SHOCK RELAY

TSB50
TSB151 TSB152
TSB151W TSB152W

INSTRUCTION MANUAL

⚠CAUTION

- Make sure you read this instruction manual thoroughly before installing, wiring, operating and inspection this SHOCK RELAY.
- Please make sure that this instruction manual accompanies the SHOCK RELAY to the end user.
- Keep this instruction manual in order not to lose so that it will always be available for the duration of the SHOCK RELAY's operation life.
- Product specifications are subject to change for improvement without notice.

TSUBAKIMOTO CHAIN CO.

2017.10.1

GENERAL

This instruction manual explains the installation and adjustment of the Shock Relay.

PRIOR TO INSTLLATION, PLESE READ THIS MANUAL COMPLETELY.

Please attach this instruction manual when you ship your equipment to end users.

SHOCK RELAY PROTECTS YOUR MACHINERY AND EQUIPMENT FROM COSTLY DOWNTIME.

Unexpected shocks and/or overloads may damage machanical elements of your machinery. This leads to high maintenance and repair expenses in addition to costly downtime.

The SHOCK RELAY is an extremely reliable electronic device for protection of machinery and equipment from damaging overloads. While conventional mechanical safety devices, such as shear pins or torque limiters provide limited control, the SHOCK RELAY delivers total protection and accuracy.

SHOCK RELAY "W" is a safety device that not only protects machines from overload but also from unexpected light load or no load operation.

As a protection device for machines / in which there is danger of damage due to a light load or an unexpected no load, or for machines in which it is necessary to swiftly detect broken chains, gears and belts / the "w" type in the best there is.

Features

- Simple variable adjustment of both LOAD and TIME sequence.
- Adjustable Start Time Delay.
- Suitable for single or three phase A.C. motor, of which the current closely follows the motor output torque.
- No mechanical connection needed.
- Easy wiring your existing control panel may be used.
- High maintenance.
- Extremely accurate and reliable.
- Protect machies from overload and underload. (TSB151W, TSB152W)
- Labor and energy saving.

Item	TSUBAKI SHOCK RELAY	SHEAR PIN
stability of function	excellent	poor
accuracy of function	excellent	unsatisfactory
case of setting	simple	difficult
fine adjustment	yes	no
reset	only push the "reset" button	considerable time and labor is required
selection	simple	new design for each application required
life cycle	long	short
threshold point	low	high

Proper adjustment is necessary to ensure satisfactory operation of the SHOCK RELAY.

PRIOR TO WIRING AND OPERATION, PLEASE READ THIS MANUAL COMPLETELY.

SPECIFICATIONS

TYPE TSB151·TSB152·TSB151W·TSB152W Specification.

ACTUAL LOAD METER

Actual current of the motor is indicated in percentages, which makes it easier to set "LOAD CURRENT" regardless of the value of the actual current load.

LOAD CURRENT

To preset the load current at the optimum setting in the range from 30% to 130% of the motor's rated current. When the actual load current exceeds the preset current and the preset SHOCK TIME, the SHOCK RELAY trips to break the motor circuit Audible alarm devices or warning lamps may be installed if desired. The LOAD CURRENT should be preset by observing the ACTUAL LOAD METER condition because the motor generally runs under its rated current value.

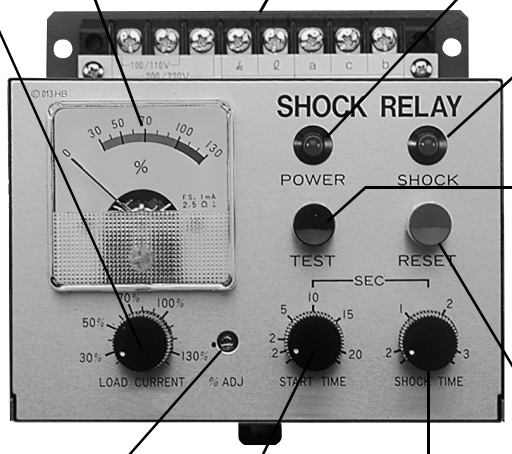
TSB151W and 152W have both UPPER LOAD CURRENT and LOWER LOAD CURRENT dials.

FINE ADJUSTMENT

Adjustment is preset at factory. When fine adjustment of actual load current is needed, this may be used to adjust from -5% to +30% of the indicated meter value.

START TIME

When starting a motor, the starting current value is greater than the rated current. This starting current value continues until the motor reaches normal speed. During this starting period which mainly depends on the type of load the function of detecting the overload current is disabled. Adjustable range is from 0.2 to 20 sec.



TERMINALS FOR CONNECTION

All terminals are located on the upper surface to provide easy access.

POWER INDICATOR

Indicates that the power supply is on.

TRIP INDICATOR

Lamp comes on when SHOCK RELAY trips.

TEST BUTTON

This switch is used to verify SHOCK RELAY operation

TSB151W and 152W have a test switch both for upper and lower limits.

RESET BUTTON (Manual)

Reset can be made quickly whenever restart is desired.

SHOCK TIME

This presets the overload period. Range is variable from 0.2 to 3 sec.

Every momentary load over the preset current with shorter period than the preset is ignored. When the overload equals the preset period, SHOCK RELAY will trip immediately to break the power supply to motor.

TYPE TSB50·TSB50D Specifications

The SHOCK RELAY TSB50 is specially designed for OEM use. It is compact in size, reliable and economical.

ON INDICATOR

Lamp cames on after completion of the fixed 3 sec start-up time.

LOAD CURRENT

Adjustable range is from 50% to 130%

SHOCK TIME

Adjustable range is from 0.3 to 3 seconds.

Since the TSB50 are provided with an "Automatic Reset", a "Self-Holding" circuit may be added at your end if necessary.

SPECIFICATIONS

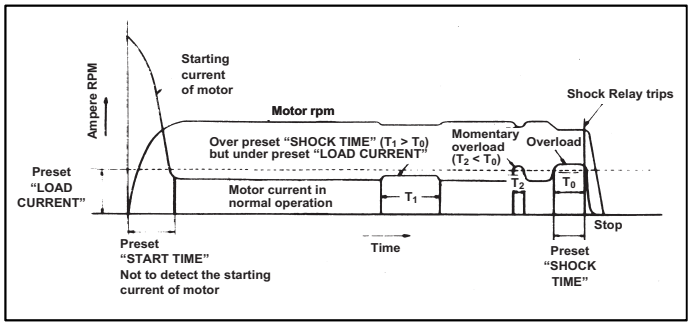
		TSB50	TSB151	TSB151W	TSB152	TSB152W
MOTOR AMPS		UP to 16A		17A to 300A		
START TIME DELAY		3 s (fixed)	0.2 to 20 s			
SHOCK TIME DELAY		0.3 to 3 s	0.2 to 3 s			
Load Current Setting (Upper/Overload)		50% to 130% of rated current	30% to 130% of rated current			
Load Current Setting (Lower/Underload)		—		30 – 130% of rated current	—	30 – 130% of rated current
INPUT VOLTAGE FOR OPERATION		115V 50/60Hz, 120V 50/60Hz, 100 – 110V 50/60Hz 230V 50/60Hz, 240V 50/60Hz, 200 – 220V 50/60Hz				
INPUT CURRENT		5mA at CT secondary			5A at CT secondary	
INPUT VOLTAGE		—				
OUTPUT RELAY	CAPACITY	A transfer contact 250V AC 0.1A at inductive load (Power factor 0.4)	A transfer contact 250V AC 0.2A at inductive load (Power factor 0.4)			
	MINIMUM LOAD	DC10V, 10mA	DC24V, 4mA			
TEMPERATURE		14°F to 122°F or –10°C to 50°C				
WITHSTANDING VOLTAGE		1500V AC at 60Hz between the terminal and the enclosure for one minute (Except terminals "k(+)" and "ℓ(–)" of type TSB50, TSB151, TSB151W)				

Note: For motors tha draw current outside the listed range, contact Tsubaki.

