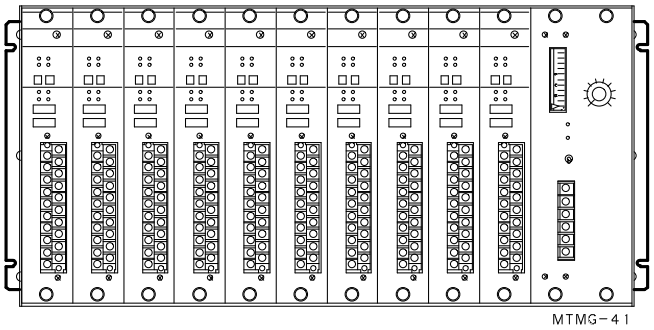
INSTRUCTION MANUAL

＊ MULTICHANNE TENSION METER ＊

Model ： MTM

（Detection card　TCM-660）



EIKO SOKKI CO., LTD.

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＊＊＊＊　INSTRUCTION MANUAL　＊＊＊＊

MULTICHANNE TENSION METER Model：MTM

（Detection card　TCM-660）

＊＊　INDEX　＊＊

1 CONSTRUCTION

This multichannel tension meter is use for tension detection in the manufacturing filmy and stringy materials. (e.g. : paper, web, rubber, film, textile, wire etc.,)
Maximum channel is 10, under illustrate show it construction.

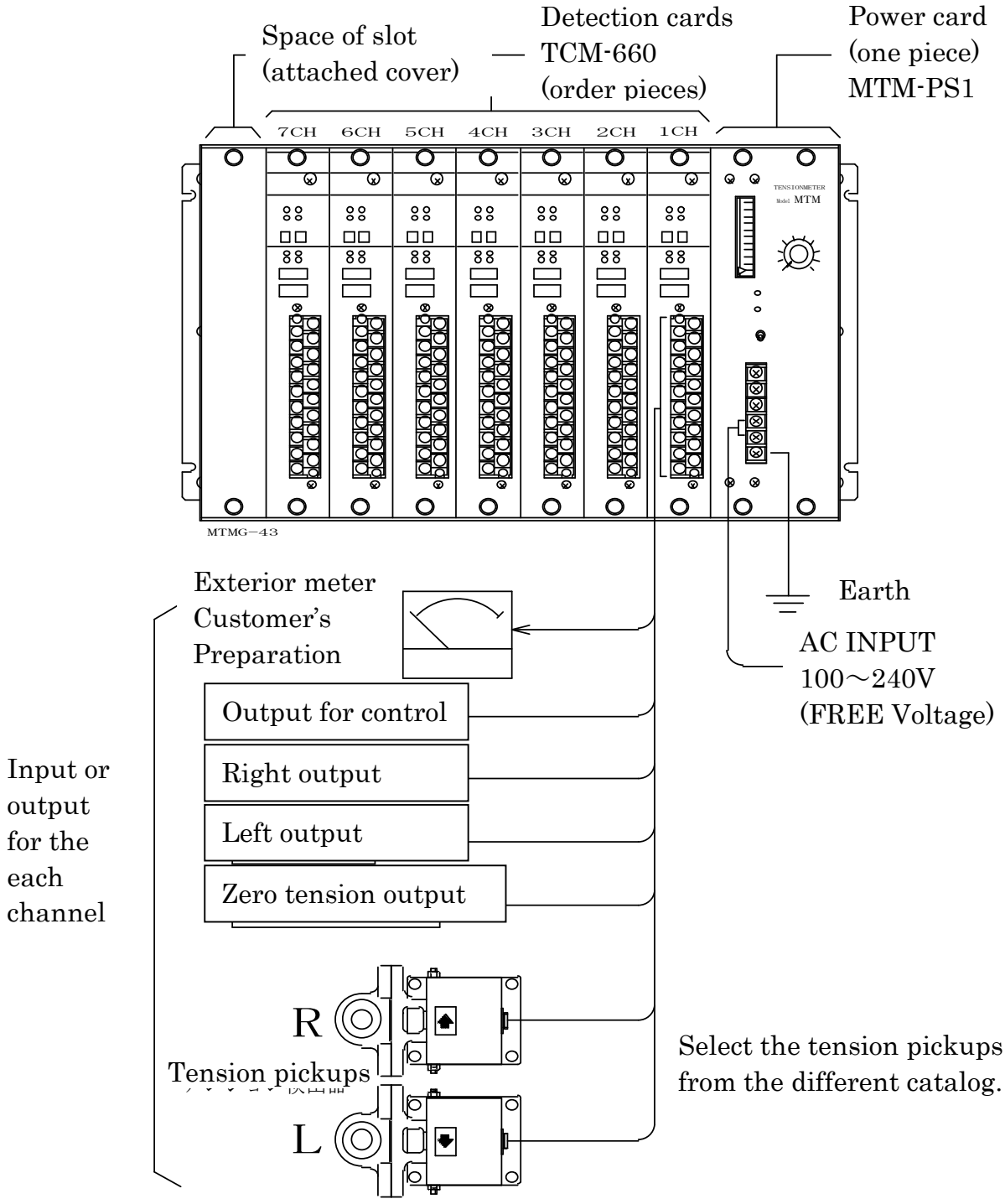


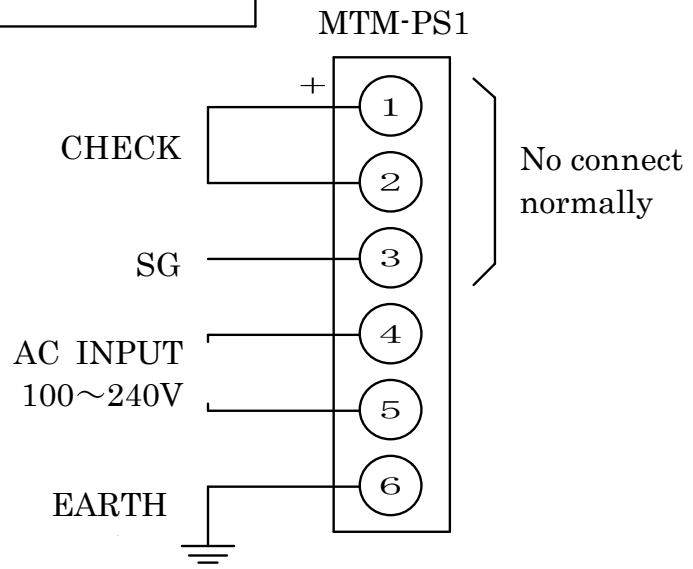
Fig1-1

(1) The detection cards of specified pieces are mounted into the slots, and indicated the capacity of tension value and the place of use on the each cards.
(2) Right side card is No.1 channel.
(3) The tension pickup of specified type are attached the each channels.
(4) The card of each channel has the exterior meter's signal and the control signal (tension signal) output.
(5) Space of slot is attached the cover.

