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Electronic Products Repair

Test Instructions for

0621L0112 G001
Device Number

Six pulse non reversing speed current control card
Description of Device

Originated By: Dennis Cully **Date:** June 8, 2005
Typed Name mm/dd/yy

Approved By: Dennis Cully **Approval Date:** June 8, 2005
Signature mm/dd/yy

TEST INSTRUCTIONS

PREVIOUS REVISION SHEET

0621L0112 G001
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Six pulse non reversing speed current control card
Description of Device

Originated By	**Date mm/dd/yy**	**Description of change**
Dale Derr	January 12, 1978	Created test instructions for Six pulse non reversing speed current control card 0621L0112 G001
Dennis Cully	November 02, 1989	Created test instructions for Six pulse non reversing speed current control card 0621L0112 G001
Dennis Cully	April 02, 1995	Created cover and revision sheet
Rob Bartoszek	October 27, 1997	Modified test instructions
Terry Fechschyn	November 03, 1999	Modified test instructions
Lucio Carrescia	December 17, 2004	Modified test instructions
Dennis Cully	June 8, 2005	Revised the document to the latest format and added the upgrade section

TEST INSTRUCTIONS

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Location: Book or file File

Six pulse non reversing speed current control card
0621L0112 G001
Date: June 8, 2005

1. PURPOSE:

a. Static and dynamic test procedures for Six pulse non reversing speed current control card 0621L0112 G001

2. ELEMENTARY:

a. S & C Data Book 1190 Section 112 drawing number 0238A2965

3. EQUIPMENT:

a. Stationary Super card Test box - TL #00363 or equivalent. SP3000/3100 Test Dive
b. Oscilloscope TEK 460A H192009
c. Multi meter HP or Fluke - or equivalent.
d. Interface DII card 0621L0110 – 113. TL # 00913
e. Resistor 2.7M.
f. Resistor 100KΩ. ½ W.
g. Power Supply –
h. 115/21 VACCT isolation transformer TL# 847-TM002

4. SET UP:

a. Connect
   i. 0° to cp031
   ii. 60° to cp033
   iii. 120° to cp035
   iv. 180° to cp032
   v. 240° to cp034
   vi. 300° to cp036
   vii. ACOM to cp037
   viii. Ø 1 acct. f1 to cp051
   ix. Ø 1 acct. f2 to cp052
   x. Ø 2 acct. f1 to cp053
   xi. Ø 2 acct. f2 to cp054
   xii. Ø 3 acct. f1 to cp055
   xiii. Ø 3 acct. f2 to cp056
   xiv. P1fg to cp001
   xv. P1fc to cp002
   xvi. P2fg to cp003
   xvii. P2fc to cp004
   xviii. P3fg to cp005
   xix. P3fc to cp006
   xx. N1fg to cp007
   xxi. N1fc to cp008

xxii. N2fg to cp009
xxiii. N2fc to cp010
xxiv. N3fg to cp011
xxv. N3fc to cp012

b. Insert interface card for 0621L0112 G001 into cr. 2.
c. Check switch positions.
   i. Switch 1 out.
   ii. Switch 2 out.
   iii. Switch 3 out.
   iv. Switch 4 in.
   v. Switch 5 out.
   vi. Switch 6 out.
   vii. Switch 7 out.
   viii. Switch 8 out.
   ix. Set IEC switch to 3000
d. Set all unsealed potentiometers CCW.
e. Set both M1 and M2 field potentiometers CCW.

