ZJ-12605A1

INSTRUCTION MANUAL

FOR TYPE LM-PC TENSIONMETER

MITSUBISHI ELECTRIC CORPORATION

Thank you very much for your purchasing MITSUBISHI's type LM-PC tensionmeter.

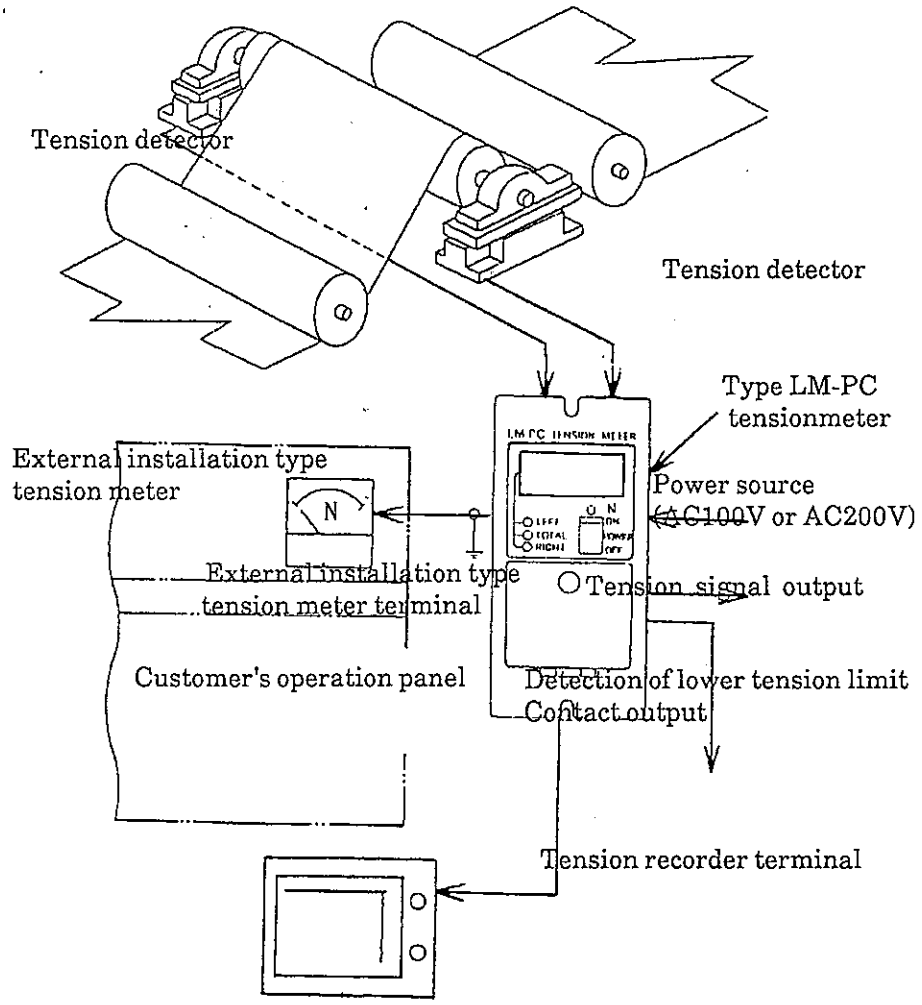
It is requested to fully read this instruction manual prior to use to understand the equipment completely so that it can be used for a long time.

It is also requested to release the manual to the end user.

CONTENTS

1.GENERAL DESCRIPTION

The tensionmeter is used to measure the sheets,paper,wires, etc.under travelling, for tension, display the measurement value, and further to output the tension signal.
Since the tension detector uses a differential deviation converter of LX-TD series, it is possible to use the guide roll as tension detection roll, and to measure the material tension at high accuracy.



TENSION METER CONFIGURATION DRAWING

2.FEATURES

(a) Light-weight/miniature

The equipment is designed light-weight/miniature type,or reduction of volume ration by 26%,panel are aratio of 29% and weight ratio of 47% as compared with MITSUBISHI's conventional product.

(b) Adoption of digital indication

The equipment adopts numeral indication system for tension, in which the indication is available in three modes of LEFT, TOTAL and RIGHT in such case when two detectors are used at right and left.

(c) Full function

(1) Lower limit tension detection contact output.....Detection of material for reakage,looseness and over-tension

(2) Recorder connecting terminal.....Used for recording oftension data ofmaterial during operation.

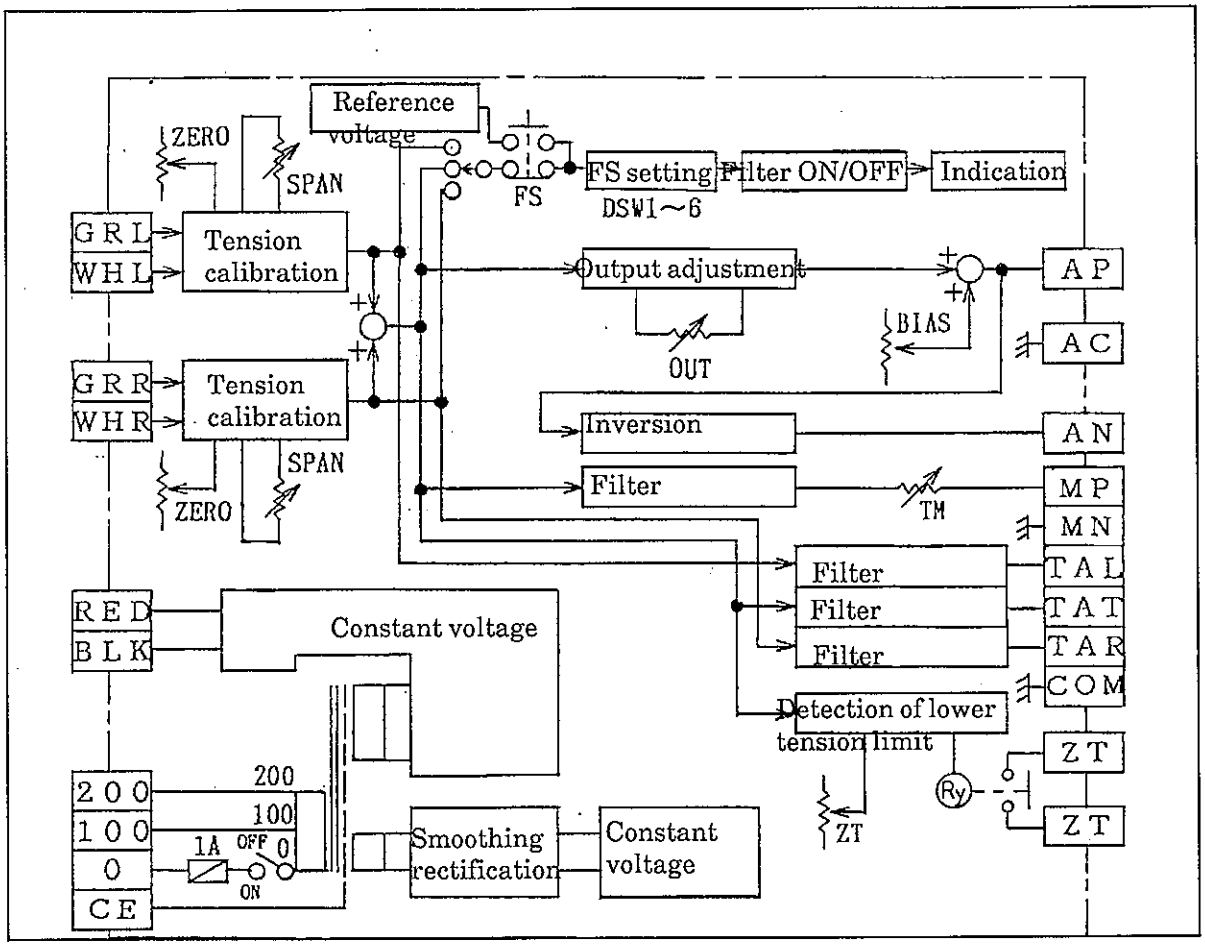
(3) External installation type tension meter terminal...Used for installation of recorder at a positionaway from tension meter

(4) Bias output.....Availability of bias addition(0V to 2V)to tension signal

(5) Filter function...Averaging of small tension fluctua-tion(indication only)