2 WIRING

MTMG−45

Power section（MTM-PS1）

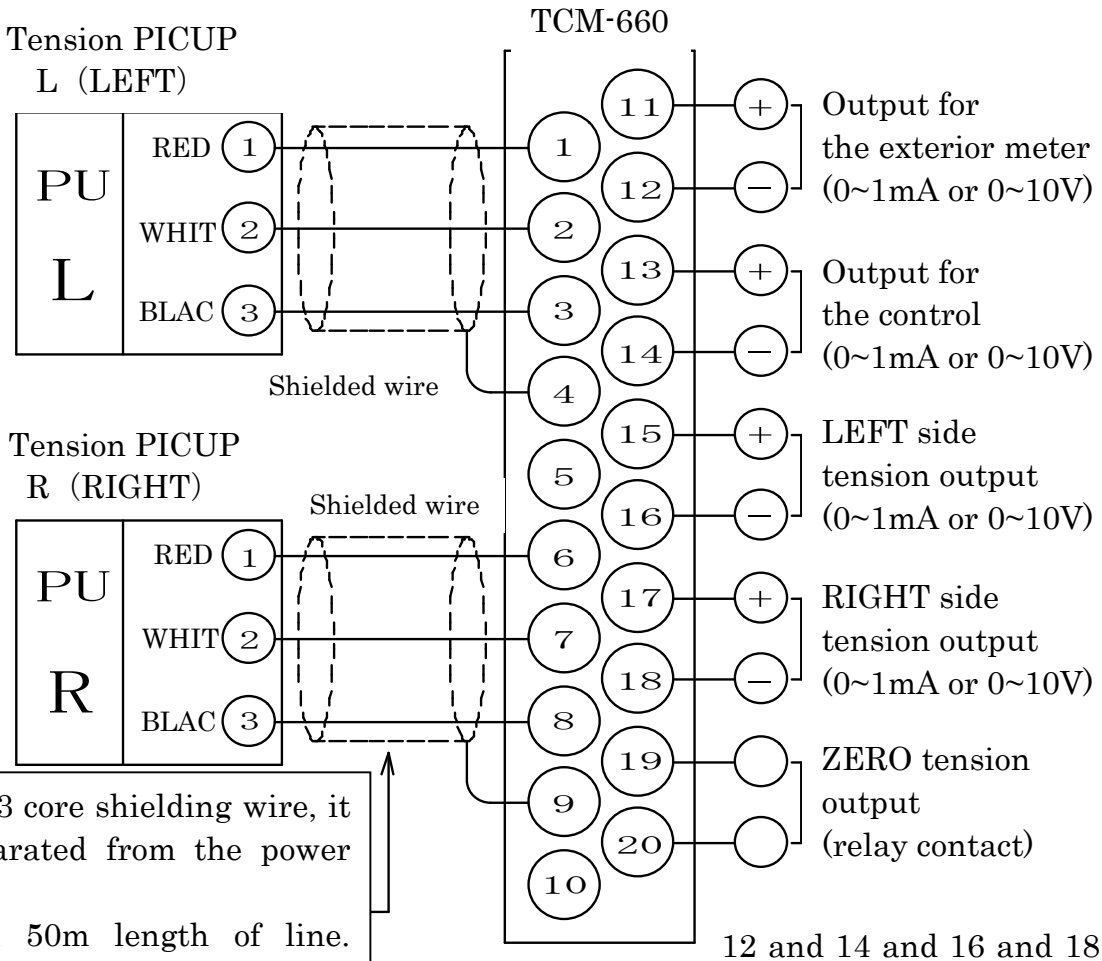


Certainly distribute the earth.

Fig2-1

Detection section（TCM-660）

Fig2-2



Using 3 core shielding wire, it is separated from the power line.
Within 50m length of line.
Over thickness of 0.75 m ㎡.

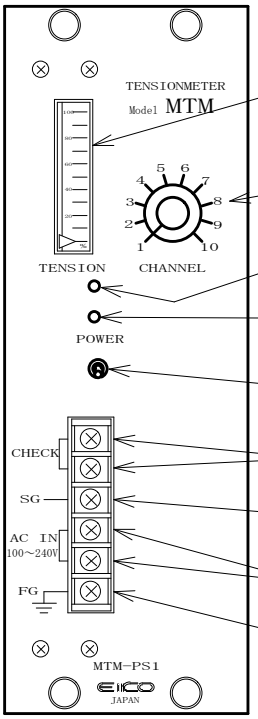
12 and 14 and 16 and 18 terminals are common in the inside.

TCM-660 the same as each channel.

