REVISIO

OCT 9 1975

III. CIRCUIT SPECIFICATIONS

A. POWER SUPPLY REQURIEMENTS

Plus Supply: +22.000 ± .002 VDC
(Pin 37) (plus supply draws approx. 70 ma)

Minus Supply: -22.000 ± .002 VDC
(Pin 41) (Minus supply draws approx. 70 ma)

B. OPERATING SIGNAL LEVELS

(no input signals required)

C. OUTPUT LOADS

Speed Ref. to Primary LVG = 9.09K ± 1% @ pin 27.

Speed Ref. to Backup LVG = 9.09K ± 1% @ pin 28.

Supp. Speed Ref. to Primary LVG = 60.4K ± 1% @ pin 29.

Supp. Speed Ref. to Backup LVG = 60.4K ± 1% @ pin 29.

UNDER SOME CONDITIONS OVERSPEED SELECTED CONN TO PIN 29 TEST W/O SPEED — LOAD ONLY

Accel. Ref. to Primary LVG

SLOW	=	100K ± 1% @ pin 16
MEDIUM	=	100K ± 1% @ pin 18
FAST	=	100K ± 1% @ pin 20

Wobbulator Signal to Primary & Backup LVG = 44.8K ± 1% or ground (when not in use) @ pin 24.

PRINTS TO

REV NO. 3	TITLE
P3K-AL-0307-A01	TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES
CONT ON SHEET 3A SH NO. 3	FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

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III. CIRCUIT SPECIFICATIONS

D. INDIVIDUAL SPEED, SUPPLEM, & ACCELERATION REFERENCE SIGNAL SPECIFICATION

ALL MEASURED AT PIN 27

CLOSE VALVES (15.3V & 9V Zeners NOT regulating)

G1 = -7.574 ± .183 VDC

G2 = -7.704 ± .186 VDC

PIN 32 CONN 33 CONN 29

LOW SPEED HOLD (15.3V & 9V Zeners NOT regulating)

Range: G1 max. = +0.608 ± .030 VDC (VR5 max CW) 31 CONN 29
min. = +0.404 ± .008 VDC (VR5 max CCW)

G2 max. = +0.713 ± .043 VDC (VR5 max CW)
min. = +0.388 ± .008 VDC (VR5 max CCW)

Set Point: = +.500 + .001 VDC

MEDIUM SPEED HOLD (15.3V & 9V Zeners NOT regulating)

Range: G1 max. = +4.728 ± .281 VDC (VR6 max CW) 34 CONN 29
min. = +1.925 ± .035 VDC (VR6 max CCW)

G2 max. = +4.464 ± .252 VDC (VR6 max CW)
min. = +2.132 ± .039 VDC (VR6 max CCW)

Set Point: +2.500 + .001 VDC

HIGH SPEED HOLD (15.3V Zener Regulating & 9V NOT regulating)

Range: G1 max. = +8.366 ± .303 VDC (VR7 max CW)
min. = +5.972 ± .132 VDC (VR7 max CCW) 35 CONN 29

G2 max. = +8.800 ± .290 VDC (VR7 max CW)
min. = +4.056 ± .066 VDC (VR7 max CCW)

Set Point: +7.500 + .001 VDC

DESIGN NOTE:

G1: At Rated Speed, current thru CR6 & CR7 = 7.5 ma (nominal) and total current thru 9V zeners CR8 and CR9 = 7.5 ma (nominal).

G2: At Rated Speed, current thru CR6 & CR7 = 7.5 ma (nominal) and total current thru 9V zeners CR8 and CR9 = 15 ma (nominal).

PRINTS TO

REVISION 3 OCT 9 1975

III. CIRCUIT SPECIFICATIONS (continued)

D. INDIVIDUAL SPEED, SUPPLEM, & ACCELERATION REFERENCE SIGNAL SPECIFICATION

RATED SPEED HOLD = +9.000 ± .090 VDC { 9.090 max / 8.910 min

OVERSPEED = +9.000 ± .090 VDC

TEST BACKUP SPEED AMPLIFIER (15.3V & 9V Zeners Regulating)

Range: max. = +.298 ± .031 VDC (VR4 Full CW)
min. = Zero (VR4 Full CCW)

Set Point: = +0.150 + .001 VDC

SLOW ACCEL.

