

MAXI-TRONIC

PROCESS SENSORS & CONTROLS

MT 400 MOTION SENSOR WITH 24 POINT BEARING MONITOR

INSTALLATION AND OPERATION MANUAL

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DEFINITIONS:

THE FOLLOWING TERMS AND DEFINITIONS ARE PROVIDED TO AID IN UNDERSTANDING THEORY OF OPERATION, INSTALLATION PROCEDURES, AND TROUBLESHOOTING.

1. **START-UP CIRCUIT** - The purpose is for the Logic circuitry to start all of the timing circuits in the motion sensor. The power source is the voltage that energizes the motor starter coil.
2. **OFFSET #1 RELAY CONTACTS** - A relay rated at 7 Amps- 110/240 VAC. This relay is usually used to shut down auxiliary equipment. Can also be used to turn on alarms, indicators at 10% reduction from normal (100%) speed.
3. **OFFSET #2 RELAY CONTACTS** - A relay rated at 7 Amps-110/240 VAC. This relay is usually used to shut down auxiliary equipment. Can also be used to turn on alarms, indicators at 20% reduction from normal (100%) speed.
4. **MOTION PROBE** - The motion probe is a sensor that detects movement of equipment that is being monitored. A signal from the motion probe is fed back to the MT400 processor PCB.
5. **TARGET DISC** - A round disc with metal targets equally spaced and embedded on the edge. This disc is usually mounted to a rotating shaft. The disc in conjunction with the motion probe detects the speed of the shaft turning by detecting the number of times the metal targets pass in front of the motion probe.
6. **MOUNTING FLANGE** - is used to mount and adjust the motion probe in relation to the target disc.
7. **ALARM RELAY OUTPUT** - The purpose of this function is to allow the user to have separate alarm output. These contacts close at 10% speed reduction. If 10% indicator is lit, contacts are closed.

Please make note of the following:

Terminal labeled Common is the voltage input terminal.

Terminal labeled N/O is the voltage output for the alarm.

Contacts are "Dry", Input on Common comes out on N/O.

For proper alarm sequence, perform the following:

- Use Start-Up voltage terminal A to power alarm.
- If Start-Up voltage is 110V use 110V AC alarm. If Start-up voltage is 24 VAC, use 24 VAC Alarm ETC. **See Drawing ES400-03.**
- By connecting Alarm this way, there will be a short alarm when monitored equipment starts.
- When monitored equipment slows 10% from normal (100%) speed, the 10% indicator will be lit while equipment is still operating.
- When monitored equipment is "Shut-Down", either by motion sensor or manually, the Shut Down Alarm will turn off.

8. 4-20 MA configuration - Used to give **linear 4 thru 20 MA** current output that is proportional to monitored equipment speed. **See Figure 1.**