(6) Full-scale indication...Indication of setting full-scale by one switch only

3.INTERNAL CIRCUIT BLOCK DIAGRAM



4. SPECIFICATIONS

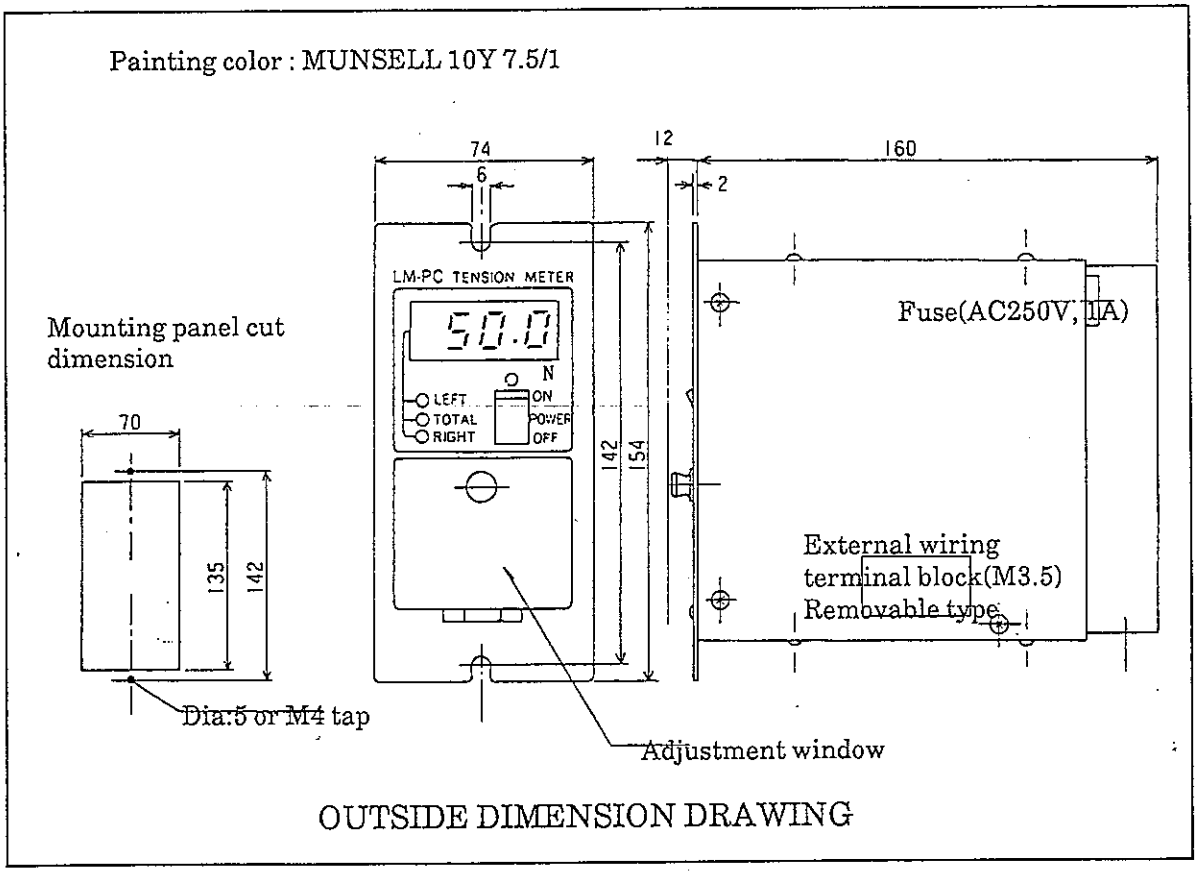
Specifications	Items
Power source	AC100/100/110V±10% 50/60/60 Hz 10VA
Meter	3-1/2 digital indication Filter is operated by DSW7.Timeconstant:approx.2seconds(LEFT/TOTAL/RIGHT)
Rated tension	FS value 2.00/3.00/5.00/10.00/20.0/30.0/50.0/100.0/200/300/500/1000 N (FS)
Tension signal output	Load resistance:300 ohms and over,34mA and less. Availability of bias addition:0 to +2V, 0 to -2V external terminals ([AP],[AC],[AN],[AC])
Lower tension limit detection contact output	Setting available within range of 5% to 100% against tension FS Contact output([ZT],[ZT]) 1a contact,contact capacity AC250V,0.5A(cosϕ=04) (ON with less than setting value,OFF with power OFF)
Output of external installation type tension meter	Applicable to DC1mA/FS meter external terminals([MP],[MN])
Recorder output	Applicable to recorder with DC+5V/FS. input resistance of 100Kohms and over(approx.)
Weight	Approx. 1.6kg
Environmental conditions	Ambient temperature ..... -10oC to 50oC Ambient humidity ..... 80% and less Vibration ..... 0.5G and less Atmosphere.....Must be free from corrosive gas or dust,or must not be applied with rain or water drop.

5.INSTALLATION

Note:Read the nameplate prepared on the right surface of the equipment to check that the equipment supplied is consistent with the ordered one.

(1) Accessories
Check that the following accessories are encased in the package.Fuse(AC250A, 1A) 2 pcs.Minus screw driver.
It is requested to provide these accessories to the end user.

(2) Installation
Install the equipment onto the panel surface. Cut the panel as shown in the following outside dimension drawing,and install the equipment by using two mounting holes(dia:5,M4 tap).
Note:When installing the equipment,care needs to be taken to direct sunshine,high-temperature,high-humidity,dust,oil,solvent,static-electricity,noise,surge,vibration,etc.