3 NAMES & FUNCTIONS OF EACH SECTIONS

(1)Names

Power section MTM-PS1

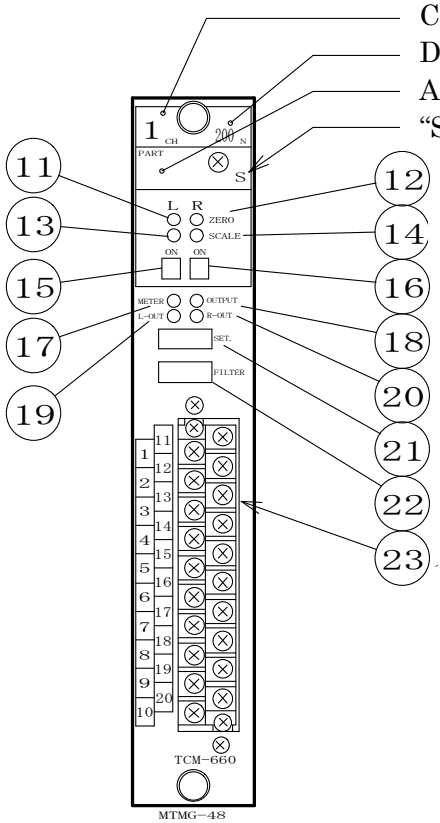


1. Tension indicator (interior meter) (0~100%) (This meter indicates tension value of selected channel by the selector switch.)
2. Selector switch
3. Fine adjustor for interior meter
4. Power LED (±15V D.C power indicator)
5. Power switch
6. Check terminals (For meter and output adjust)
7. Shielded wire grounding
8. Input terminals for power source
9. Earth terminal (power source grounding)

Fig3-1

Detection section TCM-660

Fig3-2



Channel No
Detective capacity
Application place
"S" letter means for single tension detector

11. Left side zero adjustor VR (Multirotary)
12. Right side zero adjustor VR (Multirotary)
13. Left side scale adjustor VR (Multirotary)
14. Right side scale adjustor VR (Multirotary)
15. Left side detecting ON/OFF switch
16. Right side detecting ON/OFF switch
17. External meter adjustor VR (Multirotary)
18. Control voltage adjustor VR
19. Left side control voltage adjustor VR
20. Right side control voltage adjustor VR (Multirotary)
21. Dip switch for the setting variously
22. Dip switch for the filter setting
23. External wiring terminals

(2) FUNCTION

No.	NAME	FUNCTION
①	Tension indicator	·Tension value of selected channel by ② switch, it is indicate 0 ～ 100% unit.
②	Channel select switch	·Channel select for intend to check on indicator.
③	VR for interior meter adjustor	·For ① indicator adjustor. ·No use to customer side.
④	Power LED	·Lighten at the power switch ON. ·Combine indicates ±15V DC power.
⑤	Power SW	·Power line SW.
⑥	Check terminal	·Check for the base voltage on each detection card. ·Use for adjust on external meter and controller's voltage.
⑦	Shield wire grounding	·Shield wire connected to terminals ④ and ⑨ from each detection card. These terminals not connect to another terminal usually. But if under the influence of noise, try connect to FG terminal.
⑧	Power input	·Supply 100 ～ 240V AC. ·Free voltage.
⑨	Earth terminal	·Ground the grounding.
	Channel number	·Each channel number is indicated here. ·No.1 channel is side of power source.
	Detective capacity	·Detective capacity is indicated here, it's capacity equal to the full-scale number of external tension meter.
	Using location	·If customer demanded that using location or channel number and be specify here.
	Mark "S"	·"S" letter means for single tension detector.
⑪⑫ ⑬⑭	VR for calibration	·Use for calibrate on tension pickup.
⑮⑯	ON / OFF switch	·Use for the Right or Left select switch to the tension pickup.
⑰	VR for external meter adjustor	·At the ⑥ check terminal is 5V DC, then be adjust to the external meter connected for terminals ⑪-⑫ indicate to the full scale.
⑱	VR for control signal adjustor	·At the ⑥ check terminal is 5V DC, then be adjust the output voltage on terminals ⑬-⑭ make to specific voltage. ·It was adjusted at 5V, when there was no specification.

<table>
<tr><td>⑲</td><td>VR for left side control voltage adjustor</td><td colspan="7">・It is adjusted at this volume, when it turned on only the ⑮switch, and when it made the ⑥check terminal voltage to be 2.5V at the volume of ⑪, so that the output voltage on terminals ⑮-⑯ make to specific voltage.
・It was adjusted at 5V, when there was no specification.</td></tr>
<tr><td>⑳</td><td>VR for right side control voltage adjustor</td><td colspan="7">・It is adjusted at this volume, when it turned on only the ⑯switch, and when it made the ⑥check terminal voltage to be 2.5V at the volume of ⑫, so that the output voltage on terminals ⑰-⑱ make to specific voltage.
・It was adjusted at 5V, when there was no specification.</td></tr>
<tr><td rowspan="8">□</td><td>SET. switch</td><td colspan="7">・The setting of each output.（It refers to the 8～10 page.）</td></tr>
<tr><td rowspan="7">SW3</td><td>Bit</td><td>Name</td><td>Content</td><td>ON</td><td>OFF</td><td>standard setting</td></tr>
<tr><td>1</td><td>M･V-I</td><td>External meter output current or voltage switching</td><td>Voltage</td><td>Current</td><td>OFF</td></tr>
<tr><td>2</td><td>O･V-I</td><td>Control signal output current or voltage switching</td><td>Voltage</td><td>Current</td><td>ON</td></tr>
<tr><td>3</td><td>L･V-I</td><td>Left side control output current or voltage switching</td><td>Voltage</td><td>Current</td><td>ON</td></tr>
<tr><td>4</td><td>R･V-I</td><td>Right side control output current or voltage switching</td><td>Voltage</td><td>Current</td><td>ON</td></tr>
<tr><td>5</td><td>P.U</td><td>Detection mode switching</td><td>Single</td><td>Both</td><td>OFF</td></tr>
<tr><td>6</td><td>Z-T</td><td>The zero tension output function</td><td>Use</td><td>Unused</td><td>OFF</td></tr>
<tr><td rowspan="8">□</td><td>FILTER switch</td><td colspan="7">・Filter setting..（It refers to the 8～10 page.）</td></tr>
<tr><td rowspan="7">SW3</td><td>Bit</td><td>Name</td><td>Content</td><td>ON</td><td>OFF</td><td>standard setting</td></tr>
<tr><td>1</td><td>M･FIL</td><td>External meter output filter</td><td>Use</td><td>Unused</td><td>ON</td></tr>
<tr><td>2</td><td>O･FIL</td><td>Control signal output filter</td><td>Use</td><td>Unused</td><td>OFF</td></tr>
<tr><td>3</td><td>L･FIL</td><td>Left side control output filter</td><td>Use</td><td>Unused</td><td>OFF</td></tr>
<tr><td>4</td><td>R･FIL</td><td>Right side control output filter</td><td>Use</td><td>Unused</td><td>OFF</td></tr>
<tr><td>5</td><td></td><td>No use</td><td></td><td></td><td></td></tr>
<tr><td>6</td><td></td><td>No use</td><td></td><td></td><td></td></tr>
<tr><td>□</td><td colspan="2">VR1</td><td colspan="5">・Zero tension level setting.</td><td>5%</td></tr>
<tr><td rowspan="6">Check terminal</td><td>TP1</td><td colspan="5">Left side tension reference voltage.(+2.5V/FS)</td><td></td></tr>
<tr><td>TP2</td><td colspan="5">Right side tension reference voltage.(+2.5V/FS)</td><td></td></tr>
<tr><td>TP3</td><td colspan="5">Total tension reference voltage.(+5V/FS)</td><td></td></tr>
<tr><td>TP4</td><td colspan="5">zero tension output setting voltage. (0~+5V/FS)</td><td></td></tr>
<tr><td>TPG</td><td colspan="5">Gland level.</td><td></td></tr>
<tr><td></td><td colspan="5">No use</td><td></td></tr>
</table>

