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Electronic Products Repair

Test Instructions for

0621L0118 G1 & G2
Device Number

6 Pulse Reversing Speed-current Control Card
Description of Device

Originated By: Rogerio Cordeiro **Date:** June 8, 2005
Typed Name mm/dd/yy

Approved By: Rogerio Cordeiro **Approval Date:** June 8, 2005
Signature mm/dd/yy

TEST INSTRUCTIONS

PREVIOUS REVISION SHEET

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Originated By	**Date mm/dd/yy**	**Description of change**
Dennis Cully	01/01/95	Created new instructions
Carmine Sebastiani	05/23/95	Modified Instruction for EPR format
Gary Thomas	09/18/98	Modified Instruction to add a reversing test.
Jason Humphries	03/15/99	Modified Instruction
Lucio Carrescia	09/11/00	Made minor changes
Dennis Cully	Sept. 26, 2000	Corrected the date of the document to match the cover sheet
Rogerio Cordeiro	September 4,2003	Corrected test instructions
Rogerio Cordeiro	June 8, 2005	This document went missing, retyped,
Rogerio Cordeiro	June 8, 2005	Typed information placed on label sticky
Rogerio Cordeiro	June 8, 2005	Moved document to new format.
S. Pharris	3/18/2013	Removed redundant steps and simplified steps with the help of a GE Field Service Engineer from Canada

TEST INSTRUCTIONS

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Location: Book or file File

6 Pulse Reversing Speed-current Control Card
0621L0118 G1 & G2 Pg.: 3/11
Date: June 8, 2005

1. PURPOSE:

   a. Static and dynamic test procedures for 6 Pulse Reversing Speed-current Control Card 0621L0118 G1 & G2

2. ELEMENTARY:

   a. Book #44 Dwg # 291A3387

3. EQUIPMENT:

   a. Dedicated station test box TL00363
   b. Digital Multimeter
   c. Power Supply
   d. Oscilloscope
   e. Interface DII card 621L115 – 118 (912 Jig)
   f. Resistors 2MΩ & 100KΩ

4. SET UP:

   a. **NOTE: Insure you are using the correct D2 Card**
   b. Make the following connection:

i. 0° to cp205
ii. 180° to cp204
iii. 120° to cp201
iv. 300° to cp200
v. 240° to cp202
vi. 60° to cp203
vii. G1 (CT to 1TB38 COM), G2 (CT to cp220)
viii. P1fg to cp001
ix. P1fc to cp002
x. P2fg to cp003
xi. P2fc to cp004
xii. P3fg to cp005
xiii. P3fc to cp006
xiv. N1fg to cp007
xv. N1fc to cp008
xvi. N2fg to cp009
xvii. N2fc to cp010
xviii. N3fg to cp011
xix. N3fc to cp012
xx. P1rg to cp013
xxi. P1rc to cp014
xxii. P2rg tocp015
xxiii. P2rc to cp016
xxiv. P3rg to cp017
xxv. P3rc to cp018
xxvi. N1rg to cp019
xxvii. N1rc to cp020
xxviii. N2rg to cp021
xxix. N2rc to cp022
xxx. N3rg to cp023
xxxi. N3rc to cp024
xxxii. ∅1 acct f1 to cp146
xxxiii. ∅1 acct f2 to cp147
xxxiv. ∅2 acct f1 to cp148
xxxv. ∅2 acct f2 to cp149
xxxvi. ∅3 acct f1 to cp150
xxxvii. ∅3 acct f2 to cp151
xxxviii. ∅1 acct r1 to cp152
xxxix. ∅1 acct r2 to cp153
xl. ∅2 acct r1 to cp154
xli. ∅2 acct r2 to cp155
xlii. ∅3 acct r1 to cp156
xliii. ∅3 acct r2 to cp157

c. Install the interface DII card 621L115 - 118 TL00912 and set the switches in the following positions. (O=out & I=in). Remove all other cards except the card in slot A and install TL00912 into CR2 slot k.
   I. SW1=O (CR2).
   ii. SW2=I (CR2).
   iii. SW3=I (CR2).
   iv. SW4=not changeable (CR2).
   v. SW5=I (CR2).
   vi. SW6=I (CR2).
   vii. SW7=I (CR2).
   viii. SW8=I (CR2).
   ix. SW9=I (CR2). } These are on the small switch
   x. SW10=I (CR. 2). } (For 190 series)
   xi. Panel SW-SUIC=OFF (center position).
   xii. Panel SW-3000/3100=3100 position.