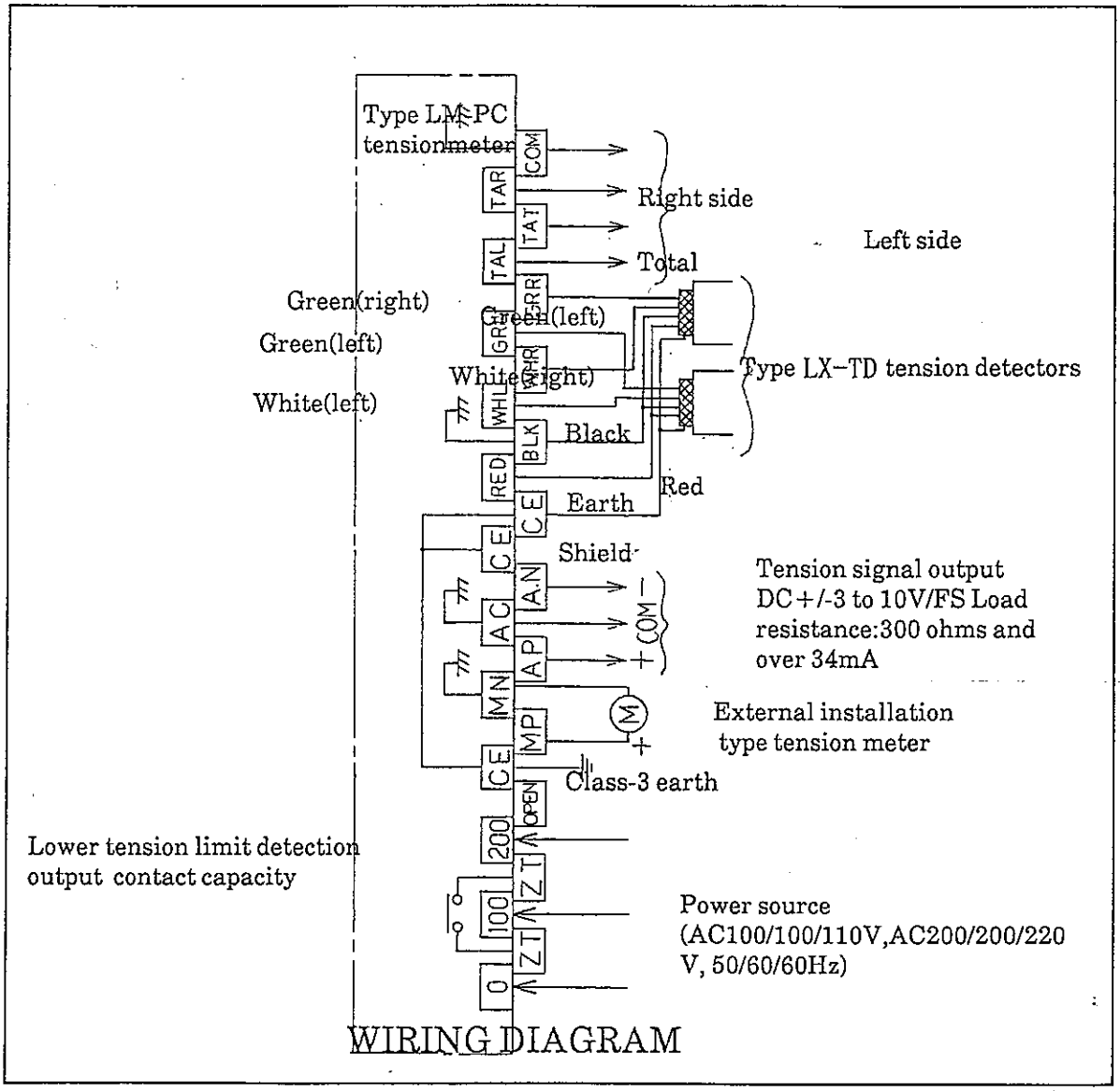


OUTSIDE DIMENSION DRAWING

see rear side:External connection procedure indication label

6.WIRING

(1) Execute the wiring through the terminal block prepared at the rear side,depending upon each application purpose.
(2) Use the shielded wire for wiring other than those described in items (a)-(1) and (b)-(1).Make it a rule to keep such wiring away from the wiring which may generate excessive noise.
(3) Execute the wiring in accordance with the following external.



WIRING DIAGRAM

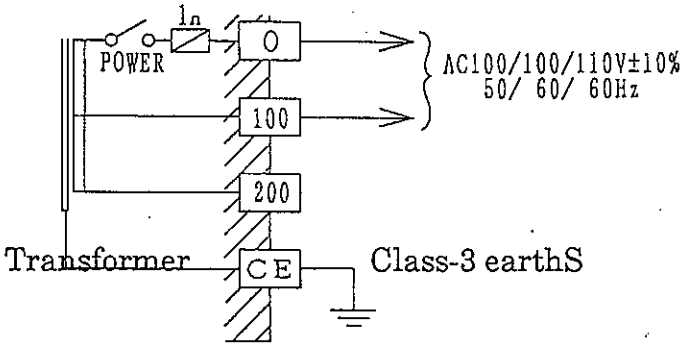
Above diagram shows for a case when detecting compression load by connecting detectors.Change white wire with green wire when used for detection of tension load.

6.1 Basic connection diagram

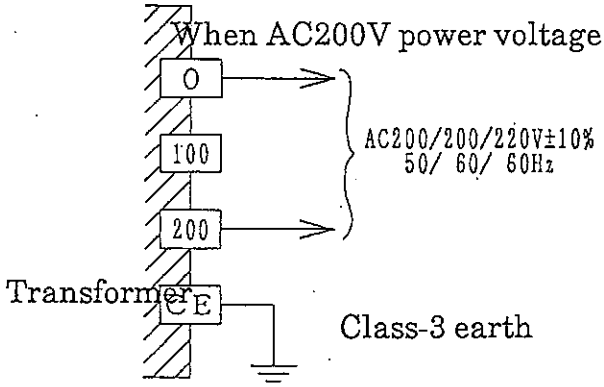
(a) [0],[100],[200].....Power source

(1) Set AC100V/AC200V power voltage system by connecting [0],[100],[200] terminals.

When AC100V power voltage system is used



When AC200V power voltage system is used



(b) [RED],[BLK],[GRL],[WHL],[GRR],[WHR],[CE],[CE].....When two tension detectors are used

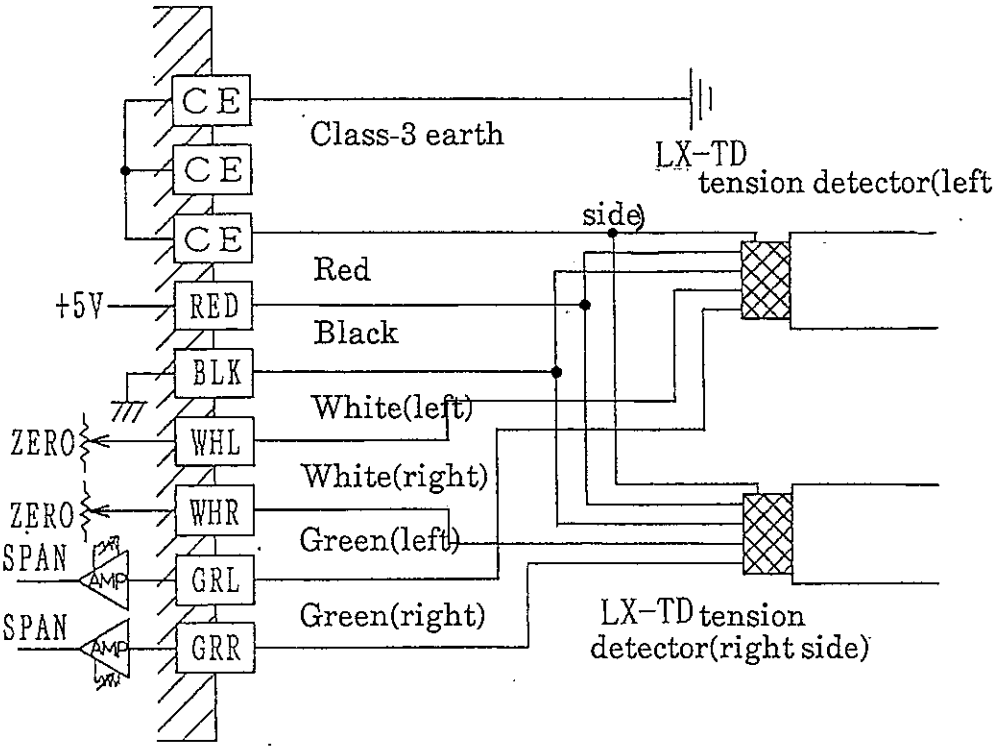
(1) Terminal used to connect type LX-TD tension detector

(2) Above figure shows for a case in which load is applied to detector to compression direction.When it is applied to tension direction,change the white wire with green wire.

(3) When only one unit is used, use the left-side unit,and keep the right-side unit short circuitted across [GRR] and [WHR] at right-side unit.In this case, turn the span adjustment volume to MIN(full counter-clockwise both for coarse adjustment and fine adjustment).

