the point No. 2 coincidence output reset command will not switch on-off.



*1..... 10 link scans+2 sequence scans

As the point No. 2 coincidence output reset command is only valid on the leading edge (OFF→ON) of the signal, always make sure that the point No. 2 signal is off before executing the command.

7. EXECUTING THE PRESET FUNCTION

This chapter explains the preset function.

7.1 Preset Function

The preset function is used to rewrite the counter's present value into any value.
This new value is called the preset value.
The preset function can be used when a pulse count is started from the set value.
The preset function is available in two modes: "preset by the sequence program (preset command {RY(n+1)1 (RY(n+1)8)}" and "preset from the external control signal (by applying a voltage to the external terminal)".

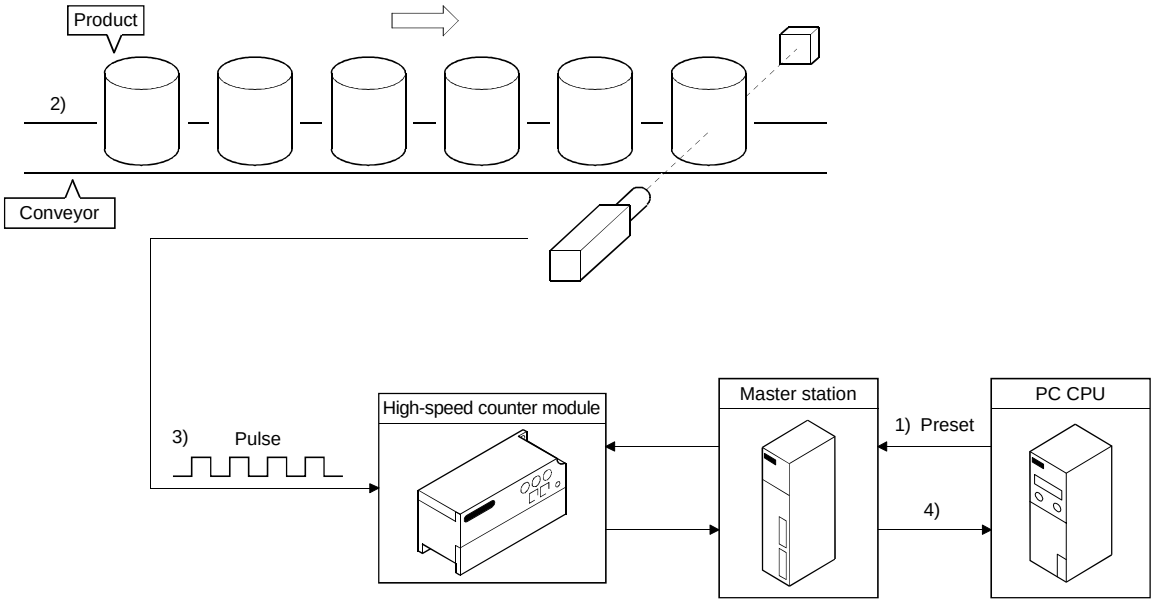
[Remote registers used]

Address	Description	
RWwm+0	CH1 preset value setting	(L)
RWwm+1		(H)
RWwm+8	CH2 preset value setting	(L)
RWwm+9		(H)

[Example of using the preset function]

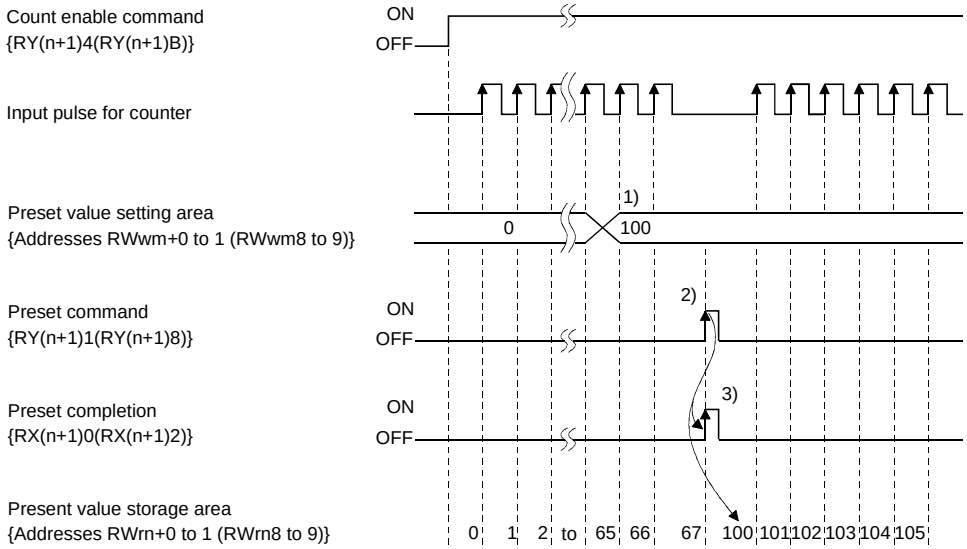
By using the preset function, the production count can be continued from the previous day.

1) Production amount of the previous day is preset from the PC CPU to the high-speed counter module.
2) Products are carried on a conveyor.
3) Production amount is counted using the pulse input from the photoelectric switch.
4) At the end of daily production, the counter value in the present value storage area is stored to the word device (D, W, etc.) in the PC CPU latch range.



7.2 Preset Using the Sequence Program

Turn on the preset command {RY(n+1)1 (RY(n+1)8} in the sequence program to execute the preset function.



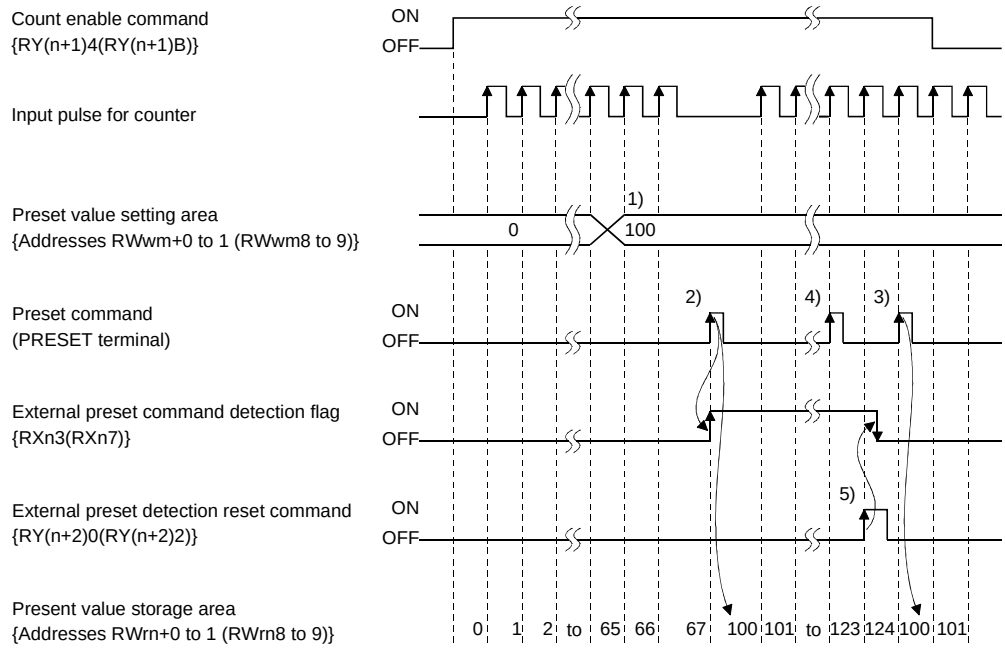
1).....Write any value in advance in 24-bit binary to the preset value setting area {addresses RWwm+0 to 1 (RWwm+8 to 9)}.

2).....On the leading edge (OFF→ON) of the preset command {RY(n+1)1 (RY(n+1)8}, the value in the preset value setting area is preset to the present value storage area. Preset can be executed independently of whether the count enable command {RY(n+1)1 (RY(n+1)8)} is on or off.

3).....When the preset function is executed by the preset command {RY(n+1)1 (RY(n+1)8} switched on, the preset completion signal {RY(n+1)1 (RY(n+1)8)} switches on. When the preset command switches off, the preset completion signal also switches off.

7.3 Preset by External Control Signal

A voltage is applied to the external input PRESET terminal to execute preset.



1).....Write any value in advance in 24-bit binary to the preset value setting area {addresses RWwm+0 to 1 (RWwm+8 to 9)}.

2).....When the preset command switches on (voltage is applied to the PRESET terminal), the value in the preset value setting area is preset to the present value storage area.

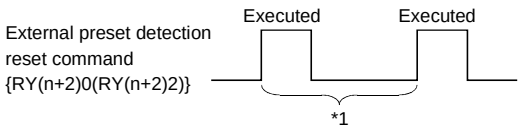
3).....Preset can be executed independently of whether the count enable command {RY(n+1)4 (RY(n+1)B)} is on or off.

POINT

·For externally input preset, make an external preset detection reset after every preset is completed. Resetting enables the next external input to be provided.

·If the external preset request detection {RXn3(RXn7)} is ON, the preset by the next external input and the next external input by the sequence program are not enabled.

·If the following time is not satisfied for the execution of the external preset detection reset command , the external preset detection reset command will not switch on-off.



*1..... 10 link scans+2 sequence scans

8. EXECUTING THE RING COUNTER FUNCTION

This chapter describes the ring counter function.

8.1 Ring Counter Function

The ring counter function repeats counting between the preset value set by the ring counter command and the ring counter value.
The ring counter function can be used for control such as fixed-pitch feed.
When using the ring counter, preset the ring counter setting switch of the high-speed counter module to ON. Also, set the preset value and ring counter value to the remote registers.

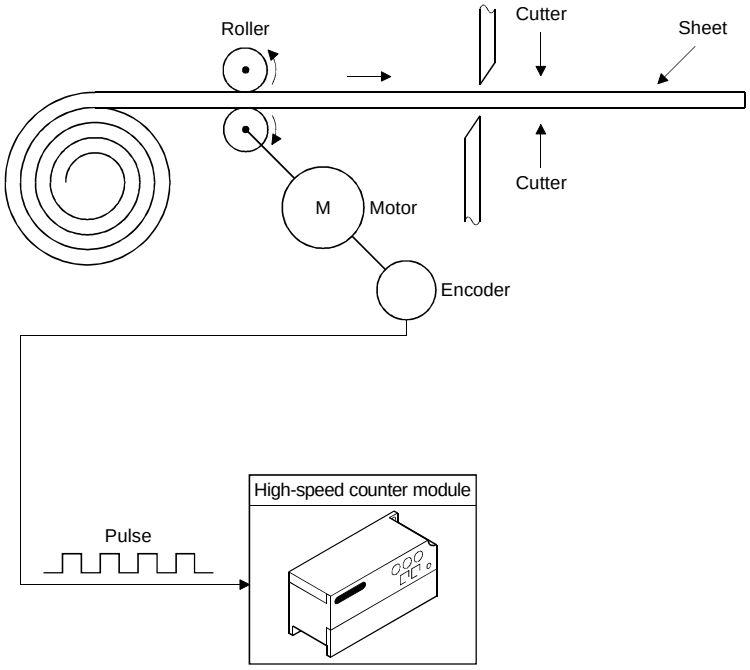
[Remote registers used]

Address	Description
RWwm+0	CH1 preset value setting (L)
RWwm+1	CH1 preset value setting (H)
RWwm+3	CH1 coincidence output pointer No. 1 setting (L)
RWwm+4	CH1 coincidence output pointer No. 1 setting (H)
RWwm+8	CH2 preset value setting (L)
RWwm+9	CH2 preset value setting (H)
RWwm+B	CH2 coincidence output pointer No. 1 setting (L)
RWwm+C	CH2 coincidence output pointer No. 1 setting (H)

[Example of using the ring counter function]

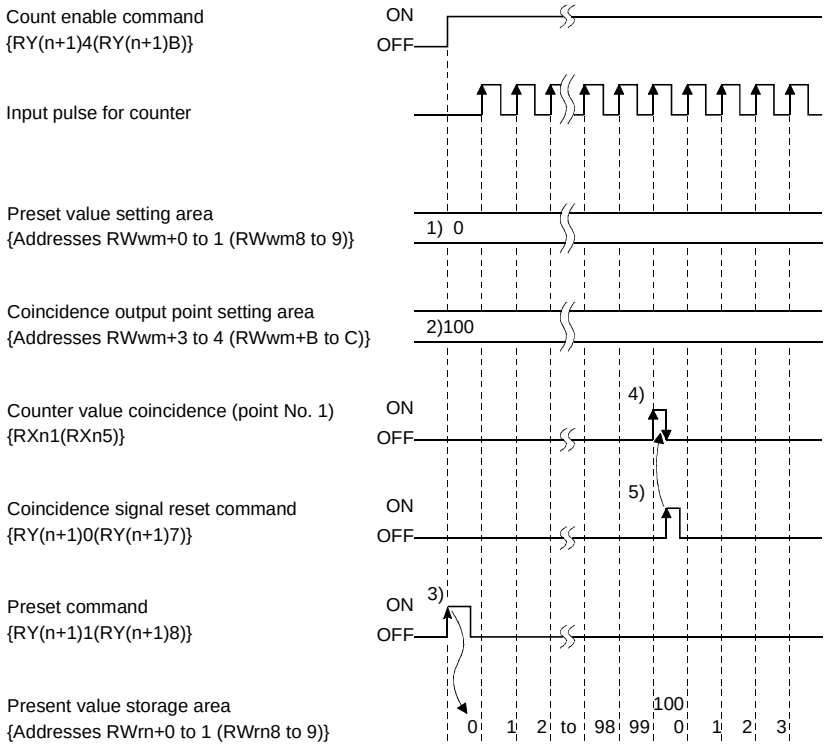
In a system where a sheet is cut to the specified size, set the ring counter value to roller-feed a sheet in fixed pitch and cut it to the given length.