Range: max. = +.021 ± .002 VDC (VR1 Full CW)
min. = Zero (VR1 Full CCW)

Set Point: = +.0111 + +.0001 VDC

MEDIUM ACCEL.

Range: max. = +.031 ± .003 VDC (VR2 Full CW)
min. = Zero (VR2 Full CCW)

Set Point: = +.0167 + .0001 VDC

FAST ACCEL.

Range: max. = +.059 ± +.006 VDC (VR3 Full CW)
min. = Zero (VR3 Full CCW)

Set Point: = +.0333 ± .0001 VDC

9.000 + .090 = 9.090
9.000 − .090 = 8.910

III. CIRCUIT SPECIFICATIONS (continued)

E. WOBBULATOR PERFORMANCE SPECIFICATIONS

1. Power Supply (CR1, CR2, CR3, CR4)

   TP1: +15.7 ± 1.0 VDC
   TP2: -15.7 ± 1.0 VDC (with respect to TP11)

2. Wobbulator Lower Limit

   IC2 Pin 3 = -2.629 ± .335 VDC -2.964 -2.294
   (when Q1 ON, & Q2 OFF)

3. Wobbulator Upper Limit

   IC2 Pin 3
   (when Q2 OFF, & Q2 ON)

   Range: max. = +3.892 ± .147 VDC (VR51, Max CW) 4.039, 3.745
   min. = +1.274 ± .360 VDC (VR51, Max CCW) 1.634, .914

   Set Point: = Set Upper Limit Equal to Lower Limit.

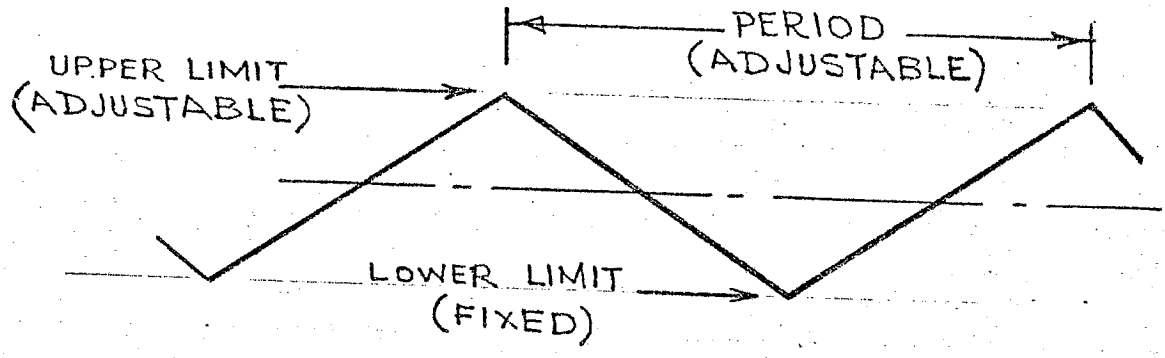
NOTE: Above Max, Min, & Tolerance Values are based on nominal supply voltage of +15.7 & -15.7. The above values will change with variations in supply voltage. See Table I for allowance variations.

REVISIONS
1 O.Y.Mone APR 5 1973
2 O.Y.Mone MAY 29 1974
3 O.Y.Mone OCT 9 1975
PRINTS

III. CIRCUIT SPECIFICATIONS (continued)

E. WOBBULATOR PERFORMANCE SPECIFICATIONS (CONTINUED)

4. Wobbulator Period



Range: Wobbulator signal @ TP6 must be adjusted for 6 minute period. Adjusting VR50 CCW increases period & CW decreases period.