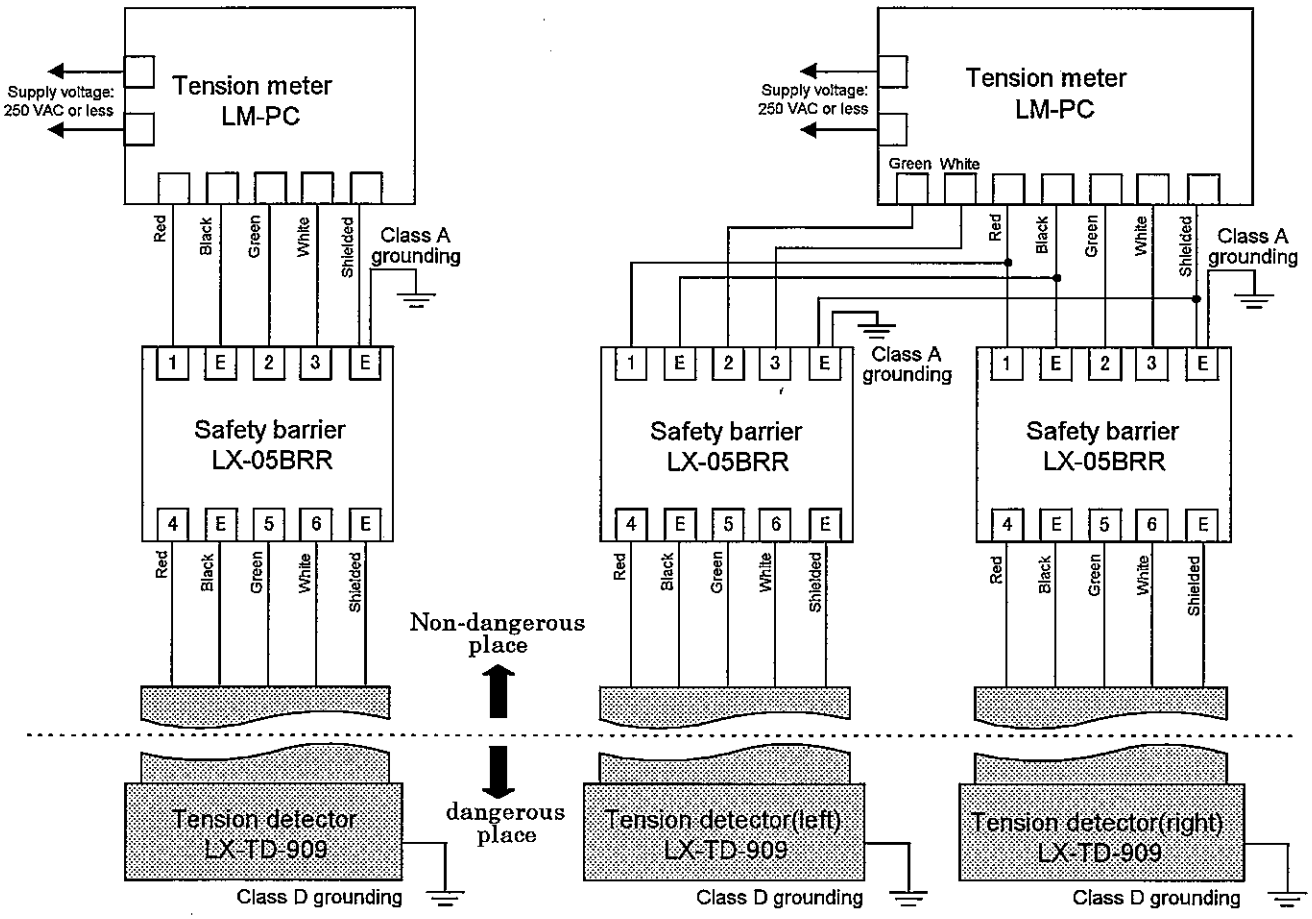
(3) When using the intrinsically safe explosion-proof type tension detector, execute the connection as shown in the following diagram.

These diagram shows for a case in which the detector is used at compression load.When it is used at tension load, change wirings at points marked with x.(from white to green/from green to white)



When one tension detector is used

When two tension detectors are used



6.2 Optional function connection diagram

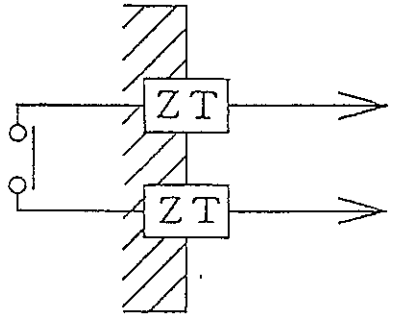
Execute the connection of optional function only when necessary.(Refer to page- for volume adjustment procedure.)

(a) [ZT],[ZT].....Lower tension limit detection contact output function

(1) Contact output function used for detection of lower tension limit and over-tension

(2) Contact capacity: AC250V, 0.5A(cosineϕ=0.4) or DC30V,0.5A
Note: When DC power source is used,connect a commutation diode in parallel to the inductive load.

(3) Bear in mind that the function is turned on when total tension appears to be less than the value set on lower tension limit detection level[ZT].This contact is turned off when the power source is turned off.
It is provided with hysteresis function(approx. 3% of tension full-scale) for prevention of chartering.

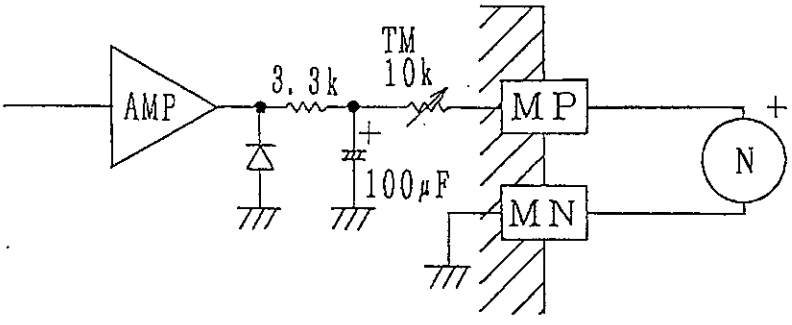


(b) [MP],[MN] External installation type tensionmeter connecting terminal

(1) Used to output current corresponding to total tension.

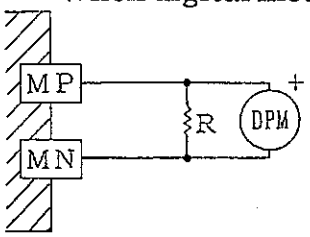
(2) When analog meter is used
Use a DC1mA meter with internal resistanceof 1.5K ohms or less, and execute connectionas shown in a).

When analog meter is used



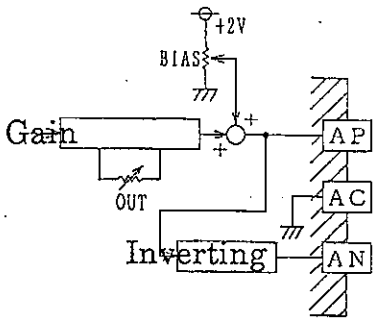
(3) When digital meter is used
Use a digital panel meter with decimal point position setting terminal of 1.999V, andexecute connection as shown in b).
Connect the decimal point position,depending upon the value of full-scale tension(FS tension).

When digital meter is used



Connect the resistor(R) in accordance with the following.
-When tension is 1000, 100, 10 N/FS .....R=1.5K ohms,1/4W
-When tension is 500, 50, 5 N/FS .....R=1K ohm,1/4W
-When tension is 300, 30, 3 N/FS .....R=470 ohms,1/4W
-When tension is 200, 20, 2 N/FS .....R=300 ohms,1/4W

(c) [AP],[AC],[AN].....Tension signal output terminal
(1) Used to output voltage in correspondence to TOTAL tension.
(2) Between [AP] and [AC].....+3 to +10V/FS
Between [AN] and [AC].....-3 to -10V/FS(load resistance:300 ohms and over) Only
polarity is changed between [AP] and [AN], and between [AN] and [AC].
(3) Availability of bias addition
Between [AP] and [AC].....0 to +2V
Between [AN] and [AC] .....0 to -2V



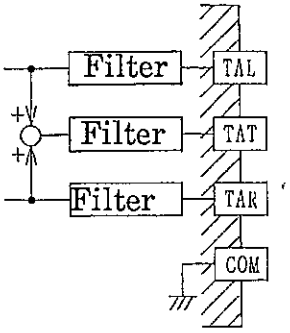
(4) Applicable as current output (4 to 20mA) at load of 500 ohms.