SHOCK RELAY monitors the change in motor current that closely approximates the torque output of the motor. Shoud the motor current exceed a preset LOAD CURRENT point for a preset length of SHOCK TIME (continuous overload time). SHOCK RELAY will shut down the motor power supply.

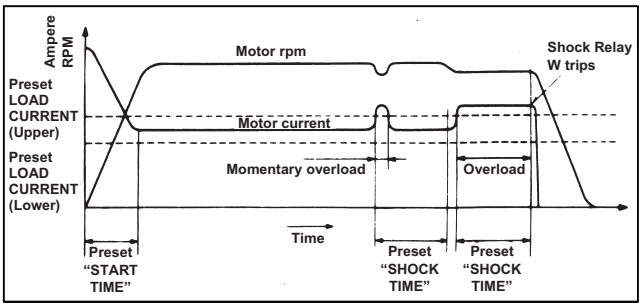
DIAGRAM OF OPERATION

- **TSB151, 152, 50**

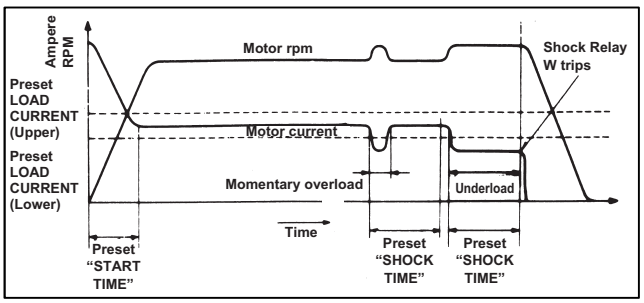


- **TSB151W, 152W**

OVERLOAD

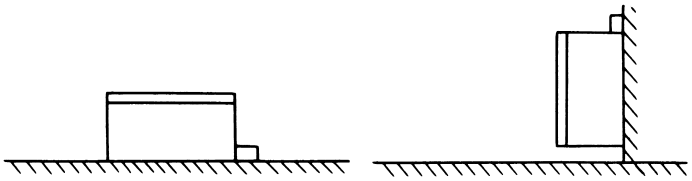


UNDERLOAD



INSTALLATION

1. The SHOCK RELAY can be mounted either horizontally or vertically



Horizontal mounting **Vertical mounting**

2. SHOCK RELAY should be mounted in a clean location with an ambient temperature from range 14°F to 122°F or –10°C to +50°C.
   The unit should not be subjected to vibration.
3. Correctly wire the two input voltage leads from the power supply to the terminals of the SHOCK RELAY.

WARNING:

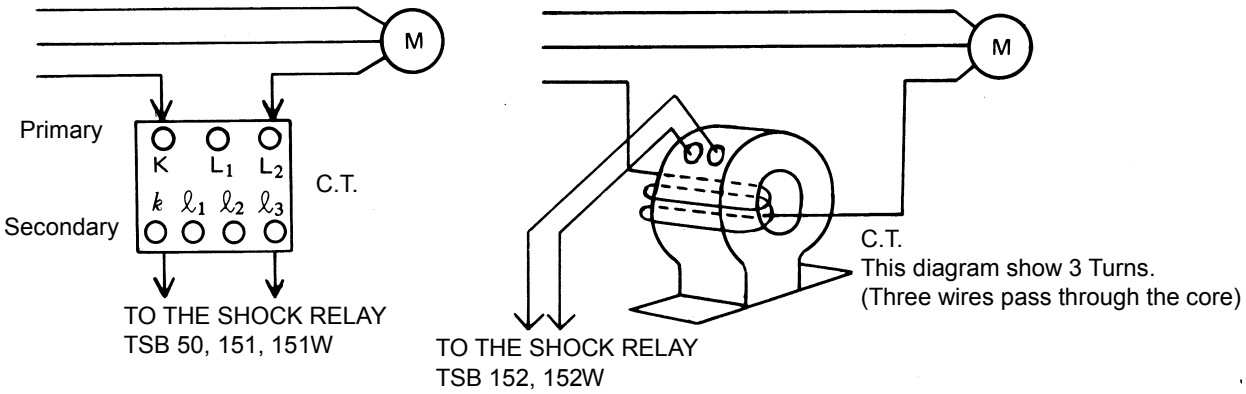
INCORRECT CONNECTION MAY CAUSE DAMAGE TO THE SHOCK RELA

4. For a high capacity motor (exceeding 300A Rated Current) or high voltage motor (over 600VAC) special CT must be used. Contact Tsubaki.
5. **If the SHOCK RELAY will be removed from service (i.e. : disconnected), also remove the current transformer from the circuit.**
6. Disconnect the SHOCK RELAY from the power supply when conducting voltage-withstand test on the control panel.
7. The SHOCK RELAY can be installed in minutes and requires no maintenance after the initial setup.

WIRING

Current Transformer (C.T.)

Connect one motor leg to the primary terminals or pass through the core as shown below. (see next procedure)



- Select the proper terminals on The C.T. or number of turn from the table based on the motor full load current. (motor rated Ampere).

Current Transformer for TSB151, TSB50 & TSB151W		
FULL-LOAD CURRENT(A)	TERMINAL	
	PRIMARY (MOTOR)	SECONDARY (SHOCK RELAY)
0.75	$K - L_2$	$\ell_1 - \ell_2$
1.0	$L_1 - L_2$	$\ell_1 - \ell_2$
1.5	$K - L_2$	$\ell_2 - \ell_3$
1.75	$K - L_2$	$k - \ell_1$
2.0	$L_1 - L_2$	$\ell_2 - \ell_3$
2.3	$L_1 - L_2$	$k - \ell_1$
2.5	$K - L_2$	$k - \ell_2$
3.0	$L_1 - L_2$	$\ell_1 - \ell_2$
3.3	$L_1 - L_2$	$k - \ell_2$
4.0	$K - L_2$	$k - \ell_3$
5.3	$L_1 - L_2$	$k - \ell_3$
6.0	$K - L_1$	$\ell_2 - \ell_3$
7.0	$K - L_1$	$k - \ell_1$
9.0	$K - L_1$	$\ell_1 - \ell_3$
10.0	$K - L_1$	$k - \ell_2$
16.0	$K - L_1$	$k - \ell_3$

FULL-LOAD CURRENT (A)	SELECTED CT	NUMBER OF TURN	FULL-LOAD CURRENT (A)	SELECTED CT	NUMBER OF TURN
20	100 AT	5	83	250 AT	3
25	100 AT	4	100	100 AT	1
30	120 AT	4	120	120 AT	1
33	100 AT	3	125	250 AT	2
37	150 AT	4	150	150 AT	1
40	120 AT	3	200	200 AT	1
50	100 AT	2	250	250 AT	1
60	120 AT	2	300	300 AT	1

When selecting Shock Relay and compatible Current Transformer, locate the closest rating in the list to actual motor full-load current.

