

## Smart Muting Actuator F3W-MA Series

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# User's Manual

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# Original instructions

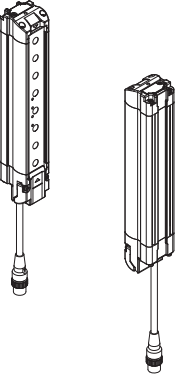
## Introduction

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Thank you for purchasing the F3W-MA Smart Muting Actuator (hereinafter referred to as the "F3W-MA").

This is the instruction manual describing the use of F3W-MA.

Before use, confirm that the items below are included with the product. If you find that an item is missing, please contact your local branch office or distributor.

Product	Quantity
F3W-MA main unit 	Emitter x 1, Receiver x 1
Instruction Sheet	1

Always heed the following points when using the F3W-MA:

- Be sure to have F3W-MA be handled by a "Responsible Person" who is well aware of and familiar with the machine to be installed.
- The term "Responsible Person" used in this Instruction Manual means the person qualified, authorized and responsible to secure "safety" in each process of the design, installation, operation, maintenance services and disposition of the machine.
- It is assumed that F3W-MA will be used properly according to the installation environment, performance and function of the machine. Responsible Person should conduct risk assessment on the machine and determine the suitability of this product before installation.
- Read this Manual thoroughly to understand and make good use of the descriptions before installing and operating the product.
- Keep this Manual at the place where the operator can refer to whenever necessary.

## Visual Aids

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The following symbols appear in this document to help you locate different types of information.



CHECK!

Indicates important information or advice on a function or operation of the product.



Indicates page numbers or chapter title of related information.

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Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

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## Safety Precautions

### Indications and Meanings for Safe Use

The precautions listed in this document indicated by alert symbols and statements must be followed for the safe use of the F3W-MA. Failure to follow all precautions and alerts may result in an unsafe use or operation. Thoroughly read this manual and understand the installation procedures, operation check procedures, and maintenance procedures before using F3W-MA.

The following word and symbols are used in this document.

### Meaning of Signal Word



**WARNING**

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

### Meanings of Alert Symbols

	Indicates prohibited actions.
	Indicates mandatory actions.
	Indicates the risk of electric shock.

### Alert Statements in this Manual

#### For users



**WARNING**

When using the F3W-MA in combination with a safety component such as safety controller or safety light curtain, make sure for a sufficiently trained and qualified person to conduct risk analysis and verification in reference to the instruction manual of such a component. An unqualified person may not be able to perform these operations properly, which may cause a person to go undetected, resulting in serious injury.



#### For machines



**WARNING**

Do not use this product as a safeguard for press machine or for human body protection. The product is intended to be used for detecting an object, not for ensuring safety.



## For installation

 **WARNING**

Make sure that foreign material such as water, oil, or dust does not enter the F3W-MA or the connector while the cap or the cover of the DIP Switch is removed.



## For wiring

 **WARNING**

Do not connect each line of F3W-MA to a DC power supply of higher than 24 VDC+20%. Also, do not connect it to an AC power supply. Failure to do so may result in electric shock.



Double or reinforced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock.



## Other

 **WARNING**

Do not try to disassemble, repair, or modify this product. Doing so may cause the functions to stop working properly.



Do not use the F3W-MA in environments where flammable or explosive gases are present. Doing so may result in explosion.



Do not use the F3W-MA in an environment where strong magnetic field is generated.



## Precautions for Safe Use

Make sure to observe the following precautions that are necessary for ensuring safe use of the product.

Do not install the F3W-MA in the following types of environments:

- Areas exposed to intense interference light, such as direct sunlight
  - Areas with high humidity where condensation is likely to occur
  - Areas where oil mist or corrosive gases are present
  - Areas exposed to vibration or shock levels higher than in the specification provisions
  - Areas where the product may come into contact with water
  - Areas where the pollution degree is harsher than 3, such as outdoor environment
  - Areas where the product may get wet with oil that can solve adhesive
- Loads must satisfy both of the following conditions:
    - Not short-circuited
    - Not used with a current that is higher than the rating
  - Do not drop the product.
  - Dispose of the product in accordance with the relevant rules and regulations of the country or area where the product is used.
  - Be sure to route the input/output lines for the F3W-MA separate from high-potential power lines or through an exclusive conduit.
  - To extend a cable length with a cable other than the dedicated cable, use a cable with the same or superior Specifications.
  - Read and understand this document for DIP Switch setting. Make sure to test the operation of the F3W-MA after setting with DIP Switch to verify that the F3W-MA operates as intended. Make sure to stop the machine until the test is complete.

## Precautions for Correct Use

Observe the precautions described below to prevent operation failure, malfunctions, or undesirable effects on product performance.

### ■ Storage conditions and installation environment

- Do not install, use, or store the F3W-MA for a long time at a temperature or humidity out of the specified range.
- This is a class A product. In residential areas it may cause radio interference, in which case the Responsible Person may be required to take adequate measures to reduce interference.

### ■ Cleaning

- Do not use thinner, benzene, or acetone for cleaning, because they affect the product's resin parts and paint on the housing.





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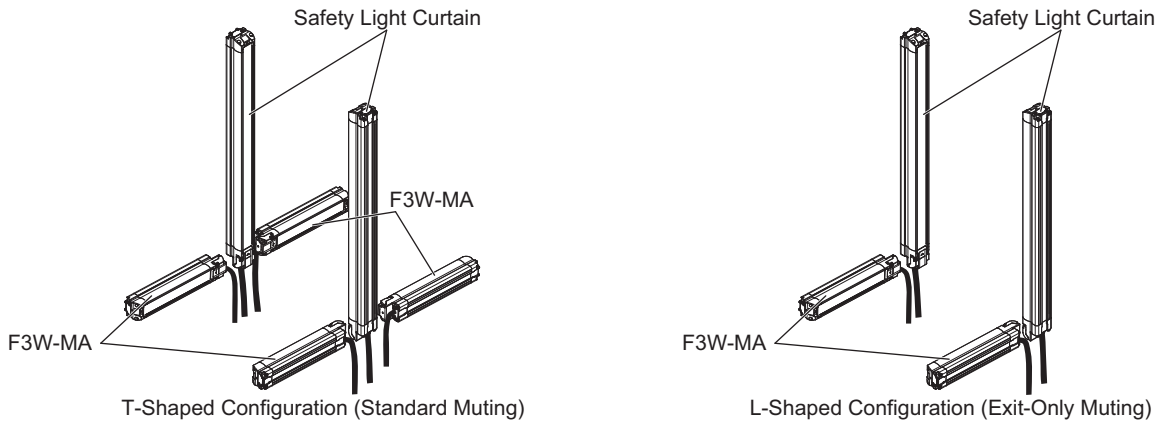



# Chapter 1 Overview and Specifications

## 1-1. System Overview


### 1-1-1. Product Overview

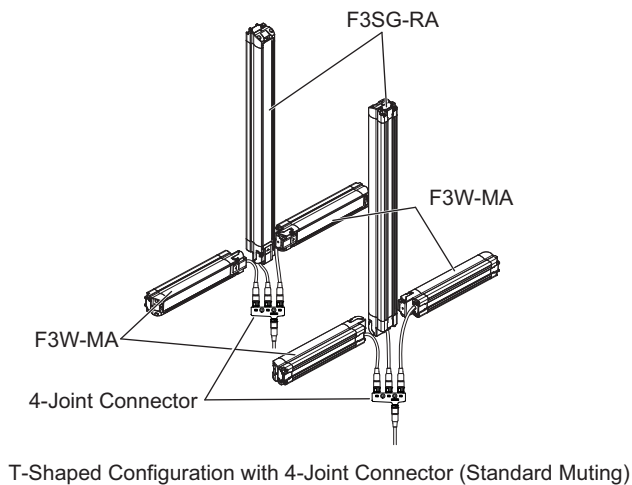
This product is an integrated (muting) sensor utilizing multiple-beam sensor. Using this product as a muting sensor, you can easily construct a muting system.



 Only PNP type of safety light curtains are applicable.  
CHECK!

In addition, connecting the F3W-MA and the F3SG-RA with a 4-Joint Plug/Socket Connector (F39-GCN4-□, sold separately) reduces time for wiring work. (The 4-Joint Plug/Socket Connector is hereinafter referred to as the "4-Joint Connector".)

 Refer to 3-4-2-4. *Reduced Wiring Connector System* for more information on the 4-Joint Connector.



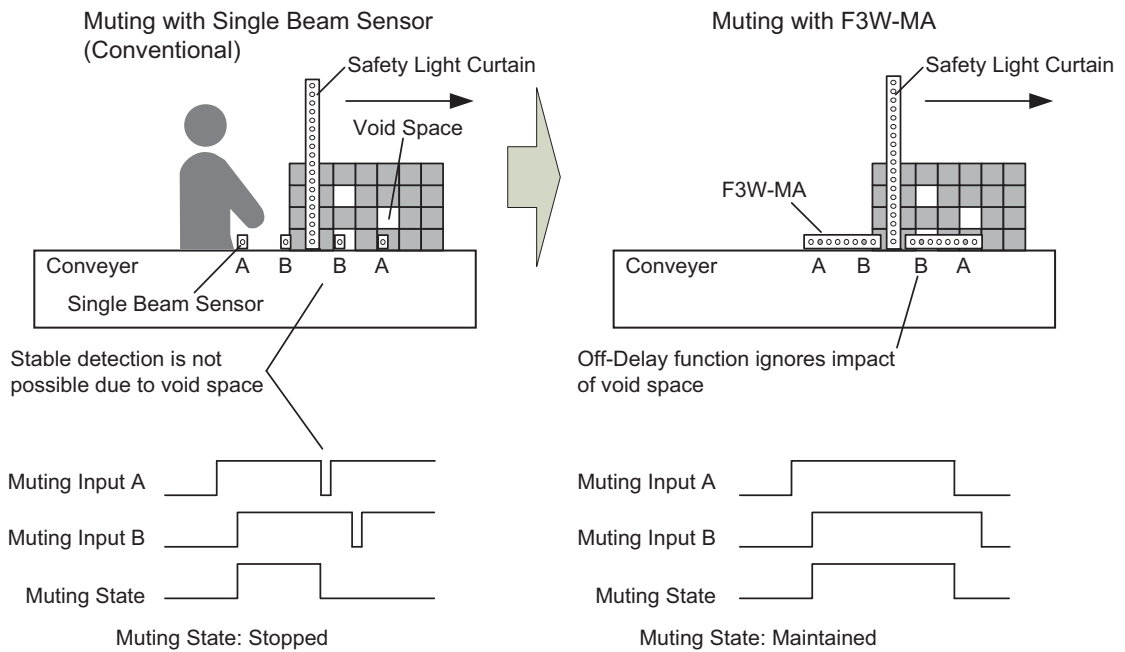
F3W-MA's functions allow easy and stable muting solution in the applications as shown below.

There are two models of F3W-MA. The difference is as described in the table below.

Model	Description	Application example
F3W-MA0300P	This model conforms to CLC/IEC TS 62046 and is suitable for various Muting applications. The conformity to CLC/IEC TS 62046 allows easy setup of safe Muting applications.	Example 1(a)(b) Example 2
F3W-MA0100P	This model does not conform to CLC/IEC TS 62046. Since the spacing between muting trigger beams is small, it is necessary to conduct thorough risk assessment analysis before the use. This model is useful for detecting small objects.	Example 1(a)

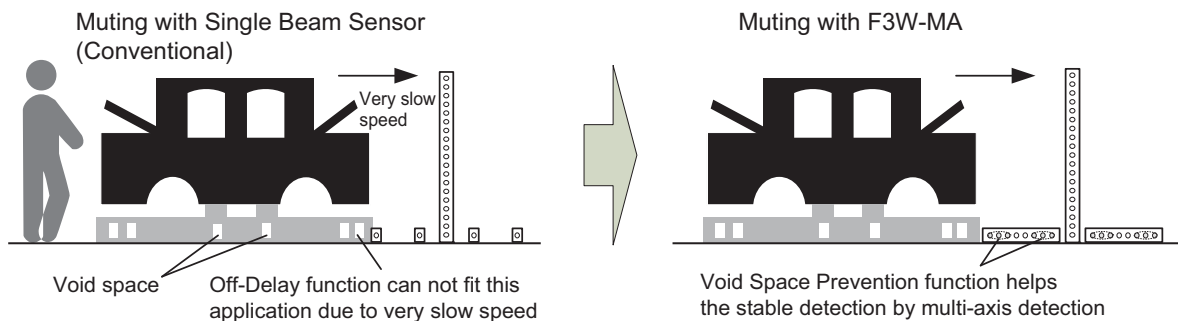
### 1-1-1-1. Example 1: Application to detect objects with void space (hole)

(a) When an object has a void space (small size) and moves at a constant speed  
(Example of Off-Delay function)



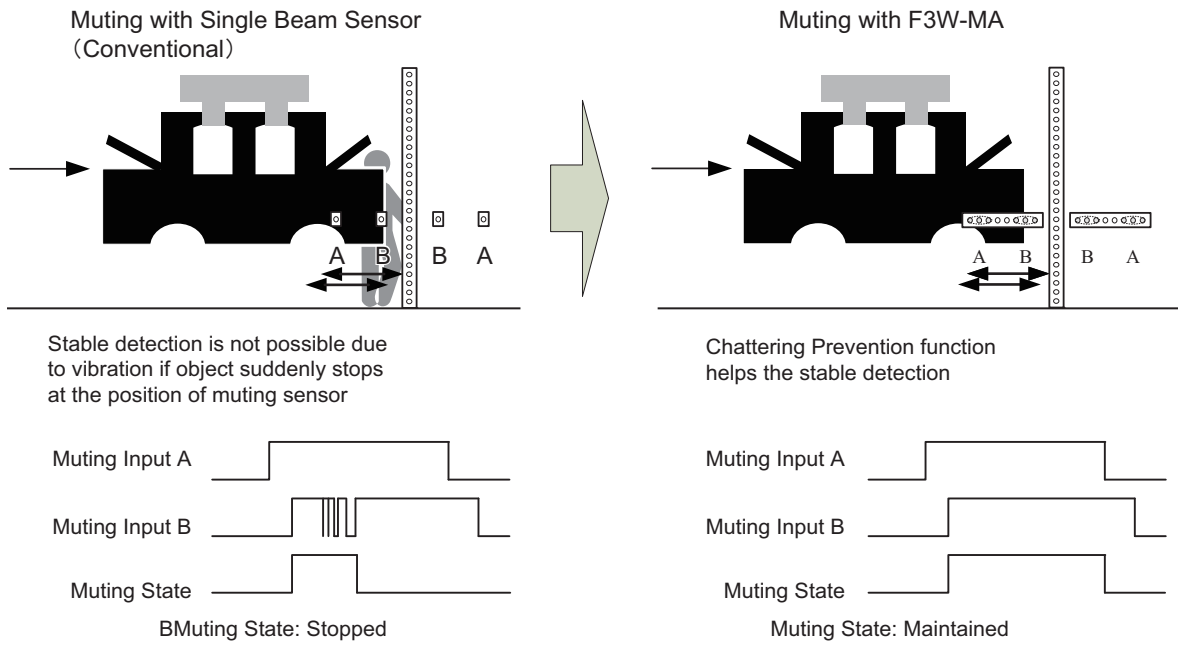
2-4. Off-Delay

(b) When an object has a void space (small size) and moves at a very slow speed  
(Example of Chattering and Void Space Prevention function)



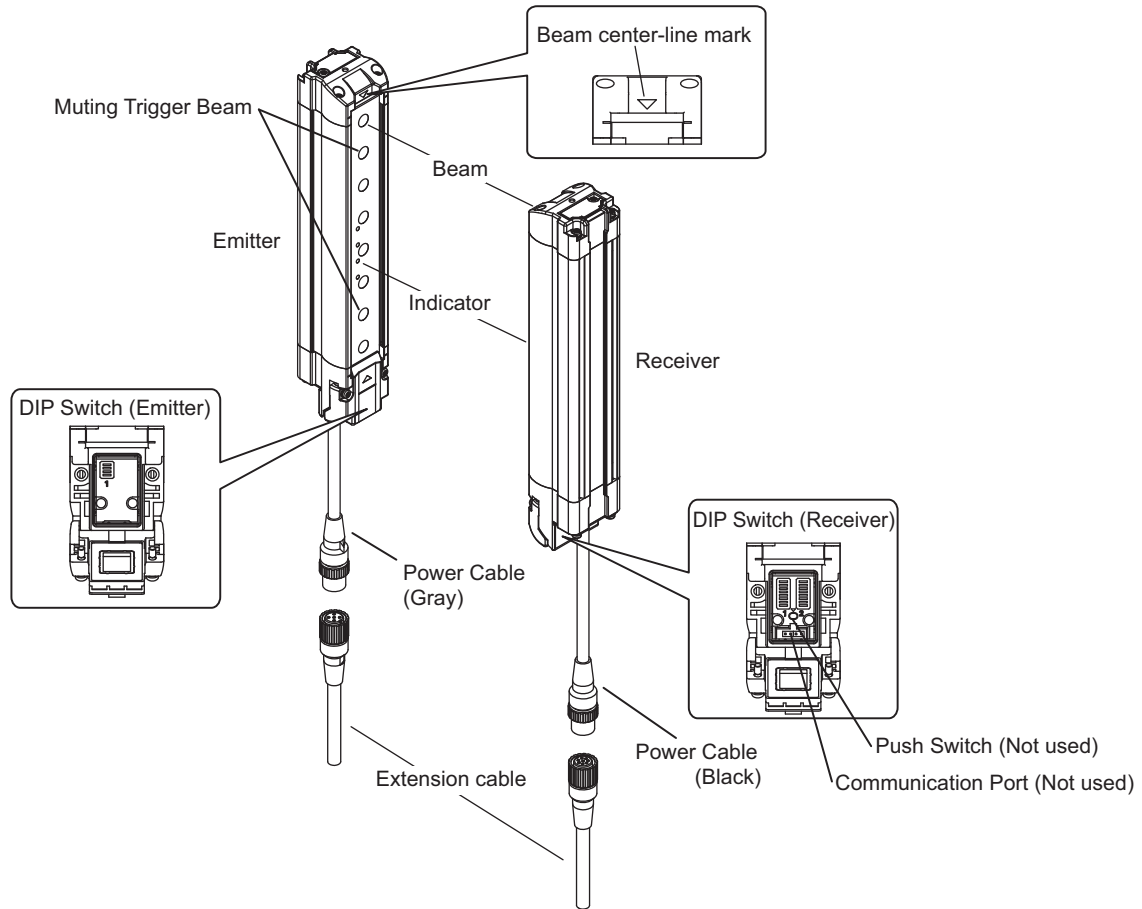
2-3-2. Chattering and Void Space Prevention


1-1-1-2. Example2: Application where an object temporarily stops and moves back and forth  
 (Example for Chattering and Void Space Prevention function)



## 1-1-2. System Components

This section describes the system components and part names of the F3W-MA system.



 To distinguish between the emitter and receiver, find the labels attached to the front of the F3W-MA. The label on the emitter reads "EMITTER" and the label on the receiver reads "RECEIVER".  
CHECK!



# 1-2. Basic Function

## 1-2-1. Optical synchronization

Synchronization is required between an emitter and a receiver for normal operation of F3W-MA. F3W-MA uses a specific beam for Synchronization. The beam is hereinafter called synchronization beam. Depending on sensor configuration, the synchronization beam is either of the followings.


Configuration	Synchronization Beam
T-Shaped configuration with COM lines	End beams (Top or Bottom beam) of the primary sensor *1 *2
T-Shaped configuration with 4-Joint Connector	
Other configurations	End beams (Top or Bottom beam)

\*1. In the T-shaped Configuration with COM lines, the primary and secondary sensors are determined based on the wiring. Refer to 4-2. *Wiring Examples* for more information.

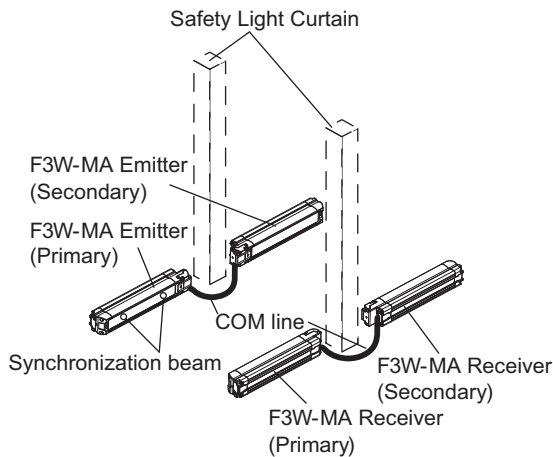
\*2. In the T-shaped Configuration with 4-Joint Connector, the primary and secondary sensors are determined based on the wiring. Refer to 3-4-2-4. *Reduced Wiring Connector System* and 4-2. *Wiring Examples* for more information.

For an emitter and a receiver to synchronize, at least one synchronization beam must be unblocked. The synchronization process is performed when:

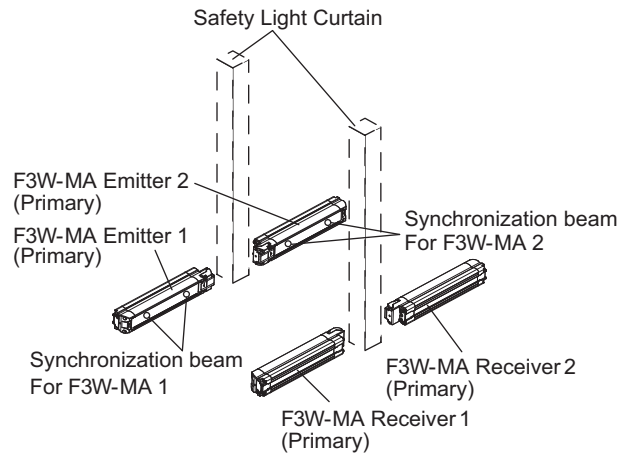
- (1) The power is turned on for an emitter and a receiver
- (2) All beams of the primary sensor are blocked and then unblocked
- (3) Synchronization is lost due to an error such as noise and ambient light

 The sensor can maintain the synchronization in other cases than those described above and it is not necessary to keep the synchronization beam unblocked all the time.