1) Set the preset and ring counter values to execute the ring counter function.
2) The motor is run to rotate the rollers.
3) The motor is stopped as soon as the given length of the sheet is fed by the rollers.
4) The sheet is cut.
5) The operations in steps 2) to 4) are repeated.



8.1.1 Ring counter function operation

When using the ring counter function, preset the ring counter setting switch of the high-speed counter module to ON.
Also set the preset value and ring count value to the remote registers.



1).....Write a preset value in advance in 24-bit binary to the preset value setting area {addresses RWwm+0 to 1 (RWwm8 to 9)}.

2).....Write a ring counter value in advance in 24-bit binary to the coincidence output point No. 1 setting area {addresses RWwm+3 to 4 (RWwm+B to C)}.

3).....On the leading edge (OFF→ON) of the preset command {RY(n+1)1 (RY(n+1)8}, the value in the preset value setting area is preset to the present value storage area. Preset can be executed independently of whether the count enable command {RY(n+1)4 (RY(n+1)B)} is on or off.

4).....When the counter value reaches the ring counter value, the counter value coincidence signal switches on to execute presetting. When the present value is read at the execution of presetting, the ring counter value or preset value is read.

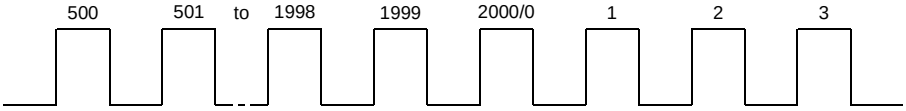
5).....The coincidence signal reset command is switched on to reset the counter value coincidence signal.If the counter value coincidence signal remains on, the next presetting cannot be performed.

8.1.2 Count range

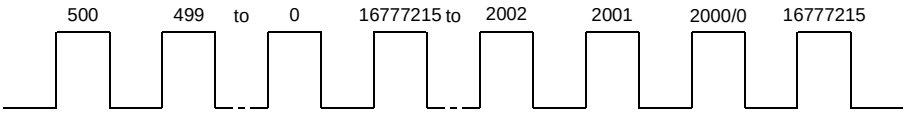
As shown below, the count range of the ring counter function differs depending on the relationship between the preset value, ring counter value, present value and counting mode (up/down count).

(1) If preset value≤present value≤ring counter value
The following operation is performed if the ring counter function is executed at the preset value of 0, ring counter value of 2000, and present value of 500.

1) In up count, the present value returns to the preset value (0) as soon as it is counted up to the ring counter value (2000)

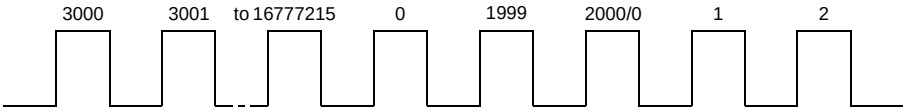


2) In down count, the present value returns to the maximum value (16777215) when it is counted down to the preset value (0).
Then, when the present value is counted down to the ring counter value (2000), it returns to the preset value(0).

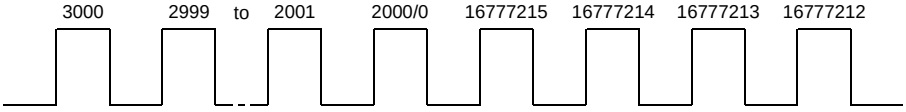


(2) If preset value≤ring counter value≤present value
The following operation is performed if the ring counter function is executed at the preset value of 0, ring counter value of 2000, and present value of 3000.

1) In up count, the present value returns to the minimum value (0) when it is counted up to the maximum value (16777215).
Then, when the present value is counted up to the ring counter value (2000), it returns to the preset value(0).



2) In down count, the present value returns to the preset value (0) as soon as it is counted down to the ring counter value (2000).



POINT

·Do not write the preset and ring counter values during execution of the ring counter function. If they are written, the ring counter operation may not be performed properly.

·Note that the ring counter function is not activated when the following expression is satisfied.

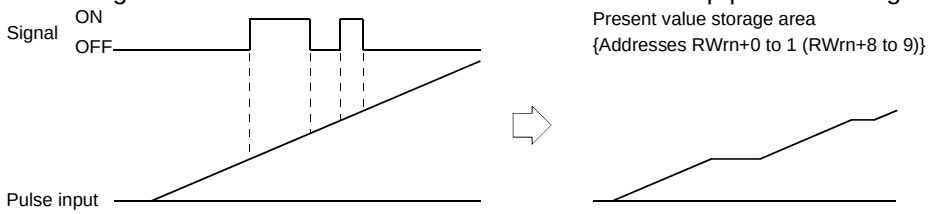
Ring counter cycle≤10-link scantime+2-sequence scantime

9. SELECTING AND EXECUTING THE COUNTER FUNCTION

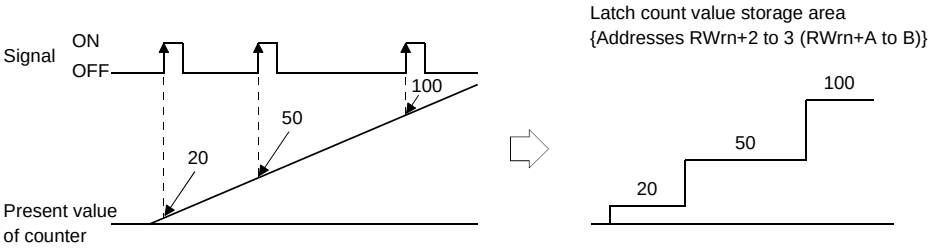
9.1 Selecting the Counter Function

Select and execute one of the following four counter functions.
Execute the selected function by switching on the counter function selection start command or by applying a voltage to the external F.START terminal.

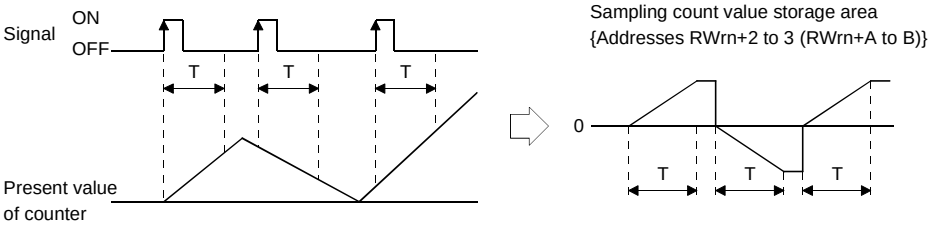
1) Count disable function.....Refer to Section 9.2
Inputs the signal while the count enable command is ON to stop pulse counting.



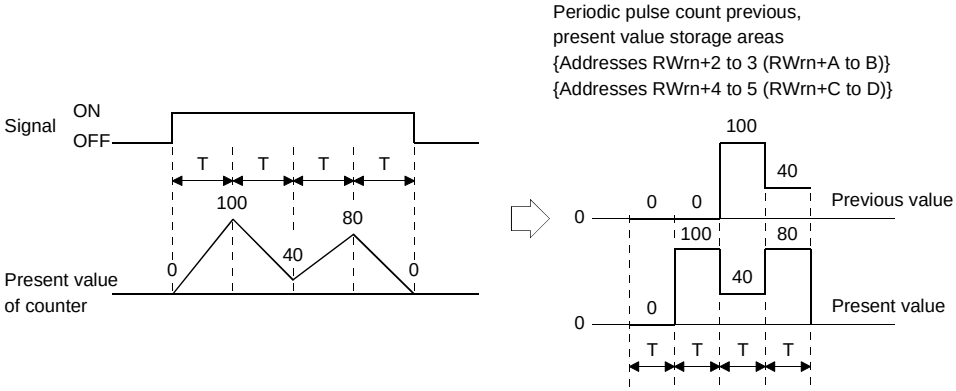
2) Latch counter function..... Refer to Section 9.3
Latches the present value of the counter at the input of the signal.



3) Sampling counter function..... Refer to Section 9.4
Counts pulses entered during a preset time (T) which begins with the input of the signal.

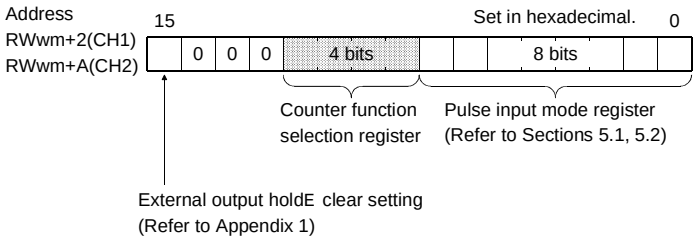


4) Periodic pulse counter function..... Refer to Section 9.5
Stores the present and previous counter values at preset intervals (T) while the signal is entered.



(1) Select any of the counter functions by writing a value to the lower 4 bits in the upper bits of the remote register {address RWwm+2 (RWwm+A)}.
When the value set is other than the following set value, the initial value (count disable function selection) is set.
However, when changing the counter function, make sure that the counter function selection start command {RY(n+1)6 (RY(n+1)D)} and F.START terminal are off.

Counter Function Selection	Set Value
Count disable function	0H
Latch counter function	1H
Sampling counter function	2H
Periodic pulse counter function	3H



(2) Either of the counter function selection start command {RY(n+1)6 (RY(n+1)D)} and F.START terminal (external input) may be used to make a counter function selection. The earlier one of the above input signals overrides the latter.

(3) Set the time for the sampling counter function and periodic counter function between 1 and 65535 in 10ms increments.

Example:When 420 is set to the sampling/interval time setting area {RWwm+5 (RWwm+D)}
420×10=4200[ms]

POINT
The sampling and interval time values are set to the same address of the remote register, but the value set is that of the function selected.

9.1.1 Reading the counter function selection count value

The counter function selection count value is the count value at a time when a counter function selection is made.
This section describes how to read the counter function selection count value.

(1) The counter function selection count values are stored in the following remote registers.

Description		Latch Count Value/ Sampling Count Value/Periodic Pulse Count Previous Value	Periodic Pulse Count Present Value
Remote register	CH1	RWrn+2 to 3	RWrn+4 to 5
	CH2	RWrn+A to B	RWrn+C to D

(2) The counter function selection count value (0 to 16777215) is stored in 24-bit binary.

(3) In up count, the counter function selection count value returns to 0 when it exceeds 1677715.
In down count, the counter function selection count value returns to 1677715 when it exceeds 0.

POINT
The latch count value, sampling count value and periodic pulse count previous value are stored in the same address but the value stored is the count value selected.

9.1.2 Counting errors

An error is produced in counting when a counter function selection is made by the external input (by applying a voltage to the F.START terminal) or by the sequence program (by turning on the counter function selection start command).

(1) For external input, there is the following count delay range.

[Maximum count delay]
1[ms]×pulse input speed [PPS]×multiplication number [count]

[Minimum count delay]
0.1[ms]×pulse input speed [PPS]×multiplication number [count]

(2) When a counter function selection is made by the sequence program, the number of pulses counted during one sequence scan plus three link scans is added to the counting delay in above (1).