Example of Selection

1. **For 4 Pole, 230V, ¼ HP MOTOR: RATED CURRENT 95A TSB151, TERMINAL L_1- L_2, ℓ_1 - ℓ_1**
2. **For 4 Pole, 230V, 7½ HP MOTOR: RATED CURRENT 21.5A TSB152, 100AT Current Transformer, 5 Turns**
3. **For 4 Pole 230V, 30 HP MOTOR: RATED CURRENT 75.6A TSB152, 150AT Current Transformer, 2 Turns**

For more than 600V AC, a high voltage type Current Transformer is required and available on request. Contact Tsubaki.

Current Transformer for TSB152 & TSB152W

WIRING

NOTE: USE THE CORRECT OPERATING INPUT VOLTAGE OF THE PURCHASED UNIT, 115/230V IS SHOWN IN THIS MANUAL AS A TYPICAL EXAMPLE.

Terminal connection

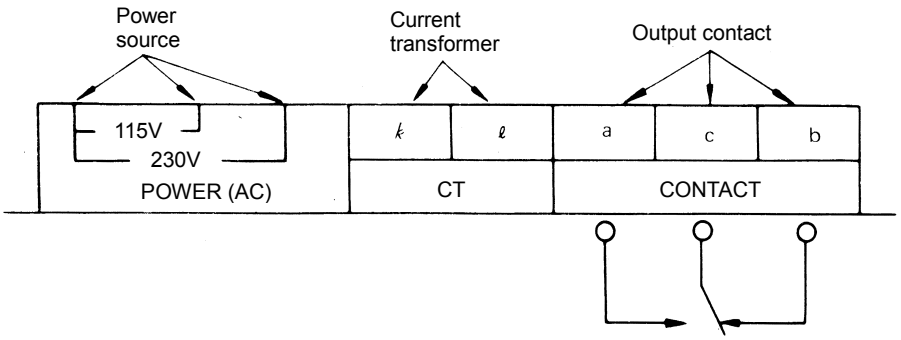
Connecting terminals are located on the SHOCK RELAY and are for “POWER”, “CT” and “CONTACT” from left to right.

POWER: Terminal for power supply.
In case of AC230V, connect the leads to 230V terminals.
In case of AC115V, connect the leads to terminals indicated 115V.

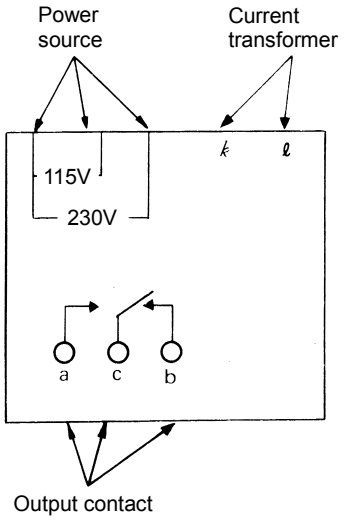
CT: Terminal for the current transformer. Connect the terminals “k” and “ℓ” of the current transformer to the terminals “k” and “ℓ” of the SHOCK RELAY.

CONTACT: Terminal for output contact.
“c” is for common contact, “a” is for normally open contact and “b” is for normally closed contact.