%	MA	%	MA	%	MA	%	MA
0	4.00	50	8.00	100	12.00	150	16.00
1	4.08	51	8.08	101	12.08	151	16.08
2	4.16	52	8.16	102	12.16	152	16.16
3	4.24	53	8.24	103	12.24	153	16.24
4	4.32	54	8.32	104	12.32	154	16.32
5	4.40	55	8.40	105	12.40	155	16.40
6	4.48	56	8.48	106	12.48	156	16.48
7	4.56	57	8.56	107	12.56	157	16.56
8	4.64	58	8.64	108	12.64	158	16.64
9	4.72	59	8.72	109	12.72	159	16.72
10	4.80	60	8.80	110	12.80	160	16.80
11	4.88	61	8.88	111	12.88	161	16.88
12	4.96	62	8.96	112	12.96	162	16.96
13	5.04	63	9.04	113	13.04	163	17.04
14	5.12	64	9.12	114	13.12	164	17.12
15	5.20	65	9.20	115	13.20	165	17.20
16	5.28	66	9.28	116	13.28	166	17.28
17	5.36	67	9.36	117	13.36	167	17.36
18	5.44	68	9.44	118	13.44	168	17.44
19	5.52	69	9.52	119	13.52	169	17.52
20	5.60	70	9.60	120	13.60	170	17.60
21	5.68	71	9.68	121	13.68	171	17.68
22	5.76	72	9.76	122	13.76	172	17.76
23	5.84	73	9.84	123	13.84	173	17.84
24	5.92	74	9.92	124	13.92	174	17.92
25	6.00	75	10.00	125	14.00	175	18.00
26	6.08	76	10.08	126	14.08	176	18.08
27	6.16	77	10.16	127	14.16	177	18.16
28	6.24	78	10.24	128	14.24	178	18.24
29	6.32	79	10.32	129	14.32	179	18.32
30	6.40	80	10.40	130	14.40	180	18.40
31	6.48	81	10.48	131	14.48	181	18.48
32	6.56	82	10.56	132	14.56	182	18.56
33	6.64	83	10.64	133	14.64	183	18.64
34	6.72	84	10.72	134	14.72	184	18.72
35	6.80	85	10.80	135	14.80	185	18.80
36	6.88	86	10.88	136	14.88	186	18.88
37	6.96	87	10.96	137	14.96	187	18.96
38	7.04	88	11.04	138	15.04	188	19.04
39	7.12	89	11.12	139	15.12	189	19.12
40	7.20	90	11.20	140	15.20	190	19.20
41	7.28	91	11.28	141	15.28	191	19.28
42	7.36	92	11.36	142	15.36	192	19.36
43	7.44	93	11.44	143	15.44	193	19.44
44	7.52	94	11.52	144	15.52	194	19.52
45	7.60	95	11.60	145	15.60	195	19.60
46	7.68	96	11.68	146	15.68	196	19.68
47	7.76	97	11.76	147	15.76	197	19.76
48	7.84	98	11.84	148	15.84	198	19.84
49	7.92	99	11.92	149	15.92	199	19.92
						200	20.00

Figure 1

MT-400 MOTION SENSOR AND CONTROL WIRING

START-UP CIRCUIT

Equipment starter switch is energized:

Voltage is supplied to the START-UP Input Terminals.

This voltage should be supplied to the START-UP terminal from the time the start switch is energized until the stop switch is energized.

START-UP voltage must be 24 to 230 VAC only - Any other voltage will result in motion sensor not working and/or damage to motion sensor.

With proper START-UP voltage:

Equipment starter switch is energized.

Motion sensor **START-UP** terminal will sense **ARM** voltage.

The 10% indicator, 20% indicator, and the **ARM** (Start-Up Circuit) that are located on motion sensor display will go from indicators "illuminated" (**ON**) to indicators "no illumination" (**OFF**).

You will hear OFFSET #1 & #2 RELAYS on the motion sensor PC Board switch to the **RUN** position.

TARGET INDICATOR on motion sensor display should start to flash "**ON**" and then "**OFF**" for each target that passes by the front of motion sensor probe.

The Equipment accelerates to operating speed.

With target light flashing you should see the tachometer (percent of operating speed) display start to increase.

When tachometer reaches 90% on scale, the **ARM** indicator should light.

The tachometer Display should continue to increase until a reading of 100%.

OFFSET #1 RELAY CONTACTS and OFFSET #2 RELAY CONTACTS:

NOTE: RELAY CONTACTS on wiring drawing ES400-1 are shown with 117 VAC input to Motion Sensor, and **EQUIPMENT Not Operating**.

The OFFSET #1 RELAY CONTACTS operate (or 10% light will turn on) when EQUIPMENT reduces speed 10% below normal operating speed.

Contacts can be used to start or stop AUXILIARY EQUIPMENT.

To turn on an alarm system, etc., see drawings ES-400-2 & 3.

The OFFSET #2 RELAY CONTACTS operate (or 10% light will turn on and ALARM will also sound) when EQUIPMENT reduces speed 20% below Normal Operating Speed.

The function of the OFFSET #2 CONTACTS are:

- To Shut Down EQUIPMENT
- To Energize Auxiliary Relay(s) for sequence shut down of other equipment

The voltage you connect to the relay common (OFFSET #2) will be the output voltage at the N/O (Normally Open) and N/C (Normally Closed) contacts.

When the 20% indicator on the motion sensor display is "ON" (lit), there will be contact between Common and N/O terminals. There will be "No" contact between Common and N/C contacts.

When the 20% indicator is "Not" illuminated there will be contact between Common and N/C terminals. There is no contact between Common and N/O. **See drawing ES400-2 & 3.**

When "Start Button" is energized:

Start-Up Voltage will appear at Start-Up terminal at motion sensor.