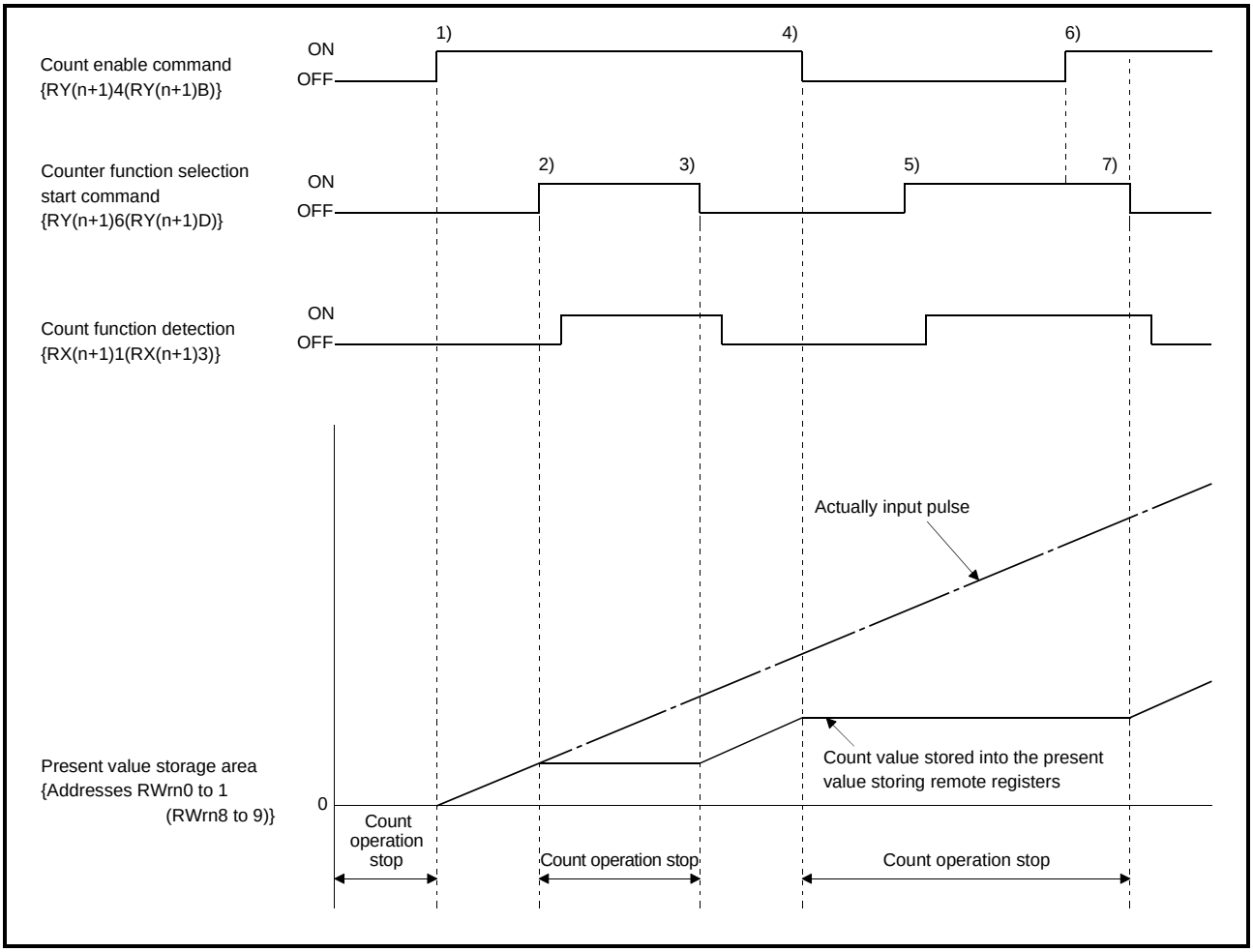
(3) The internal clock error is calculated as follows.

$$\frac{\text{Set time}}{10000} \times \text{pulse input speed [PPS]} \times \text{multiplication number [count]}$$

POINT
It is recommended to use the external input to make a counter function selection.

9.2 Count Disable Function

This function stops the counting operation while the count enable command is on. The following chart shows the relationships between the count enable command, the counter function selection start command and the counter's present value



1).....Count operation starts when the count enable command {RY(n+1)4 (RY(n+1)B} switches on.

2).....Count operation stops when the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal} switches on.
Also, the counter function detection {RX(n+1)1 (RX(n+1)3)} switches on when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches on.

3).....Count operation resumes when the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal} switches off.
Also, the counter function detection {RX(n+1)1 (RX(n+1)3)} switches off when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches off.

4).....Count operation stops when the count enable command {RY(n+1)4 (RY(n+1)B} switches off.

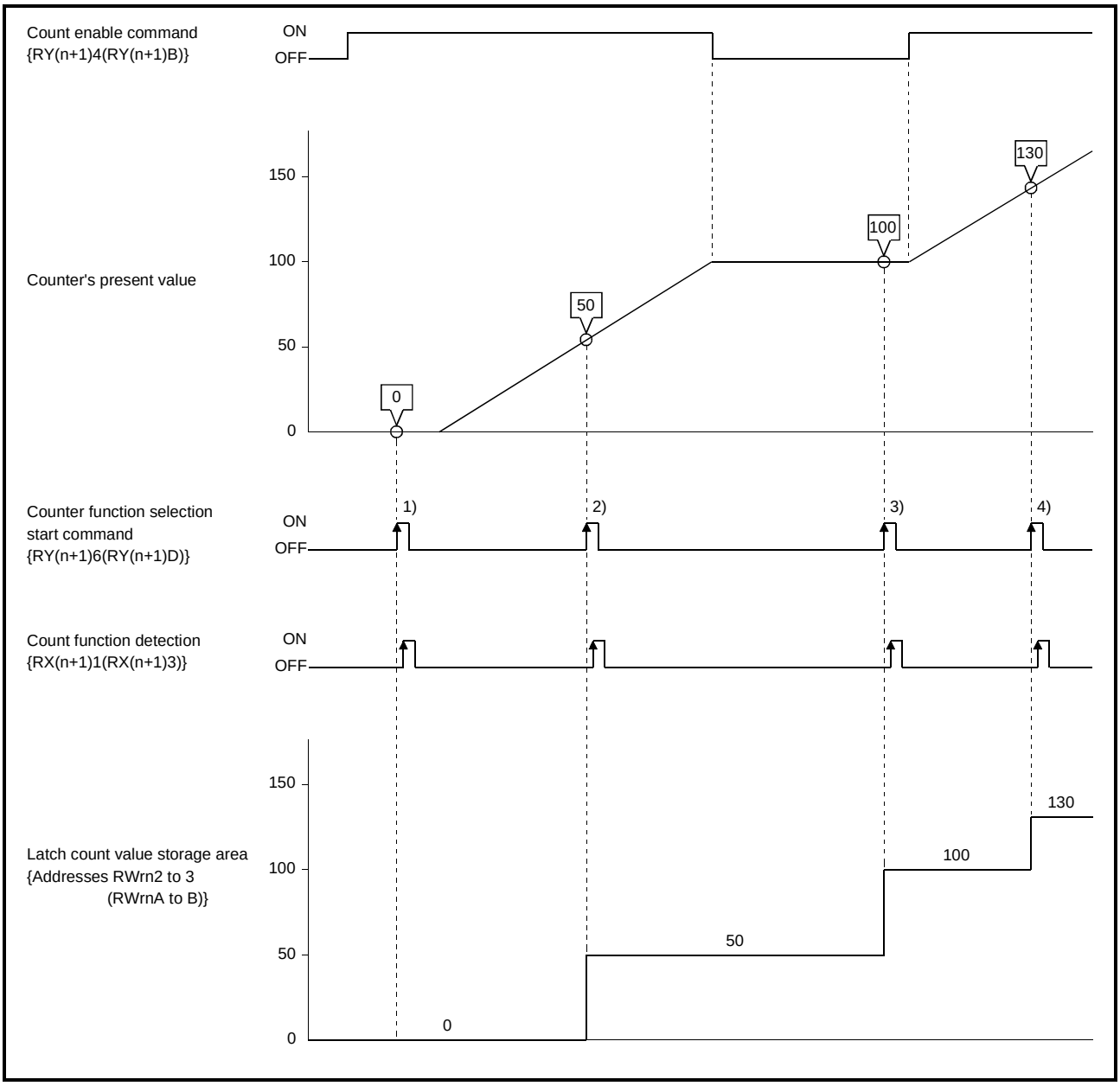
5).....Since the count enable command {RY(n+1)4 (RY(n+1)B} is off, count operation stops independently of whether the counter function selection start command {RY(n+1)6 (RY(n+1)D, F.START terminal}.

6).....If the count enable command {RY(n+1)4 (RY(n+1)B} is switched on, count operation remains stopped since the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal} is on.

7).....Count operation resumes when the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal} switches off.

9.3 Latch Counter Function

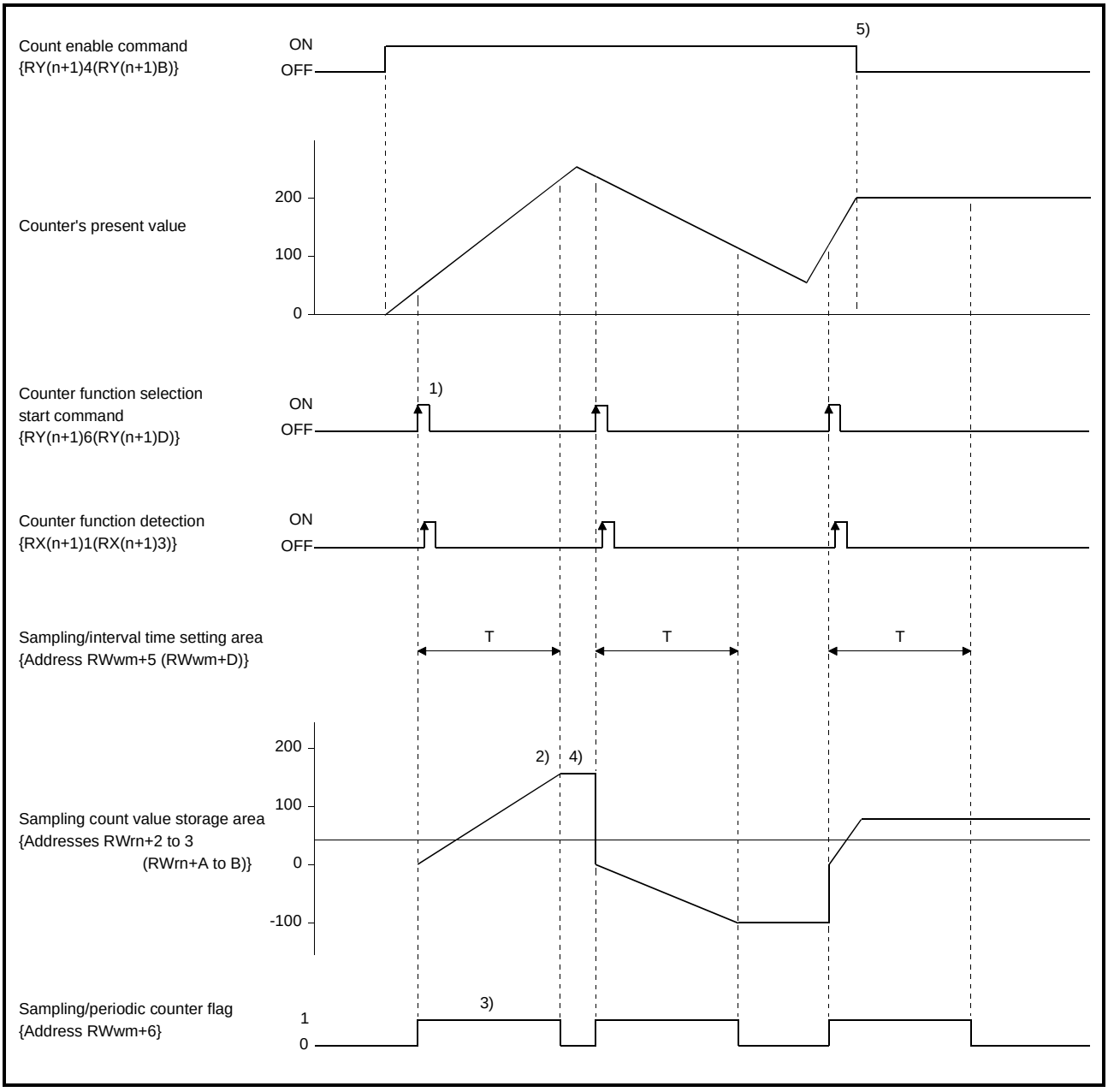
This function latches the counter's present value at a time when the signal is input.
The following chart shows the relationships between the counter's present value, counter function selection start command and latch count value storage area.



On the leading edges 1) to 4) of the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal}, the counter's present value is stored into the latch count value storage area {addresses RWrn2 to 3 (RWrnA to B)}.
The latch counter function is executed independently of whether the count enable command {RY(n+1)4 (RY(n+1)B)} is on or off. Also, the counter function detection signal {RX(n+1)1 (RX(n+1)3)} switches on when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches on, and the count function detection signal {RX(n+1)1 (RX(n+1)3)} switches off when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches off.

9.4 Sampling Counter Function

This function counts pulses input during a preset sampling period.
The following chart shows the relationships between the signals of the sampling counter function, remote registers and others.



1).....On the leading edge of the counter function selection start command {RY(n+1)6 (RY(n+1)D), F.START terminal}, pulses input are counted from 0. Also, the counter detection function signal {RX(n+1)1 (RX(n+1)3)} switches on when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches on, and the counter detection signal {RX(n+1)1 (RX(n+1)3)} switches off when the counter function selection start command {RY(n+1)6 (RY(n+1)D)} switches off.

2).....Counting stops when the preset sampling time elapses.

3).....While the sampling counter function is being executed, the following value is stored into the sampling/periodic counter flag storage area.