TSB151, TSB152, TSB151W, TSB152W



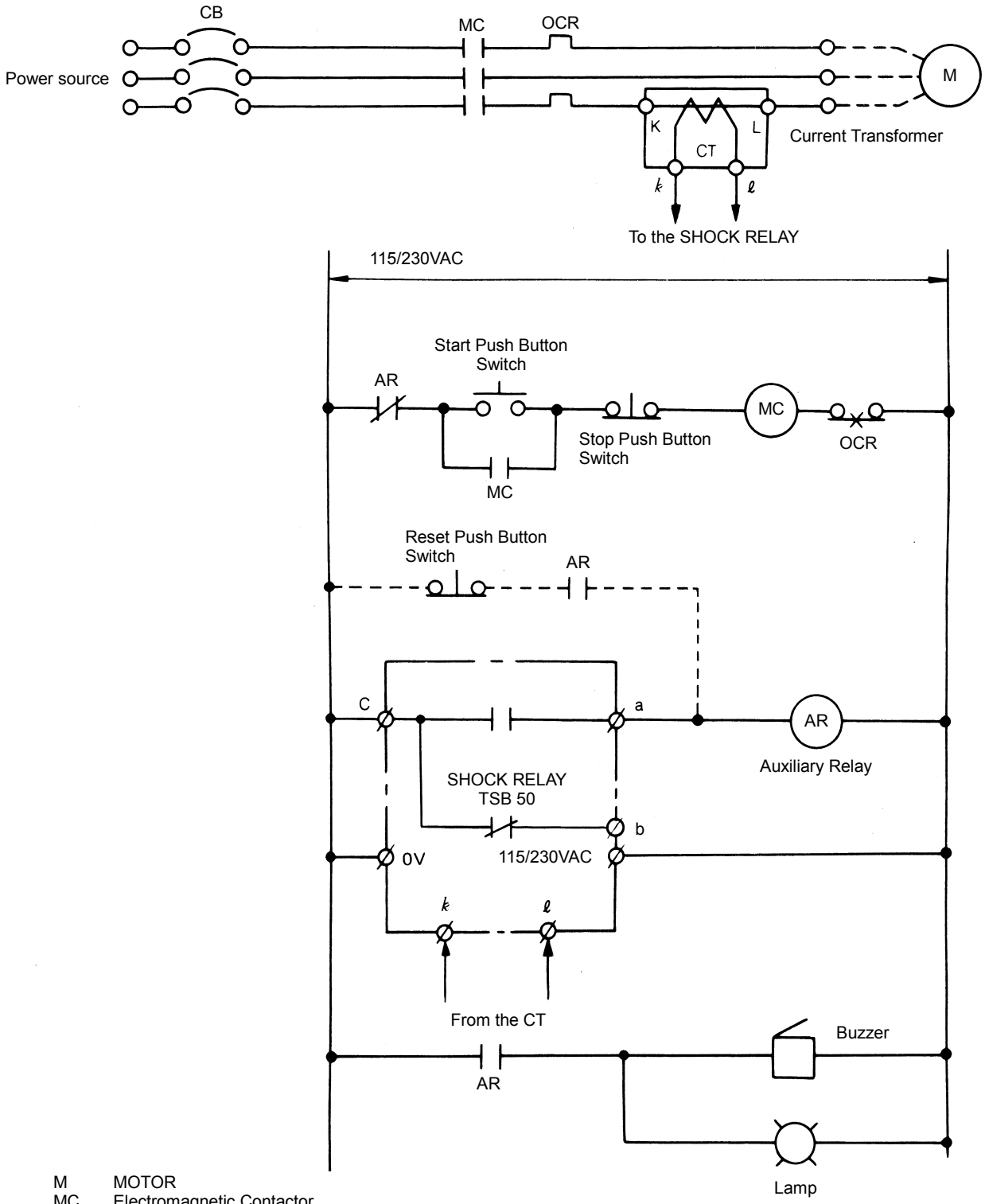
TSB50



WIRING

CAUTION: If starter (MC) coil current exceeds the SHOCK RELAY output contact value of 0.2 Amps. (TSB151 & TSB152, TSB151W, TSB152W) or 0.1 Amps. (TSB50) an auxiliary (AR) must be installed to prevent damage to SHOCK RELAY contact points.

Standard Connecting Diagram (TSB50)

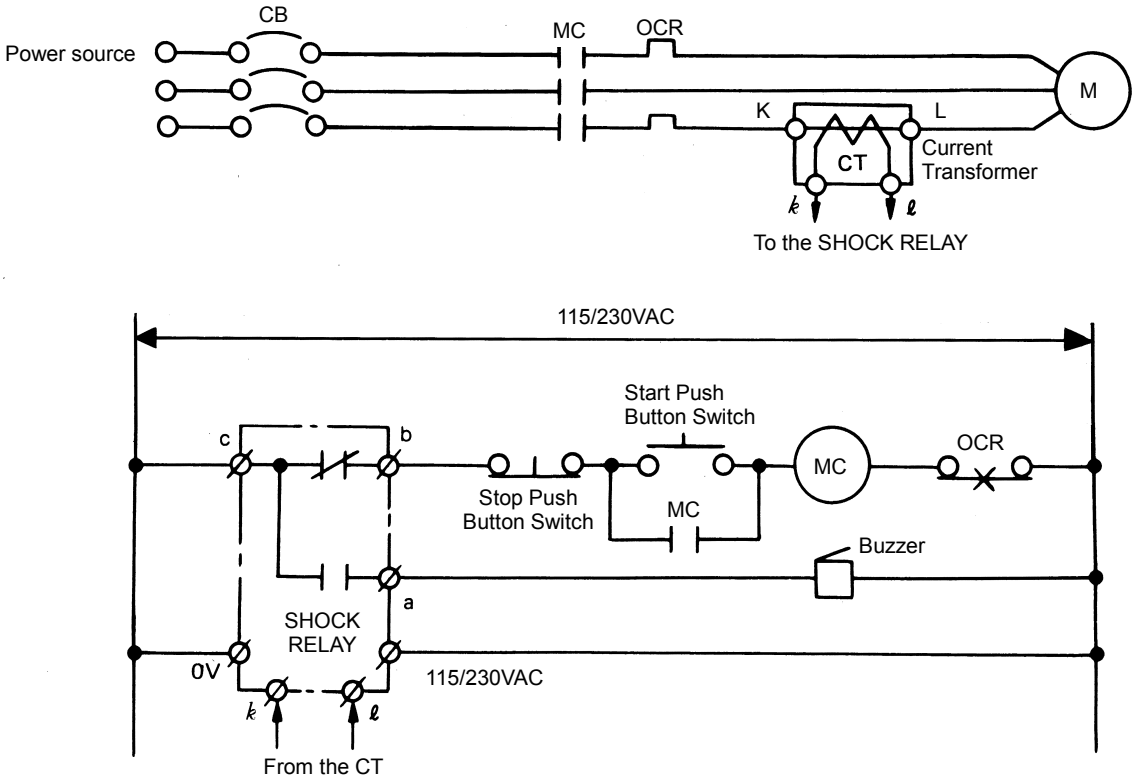


M	MOTOR
MC	Electromagnetic Contactor
OCR	Thermal Over Load Relay
CB	Circuit Breaker

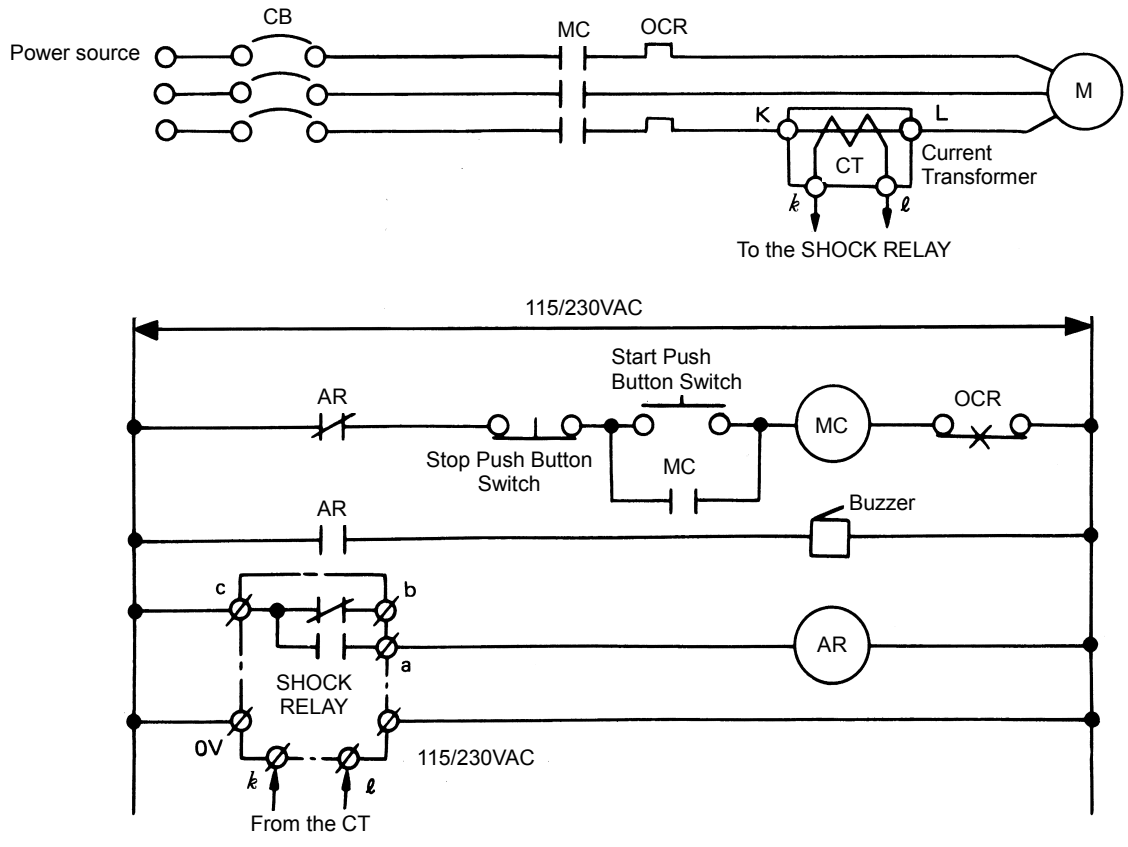
If manual reset is required,
add the circuit shown by the dotted line.