Relays in motion sensor will change state.

The OFFSET# 2 Relay Common and N/C contacts will now close.

This will allow starter relay to energize and allow EQUIPMENT to operate.

NOTE: Remember, if 20% indicator is "ON", the relay contacts will be OPEN and EQUIPMENT will not Operate.

OFFSET RELAY CONTACT RATING

Relay Contact Rating: 7 AMP at 110/220 VAC

Relay contacts are "Dry". (No internal Voltage).

TROUBLESHOOTING

PROBLEM #1: Motion Sensor Shuts EQUIPMENT Down After Approximately 3 Seconds.

Check to see that target light flashes **ON** and **OFF**.

If Target Light Does Not Flash:

- Check to see if probe is too far away from Disk.
- Remove probe from mounting bracket. Move metal target (screw driver, etc.) across front of probe approximately ½ inch away from probe.
- Target light should flash on and off accordingly if functioning properly.
- If it still does not flash, **GO TO Page 7, 4 – B.**

If Target Light Flashes:

- Check for metal too close to probe / too far away.
- No metal (casings, bearing housings, etc.) within 2 inches of probe.
- Check Calibration. See MOTION SENSOR CALIBRATION SECTION; **Page 8, 4 - G.**

PROBLEM #2: Motion Sensor Will Not Allow Equipment To Start.

- Improper or No START-UP voltage: See START-UP CIRCUIT Section, **Page 4.**
- OFFSET #2 EQUIPMENT shut down contacts not properly connected: See OFFSET #2 RELAY CONTACTS Section, **Page 5.**
- Check Motion Sensor

PROBLEM #3: Motion Sensor Will Not Allow Auxiliary Equipment Connected To Motion Sensor Offset To Operate

Check to see if OFFSET CONTACTS are connected properly.
See RELAY CONTACTS Section, **Pages 4 - 5.**

PROBLEM #4: Target Light Stays ON or OFF At All Times.

- 4 -A. Motion sensor cable not connected properly:** Check at Motion Sensor Terminal Block for the following:
1. Match wire colors from probe cable with colors at terminal strip.
 2. Verify wire conductors are making contact on terminal.

3. Verify insulation on wire is not caught under terminal.

PROBLEM # 4 continued –Target Light Stays ON or OFF At All Times.

4 - B. Conductors in Probe Cable OPEN or SHORTED:

Disconnect probe cable at motion sensor terminal and disconnect probe.

Use an OHM meter to read continuity:

1. Reading from the **Green** conductor wire, there should be NO Continuity to the **White** conductor wire.
2. Reading from the **Red** conductor wire, there should be NO Continuity to the **White** conductor wire.
3. In turn, the **White** and **Black** conductor wires should have NO Continuity when read together.

NOTE: Red-Green, and Shielded Wire Strand (if used) are all common to each other.
If you have continuity between any of these conductors, no problem.

4 – C. If you read continuity between conductors that SHOULD NOT have continuity, perform the following:

If continuity cannot be found or is incorrect, send Probe back for repairs/replacement.

4 - D. If continuity now reads properly, perform the following:

1. Replace probe.
2. Re-check for continuity (See 4 – B -1, 2, 3, above) “to read continuity”;
check for shorted conductors).

4 – E. Check for OPEN CONDUCTORS.

With probe connector cable disconnected at motion Sensor terminal strip and probe disconnected from probe cable, check for the following:

1. At terminal strip end of probe cable, twist Red-Green-Shield together. Be sure conductors are making contact.

Go to probe connector end of probe cable:

Using an OHM meter, check for continuity between the **Green** and **Red** conductors at probe connector. There should be continuity.

2. Repeat the above step with the **Black** and **White** conductor connected together.
3. If cable fails these test, excluding the probe connector housing being shorted out,

replace probe cable.

