



95-005B
2 May, 2007

MODEL 300 TEST FEATURES

- I. PURPOSE:**
This note gives guidance on how to troubleshoot problems in the IR products.
- II. TOOLS:**
N/A
- III. PARTS:**
N/A

Note - See information below:

| TEST VALUES FACTORY SET-UP | RECOMMENDED ALLOWABLE RANGES | IF NOT IN RECOMMENDED RANGES |
|-----------------------------|------------------------------|---|
| RANGE | 50 PPM | ANY RANGE SELECTABLE FROM RANGE MENU |
| CO MEASURE AT ZERO | GREATER THAN 57,000 | 30,000 TO 75,000 |
| CO REFERENCE AT ZERO | GREATER THAN 48,000 | 20,000 TO 60,000 BUT ALWAYS LESS THAN THE CO MEASURE READING |

SEE SECTION 4.0 IN M300 MANUAL UNDER SETTING THE CO CONCENTRATION RANGE

IF ENERGY IS HIGH, ADJUST R7 OF THE SYNC DEMOD CARD TO ACCEPTABLE LEVEL.

IF ENERGY IS TOO LOW:

- 1. VERIFY OPTO OUTPUT IS CORRECT. SEE “CHECKING OPTO OUTPUT” PROCEDURE (PAGE 9).**
- 2. PERFORM “ENERGY ADJUSTMENT” PROCEDURE. SEE THE “MAXIMIZING M300 ENERGY” PROCEDURE (PAGES 6,7,8).**
- 3. READJUST R7 TO CORRECT VALUE.**

IF ENERGY IS HIGH, ADJUST R7 OF THE SYNC DEMOD CARD TO ACCEPTABLE LEVEL.

IF ENERGY IS TOO LOW:

- 1. VERIFY OPTO OUTPUT IS CORRECT. SEE THE “CHECKING OPTO OUTPUT” PROCEDURE (PAGE 9).**
- 2. PERFORM “ENERGY ADJUSTMENT” PROCEDURE. SEE THE “MAXIMIZING M300 ENERGY” PROCEDURE (PAGES 6,7,8).**
- 3. READJUST R7 TO CORRECT VALUE.**

| TEST VALUES FACTORY SET-UP | RECOMMENDED ALLOWABLE RANGES | RECOMMENDED RANGES | IF NOT IN RECOMMENDED RANGES |
|----------------------------------|------------------------------|--------------------------|---|
| MR RATIO AT ZERO | 1.175 1.225 | 1.15 TO 1.225 | IF THE RATIO IS HIGH: 1. VERIFY ZERO SOURCE IS CORRECT AND PERFORM “QUICK-CAL” PROCEDURE AFTER RESOLVING ZERO SOURCE PROBLEM. 2. VERIFY OPTO OUTPUT IS CORRECT. SEE “CHECKING OPTO OUTPUT” (PAGE 9). 3. PERFORM THE “MAXIMIZING M300 ENERGY” PROCEDURE (PAGES 6,7,8). 4. READJUST R7 TO CORRECT VALUE. IF THE RATIO IS LOW: 1. VERIFY CALIBRATION GASES ARE CORRECT AND RECAL AFTER RESOLVING CALIBRATION PROBLEM. 2. VERIFY OPTO OUTPUT IS CORRECT. SEE “CHECKING OPTO OUTPUT” (PAGE 9). 3. ASSURE MASK IS ON WHEEL CORRECT. SEE “VERIFYING MASK ALIGNMENT” (PAGE 10). 4. A LEAKY WHEEL. SEE “VERIFYING WHEEL INTEGRITY” (PAGE 11). |
| MR RATIO AT SPAN (40 PPM) | 1.10 - 1.16 | 1.10 - 1.16 | 1. LEAK CHECK UNIT. 2. VERIFY CAL GASES. 3. VERIFY ALL OTHER TEST PARAMETERS OKAY. 4. PERFORM QUICK CAL PROCEDURE. |