WIRING

Standard connecting diagram (TSB151, TSB152, TSB151W, TSB152W)

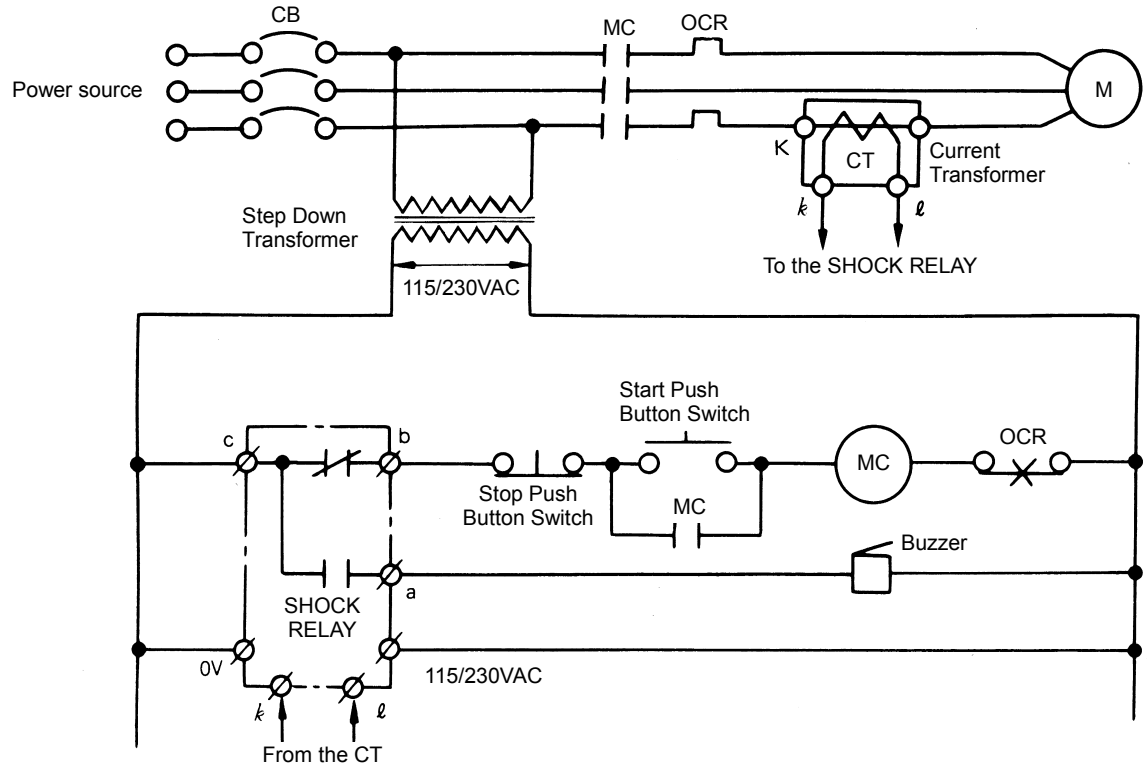


Connecting diagram for using a large capacity magnetic contactor (TSB151, TSB152, TSB151W, TSB152W)

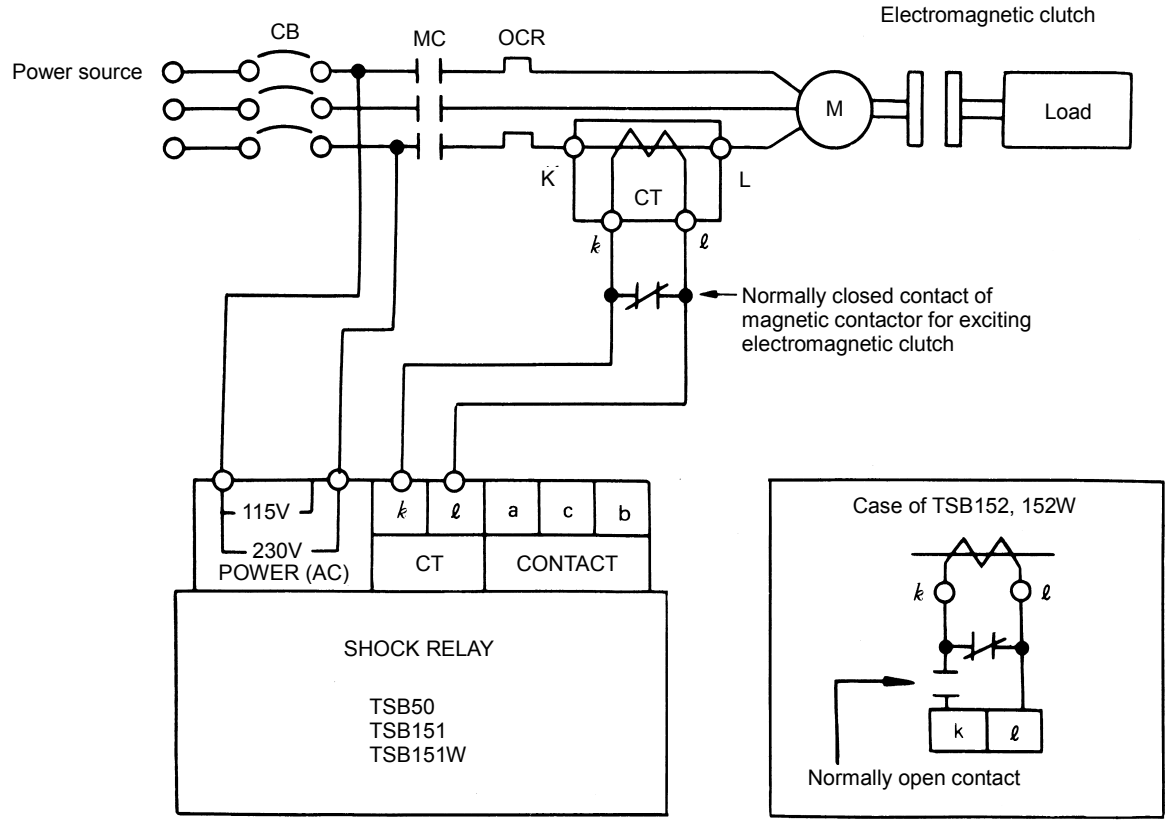


WIRING

Connecting diagram example for power source other than 115V and 230V (TSB151, TSB152, TSB151W, TSB152W)