4 - F. If probe cable checks "OK", and there is still a problem with target indicator:

1. Reconnect probe cable to motion sensor terminal strip, reconnect probe to probe cable.
2. Using a voltmeter, perform the following:
 - A. Read voltage from Red or Green - (Neg. DC) to White (+ DC) conductors; this voltage should be 12VDC +/- 5%.
 - B. Repeat above step (2-A), read from Red or Green, (-DC) to Black (+ DC) conductor. This should read between 4 to 7 volts + DC.
3. If voltages above (4 – F. 2-A and 2-B) are not within tolerance, check to be sure there are no metal casings, bearing housing, etc. within 2 inches of probe.
4. If all tests are correct, but still no target light, replace unit P.C. Board.

NOTE: If equipment is started and motion sensor allows EQUIPMENT to operate and tachometer display increases and all other motion sensor functions seem correct, check target indicator.

This is a L.E.D. and normally it will last the life of the motion sensor. Check for broken leads or a lead shorted to housing. Repair or replace as needed.

4 -G. MOTION SENSOR CALIBRATION:

1. Turn calibration control (located with motion sensor display) fully clockwise.
2. Start EQUIPMENT to operating.
3. After EQUIPMENT is at full operating speed:

In small increments, start turning calibration control counter clockwise until % tachometer display reads 100%.

NOTE:

There is a short delay between what the EQUIPMENT reads and what the meter displays. This delay is to take care of normal discrepancies of equipment operation such as power fluctuations, etc. When you calibrate, you **must** allow the meter to stabilize before moving next increment.

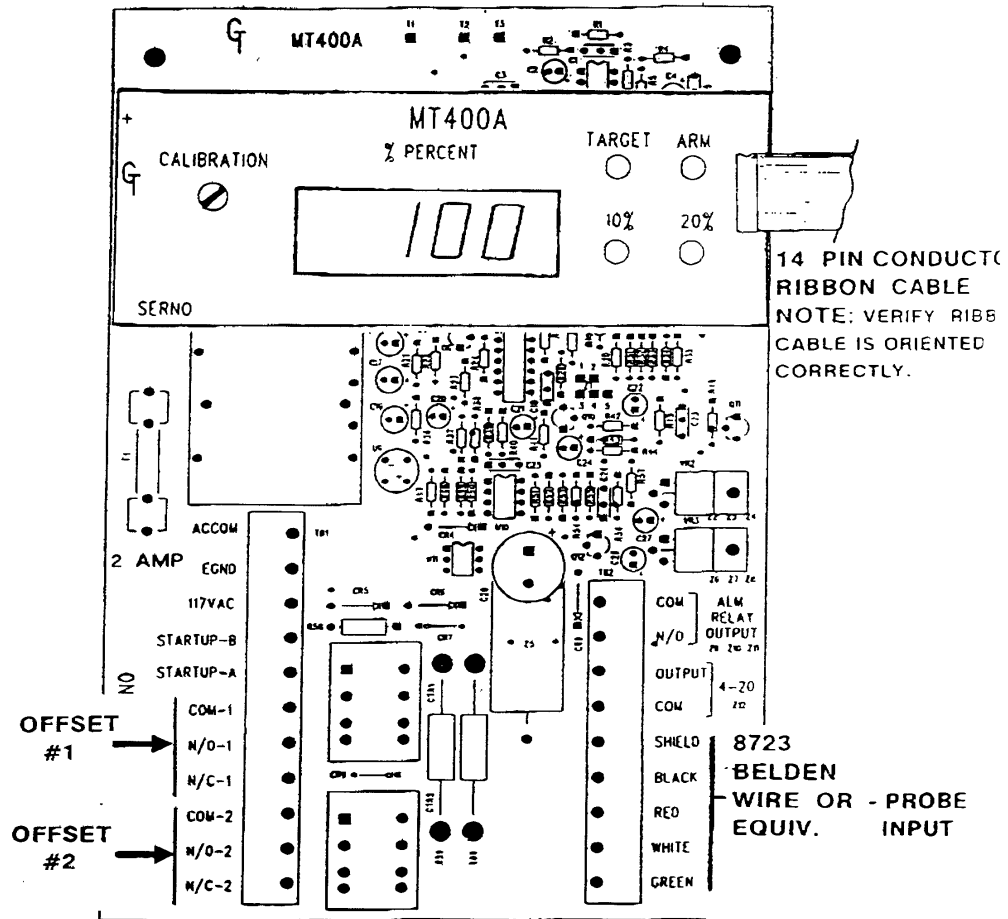
If when fully clockwise meter does not display above 100%:

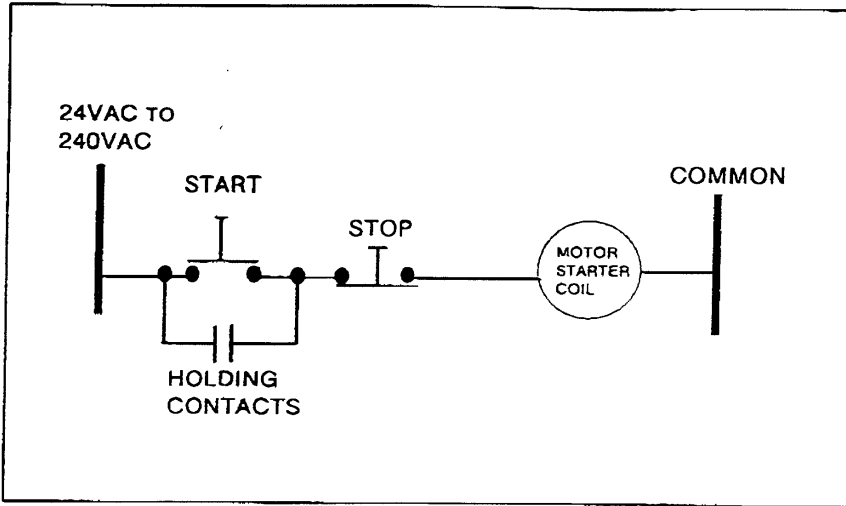
- A. There are not enough targets passing probe. The standard PC board is designed for a range of 200 to 1000 targets per minute.
 1. If when using a target disc you increase the number of targets, targets must be

evenly spaced on disc.

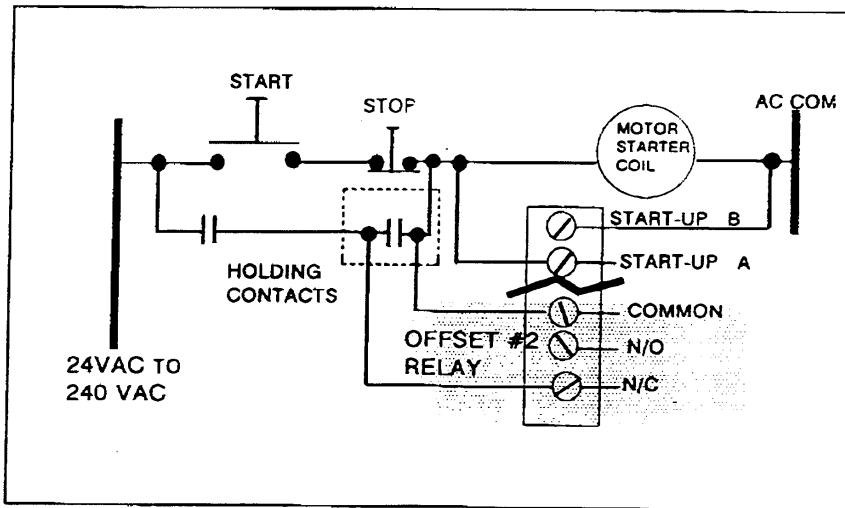
2. If monitoring slower speed, contact Maxi-Tronic (513-398-2500) to get slower speed P.C.B. board.
- B. If calibration control will not bring tachometer display below 100 %, there are too many targets passing probe.
1. If using target disc, remove targets. The targets must be evenly spaced on disc.
 2. If monitoring higher speeds, contact Maxi-Tronic to get higher speed PC board.