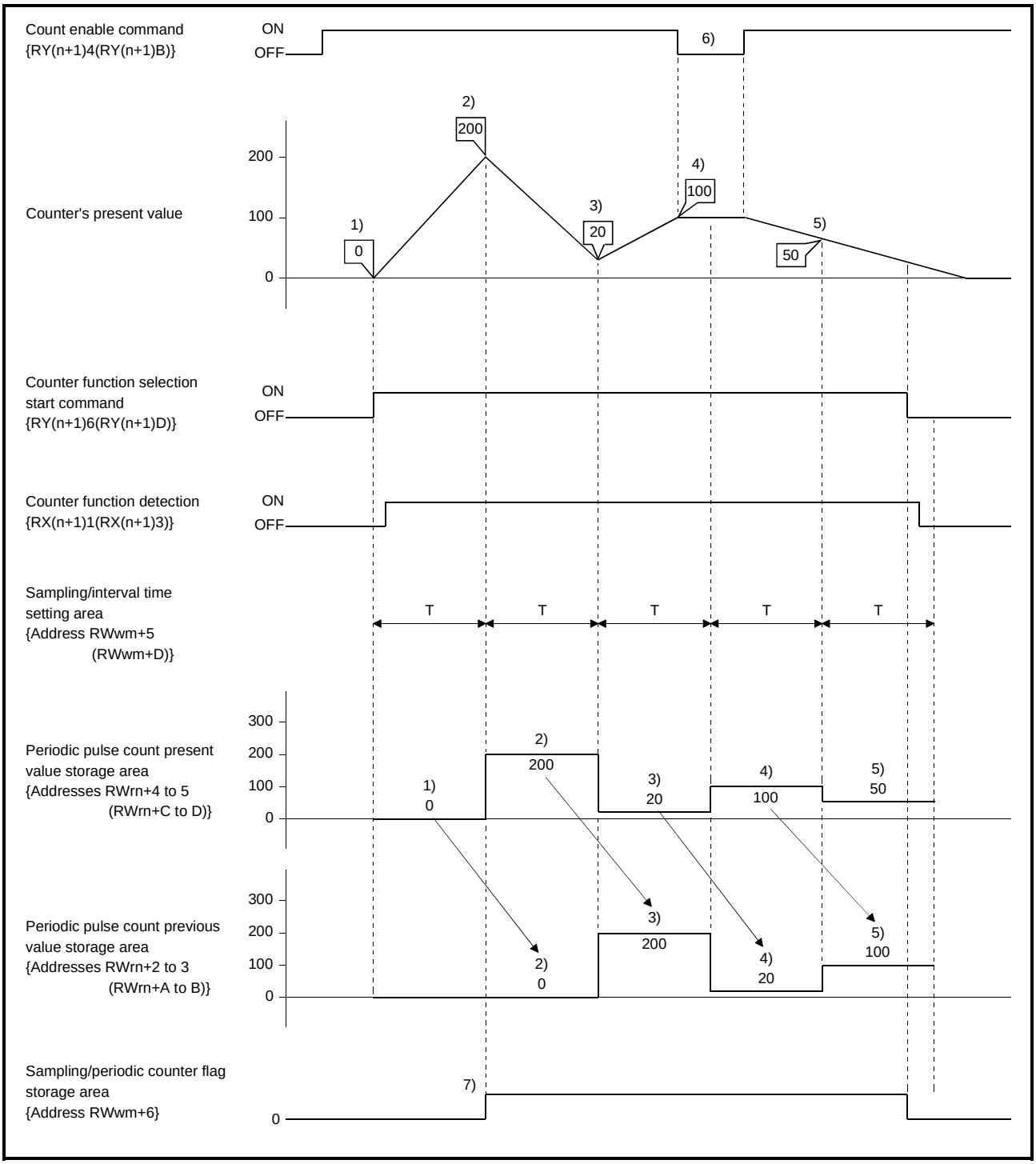
Operating Status	During Execution at CH1 Only	During Execution at CH2 Only	During Execution at CH1 and CH2
Remote register address (RWrn+6)	K1	K2	K3

4).....If the sampling counter function ends, the value in the sampling count value storage area is held.

5).....The sampling counter function is executed independently of whether the count enable command {RY(n+1)4 (RY(n+1)B)} is on or off.

9.5 Periodic Pulse Counter Function

This function stores the present and previous counter values in the corresponding periodic pulse count present and previous value storage areas at preset intervals (T).
The following chart shows the relationships between the signals, remote registers and others.



1).....The counter's present value 0 is stored into the periodic pulse count present value storage area {addresses RWrn+4 to 5 (RWrn+C to D)} (hereinafter called the present value storage area).

2).....The counter's present value 200 is stored into the present value storage area. The count value 0 stored until then is stored into the periodic pulse count previous value storage area {addresses RWrn+2 to 3 (RWrn+A to B)} (hereinafter called the previous value storage area).

3).....The counter's present value 20 is stored into the present value storage area. The count value 200 stored until then is stored into the previous value storage area.

4).....The counter's present value 100 is stored into the present value storage area. The count value 20 stored until then is stored into the previous value storage area.

5).....The counter's present value 50 is stored into the present value remote register. The count value 100 stored until then is stored into the previous value storage area.

6).....The periodic pulse counter function is executed independently of whether the count enable command {RY(n+1)4 (RY(n+1)B)} is on or off.

7).....While the periodic pulse counter function is being executed, the following value is stored into the sampling/periodic counter flag storage area.

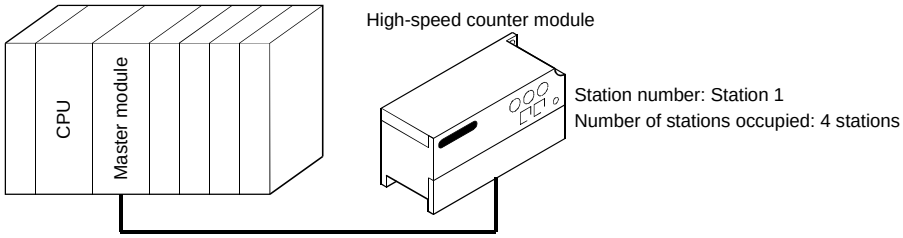
Operating Status	During Execution at CH1 Only	During Execution at CH2 Only	During Execution at CH1 and CH2
Remote register address (RWrn+6)	K1	K2	K3

10. SEQUENCE PROGRAM EXAMPLES

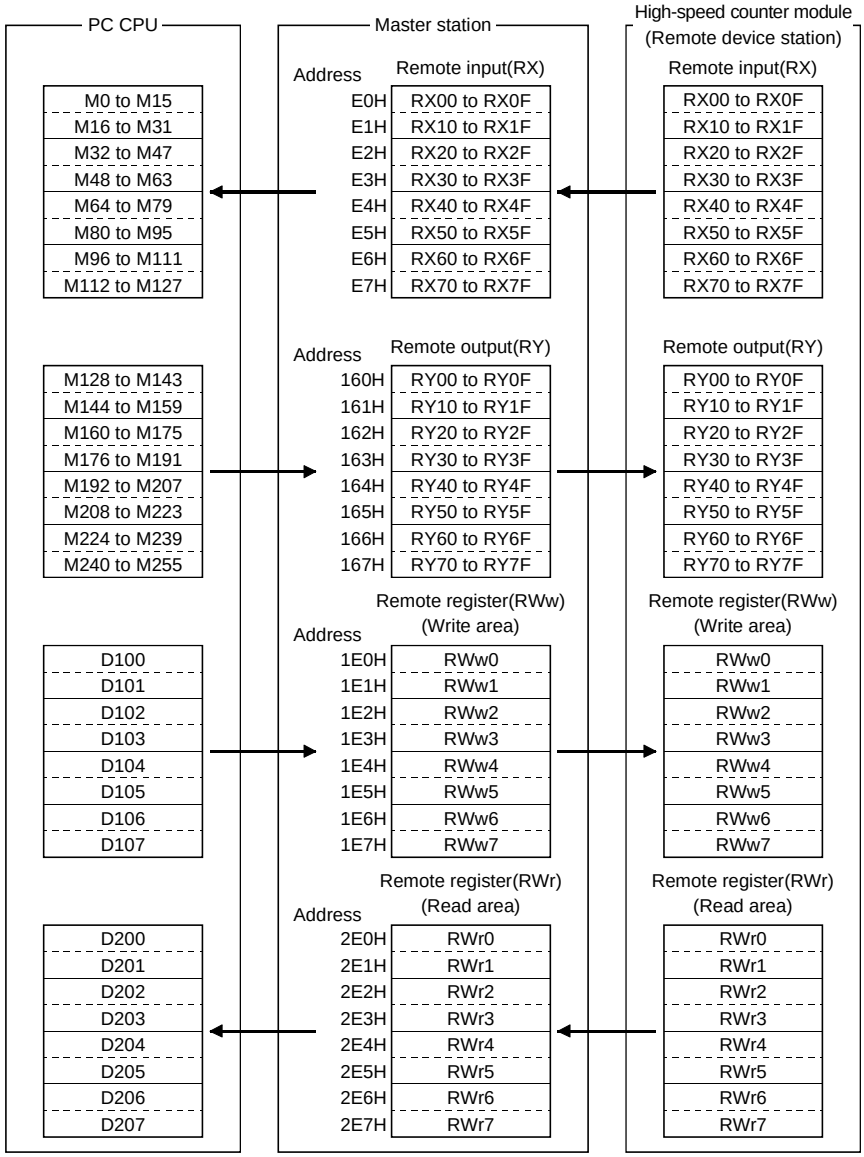
10.1 System Used in This Chapter

The sequence program examples explained in this chapter assume that the following system is used.For the sequence program of the whole CC-Link system, refer to the CC-Link Master Module User's Manual.

(1) System configuration for program examples



(2) Relationships between PC CPU, master station buffer memory and remote device station



10.2 Sequence Programs for QnA Series

The sequence programs used in this chapter are those for use with the A series. To use them as the sequence programs for QnA, note the following.

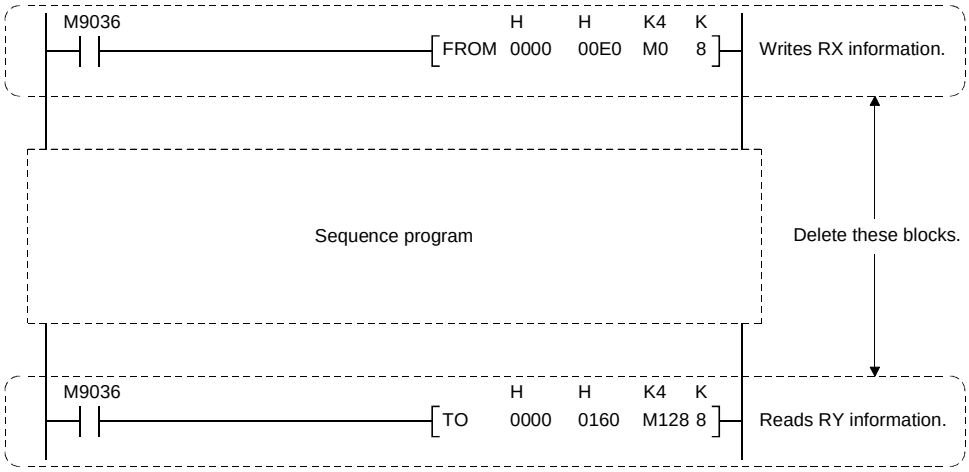
(1) Reading of contacts

Replace the following contacts designed for A series with those for QnA series.

A Series		QnA Series	Description
M9036	→	SM400	Always ON.
M9037		SM401	Always OFF.
M9038		SM402	ON during only one scan after RUN
M9039		SM403	OFF during only one scan after RUN

(2) Deletion of sequence program blocks for RX and RY refreshing

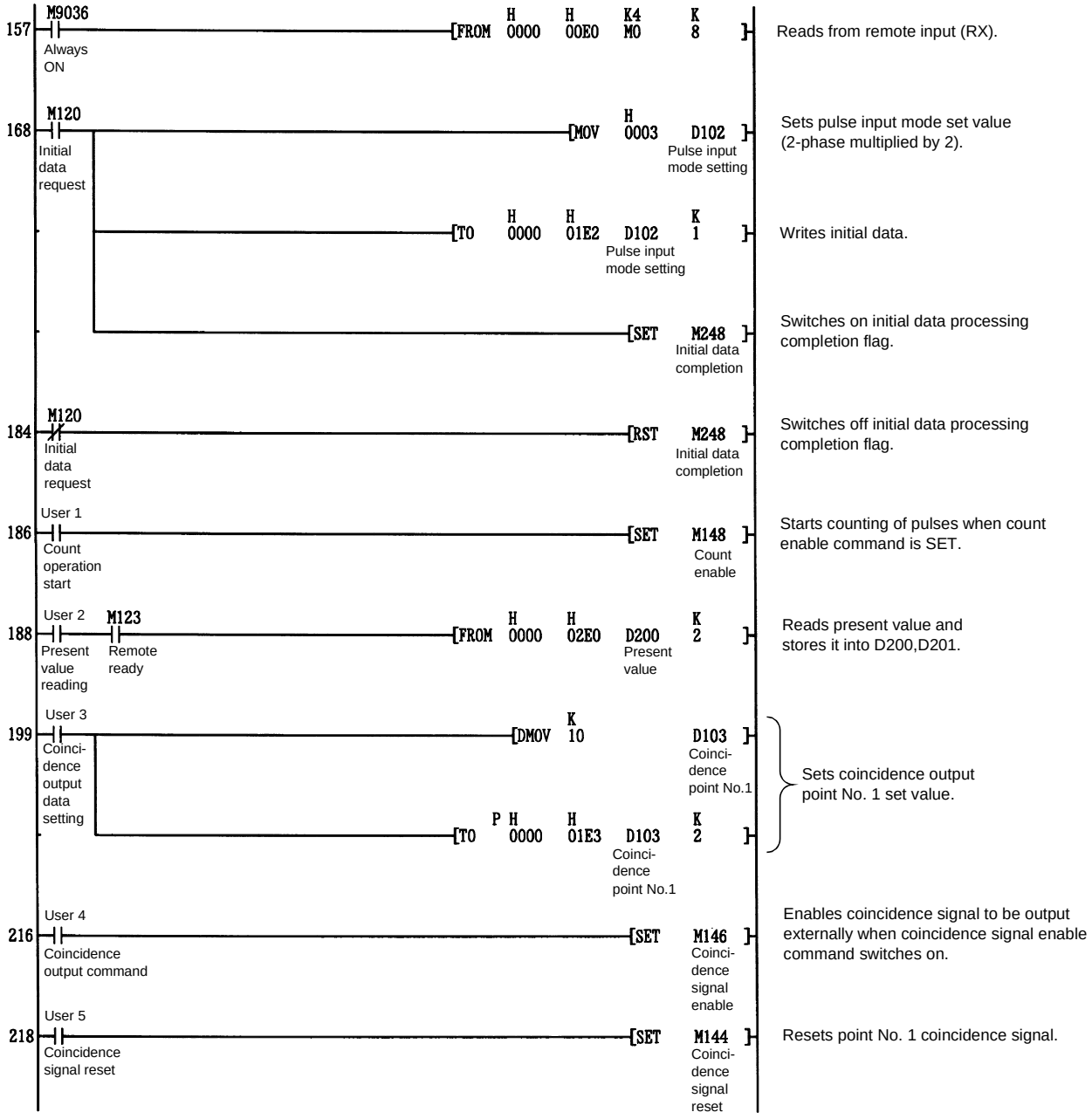
If the automatic refresh parameter setting is made in the QnACPU and master module's version "9707 B" or later indicated in Section 2.2, the contents of RX and RY are automatically refreshed. Therefore, the following blocks at the beginning and end of the sequence program are not needed and should be deleted.