d. Make sure that the cp. jumpers are as follows:
   i. cp030 to cp031
   ii. cp032 to cp033
   iii. cp035 to cp036
   iv. cp039 to cp040
   v. cp041 to cp042
   vi. cp043 to cp044
   vii. cp045 to cp046
   viii. cp049 to cp050
   ix. cp062 to cp063
   x. cp064 to cp065
   xi. cp181 to cp182
   xii. cp206 to cp207

e. Set R2, R3, R5, R10, R14 to 100%=CW.
f. Set R7, R8 to 80%.
g. Set R9 to 50%.
h. Set R13, R17, R18 to 0%.

5. PROCEDURE:

a. Static Test

i. AC. Input Power
   1. Make sure that the main 3Y 480VAC is turned on.
   2. Apply 3Y 208/120VAC power to panel with the disconnect switches.
   3. Turn panel CB1 up to apply AC power to the card.
   4. With oscilloscope observe inputs of 28Vpp to 34Vpp.
      a. cp205 is 0°
      b. cp204 is 180°
      c. cp203 is 60°
      d. cp202 is 240°
      e. cp201 is 120°
      f. cp200 is 300°.
   5. Observe phase shift inputs of 22Vpp to 26Vpp.
      a. cp210 is 30°
      b. cp211 is 210°
      c. cp212 is 90°
      d. cp213 is 270°
      e. cp214 is 150°

f. cp215 is 330°

ii. DC. Power
1. All measurements are with respect to ACOM
2. 15Vdc @1TB39 ±1.5V <300mVpp ripple
3. –15Vdc @1TB37 ±1.5V <300mVpp ripple
4. 10Vdc(adjust R16) @1TB40 ±100mV<30mVpp ripple
5. -10Vdc(adjust R15) @1TB36 ±100mV<30mVpp ripple
6. 5Vdc @cp206 ±200mV<30mVpp ripple
7. -5.6Vdc @cp208 ±1.9V

iii. Phase Rotation Circuit
1. With the 6θ AC power applied in the correct sequence and the panel SW-SUIC=up L180, L113 and L111 should be illuminated.
2. Reverse 0° and 180° and note that L111, L113 and L181 illuminate.
3. Note that L180 is now dim.
4. Replace 0° and 180° and note that step 2) stays true until PB100 is pressed and released.
5. Panel SW-SUIC=down. Note: L180 and all the L80's (Forward Firing LED's) are illuminated
6. On D2 card set SW5 out and verify reverse LED's illuminate
7. Set SW5 on D2 card in

iv. Reset
1. PB100
a. Momentarily tie cp101 to GND=1TB38.
b. Depress and release PB100 and observe that the IEC relay picks up after 100msec ±50msec.
c. **(OPTIONAL TEST FOR PROBLEMS WITH RESET CIRCUIT)**With the oscilloscope observe the 100msec ±50msec delay between cp115 (observe CP 115 drops to GND when PB100 is pressed) and the 850µsec ±350µsec wide pulse on cp103 once PB100 is released. CP103 will be noisy.

v. Phase Loss and Relay Driver (SW-SUIC=down to static and θL=up)
1. With initial card power up the phase loss circuit will be in a "trip" state until it sees the reset pulse from the PTD circuit (cp103). so, L100, L111, L113 & L181 will both be lit for ≈100msec after power up and then go out until a fault occurs.
2. Ensure that cp181 to cp 182 is connected.
3. With correct card phasing sequence verify the following:
a. L181,L100,L111, L113=off
b. cp182=logic "1"(+5Vdc±200mV)
c. Volt between 1TB29(+) & 1TB37(-) 22Vdc±3Vdc(relay on)
d. phase loss switch down(0° removed) L111, L113, & L181 is lit (L180 still lit)
e. cp182=logic "0"(+250mV±100mV)
f. Volt from 1TB29 to 1TB37≈2Vdc (relay drops out)
g. Phase Loss switch=up & PB100 depressed L181 Blinks but is still lit.
h. PB100 released (after RESET delay) a, b, c are met again.