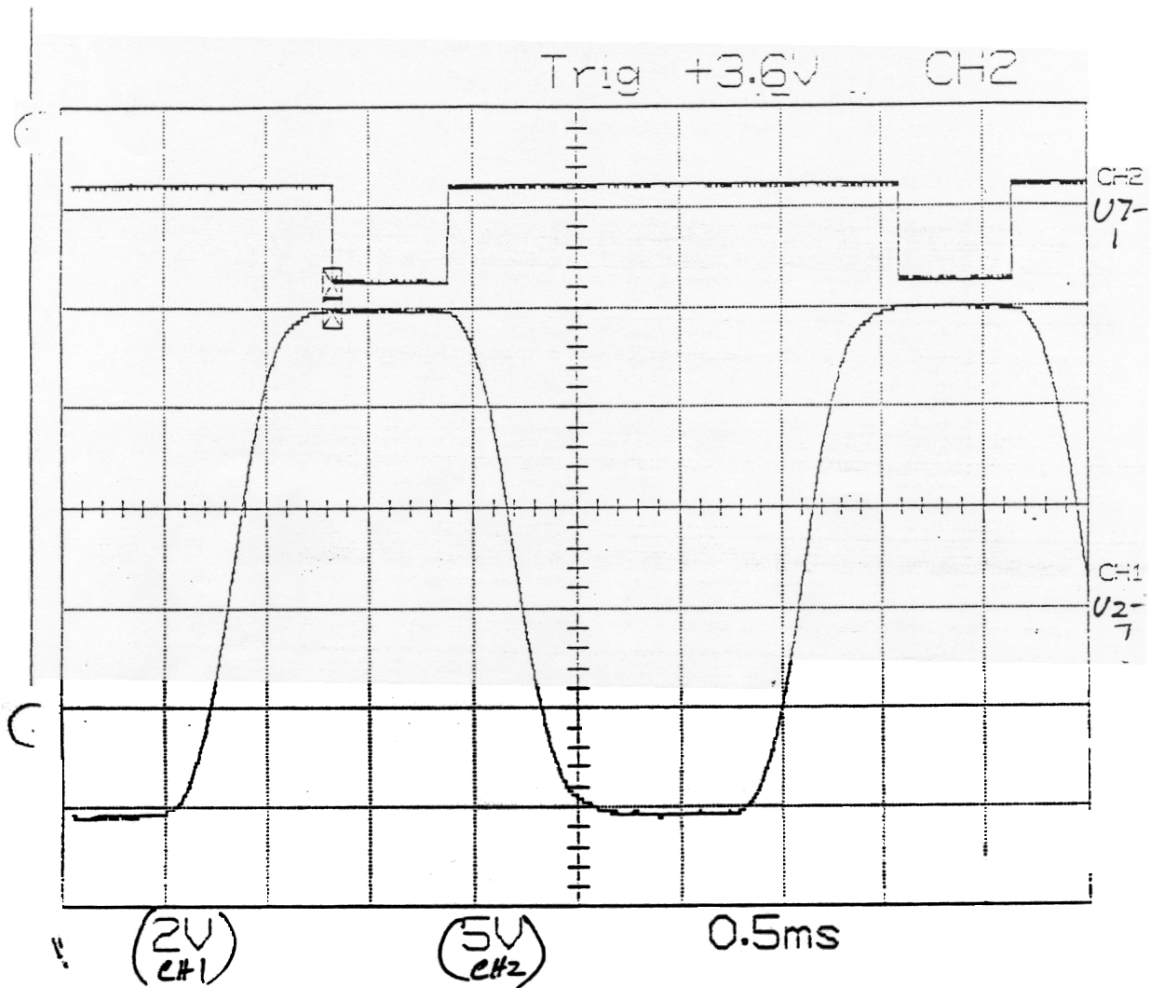
| TEST VALUES | FACTORY SET-UP | RECOMMENDED ALLOWABLE RANGES | IF NOT IN RECOMMENDED RANGES |
|-------------------------|------------------|--|---|
| CO MEASURE AT SPAN | 30,000 45,000 | 20,000 55,000 | <p>IF ENERGY IS HIGH, ADJUST R7 OF THE SYNC DEMOD CARD TO ACCEPTABLE LEVEL.</p> <p>IF ENERGY IS TOO LOW:</p> <ol style="list-style-type: none"> 1. VERIFY OPTO OUTPUT IS CORRECT. SEE "CHECKING OPTO OUTPUT" (PAGE 9). 2. PERFORM THE "MAXIMIZING M300 ENERGY" PROCEDURE (PAGES 6,7,8). 3. READJUST R7 TO CORRECT VALUE. |
| CO REFERENCE AT SPAN | 30,000 40,000 | 20,000 TO 70,000 BUT ALWAYS LESS THAN THE CO MEASURE READING | <p>IF ENERGY IS HIGH, ADJUST R7 OF THE SYNC DEMOD CARD TO ACCEPTABLE LEVEL.</p> <p>IF ENERGY IS TOO LOW:</p> <ol style="list-style-type: none"> 1. VERIFY OPTO OUTPUT IS CORRECT. SEE "CHECKING OPTO OUTPUT" (PAGE 9). 2. PERFORM THE "MAXIMIZING M300 ENERGY" PROCEDURE (PAGES 6,7,8). 3. READJUST R7 TO CORRECT VALUE. |
| PRESSURE | 30 ± 1" | 15 - 35" HG OR 29 - 31 IN HG AT SEA LEVEL | <ol style="list-style-type: none"> 1. UNPLUG PUMP USING PLIERS TO REMOVE CONNECTOR. 2. VERIFY PRESSURE AGREES WITH AMBIENT PRESSURE. IF NOT, ADJUST R1 ON FLOW SENSOR PCB. (CALL LOCAL WEATHER BUREAU TO GET AMBIENT PRESSURE.) 3. SEE SECTION 10 IN M300 MANUAL UNDER CHECKING THE PNEUMATIC SENSOR BOARD. |
| SAMPLE FLOW | 800 CC ± 10% | 700 - 900 CC | <ol style="list-style-type: none"> 1. FIRST USE CALIBRATED FLOWMETER TO VERIFY FLOW AT SAMPLE INLET. 2.A. IF FLOW IS CORRECT, ADJUST R3 ON FLOW SENSOR PCB. 2.B. IF FLOW IS LOW OR HIGH, SEE SECTION 10 IN M300 MANUAL UNDER TROUBLESHOOTING FLOW PROBLEMS. |