(d) [TAL],[TAT],[TAR],[COM].....Recorder terminal

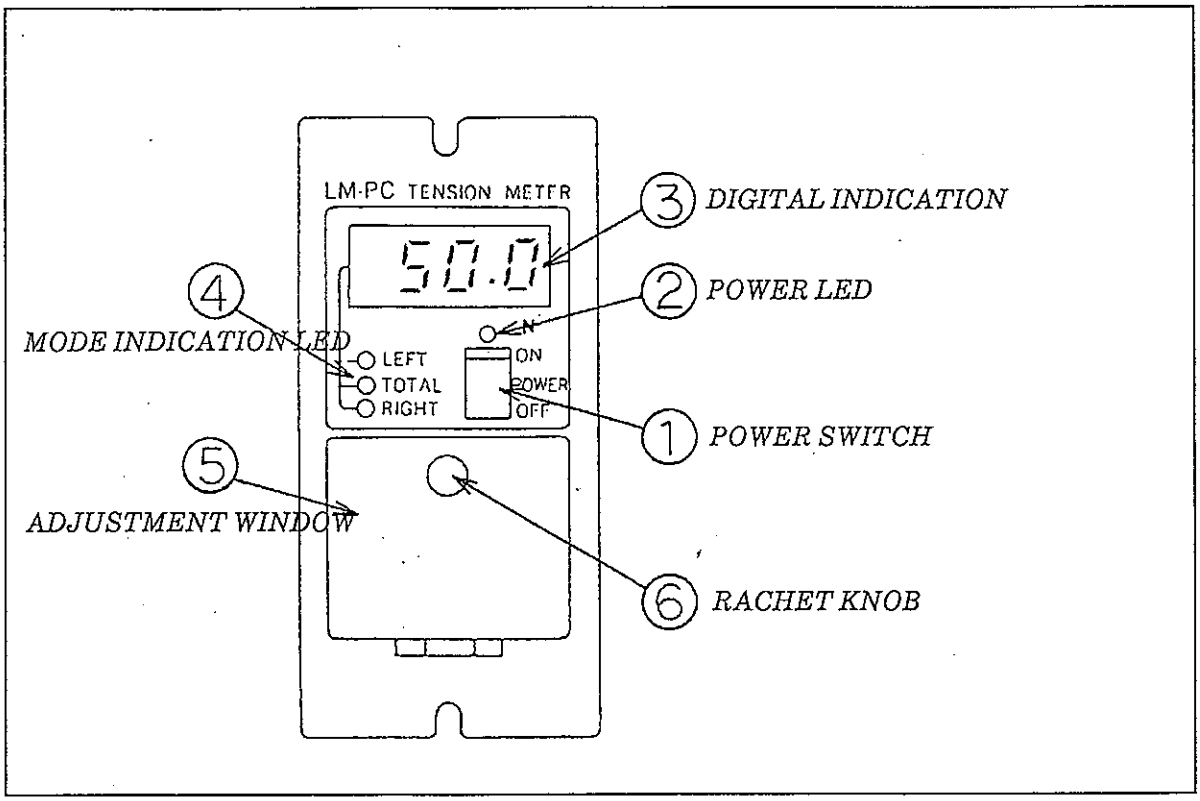
(1) Used to output to [TAL],[TAT],[TAR] by 5V/FS in correspondence to tension of LEFT, TOTAL and RIGHT.

(2) Applicable to recorder with input resistance of 100K ohms or over.

(3) When sufficient effect is not assured only by built-in filter,insert the aluminum electrolytic capacitor with withstand voltage of 16V or over between clearance with [COM] terminal.
(In this case,execute connection in such a manner that (-)pole is arranged at the [COM]terminal).



7 DESCRIPTION OF OPERATION UNIT (PANEL SURFACE)



(1) *POWER SWITCH*
The power source is applied when the switch is turned on, by which the *POWER LED* and *MODE INDICATION LED* are turned on. (Either one of *MODE INDICATION LED* is turned on).

(2) *POWER LED*
The LEDs comes on when the power source is turned on.

(3) *DIGITAL DISPLAY*

(a) The digital indication serves to indicate the tension value detected, by numeral (red LED) of 3-1/2 digits (1999 to -1999)....Since the indication can be changed over to LEFT side tension,TOTAL tension or RIGHT side tension by the used of mode selector switch arranged within the *ADJUSTMENT WINDOW*, it becomes possible to check for single-sided tension,etc.

(b) The indication is given within the range from 1999 to -1999 (saturated at approx. two times of full-scale value).
even if the indication exceeds full-scale.The indication of "1999" flickers when the value exceeds 1999,and that of "-1999" flickers when the value is smaller than-1999 respectively,for the warning of display-over.The DSW7 built in the *ADJUSTMENT WINDOW* is used to cancel the slight deviation of numeral by filtering the indication value,to stabilize the indication.

(4) *MODE INDICATION LED*

When the mode selector switch built in the *ADJUSTMENT WINDOW*(5) is used,either one of LEFT, TOTAL or RIGHT selected is indicated by LEDs.

(5) *ADJUSTMENT WINDOW*

The *ADJUSTMENT WINDOW* incorporates various volumes and switches used for initial setting and function.for each volume and switch, refer to page-

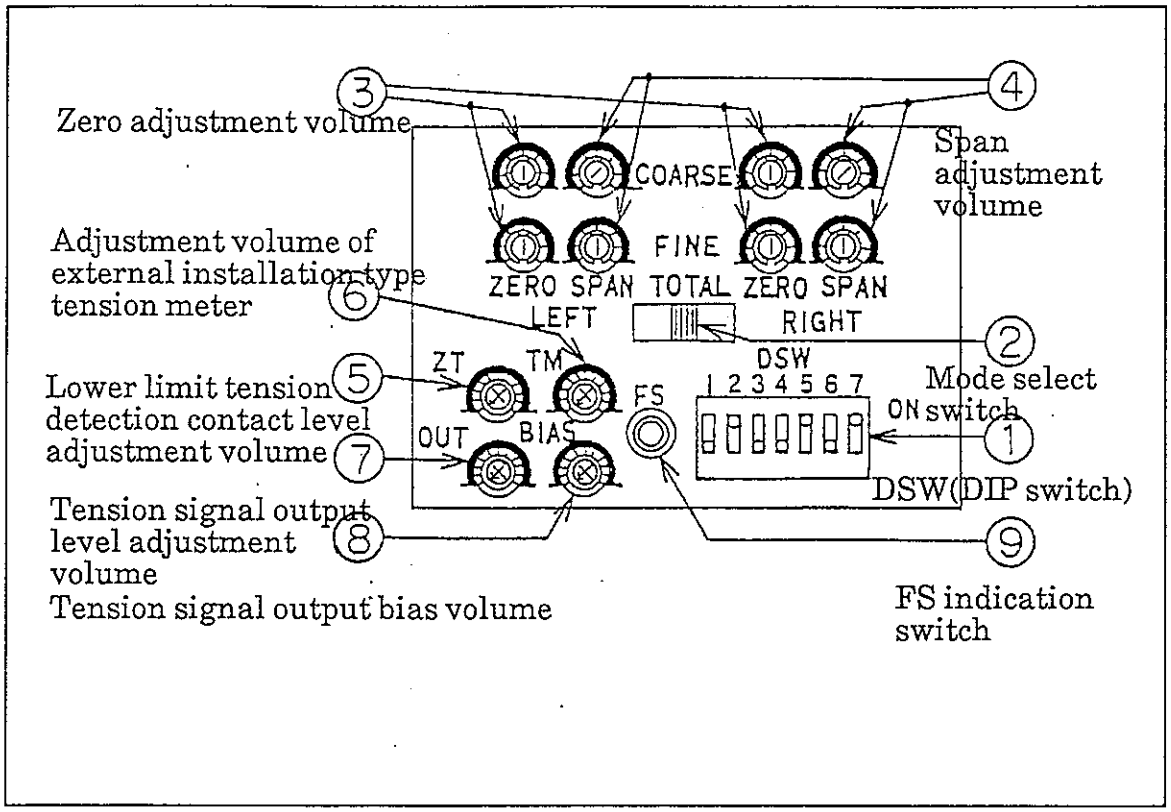
(6) *RACHET KNOB*

When it is pulled directly, the window is opened.It the *ADJUST WINDOW* is closed and then the knob is pushed on the other hand,it clicks and locked,by which the window is protected from being opened unnecessarily.

It is recommended to wipe the panel surface with a dry and soft cloth.Bear in mind wiping it with a tissue paper may cause the acryl surface of the display unit to be fissured.

8.DESCRIPTION OF ADJUSTMENT UNIT(BUILT IN ADJUSTMENT WINDOW)

Note:DSW8 is not used.



フルスケール	DSW					
設定値	1	2	3	4	5	6
FS(N)	1000	500	300	200	×0.1	×0.01
1000	○					
500		○				
300			○			
200				○		
100.0	○				○	
50.0		○			○	
30.0			○		○	
20.0				○	○	
10.00	○					○
5.00		○				○
3.00			○			○
2.00				○		○

Full-scale setting value.Turn on DSW positions marked at with "o".Turn off DSW at other positions than those marked with "o".