5. PROCEDURE:

a. Static Tests
   i. Apply 3-phase AC power with CB1 up.
   ii. DC. Power
      1. + 15 VDC ± 1.5 VDC between 1TB35 (+) and 1TB37 (-) < 300 MV ripple P / P.
      2. - 15 VDC ± 1.5 VDC between 1TB39 (-) and 1TB37 (+) < 300 MV ripple P / P.
      3. + 10 VDC ± 500 MV between 1TB36 (+) and 1TB37 (-) < 30 MV ripple P / P.
      4. - 10 VDC ± 500 MV between 1TB38 (-) and 1TB37 (+) < 30 MV ripple P / P.
      5. + 5 VDC ± 300 MV between cp110 (+) and 1TB37 (-) < 30 MV ripple P / P.
   iii. AC. Input Power (Drawing 0238A2965 pg. 10)
      1. Apply 3-phase AC power with CB1 up.
      2. With oscilloscope observe inputs of 28 to 34 VAC P / P. (Use Ø1 and Ø2 in differential mode to compare the other positions).
         a. Cp031 is 0°
         b. Cp032 is 180°
         c. Cp033 is 60°
         d. Cp034 is 240°
         e. Cp035 is 120°
         f. Cp036 is 300°

         g. Observe phase shift inputs of 22 to 26 VAC. P / P. (Use Ø1 and Ø2 in differential mode to compare the other positions).
            i. Cp112 is 30°

ii. Cp113 is 210°
iii. Cp114 is 90°
iv. Cp115 is 270°
v. Cp116 is 150°
vi. Cp117 is 330°

iv. Phase Rotation Circuit (Drawing 0238A2965 pg. 9)
1. With the 3-phase AC power applied in the correct sequence L180 should be illuminated.
2. Reverse 0° and 180°
   a. L180 goes out when one lead is off
   b. L100 illuminates.
3. Replace 0° and 180°
   a. L180 is illuminated and L100 stays illuminated until PB100 is pressed and released.

v. Reset (Drawing 0238A2965 pg. 8)
1. Set the suicide switch to static
2. Depress PB100.
3. IEC relay picks up.
4. Release PB100.
   a. IEC relay drops out
   b. Cp106 is + 250 MVDC ±100 MV.
   c. L100 is extinguished.

vi. Phase Loss and Relay Driver (Drawing 0238A2965 pg. 8 and 9)
1. Remove 0° from cp031.
   a. IEC relay picks up
   b. Cp106 goes to -15VDC ± 100 MV.
   c. L100 illuminates.
2. Replace 0° to cp031
3. Depress and release PB100.
   a. Relay drops out
   b. Cp106 goes to + 250 MVDC ± 100 MV.
   c. L100 extinguishes.
4. Repeat with 120° on cp035.
5. Repeat with 240° on cp034.

vii. Ramp Circuit
1. Zero
   a. Place suicide to static.
   b. Adjust R1 & R2 CW
   c. Disconnect cp071 from cp099.
   d. Connect a 2.7MΩ resistor between 1TB3 and 1TB4.
   e. Connect cp99 to ground.
   f. Adjust output on 1TB4 to 0 VDC ± 10 MV with R19.
   g. Reconnect all changes.
2. Positive Ramp and Suicide (Maximum Ramp Rate)
   a. Apply + 10 VDC to 1TB1 with switch 5 out and R10 CW.

b. Set suicide switch to off (middle) to disconnect 1TB5 from 1TB37 (ACOM.)
c. Ensure that the voltage on cp071 or 1TB6 is < - 10 VDC (R1)
d. Set suicide switch to static to connect 1TB5 to 1TB37 (ACOM.)
e. Ensure that the voltage on 1TB4 ramps to + 10 VDC ± 400 MV in 500 milliseconds ± 15 milliseconds.
f. Set suicide switch to off to disconnect 1TB5 from 1TB37 (ACOM.)
g. Output on 1TB4 should snap to 0 VDC ± 10 MV.