Linearity: (No Spec)

Half Cycle Time: (No Spec)

CW - FASTER RAMP

VR 50

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1 O.Mone APR 5 - 1973

MAY 29 1974 O.Mone

3 O.Mone OCT 9 1973

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TITLE
TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES
FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

REVISIONS
1 D.Mone APR 5 1973 Added this sht.
2 D.Mone MAY 29 1974 No chg. this sht.
3 D.Mone OCT 9 1975 No chg. this sht.

TABLE I

WOBBULATOR UPPER LIMIT ADJUSTMENT

VARIATIONS WITH POWER SUPPLY VARIATIONS

Positive supply voltage @ TP1	Negative supply voltage @ TP2	Voltage @ IC2 Pin 3 VR51, Max. CW	Voltage @ IC2 Pin 3 VR51 Max. CCW
	-14.7	4.889 ± .147	2.270 ± .360
+16.7	-15.7	4.514 ± .152	1.812 ± .371
	-16.7	4.1394 ± .156	1.355 ± .383
	-14.7	4.266 ± .142	1.731 ± .348
+15.7	-15.7	3.892 ± .147	1.274 ± .360
	-16.7	3.517 ± .152	.816 ± .371
	-14.7	3.644 ± .138	1.192 ± .337
+14.7	-15.7	3.269 ± .142	.735 ± .348
	-16.7	2.895 ± .147	.277 ± .360

PRINTS TO

MADE BY D.Mone Nov. 2, 1972 | APPROVALS | Steam Turbine DIV OR DEPT.
ISSUED NOV 3 1972 | | Schenectady, N.Y. LOCATION

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TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES
FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

REVISIONS

1	D.Mone APR 5 1973	Per Chg Notice
2	D.Mone MAY 29 1974	* - New Values
3	D.Mone OCT 9 1975	Per Chg Notice

IV. TEST INSTRUCTIONS

(Refer to the circuit board schematic while board is being tested)

1. Connect board as shown in test set-up.

2. Check DC voltage at TP1 (+15.7 ± 1 VDC).

3. Check DC voltage at TP2 (-15.7 ± 1 VDC)

4. Check DC voltage at TP11 (zero volts) .021 MV

5. Close S1 and check SLOW acceleration reference voltage at TP3. Check that this voltage can be varied from +21 ± 2 MV (max CW) to zero volts (max CCW) by adjusting VR1. Set this voltage at +11.1 MV. Open S1.

6. Close S2 and check MEDIUM acceleration reference voltage at TP4. .031 Check that this voltage can be varied from +31 ± 3 MV (max CW) to zero volts (max CCW) by adjusting VR2. Set this voltage at +16.7 MV. Open S2.

*G2 VALUES ARE DIFFERENT. See Sheet 3 of CKT specs 92689 + EHC

7. Close S3 and check FAST acceleration reference voltage at TP5. .037 Check that this voltage can be varied from +59 ± 6 MV (max CW) to zero volts (max CCW) by adjusting VR3. Set this voltage at +33.3 MV. Open S3.

8. Close S4 and check RATED speed reference voltage at TP8 (+9.000 ± .090 VDC).

* 9. Keep S4 closed. Close S5 and check CLOSE VALVES reference voltage at
G1 = TP8 (-7.574 ± .183). Open S5.
G2 = -7.709 ± .188

10. Keep S4 closed. Close S6 and check ROTOR WARMING reference voltage at TP8 (zero volts). Open S6.

11. Keep S4 closed. Close S7 and check LOW SPEED HOLD reference voltage at TP8. Check that this voltage can be varied from +.608 ± .030 VDC (max CW) to +.404 ± .008 VDC (Max CCW) by adjusting VR5. Set this voltage at +.500V. Open S7. G2 CW = +.713 ± .043 VDC. CCW = +.388 ± .008 VDC.

