2016/06/14

Solar Powered Wireless Signal Torque Wrench System

BL series

Operation Manual

Tohnichi Mfg. Co., Ltd.

Safety Precautions

To customers: Before using this product, please read this operating instruction carefully to use it properly. If you have any question, please contact your nearest distributor or TOHNICHI MFG. CO., LTD. This operating instruction should be stored in a safe place.

Safety Symbol

This symbol is used for drawing attention to "safety precautions". If you see this symbol in this operating instruction, attention should be paid to safety. Take preventative actions according to the description and conduct "safety operations and proper control".

Signal Words

The signal words are the headers which indicate the level of hazard that should be known for human safety and in handling devices. The signal words for safety are "Danger", "Warning" and "Caution" depending on the level of hazard to human. The signal words are used with the safety symbol to indicate the following situations.

"⚠ ***Danger***"	Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
"⚠ ***Warning***"	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
"⚠ ***Caution***"	Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

⚠Warning

- The receiver can be operated only with the power voltage of DC18V to 36V specified in this operating instruction.
- Do not drop water or oil on this instrument. Do not use this instrument in an atmosphere of flammable gas and steam. Use in such an atmosphere may result in fire.
- Avoid shock or vibration to this instrument. It may cause a damage or failure.
- Before use, make a pre-operation inspection and check the settings.
- Be sure to conduct a periodic inspection of torque wrenches.
- Use a torque wrench within the measurement range specified in the operating instruction.
- Disconnect from power supply if the product needs to be stored for a long period of time.
- Avoid using the instrument in a place where there are metal structures around it.
- Avoid using the instrument near welding machines, electric discharge machines or machines producing electromagnetic noise such as PC.
- Before wiring, check power supply off.

Contact your nearest distributor or Tohnichi if any trouble.

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1 Outline

Tohnichi BL series torque wrenches send tightening completion signals by radio waves. The Solar Panel eliminates need for battery maintenance and costs associated. R-BL receiver models capture signals from BL wrenches and transfer to external equipment, such as a count checker CNA-4mk3, Poka-Patrol. The receiver can transfer Completion signals and transmitter serial number to external equipment. Miss-tightening prevention system can be established with PC or PLC.

2 Feature

- World's first solar power transmitter
- Create up to 4 contact-free outputs in one receiver
- DC24V power source
- Available AC100V - 240V with optional BA-8 AC adapter
- Upgrading LS type torque wrench to BL type is possible
- Quick communication setting with one click

3 Components

4 Specifications

Model	T-BLE	R-BLE	T-BLA	R-BLA	T-BL	R-BL
Description	Transmitter	Receiver	Transmitter	Receiver	Transmitter	Receiver
Frequency	868.3Mhz		902.875Mhz		928.35Mhz	
Modulation System	FSK					
Rate	125kbps					
ID	Fixed 8 digit					
	LED Light	**#1**	LED Light	**#1**		**#1**
Power	Solar Cell	DC24V **#2**	Solar Cell	DC24V **#2**	Solar Cell	DC24V **#2**
Antenna	Helix Antenna	Dipole Antenna	Whip Antenna	Dipole Antenna	Helix Antenna	Dipole Antenna
Temperature	0 – 40 degree Celsius					
Distance	10 – 20 m, 30 – 60 feet **#3**					
Wireless Certificate	EU, China		USA, Canada		Japan	

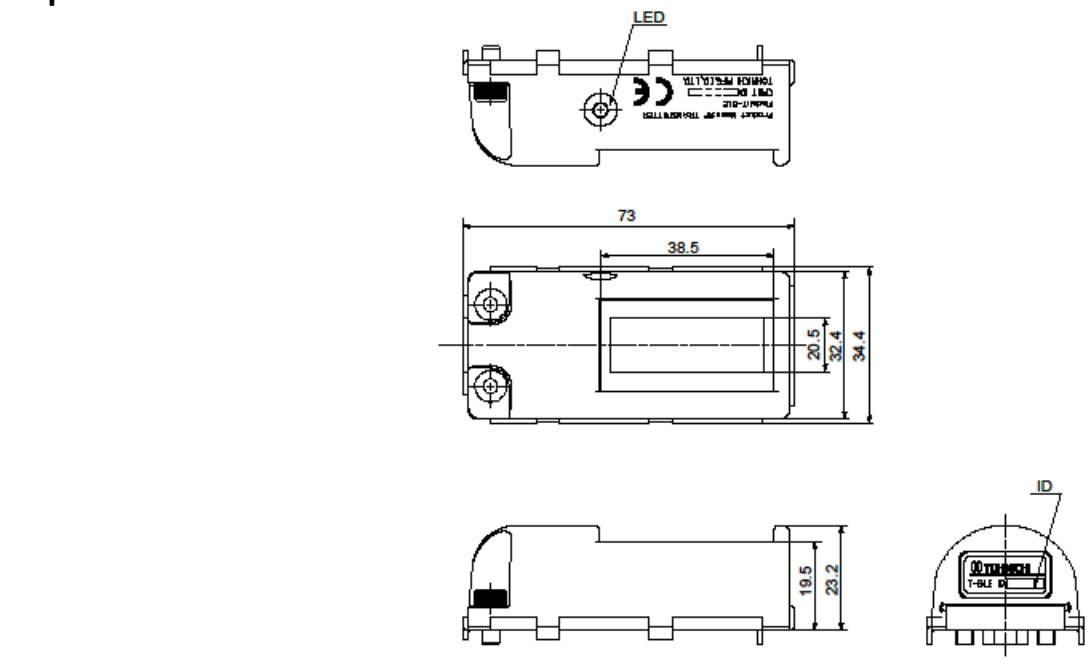
#1 4 Contact Signal Outputs and 6 RS232C Outputs, LAN Output by Request