4 ADJUSTMENTS

After mounted and wired to the tension pickups, and must be adjust or tune up before the machine driving. The following is method of adjusting about to the only one channel, but the other channels are same as procedure. Do begin the adjusting about ten minutes after the power switch is ON.
(Number makes are indicating each position of adjusting parts. See page 4.)

4-1. OUTPUT SETTING

The switching of a voltage output/current output is possible for each output.
It refers to the table in 7 pages, and it is set by the "SET. switch" (BIT.1~4).
Standard setting of the external meter output has been set at the current output.
A voltage output becomes the standard setting except for the external meter output.

4-2. EXTERIOR METER ADJUSTMENT

Usable exterior (tension) meter that the ammeter to range DC1mA or voltmeter to range DC10V.

(1) Using meter confirms ammeter or voltmeter.
It refers to 6~7 pages, and it is switched to voltmeter or ammeter by the SET. switch [bit 1].

□	SET. SW [bit 1]	ON	Voltmeter
		OFF	Ammeter

(2) External meter output filter use or unused switching.
The value is easy to read, when the filter is used, when meters are digital display or analog ammeter. The standard setting is filter use.

□	FILTER. SW [bit 1]	ON	filter use
		OFF	filter unused

Make the filter to be OFF, when it uses the external meter except for the meter, and when early responses are necessary.

(3) The tester is connected with check terminal ⑥ of power section (MTM-PS1)
(The terminal of the upper part is "+".)

(4) In channel select switch ②, adjusting channel is chosen.

(5) ⑮⑯ switches of adjusting channel is turned on. It is adjusted so that between check terminal may become 5.0V by the rotation of ⑪⑫zero adjustor volume.
(If set to 5V, you may turn how many which volumes.)

(6) When between check terminals is 5.0V, it adjusts by ⑰external meter adjustor volume so that external meter may become a full scale.

（External meter adjusts either a voltmeter or an ammeter by this volume volume.）

(7) When external meter does not require the accuracy of a display. When internal meter becomes a full scale (100％), you may adjust by ⑰external meter adjustor volume so that external meter may also become a full scale.
（When the ⑥ check terminal of A is 5.0V, it is adjusted and shipped so that internal meter may become a full scale. ）

(8) If adjustment of external meter is completed, please move on to control output voltage adjustment. (In the state where 5.0V was made to output to a check terminal)
When there is no necessity for change of control output voltage, please move on to 4-6. Zero adjustment

4-3. CONTROL OUTPUT VOLTAGE ADJUSTMENT (Total output)

At the tension meter point to full scale, the output signal level is changeable 0～10V DC or 0~1mA DC of range.(Standard level is 5.0V/F.S.)

(1) The channel to adjust is chosen with the changeover switch of ②.

(2) When using a current output, it changes with the following DIP switch.

□	SET. SW [bit 2]	ON	Voltage output
		OFF	Current output

(3) The following DIP switch performs a filter setting.
A standard setup is the filter OFF.

□	FILTER. SW [bit 2]	ON	filter use
		OFF	filter unused

(4) The voltage of ⑥ check terminal is adjusted to 5.0V. (refer to 4-2(5).)

(5) Then, it adjusts by ⑱ control voltage adjustor volume so that the voltage between the external terminals ⑬ and ⑭ may become a value (standard 5.0V) of hope.

(6) Also in a current output, it adjusts by ⑱ control voltage adjustor volume.

4-4. Left and Right TENSION OUTPUT VOLTAGE ADJUSTMENT

At the tension meter point to full scale, the output signal level is changeable 0～10V DC or 0~1mA DC of range.(Standard level is 5.0V/F.S.)

(1) The channel to adjust is chosen with the changeover switch of ②.

(2) When using a current output, it changes with the following DIP switch.

□ SET. switch	bit 3	L･V-I	ON	Voltage output
			OFF	Current output
	bit 4	R･V-I	ON	Voltage output
			OFF	Current output

(3) The following DIP switch performs a filter setting.

A standard setup is the filter OFF.

□ FILTER switch	bit 3	L･FIL	ON	filter use
			OFF	filter unused
	bit 4	R･FIL	ON	filter use
			OFF	filter unused

(4) The output voltage of L side is adjusted.
⑮ switch of a channel to adjust is turned on and ⑯ switch is turned off. It adjusts by volume of ⑪ so that the check terminal voltage of ⑥ may be set to 2.5V.

(5) Then, it adjusts by ⑲ left side control voltage adjustor volume so that the voltage between the external terminals ⑮ and ⑯ may become a value of hope.