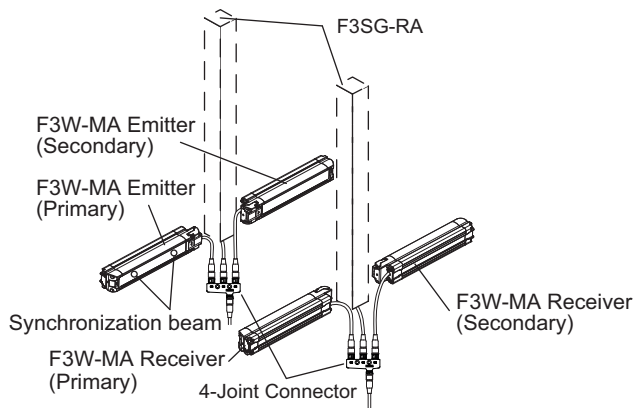
CHECK!




T-shaped configuration with COM lines



Other configurations  
(T-shaped and L-shaped configurations not using COM lines)



T-shaped Configuration with 4-Joint Connector

 COM indicator for primary sensor blinks when

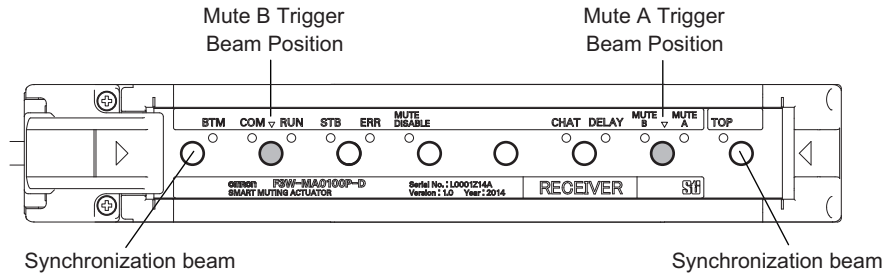
- Power of F3W-MA is turned on (for approx. 3 s)
- Synchronization between emitter and receiver is lost.


CHECK!

## 1-2-2. Basic operation


The F3W-MA performs the Self-Test when the power is turned ON (within 2 seconds) to check for errors. When no errors are detected during the Self Test, the F3W-MA starts normal operation.

The basic operation of the beam-aligned F3W-MA is that when a Muting Trigger Beam (Mute A/B Trigger Beam) is blocked, the F3W-MA sends a corresponding muting signal.



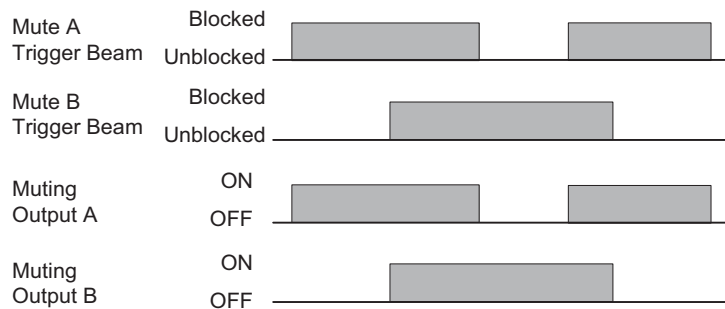
 The positions of the Muting Trigger Beams can be switched by the DIP Switch. Refer to *Chapter 2 Setting with DIP Switch* for more information on DIP Switch.


CHECK!

 The positions of the Muting Trigger Beams can be identified by the symbols "▼" printed on the indicator label of the F3W-MA. The above example shows the F3W-MA0100P. For the F3W-MA0300P, the Muting Trigger Beams are the third beams from both ends of the sensor.

CHECK!


<Timing chart>



 MUTE A and MUTE B indicators are illuminated when the F3W-MA sends a Muting signal.

CHECK!

Also, the F3W-MA regularly performs the Self-Test while operating. This function cannot be cancelled. If an error is found in the Self-Test, the F3W-MA enters the Error state, keeps the muting output in the OFF state, and indicates the error at the same time.

 The Self-Test detects such errors as described below.

CHECK!

Emitter

- Failure of emitter unit or circuit
- CPU failure
- Memory failure
- Failure of DIP Switch

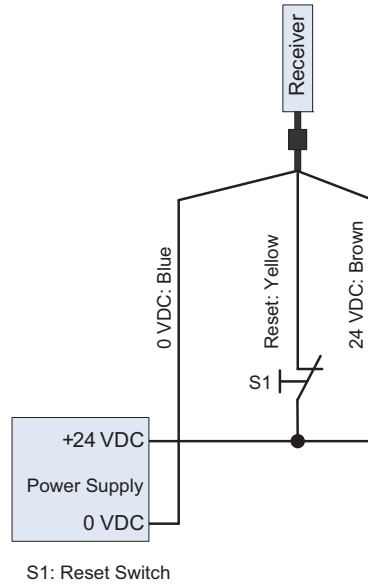
Receiver

- Abnormal external power supply voltage
- Failure of internal power supply circuit
- Failure of receiver unit or detection circuit
- CPU failure
- Memory failure
- Failure of safety output circuit
- Disconnected or short-circuited cable
- Failure of DIP Switch

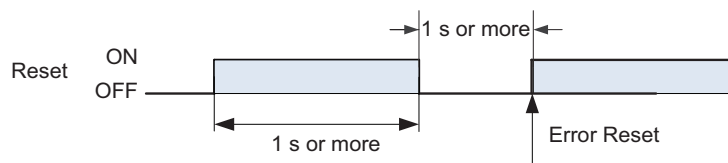
When the cause of the error is removed, you can release the Error state by using either of the following methods.

- Cycle the power back ON
  - Reset input (Only for Receiver side) \*
- \* This is shared with the Muting Enable line.

<Error resetting wiring for receiver >

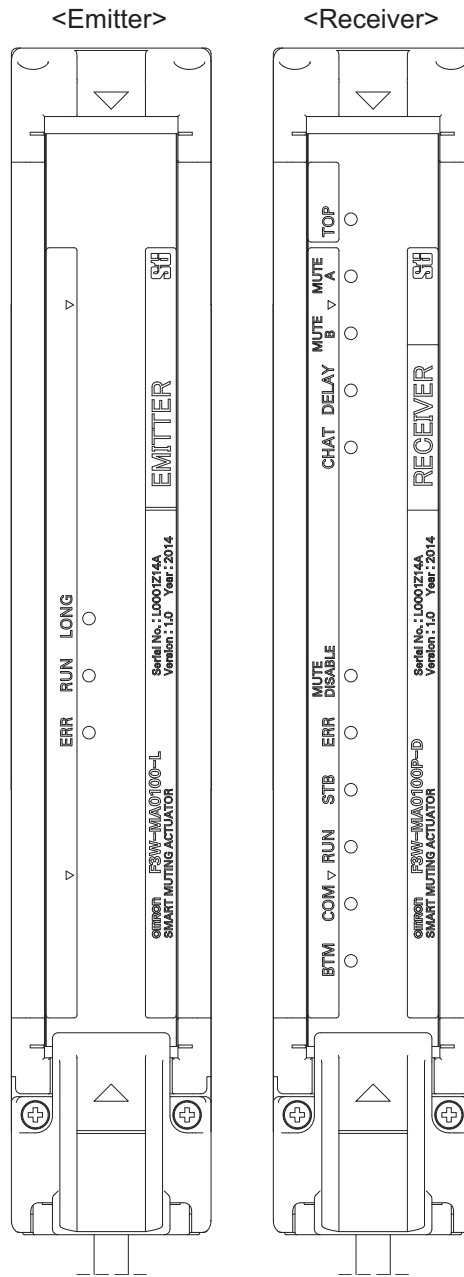


<Error resetting timing chart for receiver >



# 1-3. LED Indicators

- 2. Operation range indicator (Green)
- 3. Running indicator (Green)
- 4. Error indicator (Red)



- 1. Top-beam-state indicator (Blue)
- 2. Muting output A indicator (Green)
- 3. Muting output B indicator (Green)
- 4. Off-Delay indicator (Yellow)
- 5. Chattering/ Void space indicator (Green)
- 9. Muting enable indicator (Red)
- 10. Error indicator (Red)
- 11. Stable-state indicator (Green)
- 12. Running indicator (Green)
- 13. Communication indicator (Green)
- 14. Bottom-beam-state indicator (Blue)

## 1-3-1. LED Indicator Status

Shown below are indication statuses of F3W-MA LED indicators when you purchased.


### Emitter

Location	Name of Indicator		Color	Illuminated	Blinking
1	Reserved	-	-	-	-
2	Operating range	LONG	Green	Long Range mode is selected by DIP Switch.	-
3	Running	RUN	Green	Power is ON.	-
4	Error	ERR	Red	-	Error in emitter. Generic error happens.

### Receiver

Location	Name of Indicator		Color	Illuminated	Blinking
1	Top-beam-state	TOP	Blue	The top beam is unblocked.	-
2	Muting output A	MUTE A	Green	Muting Output A is activated.	-
3	Muting output B	MUTE B	Green	Muting Output B is activated.	-
4	Off-Delay	DELAY	Yellow	Off-Delay function is enabled by DIP Switch.	-
5	Chattering/ Void space	CHAT	Green	Chattering and Void Space Prevention mode is selected by DIP Switch.	-
6	Reserved	-	-	-	-
7	Reserved	-	-	-	-
8	Reserved	-	-	-	-
9	Muting Enable	MUTE DISABLE	Red	The Muting Enable function is enabled and Muting Enable input is turned OFF by DIP Switch.	-
10	Error	ERR	Red	-	Error in receiver. Generic error happens.
11	Stable-state	STB	Green	Incident light level is 170% or higher of ON-threshold	-
12	Running	RUN	Green	Power is ON.	-
13	Communication	COM	Green	Synchronization between emitter and receiver is maintained.	[Primary sensor] - Start-up (for approx. 3 s) - Synchronization between emitter and receiver is lost
14	Bottom-beam-state	BTM	Blue	The bottom beam is unblocked.	-

# 1-4. Ratings/Specifications

		F3W-MA0100P	F3W-MA0300P
<b>Performance</b>			
Beam Gap between Muting Trigger Beams		100 mm	300 mm
Number of Beams		8	20
Standard Detection Object		30 mm	
Operating Range	Long	0.3 to 20.0 m (1 to 65 ft.)	
	Short	0.3 to 7.0 m (1 to 23 ft.)	
Response Time	Operation	13 ms max.	
	Reset	26 ms max. (Synchronized) 78 ms max. (Not synchronized)	
Effective Aperture Angle		±2.5° max., emitter and receiver at operating range of 3 m or greater	
Light Source		Infrared LEDs, Wavelength: 870 nm	
Startup Waiting Time		2 s max.	
<b>Electrical</b>			
Power Supply Voltage (Vs)		SELV/PELV 24 VDC±20% (ripple p-p 10% max.)	
Current Consumption	Emitter	35 mA	45 mA
	Receiver	75 mA	75 mA
Muting Outputs		Two PNP transistor outputs. * Load current of 300 mA max., Residual voltage of 2 V max. (except for voltage drop due to cable extension) * F3W-MA is an PNP model. Safety light curtains used with F3W-MA must also be an PNP model.	
Output Operation Mode	Muting Output A	Dark-ON (Muting Output A is enabled when MuteA trigger beam is blocked.)	
	Muting Output B	Dark-ON (Muting Output B is enabled when MuteB trigger beam is blocked.)	
Input Voltage	ON Voltage	[MuteEnable] Vs to Vs-3 V (sink current 5 mA max.) *	
	OFF Voltage	[Mute Enable] 0 to 1/2 Vs, or open *	
	* The Vs indicates a supply voltage value in your environment.		
Indicators		 Refer to 1-3-1. LED Indicator Status	
Protective Circuit		Output short protection, Power supply reverse polarity protection	
Insulation Resistance		20 MΩ or higher (500 VDC megger)	
Dielectric Strength		1,000 VAC, 50/60 Hz (1 min)	
<b>Functional</b>			
Functions		<ul style="list-style-type: none"> <li>- Scan Code Selection</li> <li>- Operation Mode Selection (Point to Point Detection/ Chattering and Void Space Prevention)</li> <li>- Off-Delay</li> <li>- Muting Enable</li> <li>- Muting Trigger Beam Allocation</li> <li>- Operating Range Selection</li> </ul>	

		F3W-MA0100P	F3W-MA0300P
<b>Environmental</b>			
Ambient Temperature	Operating	-10 to 55°C (13 to 131°F) (non-icing)	
	Storage	-25 to 70°C (-13 to 158°F)	
Ambient Humidity	Operating	35% to 85% (non-condensing)	
	Storage	35% to 95%	
Ambient Illuminance		Incandescent lamp: 3,000 lx max. on receiver surface Sunlight: 10,000 lx max. on receiver surface	
Degree of Protection (IEC 60529)		IP65 and IP67	
Vibration Resistance (IEC 61496-1)		10 to 55 Hz, Multiple amplitude of 0.7 mm, 20 sweeps for all 3 axes	
Shock Resistance (IEC 61496-1)		100 m/s <sup>2</sup> , 1000 shocks for all 3 axes	
Pollution Degree (IEC 60664-1)		Pollution Degree 3	
<b>Connections</b>			
Extension of Power Cable		100 m max. Note: For T-Shaped configuration with COM lines, the length of cable extension is 30m max.	
<b>Material</b>			
Material		Housing: Aluminum, Cap: PBT, Front Window: PMMA, Cable: Oil resistant PVC, FE plate: SUS	
Weight (packaged)		1.8 kg max.	2.8 kg max.
Included Accessories		Instruction Sheet	



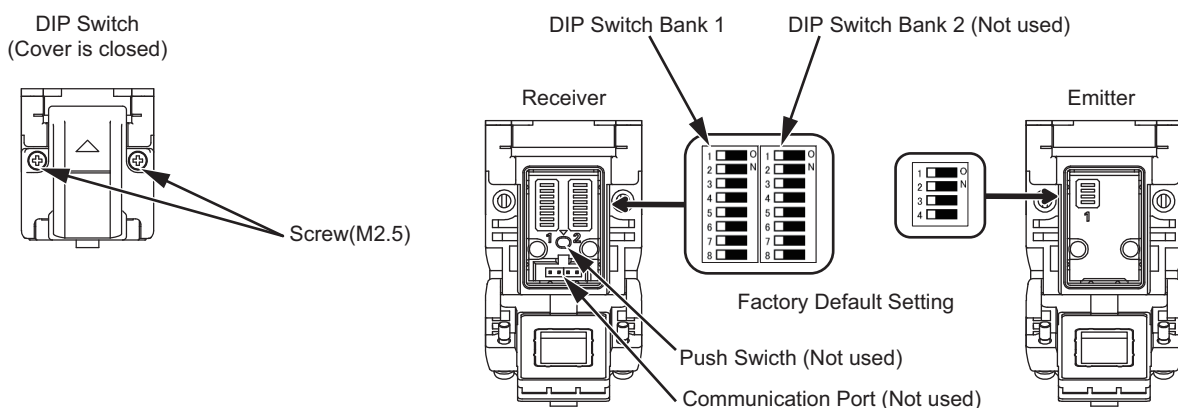


# Chapter 2 Setting with DIP Switch

## 2-1. DIP Switch

F3W-MA series has DIP Switches to configure functions. Configure functions with the DIP Switches before installing F3W-MA in your site. To set DIP Switches, turn the power of the F3W-MA off and open the cover as shown below. When the setting the DIP Switch is complete, close the cover and turn the power of the F3W-MA on.

F3W-MA in T-Shaped configuration with COM lines or 4-Joint Connector is operated based on the DIP Switches setting of the primary sensor. The DIP Switch setting of a secondary sensor does not affect the operation.



When attaching the cover, tightly fasten the screws (M2.5, recommended torque: 0.35N.m). Failure to do so may cause the cover to come loose, leading to deterioration of the functionality.

CHECK!



Operate the DIP Switch before turning the power of the F3W-MA on.  
If the DIP Switch is operated during operation of the F3W-MA, the F3W-MA transitions to the Error state.  
A change of the DIP Switch setting is activated upon power-on.

CHECK!



Note that do not use any tool which may damage F3W-MA's body when operating the DIP Switch.

CHECK!

## 2-1-1. DIP Switch on Receiver

The following functional settings are available by DIP Switches on the receiver. A receiver has two DIP Switches, DIP Switch Bank 1 must be configured based on the table below. For the details of each function, refer to the chapters written in the "Functional Details" column on the table below.



DIP Switch Bank 2 is not used.

CHECK!

DIP Switch Bank 1

: Indicates a switch position.

Position	Function	Setting: DIP-SW1	Description	Functional Details
1	Scan Code Selection	1 <input type="checkbox"/> ON	Scan Code B (factory default setting)	2-2.
		1 <input type="checkbox"/> ON	Scan Code A	
2,3	Operation Mode Selection	2 <input type="checkbox"/> ON 3 <input type="checkbox"/> ON	Point to Point Detection (factory default setting)	2-3.
		2 <input type="checkbox"/> ON 3 <input type="checkbox"/> ON	Chattering and Void Space Prevention 1	
		2 <input type="checkbox"/> ON 3 <input type="checkbox"/> ON	Chattering and Void Space Prevention 2	
		2 <input type="checkbox"/> ON 3 <input type="checkbox"/> ON	Point to Point Detection (same as factory default setting)	
4, 5	Off-Delay	4 <input type="checkbox"/> ON 5 <input type="checkbox"/> ON	Disabled (factory default setting)	2-4.
		4 <input type="checkbox"/> ON 5 <input type="checkbox"/> ON	100 ms	
		4 <input type="checkbox"/> ON 5 <input type="checkbox"/> ON	250 ms	
		4 <input type="checkbox"/> ON 5 <input type="checkbox"/> ON	500 ms	
6	Muting Enable	6 <input type="checkbox"/> ON	Disabled (factory default setting)	2-5.
		6 <input type="checkbox"/> ON	Enabled	
7	Muting Trigger Beam Allocation	7 <input type="checkbox"/> ON	MUTE A TOP-Side Pattern (factory default setting)	2-6.
		7 <input type="checkbox"/> ON	MUTE A BTM-Side Pattern	
8	Reserved	-	-	-

## 2-1-2. DIP Switch on Emitter

The following functional settings are available by DIP Switches on the emitter. For the details of each function, refer to the chapters written in the "Functional Details" column on the table below.

: Indicates a switch position.

Position	Function	Setting	Description	Functional Details
1	Scan Code Selection	1 <input type="checkbox"/> ON	Scan Code B (factory default setting)	2-2.
		1 <input type="checkbox"/> ON	Scan Code A	
2	Operating Range Selection	2 <input type="checkbox"/> ON	Short Mode (factory default setting)	2-7.
		2 <input type="checkbox"/> ON	Long Mode	
3, 4	Reserved	-	-	-

## 2-2. Scan Code Selection

---

The F3W-MA has two scan codes (Code A and Code B). These scan codes have different internal processing time. The use of different scan codes allows for placement of systems in close proximity and in line with each other and minimize mutual interference.

The following settings are available for the Scan Code Selection.

- Scan Code A
- Scan Code B (Factory Default Setting)



Both the emitter and receiver units must be set to the same code.

CHECK!



You can minimize the impact of light interference by configuring the Scan Code settings for F3W-MA and F3SG-R when they are in proximity to each other.

CHECK!



Refer to 3-1-1. *Mutual Interference Prevention* for more information on setting the scan code and mounting condition.

## 2-3. Operation Mode Selection

---

For F3W-MA, one of the three operation modes below can be selected according to the installation environment and the shape of the work piece.

1. Point-to-point detection mode (factory default setting)
2. Chattering/void space prevention mode 1
3. Chattering/void space prevention mode 2 (for F3W-MA0300 type only)



If the chattering/void space prevention mode 1 or 2 has been configured, the CHAT indicator turns ON.

CHECK!



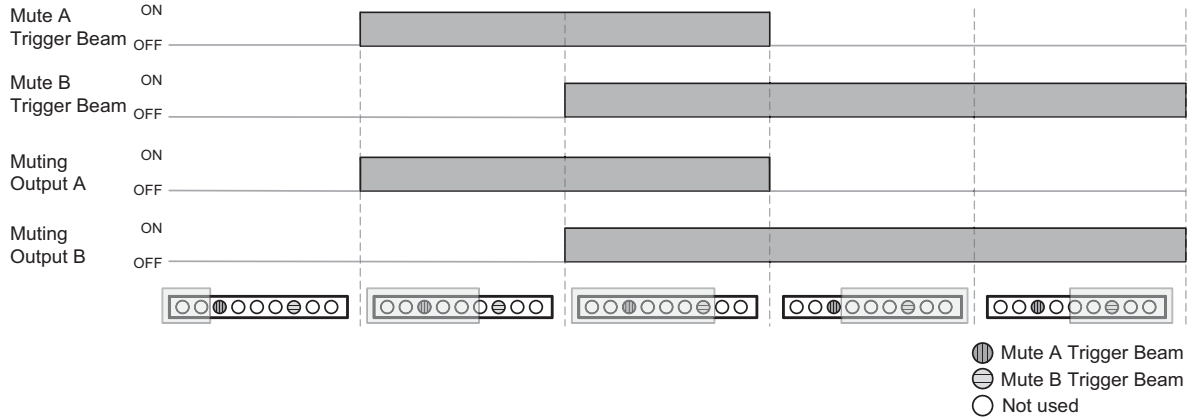
If the chattering/void space prevention mode 2 has been configured for F3W-MA0100, the mode actually works as the chattering/void space prevention mode 1.

CHECK!

## 2-3-1. Point-To-Point Detection

The point-to-point detection mode detects a workpiece in a spot as with traditional single-beam sensors. It can be used for workpieces with a constant shape, such as one without any hole.

<Timing chart>



## 2-3-2. Chattering and Void Space Prevention

The chattering/void space prevention mode uses the beams adjacent to the muting trigger beam(s) as extended muting trigger beams for stable detection. After the extension, a workpiece is detected by multiple beams, preventing impact of small holes (void spaces) regardless of a workpiece speed and sensor chattering due to oscillation of the sensor.



When all of the beams extended as the trigger beams by this function receive light, the original status is recovered.

CHECK!

Operation Mode	Functional Description	Largest void space ignorable (MVS)
Chattering/void space prevention mode 1	When muting trigger beams are interrupted, adjacent two beams, one before and one after them respectively, are extended as muting trigger beams	33 mm
Chattering/void space prevention mode 2 *1	When muting trigger beams are interrupted, adjacent four beams, two before and two after them respectively, are extended as muting trigger beams	73 mm

\*1 For F3W-MA0300 type only



This function operates individually both at the A side and B side of the muting trigger beam.