| TEST VALUES | RECOMMENDED | | IF NOT IN RECOMMENDED RANGES |
|-------------|----------------|------------------------|---|
| | FACTORY SET-UP | ALLOWABLE RANGES | |
| SAMPLE TEMP | 48°C ± 2 | 46 - 50°C | <ol style="list-style-type: none"> CHECK THERMISTOR WITH OHM METER TO VERIFY ACTUAL TEMP. OHMS AT 48°C = 11.83K. CHECK HEATER WITH OHM METER. VERIFY 115 VAC AT HEATER CONNECTOR, IF NOT 115 VAC SEE SECTION 10 IN M300 MANUAL UNDER TROUBLESHOOTING TEMPERATURE PROBLEMS. |
| BENCH TEMP | 48 | 48 ± 1°C | <ol style="list-style-type: none"> CHECK THERMISTOR WITH OHM METER TO VERIFY ACTUAL TEMP. OHMS AT 48°C = 11.83K. CHECK HEATER WITH OHM METER. VERIFY 115 VAC AT HEATER CONNECTOR, IF NOT 115 VAC SEE SECTION 10.6.2 IN M300 MANUAL UNDER TROUBLESHOOTING TEMPERATURE PROBLEMS. |
| MIRROR TEMP | 48 | 48 ± 1°C | <ol style="list-style-type: none"> CHECK THERMISTOR WITH OHM METER TO VERIFY ACTUAL TEMP. OHMS AT 48°C = 11.83K. CHECK HEATER WITH OHM METER. VERIFY 115 VAC AT HEATER CONNECTOR, IF NOT 115 VAC SEE SECTION 10 IN M300 MANUAL UNDER TROUBLESHOOTING TEMPERATURE PROBLEMS. |
| BOX TEMP | NONE | SHOULD NOT EXCEED 45°C | IF OVER 45°C, CHECK BACK PANEL FAN FOR OPERATION. THE BOX TEMP IS TYPICALLY 7°C HIGHER THAN AMBIENT. |
| DCPS | 2,500 mV | 2,500 mV ± 100 mV | <ol style="list-style-type: none"> VERIFY +5V, +15V, -15V, +12V. CHECK FOR SHORTS IN CHASSIS. REPLACE D.C.P.S. VERIFY DCPS IS SEATED PROPERLY. |
| SLOPE | .65 TO .95 | .65 TO .95 | <ol style="list-style-type: none"> LEAK CHECK UNIT. VERIFY CAL GASES. VERIFY ALL OTHER TEST PARAMETERS OKAY. PERFORM QUICK CAL PROCEDURE. |
| OFFSET | .05 TO .1 | .03 TO .1 | <ol style="list-style-type: none"> LEAK CHECK UNIT. PERFORM QUICK CAL PROCEDURE. PERFORM "ENERGY ADJUSTMENT" PROCEDURE. SEE THE "MAXIMIZING M300 ENERGY" PROCEDURE (PAGES 6,7,8). |