(6) The output voltage of R side is adjusted.
⑯ switch of a channel to adjust is turned on and ⑮ switch is turned off. It adjusts by volume of ⑫ so that the check terminal voltage of ⑥ may be set to 2.5V.

(7) Then, it adjusts by ⑳ Right side control voltage adjustor volume so that the voltage between the external terminals ⑰ and ⑱ may become a value of hope.

	⑥ Check terminal reference voltage		Output adjustment volume	Output terminal
		Adjustment volume		
L side	2.5V	⑪	⑲ L-OUT	⑮－⑯
R side	2.5V	⑫	⑳ R-OUT	⑰－⑱

(8) Also in a current output, it adjusts by ⑲ ⑳ left or right side control voltage adjustor volume.

4-5. SETTING OF ZERO TENSHION OUTPUT

When a total output becomes near the zero, a relay contact output can be carried out between ⑲ and ⑳ terminals.

(1) Selection of function （A standard is OFF. Please turn on, only when you use it.）

□	SET. SW [bit 6]	ON	use
		OFF	unused

4-6. CALIBRATION OF TENSION METER & PICKUPS

4-6-[1]. Pre-adjustment

(1) Make sure that the power is OFF and that each tension meter indicates zero. If there is an error in the adjustment, readjust with the mechanical zero adjusting screw located under the front face. (For the exterior analogue meter.)

(2) Push upwards and tilt the power switch lever at the right end of the tension meter to turn the power ON. When the power is ON, the LED at the light will be ON as well.

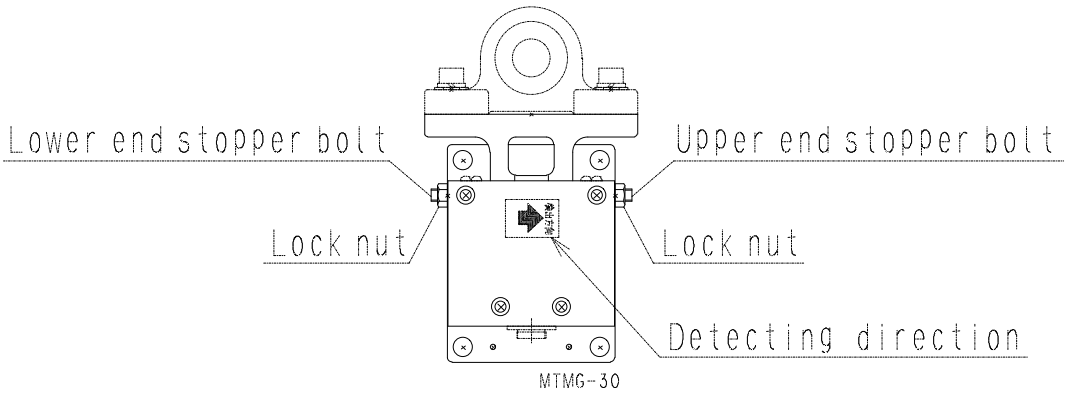


Fig4-1

4-3-[2] Calibration

Calibrate the tension meter so that it will indicate the actual tension values.
The tension detecting signal from the micro dislocation tension pickups located at both ends of the roll are input into the tension detecting circuit.
The tension detection circuit feed signals to the tension meter. At the same time, it output signal the applicable to the tension control system.
The tension detecting circuit is a type TCM-660, and the requisite number of substrates are incorporated as necessary. Refer to Figs. 3-1, 3-2, and 4-1, 4-2 in the following order.

(1) Loosening the pickup stopper screws: Refer to Fig.4-1

Completely loosen the pickup stopper screws to expand both the upper and the lower limits. The purpose of the stopper screws is to protect the mobile region of the detector from excessive forces and to prevent the dislocation of the zero position. In general, the stopper bolts have been adjusted before shipping from the factory and accordingly there it is not necessary to readjust except in special cases (for example, where the installed configuration or detector roll weight is different.)

(2) Roping ： Refer to Fig.4-2

Set the ropes to the roll along the path the sheet will actually travel. It is desirable for the ropes to be flexible, light, and thin. When setting the ropes, be sure to set them to both the front and the rear rolls from the pickup mounted rolls. (Which are referred to as detecting rolls?)

The ropes must pass the center of each roll.

(3) Zero adjustment

Before hang a weight at the end of the rope, adjust the tension meter through the following procedure so that the needle will indicate zero:

① Channel to adjust with the changeover switch of ② is selected. Tester is connected to the check terminal of ⑥. (Refer to 5~6 pages.)

② Turn the L switch of ⑮ ON and the R switch of ⑯ OFF.
(R switch: ⑯, L switch: ⑮)

③ The volume of ⑪ is adjusted so that a tester's value may be set to "0."
You may check zero in internal meter or corresponding external meter.

④ Turn the R switch of ⑯ ON.
(At this time, the L switch of ⑮ must remain ON.)

⑤ The volume of ⑫ is adjusted so that a tester's value may be set to "0."

⑥ Henceforth, the switch of ⑮ and ⑯ should turn both on.

Despite the adjustment described above, if the tension indication does not read zero, the pickup must be adjusted.

(4) Scale adjustment

By connecting the weight to one end of the rope, adjust the tension indication through the following procedure:

① Channel to adjust with the changeover switch of ② is selected. Tester is connected to the check terminal of ⑥. (Refer to 5~6 pages.)
② Turn the L switch of ⑮ ON and the R switch of ⑯ OFF.
(R switch: ⑯, L switch: ⑮)
③ When doing this, adjust the L SCALE of ⑬ so that the tension indicator will indicate half of the applied weight. (Tester voltage is 2.5V.)
④ Turn the R switch of ⑯ ON.
(At this time, the L switch of ⑮ must remain ON.)
⑤ At the same time, adjust the R SCALE of ⑭ so that the tension indicator will indicate the applied weight itself. (Tester voltage is 5.0V.)
⑥ Henceforth, the switch of ⑮ and ⑯ should turn both on.
⑦ Then, please check that impose somewhat larger load than a full scale, and meter sways more than a full scale.(Tester voltage is more than 5.0V.)
When meter goes up only to the middle, it is necessary to loosen and adjust a stopper bolt.
If possible, please apply about 1.5 full-scale times load, and check that the tester voltage at this time does not go up more than 6～7V.
Stopper adjustment is needed when going up to about 7.5V.