CHECK!



It is possible to ignore larger void space by combining with the Off-Delay setting.

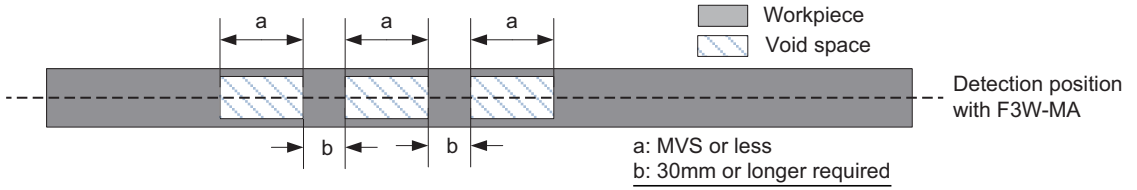
CHECK!



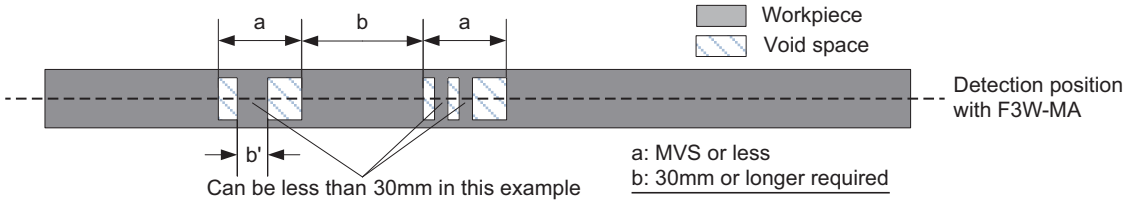
The standard object detected by F3W-MA has a diameter of 30mm. You need extra attention to properly detect a workpiece with continuous void spaces as shown below.

CHECK!

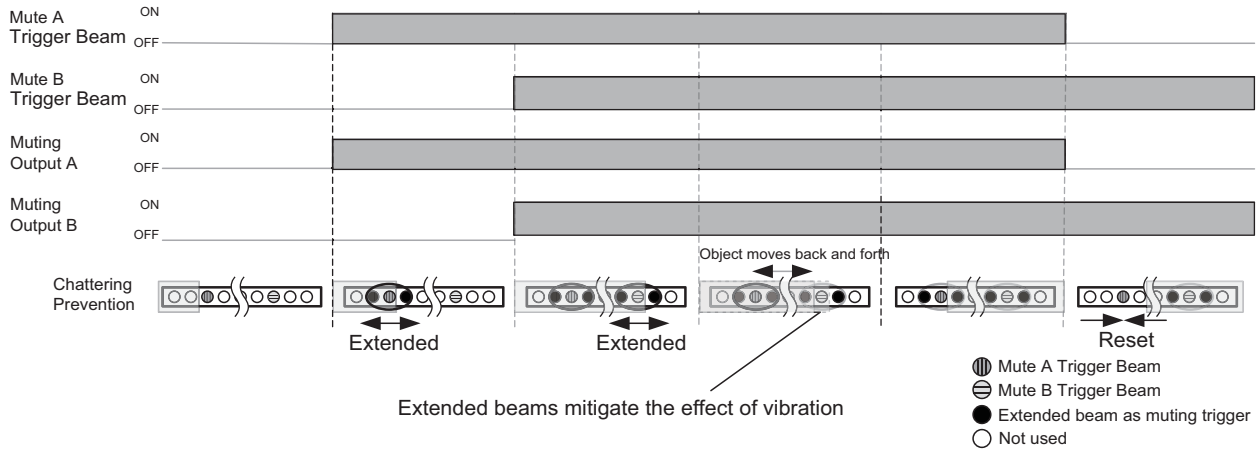
- An example of the inter-void-space length always requiring 30mm or more (b)



- An example of the inter-void-space length not always requiring 30mm or more (b')



<Timing chart>




## 2-4. Off-Delay

This function allows the muting output to keep ON state during Off-Delay time. Using this function, the presence of void space in the object can be ignored.


The following settings are available for the Off-Delay function.

- Disable(factory default setting)
- 100 ms
- 250 ms
- 500 ms

Workpiece speed	Largest void space ignorable (MVS)		
	Toff = 100ms	Toff = 250ms	Toff = 500ms
0.3 m/s	30 mm	75 mm	150 mm
0.6 m/s	60 mm	150 mm	300 mm
1.2 m/s	120 mm	300 mm	600 mm

 DELAY indicator turns on when Off-Delay time is set by DIP Switch.

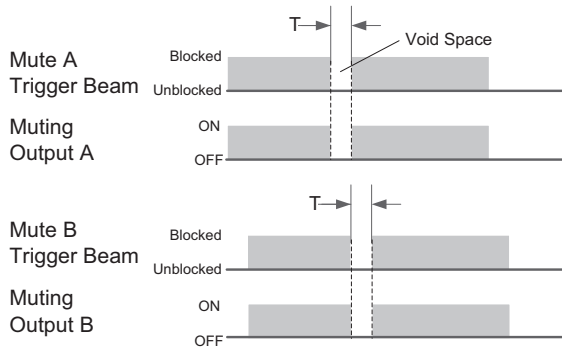
CHECK!

 When the Off-Delay time is set by DIP Switch, take additional safety measures because end time of muting is extended.

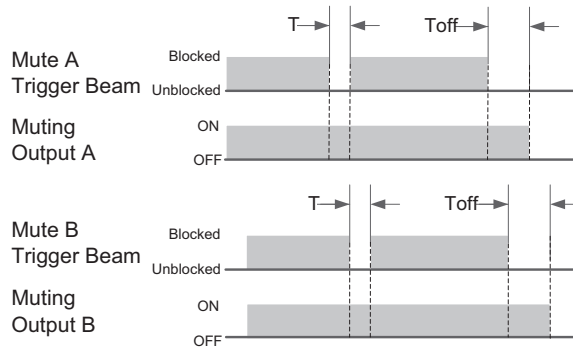
CHECK!

### <Timing chart>

#### • Off-Delay : Disabled



#### • Off-Delay: Enabled



T: Time to pass through the void space  
Toff: Off-Delay time

By using the chattering/void space prevention mode and this function at the same time, you can ignore impact of larger void spaces as well.

Workpiece speed	Largest void space ignorable (combined with the chattering/void space prevention mode 1)			Largest void space ignorable (combined with the chattering/void space prevention mode 2)*1		
	Toff = 100 ms	Toff = 250 ms	Toff = 500 ms	Toff = 100 ms	Toff = 250 ms	Toff = 500 ms
0.3 m/s	63 mm	108 mm	183 mm	103 mm	148 mm	223 mm
0.6 m/s	93 mm	183 mm	333 mm	133 mm	223 mm	373 mm
1.2 m/s	153 mm	333 mm	633 mm	193 mm	373 mm	673 mm

\*1 For F3W-MA0300 type only

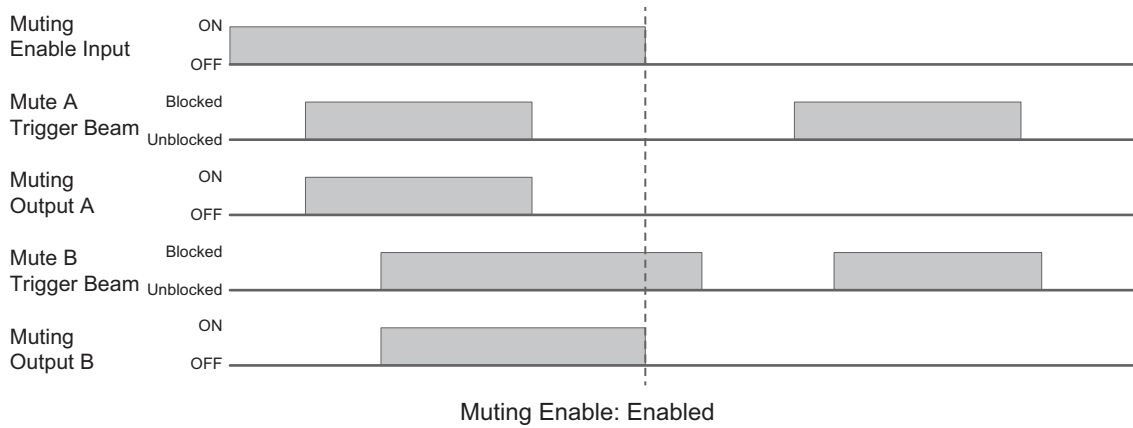
## 2-5. Muting Enable


This function enables issuing the muting signal only when needed. By enabling this function, F3W-MA issues the muting signal according to unblocking/blocking of the muting trigger while the Muting Enable Input is ON.

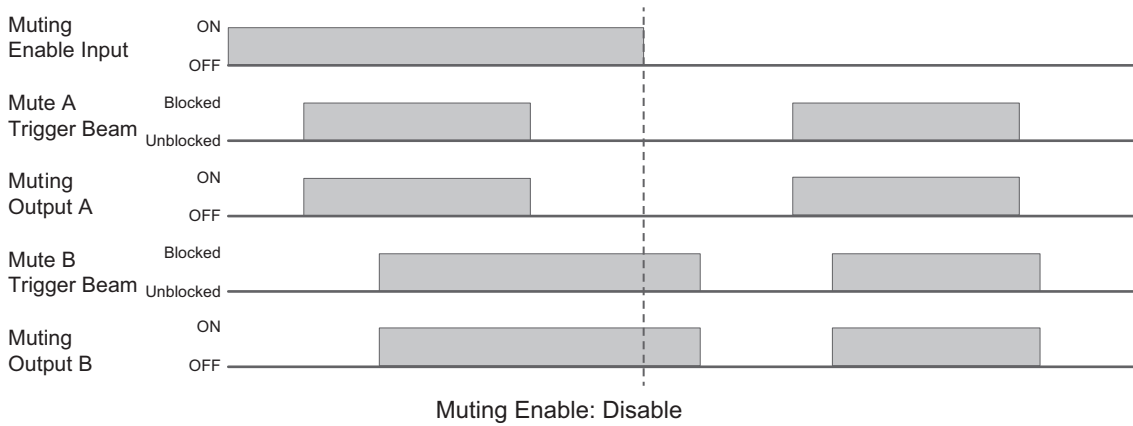
The following settings are available for the Muting Enable function.

- Disabled (Factory Default Setting)
- Enabled

### <Timing Chart>



 **CHECK!** MUTING DISABLE indicator turns on while Muting Enable Input keeps OFF.



## 2-6. Muting Trigger Beam Allocation

This function is used to allocate the trigger beam position of Mute A and Mute B.

The following settings are available for the Muting Trigger Beam Allocation function.

Beam Layout	Functional Description	Beam Layout Example
MUTE A TOP-Side Pattern (factory default setting)	Mute A trigger beam is set to TOP indicator side	
MUTE A BTM-Side Pattern	Mute A trigger beam is set to BTM indicator side	

## 2-7. Operating Range Selection

The Operating Range Selection function can change the operating range by changing emission light intensity. Short Mode is used to prevent the F3W-MA from affecting other photoelectric sensors, or to prevent mutual interference in a close area.

The following settings are available for the Operation Range Selection function.

- Short Mode (factory default setting)
- Long Mode



LONG indicator turns on while Operation Range Setting is Long Mode.

CHECK!



# Chapter 3 Wiring/Installation

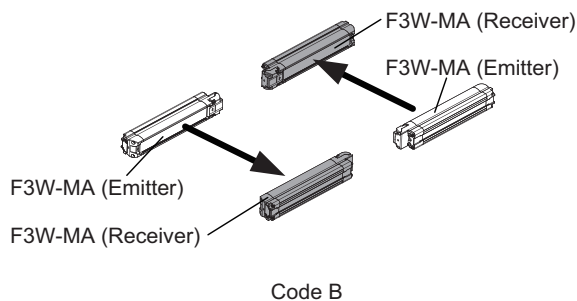
## 3-1. Installation Considerations

### 3-1-1. Mutual Interference Prevention

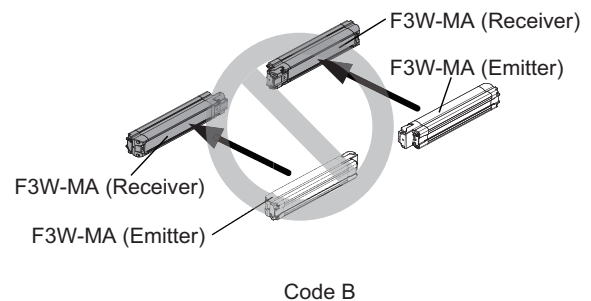
#### 3-1-1-1. F3W-MAs

When two F3W-MA systems with the same scan code are mounted in close proximity and in alignment with each other, a light interference should be taken into account with another. This can be corrected by mounting the emitters and receivers in alternation.

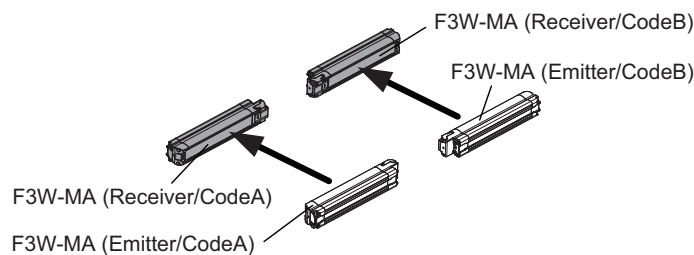
PREFERRED INSTALLATION



NOT RECOMMENDED INSTALLATION



The scan code feature of the F3W-MA system allows for placement of the two systems in close proximity and in line with each other. The distinctive coding of the beams provide for unique operation of a system while in view of another system with a different scan code. Two unique codes are available on the F3W-MA.



The emitter and receiver units for F3W-MA must be set to the same scan code. The scan code is selectable by the DIP Switch on the emitter and receiver units.



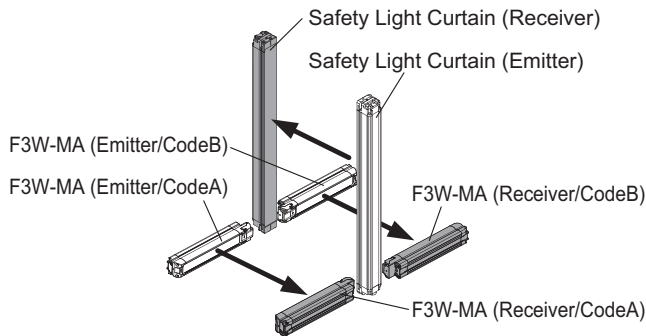
Refer to 2-1. *DIP Switch* for more information on setting the scan code by the DIP Switch.

### 3-1-1-2. F3W-MA in combination with Safety Light Curtain

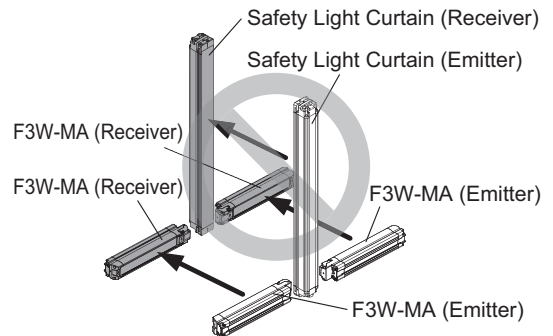
When the F3W-MA and safety light curtain systems are mounted in close proximity and in alignment with each other, a light interference with one another should be also taken into account. This can be avoided by arranging the F3W-MA and safety light curtain system in alternation. When two F3W-MA systems are mounted, one must have a different scan code from the other.

#### - Example for T-Shaped Configuration

PREFERRED INSTALLATION

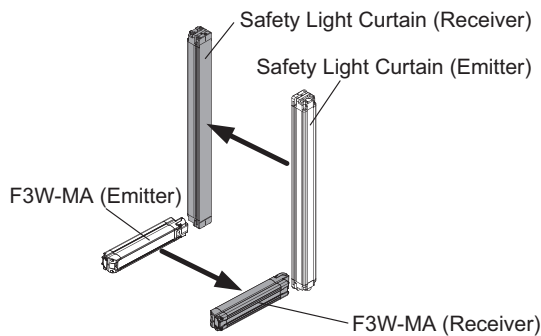


NOT RECOMMENDED INSTALLATION

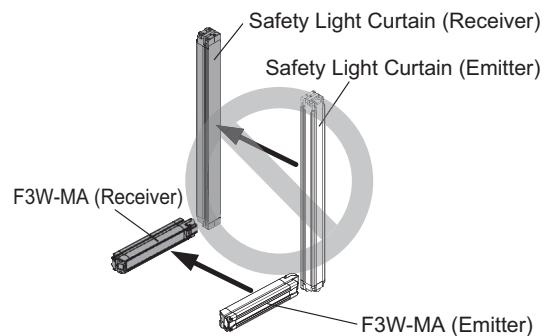


#### - Example for L-Shaped Configuration


PREFERRED INSTALLATION



NOT RECOMMENDED INSTALLATION



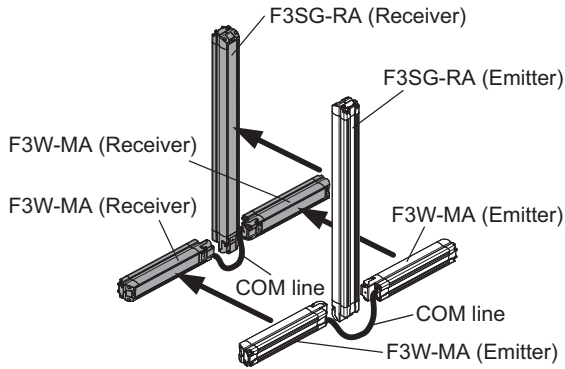
The emitter and receiver units for F3W-MA must be set to the same scan code. The scan code is selectable by the DIP Switch on the emitter and receiver units.

 Refer to 2-1. *DIP Switch* for more information on setting the scan code by the DIP Switch.

### 3-1-1-3. F3W-MA in combination with F3SG-RA

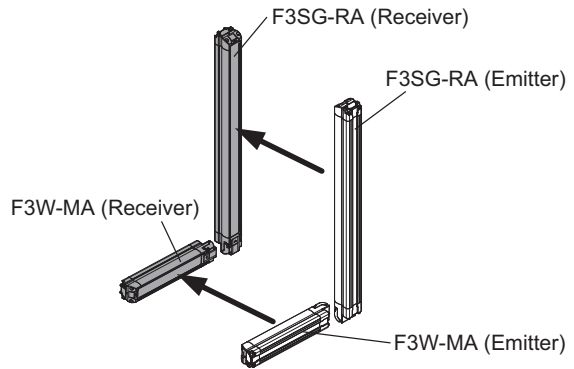
When arranging the F3W-MA and F3SG-RA systems close to each other on a straight line, more flexible arrangement is possible by wiring the two systems using COM lines and employing different scan codes.

POSSIBLE INSTALLATION




Code A (F3SG-RA system)  
Code B (F3W-MA systems)


POSSIBLE INSTALLATION



Code B (F3SG-RA system)  
Code A (F3W-MA systems)

 Refer to 2-1. *DIP Switch* for more information on setting the scan code by the DIP Switch for the F3W-MA.

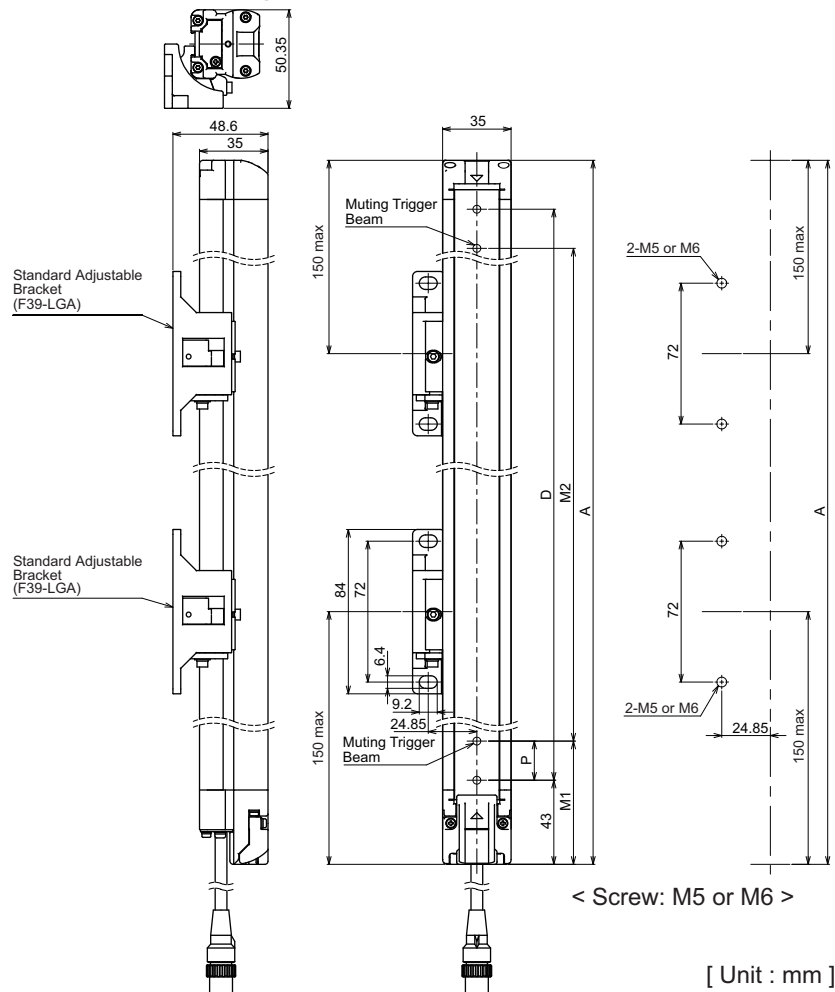
 Refer to 4-2. *Wiring Examples* for more information on wiring.

 Refer to *F3SG-R User's Manual* for more information on setting the scan code by the DIP Switch for the F3SG-RA.