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TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES

FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

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IV. TEST INSTRUCTIONS (continued)

12. Keep S4 closed. Close S8 and check MEDIUM SPEED HOLD reference voltage at TP8. Check that this voltage can be varied from +4.728 ± .281 VDC (max CW) to +1.925 ± .035 VDC (max CCW) by adjusting VR6. Set this voltage at +2.500 V. Open S8. *G2 CW = +4.464 ± .252 VDC; CCW = +2.132 ± .039 VDC*

13. Keep S4 closed. Close S9 and check HIGH SPEED HOLD reference voltage at TP8. Check that this voltage can be varied from 8.366 ± .303 VDC (max CW) to 5.972 ± .132 VDC (Max.CCW) by adjusting VR7. Set this voltage at +7.500 V. Open S9. *G2 CW = +8.800 ± .290 VDC; CCW = +4.056 ± .066 VDC.*

**G2 VALUES ARE DIFFERENT see sheet 3 of CKT. SPECS. HMC 6/26/81*

14. Keep S4 closed. *(PIN 30)* Close S10 and check TEST BACKUP SPEED AMPLIFIER reference voltage at J2. Check that this voltage can be varied from + .298 ± .031 VDC (max CW) to zero volts (max CCW) by adjusting VR4. Set this voltage at +0.150V. Open S10.

15. Keep S4 closed. Close S11 and check the OVERSPEED reference voltage at J1 *(PIN 29)* (+9.000 ± .090 VDC). Open S4 and S11.

16. Check Wobbulator Circuit as follows: *TURN ON S12*

This circuit is used to generate a triangular waveform which varies turbine speed approximately ± 100 RPM when HIGH SPEED HOLD is selected. The generated waveform varies from approximately +2.5 Volts to -2.5 Volts and completes one cycle in six minutes (approx. time).

*** SEE SPEC SHEET FOR WOBBULATOR WAVEFORM***

Check the slowly varying WOBBULATOR reference voltage at TP6. Measure and record the maximum negative voltage (-2.629 ± .335 VDC). Note that the magnitude of the negative portion of the wave cannot be adjusted.

17. Check at TP6 that the maximum positive voltage of the wobbulator wave can be varied from +3.892 ± .147 V (mac CW) to +1.274 ± .360 (max CCW) by adjusting VR51. Set this voltage to be equal in magnitude to the negative half of the wave. (See Table I of Specifications for allowable deviation due to allowable power supply variations). *VR51 +2.62v*

18. Check at TP6 that the time between maximum positive peaks can be varied to obtain a 6 min cycle. *VR50 CW for Faster.*

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TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES

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CONT ON SHEET 10 SH NO. 9

FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

REVISIONS

1 D.Mone APR 5 1973

2 D.Mone MAY 29 1974

3 D.Mone OCT 9 1975

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IV. TEST INSTRUCTIONS (continued)

19. Set up the X-Y recorder to plot the voltage waveform at TP6 versus time. Close S12 and record the waveform. Open S12 and review the plot. If the time between positive peaks is not 6 minutes, readjust the circuit and repeat the recording.

20. Open S12 and check voltage at TP6 (zero volts). Check wobbulator signal at TP7. The wobbulator circuit should continue to generate the triangular waveform even though the output has been grounded.

21. Optional Test of Wobbulator Circuit

A strip chart recorder may be used in place of the X-Y recorder when steps 16 to 20 are being performed.