NOTE: Units can be purchased to detect OVER-SPEEDS and/or UNDER-SPEEDS



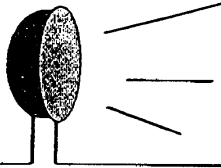


ES400-02

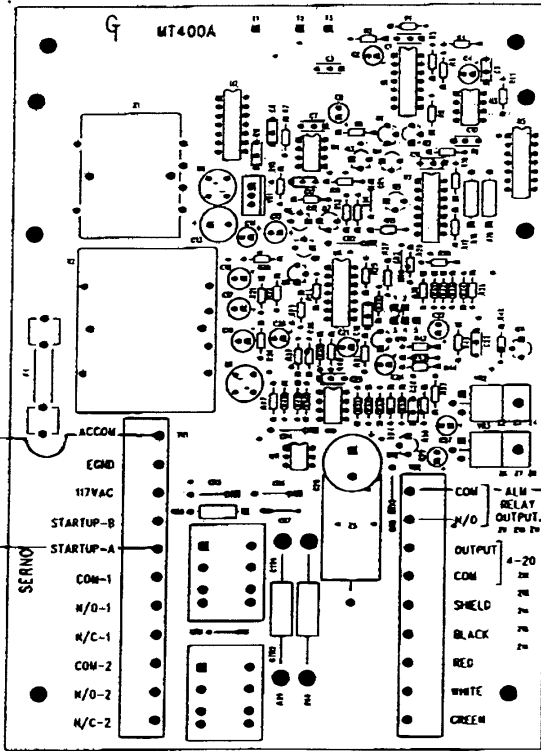


ES400-03

110VAC ALARM

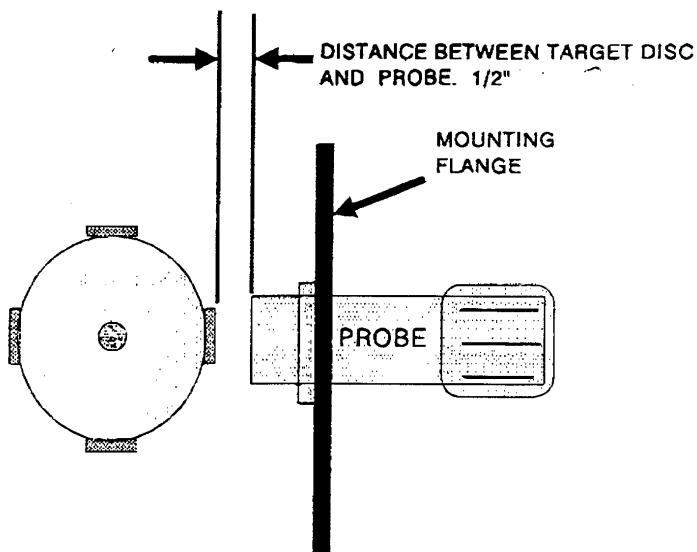


NOTE: Use the START-UP voltage
For Alarm output: Alarm will only
sound when EQUIPMENT starter is
energized and motion speed
indicator is below 90%



Note: The voltage you put on relay common will be output on relay n/o whenever 10% indicator is lit.

ES400-1

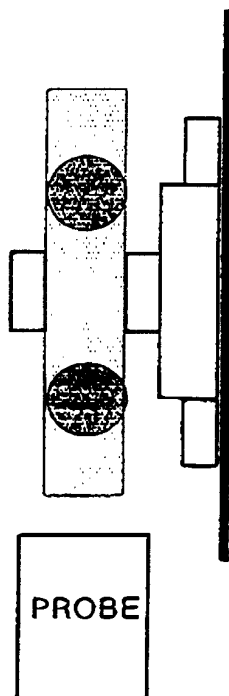


NOTE: IF EXCESS WOBBLE EXIST PERFORM THE FOLLOWING:

1. ENLARGE HOLE IN DISC CENTER.
2. USING ORIGINAL BOLT, SNUG ONLY TARGET TO DISC.
3. USING RUBBER Mallet BUMP DISC ON "WOBBLE" SIDE UNTIL WOBBLE CEASES.
4. ADJUST TARGETS FOR SPACING BETWEEN PROBE AND WOBBLE.

USING MOUNTING FLANGE SUPPLIED WITH PROBE
BECAUSE OF VARIATIONS IN INSTALLATIONS, PLEASE FOLLOW THESE STEPS:

1. PROBE SHOULD BE MOUNTED SO THERE IS NO METAL WITHIN 2" OF PROBE SIDES.
2. BE SURE PROBE IS ALIGNED DIRECTLY IN FRONT OF TARGETS ON DISC. SEE DRAWING ABOVE.
3. ADJUST PROBE SO THERE IS A GAP BETWEEN FRONT OF PROBE AND TARGETS OF 1/2" MIN. 1.5" MAX. SEE DRAWING ABOVE.