	Function	Characteristics	DIP switch adjustment position(at shipment)
(1) DSW1-6 Tension full-scale setting switch	Switch used to set full-scale tension.Tension signal output and terminal for recorder or terminal for external.installation type tension meter correspond to these values. DSW1-4 are used to set numeral value,and DSW5 and DSW6 to set decimal point position respectively.	Do not attempt to use equipment with DSW set to other combination Set DSW securely.before table	
(1) DSW7 Tension display filter select switch	When the switch is turned off, change in tension display will become dull, causing it is be read easily.It has been set to ON side at the time of shipment to facilitate zero/span adjustment.	OFF:Filter provided ON:Filter not provided Tim constant 2 seconds (approx.)	Filter not provided(ON)
(2) Mode select switch	The use of switch allows only LEFT,FIGHT or TOTAL to be displayed against the tension displayed on panel surface.It makes it possible to check material for one-sided tension, etc.	LEFT:Displays tension for LEFT side detector only. TOTAL:Displays LEFT +RIGHT or total tension. RIGHT:Displays tension for RIGHT side detector only.	TOTAL position

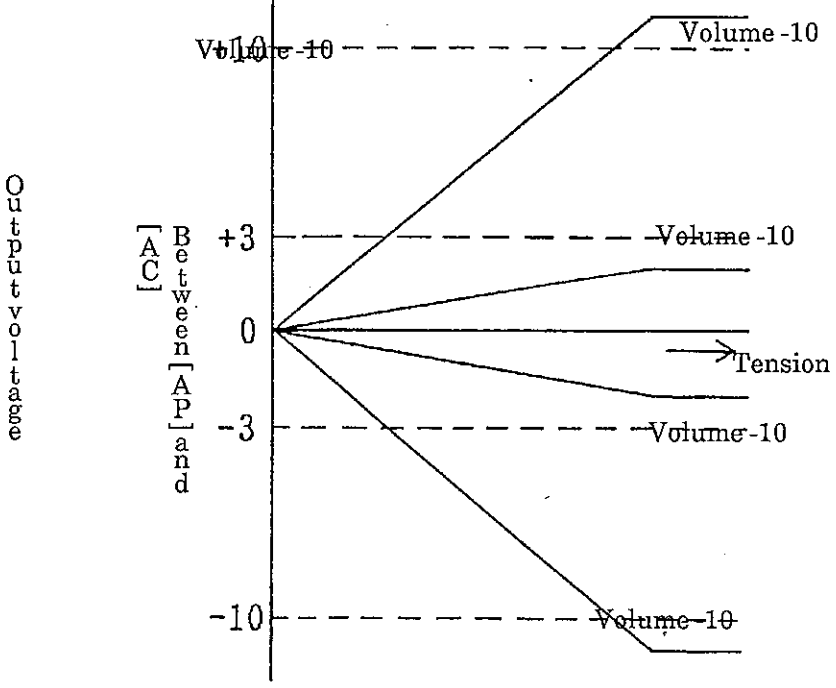
	Function	Characteristsics	DIP switch adjustment position (at shipment)
(3) Zero adjustment volume (ZERO)	Even when tension applied is "0",the tension detector is applied with weight of roll or bearing all times. Zero adjustment is executed to negate the signal.It is provided at RIGHT and LEFT. It is available in coarse adjustment volume and fine adjustment volume. Make coarse adjustment at first and then make fine adjustment.	Adjustable range within range from 0% to 80% of rating by load applied to tension detector.	(at shipment) Center both for coarse and fine

	Function	Characteristsics	DIP switch adjustment position (at shipment)
(4)Span Adjustment volume (SPAN)	Even when material is applied with the same tension, the load applied to the tensionmeter may be different depending on tension detector setting method or arrangement of roll.Span adjustment is performed so that the actual tension value is equal to tension displayed on panel.It is provided at RIGHT and LEFT. It is also available in coarse adjustment volume and fine adjustment volume as with zero adjustment.	Adjustable range within 10% to 100% of rating FS tension.	Center for coarse,min. fine

	Function	Characteristics	DIP switch adjustment position(at shipment)
(5) Lower tension limit detection point level adjustment volume (ZT)	Used to set operation point of zero tension and over-tension detection function.Detection point is provided with the hysteresis of approx.3%/FS.	Adjustable within range from 5% to 100% against full-scale tension. 1a contact Contact capacity AC250v, 0.5A($\cos\phi = 0.4$) Turned on at value smaller than setting value when tension is decreased, and off at value further decreased from setting value by portion of hysteresys when load is increased with contact ON.	MIN position
(6) External installation type tension meter adjustment volume(TM)	Volume used to adjust value indicated by external installation type tension to be connected between [MP] and [MN] Make adjustment so that total tension digitally indicated on panel becomes equal to the tension displayed by external installation type tension meter.	Indication value is increased when turned clockwise, and decreased when turned counter-clockwise.	MIN position

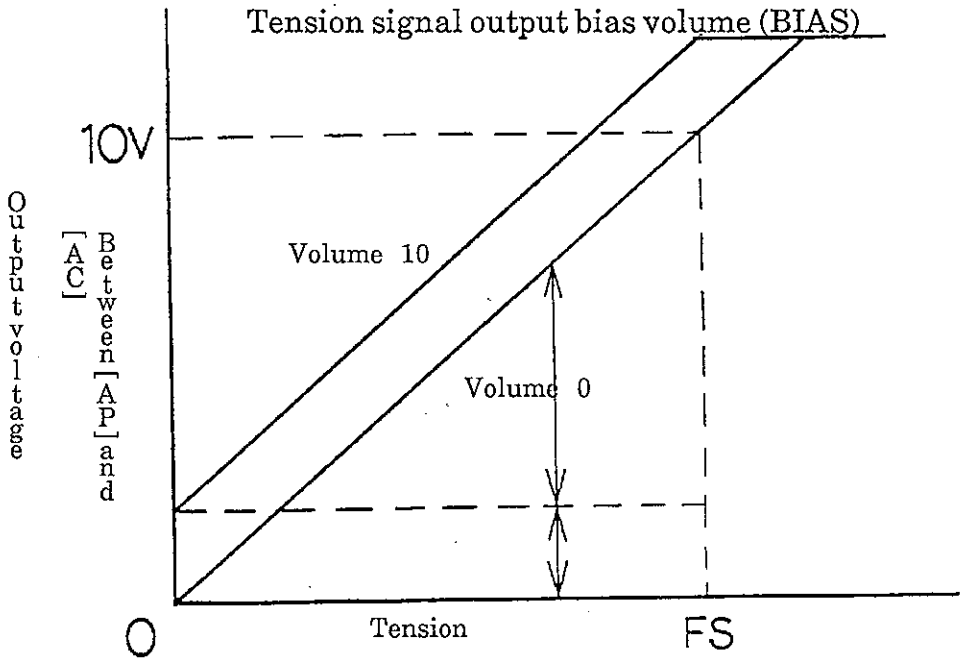
	Function	Characteristics	DIP switch adjustment position(at shipment)
(7) Tension signal output adjustment volume(OUT)	Volume used to adjust signal between [AP] and [AC] to +3V to 10V/FS, and that between [AN] and [AC] to -3V to 10V/FS. Bear in mind output voltage between [AP] and [AC] and between [AN] and [AC] are unable to be set independently.	(See next page)	MIN position
(8)Tension signal output bias volume (BIAS)	It becomes possibleto to add bias output to signal output [AP] -[AC] 0 to +2V [AN]-[AC] 0 to -2V	(See next page)	MIN position
(9) FS(full-scale) display switch (FS)	When the switch is depressed, it is possible to roughly (error of approx.within 2% may occur) display full scale value set by DIP SW1 to 6.	Full-scale value is displayed only while the switch is depressed, and returned to the normal indication when it is released.	

Tension signal output adjustment volume(OUT)



*Shows volume Characteristic when FS tension is indicated.

Tension signal output bias volume (BIAS)



9.INITIAL ADJUSTMENT

(1) Preparations

(a) Be sure to check the wiring again prior to turning on the power source.In this case,however do not attempt to execute any insulation resistance test and/or dielectric strength test.

(b) Check that the tension detector to be used in combination is the applicable one.

(1) Load of tension detector....Check the load in accordance with the instruction manual attached to the product Setting condition.

(2) Check the setting condition.... in accordance with the instruction manual attached to the product.

(c) Open the *ADJUSTMENT WINDOW* to turn over each setting switch.

(3) Be sure to set the tension full-scale setting switch DSW1 to 6.of adjustment unit".Do not fail to turn on/off each switch.(ON...upper side)

(d) Turn on the *POWER SWITCH* after completing the above step.