GENERAL ELECTRIC

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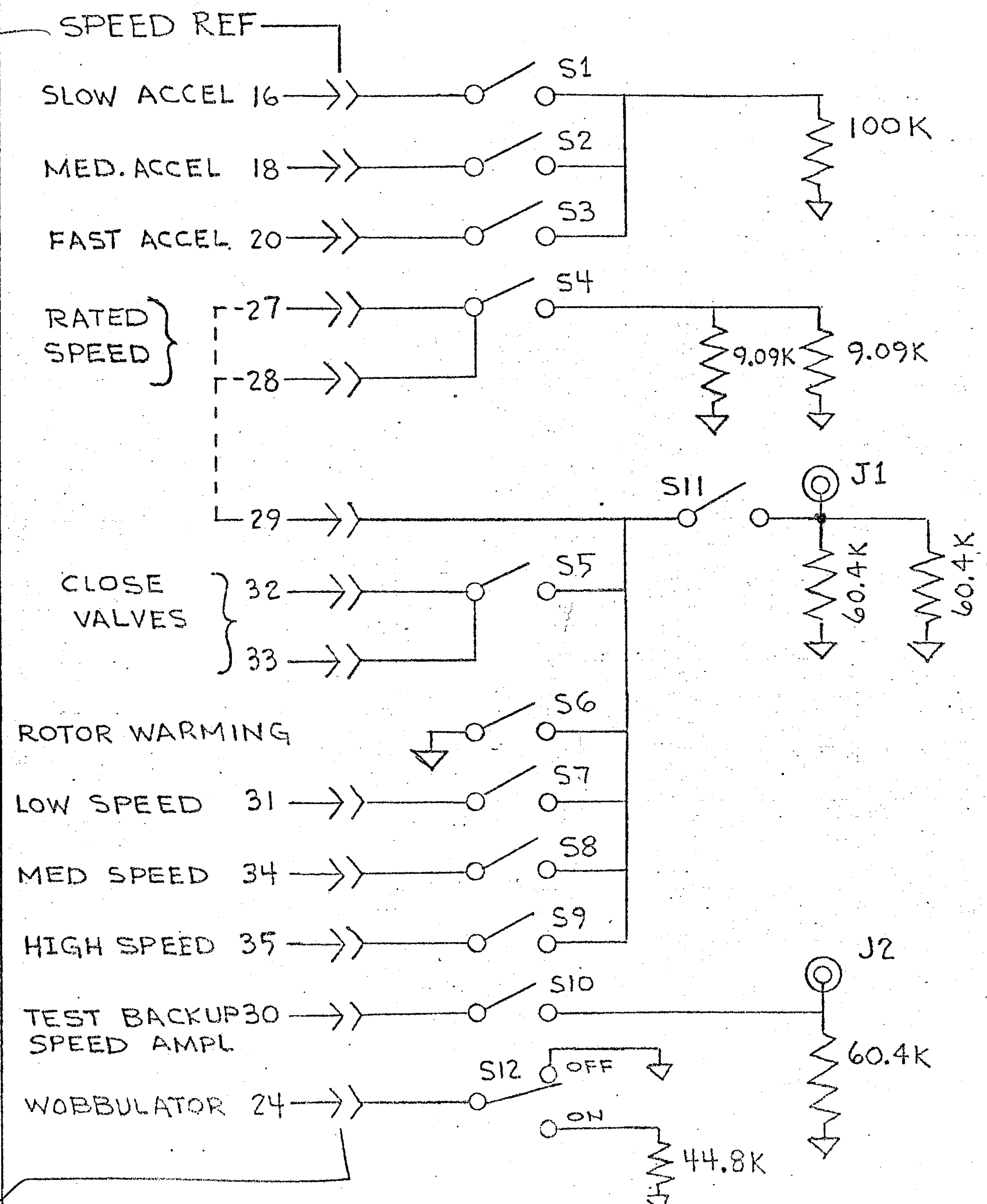
TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES

FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)



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1 D.Mone APR 5 1973
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TEST INSTRUCTIONS FOR SPEED CONTROL REFERENCES

FIRST MADE FOR EHC MARK II (SPEED CONTROL UNIT)

REVISIONS

1	APR 5 1973
2	MAY 29 1974
3	OCT 9 1975

PREPARED BY [signature] DATE 10/25/72

EHC DESIGN ENGINEERING

APPROVED BY [signature] DATE 10/26/72

EHC TEST ENGINEER

APPROVED BY PC Cullen DATE 10-30-72

MANAGER - EHC DESIGN ENGINEERING

PRINTS TO

MADE BY D. Mone Nov. 2, 1972

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