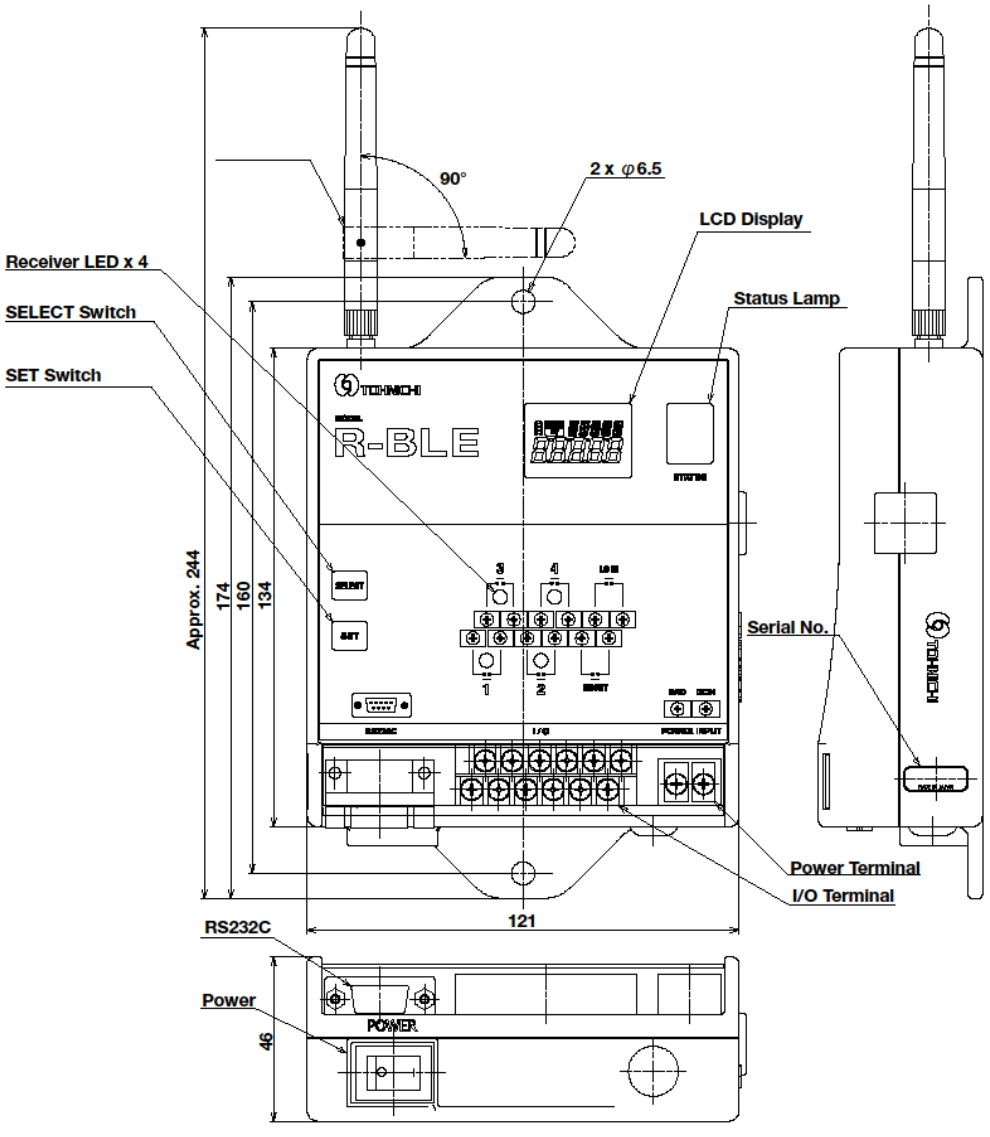
#2 Connected directly to DC18-36V or with Optional, AC Adapter BA-8, 100 – 240V

#3 Radio frequency communication errors may be caused by electronic noise or a shield placed between the transmitter and receiver. In addition, radio waves reflected by metal, concrete, etc. may interfere with radio waves directly sent to the antenna of the receiver and dead point occurs, resulting in communications errors.