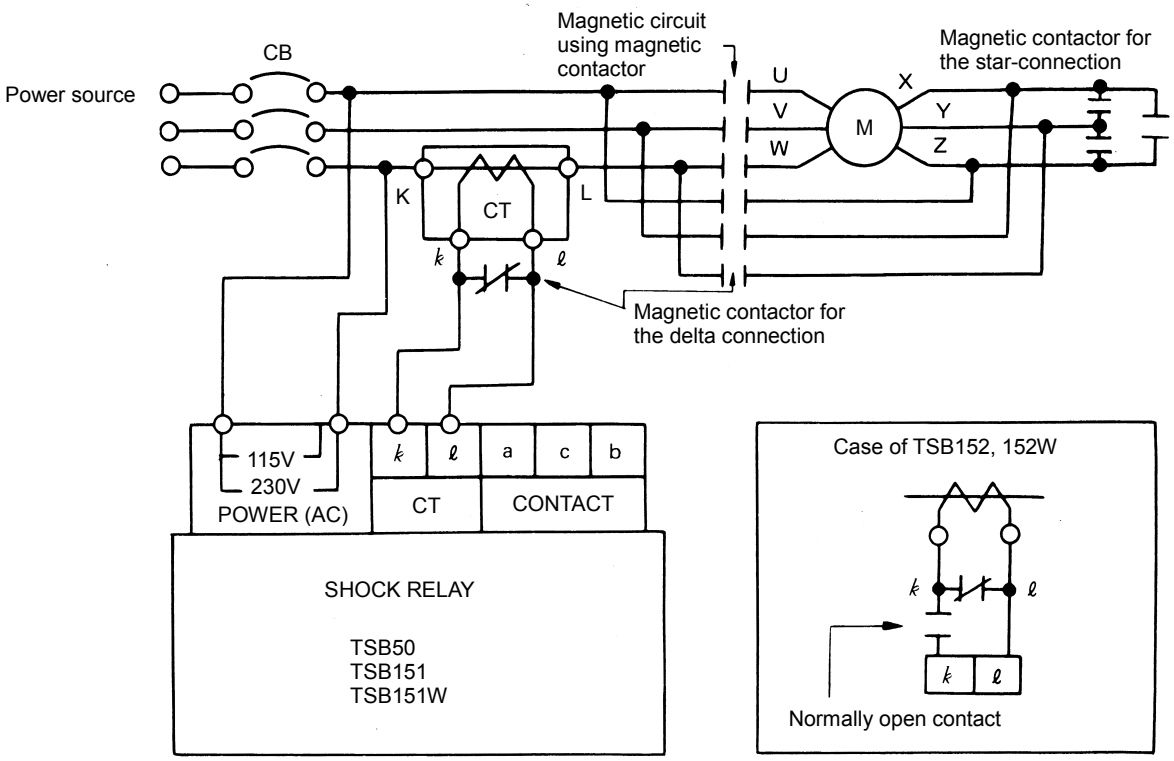


Connecting diagram with the electromagnetic clutch (example)

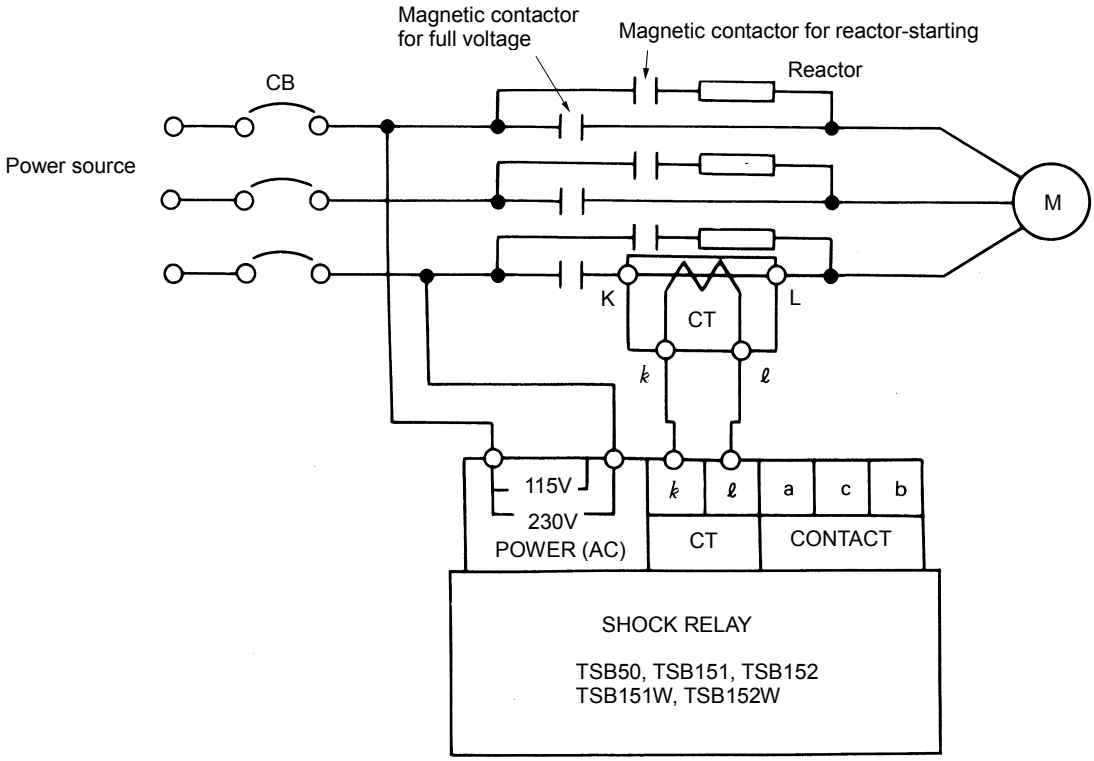


WIRING

Connecting diagram for star-delta starting (example)