## 3-2. Dimensions

### 3-2-1. Mounted with Standard Adjustable Brackets (F39-LGA)

#### 3-2-1-1. Backside Mounting




Model	F3W-MA0100P	F3W-MA0300P
Dimension A	208	448
Dimension M1	63	83
Dimension M2	100	300
Dimension D	140	380
Dimension P	20	20
Number of Standard Adjustable Brackets *1	2 *2	2


\*1. The number of brackets required to mount either one of emitter and receiver.

\*2. Mounting an emitter or receiver with one bracket is possible. In this case, locate this bracket at half the Dimension A (or at the center of the sensor length).


#### 3-3-2-1. Mounting with Standard Adjustable Brackets (F39-LGA)

 Use the brackets of specified quantities and locations according to the dimensions. The other brackets than described above may not meet the specified ratings and performance.

CHECK!

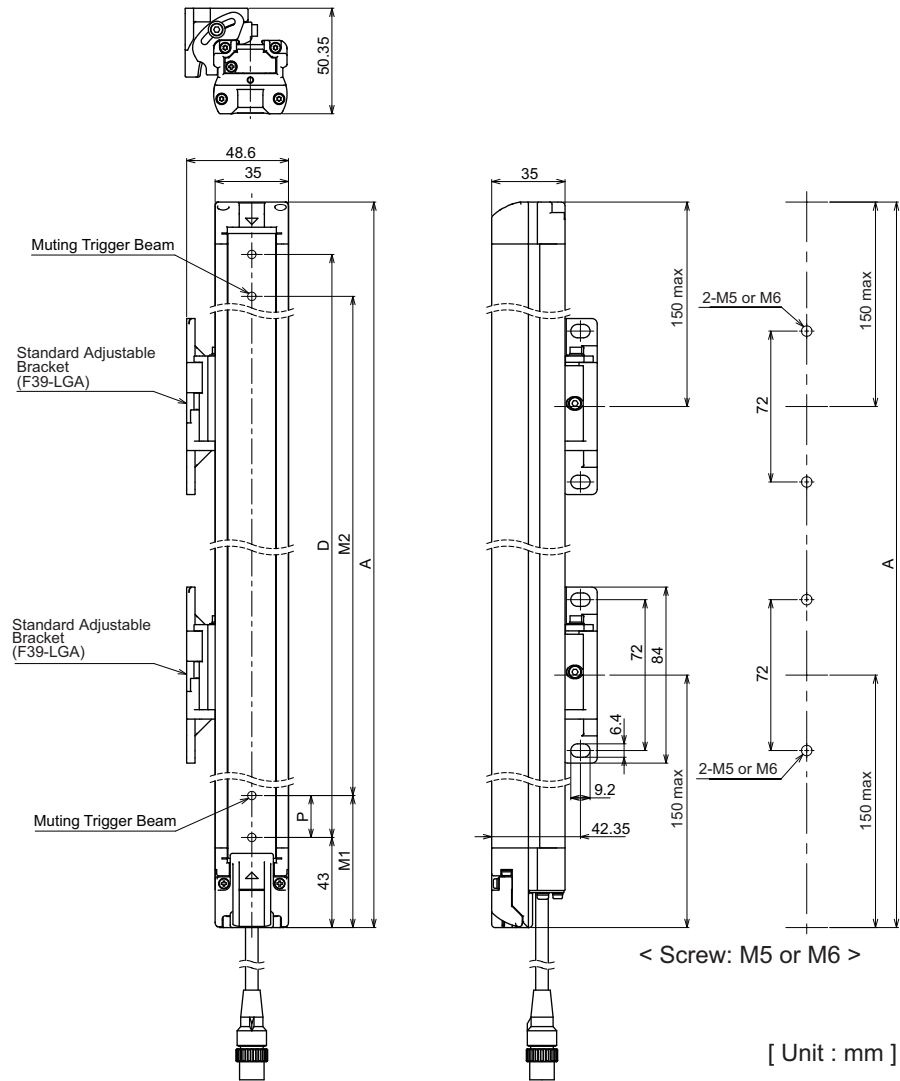
 When you use the sensor in a situation where the sensor is under a load, increase the number of the brackets used.

CHECK!

 The Standard Adjustable Bracket allows beam alignment after fixing the bracket to a wall surface. The angle adjustment range of the Standard Adjustable Brackets is  $\pm 15^\circ$ .

CHECK!

### 3-2-1-2. Side Mounting



Model	F3W-MA0100P	F3W-MA0300P
Dimension A	208	448
Dimension M1	63	83
Dimension M2	100	300
Dimension D	140	380
Dimension P	20	20
Number of Standard Adjustable Brackets *1	2 *2	2

\*1. The number of brackets required to mount either one of emitter and receiver.

\*2. Mounting an emitter or receiver with one bracket is possible. In this case, locate this bracket at half the Dimension A (or at the center of the sensor length).

#### 3-3-2-1. Mounting with Standard Adjustable Brackets (F39-LGA)

Use the brackets of specified quantities and locations according to the dimensions. The other brackets than described above may not meet the specified ratings and performance.

CHECK!

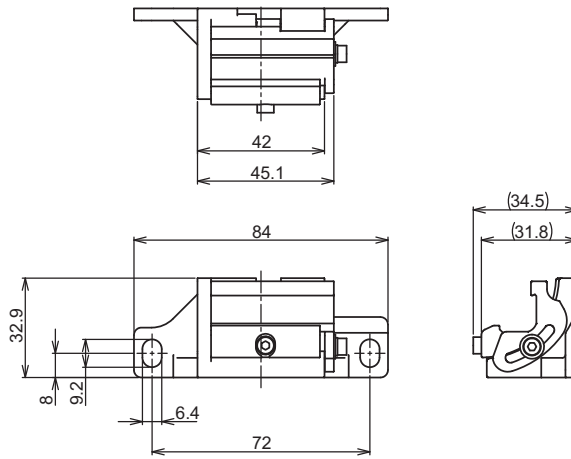
When you use the sensor in a situation where the sensor is under a load, increase the number of the brackets used.

CHECK!

The Standard Adjustable Bracket allows beam alignment after fixing the bracket to a wall surface. The angle adjustment range of the Standard Adjustable Brackets is  $\pm 15^\circ$ .

CHECK!

### 3-2-1-3. Standard Adjustable Bracket

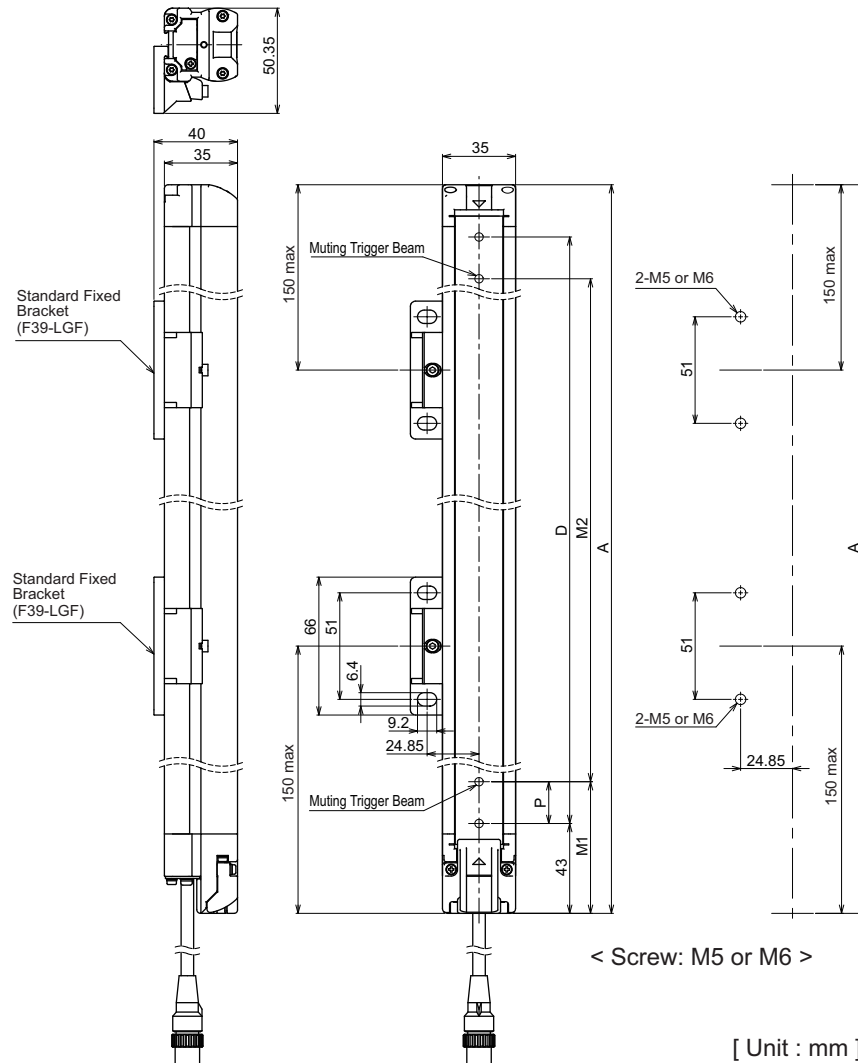


[ Unit : mm ]

Material: ZDC2, Fluorine-containing lubricant

### 3-2-2. Mounted with Standard Fixed Brackets (F39-LGF)

#### 3-2-2-1. Backside Mounting



Model	F3W-MA0100P	F3W-MA0300P
Dimension A	208	448
Dimension M1	63	83
Dimension M2	100	300
Dimension D	140	380
Dimension P	20	20
Number of Standard Adjustable Brackets *1	2 *2	2

\*1. The number of brackets required to mount either one of emitter and receiver.

\*2. Mounting an emitter or receiver with one bracket is possible. In this case, locate this bracket at half the Dimension A (or at the center of the sensor length).



Use the brackets of specified quantities and locations according to the dimensions. The other brackets than described above may not meet the specified ratings and performance.

CHECK!



When you use the sensor in a situation where the sensor is under a load, increase the number of the brackets used.

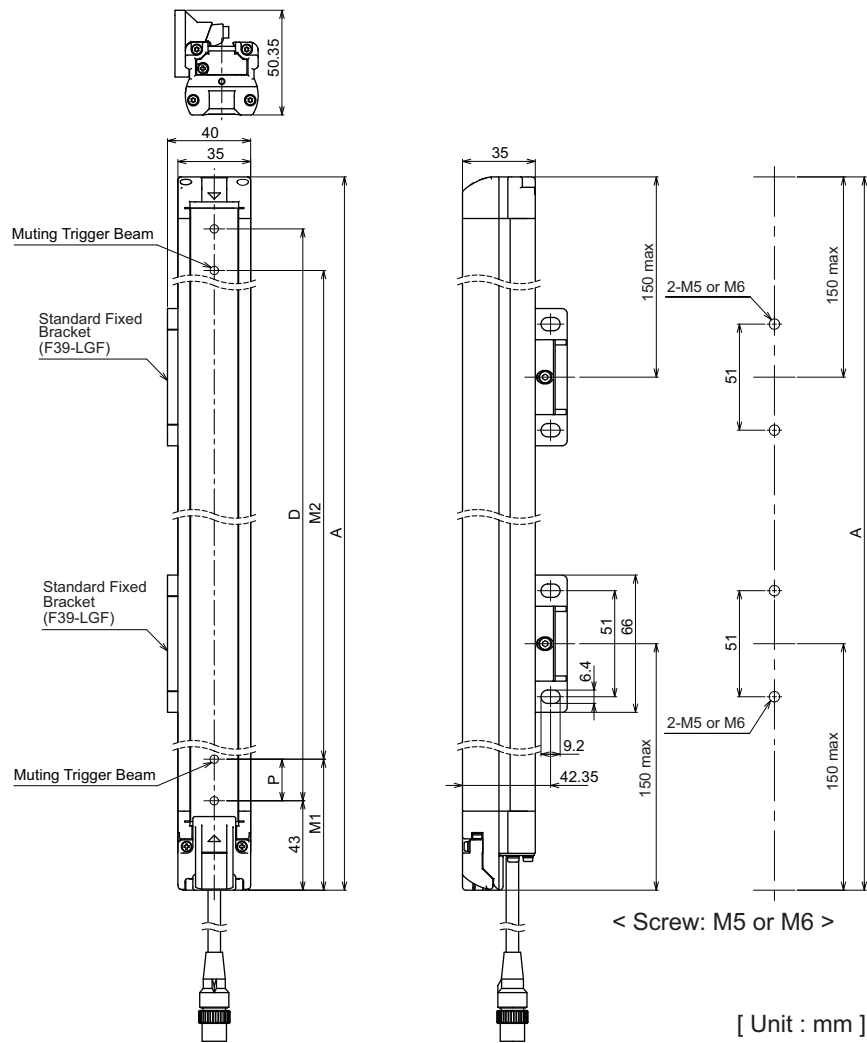
CHECK!



The Standard Fixed Bracket does not allow beam alignment after fixing the bracket to a wall surface.

CHECK!

### 3-2-2-2. Side Mounting



Model	F3W-MA0100P	F3W-MA0300P
Dimension A	208	448
Dimension M1	63	83
Dimension M2	100	300
Dimension D	140	380
Dimension P	20	20
Number of Standard Adjustable Brackets *1	2 *2	2

\*1. The number of brackets required to mount either one of emitter and receiver.

\*2. Mounting an emitter or receiver with one bracket is possible. In this case, locate this bracket at half the Dimension A (or at the center of the sensor length).



Use the brackets of specified quantities and locations according to the dimensions. The other brackets than described above may not meet the specified ratings and performance.

CHECK!



When you use the sensor in a situation where the sensor is under a load, increase the number of the brackets used.

CHECK!

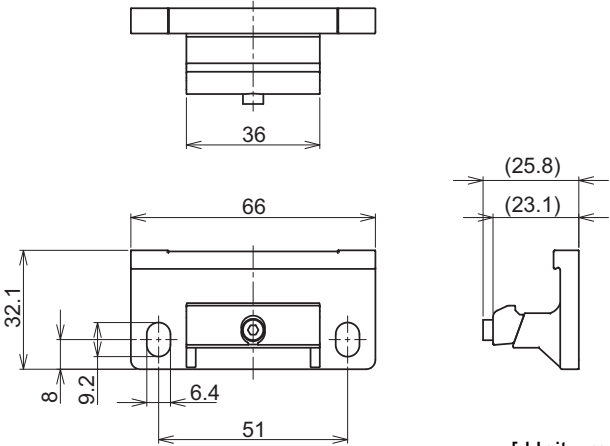


The Standard Fixed Bracket does not allow beam alignment after fixing the bracket to a wall surface.

CHECK!



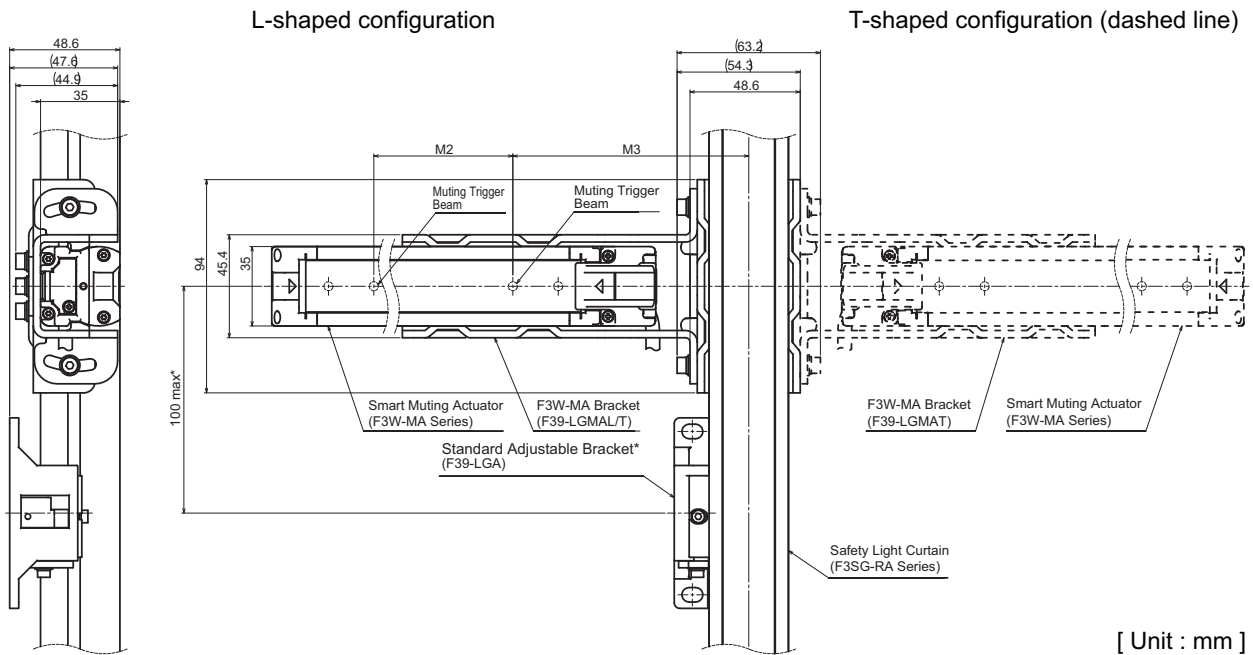
### 3-2-2-3. Standard Fixed Bracket



[ Unit : mm ]

Material: ZDC2

### 3-2-3. Mounted with F3W-MA Bracket (F39-LGMA□) and Standard Adjustable Bracket (F39-LGA)



\* The distance between the centers of the F3W-MA and the Standard Adjustable Bracket (F39-LGA) must be 100 mm or less. When the distance is longer than 100 mm, add an extra Standard Adjustable Bracket for reinforcement.

Model	F3W-MA0100P	F3W-MA0300P
Dimension M2	100	300
Dimension M3	104	124

#### 3-3-2-2. Mounting with F3W-MA Bracket (F39-LGMA□)

When mounting an F3W-MA0300P in the L-shaped configuration, the shock resistance becomes as follows.  
Shock resistance: 50 m/s<sup>2</sup>, 1000 shocks for all 3 axes

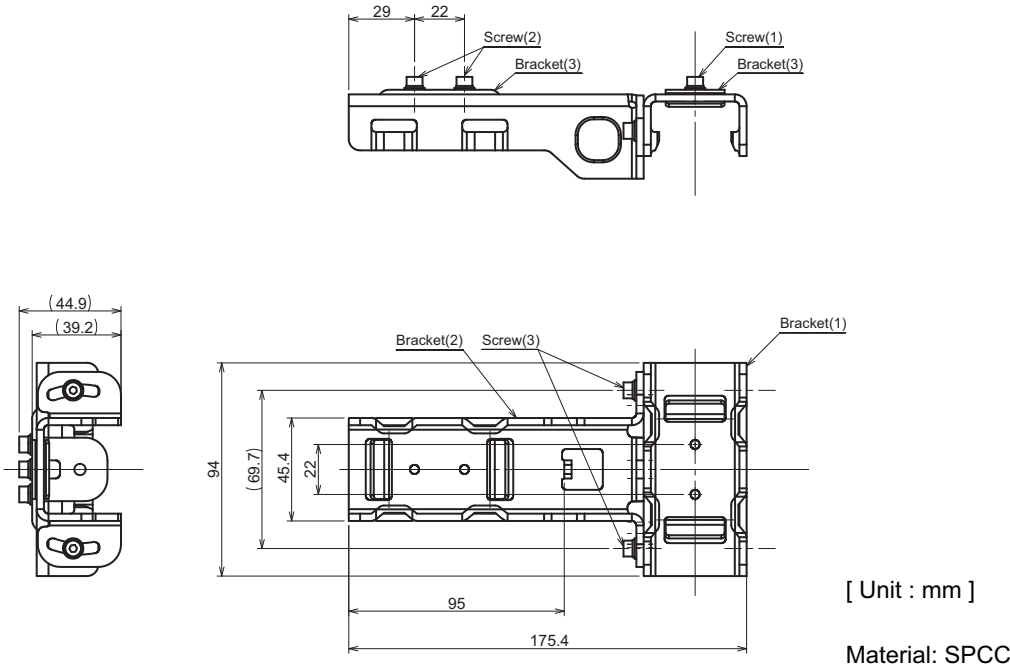
**CHECK!** For mounting an F3W-MA0300P under a shock environment exceeding this, the F3W-MA Bracket cannot be used. Use a Standard Adjustable Bracket (F39-LGA).

**CHECK!** F3W-MA Bracket cannot be used for mounting an F3W-MA to an F3SG-□R□0160/0190□□□.

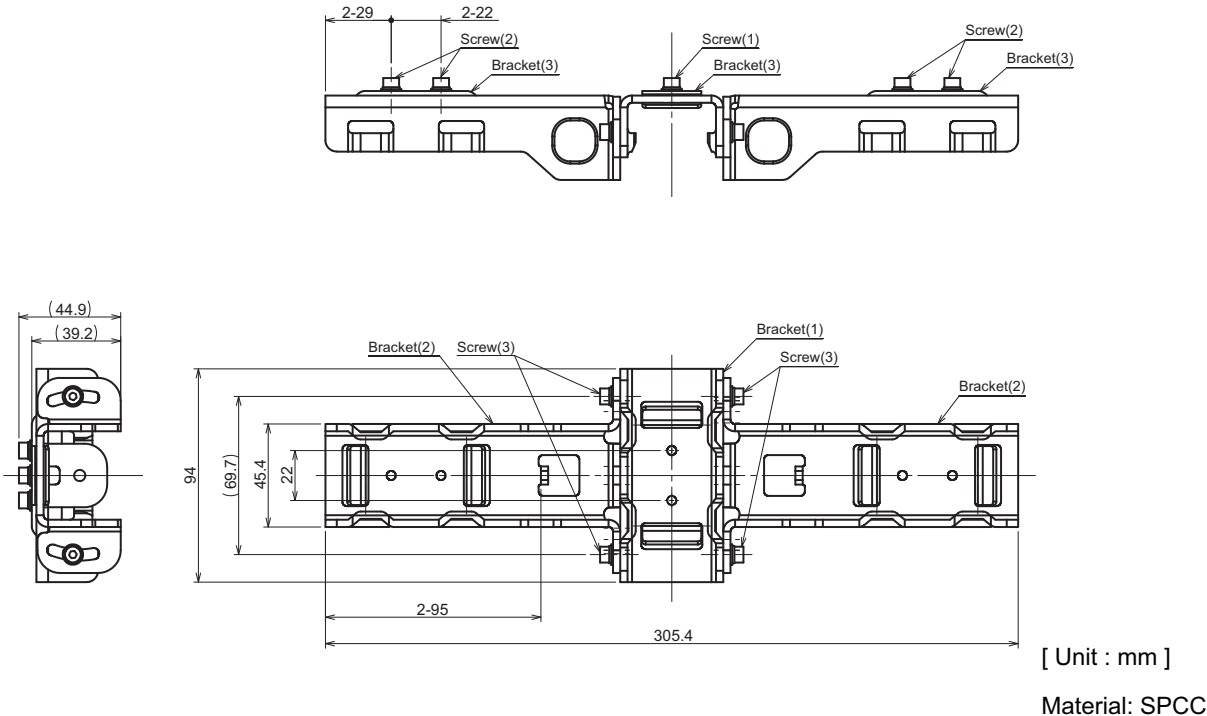
**CHECK!** Use the brackets of specified quantities and locations according to the dimensions. The other brackets than described above may not meet the specified ratings and performance.