3. Negative Ramp and Suicide (Maximum Ramp Rate)
   a. Apply - 10 VDC to 1TB1 with switch 5 in and R10 CW.
   b. Set suicide switch to off (middle) to disconnect 1TB5 from 1TB37 (ACOM.)
   c. Ensure that the voltage on cp071 is > + 10 VDC.
   d. Set suicide switch to static to connect 1TB5 to 1TB37 (ACOM.)
   e. Ensure that the voltage on 1TB4 ramps to - 10 VDC ± 400 MV in 500 milliseconds ± 15 milliseconds.
   f. Set suicide switch to off (middle) to disconnect 1TB5 from 1TB37 (ACOM.)
   g. Output on 1TB4 should snap to 0 VDC ± 10 MV.
4. Minimum Ramp Rate
   a. Set R1 and R2 CCW.
   b. Apply + 10 VDC to 1TB1 with switch 5 out and R10 CW.
   c. Set suicide switch to static to connect 1TB5 to 1TB37 (ACOM.)
   d. Ensure that the voltage on 1TB4 ramps to + 10 VDC ± 400 MV in 9 seconds ± 2 seconds.
   e. Set suicide switch to off to disconnect 1TB5 from 1TB37 (ACOM.)
   f. Output on 1TB4 should snap to 0 VDC ± 10 MV.
   g. Apply - 10 VDC to 1TB1 with switch 5 in.
   h. Set suicide switch to static to connect 1TB5 to 1TB37 (ACOM.)
   i. Ensure that the voltage on 1TB4 ramps to - 10 VDC ± 400 MV in 9 seconds ± 2 seconds.
   j. Set suicide switch to off to disconnect 1TB5 from 1TB37 (ACOM.)
   k. Output on 1TB4 should snap to 0 VDC ± 10 MV.

viii. Auxiliary op. / amp.

1. IC 44
   a. Connect 1TB25 to 1TB37 (ACOM.).
   b. Output on 1TB26 should be 0 V ± 40 MV.
   c. Connect 1TB1 to 1TB25
   d. Apply + 10 VDC with R10 CW, switch 5 out and switch 1 out.
   e. Output on 1TB26 should be - 10 VDC ± 240 MV.
   f. Apply - 10 VDC with R10 CW and switch 5 in.
   g. Output on 1TB26 should be + 10 VDC ± 240 MV.
   h. Return R10 CCW.

2. IC 45
   a. Output on 1TB28 should be 0 V ± 40 MV (Plus the offset of IC 44).

b. Apply + 10 VDC with R10 CW and switch 5 out.
c. Output on 1TB28 should be + 10 VDC ± 500 MV.
d. Apply - 10 VDC with switch 5 in.
e. Output on 1TB28 should be - 10 VDC ± 500 MV.
f. Disconnect 1TB1 to 1TB25.

ix. Speed Regulator Amplifier (Drawing 0238A2965 pg. 2)

1. Zero IC 40
   a. Ensure that the voltage on 1TB18 is - 10 VDC ± 500 MV
   b. Ensure that the voltage on 1TB19 is + 10 VDC ± 500 MV.
   c. Adjust R3 and R7 CW
   d. Adjust R4 to R6 CCW.
   e. Set suicide to static to connect 1TB21 to 1TB37 (ACOM.)
   f. Put a 2.7MΩ resistor between 1TB8 and 1TB16.
   g. Remove 1TB07.
   h. Apply 0 VDC to 1TB9 with switch 2 out and R10 CCW.
   i. Adjust voltage on 1TB16 to 0 VDC ± 10 MV with R15.
   j. Remove a 2.7MΩ resistor from 1TB8 and 1TB16.
   k. Reconnect 1TB07.
2. Current Limit
   a. Adjust R10 to apply + 10 VDC to 1TB9 with switch 5 out, switch 2 out and R5 CCW.
   b. Set suicide switch to static which will connect 1TB21 to 1TB37 (ACOM.)
   c. Output on 1TB16 should be - 500 MVDC ± 100 MV.
   d. Adjust R5 CW
   e. Output on 1TB16 should increase to -10.85 VDC ± 800 MV.
   f. Set suicide switch to off (middle) which will disconnect 1TB21 from 1TB37 (ACOM.)
   g. Apply - 10 VDC to 1TB9 with switch 5 in, switch 2 out and R6 CCW.
   h. Set suicide switch to static which will connect 1TB21 to 1TB37 (ACOM.)
   i. Output on 1TB16 should be 500 MVDC ± 100 MV.
   j. Adjust R6 CW
   k. Output on 1TB16 should increase to + 10.85 VDC ± 800 MV.
   l. Set suicide switch to off which will disconnect 1TB21 from 1TB37 (ACOM.)
3. Maximum Speed Potentiometer Response
   a. Apply + 10 VDC to 1TB9 with switch 2 & 5 out, R03 CCW, R5 & R6 CW.
   b. Jumper 1TB8 to 1TB16
   c. Set suicide switch to static which will connect 1TB21 to 1TB37 (ACOM.)
   d. Output on 1TB16 should be - 9 VDC ± 500 MV.
   e. Adjust R3 CW
   f. Output on 1TB16 should increase to -11 VDC ± 1 V (Max Speed)
   g. Set 1TB14 to -10 VDC with R7.
   h. The voltage on 1TB 15 should be + 10 VDC ± 40 MV.
   i. Apply - 10 VDC to 1TB9 with switch 5 in, switch 2 out and R3 CCW.
   j. Output on 1TB16 should be + 9 VDC ± 500 MV.