(5) Stopper bolts adjustment

Set the stopper screws, which have previously been loosened.
(See paragraph 【2】-(1))

There are two stopper-screws: one is at the upper end and the other is at the lower end. The screw at the tension detecting direction is called the upper end screw and the screw on the opposite side (the ZERO side) is called the stopper screws through the following procedure (during adjustment, the weight must be kept off):

Adjustment the tension pickup stoppers on the L side

① Turn the L switch ON and the R switch OFF.
② Tighten the lower limit stopper screw so that the tension indicator will show approximately 70% of the full scale of the meter. (Since little tightening is required, tighten the stopper screw slowly while reading the indicator.)
③ Next, tighten the upper end stopper screw until the tension indicator shows approximately 60% of the full scale of the meter. At this time, tighten the locknuts and fix the upper end stopper screw.
④ Loosen the lower end stopper screw, and while the tension indicator is indicating zero, tighten the locknuts and fix the lower end stopper screw.

Adjustment the tension pickup stoppers on the R side

Turn the R switch ON and the L switch OFF, then make the same adjustments as in steps ② through ④ on the L side.

4-3-[3]Caution

(1) Each substrate on the tension meter can be pulled out with the handle by removing setscrews (2 or 4) on the upper and lower sections of the front side. To pull the screws out, turn OFF the power.
(2) When the power is ON and the LED on the power substrate dose not go ON check the fuse which is located on its substrate.

<Roping & weigh>

[e.g. : Weigh is 200N]