**CHECK!** The angle adjustment range of the F3W-MA Bracket is ±15°.

### 3-2-3-1. F3W-MA Bracket (F39-LGMAL)



### 3-2-3-2. F3W-MA Bracket (F39-LGMAT)



## 3-3. Mounting

### 3-3-1. Mounting Method

You can mount the F3W-MA with Standard Fixed Brackets, Standard Adjustable Brackets and F3W-MA Brackets. Side or backside mounting is possible according to the place to install sensors.



CHECK!

Make sure that the F3SG-R is securely mounted and its cables and connectors are properly connected.

### 3-3-2. Mounting Procedure

- Before mounting

When it is required to configure functions with DIP Switch, do so before installing the F3W-MA in your site, according to the procedure described in 2-1. *DIP Switch*.

#### 3-3-2-1. Mounting with Standard Adjustable Brackets (F39-LGA)

- Example of mounting the F3W-MA and the F3SG-RA in the L-shaped configuration (Backside mounting)

1. Mount the F3SG-RA according to the mounting procedure described in the Safety Light Curtain F3SG-R Series User's Manual.

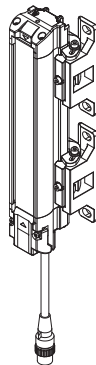


Fig. 1



CHECK!

The mounting procedure of the F3W-MA described below is basically the same as the F3SG-R.



CHECK!

When using a light curtain other than F3SG, refer to the applicable user's manual to mount it.

**2.** Temporarily fix the Standard Adjustable Bracket to the housing of the F3W-MA.

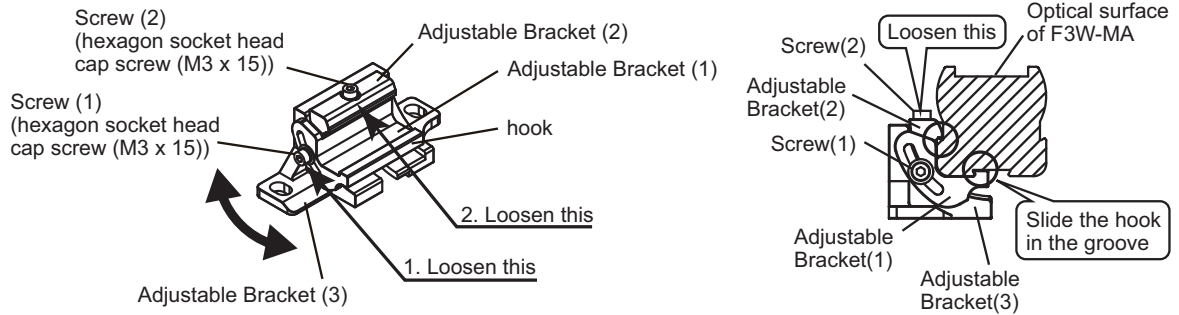
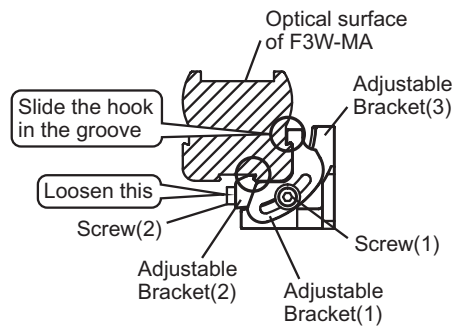


Fig. 2



Side mounting is possible by mounting the F3W-MA as shown below.



**3.** Adjust the Standard Adjustable Bracket to the mounting position of the wall surface. Securely tighten the Screw (2) to fix the Standard Adjustable Bracket to the housing of the F3W-MA. The recommended torque to tighten the Screw (2) is 2.0 N•m.

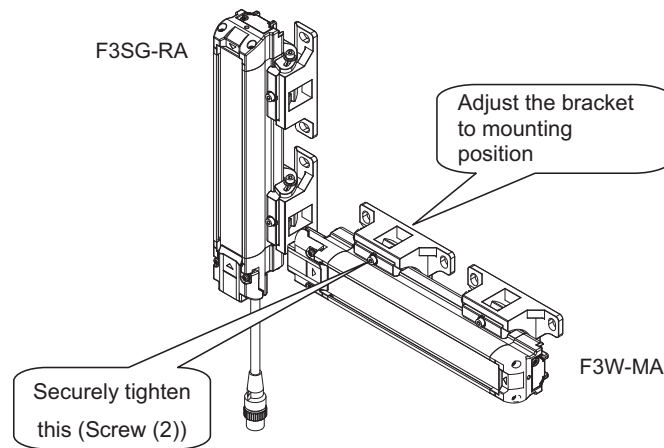


Fig. 3



Tightening screws with a torque that considerably exceeds the recommended torque may cause failure.

- Securely tighten screws to fix the Standard Adjustable Bracket to the mounting position of the wall surface.

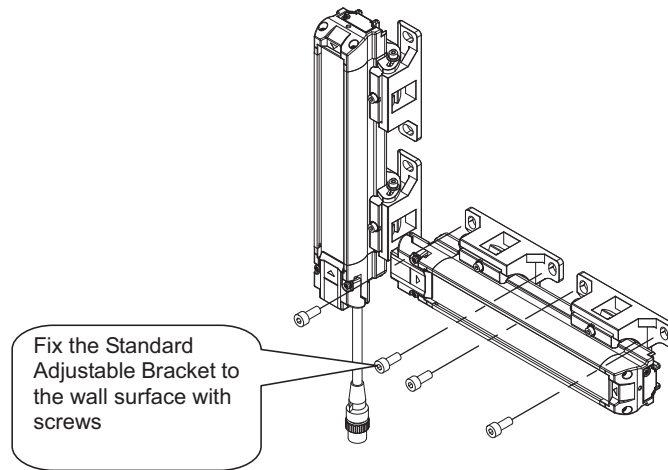


Fig. 4



CHECK!

Screws to mount the brackets to the wall are not included.

- Power the F3W-MA on to perform beam alignment.

Move the emitter from side to side (Fig. 4) to align it to a center position where the Stable-state indicator (STB, green) of the receiver is illuminated while checking the state of the top and bottom beams with the Top-beam-state indicator (TOP, blue) and Bottom-beam-state indicator (BTM, blue) of the receiver. (Fig. 5)

Repeat this step for beam alignment of the receiver.



CHECK!

COM indicator blinks when synchronization between emitter and receiver is lost. While the synchronization is lost, the STB, TOP and BTM indicators do not turn ON.

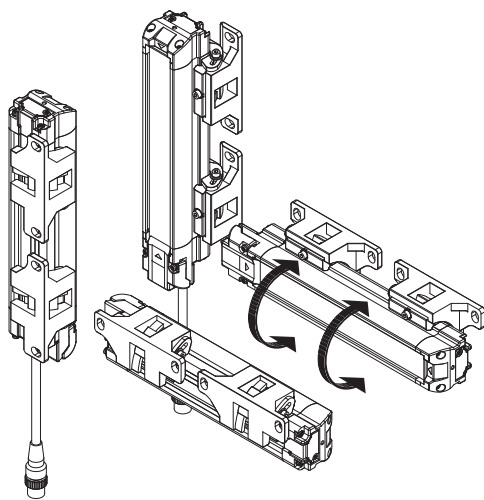


Fig. 5

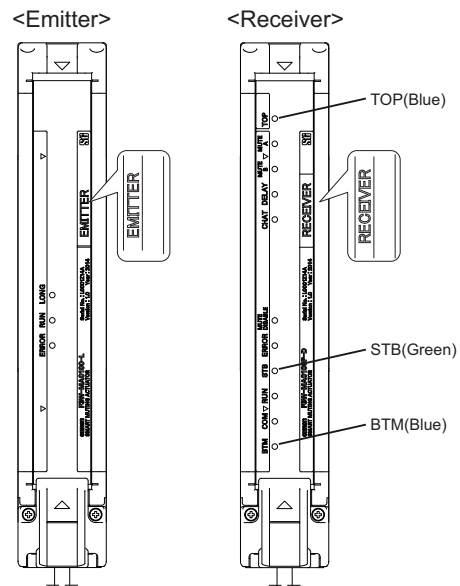


Fig. 6



CHECK!

The angle of the Standard Adjustable Bracket is adjustable between  $\pm 15^\circ$ .

- Securely tighten the Screw (1) to fix the Standard Adjustable Bracket to the housing of the F3W-MA. The recommended torque to tighten the Screw (1) is 2.0 N•m.

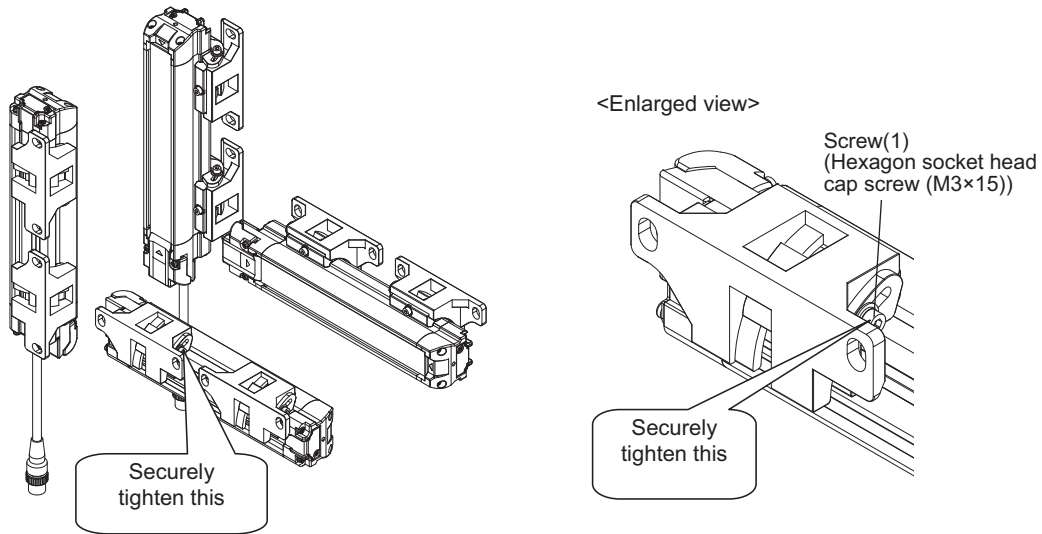


Fig. 7

### 3-3-2-2. Mounting with F3W-MA Bracket (F39-LGMA□)

**CHECK!** Always use the F3W-MA Bracket (F39-LGMA□) together with a Standard Adjustable Bracket (F39-LGA). Refer to 3-2-3. Mounted with F3W-MA Bracket (F39-LGMA□) and Standard Adjustable Bracket (F39-LGA) for the mounting position of the Standard Adjustable Bracket (F39-LGA).

- Example of mounting the F3W-MA and the F3SG-RA in the L-shaped or T-shaped configuration

- Loosen the Screw(1) (hexagon socket head cap screw (M4x8)) of Bracket(1) and the Screw(2) (hexagon socket head cap screw (M4x8)) of Bracket(2). (Fig. 1)

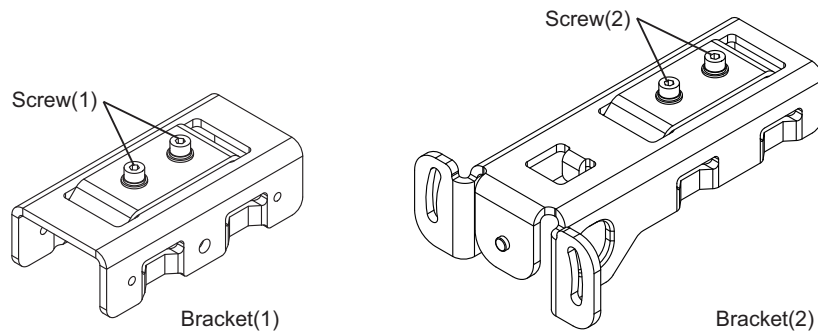


Fig. 1

- Slide the Bracket(1) in the grooves of the F3SG-RA housing. Adjust the Bracket(1) to the mounting position and securely tighten the Screw(1) to fix the Bracket(1) to the housing of the F3SG-RA. The recommended torque to tighten the Screw(1) is 3.0 N•m. (Fig. 2)

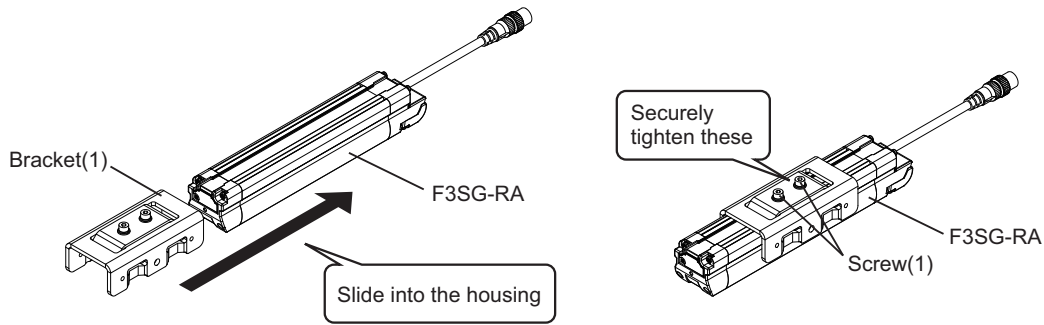


Fig. 2



Tightening screws with a torque that considerably exceeds the recommended torque may cause failure.

- Pass the cable of the F3W-MA from the inside to the outside through a hole in the side of the Bracket(2). Slide the Bracket(2) in the grooves of the F3W-MA housing to the position shown below. (Fig. 3)

Then securely tighten the Screw(2) to fix the Bracket(2) to the housing of the F3W-MA. The recommended torque to tighten the Screw(1) is 3.0 N•m. (Fig. 4)

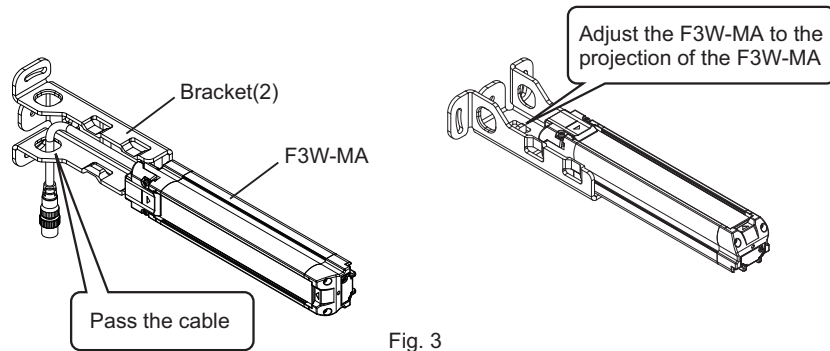


Fig. 3

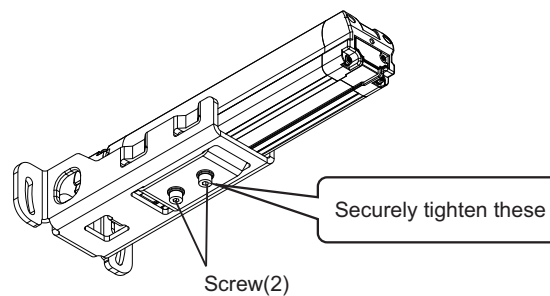


Fig. 4



Tightening screws with a torque that considerably exceeds the recommended torque may cause failure.



4. Temporarily tighten the included Screw(3) (hexagon socket head cap screw (M4×8)) to fix the Bracket(2) to the Bracket(1). (Fig. 5)

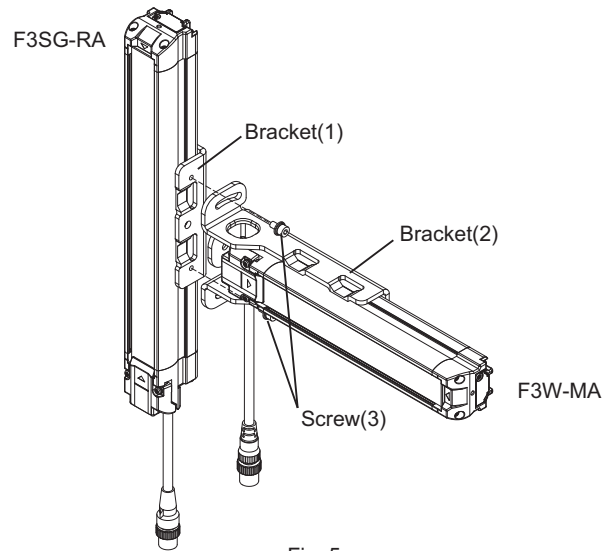


Fig. 5




CHECK!

Repeat this for the opposite side when mounting in the T-shaped configuration.

5. Mount the F3SG-RA with a Standard Adjustable Brackets (F39-LGA) or a Top/Bottom Adjustable Brackets (F39-LGTB) to the mounting position of the wall surface.  
For the mounting positions of these brackets, and the mounting procedure of the F3SG-RA, refer to the *F3SG-R User's Manual*.
6. Perform beam alignment for the F3SG-RA. For the procedure, refer to the *F3SG-R User's Manual*.

- Power the F3W-MA on to perform beam alignment for the F3W-MA.  
Move the emitter from side to side (Fig. 6) to align it to a center position where the Stable-state indicator (STB, green) of the receiver is illuminated while checking the state of the top and bottom beams with the Top-beam-state indicator (TOP, blue) and Bottom-beam-state indicator (BTM, blue) of the receiver. (Fig. 7)

Repeat this step for beam alignment of the receiver.

 COM indicator blinks when synchronization between emitter and receiver is lost. While the synchronization is lost, the STB, TOP and BTM indicators do not turn ON. Refer to 1-3-1. LED Indicator Status for more information.

CHECK!

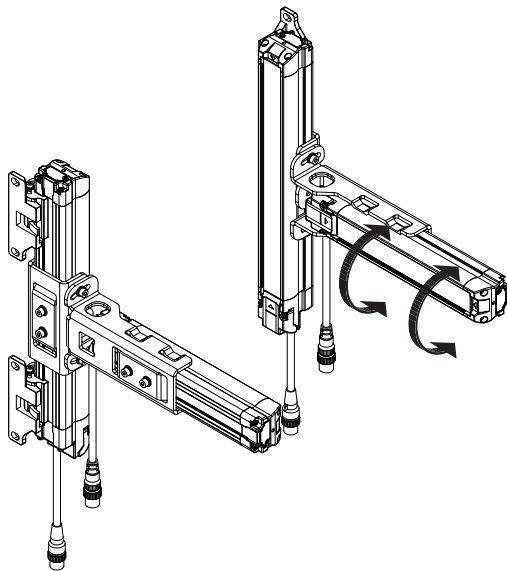


Fig. 6

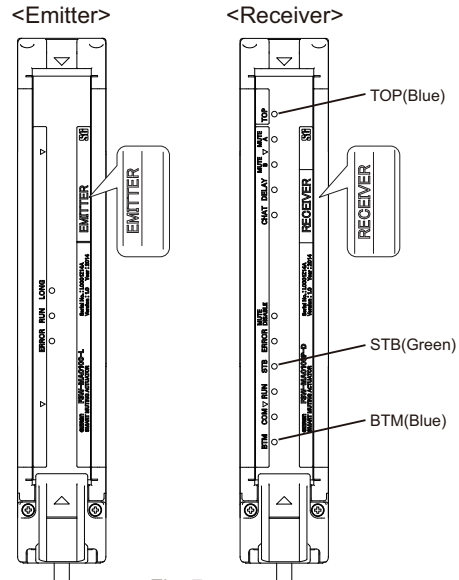



Fig. 7

 The angle of the Bracket(2) is adjustable between  $\pm 15^\circ$ .

CHECK!

- Securely tighten the Screw(3) to fix the Bracket(2) to Bracket(1). The recommended torque to tighten the Screw(3) is 3.0 N•m. (Fig. 8)

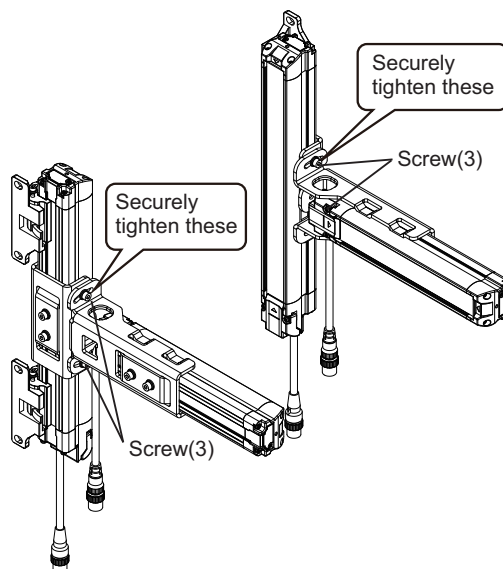



Fig. 8

 Tightening screws with a torque that considerably exceeds the recommended torque may cause failure.

CHECK!

### 3-3-3. Beam Alignment Procedure



CHECK!

The Standard Adjustable Bracket allows beam alignment after fixing the bracket to a wall surface. The Standard Fixed Bracket does not allow beam alignment after fixing the bracket to a wall surface.

1. Verify the following points:
  - The optical surfaces of the emitter and receiver are clean.
  - There is no interrupting object in the detection zone of the F3W-MA.