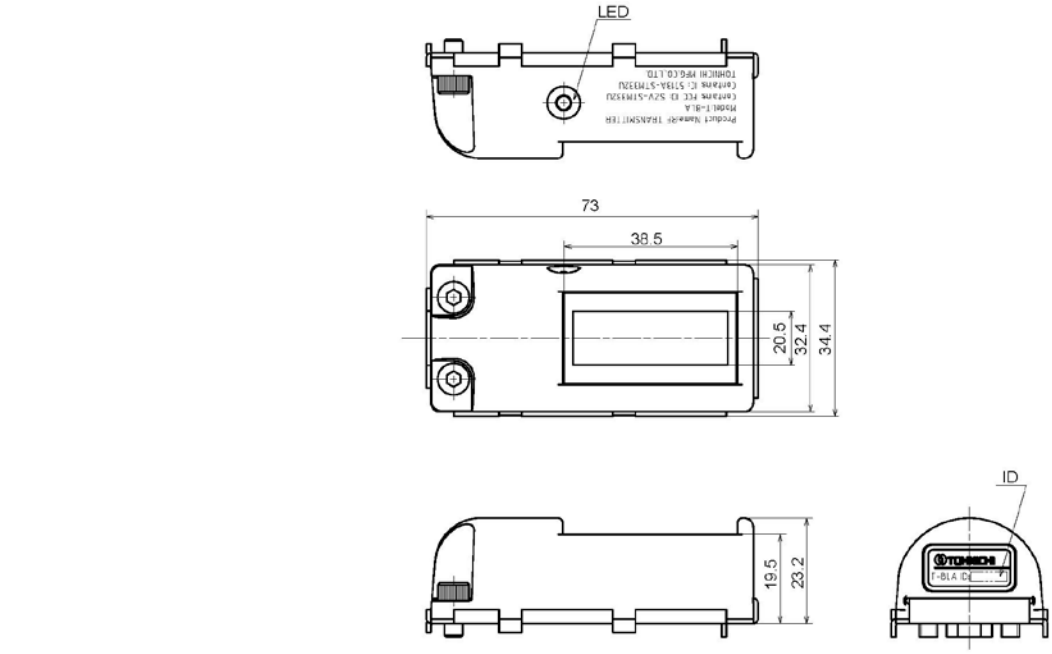
5 External View and Each Part Name

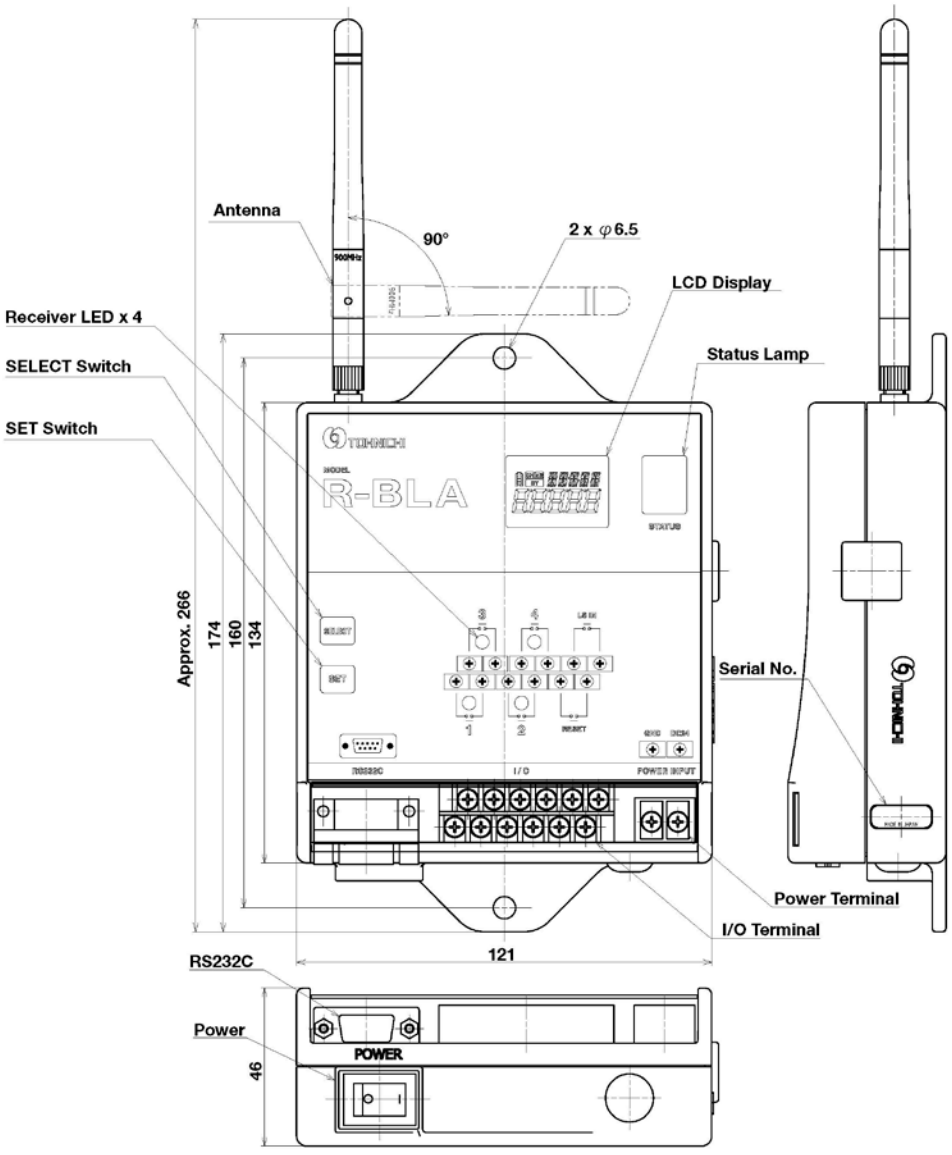
5-1 BLE, European and China model



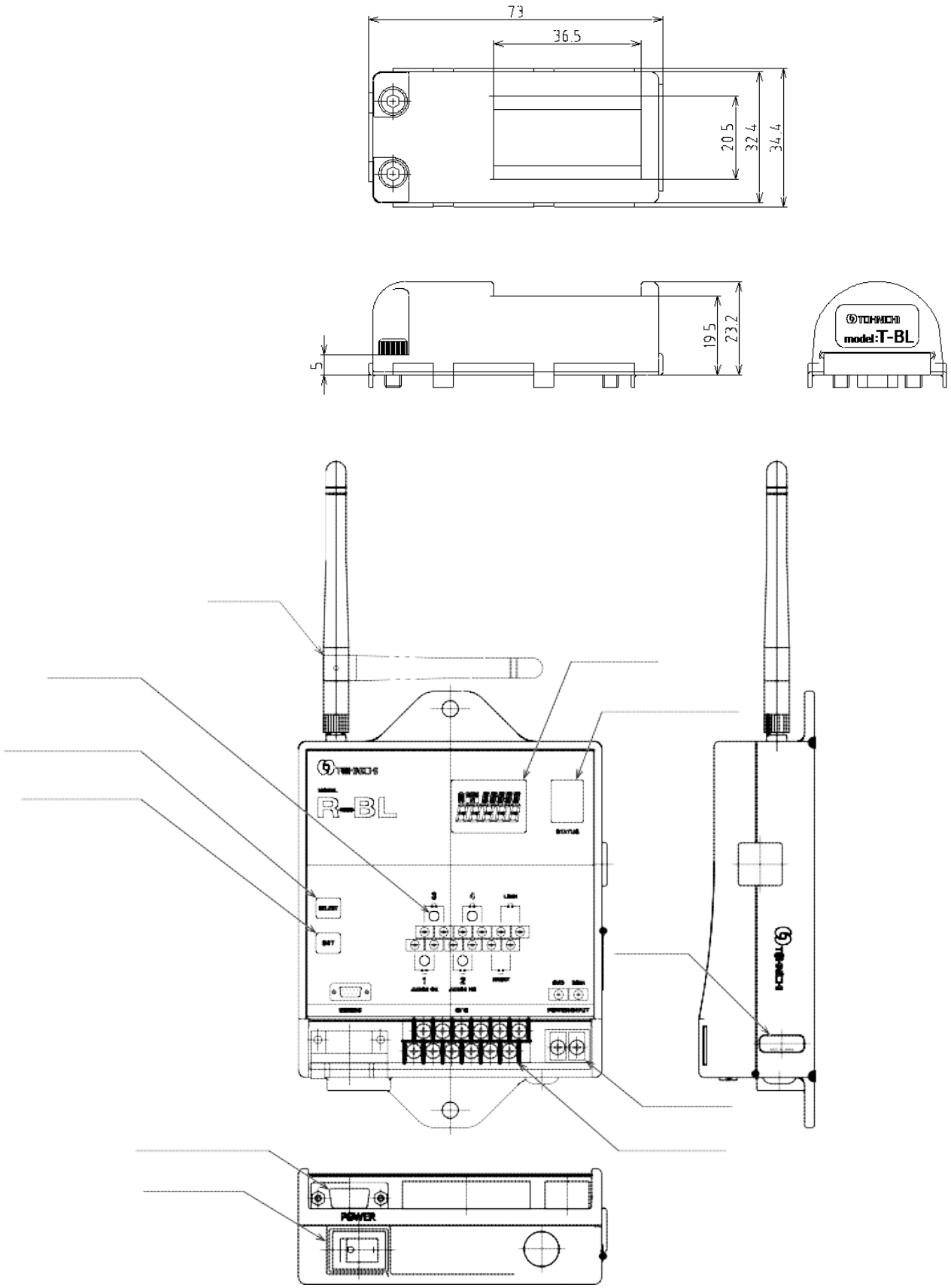


5-2 BLA, US model

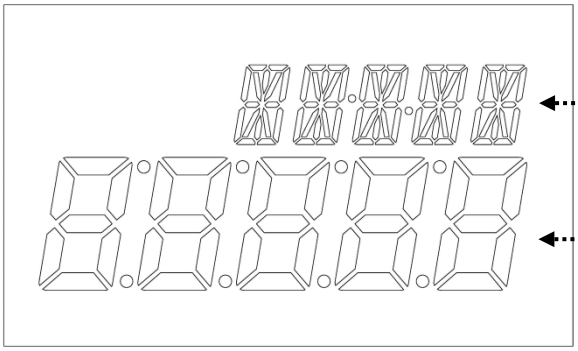




5-3 BL, Japan model



5-4 Receiver Display and RS232C



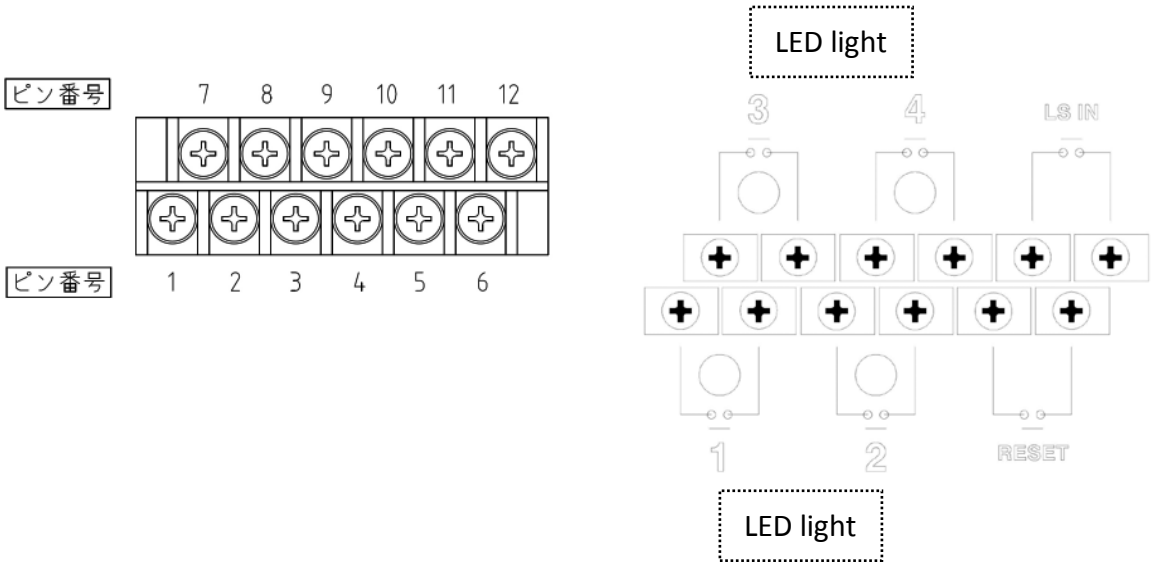
RS232C Pin Assignment

Pin Number	Signal	Description	Direction
1			
2	TXD	Transmitted Data Signal	→
3	RXD	Received Data Signal	
4			
5	GND	Ground	←
6			
7	CTS	Clear to Send Signal	←
8	RTS	Request to Send Signal	→
9			

R-BL to PC/PLC

R-BL				PC/PLC D-Sub9S		
Pin #	**Signal**	**Description**		**Pin #**	**Signal**	**Description**
1			—	1	DCD	N/A
2	TXD	Transmitted Data Signal	—	2	TXD	Transmitted Data Signal
3	RXD	Received Data Signal	—	3	RXD	Received Data Signal
4			—	4	DTR	N/A
5	GND	Ground	—	5	GND	Ground
6			—	6	DSR	N/A
7	CTS	Clear to Send Signal	—	7	CTS	Clear to Send Signal
8	RTS	Request to Send Signal	—	8	RTS	Request to Send Signal
9			—	9	NC	N/A
Frame	Shield			Frame	Shield	

5-5 Input / Output Receiver



Terminal Block

Terminal #	Description	Features
1	OUT1	Output non-voltage contact signal and LED1 is lit When receiving completion signal from BL transmitter #1. There is no polarity.
2		
3	OUT2	Output non-voltage contact signal and LED2 is lit When receiving completion signal from BL transmitter #2. There is no polarity.
4		
5	RESET	Contact terminal to reset “outputting non-voltage contact signal” and “auto-reset”. Required to input pulse, more than 0.1 second.
6		
7	OUT3	Output non-voltage contact signal and LED3 is lit When receiving completion signal from BL transmitter #3. There is no polarity.
8		
9	OUT4	Output non-voltage contact signal and LED4 is lit When receiving completion signal from BL transmitter #4. There is no polarity.
10		
11	LS IN	When BL torque wrench is down, LS torque wrench can be wired to LS-IN and COM for back-up.
12		

6 Precautions for Use

6-1 Solar Cell

- Charge the battery before first use and after long periods of nonuse.