IV. PROCEDURE:

MAXIMIZING M300 ENERGY - The mirrors used in the optical system of the M300 are designed to have their alignment set permanently during the manufacturing process and no adjustment is normally needed. If the optical system is disassembled or if failure of any of the optical components is suspected, the instrument can be checked for proper optical alignment as follows:

1. Connect a source of zero air to the analyzer.
2. Allow the analyzer to warm-up for 60 minutes.
3. Confirm Optical System Energy through-put by:
 - a. Press the TST> or TST< button on the front panel until the CO MEAS value is displayed.
 - b. Increase the gain of the Synchronous Demodulation by turning Pot R7 on the Sync Demodulator board clockwise. If a CO MEAS value of 80,000 counts can be obtained, energy throughput is acceptable.
 - c. Re-adjust Pot R7 on the Sync Demodulator Board to obtain a CO MEAS reading of 65,000 counts (+/- 2,000).
- 4a. Connect an oscilloscope to U7-1. Sync the oscilloscope on this channel.
- 4b. Confirm the wave form of the optical signal by attaching an oscilloscope to Sync Demodulator board a U2 Pin 7. The oscilloscope trace should appear like those shown in the following figures. In particular the wave form should be symmetrical and should have distinct flat regions at the top and bottom of the pulses.
5. If unable to achieve 65,000 counts on CO MEAS, then do the following:
6. Adjust source for maximum signal strength. Typically source has no effect wave shape. (Not to exceed 27V peak to peak.)
- 7a. Adjust input mirror as needed to create a wave shape with distinct flattening of the peaks and symmetrical "Knees" at the peaks. A smaller waveform with nice symmetry is preferable to a larger one which is asymmetrical.
- 7b. With zero air in, verify an MR ratio of 1.18 - 1.22 is desired. If analyzer shows significantly different, slightly adjust input mirror.
- 7c. Adjust R7 for a comeas reading of 65,000 +/- 2,000 counts.