2. Align the beams of the emitter and receiver:

Move the emitter from side to side to align it to a center position where the Stable-state indicator (STB, green) of the receiver is illuminated while checking the state of the top and bottom beams with the Top-beam-state indicator (TOP, blue) and Bottom-beam-state indicator (BTM, blue) of the receiver.

Next, move the receiver from side to side to align it to a center position where the Stable-state indicator (STB, green) of the receiver is illuminated while checking the state of the top and bottom beams with the Top-beam-state indicator (TOP, blue) and Bottom-beam-state indicator (BTM, blue) of the receiver.



1-3. LED Indicators



CHECK!

In the "T-Shaped Configuration with COM lines," adjust the beams from the primary sensor side, which has the synchronous beams.



CHECK!

COM indicator for primary sensor blinks when synchronization between emitter and receiver is lost. While the synchronization is lost, the STB, TOP and BTM indicators do not turn ON.

3. Verify that all the three indicators of the receiver, Top-beam-state (TOP, blue), Bottom-beam-state (BTM, blue) and Stable-state (STB, green) indicators are illuminated.

4. Make sure to keep the beams aligned and tightly fasten all screws.

The table below shows the recommended tightening torques for the included screws.

Mounting bracket type	Nominal diameter x length of screw (mm)	Tightening torque (recommended)
Standard Adjustable Bracket	M3 x 15	2.0 N•m
Standard Fixed Bracket		
F3W-MA Bracket	M4x8	3.0 N•m



CHECK!

- If any of the Top-beam-state (TOP, blue), Bottom-beam-state (BTM, blue) and Stable-state (STB, green) indicators are not illuminated, check if the emitter and receiver are mounted parallel and at the same height.

- Tightening screws with a torque that considerably exceeds the recommended torque may cause failure.

## 3-4. Wiring

### 3-4-1. Wiring Precautions

**⚠ WARNING**

Do not connect each line of F3W-MA to a DC power supply higher than 24 VDC+20%.  
Also, do not connect it to an AC power supply.  
Failure to do so may result in electric shock.



Double or reinforced insulation from hazardous voltage must be applied to all input and output lines. Failure to do so may result in electric shock.



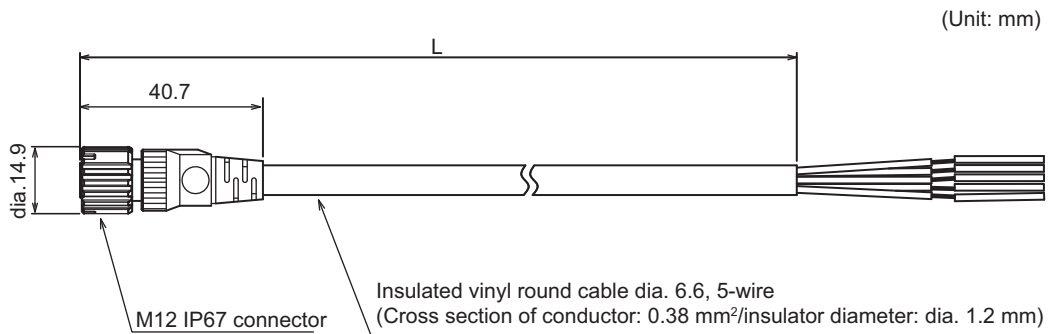
### 3-4-2. Cable Connections

Perform wiring according to the following procedure.

1. Connect an emitter cable (F39-JG□-L, gray, sold separately) to the emitter-side power cable (gray).
2. Connect a receiver cable (F39-JG□-D, black, sold separately) to the receiver-side power cable (black).

#### 3-4-2-1. Single-Ended Cable

- Single-Ended Cable for Emitter (F39-JG□A-L, sold separately)



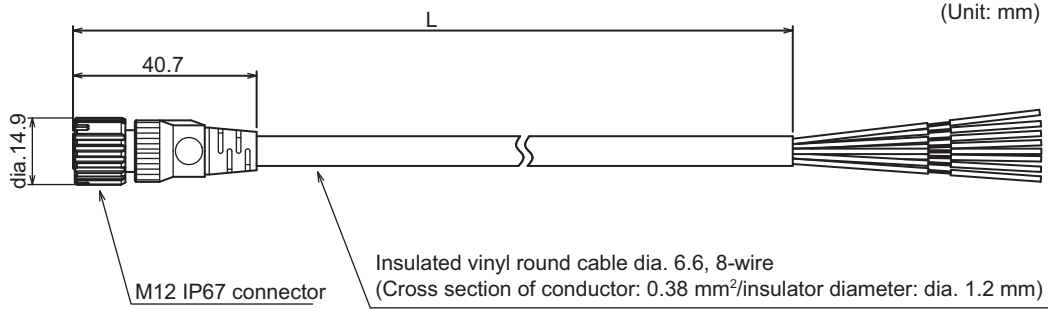
#### <Internal wiring diagram>

Connect to Power Cable  
or Double-Ended Cable



1	Brown	+24 VDC
2	Black	CFG In
3	Blue	0 VDC
4	White	COM+
5	Yellow	COM-

▪ Single-Ended Cable for Receiver (F39-JG□A-D, sold separately)



<Internal wiring diagram>

Connect to Power Cable  
or Double-Ended Cable



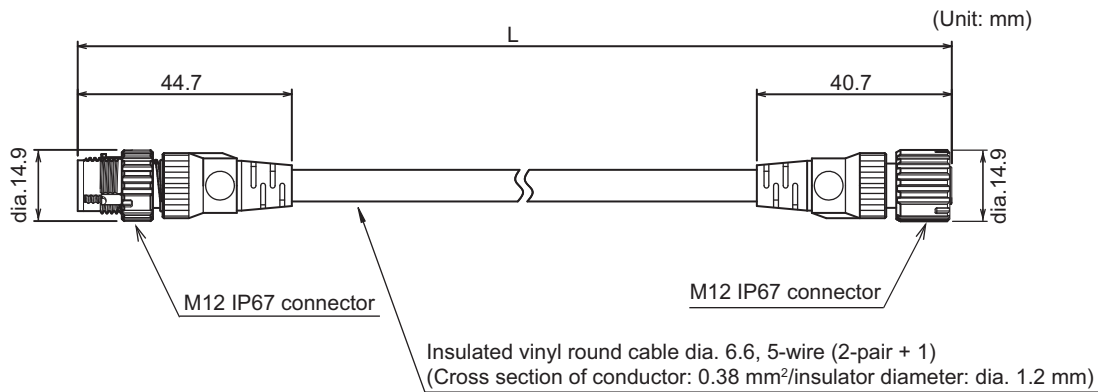
Female

2	Brown	+24 VDC
7	Blue	0 VDC
5	Black	Muting Output A
6	White	Muting Output B
1	Yellow	Mute Enable / CFG In / Reset
8	Red	CFG Out
3	Gray	COM+
4	Pink	COM-

Emitter cable (Gray)	Receiver cable (Black)	L (m)
F39-JG3A-L	F39-JG3A-D	3
F39-JG7A-L	F39-JG7A-D	7
F39-JG10A-L	F39-JG10A-D	10
F39-JG15A-L	F39-JG15A-D	15
F39-JG20A-L	F39-JG20A-D	20

3-4-2-2. Double-Ended Cable

▪ Double-Ended Cable for Emitter: Cable for extension (F39-JG□B-L, sold separately)

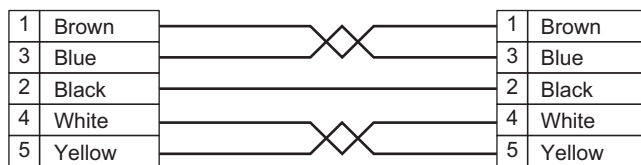


<Internal wiring diagram>

Connected to Power Cable  
or Double-Ended Cable



Female



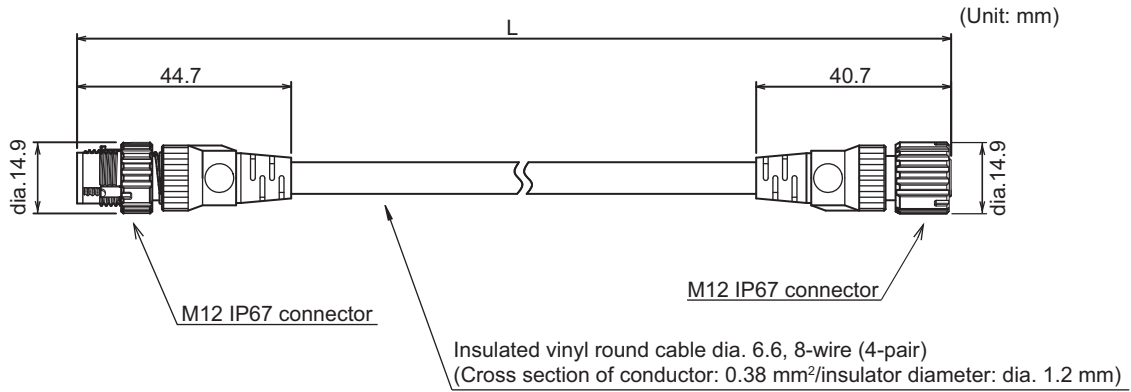
Connected to Single-Ended Cable, or  
Double-Ended cable



Male

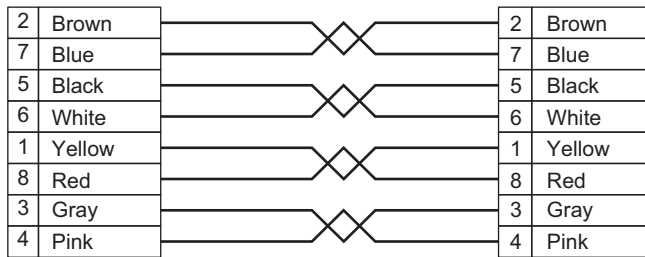
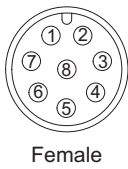
Twisted pair wires are brown and blue, and white and yellow.

- Double-Ended Cable for Receiver: Cable for extension (F39-JG□B-D, sold separately)



<Internal wiring diagram>

Connected to Power Cable  
or Double-Ended Cable



Connected to Single-Ended Cable, or  
Double-Ended cable



Twisted pair wires are brown and blue, black and white, yellow and red, and gray and pink.

Emitter cable (Gray)	Receiver cable (Black)	L (m)
F39-JGR5B-L	F39-JGR15B-D	0.5
F39-JG1B-L	F39-JG1B-D	1
F39-JG3B-L	F39-JG3B-D	3
F39-JG5B-L	F39-JG5B-D	5
F39-JG7B-L	F39-JG7B-D	7
F39-JG10B-L	F39-JG10B-D	10
F39-JG15B-L	F39-JG15B-D	15
F39-JG20B-L	F39-JG20B-D	20

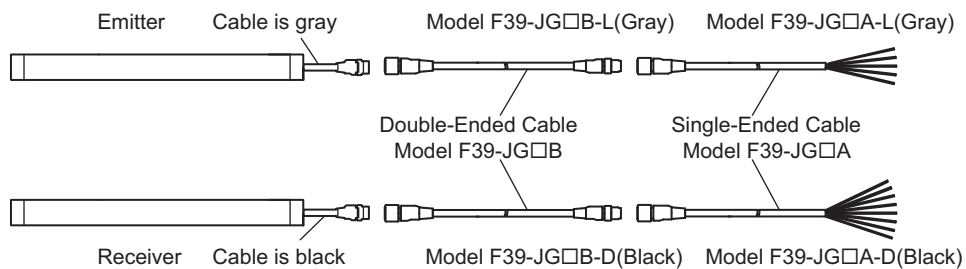
If the length of the F39-JG□A Single-Ended Cable is insufficient, use 1 or more F39-JG□B Double-Ended Cables to extend the length, as required. The length of cable extension of the power cable is 100 m max.



For the T-Shaped Configuration with COM lines, the length of cable extension is 30 m max.

CHECK!

<Connection example>



### 3-4-2-3. Extending Cable Length with Commercially Available Cable

When you need to use a cable that is not specified by OMRON, use a cable that satisfies the following specifications.

1. Emitter: 5-wire Receiver: 8-wire
2. 0.3 mm<sup>2</sup> or larger, conductor resistance 0.058 ohms/m max.
3. Positive and negative COM lines, and 24 V and 0 V DC lines must be used as twisted pair cables.



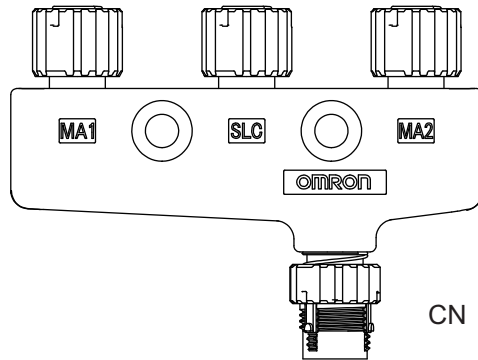
Do not use cables in the same conduit as high voltage or electric power lines.

CHECK!

### 3-4-2-4. Reduced Wiring Connector System

Reduced wiring can be achieved by connecting the F3W-MA and the F3SG-RA (PNP output) with a 4-Joint Plug/Socket Connector (F39-GCN4-□, sold separately).

The cable connection of the connector is as follows.



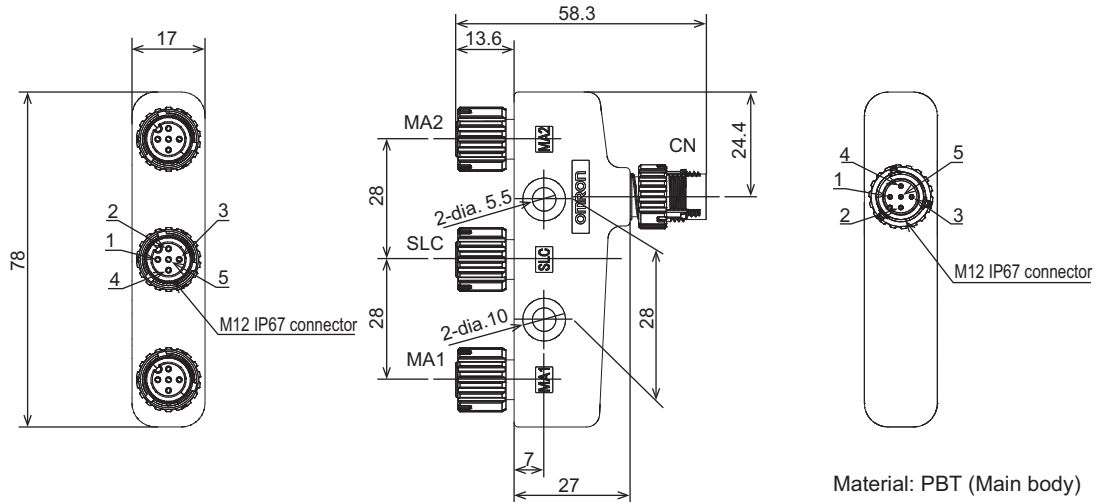
Plug/Socket	Description
MA1	Connect an F3W-MA to this socket. The sensor connected here serves as a primary sensor. For the Exit-Only Muting Mode (or L-shaped configuration), also connect an F3W-MA here.
SLC	Connect an F3SG-RA to this socket.
MA2	Connect an F3W-MA to this socket. The sensor connected here serves as a secondary sensor.
CN	Connect a Single-Ended or Double-Ended Connector Cable to this plug. (Control-panel side)



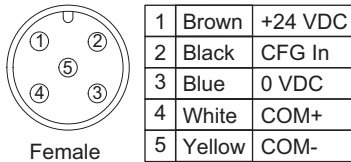
This connector cannot be used for the Position Detection Muting Mode.

CHECK!

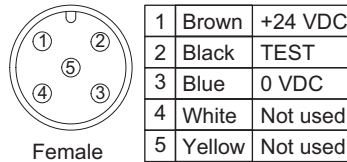
▪ 4-Joint Plug/Socket Connector for Emitter (F39-GCN4-L, sold separately)



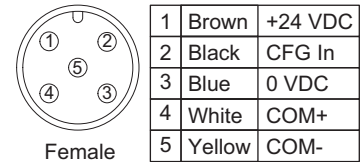
<Internal wiring diagram>



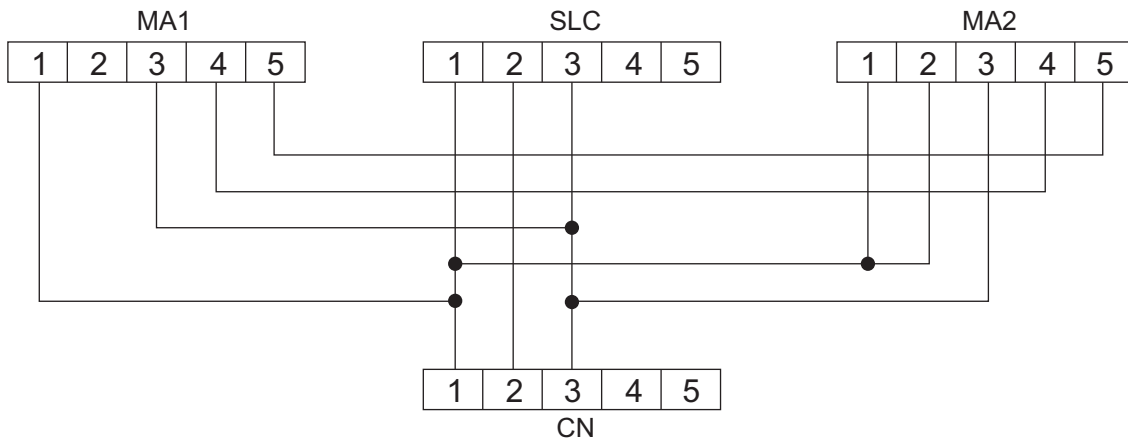
Connected to Power Cable or Double-Ended Cable of F3W-MA Emitter



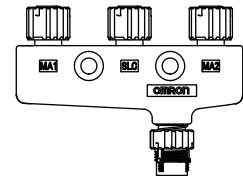
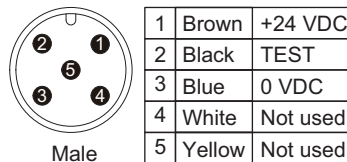
Connected to Power Cable or Double-Ended Cable of F3SG-RA Emitter



Connected to Power Cable or Double-Ended Cable of F3W-MA Emitter

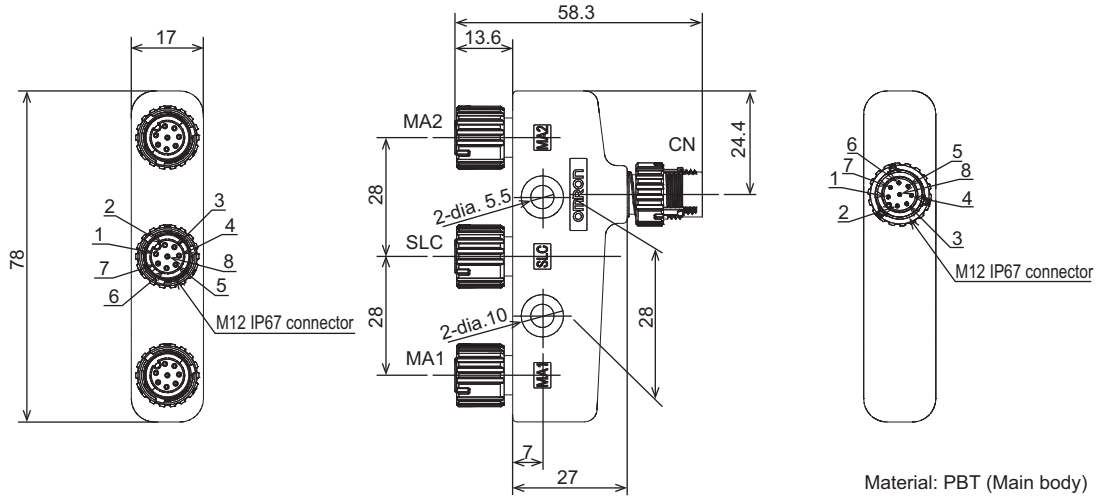


Connected to Single-Ended Cable or Double-Ended Cable for Emitter





▪ 4-Joint Plug/Socket Connector for Receiver (F39-GCN4-D, sold separately)



<Internal wiring diagram>

1	Yellow	Muting Enable
2	Brown	+24 VDC
3	Gray	COM+
4	Pink	COM-
5	Black	Muting Output A
6	White	Muting Output B
7	Blue	0 VDC
8	Red	CFG Out

Female

Connected to Power Cable or Double-Ended Cable of F3W-MA Receiver

1	Yellow	RESET
2	Brown	+24 VDC
3	Gray	MUTE A
4	Pink	MUTE B
5	Black	OSSD 1
6	White	OSSD 2
7	Blue	0 VDC
8	Red	AUX

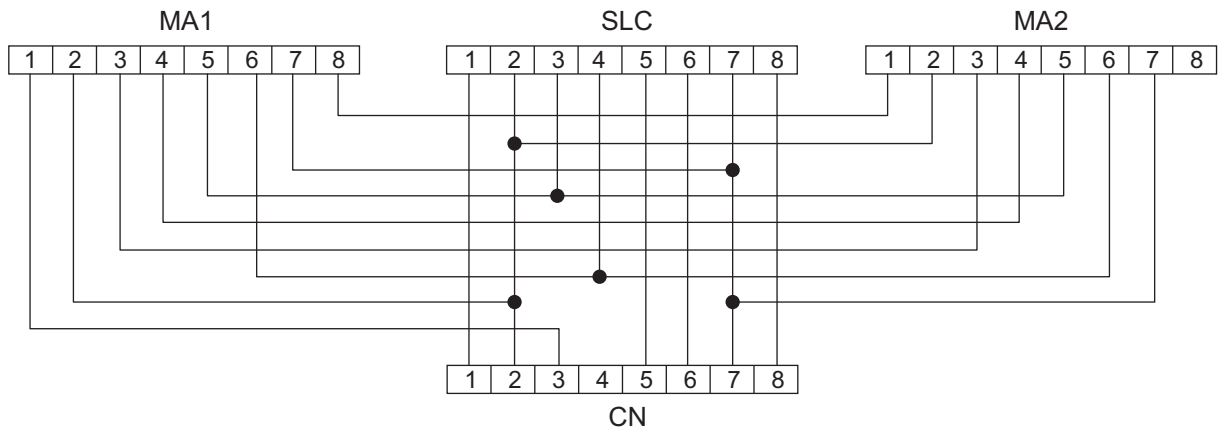
Female

Connected to Power Cable or Double-Ended Cable of F3SG-RA Receiver

1	Yellow	CFG In
2	Brown	+24 VDC
3	Gray	COM+
4	Pink	COM-
5	Black	Muting Output A
6	White	Muting Output B
7	Blue	0 VDC
8	Red	CFG Out

Female

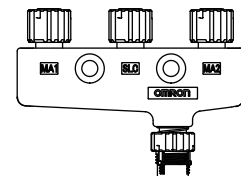
Connected to Power Cable or Double-Ended Cable of F3W-MA Receiver



Connected to Single-Ended Cable or Double-Ended Cable for Receiver

1	Yellow	RESET
2	Brown	+24 VDC
3	Gray	Muting Enable
4	Pink	Not used
5	Black	OSSD 1
6	White	OSSD 2
7	Blue	0 VDC
8	Red	AUX

Male



Set model name	Emitter	Receiver
F39-GCN4	F39-GCN4-L	F39-GCN4-D

### 3-4-3. Functional Earth Connection

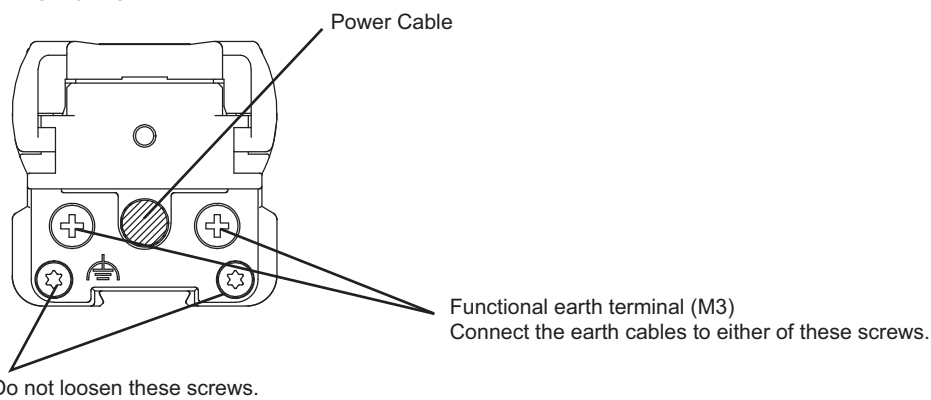
The F3W-MA operates properly without functional earth connection in a general industrial environment. If the F3W-MA fails due to electrical noise, connecting the F3W-MA to the functional earth may work to prevent the noise. It is recommended the functional earth terminal of the F3W-MA be connected to functional earth cables. Connection with protective earth cables may cause the F3W-MA to fail due to a noise level of the environment.