(e) Depress the FS switch at this stage,by which it is possible to roughly check the full-scale set in the above step-(c)

(2) Calibration of *TENSION INDICATION* unit

(a) Select the tension indication select switch DSW7 (Prepared to adjustment unit) to ON side to turn off filter.

ZERO ADJUSTMENT (ZERO)

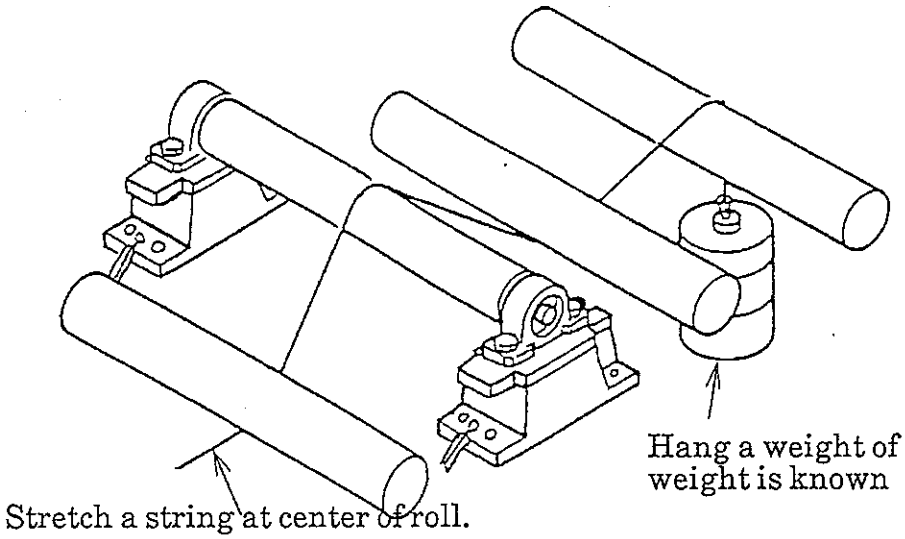
(b) Check that the tension detection roll is not applied with any material, etc.,turn the LEFT side zero adjustment volume for adjustment, so that the *DIGITAL DISPLAY* indicates "0".In this case,turn the fine adjustment(FINE) volume almost at the center position for coarse adjustment,and than turn the fine adjustment volume for the correct adjustment.

(c) Turn the mode select switch to RIGHT similarly, and then turn the RIGHT side zero adjustment volume for adjustment.

SPAN ADJUSTMENT (SPAN)

(d) Pass a string in accordance with the pass line (passage) of material as shown in the figure on former page,and hang a weight lighter(W_N) than preset full-scale value,at the center of the roll.(Where such weight is not available,use a spring scale).

(e) Turn the mode select switch to LEFT,and turn the LEFT side span adjustment volume so that the digital display indicates $W/2_N$. In this case,turn the fine adjustment volume almost to center position, and turn the coarse adjustment volume for rough



SPAN ADJUSTMENT PROCEDURE

adjustment.After the above steps, turn the fine adjustment volume for correct adjustment.

(f) Turn the mode select switch similarly to RIGHT,and turn the RIGHT side span adjustment volume for adjustment so that the *DIGITAL DISPLAY* can indicate W/2 N.
Note:Since the direction of load to detector by portion of tension in reversed when the value indicated appears to be negative(−),change the white wire with green wire,both of which are connected to the detector.In this case, execute another zero/span adjustments.

(g) Turn the mode select switch to TOTAL to check that the display indicates "W N".

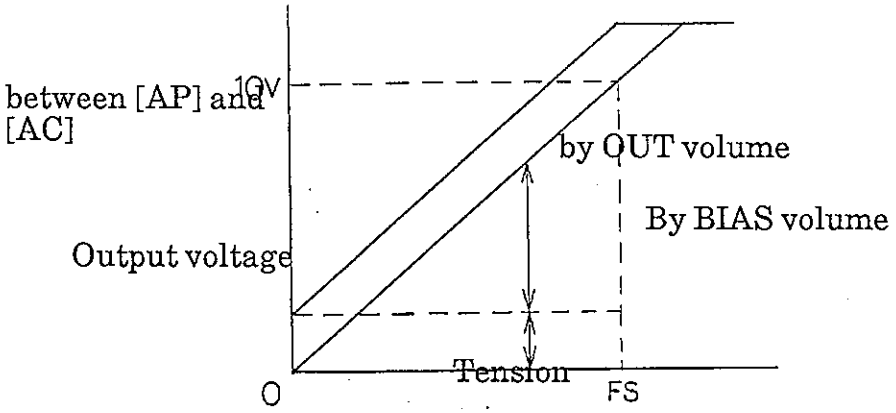
(h) Remove the string and weight,and check that the total indication value appears to be "0".If the zero point is found to be deviated,then return to the step-(b) again to perform another zero adjustment both at LEFT side and RIGHT side.

(i) Return the mode select switch to TOTAL to start the normal operation.Select the tension indication filter switch DSW7 to OFF side to turn on the filter.

(3) Check of adjustment volume

(a) Setting of each volume(prepared to adjustment unit) is described at right-hand column of the section-8.

(b) Adjustment of OUT
BIAS volumes adjust the OUT volume and BIAS volume to suit each use condition.Perform the adjustment by using the OUT volume and BIAS volume so that the desired voltage can appear between [AP] and [AC], or between [AN] and [AC].Taking up "Between [AP] and [AC] to explain the adjustment procedure of volume,for instance,adjust the BIAS volume to output the desired bias (0 to +2V) with the tension set to zero ("zero" indication),and adjust the OUT volume with the tension applied fully)condition of full-scale indication),so that the desired full-scale voltage(+3V to +10V) can be outputted.If the full-scale is indicated by using the zero adjustment volume with the mode select switch turned to TOTAL in this case the tensionmeter is under full-scale application condition. Consequently, it is not necessary,in fact,toapply the full-scale tension to the detector.After completing the adjustment,do not fail to perform another zero adjustment. In this case, only the polarity is inversed between [AP] and [AC] and between [AN] and [AC].Bear in mind that independent setting will not be possible.



[AP] to [AC] characteristic

(4) Insulation resistance/dielectric strength tests

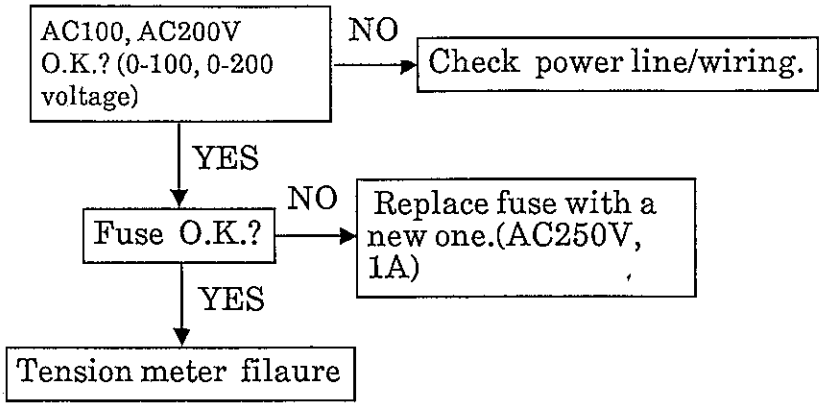
(a) When measuring the control panel for insulation resistance or dielectric strength,do not fail to disconnect all connections of the tension meter and tension detector to prevent them from breakage in the even of unexpected wrong wiring or false operation.Use a low-voltage circuit tester(less than DC6V)

(b) The conditions in formally measuring the tension meter for insulation resistance or dielectric strength are as follows
Do not attempt to perform such tests on the tension detector.
Measure the tension meter for insulation resistance or dielectric strength between all terminals and case.
*Insulation resistance 5M ohms and over(when measured with DC500V megger)
*Dielectric strength AC1, 500V, for one minute