k. Adjust R3 CW.
l. Output on 1TB16 should increase to + 11 VDC ± 1 V (Max Speed.)
m. Observe + 10 VDC on 1TB14.
n. The voltage on 1TB 15 should be - 10 VDC ± 40 MV.
o. Return R5 and R6 CCW.
p. Remove 1TB8 from 1TB16.
q. Set suicide switch to off (middle).

4. Current Regulator Amplifier (Drawing 0238A2965 pg. 3)
   a. Zero
      i. Put a 2.7MΩ resistor between 1TB13 and 1TB34.
      ii. Set switch 3 & 5 out and R10 CCW.
      iii. Remove both 1TB12 and the jumper on CP77 – CP78.
      iv. Connect cp120 to cp121, cp122 to cp123, cp126 to cp127, cp079 to cp080, and cp73 to cp74.
      v. Set suicide switch to static to connect 1TB20 to 1TB37 (ACOM).
      vi. Adjust output of 1TB34 to 0 VDC ± 10 MV with R016. Adjust R16 in small increments. Allow oscillations to die down then continue to adjust R16.
   b. Functionality
      i. Remove a 2.7MΩ resistor
      ii. Connect a 100KΩ resistor from 1TB23 to 1TB34.
      iii. Turn R12 and R13 CCW.
      iv. Remove jumper from CP73-CP74.
      v. Connect 1TB44 to 1TB1 with switch 3 & 5 out and R10 CCW.
      vi. Apply + 1 VDC to 1TB44 with R10 CW.
      vii. Set suicide switch to static to connect 1TB20 to 1TB37 (ACOM.)
      viii. Output on 1TB34 should be -0.5 VDC (D176) and 1TB23 should be ≈ 0VDC ± 100MV.
      ix. Apply - 1 VDC to 1TB44 with switch 5 in and R10 CW.
      x. Output on 1TB34 should be > + 10 VDC
      xi. Output on 1TB23 should be 0VDC ± 100 MV.
      xii. Lower the voltage on 1TB44 until the output is + 10 VDC
      xiii. The voltage on 1TB23 should be 0 VDC ± 10 MV.
      xiv. Set suicide switch to off to disconnect 1TB20 from 1TB37 (ACOM.)
      xv. Ensure that 1TB34 snaps to 0 VDC ± 10 MV.
      xvi. Remove a 100KΩ resistor from 1TB23 to 1TB34.
      xvii. Replace the jumper from CP73 to CP74 and CP77 to CP78.
      xviii. Reconnect 1TB12.

x. Auxiliary Functions (Drawing 0238A2965 pg. 4)
   1. Ensure that the voltage on cp129 is + 10 VDC ± 500 MV.
   2. Ensure that the voltage on cp131 is - 10 VDC ± 500 MV.
   3. Turn R17 and R18 CCW.
   4. Connect cp130 to cp131.
   5. Connect 1TB24 to 0 VDC with switch 5 out and R9 CCW.