- BL has available 3000 uses within 8 hours under 500 lux illuminance and 9.6 sec. communication cycle.
- BL can perform 300 uses on a full charge under 0 lux illuminance, No Light Conditions.
- A fully charged battery will lose power after approx. 4 days if under no light conditions, 0 lux.
- It is recommended to have sufficient light on the line/station to continually recharge the internal battery cell.
- There is no battery level indicator.
- Keep the solar panel clean. A dirty panel decreases power generation efficiency.
- Do not use a solvent such as paint thinner when you clean up the solar panel.
- Recharge to full within 1 and half years even if you do not use BL to prevent the battery from dying.

Table 1. Measure of the solar cell charging time

Illuminance lux	Activity	Charging time for available one use	Charging time for fully charge
200	-	Approx. 3 min.	Approx. 144 hours
500	Standard factory	Approx. 1.5 min.	Approx. 72 hours
1000	Under 60 to 70 cm of fluorescent light, 30W	Approx. 44 sec.	Approx. 35 hours
2000	Under 40 cm of fluorescent light, 30W	Approx. 22 sec.	Approx. 17 hours

1 Above table is an estimate only. It is when BL is being charged under continuous light conditions.

2 BL charges as you are using it, therefore it is not a requirement for to have a fully charged battery before use.

Table 2. Measure of illuminance by the available uses

Illuminance lux	No pre-charge		30 min. pre-charge		1 hour pre-charge	
	Available Uses	Communication Cycle /s	Available Uses	Communication Cycle/s	Available Uses	Communication Cycle/s
200	1500	19.2	1594	18.1	1688	17.1
500	3000	9.6	3188	9.0	3375	8.5
1000	6140	4.7	6524	4.4	6908	4.2
2000	12278	2.3	13045	2.2	13813	2.1

3 Available uses means when BLA is charged under continuous light under each level of illuminance, lux.

4 "No pre-charge" not include the time of available one use on Table 1.

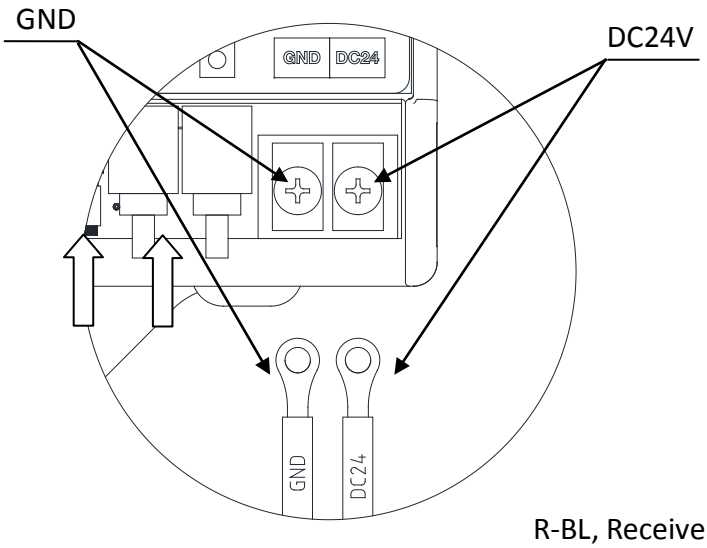
5 "Communication cycle" means 8 hours, 28,800 sec. divided by available uses.