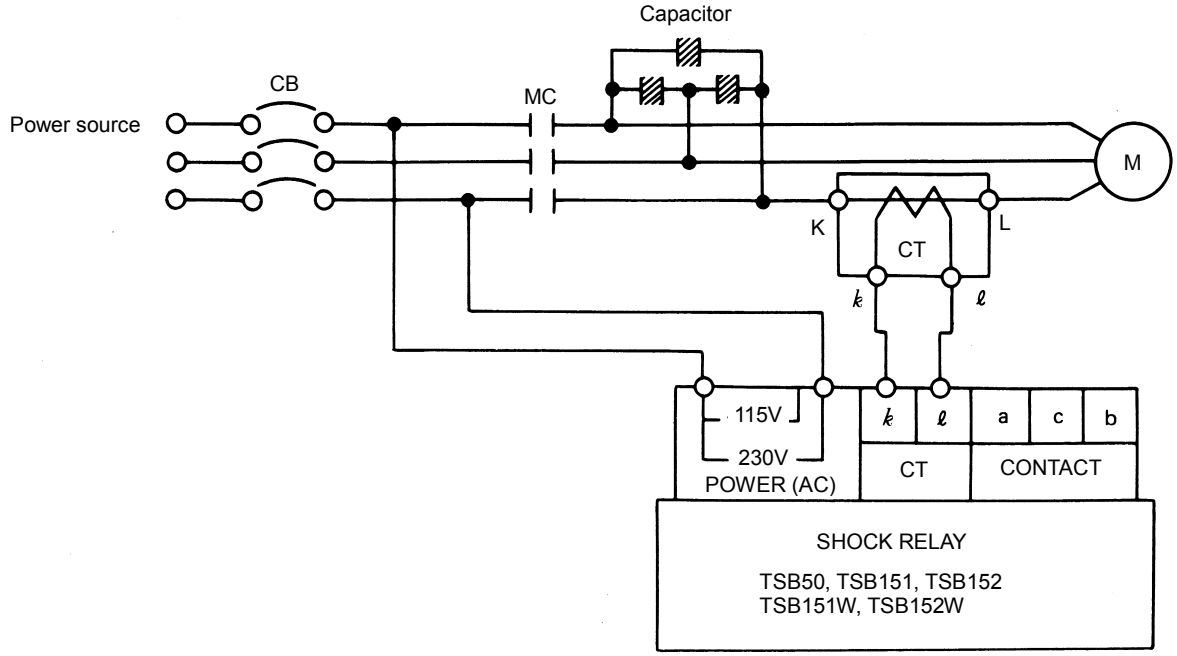


Connecting diagram for the reactor-starting (example)

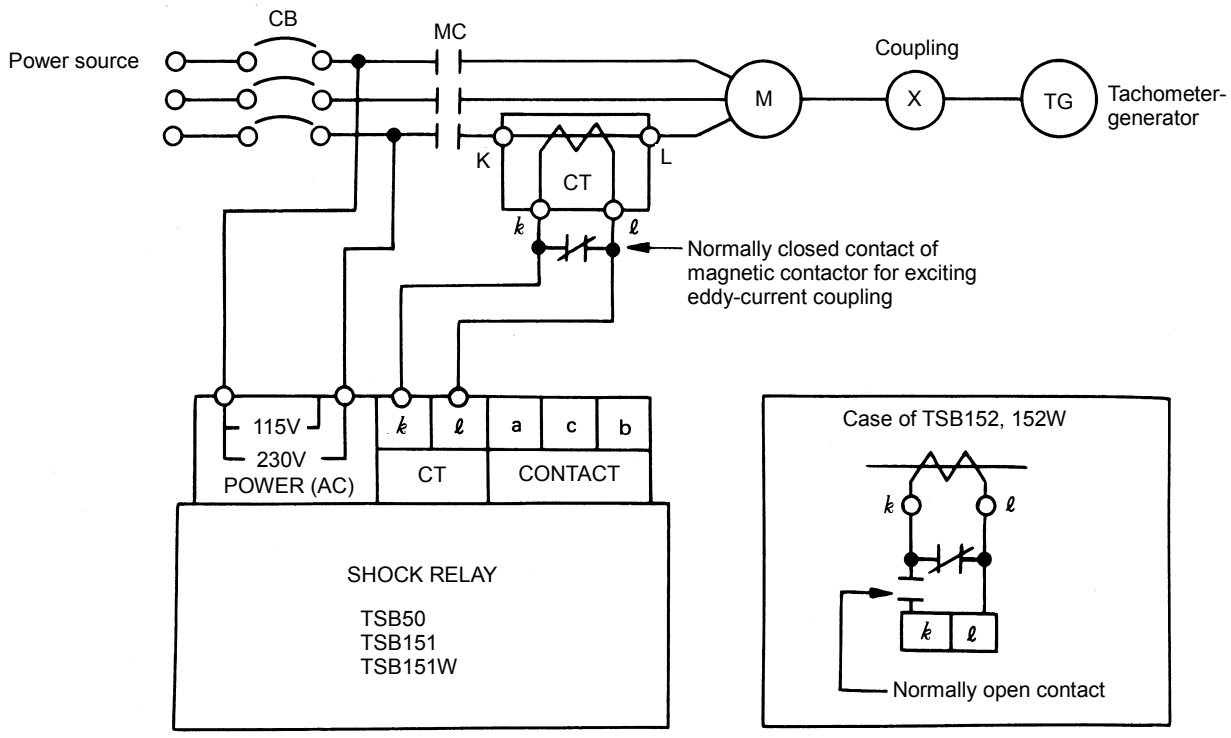


WIRING

Connecting diagram with the power factor compensation capacitor (example)



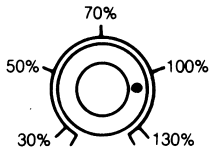
Connecting diagram with eddy-current coupling motor (example)



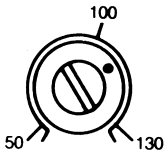
SETTING UP

Prior to operation, set the various adjustments on the SHOCK RELAY as per the following procedure.

1. Set “LOAD CURRENT” dial (TSB151 & TSB152) or “UPPER LOAD CURRENT” dial (TSB151W & TSB152W) or Screw (TSB50) to 110%



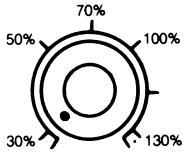
SET TO 110%



TSB151, 152
TSB151W, 152W

TSB50

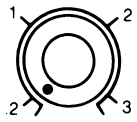
2. Set “LOWER LOAD CURRENT” dial (TSB151W & TSB152W) to 30%.



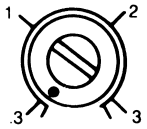
SET TO 30%

TSB151W, 152W

3. Set “SHOCK TIME” dial (TSB151, 152, 151W, 152W) or Screw (TSB50) fully counterclockwise.



SET TO MINIMUM

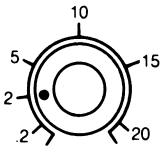


TSB151, 152
TSB151W, 152W

TSB50

4. Set “START TIME” dial (TSB151 & 152, 151W, 152W) to 2 seconds.

NOTE: TSB50 has a fixed Start Time delay of 3 sec. built-in.



SET TO 2 SECONDS

TSB151, 152
TSB151W , 152W

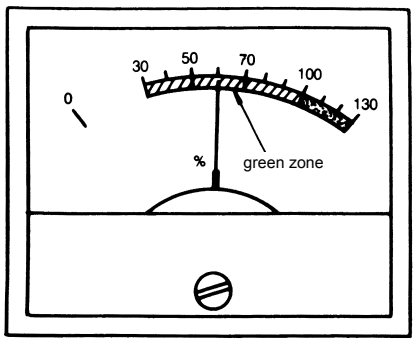
After preliminary set-up is completed, start the motor.

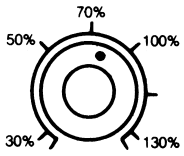
The motor will operate without activating the SHOCK RELAY, provided that the driven machine is operating under normal conditions.

Some machinery may require a longer time to reach its normal revolution.
In this case, turn the START TIME dial clockwise to a slightly higher setting and then start the motor.
Repeat this procedure till the point is found where the SHOCK RELAY will not be activated.

Load Current

Start the motor and observe that the indicator on the Actual Load Meter is in the green zone.
The load current dial (or screw for TSB50) must be set at a point which is 10 to 30% higher than the actual current value (%).
If the load current dial is set below actual current value (%). THE SHOCK RELAY will be activated and thus stop the motor.