vi. Lockouts, IEC. and Fault Finder Logic
   1. Forward Lockout
      a. The voltage on 1TB28 should be 0VDC and L100 and L181 should not be illuminated.
      b. The voltage on cp100 should be ≈-8.50VDC±500mV.
      c. The voltage from 1TB29(+) to 1TB37(-) should be 22VDC±3Vdc (Relay on)
      d. Cp104 should be 5VDC±200mV.
      e. Set SUIC=off (Center) and note that L111 and L113 are illuminated, cp104, cp105 and cp106 should be 5VDC±200mV and cp108 and cp110 should be -15VDC ±1.5V.
      f. Set SW-SUIC down.
      g. Both L111 and L113 should be extinguished and the voltage on cp108 and cp110 should be 0VDC±700mV.
      h. L100 and L181 should be extinguished and cp104 should be 5VDC±200mV.
      i. Apply 0VDC to 1TB28 with power supply.
      j. Slowly increase the voltage on 1TB28 and note when L111 illuminates. This should occur at 350mVDC±150mV.
      k. The voltages on cp104, cp105 and cp106 should be 5VDC±200mV.
      l. Continue to slowly increase the voltage on 1TB28 to 10VDC±1.2V until IEC trip occurs.
      m. This should result in L100, L111 and L113 being illuminated.
      n. Reduce the power supply on 1TB28 to 0Vdc and the voltage on cp104 should return to 5Vdc±200mV.
      o. L100, L111 and L113 remain illuminated 100msec±50msec after PB100 is depressed and released, L100, L111 and L113 extinguishes.
      p. Remove the power supply from 1TB28.
      q. Apply 0vdc to 1TB26 with the power supply.
      r. Repeat 'j' to 'p' with input at 1TB26. This time L113 will illuminate at ≈350mVdc.
      s. Apply 0V to both 1TB26 and 1TB28 and repeat step "j" to "p" L111 and L113 will illuminate at ≈350mVdc IEC will trip at ≈5Vdc cp104, cp105 and cp106 =5V at 0.4V on the power supply. cp104, cp105 and cp106 =0V when IEC trips at ≈5Vdc on the power supply.

vii. Zero IC 21
   1. Remove jumper from cp030 to cp031
   2. Connect cp031 to 1TB38 (ACOM).
   3. Set SW-SUIC=down.
   4. Connect a 2MΩ resistor between 1TB3 and 1TB4
   5. Adjust R4 to give 0VDC±10mV on 1TB4 (Wait at least 10sec after each adjustment of R4).
   6. Remove jumper from cp031 and 1TB38 and replace the original jumper between cp030 and cp031.

viii. Zero IC 20
   1. Turn R2 and R3 CW.
   2. Remove the 2MΩ resistor from 1TB3 and 1TB4
   3. 1TB1 should be 0VDC with R14 CCW.
   4. Adjust output on 1TB4 to 0VDC±10mV with R1.

ix. Positive Ramp and Suicide (Maximum Ramp Rate - set R2&R3 CW)(SW5=OUT)
1. Note: SW-SUIC=down; this is to insure the 6 LED's on the Right hand side are illuminated (D2 switch 5 position).
2. 1TB1 should be 10VDC with R14 CW. Note if the voltage is -10V insure correct position of switch on D2 card
3. Set SW- SUIC=down.
4. Output on 1TB4 should ramp to 10VDC±400mV in 450msec ±150msec.
5. Set SW-SUIC=off.
6. Output on 1TB4 should snap to 0VDC±10mV and voltage on 1TB8 should be between -10Vdc & -15Vdc.