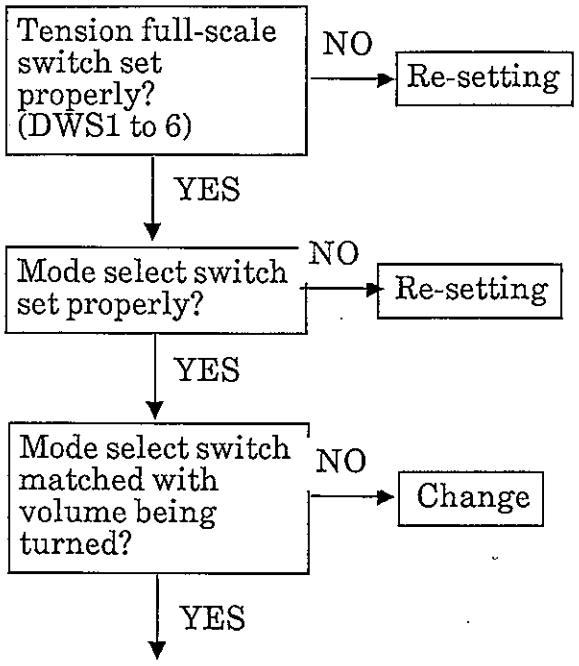
10.TROUBLE-SHOOTING PROCEDURE

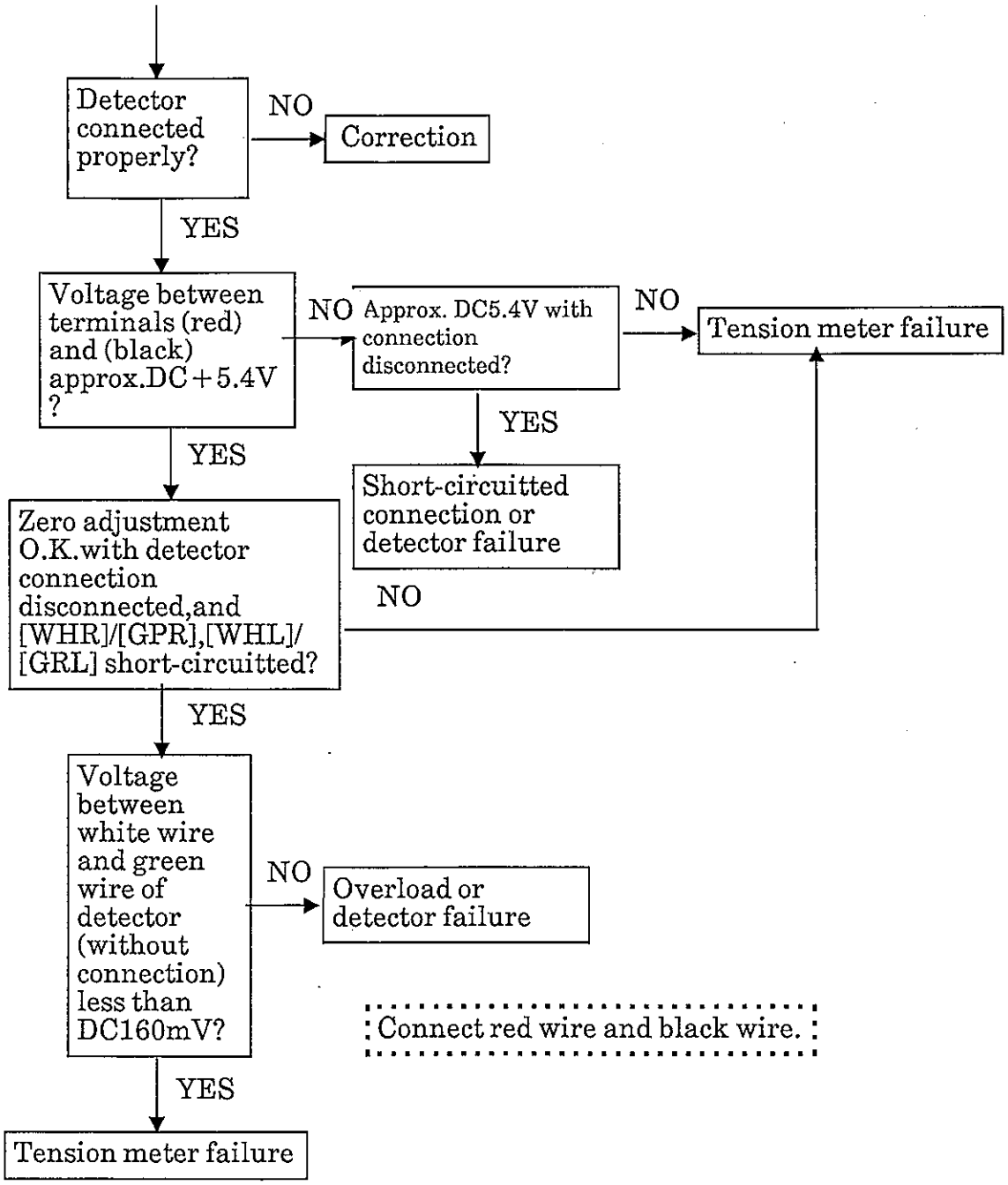
This section describes the procedure of inspection to be performed to check whether the trouble occurred results from the fault of tension meter.

(1) *DIGITAL DISPLAY* does not come on even when *POWER SWITCH* is turned

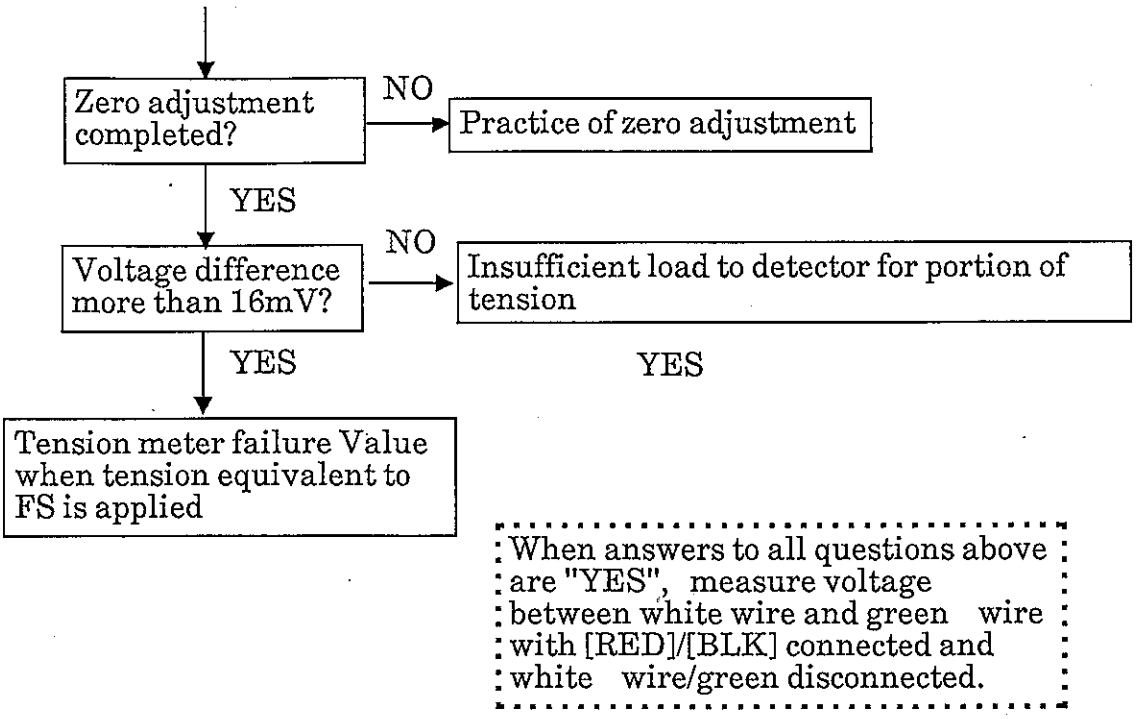


(2) Zero adjustment of tension indication values fails.




Detector connected properly?
NO
Correction
YES
Voltage between terminals (red) and (black) approx.DC+5.4V ?
NO
Approx. DC5.4V with connection disconnected?
NO
Tension meter failure
YES
Short-circuitted connection or detector failure
YES
Zero adjustment O.K.with detector connection disconnected,and [WHR]/[GPR],[WHL]/[GRL] short-circuitted?
NO
YES
Voltage between white wire and green wire of detector (without connection) less than DC160mV?
NO
Overload or detector failure
: Connect red wire and black wire. :
YES
Tension meter failure

3) Span adjustment



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