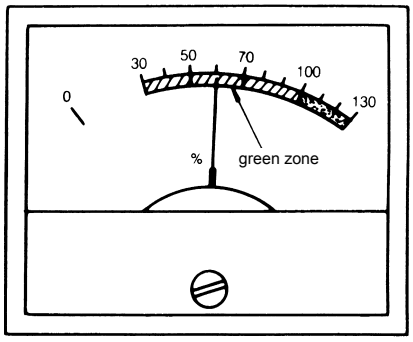


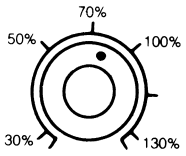


SETTING UP

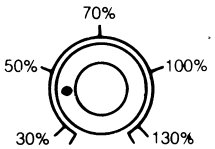
FOR TSB151W, TSB152W

The upper load current knob must be set at a point which is higher than the actual current value (%) and the lower load current dial must be set at a point which is lower than the actual current value (%).
If the upper load current dial is set below the actual current value (%), or the lower load current dial is set above the actual current value (%), the SHOCK RELAY will be activated and thus stop the motor.





Upper load current dial

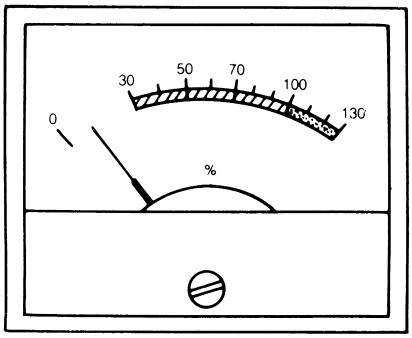


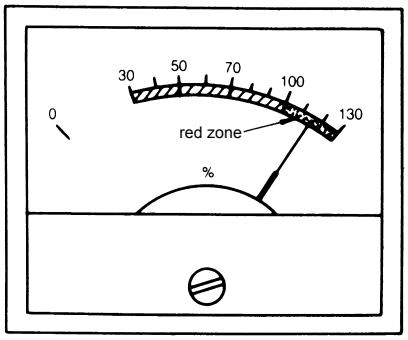
Lower load current dial

For correct operation the LOAD CURRENT dials must be set above the minimum value :

TSB50 > 50%
TSB151, TSB152, TSB151W, TSB152W > 30%

If the actual LOAD CURRENT is above the 100% setting, please recheck the Current Transformer selection and wiring is correct.





TROUBLE SHOOTING

The SHOCK RELAY becomes activated before the motor has reached its normal operating condition :

a) Check that the operating voltage and connections are correct.

b) Check that the START TIME adjustment is longer than the start-up time of the motor (TSB151, TSB152,TSB151W, TSB152W)

NOTE : It is desirable for the START TIME setting to be at the minimum acceptable level.

The SHOCK RELAY becomes activated during operation without the load side showing any abnormality :

a) Check that the load side shows any abnormality.
Check visually and measure the load current.

b) Check to see if the current transformer selection and wiring is correct.

c) Check that the LOAD CURRENT setting is higher than the actual load current.

NOTE : It is desirable for the LOAD CURRENT setting to be made at its minimum level.

d) Check that the SHOCK TIME adjustment is longer than the normal fluctuation of the load current

NOTE : It is desirable for the SHOCK TIME setting to be at its minimum acceptable level.

Routine Inspection

a) Check that all connections and mounting points of the SHOCK RELAY and current transformer are in a secure and safe condition.

b) Priodically check that the SHOCK RELAY can be activated by lowering the LOAD CURRENT and SHOCK TIME settings.

c) Please do periodical test every half year.
Regarding TSB50, please decrease setted load current value and start time when testing
Regarding TSB151, 152, 151W and 152W, please push the test button when testing.

Guarantee.

Range of guarantee

With regard to any troubles happened to our products, replacement or repair of such troubled parts will be Provided for free of charge during the effective period of guarantee, provided that installation and maintenance/management of said products have been performed properly pursuant to the description of this instruction manual and said products have been used under the condition described in the brochures or agreed separately through mutual consultations. The content of guarantee is limited only to the Shock Relay itself delivered to you and the judgment thereof will be made by our selection because such judgment pertaining to the range of guarantee is often complex. Items falling under any of the following points shall be excluded from our guarantee;

1. when used under other conditions than the same described in the brochures or agreed separately,
2. when any failure is found in the installation , wiring or coupling with other equipment,
3. in case either the customer or supplier has altered the structure of our products by undertaking remodeling, etc.,
4. in case the product is repaired by other facility than our company or our designated factory,
5. in case the customer's maintenance /management has been insufficient and operational environment is not appropriate,
6. when damaged by such unavoidable situations as an act of God or disaster,
7. when our product has suffered from secondary damage owing to the failure of customer's equipment,
8. when damaged owing to the parts which were supplied by the customer and built-in our product, or the Parts Which were designated by the customer and used in our product, or
9. when any damage other than the above has been caused bv reason we shall not be held

Guarantee period

The guarantee period shall be either 18 months after shipment from our factory or 12 months after starting operation, whichever is shorter. Any and all inspection/repair undertaken by us after the above guarantee period has passed will be charged. We will be willingly accepting at cost your request for any inspection and repair arising by reasons outside our guarantee as above even during the guarantee period. Please do not hesitate to contact our dealers from whom you purchased.

Miscellaneous

(1) Any matters described in this instruction manual may be changed without notice, to which your understanding is appreciated.

(2) We have tried our best in preparing the contents of this instruction manual so that any mistakes or oversights may be minimized. Should any mistake or oversight be found, we will be more than happy if you would advice us of them.

MEMO

⚠ WARNING

USE CARE TO PREVENT ELECTRICAL SHOCK

COMPLY WITH THE FOLLOWING TO AVOID SERIOUS PERSONAL INJURY

1. Disconnect power. Always lock out power switch before installing, removing, or servicing unit. Comply with Occupational Safety and Health Standards 1910. 147 “The Control of Hazardous Energy (Lock Out/Tag Out)”.
2. Install in proper enclosure in accordance with NEMA 250-1991 “Enclosures for Electrical Equipment (1000Volts Maximum)” and NFPA496 1993 edition “Purged and Pressurized Enclosures for Electrical Equipment, 1993 Edition” When revisions of these standards are published, the updated edition shall apply.
3. Guards must be provided on all power transmission and conveyor applications in accordance with provisions of ASMEB15.1-1992 “Safety Standards for Mechanical Power Transmission Apparatus” and ASMEB201.1-1993 “Safety standard for Conveyors and Related Equipment”, or other applicable standards. When revisions of these standards are published, the updated edition shall apply.

⚠ CAUTION

- If danger is expected from your application, take the necessary steps to ensure that it operates safely.
- If your Tsubaki product does not operate normally, take care to ensure that dangerous perating conditions do not occur.
- Wear suitable clothing and protective equipment (safety glasses, gloves, safety shoes, etc.)
- Keep your work place tidy and safe to prevent secondary accidents.

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