6-2 R-BL, Receiver

a Power Source

Use the Receiver R-BLA within the range of DC24V.

- Make sure to connect DC24V and GND to respective terminal.
- The tightening torque of the terminal block is T=50cN.m.



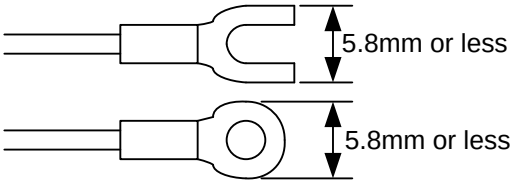
R-BL, Receiver

b Operating environment

- Use the device in an environment where no metal structure exits nearby wherever possible.
- Do not set the antenna for the receiver close to any metal pole, wire or iron pipe. The BL receiver antenna is arranged parallel to pipes, the communication status may be worsened.
- Do not use the device around welding machines, electric discharge machines or any machine producing electromagnetic noise such as PC.

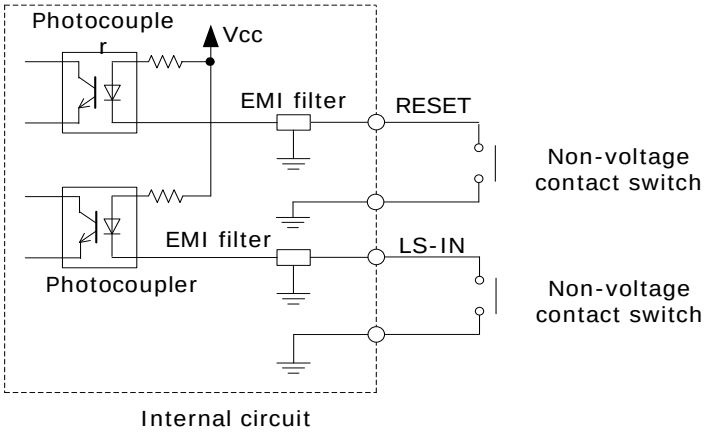
c Connection with other equipment

- Before wiring, check that the power of the device to be connected with the receiver is in the OFF position.
- Use a solder-less terminal of the size as shown below.
- The tightening torque of the terminal block screw is T=50cN.m.

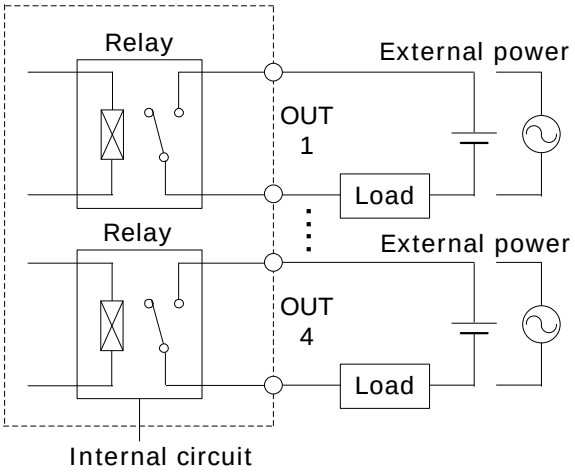


d Connecting “RESET” and “LS IN”

- If you would like to connect to the "RESET" and "LS IN" terminal please use a non-contact voltage switch. Example, LS torque wrench, relay, etc.
- Do not feed the external power to input circuit to prevent damage.



e Relay output from OUT1, OUT2, OUT3 and OUT4.

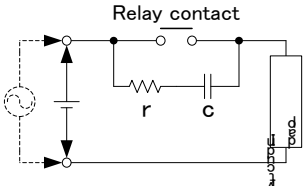
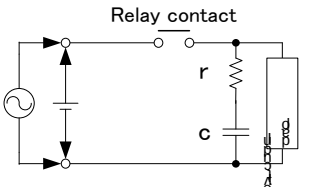
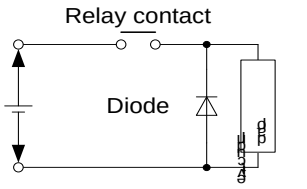


Set the load of the contact output within the rated load. Relay output rating: DC30V 1A, AC125V 0.5A. The above rated contact capacity is according to resistance load. Some kinds of loads have a big difference between the steady-state current and the inrush current. Typical loads and inrush currents are as follows:

Kind of Load	Inrush Current
Resistive Load	1 time as large as the steady-state current
Solenoid Load	10 to 20 times as large as the steady-state current
Motor Load	5 to 10 times as large as the steady-state current
Incahdescent Lamp	10 to 15 times as large as the steady-state current
Mecury Vapor Lamp	About 3 times as large as the steady-state current
Sodium Vapor Lamp	1 to 3 times as large as the steady-state current
Capacitor Load	20 to 40 times as large as the steady-state current
Trans Load	5 to 15 times as large as the steady-state current

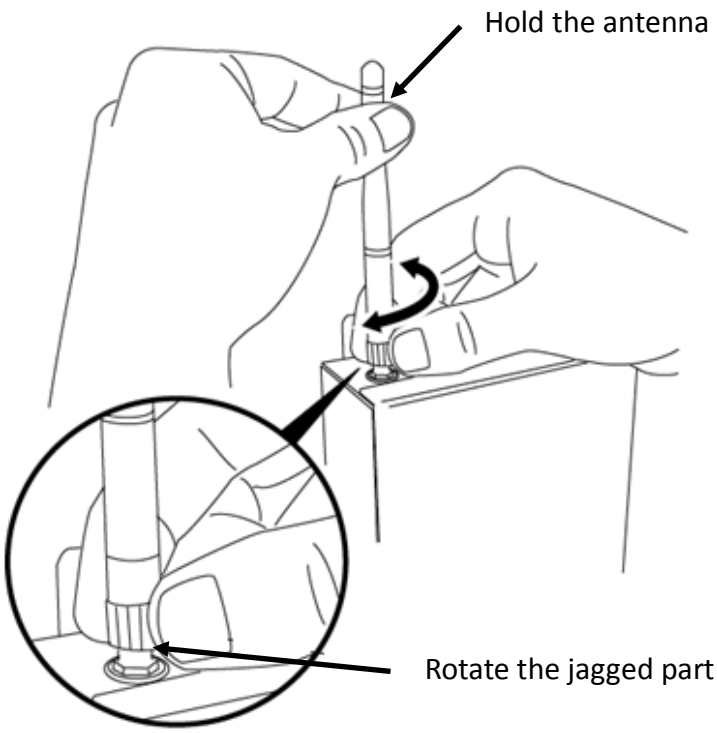
f Contact Protection Circuit

When the inductive load is opened or closed, a counter-electromotive voltage is generated and causes a heavy damage to the contact, resulting in a significant shortening of operating life. Therefore, a contact protection circuit is required. The examples of contact protection circuits are as shown in the table below.