6. Voltage on cp030 should be 0 VDC ± 55 MV.
7. Voltage on cp040 should be 0 VDC ± 60 MV.
8. Voltage on cp041 should be 0 VDC ± 80 MV.
9. Adjust R18 CW.
10. Cp041 should be - 2.1 VDC ± 800 MV.
11. Adjust R17 CW.
12. Cp041 should be - 10.5 VDC ± 1.8 V.
13. Connect cp131 to cp132
14. Turn R18 CW
15. Turn R17 CCW.
16. Jumper 1TB1 to 1TB24
17. Turn R10 CW to apply + 10 VDC to 1TB24 with switch 5 out.
18. Output on cp040 should be 0 VDC ± 2.2 V.
19. Disconnect 1TB1 from 1TB24.
20. Set R18 CCW.
21. Move jumper from CP131-132 to CP129-132
22. Output on cp040 should be 0 VDC ±3.3 VDC.
23. Put a jumper between cp029 and cp030
24. Output of CP40 should be - 2.2 VDC ± 320 MV when R18 CW.
25. Turn R17 CW.
26. Voltage on cp041 should be + 10.5 VDC ± 1.8 V.
27. Return R10 CCW.
28. Disconnect CP29 from CP30
29. Disconnect CP129 from CP132
30. Set switch 5 in.
31. Connect cp042 to 1TB1.
32. Slowly turn R10 CW until the voltage between 1TB43 and 1TB39 becomes 0VDC (voltage at CP42 is about - 1.5VDC).
33. Connect a 24-volt relay coil to 1TB43 (+) and 1TB39 (-).
34. Turn R10 CCW.
35. Output between 1TB43 and 1TB39 should be + 25 VDC ± 3 V.
36. Return R10 CCW.
37. Remove jumper from cp042 and 1TB1.

xi. Stall Function

1. Jumper cp043 to 1TB1
2. Apply + 1 VDC with R10 CW to + 1 VDC.
3. Output on cp044 should be - 10 VDC ± 200 MV.
4. Remove jumper from 1TB1 from CP43.
5. Connect 1TB1 to 1TB41.
6. Voltage on cp044 should be - 1VDC ± 40 MV
7. Readjust R10 to attain -+ 1VDC at 1TB1-1TB41 due to load of the potentiometer within interface card.
8. Repeat the above procedure for 1TB42 and the result should be the same.

9. Remove the jumper from 1TB42
10. Turn R10 CCW.

xii. Current Feedback (Drawing 0238A2965 pg. 5)

1. Forward
   a. Apply 10 VAC with an isolation transformer (TL # 847 - TM002) between the following:
      i. Cp051 and cp052
      ii. Cp053 and cp054
      iii. Cp055 and cp056.
   b. Measure + 8.3 VDC ± 200 MV on 1TB42 for each set of "a"
   c. Voltage on 1TB22 should + 8.3 VDC ± 280 MV.
2. Reverse
   a. N / A

xiii. Lockout

1. Forward
   a. Voltage on CP98 should be – 6.9 VDC ± 500 MV.
   b. Connect the power supply between 1TB42 (+) and 1TB37 (-ACOM)
   c. Increase the voltage on 1TB42 until the IEC trips at + 10 VDC ± 1.2 VDC
2. Reverse
   a. N/A

xiv. Gate Pulse Generator (Drawing 0238A2965 pg. 6 and 7)

1. Forward
   a. Remove jumper from cp079 and cp080.
   b. Set suicide switch to static to connect 1TB20 to 1TB37 (ACOM.)
   c. Jumper 1TB1 to 1TB34.
   d. Turn R10 CCW & put switch 5 out to apply 0 VDC on 1TB34.
   e. Output on the following should be + 15 VDC ± 1.5 V.
      i. Cp085
      ii. Cp086
      iii. Cp087
      iv. Cp088
      v. Cp089
      vi. Cp090
   f. Apply + 8 VDC to 1TB34 with R10 CW.