When you connect the F3W-MA with the functional earth, connect the earth cables to the functional earth terminal, as shown below.

The size of the screws of the terminals is M3. Make sure to use crimp terminals that fits the size.

The earth cable must have a cross section of 1 mm<sup>2</sup> or more with conductor resistance of 0.058 ohms/m or less and a length of 20 m or less.

Bottom view of F3W-MA



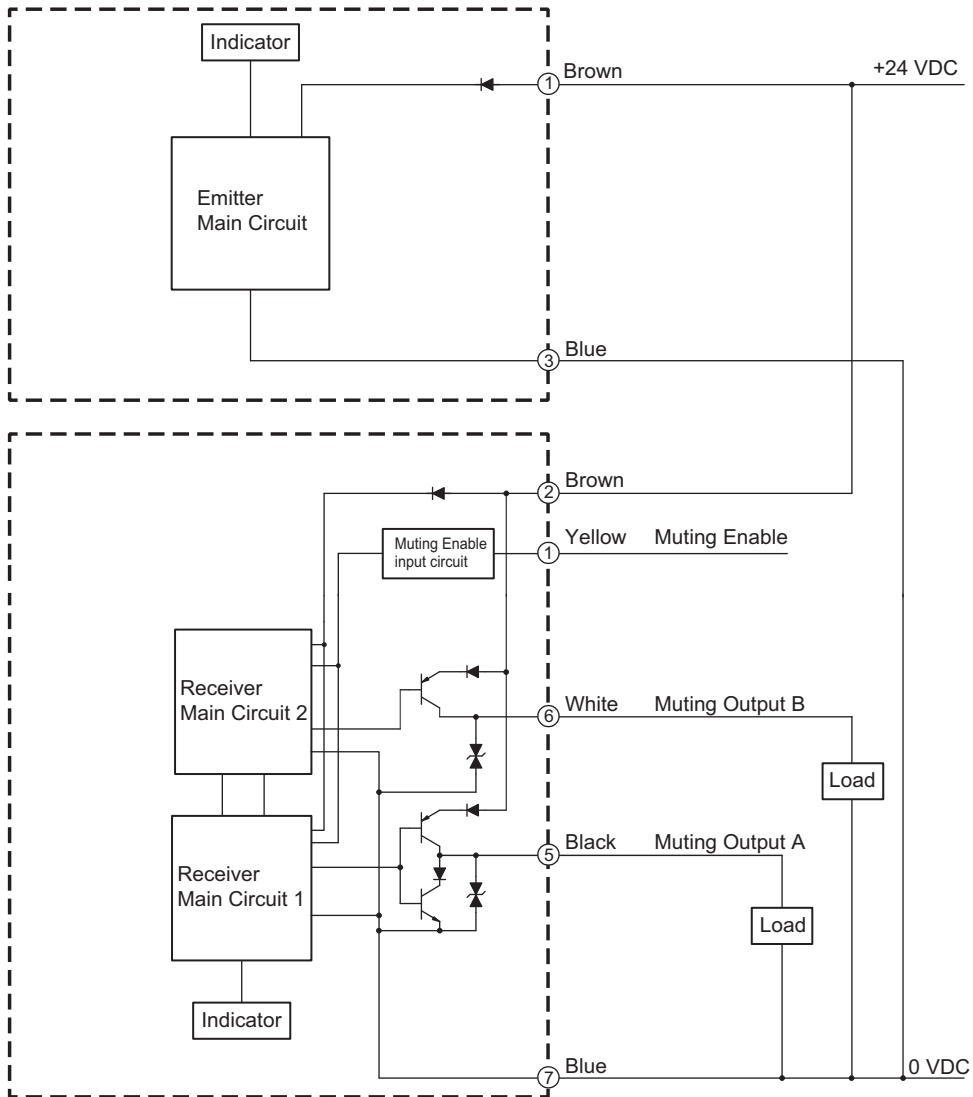
\*Select either of the terminals of the emitter and receiver according to your environment.

# Chapter 4 Input/Output Circuit and Applications

## 4-1. Input/Output Circuit

The entire circuit diagram of the F3W-MA is shown below.

The numbers in the circles indicate the connector's pin numbers.



## 4-2. Wiring Examples

Note 1. For the wiring of safety light curtains such as F3SG-R, refer to the applicable user's manual separately.  
 Note 2. For devices connecting to the F3W-MA, the same power supply must be used.

### 4-2-1. Standard Muting Mode with F3SG-R (T-Shaped Configuration with COM lines)

The following is the example of F3W-MA with Scan Code B, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable disabled.

▪ DIP Switch settings\*1

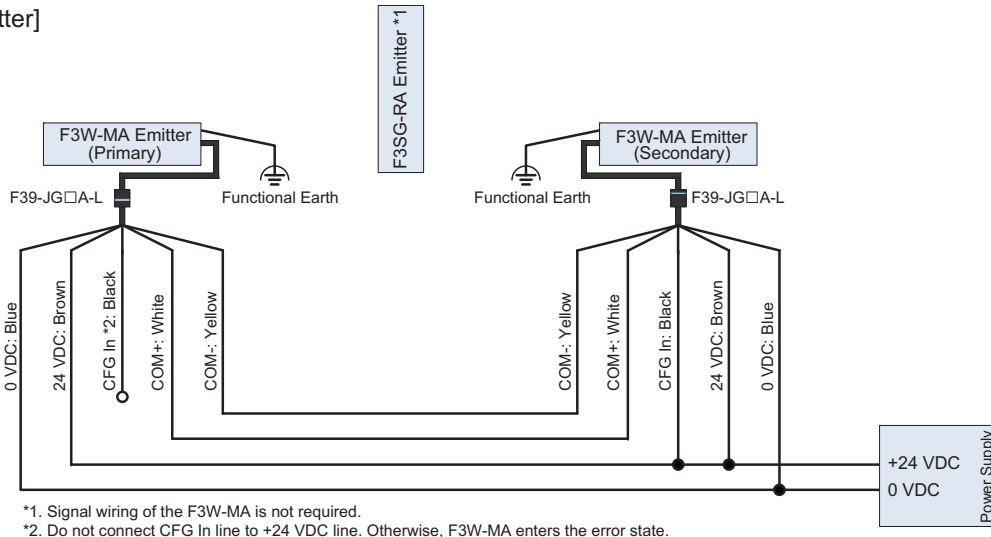
		Function	DIP-SW1	DIP-SW2 *2
F3W-MA Primary	Receiver	Scan Code B (factory default setting)	1 <input checked="" type="checkbox"/> ON	1 <input checked="" type="checkbox"/> ON
		Chattering and Void Space Prevention 1	2 <input checked="" type="checkbox"/> ON	2 <input checked="" type="checkbox"/> ON
		Off-Delay 100 ms	3 <input checked="" type="checkbox"/> ON	3 <input checked="" type="checkbox"/> ON
		Muting Enable Disabled (factory default setting)	4 <input checked="" type="checkbox"/> ON	4 <input checked="" type="checkbox"/> ON
			5 <input checked="" type="checkbox"/> ON	5 <input checked="" type="checkbox"/> ON
F3W-MA Secondary	Emitter	Scan Code B (factory default setting)	6 <input checked="" type="checkbox"/> ON	6 <input checked="" type="checkbox"/> ON
	Receiver	-	No setting required	No setting required

☐: Indicates a switch position.

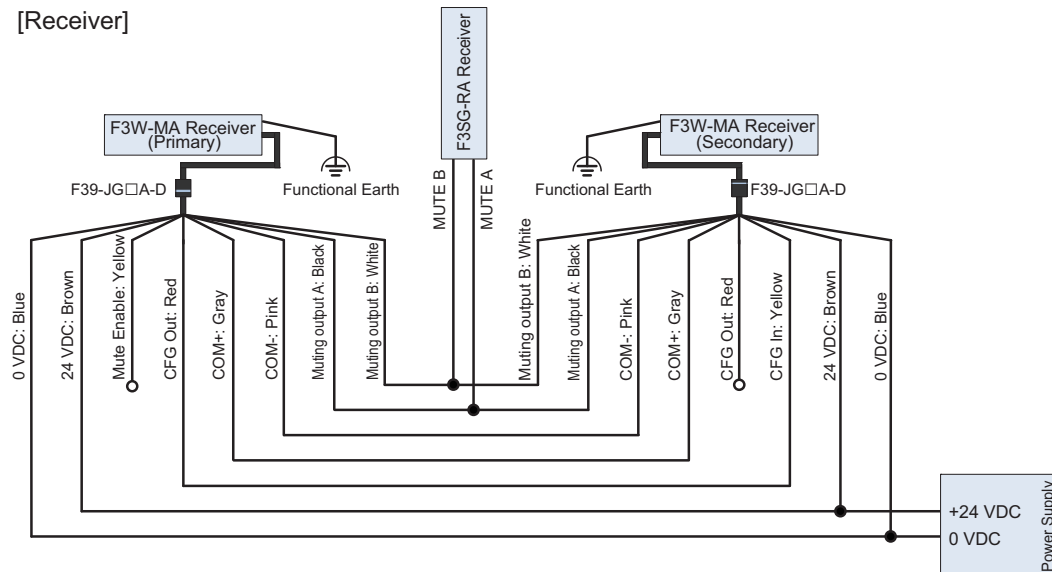
\*1. Configure functions with the DIP Switches before wiring. Refer to *Chapter 2 Setting with DIP Switch* for more information.  
 \*2. DIP Switch Bank 2 is not used.

▪ Wiring example

[Emitter]



[Receiver]



The wiring examples in later pages do not indicate functional earth. To use functional earth, wire an earth cable according to the example above. Refer to 3-4-3. *Functional Earth Connection* for more information.



## 4-2-2. Standard Muting Mode with F3SG-R (T-Shaped Configuration with 4-Joint Connector)

The following is the example of F3SG-RA with Scan Code B, External Device Monitoring disabled, Auto Reset mode, PNP output and External Test in 24 V Active, and F3W-MA with Scan Code A, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable disabled.

### DIP Switch settings\*1

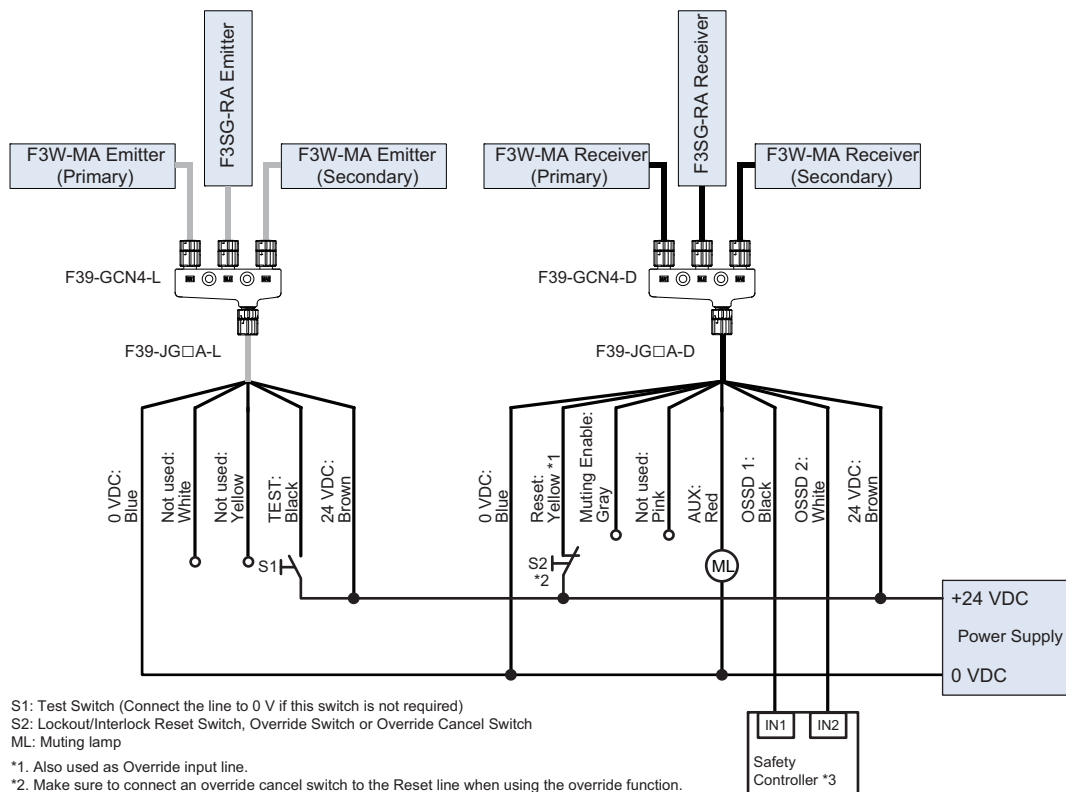
		Function	DIP-SW1	DIP-SW2
F3SG-RA	Receiver	Scan Code B	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON
		EDM Disabled (factory default setting)	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
		Auto Reset (factory default setting)	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
		PNP (factory default setting)	4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
	Emitter	Scan Code B	7 <input type="checkbox"/> ON	7 <input type="checkbox"/> ON
		External Test: 24 V Active (factory default setting)	4 <input type="checkbox"/> ON	-
F3W-MA Primary	Receiver	Scan Code A	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON*2
		Chattering and Void Space Prevention 1	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON*2
			3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON*2
		Off-Delay 100 ms	4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON*2
			5 <input type="checkbox"/> ON	5 <input type="checkbox"/> ON*2
	Muting Enable Disabled (factory default setting)	6 <input type="checkbox"/> ON	6 <input type="checkbox"/> ON*2	
Emitter	Scan Code A	1 <input type="checkbox"/> ON	-	
F3W-MA Secondary	Receiver	-	No setting required	No setting required
	Emitter	-	No setting required	No setting required

□: Indicates a switch position.

\*1. Configure functions with the DIP Switches before wiring. For the DIP Switch of the F3W-MA, refer to *Chapter 2 Setting with DIP Switch*. For the DIP Switch of the F3SG-RA, refer to the *Safety Light Curtain F3SG-R Series User's Manual*.

\*2. DIP Switch Bank 2 of F3W-MA receiver is not used.

### Wiring example



S1: Test Switch (Connect the line to 0 V if this switch is not required)  
 S2: Lockout/Interlock Reset Switch, Override Switch or Override Cancel Switch  
 ML: Muting lamp

\*1. Also used as Override input line.

\*2. Make sure to connect an override cancel switch to the Reset line when using the override function.

Otherwise the override state may not be released by the override cancel switch, resulting in serious injury.

\*3. Refer to *Safety Light Curtain F3SG-R Series User's Manual* for more information on connectable safety controller units.

### 4-2-3. Exit-Only Muting Mode with F3SG-R (L-Shaped Configuration)

The following is the example of F3W-MA with Scan Code A, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable enabled.

▪ DIP Switch settings\*1

		Function	DIP-SW1	DIP-SW2 *2
F3W-MA	Receiver	Scan Code A	1 <input checked="" type="checkbox"/> ON	1 <input checked="" type="checkbox"/> ON
		Chattering and Void Space Prevention 1	2 <input checked="" type="checkbox"/> ON	2 <input checked="" type="checkbox"/> ON
		Off-Delay 100 ms	3 <input checked="" type="checkbox"/> ON	3 <input checked="" type="checkbox"/> ON
		Muting Enable Enabled	4 <input checked="" type="checkbox"/> ON 5 <input checked="" type="checkbox"/> ON	4 <input checked="" type="checkbox"/> ON 5 <input checked="" type="checkbox"/> ON
	Emitter	Scan Code A	6 <input checked="" type="checkbox"/> ON	6 <input checked="" type="checkbox"/> ON

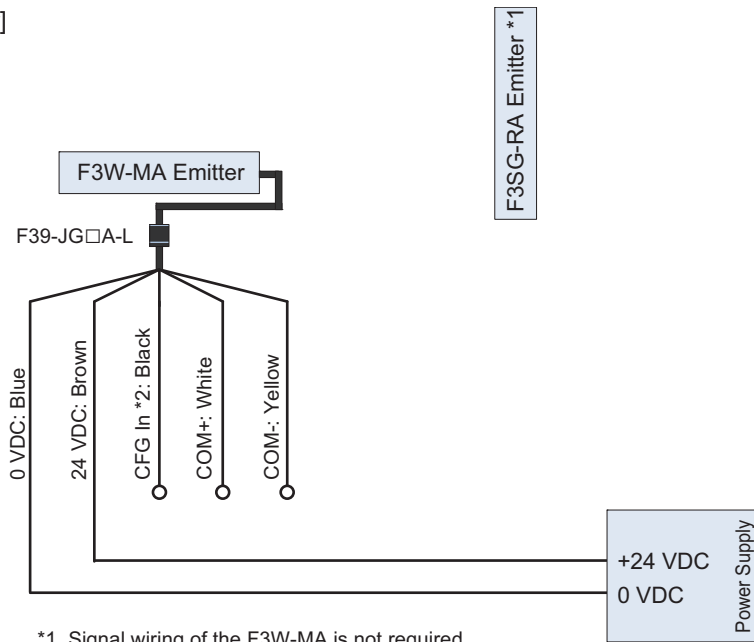
☐: Indicates a switch position.

\*1. Configure functions with the DIP Switches before wiring. Refer to *Chapter 2 Setting with DIP Switch* for more information.

\*2. DIP Switch Bank 2 is not used.

▪ Wiring example

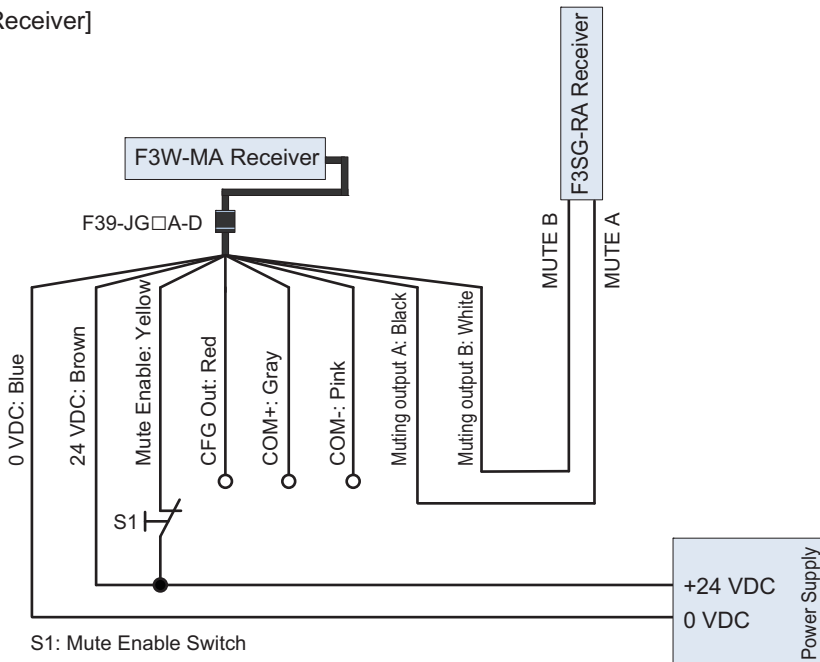
[Emitter]



\*1. Signal wiring of the F3W-MA is not required.

\*2. Do not connect CFG In line to +24 VDC line. Otherwise, F3W-MA enters the error state.

[Receiver]



S1: Mute Enable Switch

### 4-2-4. Exit-Only Muting Mode with F3SG-R (L-Shaped Configuration with 4-Joint Connector)

The following is the example of F3SG-RA with Scan Code A, External Device Monitoring disabled, Auto Reset mode, PNP output and External Test in 24 V Active, and F3W-MA with Scan Code B, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable enabled.