	Circuit example	Applicability AC	Applicability DC	Features/others	Selection of element
CR type		※ △	○	If this circuit is used for timer loads, leakage current flowing through cr cause faulty operation. *If used with AC voltage, impedance of the load should be	The standard c and r are as follows: c : 0.5 to 1 (μF) per contact current (1A) r : 0.5 to 1(Ω) per contact vaolage (1V) The above values vary depending on the property of load or variations in relay characteristic. Considering that the capacitor "c" has the effect of controlling the discharge when the contactes are open and the resistor "r" plays the role fo controlling the current at the next power-on, check through experiments is required. Normally, use a capacitor with a
		○	○	If the load is a relay or solenoid, the reset time is delayed. It is effective to connect between the loads when the power supply voltage is 24 or 48V and to connect between the contacts when the power supply voltage is 100 to 200V	
Diode type		×	○	Energy stored in the coil is discharged to the coil by flow of current by the diode connected in parallel to the load and is consumed by joule heat of the resistance of the inductive	Use a diode with a peak inverse voltage 10 times higher than the circuit voltage and a forward current as high as or higher than the load current. In an electronic circuit where the circuit voltage is not so high, a diode with a peak inverse voltage about 2 to 3 times higher

6-3 BL Antenna

Refer to below drawing when mounting or dismounting an antenna on R-BL receiver. Do not turn antenna itself. Hold the antenna and turn the notched end of the antenna.



6-4 Error on R-BL receiver

When following Error codes are indicated on R-BL receiver, cancel each error condition.

Code	Description	Solution
ERR6	Flow Control Error	CTS, Clear to Send signal is undetected. Make sure CTS/RTS flow control. Check if the connector cable is properly connected.
ERR8	Memory Abnormality	Memory data is defected. Reset all. Contact Tohnichi for repairing.
ERR13	Overlapping	The ID has been registered to a different output already. Remove it and register again.

6-5 RS232C

	Description	Factory Default
Baud Rate	Selectable 2400/4800/9600/19200/38400/115200bps	115200bps
Parity	Selectable None/Even/Odd	None
Data Length	Selectable 7 or 8 bit	8bit
Stop Bit	Selectable 1 or 2 bit	1bit
Flow Control	Selectable ON/OFF, CTS-RTS	off

Output Format, non registered ID

R	E	,	*	*	*	*	*	*	*	*	CR	LF

Output Format, registered OUT1 to 4

R	E	,	*	*	*	*	*	*	*	*	,	O	U	T	*	CR	LF

Output Format, registered RS1 to 6

R	E	,	*	*	*	*	*	*	*	*	,	R	S	*	CR	LF

Output Format when input LS-IN

R	E	CR	LF

Reset Command Format

A	T	1	3	0	CR	LF

Input Contact terminal to reset “outputting non-voltage contact signal” and “auto-reset”.

7 Setting Receiver

7-1 Setting Receiver

As a default setting, BL Receiver receives all signals of BL Transmitter, T-BLA to R-BLA, T-BLE to R-BLE and T-BL to R-BL. Refer to 7-2, Setting Procedure. ID registered receiver does not receive any other ID signal. Up to 10 Transmitters can be registered to one receiver. Total 4 IDs output as non-voltage contact signal and RS232C output. Other 6 IDs output through RS232C only.

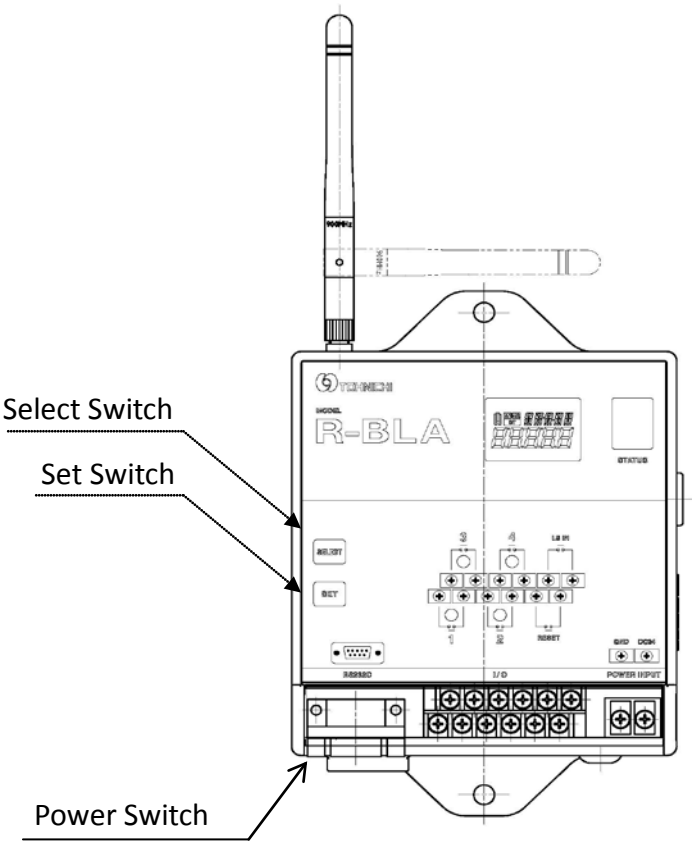
OUT1 to OUT4	Register IDs on OUT1 to OUT4 OUT1 to OUT4 outputs ID through contact output and RS232C.
RS1 to RS6	Register IDs on RS1 to RS6 RS1 to RS6 outputs ID through RS232C
Flow Control	Select ON/OFF of CTS, RTS control
Baud Rate	Select one from 2400, 4800, 9600, 19200, 38400, and 115200bps
Parity	Select one from NONE, ODD, and EVEN
Data Length	Select one between 7 and 8bit
Stop Bit	Select one between 1 and 2bit
Buzzer Sound	Select ON/OFF of buzzer sound
Auto Reset Timer	Select between 0.0~9.9 seconds Since R-BL does not receive any signal during the auto reset process, this function also can be used as double count prevention

Auto reset function will be disabled if set as 0.0 second. In this case, reset can be done only through reset input or through reset command.

Factory Default

Item	OUT1 to OUT4	RS1 To RS6	Flow Control	Baud Rate	Parity	Data Length	Stop Bit	Buzzer	Auto Reset Timer
Status			Off	115200bps	NONE	8bit	1bit	ON	0.1 Sec

7-2 Setting Procedure

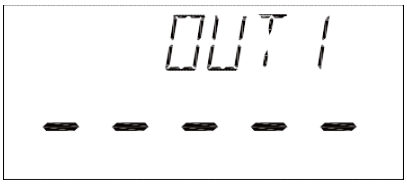


Turn on the power switch while pressing SET key to start mode setting.

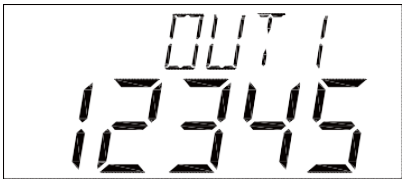
Status lamp flashes red and blue when you are in Mode Setting.