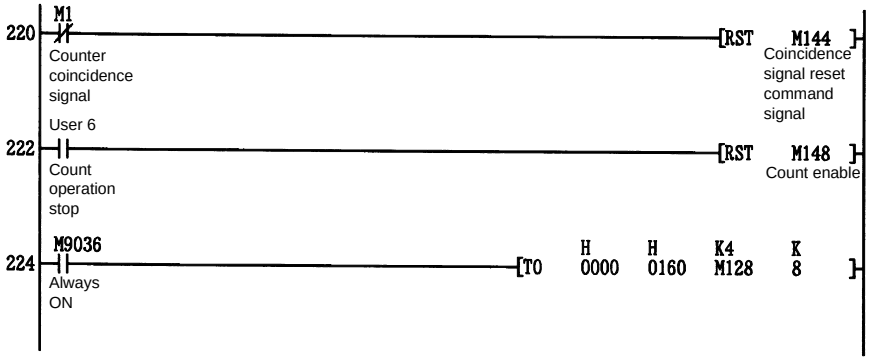


POINT
Note that automatic refresh parameter setting must be made to perform automatic refresh. For details, refer to "Automatic refresh parameter setting" in the CC-Link system master/local user's manual (details). (Automatic refresh setting can be made to RX, RY, RWr, RWw, SB and SW.)

10.3 Sequence Program Example for Execution of the Coincidence Output Function

The following sequence program uses channel 1 to count pulses in the 2-phase pulse input multiplied-by-2 mode.

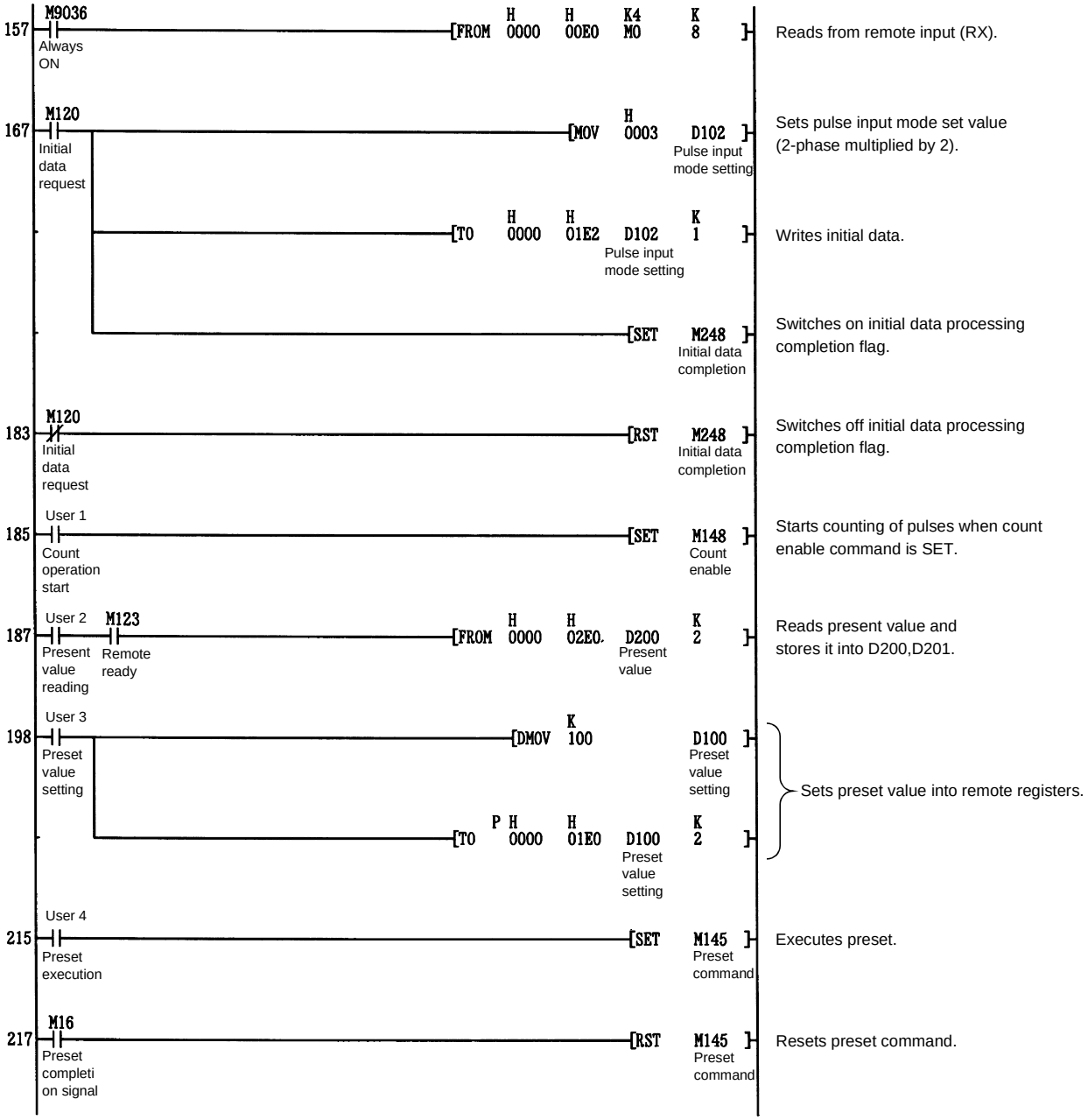


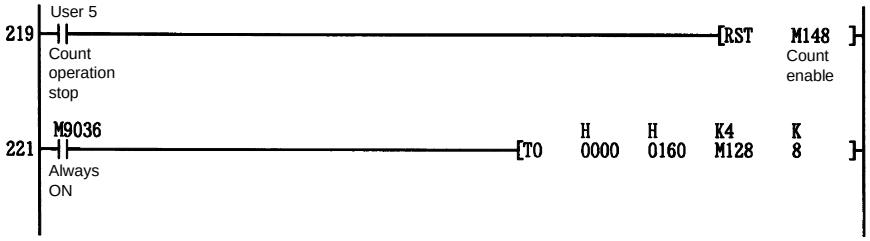

220
M1
Counter coincidence signal
RST M144
Coincidence signal reset command signal
Resets coincidence signal reset command signal.
User 6
222
Count operation stop
RST M148
Count enable
Stops counting of pulses when count enable command is RST.
224
M9036
Always ON
TO H0000 H0160 K4 M128 K8
Writes to remote output (RY).

10.4 Sequence Program Example for Execution of the Preset Function

The following sequence program uses channel 1 to count pulses in the 2-phase pulse input multiplied-by-2 mode.

10.4.1 When preset is made by sequence program

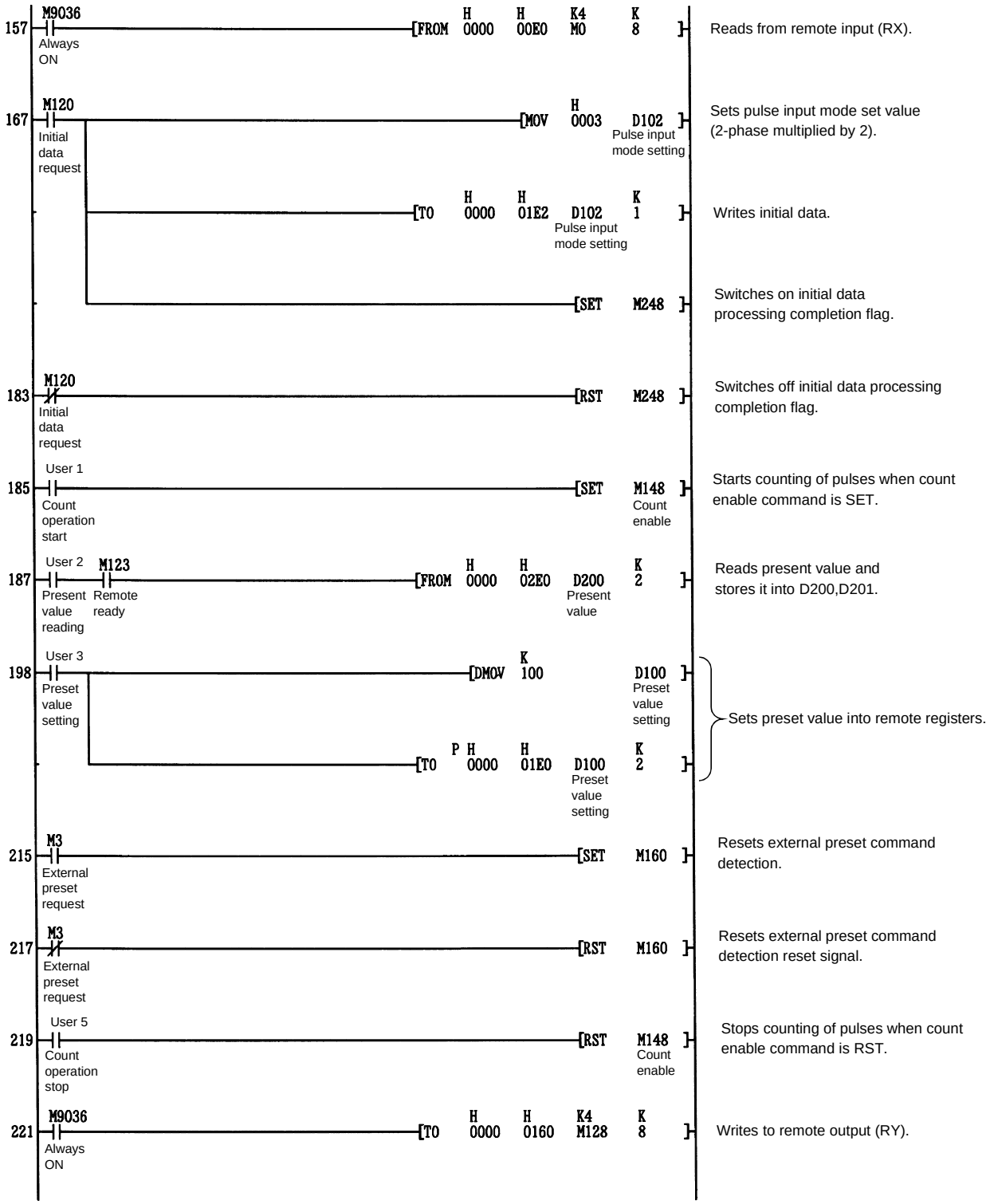




Stops counting of pulses when count enable command is RST.