Pickup roller ⟹

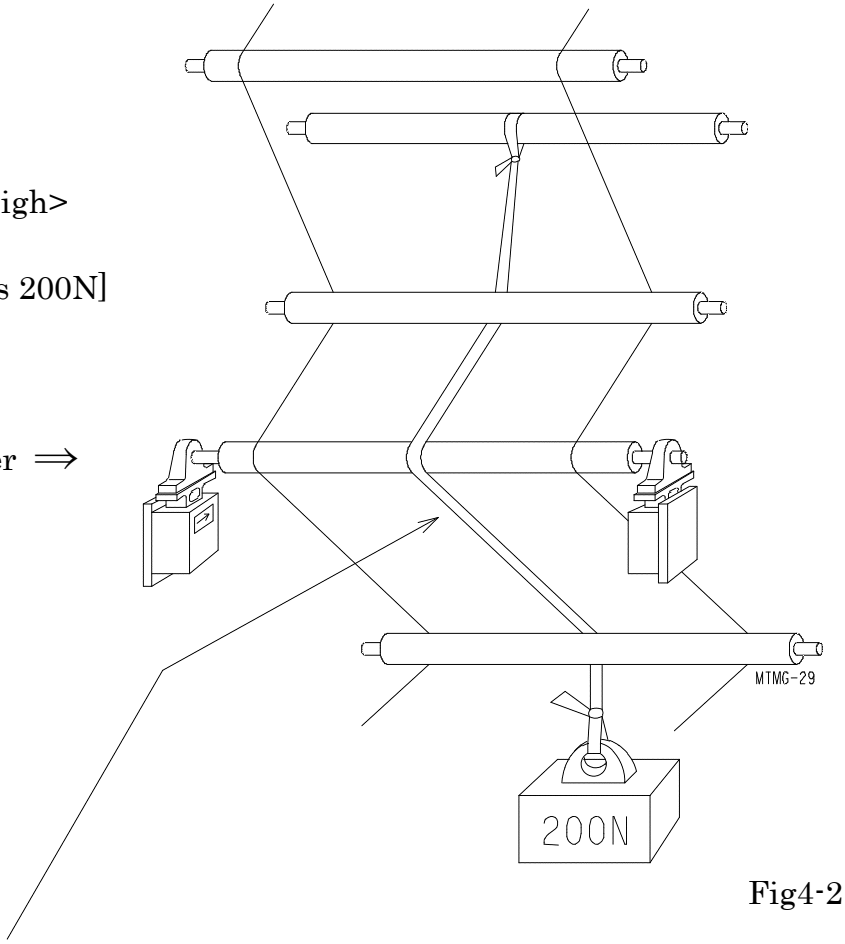


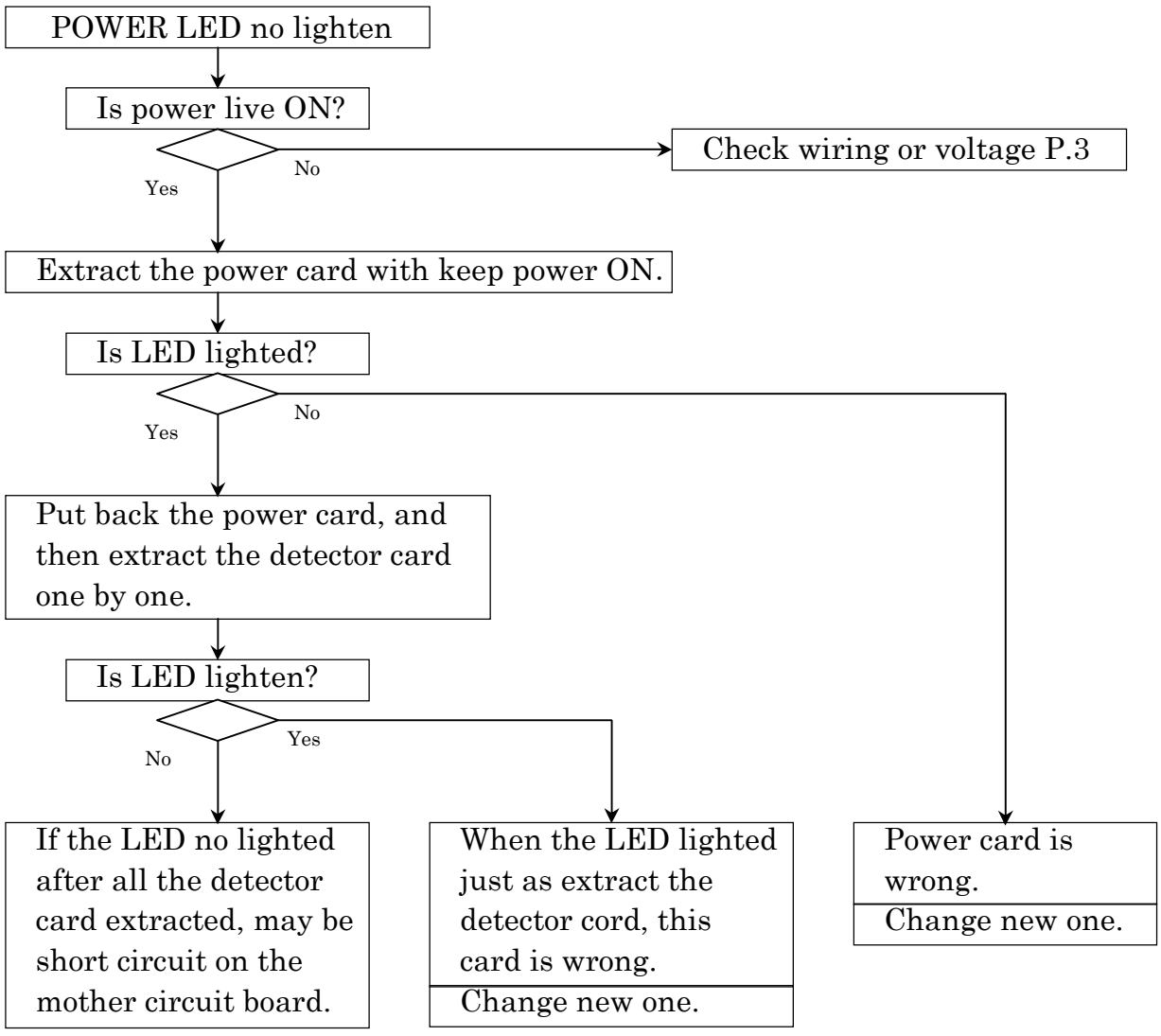
Fig4-2

The rope must pass the center of each roll.
And to set then to both the front and the rear pickup mounting rolls.
Set the rope to the roll along thee path the sheet will actually travel.

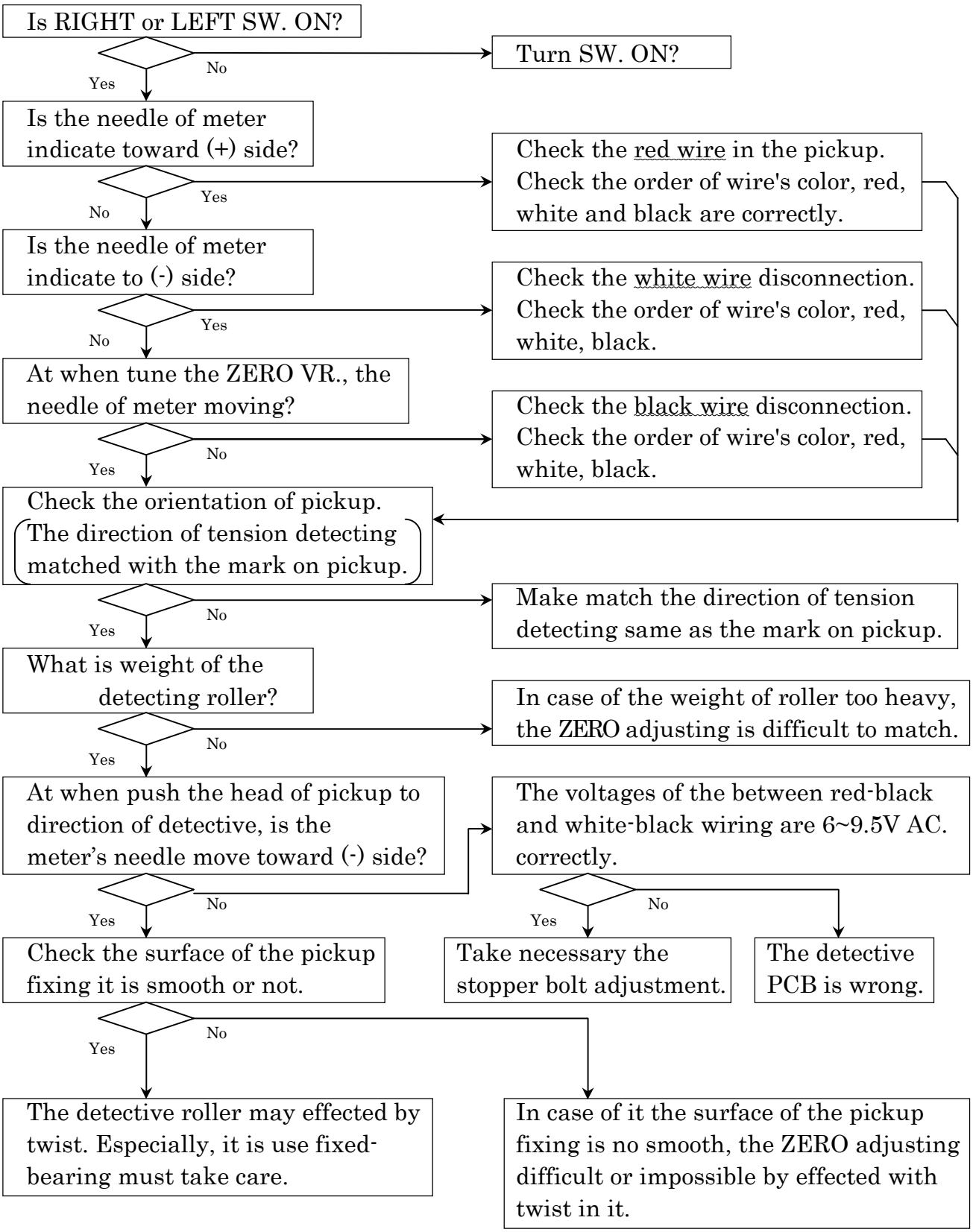
5 TROUBLE SHOOTING

No.	CONDITIONS	Page to ref.
(1)	Power indicator no light. (Not power supply.)	This P.
(2)	Impossible to the zero adjust of the tension pickups.	P12
(3)	Impossible to the scale adjust of adjustment.	P13
(4)	Lose stability of the tension.	P14
(5)	Trouble on the tension meter is no smooth.	P14
	① Not indicate zero point at power OFF.	
	② Moving of meter is no smooth.	
	③ Meter needle's sway.	
	④ Meter indicant is change at the machine stop.	
	⑤ Meter needle's sway at machine operates high speed.	