In Mode Setting, select BL preference by press “SET” key, from OUT1 to the End.
OUT1-OUT2-OUT3-OUT4-RS1-RS2-RS3-RS4-RS5-RS6-Flow-Baud-Parity-Length-Stop-Buzz-Auto-End

Setting OUT1 to OUT4



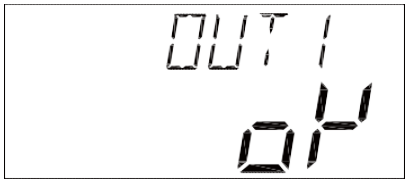
“ - - - - -“ is displayed on status screen when no tool is registered.

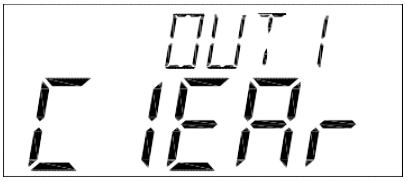


Registered 8 digit number of Transmitter ID is displayed.

Press The “SELECT” key to choose between “ENTRY”or “CLEAR”. Select “ENTRY” by pressing the “SET” key. “READY” appears on screen. Status lamp blinks in red.

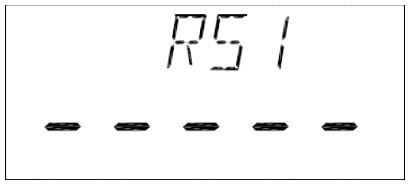
Operate BL transmitter and the receiver receives ID. The registered ID number is displayed on status screen.



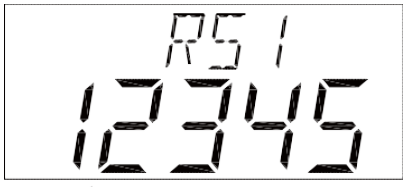


To cancel any registered ID, press SELECT key and choose “CLEAR” and press the SET key.

Setting RS1 to S6



Press “SET” key to register the next tool.



After making a selection, press the “SET” key to go to the next screen.

Setting Flow Control

Press SELECT key to select ON/OFF of Flow Control.

Setting Baud Rate

Press SELECT key to select a Baud Rate from 2400, 4800, 9600, 19200, 38400, and 115200bps.

Setting Parity

Press SELECT key to select parity from NONE, ODD, and EVEN.

Setting Data Length

Press SELECT key to select data length between 7 and 8 bit.

Setting Stop Bit

Press SELECT key to select stop bit between1 and 2 bit.

Setting Buzzer Sound

Press SELECT key to select buzzer sound ON/OFF.

Setting Auto Reset Timer

SELECT key to increase number. Press SET key to move digit or end setting. Set 0.0 to 9.9 seconds.

END Process

This is the end of settings. Restart the receiver.

8 Mounting Method of BL transmitter onto LS torque wrench

Preparation

LS torque wrench

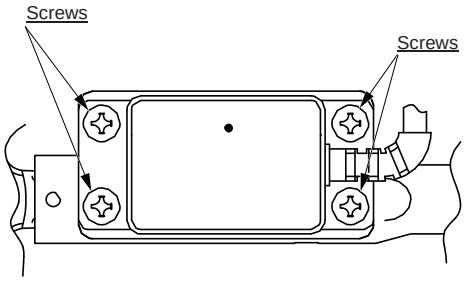
T-BL / T-BLA / T-BLE transmitter

Torque drivers 25 and 150 cN.m
e.g. RTD120CN for 25cN.m and RTD500CN for 150cN.m

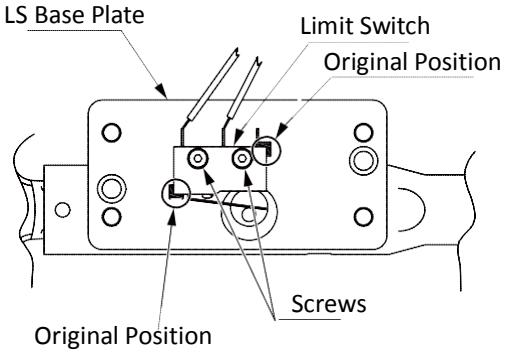
Hex. Bit w1.5, w3

Minus bit

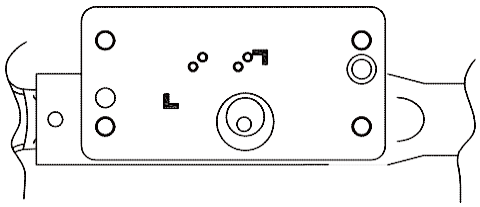
Philip Driver



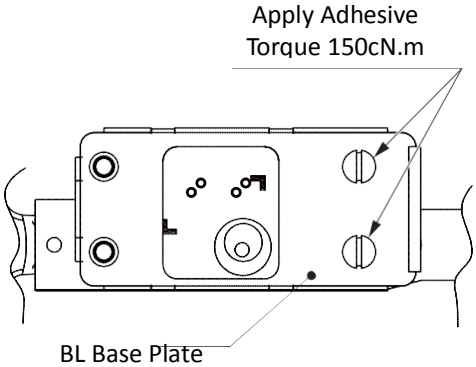
Loosen 4 screws of LS top cover.



Mark LS position on LS base to make sure the original position, and loosen two screws of limit switch.

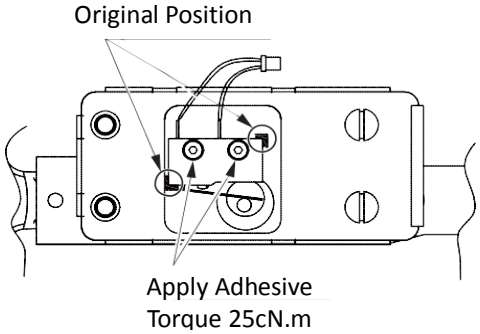


Remove LS Switch



Put attached BL base plate onto LS base. Apply adhesive and tighten with 150cN.m.

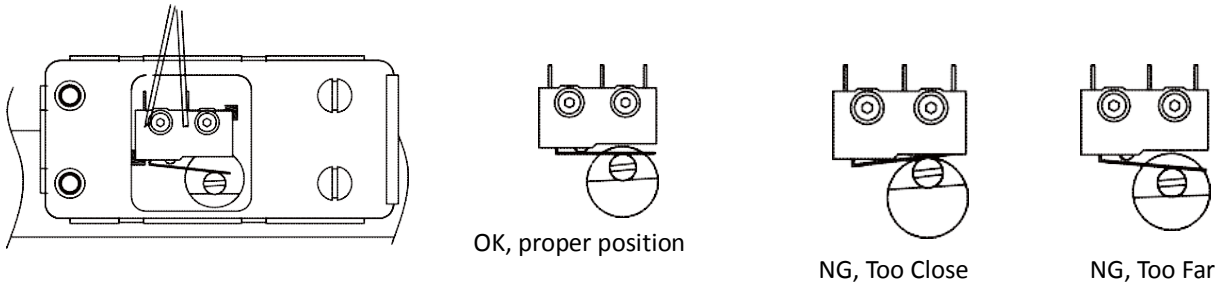
Recommended: Three Bond TB1324



Set attached LS switch on the predetermined position. Apply adhesive and tighten with 25cN.m. There is a tiny washer for each screw.