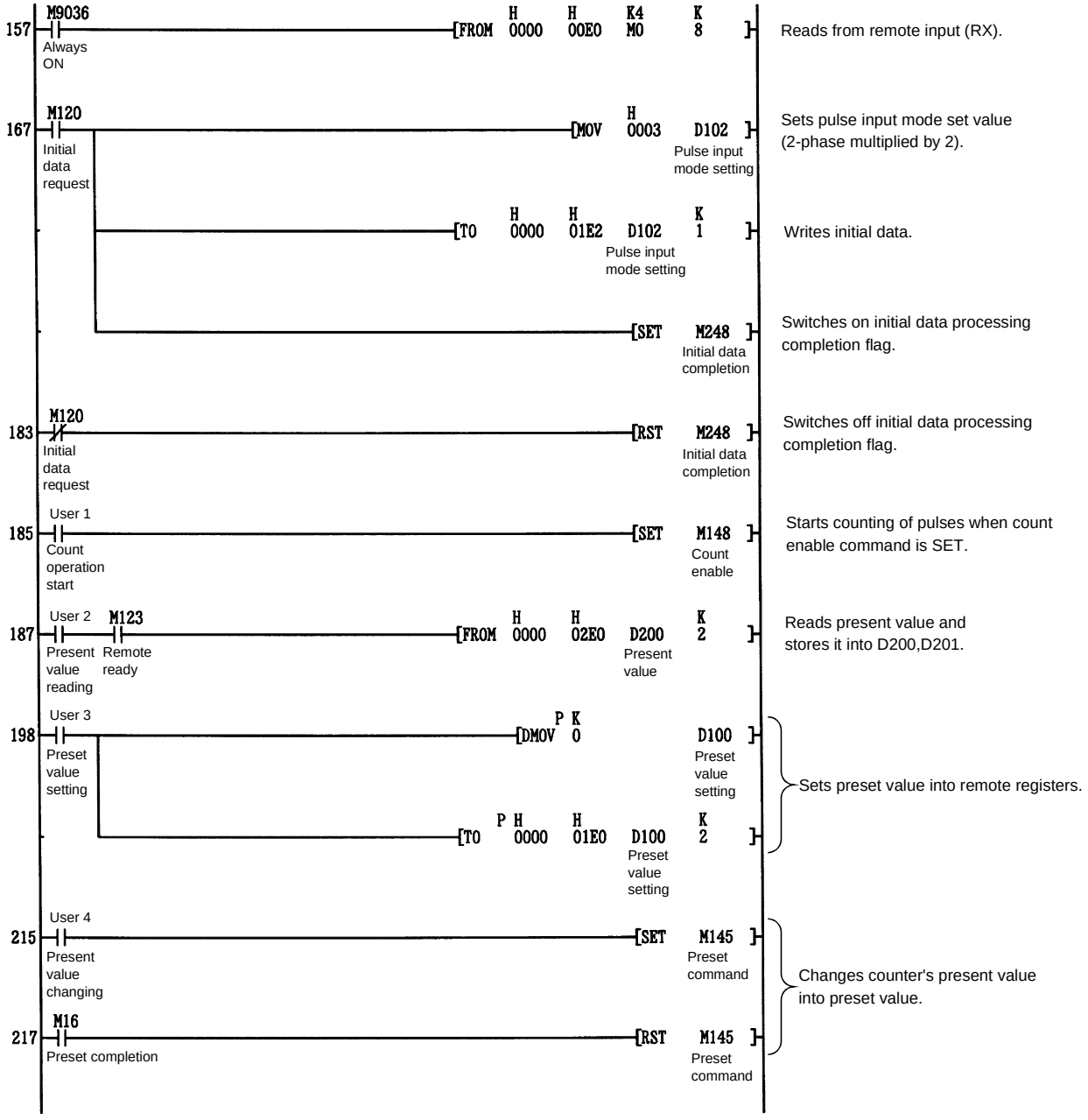
Writes to remote output (RY).

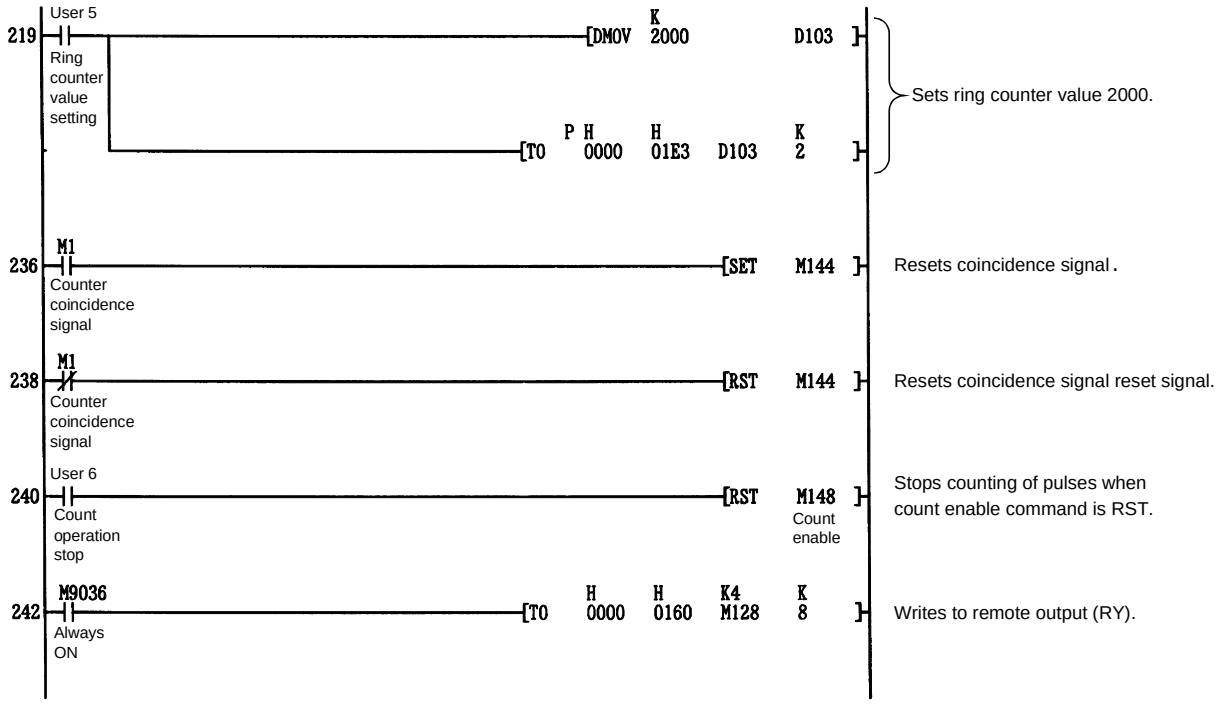
10.4.2 When preset is made by external control signal



10.5 Program Example for Execution of the Ring Counter Function

The following sequence program uses channel 1 to count pulses in the 2-phase pulse input multiplied-by-2 mode.

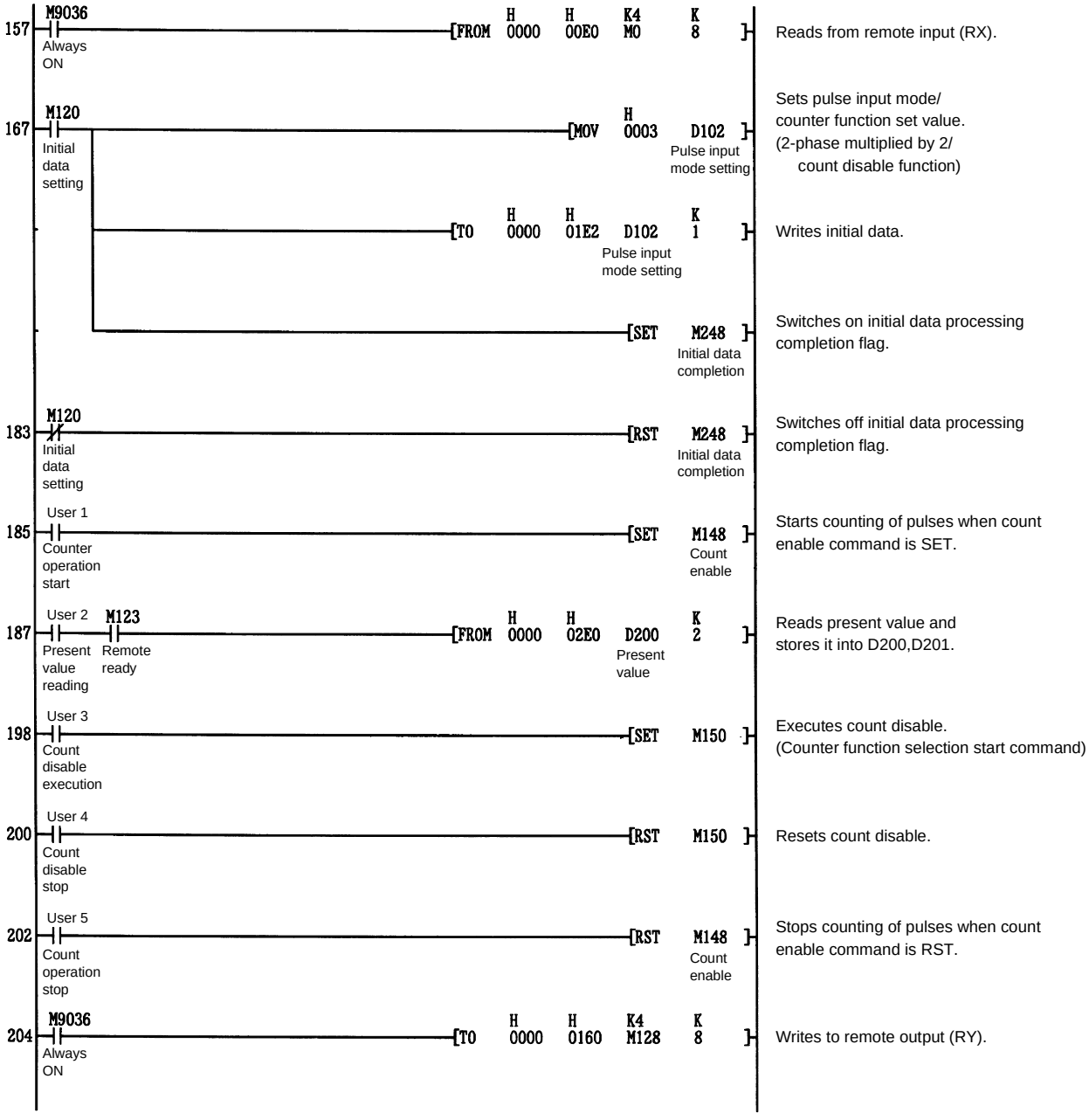



User 5
219
Ring counter value setting
[DMOV K2000 D103]
[TO P H0000 H01E3 D103 K2]
Sets ring counter value 2000.
M1
236
Counter coincidence signal
[SET M144]
Resets coincidence signal.
M1
238
Counter coincidence signal
[RST M144]
Resets coincidence signal reset signal.
User 6
240
Count operation stop
[RST M148]
Count enable
Stops counting of pulses when count enable command is RST.
M9036
242
Always ON
[TO H0000 H0160 K4 M128 K8]
Writes to remote output (RY).

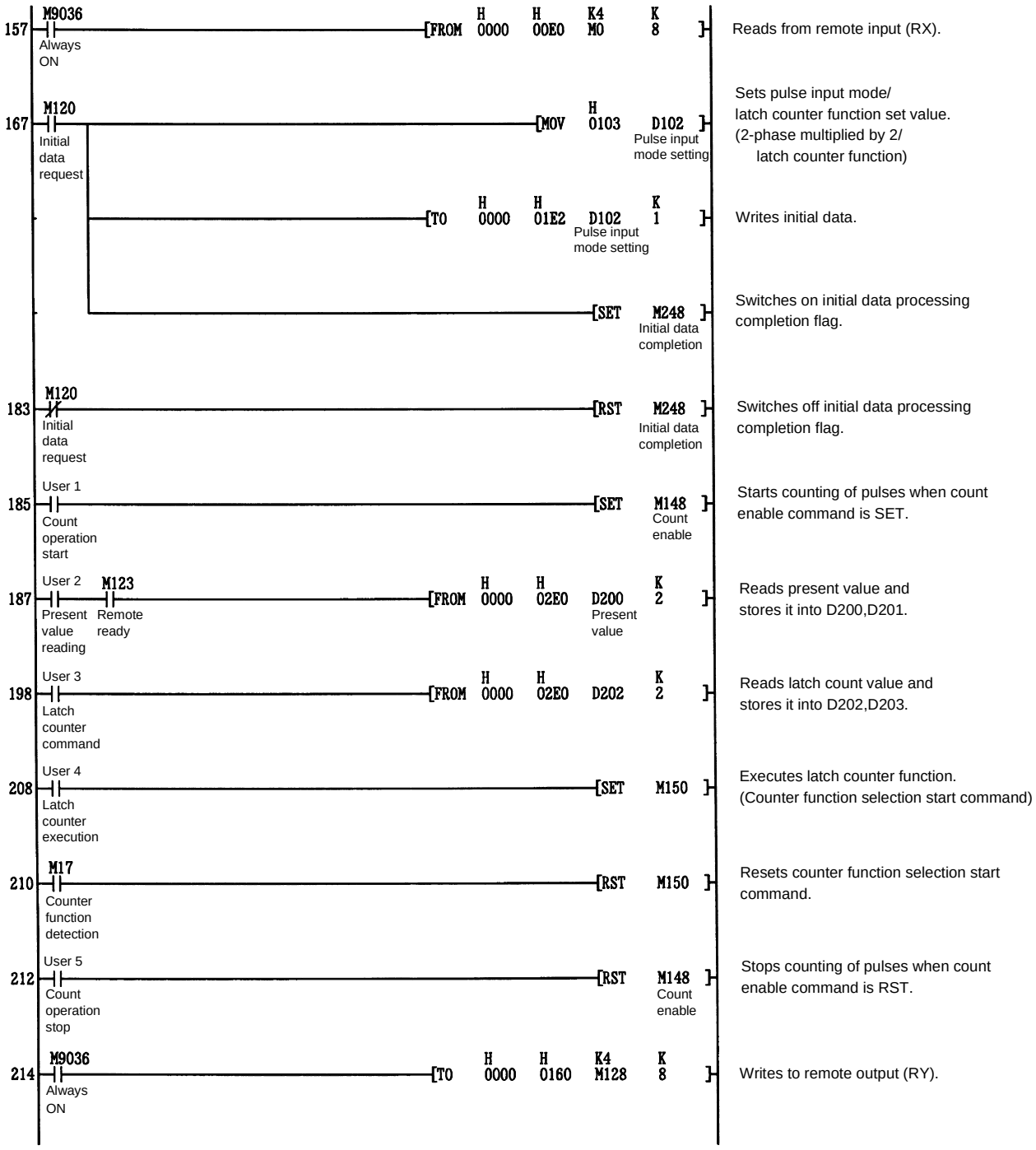
10.6 Program Example for Selection and Execution of the Counter Function

The following sequence program uses channel 1 to count pulses in the 2-phase pulse input multiplied-by-2 mode.