TARGET DISC INSTALLATION

1. DRILL HOLE AND TAP FOR 1/4" DIA. MIN. BOLT
2. BE SURE HOLE IS IN MIDDLE OF SHAFT END.
3. BOLT TARGET DISC. TO END OF SHAFT.

NOTE: THE MOTION SENSOR WILL ALLOW FOR SMALL AMOUNTS OF WOBBLE OF THE DISC. IF WOBBLE IS EXTREME YOU WILL SEE AN ERRATIC SKIP IN THE TARGET INDICATOR LOCATED ON THE DISPLAY OF MOTION SENSOR.

**MT MOTION SENSOR TEST PROCEDURES
PAGE 2**

- When percent meter drops (decreases) to 80%:
- 20% Indicator will turn **ON**
 - If equipment is connected for shut down at 20%-Reduction of speed equipment will shut down and alarm will shut off

3. Recalibrate Motion Sensors:

- Turn calibration control full clockwise
- Start monitored equipment to operating
- Percent meter should go above 100%

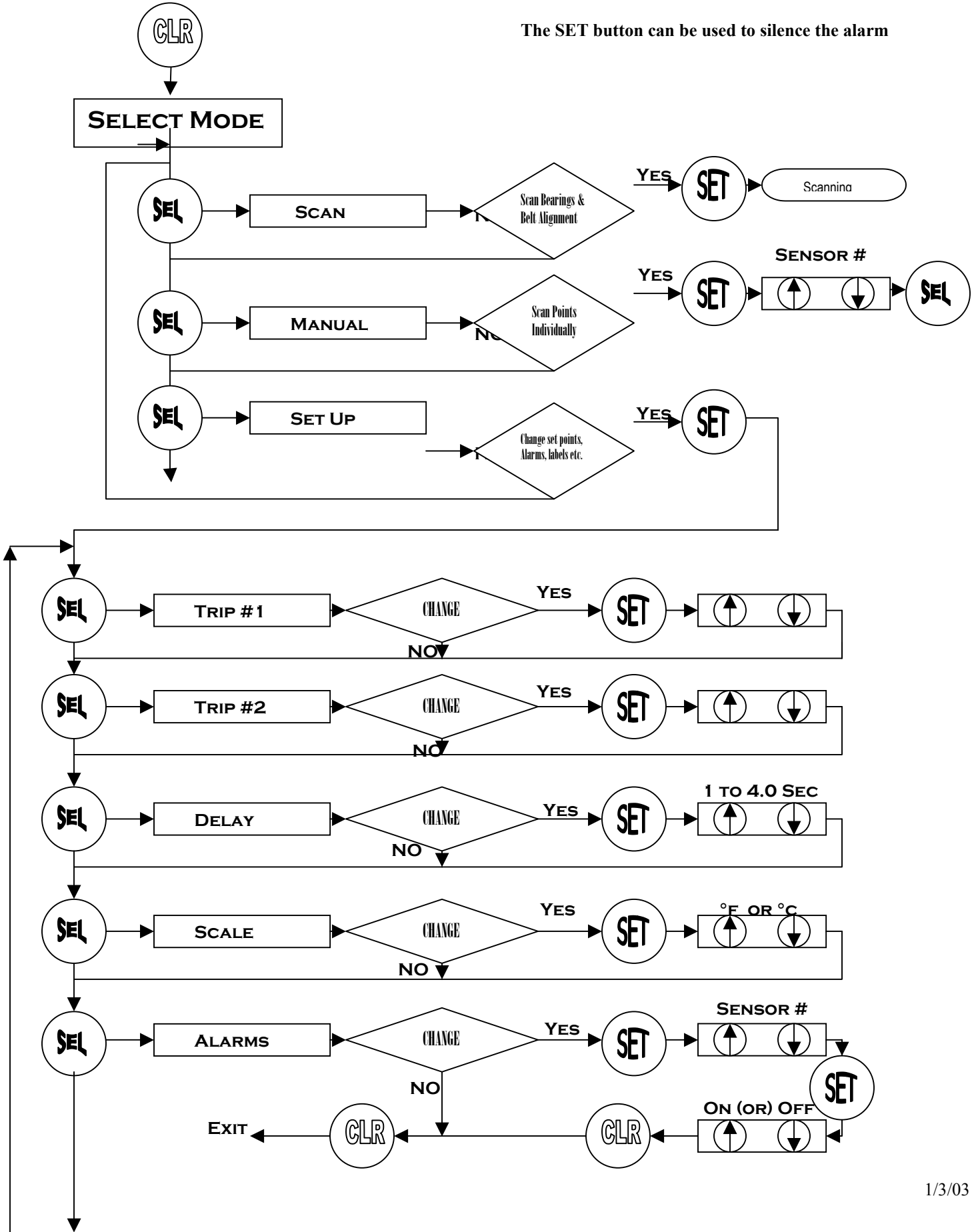
Without Load on monitored equipment perform the following:

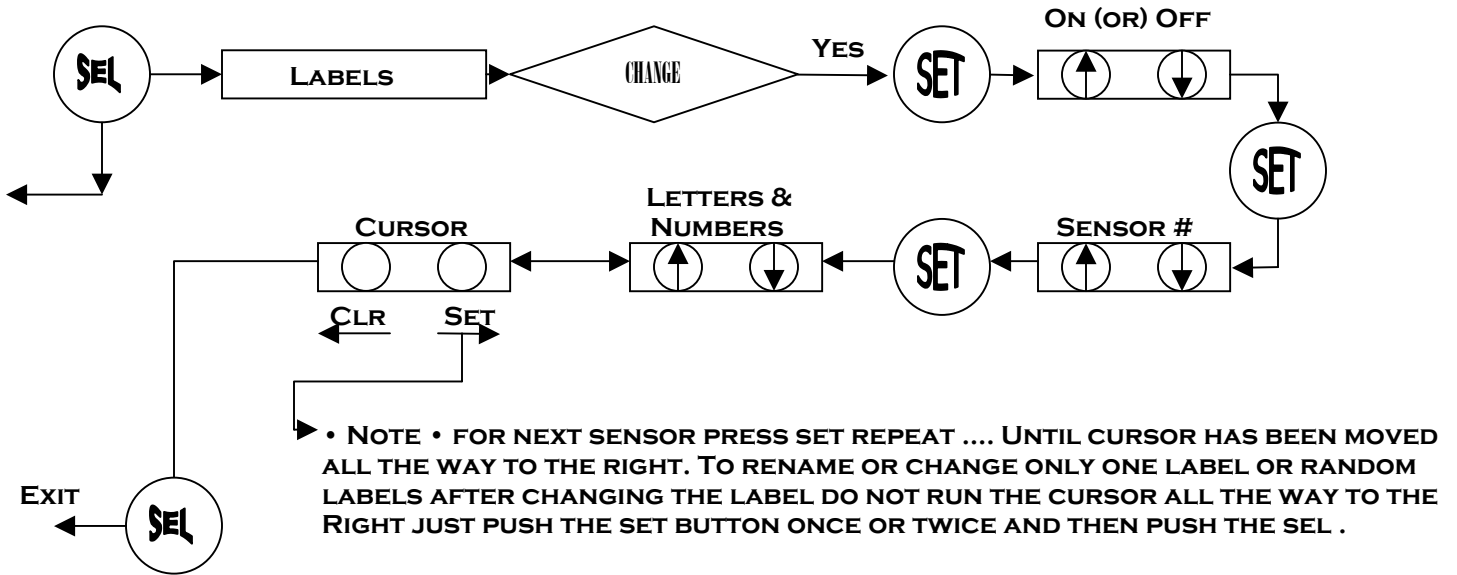
Slowly turn calibration control counter-clockwise until percent meter reads 100%

NOTE: Motion sensor is now ready for normal operation. IF ANY PART OF THIS TEST PROCEDURE DOES NOT OCCUR, CONTACT MAXI-TRONIC AT 800-659-8250.

SET-UP & OPERATION INSTRUCTIONS FOR BEARING MONITOR

The SET button can be used to silence the alarm





When an alarm sound these characters below will appear on the alarming point.

F- Hot Point Alarm
Set Trip #1

R- Rapid Alarm
Set Trip #2

FR – Open

NOTE: Points that are armed (turned on to Alarm) will hve an asterisk * behind each point.
If point is turned off this will not appear.