Recommended: Three Bond TB1324
Do not pull cables strongly. It may cause short cut.

After all set, make sure the LS switch position when torque wrench operated.



Connect the coupler and put BL transmitter onto the torque wrench. Hook on jaw and tighten two screws to 150cN.m. Recommended: Three Bond TB1324

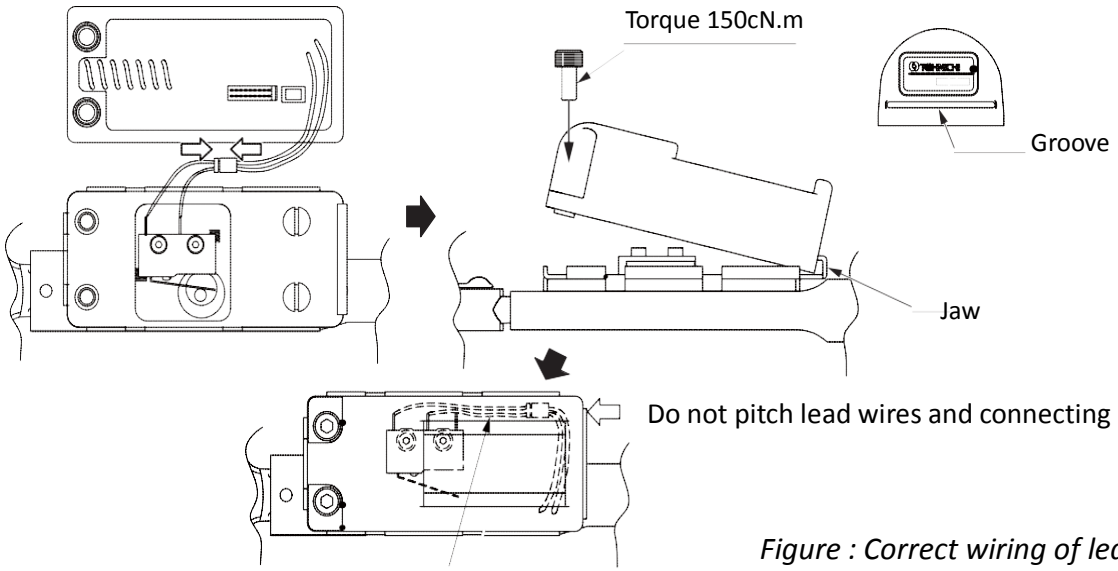
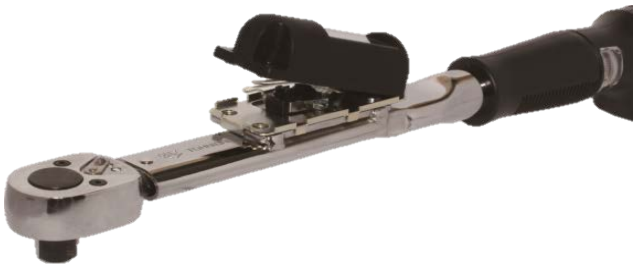


Figure : Correct wiring of lead cable

Please perform transmitting test after finishing. If transmission error happens during test, make sure LS switch position is correct. Check LS lever switch position when torque wrench clicks. If further problem, contact Tohnichi.



9 Troubleshooting

Phenomenon	Causes	Solutions
Decreasing number of transmissions	Solar panel is dirty.	Remove dirt. Do not use thinner.
No signal to BL Receiver	No Battery Power.	Charge battery. Refer to Page 10.
	The transmitter ID is not registered on the receiver.	Refer to 7-2.
	Transmitter switch malfunction	Ask Tohnichi for Repair
	Auto-Reset Timer as 0.0 second.	Reset “Auto-Reset Timer” from terminal block. Otherwise, adjust “Auto-Reset” Time.
Short Distance	Installation Environment	Improve the reception performance by relocating receiver.
	Obstacles	Improve the reception performance by relocating receiver.
	Radio Wave Environment	Improve the reception performance by relocating receiver.
	Antenna	Confirm whether the appropriate antenna is attached. Check for damage.

10 Option

BL-PCV

Protective cover for BL, BLA and BLE transmitters.

11 Regulations

Remote control devices, transmitter and receiver meet each requirement for certification.

BLA

For US

T-BLA, Transmitter module	FCC ID：SZV-STM332U
R-BLA, Transceiver module	FCC ID：SZV-STM300U

For Canada

T-BLA, Transmitter module	IC：5713A-STM332U
R-BLA, Transmitter module	IC：5713A-STM300U

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution:

Any changes or modifications not expressly approved by the party responsible for product compliance could void the user's authority to operate the equipment. To comply with FCC RF exposure compliance requirements, this device must not be co-located or operating in conjunction with any other antenna or transmitter.

For R-BLA RF TRANSCEIVER

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Canada Regulatory Compliance Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numériqué de ia classe B est conformé à la norma NMB-003 du Canada.

For Customers in Canada

This device complies with RSS 210 of Industry Canada (IC).

Operation is subject to the following two conditions:

(1) this device may not cause interference, and

(2) this device must accept any interference, including interference that may cause undesired operation of this device.

L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes:

(1) il ne doit pas produire de brouillage et

(2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

Exposure to radio frequency radiation

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada's website at www.hc-sc.gc.ca/rpb.

BLE

For Europe

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Distributed by N.V. Tohnichi Europe S.A.
Industrieweg 27, Boortmeerbeek, B-3190, Belgium

Product **T-BLE, RF Transmitter**

Standards	R&TTE Directive	EN 301 489-3 v1.6.1 EN 301 489-1 v1.9.2 EN 60950-1: 2006 + Amd. 11: 2009 + Amd.1: 2010 + Amd. 12: 2011 + Amd.2: 2013
Test Report	1044769S-A and 1044769S-C	

R-BLE, RF Receiver

Standards	R&TTE Directive	EN 301 489-3 v1.6.1 EN 301 489-1 v1.9.2 EN 55022: 2010 Class B EN 61000-3-2: 2014 EN 61000-3-3:2013 EN 55024: 2010 EN 60950-1: 2006 + Amd. 11: 2009 + Amd.1: 2010 + Amd. 12: 2011 + Amd.2: 2013
Test Report	1044769S-A, 1044769S-B and 1044769S-D	

The product conformity with EMC Directive 89/336/EEC as amended by 92/31/EEC and 93/68/EEC, based on test results using harmonized standards in accordance with Article10(1) of the Directive.

For China

In accordance with the provisions on the Radio Regulations of the People's Republic of China, the following radio transmission equipment, after examination, conforms to the provisions with its CMIIT ID: 2016DJ2948

Equipment Name	T-BLE
Frequency Range	868.3Mhz

Your Torque Partner
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