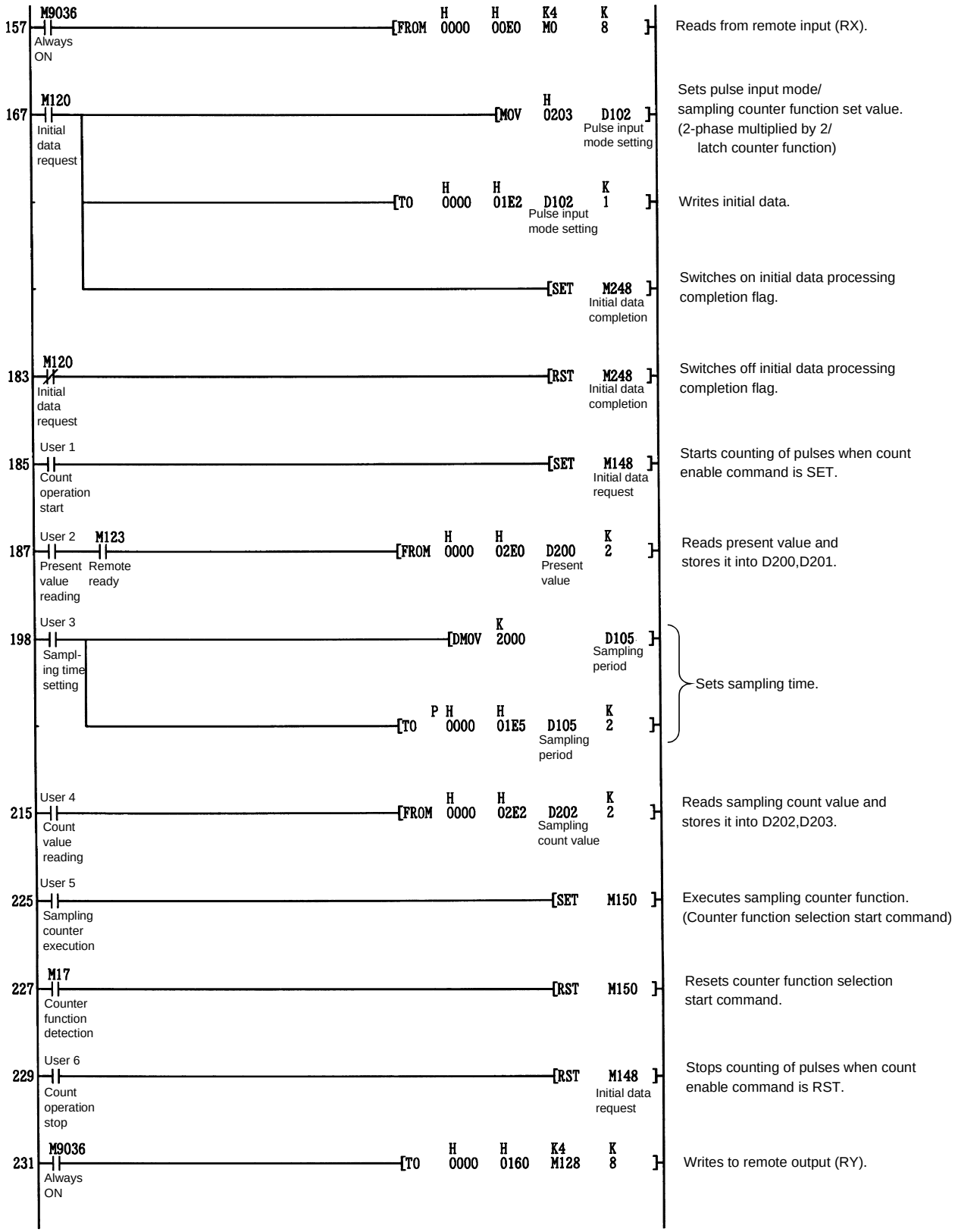
10.6.1 When using the count disable function



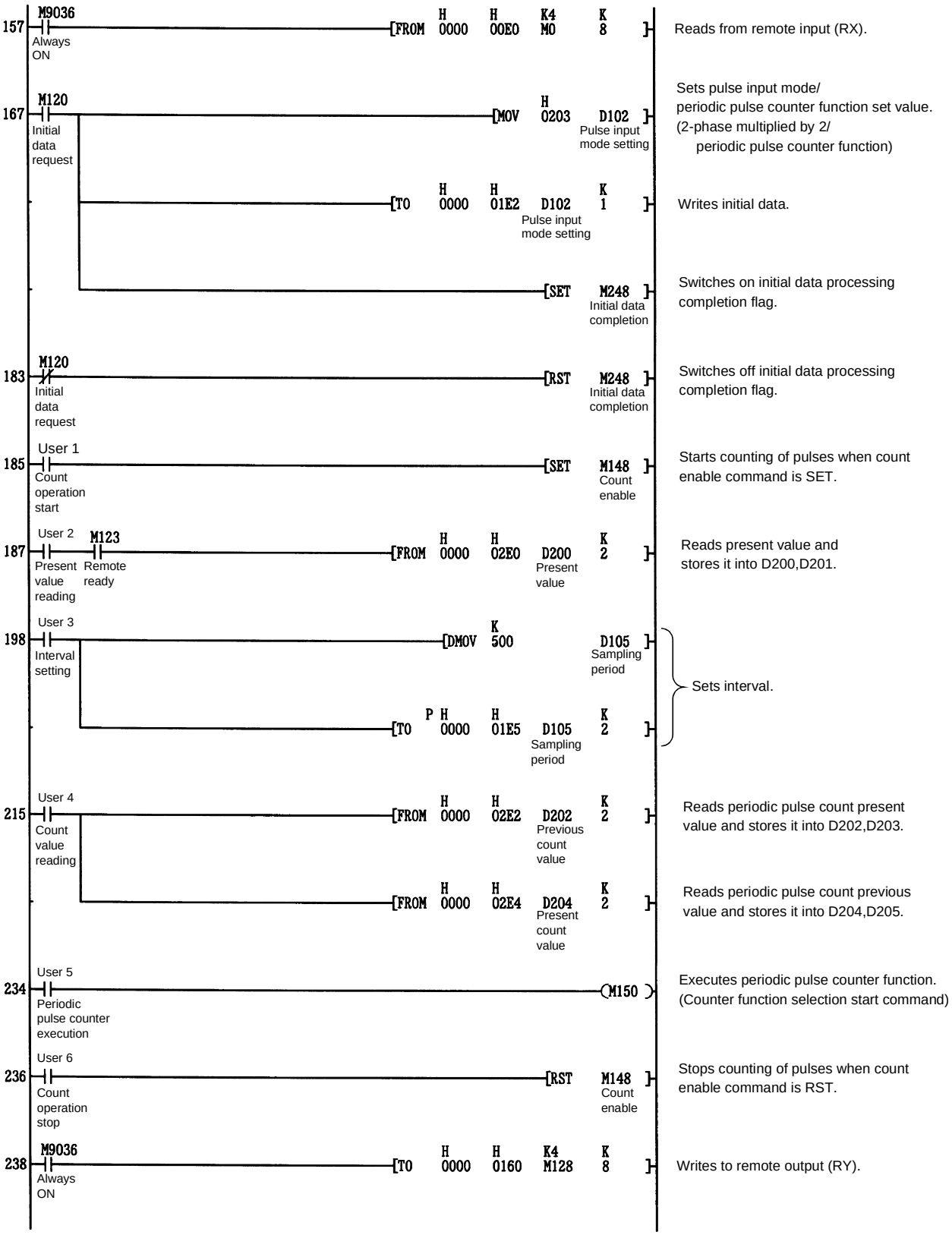
10.6.2 When using the latch counter function



10.6.3 When using the sampling counter function



10.6.4 When using the periodic pulse counter function



11. TROUBLESHOOTING

11.1 Count Value Is Incorrect

The following table lists check items for use when the count value is incorrect.

Check Item	Corrective Action
Is the pulse input mode consistent with the pulse input setting in the remote register?	Make the pulse input mode consistent with the pulse input setting in the remote register.
Is the sequence program data processed in 24-bit binary?	Correct the sequence program so that the data is processed in 24-bit binary.
Is a twisted shielded cable used for pulse input wiring?	Use a twisted cable for wiring.
Does noise enter through the ground of the high-speed counter module?	· Disconnect the high-speed counter module from the ground. · If the high-speed counter module is in contact with the ground, separate it from the ground.
Have adequate measures been taken against noise in the panel or noise resulting from the other equipment?	Provide CR surge suppression to magnetic switches, etc.
Is sufficient distance provided between heavy current equipment and counter input line?	Wire the pulse input line independently, and separate in-panel wiring 150mm(5.91inch)or more from power line.
Is the count value the same at CH1 and CH2 after the same count value was entered?	If the count values are different, hardware is faulty. Check the cause of the fault and contact your sales representative.
Does the input pulse waveform match the performance specifications?	Monitor and confirm the pulse waveform using a synchroscope. If the waveform does not match the specifications, enter pulses of a correct waveform.

11.2 Count Operation Is Not Performed

The following table lists check items for use when count operation is not performed.

Check Item	Corrective Action
Is the external wiring of phases ϕA and ϕB correct?	Check the external wiring and make correction.
When a voltage is applied directly to the pulse input terminals of phases ϕA and ϕB, are the LEDs of phases ϕA and ϕB lit?	· If they are lit, check the external wiring and pulse generator and make correction. · If they are not lit, hardware is faulty. Check the cause of the fault and contact your sales representative.
Is the count enable command {RY(n+1)4 (RY(n+1)B} on?	Switch on the count enable command {RY(n+1)4 (RY(n+1)B} using the sequence program.
Does the master module indicate an error?	If the master module is in error, refer to the troubleshooting procedure of the manual of the master module used and make operation normal.
Is the counter function selection start command {RY(n+1)6 (RY(n+1)D)} on or a voltage applied to the F.START terminal?	When the count disable function has been set by the counter function selection, switch off {RY(n+1)6 (RY(n+1)D)} or F.START terminal.

11.3 How to Check an Error with the LED Lamps

This section describes how to check an error using the LED lamps of the high-speed counter module.
For errors related to the PC CPU and master module, refer to the PC CPU and master module user's manuals.

(1) If the RUN LED of the high-speed counter module goes off

Cause	Corrective Action
Watchdog timer error occurred.	Switch on power of the high-speed counter module again*1. If the RUN LED is not lit after power is switched on again, the hardware may be faulty. Consult your sales representative.

(2) If the L RUN LED of the high-speed counter module goes off

Cause	Corrective Action
Watchdog timer error occurred.	Switch on power of the high-speed counter module again*1. If the L RUN LED is not lit after power is switched on again, the hardware may be faulty. Consult your sales representative.
Cable is broken or shorted.	Check for a broken or shorted cable among transmission cables and repair it.
Master station stopped link.	Check for an error at master station.
24V power is not supplied to the high-speed counter module or voltage is insufficient.	Check the 24V power voltage.
Station number was repeated.	Switch power on again*1 after correcting the station number setting of the module of which station number was repeated.
Switch setting is outside the permissible range (station number 0 or not less than 62, transmission speed 5 to 9).	Correct the switching setting and switch power on again*1.

(3) If the L ERR. LED of the high-speed counter module flickers

Cause	Corrective Action
Station number or transmission speed switch setting was changed during normal operation.	Return the station number or transmission speed switch setting to the old value and switch power on again*1. If the L RUN LED is not lit after power is switched on again, the hardware may be faulty. Consult your sales representative.
Station number or transmission speed switch is faulty	If the L ERR. LED begins to flicker though switch setting was not changed during operation, the hardware may be faulty. Consult your sales representative.