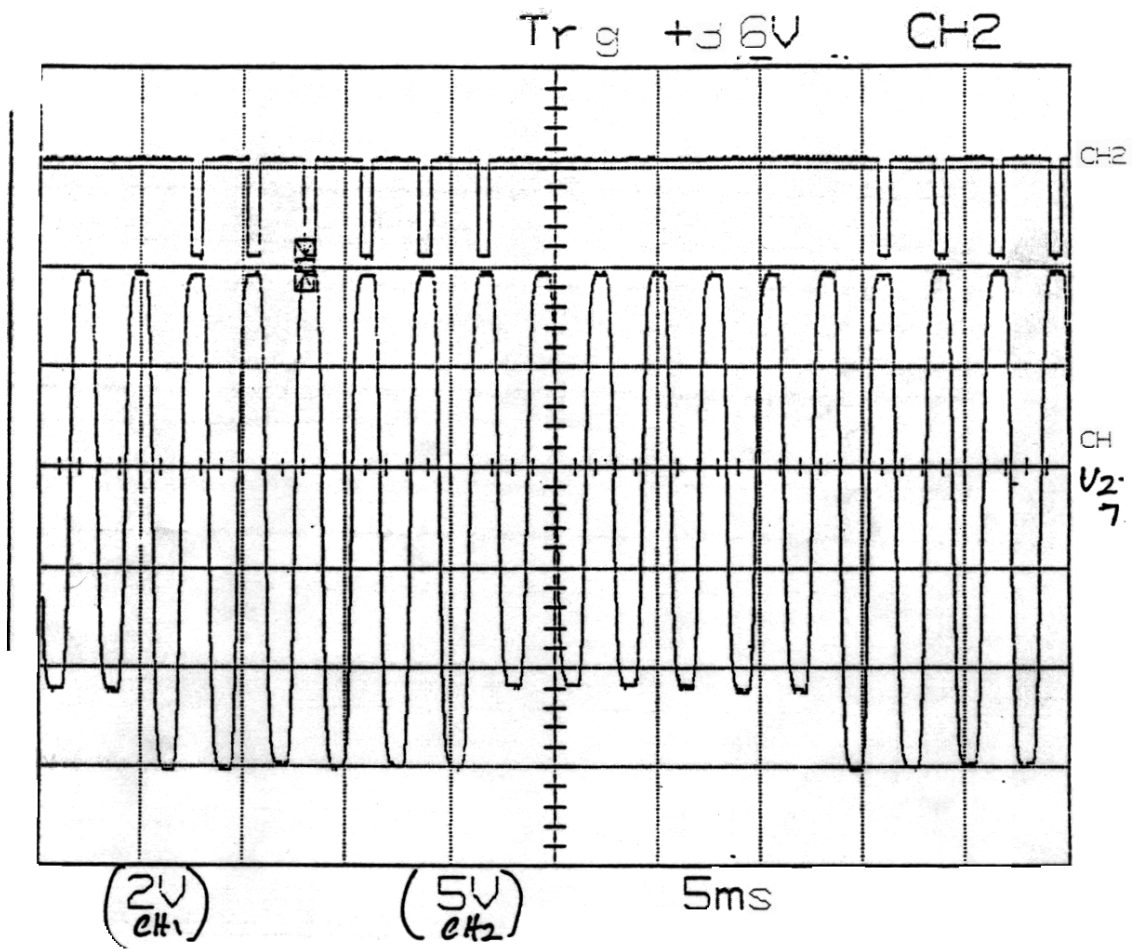
Tektronix 2212

#2

M300

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Tektronix 12

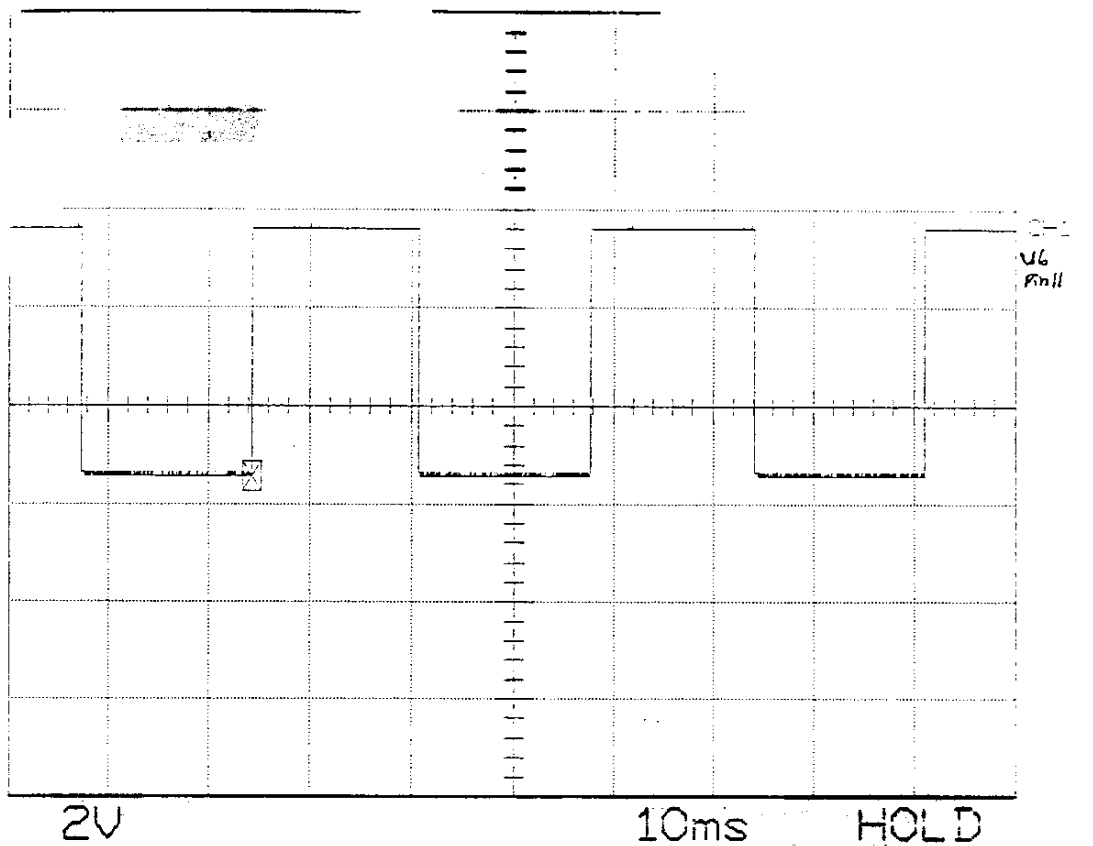
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M300