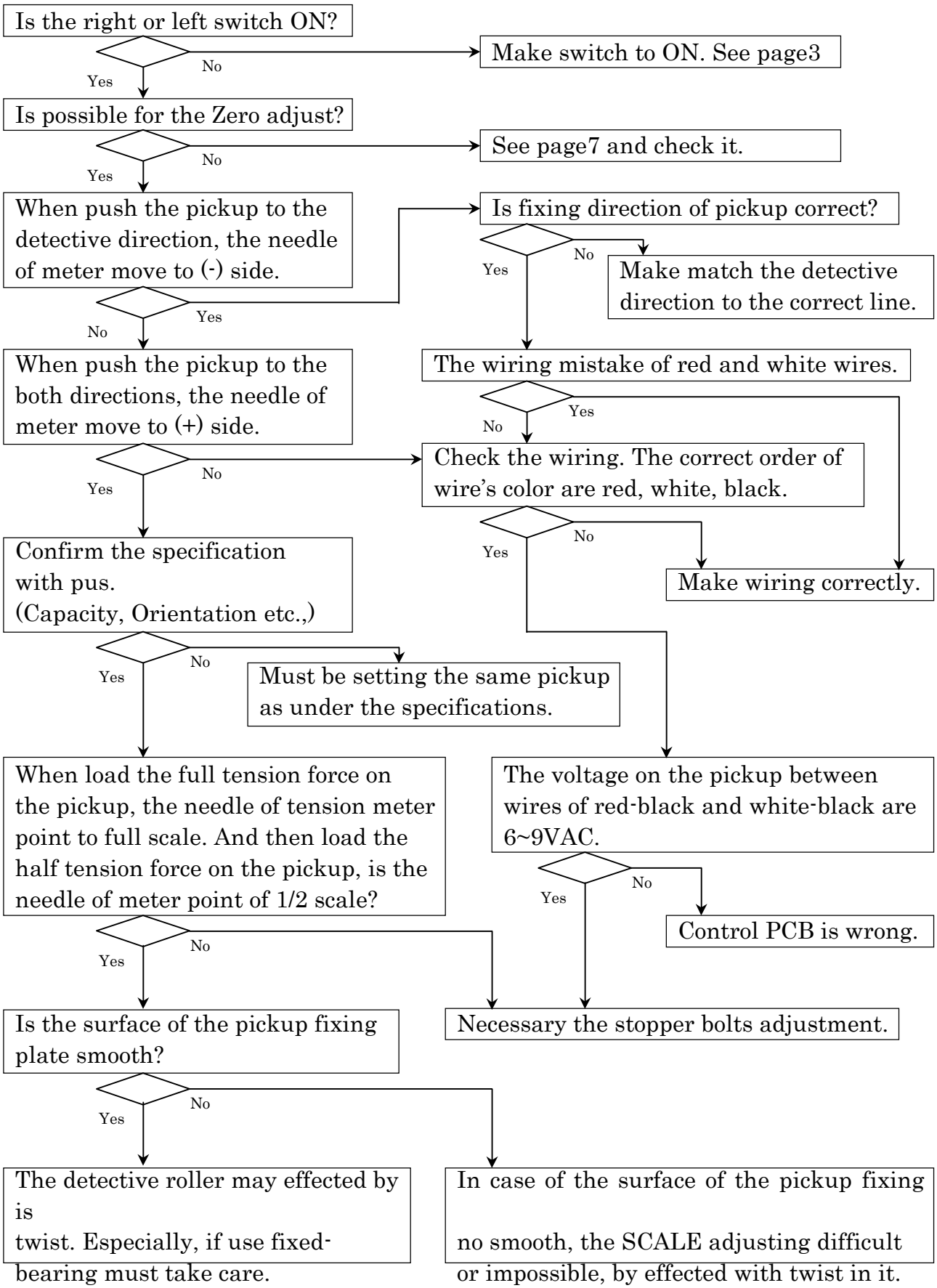
(1) Not power supply



(2) Impossible to the zero adjust of the tension pickups.



(3) Impossible to the scale adjustment.



(4) Lose stability of the tension.

Check the followings.

① Is the paper roll center unbalanced?
② Is the rewinder shaft turning unbalanced?
③ Is the line speed stability?
④ Check the guide roll unbalanced, turning stability and the dynamic balance.
⑤ Is the paper shaft slip?

(5) Trouble on the tension meter is no smooth.

① The needle of tension meter does not indicate to zero point at the power off.
- Set to zero point by the Meter Zero Screw.

② The moving of meter dose not smooth. (The needle of meter may catch in it self.)
- If the static electricity charges on the mater, sometime the needle gets to catch.
- Remove the static electricity or change for new meter.

③ Meter needle's sway.
- May be cause of the machine vibrate.
- Separate the meter from frame of machine. And take an anti-vibration measure.

④ Meter indicant is change at the machine stop.
- May be affecting of the electric noise.
- Make wiring of pickup's are separate from the power lines.
- Select wiring to the SG or FG terminals, whichever that most effective of the noise reducing.

⑤ Meter needle's sway at machine operates high speed.
- May be get resonant with the machine.
- When if change the machine speed, and vibration goes reducing it is the proof that the machine into resonant.
- In such case, take the balance of rollers, but not to reducing yet, may necessary change a suitable springs for the pickup's.