(4) If the L ERR. LED of the high-speed counter module is lit

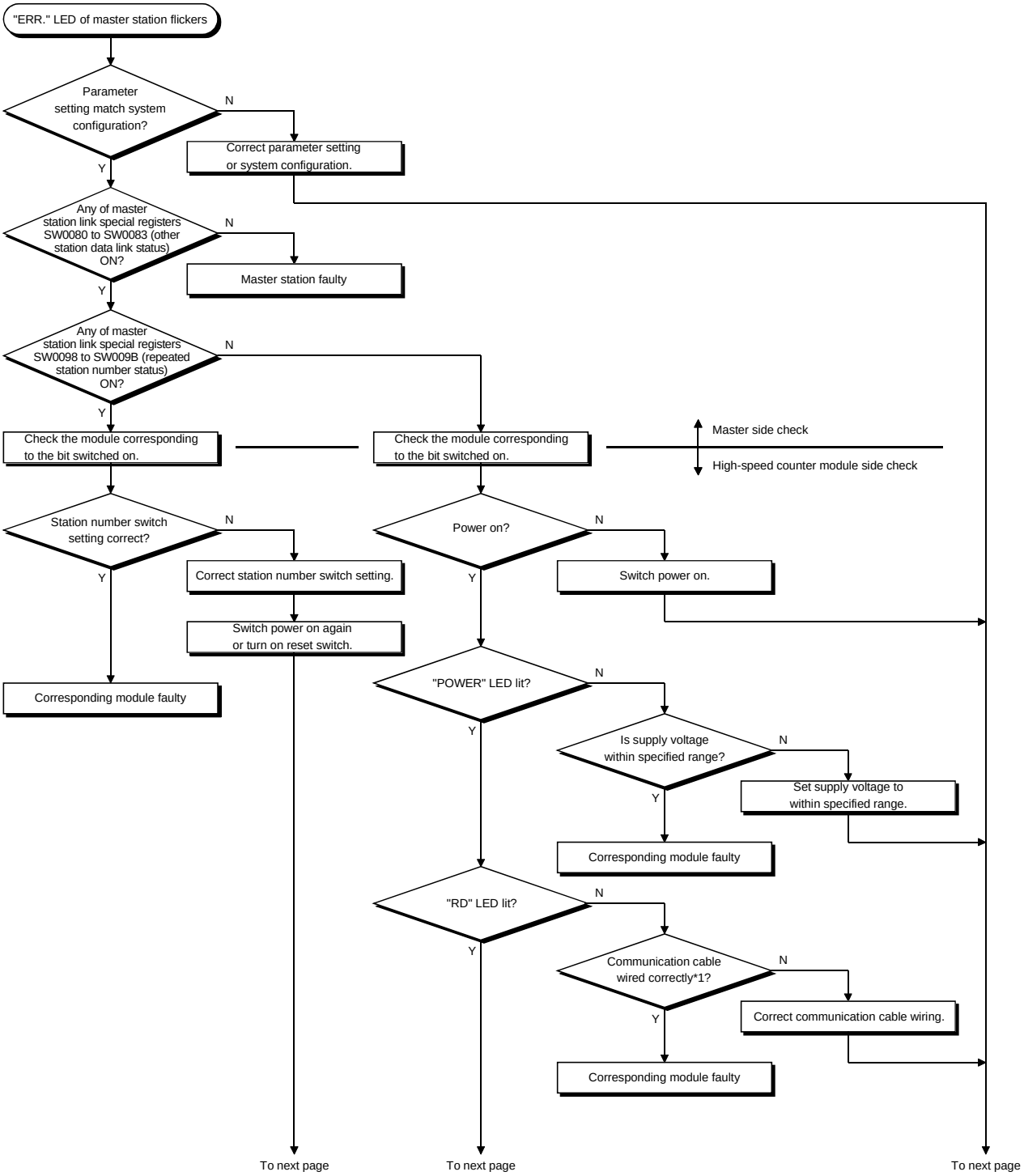
Cause	Corrective Action
Switch setting is outside the permissible range (station number 0 or not less than 62, transmission speed 5 to 9).	Correct the switching setting and switch power on again*1.
Terminal resistor is not connected.	Confirm that terminal resistor is connected. If not connected, connect it and switch power on again*1.
Module or transmission cable is affected by noise.	· Connect both ends of the shielded wire of the twisted cable to ground (class D grounding) via SLD and FG of each module. · Securely connect the FG terminal of the module to ground. · Securely ground the piping when running cables in piping.

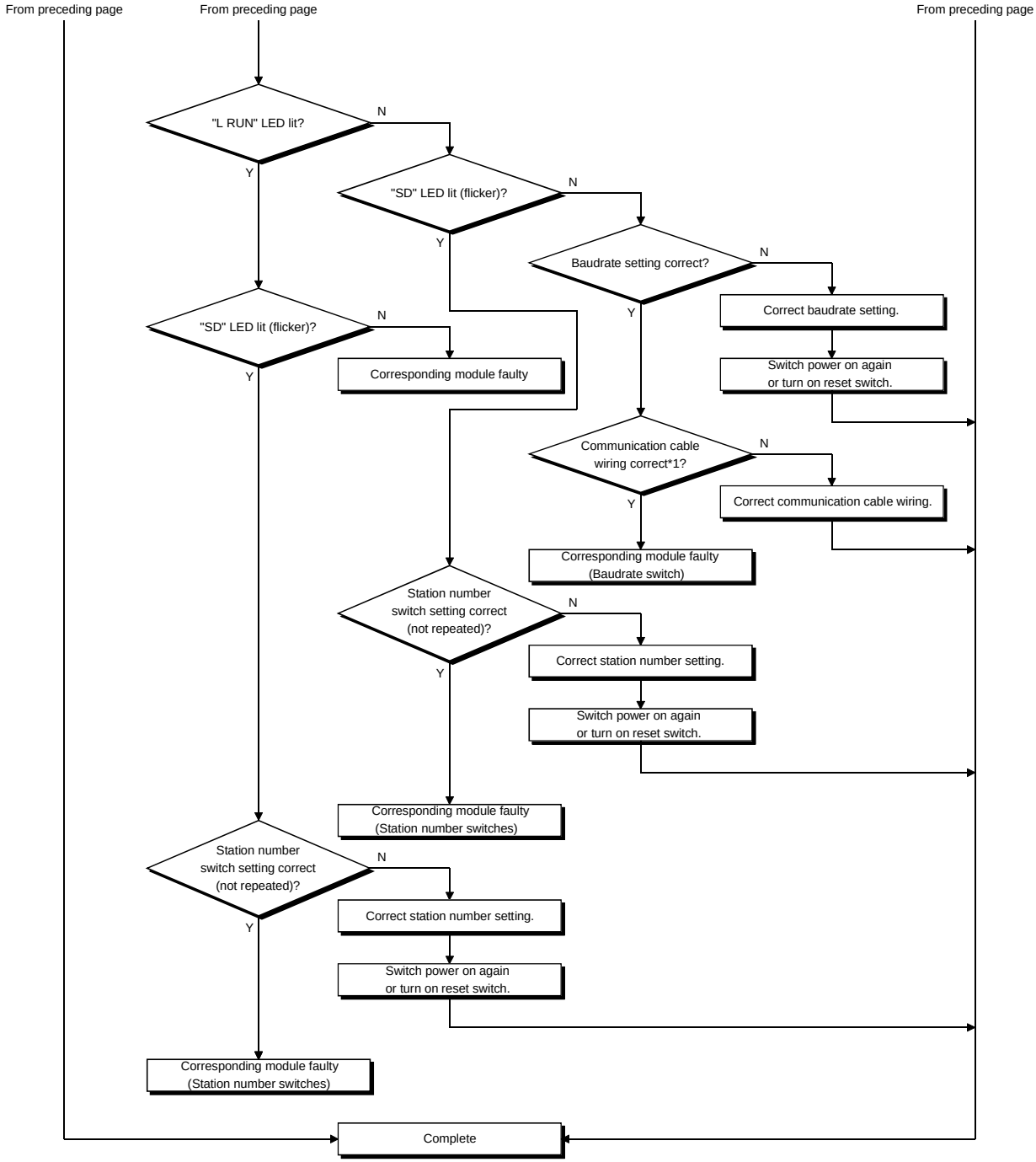
*1: Switch power on again: Switch power on again or turn on the reset switch.

11.4 If Communication Error Occurs between Master Station and This Module

If any repeated station number bit in any of the link special registers SW0098 to SW009B (repeated station number status) switches on, check the high-speed counter module of the corresponding station number in the following flowchart.

Troubleshooting flowchart used when the "ERR." LED of the master station flickers





*1: Check for short circuit, reverse connection, wire breakage, no terminal resistor, improper FG connection, improper overall distance and improper interstation distance.

APPENDIX

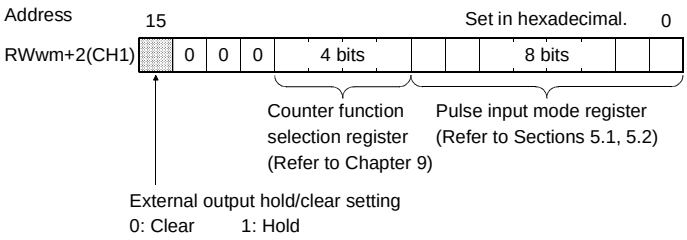
Appendix 1 Directions for Use

(1) For the master station, you can select whether data is cleared or held when a communication error or WDT error occurs or when remote device power switches off, using the condition setting switch.
Make setting according to the system.

*The above error can be confirmed by monitoring the link special registers for other station communication status in the master station.
When the error has occurred, the status of the corresponding station is stored into the following area in bit pattern.

SW0080 to SW0083: Data link status (0: normal, 1: data link error occurrence)
SW0084 to SW0087: WDT error status (0: normal, 1: WDT error occurrence)

(2) For the remote device station, you can select whether the external output (coincidence) status is held or cleared when a communication error, PC CPU stop or master station reset is detected, using the external output hold/clear setting area of the remote register {most significant bit of address RWwn+2}.
As the external output hold/clear setting is used for both CH1 and CH2, set it to the remote register of CH1.



(3) When a hardware reset or WDT error occurs, the external output (coincidence output) is forcibly switched off.

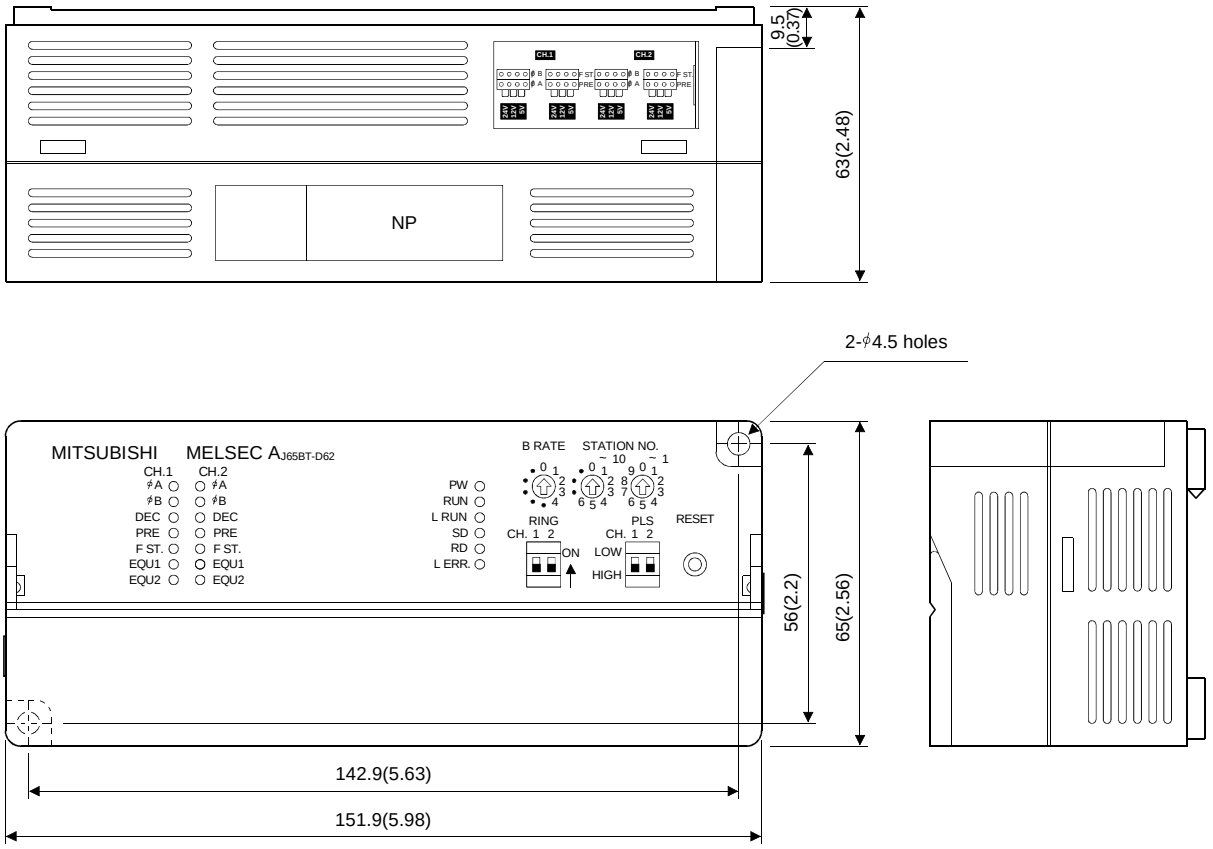
(4) If the fuse of the high-speed counter module is blown, it can be confirmed by monitoring the link special registers for other station fuse blown status in the master station.

SW0088 to SW008B: Fuse blown status (0: normal, 1: fuse blown)
If the "fuse blown" bit is set, check the following once.

Cause	Corrective Action
External power supply is not wired	When using the external output (EQU1 to EQU2) terminals, wire an 10.2VDC to 30VDC external power supply as it is needed. (Refer to 4.4.6)
Fuse is blown	The coincidence output function signal is not output. (Fuse for external power supply which operates the internal photocoupler when the EQU terminals are used) Since the fuse cannot be changed by the user, give details of the fault and consult our branch or sales representative.

Appendix 2 Outline Drawing

The following is the outline drawing of the AJ65BT-D62.
(This applies also to the AJ65BT-D62D and AJ65BT-D62D-S1.)



Unit: mm(inch)

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