Negative Ramp and Suicide (Maximum Ramp Rate)

7. Apply -10VDC to 1TB1 with SW5=in on the D2 card.
8. Set SW-SUIC=down.
9. Output on 1TB4 should ramp to -10VDC±400mV in 450msec ±150msec.
10. Set SW-SUIC=off.
11. Output on 1TB4 should snap to 0VDC±10mV and voltage on 1TB8 should be between +10Vdc & +15Vdc.

x. Minimum Ramp Rate
1. Put R2 and R3 CCW.
2. Set SW-SUIC=down.
3. Output on 1TB4 should ramp to -10VDC±400mV in 9sec ±2sec.
4. Set SW-SUIC=off. SW5 on D2 card must be flipped out to get positive polarity.
5. Set SW-SUIC=down.
6. Output on 1TB4 should ramp to 10VDC±400mV in 9sec ±2sec.
7. Set SW-SUIC=off.
8. Put R14 CCW and R2, R3 CW.

xi. Auxiliary op. / amp.
1. IC 44 & IC45
   a. Disconnect wire on 1TB35.
   b. Connect 1TB1 to 1TB35, R14 CCW and SW5=in.
   c. 1TB34=0Vdc±40mV and 1TB32=0Vdc±80mV
   d. Tie 1TB34 to Acom and 1TB32=0Vdc±40mV
   e. Remove Acom from 1TB34 and leave 1TB1 tied to 1TB35.
   f. Turn R14 to -10V @1TB35 ⇒ 1TB34=10Vdc ±250mV
   g. Flick SW5 on D2 card out.
   h. Turn R14 to 10V @1TB35 ⇒ 1TB34=-10Vdc ±250mV
   i. Turn R14 to -10V @1TB34 ⇒ 1TB32=10Vdc ±250mV
   j. Turn R14 CCW and remove 1TB1 from 1TB35.
   k. Reconnect wire to 1TB35.

xii. Speed Regulator Amplifier
1. Zero IC 40
   a. Ensure that the voltage on 1TB12 is -10VDC±500mV and 1TB10 is 10VDC±500mV.
   b. Adjust R5, and R7 through R10 CW.
   c. Set SW-SUIC=down.
   d. Connect a 2MΩ resistor between 1TB13 and 1TB16 with 1TB7 & 1TB16 wires disconnected.
   e. Apply 0VDC to 1TB6 with D2 card SW2=out and R14 (voltage source) CCW.
   f. Adjust voltage on 1TB22 to 0Vdc±10mV with R6.

g. Remove the 2MΩ resistor from 1TB13 and 1TB16.
h. Reconnect 1TB7 and 1TB16. Set D2 card SW2=in.

2. Minimum Current Limit
   a. Set R14 CW
   b. Apply 10VDC to 1TB6 (via R14) by SW2=in on D2 card, SW5 on D2 card must be out.
   c. Set SW=SUIC=down.
   d. With R7 CCW output on 1TB22 should be -500mVdc±100mV and 1TB9 should be +500mVDC. ±100mV.
   e. On D2 card set SW5=in
   f. With R8 CCW output on 1TB22 should be +500mVdc ±100mV and 1TB9 should be -500mVdc ±100mV.
   g. Set SW-SUIC=off and voltage on 1TB22 should snap to 0Vdc.
3. Maximum Current Limit
   a. Set SW-SUIC=down.
   b. Apply +10VDC to 1TB6 by setting SW5=out on D2 card
   c. Output on 1TB22 should be -500mVdc±100mV.
   d. Turn R7 CW and output on 1TB22 should be ≥-10Vdc. Turn R7 CCW until output = -10Vdc ±5mV.
   e. On D2 card set SW5=in.
   f. Output on 1TB22 should be 500mVdc ±100mV.
   g. Turn R8 CW and output on 1TB22 should be ≥10Vdc. Turn R8 until output =10VDC ±5mV.
   h. Set SW-SUIC=up. Note: 1TB22=0V and 1TB9=0V