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CHECKING OPTO OUTPUT



Tektronix 2212

#1

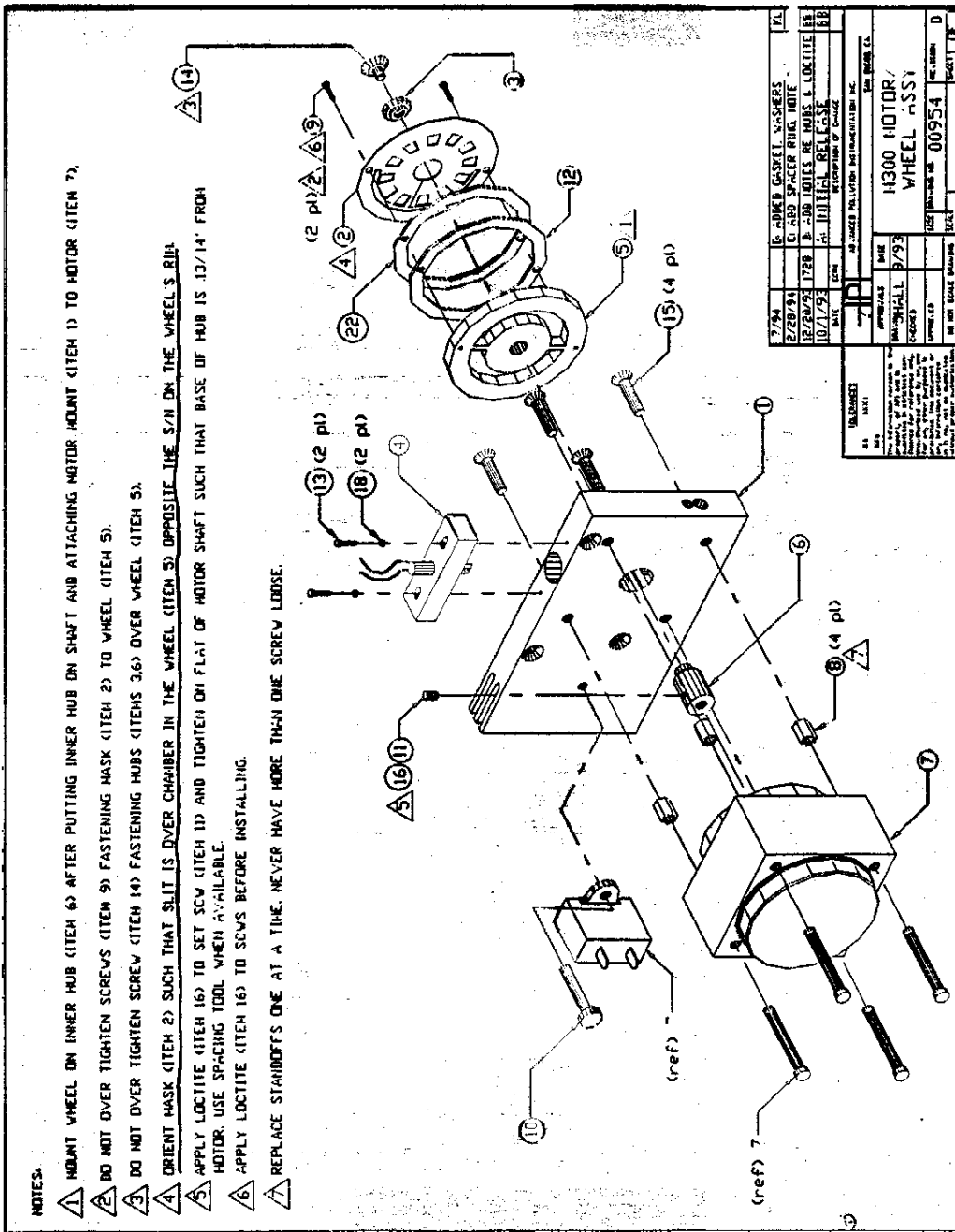
Connect an oscscope to U6-11 of Sync-demod board. Compare waveform to above.