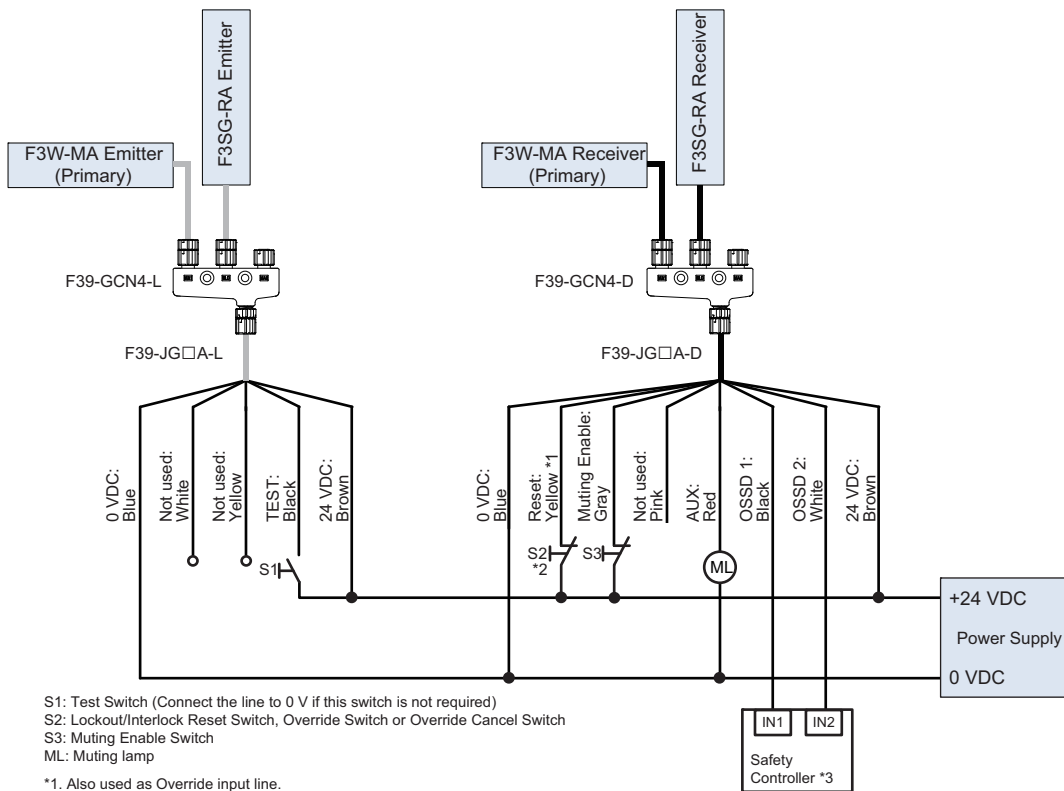
▪ DIP Switch settings\*1

		Function	DIP-SW1	DIP-SW2
F3SG-RA	Receiver	Scan Code A (factory default setting)	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON
		EDM Disabled (factory default setting)	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
		Auto Reset (factory default setting)	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
		PNP (factory default setting)	4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
	Emitter	Scan Code A (factory default setting)	7 <input type="checkbox"/> ON	7 <input type="checkbox"/> ON
F3W-MA	Receiver	Scan Code B (factory default setting)	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON*2
		Chattering and Void Space Prevention 1	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON*2
Off-Delay 100 ms		3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON*2	
Muting Enable Enabled		4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON*2	
5 <input type="checkbox"/> ON		5 <input type="checkbox"/> ON*2		
Emitter	Scan Code B (factory default setting)	6 <input type="checkbox"/> ON	6 <input type="checkbox"/> ON*2	

☐: Indicates a switch position.

\*1. Configure functions with the DIP Switches before wiring. For the DIP Switch of the F3W-MA, refer to Chapter 2 Setting with DIP Switch. For the DIP Switch of the F3SG-RA, refer to the Safety Light Curtain F3SG-R Series User's Manual.  
 \*2. DIP Switch Bank 2 of F3W-MA receiver is not used.

▪ Wiring example



### 4-2-5. Standard Muting Mode with Other Safety Component(T-Shaped Configuration)

The following is the example of F3W-MA-1 with Scan Code A, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable enabled, and F3W-MA-2 with Scan Code B, Chattering and Void Space Prevention 1, Off-Delay 100 ms and Muting Enable enabled.

■ DIP Switch settings\*1

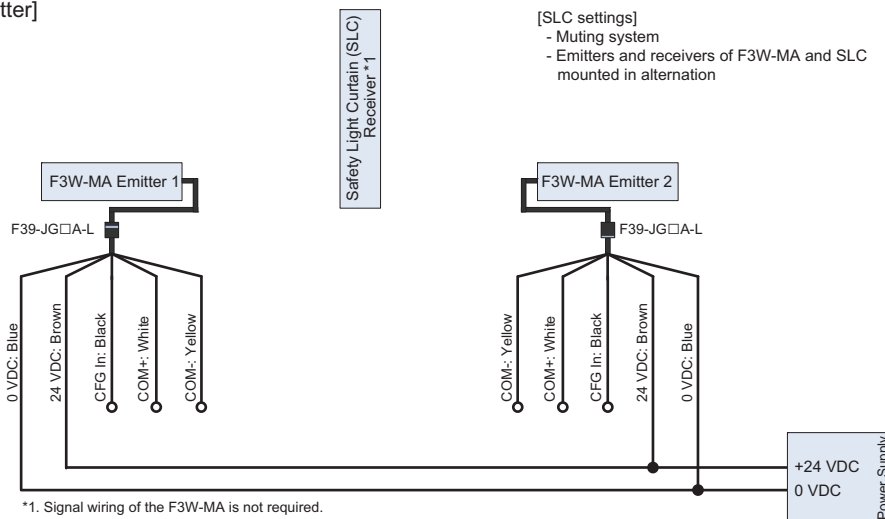
		Function	DIP-SW1	DIP-SW2 *2
F3W-MA-1	Receiver	Scan Code A	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON
		Chattering and Void Space Prevention 1	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
		Off-Delay 100 ms	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
	Emitter	Off-Delay 100 ms	4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
		Muting Enable Enabled	5 <input type="checkbox"/> ON	5 <input type="checkbox"/> ON
		Scan Code A	6 <input type="checkbox"/> ON	6 <input type="checkbox"/> ON
F3W-MA-2	Receiver	Scan Code B (factory default setting)	1 <input type="checkbox"/> ON	1 <input type="checkbox"/> ON
		Chattering and Void Space Prevention 1	2 <input type="checkbox"/> ON	2 <input type="checkbox"/> ON
		Off-Delay 100 ms	3 <input type="checkbox"/> ON	3 <input type="checkbox"/> ON
	Emitter	Off-Delay 100 ms	4 <input type="checkbox"/> ON	4 <input type="checkbox"/> ON
		Muting Enable Enabled	5 <input type="checkbox"/> ON	5 <input type="checkbox"/> ON
		Scan Code B (factory default setting)	6 <input type="checkbox"/> ON	6 <input type="checkbox"/> ON

□: Indicates a switch position.

- \*1. Configure functions with the DIP Switches before wiring. For the DIP Switch of the F3W-MA, refer to Chapter 2 Setting with DIP Switch. For the DIP Switch of the F3SG-RA, refer to the Safety Light Curtain F3SG-R Series User's Manual.
- \*2. DIP Switch Bank 2 is not used.

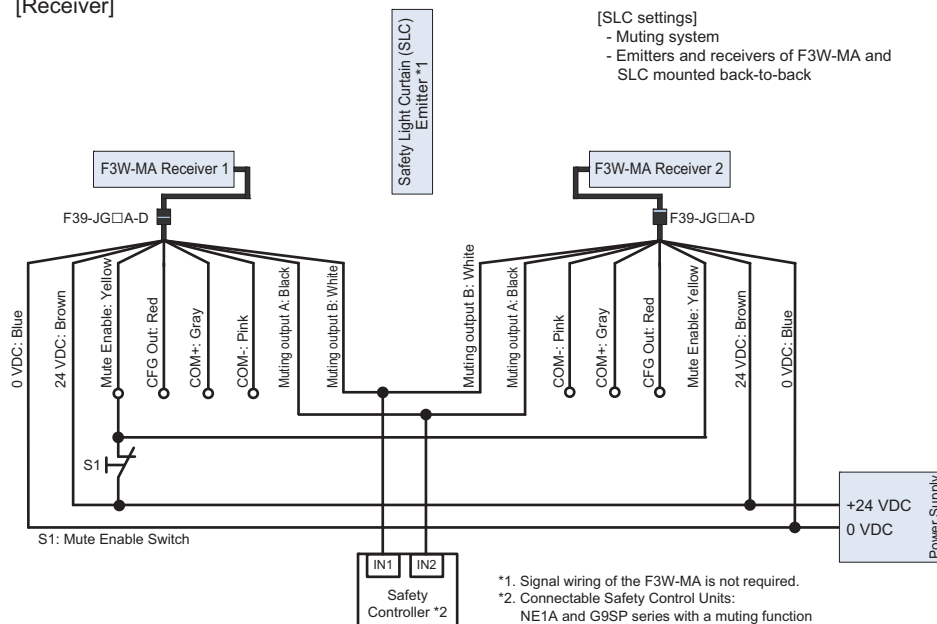
■ Wiring example

[Emitter]



[SLC settings]  
 - Muting system  
 - Emitters and receivers of F3W-MA and SLC mounted in alternation

[Receiver]



[SLC settings]  
 - Muting system  
 - Emitters and receivers of F3W-MA and SLC mounted back-to-back

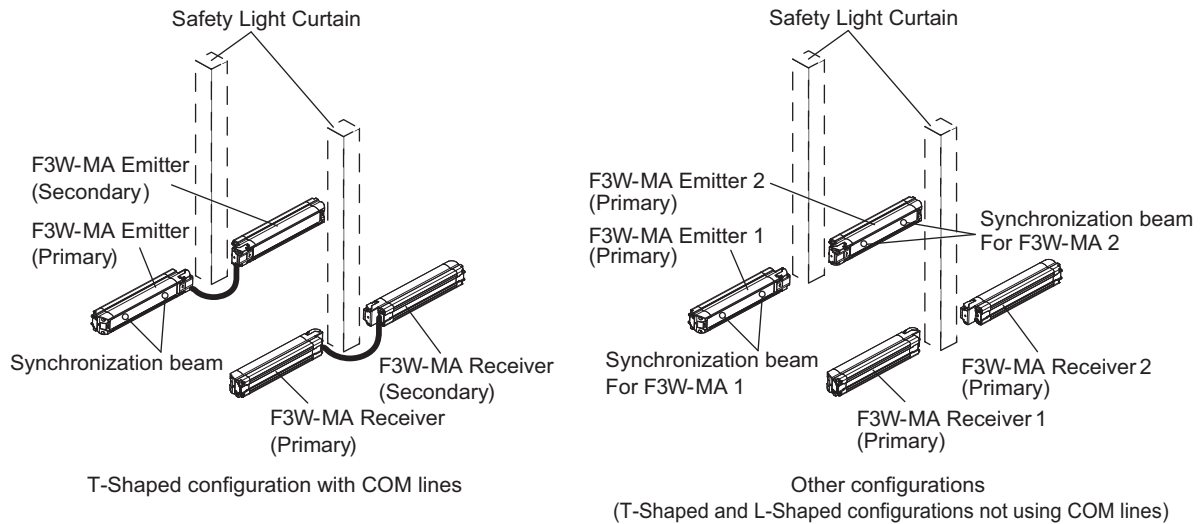
- \*1. Signal wiring of the F3W-MA is not required.
- \*2. Connectable Safety Control Units: NE1A and G9SP series with a muting function



# Chapter 5 Appendix

## 5-1. Troubleshooting

When taking action, refer to the troubleshooting tables below according to the system configuration.



### 5-1-1. The Emitter's ERR indicator is blinking to show an error has occurred

System Configuration Example	Expected error	Assumed Causes and Actions
T-Shaped Configuration with COM lines	Incorrect wiring	The communication line may have been short-circuited or broken. Wire the communication lines properly.
	Configuration error	The F3W-MA may have been used under a cascaded configuration. Do not use F3W-MA under a cascaded configuration.
		A DIP switch may have been changed during operation. Do not operate a DIP switch during operation.
	Communication error	If the wiring is extended by using other cable than the dedicated one, the cable may not have the same or better performance. Check the dedicated and extension cables for any abnormality.
The wiring may have exceeded the maximum power cable length. Check the cable length.		
	Other errors	A communication error or an internal circuit failure due to noise may have occurred. Check the noise level in the environment.
Other configurations	Incorrect wiring	The configuration line may have been short-circuited to 24V. Do not short-circuit the configuration line to 24V.
	Configuration error	The F3W-MA may have been used under a cascaded configuration. Do not use F3W-MA under a cascaded configuration.
		A DIP switch may have been changed during operation. Do not operate a DIP switch during operation.
	Other errors	A communication error or an internal circuit failure due to noise may have occurred. Check the noise level in the environment.

## 5-1-2. The Receiver's ERR indicator is blinking to show an error has occurred

System Configuration Example	Expected error	Assumed Causes and Actions
T-Shaped Configuration with COM lines	Incorrect wiring	The communication line may have been short-circuited or broken. Wire the communication lines properly.
		The muting output line may have been short-circuited to 0V. Wire the muting output lines properly.
		The input/output line of the configuration of the sensor which sensed the error might be short-circuited. Confirm the wiring of these lines.
	Configuration error	The F3W-MA may have been used under a cascaded configuration. Do not use F3W-MA under a cascaded configuration.
		A DIP switch may have been changed during operation. Do not operate a DIP switch during operation.
Communication error	If the wiring is extended by using other cable than the dedicated one, the cable may not have the same or better performance. Check the dedicated and extension cables for any abnormality.	
	The wiring may have exceeded the maximum power cable length. Check the cable length.	
Other errors	A communication error or an internal circuit failure due to noise may have occurred. Check the noise level in the environment.	
Other configurations	Incorrect wiring	The muting output line may have been short-circuited to 0V. Wire the muting output lines properly.
		The input/output line of the configuration of the sensor which sensed the error might be short-circuited. Confirm the wiring of these lines.
	Configuration error	The F3W-MA may have been used under a cascaded configuration. Do not use F3W-MA under a cascaded configuration.
		A DIP switch may have been changed during operation. Do not operate a DIP switch during operation.
Other errors	A communication error or an internal circuit failure due to noise may have occurred. Check the noise level in the environment.	

## 5-1-3. The receiver's COM indicator is blinking (primary sensor only)

Occurrence factor	Assumed Causes and Actions
The synchronization between the emitter and receiver has been lost.	The beam might not have been adjusted correctly. Confirm the description of Section 3-3-3 to adjust the beams.
	The emitter and receiver might have different scan codes. Confirm the scan code settings of the DIP-SW.
	The power of the emitter might not have been turned ON. Confirm the power supply of the emitter side.
	The emitter might have been in an error state. Confirm the description of Section 5-1-1 to fix the error.
	The optical surface of the emitter or receiver might have dirt or scratches. Confirm the state of the optical surface.



CHECK!

The primary sensor's COM indicator blinks for approximately three seconds after power of the system is turned ON.




CHECK!


The COM indicator also blinks when all the beams of the primary sensor are being blocked due to some reason such as retention of the workpiece.

## 5-2. Optional Accessories(Sold Separately)

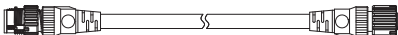
### Single-Ended Connector Cable (for emitter)

Appearance	Model	Cable length	Specifications
	F39-JG3A-L	3 m	M12 connector (5-pin), 5 wires
	F39-JG7A-L	7 m	
	F39-JG10A-L	10 m	
	F39-JG15A-L	15 m	
	F39-JG20A-L	20 m	

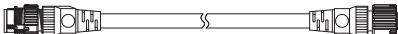
### Single-Ended Connector Cable (for receiver)

Appearance	Model	Cable length	Specifications
	F39-JG3A-D	3 m	M12 connector (8-pin), 8 wires
	F39-JG7A-D	7 m	
	F39-JG10A-D	10 m	
	F39-JG15A-D	15 m	
	F39-JG20A-D	20 m	

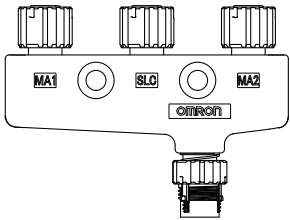
### Double-Ended Cable (for emitter)

Appearance	Model	Cable length	Specifications
	F39-JGR5B-L	0.5 m	M12 connector (5-pin) on both ends
	F39-JG1B-L	1 m	
	F39-JG3B-L	3 m	
	F39-JG5B-L	5 m	
	F39-JG7B-L	7 m	
	F39-JG10B-L	10 m	
	F39-JG15B-L	15 m	
	F39-JG20B-L	20 m	

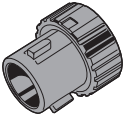


### Double-Ended Cable (for receiver)

Appearance	Model	Cable length	Specifications
	F39-JGR5B-D	0.5 m	M12 connector (8-pin) on both ends
	F39-JG1B-D	1 m	
	F39-JG3B-D	3 m	
	F39-JG5B-D	5 m	
	F39-JG7B-D	7 m	
	F39-JG10B-D	10 m	
	F39-JG15B-D	15 m	
	F39-JG20B-D	20 m	

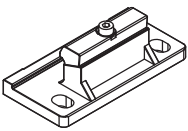
4-Joint Plug/Socket Connector

Appearance	Model	Remarks
	<p>F39-GCN4 F39-GCN4-L F39-GCN4-D</p>	<p>M12 connectors, IP67 rated when attached. Used for reduced wiring for connecting F3W-MA with F3SG-RA. F39-GCN4: Includes one each of F39-GCN4-L and F39-GCN4-D. F39-GCN4-L: Used to connect F3W-MA emitter with F3SG-RA emitter. F39-GCN4-D: Used to connect F3W-MA receiver with F3SG-RA receiver (PNP output).</p>

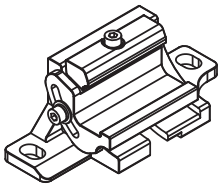
Cover for 4-Joint Plug/Socket Connector

Appearance	Model	Application	Remarks
	XS5Z-11	Water-resistive cover for an F39-GCN4-L/-D 4-Joint Plug/Socket Connector. You can use this when the MA2 connector part is not used.	Material: PBT IP67 rated when attached. Smart click mechanism.
	XS2Z-14	Dust cover for an F39-GCN4-L/-D 4-Joint Plug/Socket Connector. You can use this when the MA2 connector part is not used.	Material: Rubber/black This cover does not ensure IP67 degree of protection. XS2Z-14: Attach to a pin block inside the M12 female screw. XS2Z-15: Attach to a M12 female screw. When attaching the cover to the connector, press the cover onto the connector until the connector is fully inserted into the cover.
	XS2Z-15		

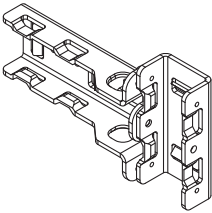
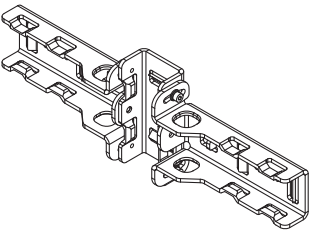

Standard Fixed Bracket

Appearance	Model	Application	Remarks
	F39-LGF	Bracket to mount the F3W-MA. Side mounting and backside mounting possible. Beam alignment after mounting not possible.	2 brackets per set.

Standard Adjustable Bracket

Appearance	Model	Application	Remarks
	F39-LGA	Bracket to mount the F3W-MA. Beam alignment after mounting possible. Side mounting and backside mounting possible.	2 brackets per set.

## F3W-MA Bracket

Appearance	Model	Application	Remarks
	F39-LGMAL	Bracket to fix the F3W-MA to the F3SG-RA. F39-LGMAL: L-shaped configuration F39-LGMAT: T-shaped configuration Beam alignment after mounting possible. When using the F3W-MA Bracket, it is necessary to add an extra Standard Adjustable Bracket (F39-LGA) to the F3SG-RA. * Please also purchase Standard Adjustable Bracket (F39-LGA). * When using F39-LGMA□, there are some restrictions on the brackets to mount the F3SG-RA. This bracket is not usable together with F39-LGF. When using together with F39-LGA, the F3SG-RA must be 270 mm or longer. When using together with F39-LGTB, the F3SG-RA must be 400 mm or longer.	2 brackets per set.
	F39-LGMAT	An extra F39-LGA is required for reinforcement, depending on the mounting position of the F39-LGMA□.   Refer to 3-2-3. Mounted with F3W-MA Bracket (F39-LGMA□) and Standard Adjustable Bracket (F39-LGA) for more information.	

## 5-3. Revision History

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A manual revision code appears as a suffix to the manual number at the bottom of the front and back covers of this manual.

Z355-E1-04



Revision No.

Revision symbol	Revision date	Revisions
01	November, 2014	First edition
02	January, 2015	Minor corrections
03	August, 2015	<ul style="list-style-type: none"> <li>•Added reduced wiring connector.</li> <li>•Minor corrections.</li> </ul>
04	January, 2016	<ul style="list-style-type: none"> <li>•Added F3W-MA Bracket and Cover for 4-Joint Plug/Socket Connector.</li> <li>•Minor corrections.</li> </ul>

**OMRON Corporation** Industrial Automation Company  
Kyoto, JAPAN

Contact: [www.ia.omron.com](http://www.ia.omron.com)

**Regional Headquarters**

**OMRON EUROPE B.V.**

Wegalaan 67-69, 2132 JD Hoofddorp  
The Netherlands  
Tel: (31)2356-81-300/Fax: (31)2356-81-388

**OMRON ELECTRONICS LLC**

2895 Greenspoint Parkway, Suite 200  
Hoffman Estates, IL 60169 U.S.A.  
Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

**OMRON ASIA PACIFIC PTE. LTD.**

No. 438A Alexandra Road # 05-05/08 (Lobby 2),  
Alexandra Technopark,  
Singapore 119967  
Tel: (65) 6835-3011/Fax: (65) 6835-2711

**OMRON (CHINA) CO., LTD.**

Room 2211, Bank of China Tower,  
200 Yin Cheng Zhong Road,  
PuDong New Area, Shanghai, 200120, China  
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

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