xiii. Current Regulator Amplifier

1. Zero
   a. Connect a 100KΩ resistor between 1TB18 and 1TB23.
   b. Remove wire from 1TB15.
   c. Verify the following connections: cp041 to cp042, cp043 to cp044, cp045 to cp046, cp049 to cp050 and cp062 to cp063.
   d. On D2 card set SW3=out for 0V at 1TB17. Set SW-SUIC=down.
   e. Adjust output of 1TB23 to 0VDC ±10mV with R12.
2. Functionality
   a. Remove the 100KΩ from 1TB18 and 1TB23.
   b. Reconnect jig wire from 1TB15.
   c. Ensure that the voltage on cp37 is -900mVDC±200mV and cp38 is 900mVDC±200mV (they should be fairly balanced).
   d. Apply 10VDC to 1TB17 by setting SW3 and SW5=out on D2 card and R14 CW.
   e. Output on 1TB23 should be ≤ -10VDC and 1TB18 should be +1.6VDC ±200mV.
   f. Set SW-SUIC=up.
   g. Ensure that 1TB23 snaps to 0VDC.
   h. Set SW-SUIC=down.
   i. Adjust for -10VDC at 1TB17. On D2 card set SW5=in
   j. Output on 1TB23 should be ≥13VDC and 1TB18 should be -1.6VDC±200mV.
   k. Remove jumper from cp043 and cp044, connect a jumper between cp044 and 1TB23; note that the output on 1TB23 is 7.5VDC ±250mV and the voltage on 1TB18 is 0VDC±10mV.
   l. Set SW-SUIC=up and ensure that 1TB23 snaps to 0VDC.
   m. Remove the connection cp044 and 1TB23 and connect the original jumper between cp043 and cp044.

xiv. Auxiliary Functions

NOTE: REMOVE CONNECTION BETWEEN CP250 AND CP251

1. Verify
   a. cp255= 10VDC ±500mV.
   b. cp257= -10VDC ±500mV.
2. Turn R017 and R018 CCW.
3. Connect cp256 to cp257
4. With 0Vdc on 1TB43 (via R13 CCW)
   a. cp251= 0VDC±55mV
   b. cp252= 0VDC±60mV
   c. cp253= 0VDC±80mV
5. Adjust R017 CW
   a. cp251= 2.0VDC±355mV
   b. cp252= 2.0VDC±360mV
   c. cp253= -2.0VDC±380mV
6. Adjust R018 CW
   a. cp251= 700mVDC±355mV
   b. cp252= 10.5VDC±360mV
   c. cp253= -10.5VDC±380mV
7. Remove jumper from cp256 and cp257, connect cp257 to cp258 and turn R017 CW and R018 CCW.
8. Apply 10VDC to 1TB43 by setting R13 CW and SW5=out on D2 card
   a. cp251= 0VDC±1V
   b. cp252= 0VDC±1.10V
   c. cp253= 0VDC±1.20V
9. Apply -10VDC to 1TB43: By setting SW5=in on D2 card
   a. cp251= 0VDC±1V
   b. cp252= 0VDC ±1.10V
   c. cp253= 0VDC±1.20V
10. Remove the jumper cp257-cp258 and install cp250-cp251:
    a. cp252= -2.0VDC ±360mV
    b. cp253= 2.0VDC±380mV
11. Turn R018 CW:
    a. cp252= -10.5VDC ±360mV
    b. cp253= 10.5VDC±380mV

xv. Current Feedback

1. Forward/Reverse
   a. Note: burden resistor between 1TB28 and Acom is already in place via the interface card.
   b. Apply 10VAC to cp146 and cp147. Repeat for cp148 and cp149, cp150 and cp151 in turn. Also for Reverse, use 1TB26 instead of 1TB28. Use cp152 and cp153, cp154 and cp155, cp156 and 157 IEC will trip and GPG's will fire while AC is on.
   c. Measure 7.5VDC±500mV on 1TB28 and 7.5VDC±600mV on 1TB41 for each set. For reverse 1TB41 will be negative. **(VERIFY EACH IN TURN THEN RESET AND CONTINUE)**