The output should be symmetrical and 0-5 VDC peak to peak.

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- NOTES:
- 1. MOUNT WHEEL ON INNER HUB (ITEM 6) AFTER PUTTING INNER HUB ON SHAFT AND ATTACHING MOTOR MOUNT (ITEM 1) TO MOTOR (ITEM 7).
 - 2. DO NOT OVER TIGHTEN SCREWS (ITEM 9) FASTENING MASK (ITEM 2) TO WHEEL (ITEM 5).
 - 3. DO NOT OVER TIGHTEN SCREW (ITEM 14) FASTENING HUBS (ITEMS 3,6) OVER WHEEL (ITEM 5).
 - 4. ORIENT MASK (ITEM 2) SUCH THAT SLIT IS OVER CHAMBER IN THE WHEEL (ITEM 5) OPPOSITE THE S/N ON THE WHEEL'S RIM.
 - 5. APPLY LOCTITE (ITEM 16) TO SET SCW (ITEM 17) AND TIGHTEN ON FLAT OF MOTOR SHAFT SUCH THAT BASE OF HUB IS 13/14" FROM MOTOR. USE SPACING TOOL WHEN AVAILABLE.
 - 6. APPLY LOCTITE (ITEM 16) TO SCWS BEFORE INSTALLING.
 - 7. REPLACE STANDOFFS ONE AT A TIME. NEVER HAVE MORE THAN ONE SCREW LOOSE.

- 1. IF IN ASSEMBLING AND DISASSEMBLING THE CO MEASURE VALUE IS GREATER THAN THE CO REFERENCE, THEN THE MASK IS ON BACKWARDS. THE MASK GOES ON ONLY 2 DIFFERENT WAYS: CORRECT OR INCORRECT.
- 2. LOOK AT NOTE 4 ON THE ASSEMBLY DIAGRAM FOR PROPER MASK ORIENTATION.

VERIFYING WHEEL INTEGRITY - A leaky wheel is almost the only way a wheel can fail.

The symptoms of a leaky wheel are:

1. The CO reference value approaches the CO measure value.
2. The ppm value on the analyzer reads 300 to 1000 ppm or a constant increase of ppm value with no apparent faults.
3. The MR ratio approaches 1.0