   g. Measure pulses with oscilloscope (comparing channel 1 on 0° with channel 2) on cp085 (P1), cp086 (P2), cp086 (P3), cp088 (N1), cp089 (N2) and cp090 (N3). Each pulse width should be 375 µseconds ± 100 µseconds.
      i. P1 occurs at 120° @ 5.5ms
      ii. P2 occurs at 240° @ 11*ms*
      iii. P3 occurs at 0°

iv. N1 occurs at 300° @ 13.8ms
v. N2 occurs at 60° @2.8ms
vi. N3 occurs at 180° @ 8.35ms

h. Disconnect 1TB1 from 1TB34
i. Connect 1TB34 to 1TB35.
j. Pulses should appear as above, but at the following positions with the same pulse width.
   i. P1 occurs at 60° @ 2.8ms
   ii. P2 occurs at 180° @ 8.35ms
   iii. P3 occurs at 300° @ 13.8ms
   iv. N1 occurs at 240° @ 11ms
   v. N2 occurs at 0°
   vi. N3 occurs at 120° @ 5.5ms
k. Retard limit:
   i. N / A
l. Disconnect 1TB34 from 1TB35.
m. Disconnect 3-phase power with CB1 down.
n. Reattach CP79 to CP80.
o. Seal R15, R16 and R19.

2. Reverse
   a. N / A

b. Dynamic Tests

i. Setup

1. Switch 1 out.
2. Switch 2 in.
3. Switch 3 in.
4. Suicide switch to dynamic
5. Switch 5 in.
6. Switch 6 in.
7. Switch 7 in.
8. Switch 8 in.
9. Select switch to 6p
10. IEC switch to 3000
11. PS switch to N. C.
12. φL switch to N. C.
13. VFBK switch to N. C.
14. M1 FLD to internal.
15. Suicide switch to dynamic.
16. R1-3, R7, R10 CW
17. R4, R11 Middle
18. R5, R6, R9 CCW
19. R12 & R13 1/8 Back from CW
20. Turn M2 field potentiometer CCW

21. M1 field potentiometer to 40%.
22. FEX switch to INT-M2
23. KS-M2 Bridge
24. KS-M1 Load

ii. AC. Input Power
1. Put oscilloscope leads on current (1TB22).
2. Apply 3-phase power with CB1 up.

iii. Current Limit
1. Forward
a. Put suicide switch to dynamic.
b. Turn M1 field potentiometer CW to 40%.
c. M2 field potentiometer CCW.
d. Press Start.
e. Voltage on 1TB22 should be + 500 MVDC ± 500 MV.
f. Increase voltage on 1TB22 to + 7.5 VDC by slowly rotating R6 CW.
g. M2.armature ampere meter should read + 10 ADC ± 1 A.
h. Put suicide switch to off.
2. Reverse
a. N / A

iv. Drive Power
1. Set R10 CCW
2. M2 to 100%
3. Set suicide switch to dynamic.
4. Slowly turn R10 CW until M2 armature volts = 180 VDC (equal to - 10 VDC on 1TB1)
5. Turn R3 CCW to vary the motor speed.

6. UPGRADES:

a. Since we are not sure of the latest revision status let's use REV. 5.
b. Ensure that all components circled in the schematics are the correct values. (R190, C215 and R035 from pg. 001; R038 from pg. 002; R065 from pg. 003; C150, C151 and C152 from pg. 004; R253, R254 and Z100 from pg. 008; C180, R183 and R185 from pg. 009; R210 and R211 from pg. 010; R220 to R225 from pg. 011).
c. **REFERENCE RAMP**

	i.	R35	1K	0177A1001 P049
	ii.	R190	47	0177A1001 P017
	iii.	C215	0.047µF	0177A1049 P021
d.	**SPEED REGULATOR**			
	i.	R38	1K	0177A1001 P049
e.	**CURRENT REGULATOR**			
	i.	R65	1K	0177A1001 P049
f.	**AUXILLARY FUNCTIONS**			
	i.	C150	0.0047µF	0177A1049 P009
	ii.	C151, C152	0.1µF	0177A1283 P016
g.	**IEC**			
	i.	Z100	1N961B, 10V	0177A1090 P008
h.	**PHASS LOSS**			
	i.	C180	2.2µF	0177A1270 P035
	ii.	R183, R185	47K	0177A1001 P089
i.	**POWER SUPPLY**			
	i.	R210, R211	47	0177A1001 P017
j.	**SNUBBERS**			
	i.	R220-225	40	0177A1030 P015

7. END.