xvi. Forward Gate Pulse Generator

1. Remove jumper from cp062 and cp063.
2. Set SW-SUIC=down and SW5=in on D2 card
3. Connect 1TB1 to 1TB23.
4. Output on cp085, cp086, cp087, cp088, cp089, cp090, cp91, cp92, cp93, cp94, cp95, and cp96. These points should be 15VDC±1.5V.
5. Adjust R14 until 8VDC is applied to 1TB23. Set SW5=out on the D2 Card
6. Measure pulses with oscilloscope (comparing channel 1 on 0° with channel 2) Set SW-SUIC=down)(cp085 (P1), cp086 (P2), cp087 (P3), cp088 (N1), cp089 (N2) and cp090 (N3).
7. Each pulse width should be 500μsec±125μsec with its multiplexed pulse 2.78msec±.2msec later. Note: also do for the reverse field, i.e. SW5=in.
    a. P1 occurs at 120°± 5°.
    b. P2 occurs at 240°± 5°.
    c. P3 occurs at 0°± 5°.
    d. N1 occurs at 300°± 5°.
    e. N2 occurs at 60°± 5°.
    f. N3 occurs at 180°± 5°.
8. Disconnect 1TB1-1TB23 and connect 1TB23-1TB39 (15V buss).
9. Pulses should appear as in Q 7, but at the following positions with the same pulse width.
    a. P1 occurs at 60°±5°.
    b. P2 occurs at 180°±5°.
    c. P3 occurs at 300°±5°.
    d. N1 occurs at 240°± 5°.
    e. N2 occurs at 0°±5°.
    f. N3 occurs at 120°±5°.
10. Connect cp208 to 1TB37 (-15V bus) and all pulses will disappear. Note: this is the same step for reverse
11. Disconnect cp208 from 1TB37 and all pulses should reappear after the time delay.
12. Connect 1TB28 to 1TB39 and note that all pulses phase back to their retard limit positions lagging # 1 and # 2 as follows:
    a. P1 occurs at 222°±5°.
    b. P2 occurs at 342°±5°.
    c. P3 occurs at 102°±5°.
    d. N1 occurs at 42°±5°.
    e. N2 occurs at 162°± 5°.
    f. N3 occurs at 282°± 5°.
13. Remove 1TB28 from 1TB39 leaving IEC tripped and all pulses should disappear from the forward GPG's. (Remove 1TB26 from 1TB39 if doing reverse.)
14. Push and release PB100 and all forward pulses should reappear. Disconnect 1TB23 from 1TB39 connect 1TB23 to 1TB37 for reverse.
15. Repeat the same test starting with procedure 9, for the Reverse Gate Pulse Generator. 1TB23 must be negative to turn on the reverse GPG's. Note connect 1TB26 to 1TB39 for retard limits in addition to the above jumper for reverse.
16. Remove jumper from 1TB23 to 1TB37. Replace jumper cp062 to cp063.
17. Seal pots R1, R4, R6, R12, R15, and R16.

b. Dynamic Tests (panel SW-SUIC=up to dynamic, D2 Card SW1=out the rest in)
    i. AC. Input Power
        1. Adjust
            a. Put R9, R11 to the mid position
            b. R5 to max.
            c. R7 and R8 CCW
            d. R14 CW
            e. R2, R3 and R10 CW.
        2. Put M1 field=40%. Put SW-SUIC=UP to dynamic mode .
        3. Push start button!!
        4. Adjust R14 and verify motor begins to rotate.
        5. Stop motor and set SW5=Out.
        6. Adjust R13 and verify motor begins to rotate.

6. UPGRADES:

a. G001
    i. No documentation leave card as is.
b. G002
    i. Rev1 to Rev2
        1. Change IC40 from 0177A1630P011(LM308AH) to 0177A1630P016(LH0042).
        2. Remove C42 only needed for LM308AH.
    ii. Rev2 to Rev3
        1. Change All R89 from 0177A1457P035(270Ω) to 0177A1457P032(200Ω) and reverse mount.
        2. Scrape conformal coat off label marked C80.
        3. Solder a 0177A1457P057(2.2kΩ) from the exposed lead of R89 to the trace that was just scraped.
    iii. Rev3 to Rev4
        1. Change all R90 from 0177A1001P017(47Ω ½W 5%) to 0177A1504P066(47Ω ¼W 5%).
        2. Change all L80 and L111 from 0177A1952P001(red LED) to 0177A1953P001(Yellow LED).
        3. Change L180 from 0177A1952P001(red LED) to 0177A1954P001(green LED).
    iv. Rev4 to Rev5
        1. Add 0177A1283P018 on IC113 pin5 and Pin7.
    v. Rev5 to Rev6
        1. Change R115 and R120 from 0177A1460P223(10kΩ) to 0177A1460P240(15kΩ).
        2. Change Q106, Q108 to 0177A1067P020.
    vi. Rev6 to Rev7
        1. Add 0177A1283P018 on IC180 pin8 and pin7.

7. END.