1 PURPOSE:

To test the Brushless Exciter Power\Control Card ML 0621L0514 G001.

2 ELEMENTARY:

Industrial Electronics data book NO. 1190, Sec 0514 G001, Dwg # 0316A5678AA.

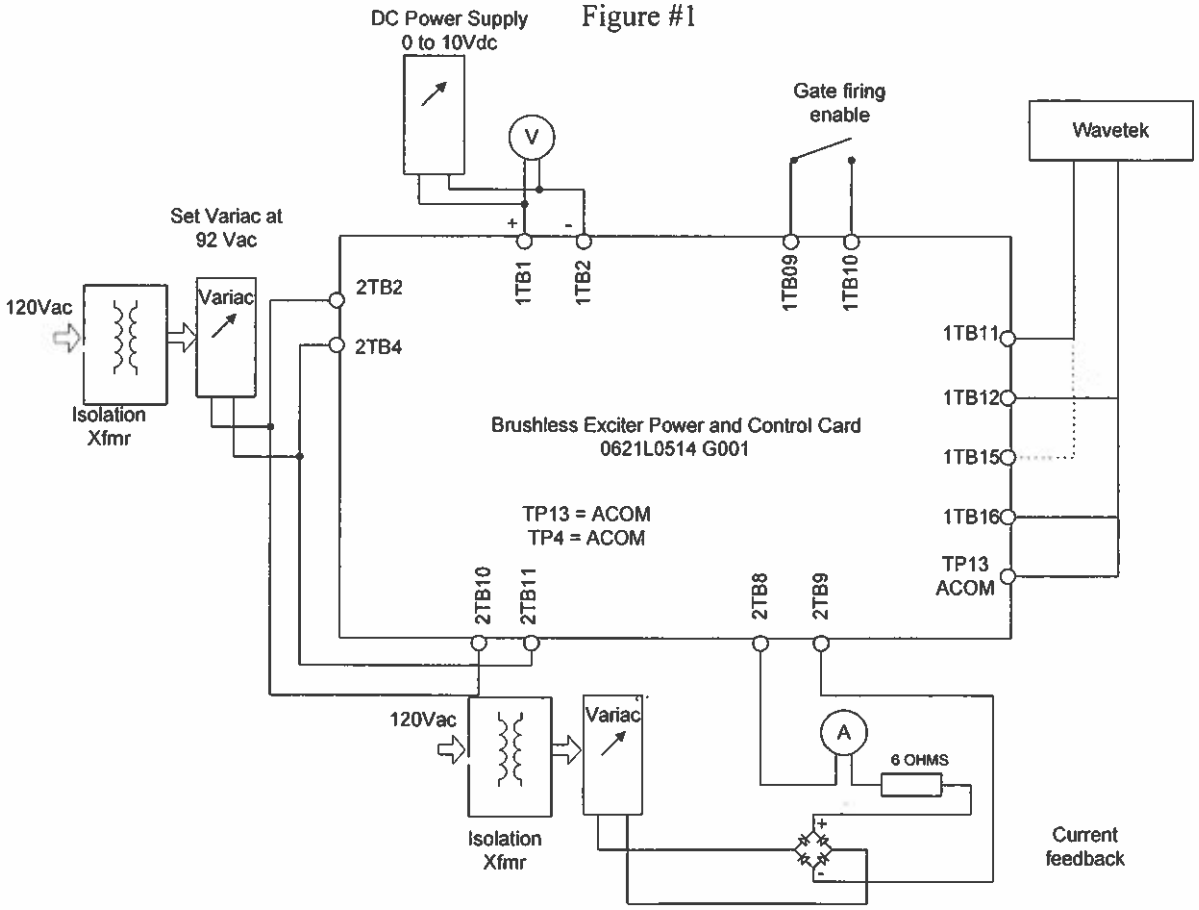
3 TEST EQUIPMENT (see Figure #1):

A) Variac for 115V RMS single Phase AC Supply. Connect *Line* to 2TB2 & 2TB10, connect *Neutral* to 2TB4 & 2TB11. Isolate the Variac with an isolation transformer.
B) Variac, Full Wave Bridge Rectifier and a 4 to 6 Ω Resistor 200 Watt.
C) Oscilloscope (Wave forms displayed in test instruction produced using a Fluke Model 99 Scopemeter, any traces requiring isolation between channel were accomplished with an isolation transformer, Current Traces taken with a Fluke 80I-110S AC-DC Current Probe).
D) Two DVM's: 1 for measuring Voltage signals and 1 for measuring Output Current.
E) Switch or Jumper for Current Regulator Enable (1TB9 to 1TB10).
F) Wavetek waveform generator.

TEST SETUP

- Connect as per Figure #1:

Figure #1



PROCEDURE:

Perform a visual inspection of the circuit card.

1. Measure the 5 Vdc (TP12), +15 Vdc (TP11) and -15 Vdc (TP14) busses to Common to ensure there is not a short on one of the busses.
2. With an Ohms meter check that the correct values of resistance can be measured between the following TB points

   Between: 1TB19 and 1TB21 = 5.6 Kohms (± 5%: *5.88K*, *5.32K*)
   1TB25 and 1TB26 = 10 Kohms (± 1%: *10.1K*, *9.9K*)
   1TB27 and 1TB28 = 10 Kohms (± 1%: *10.1K*, *9.9K*)
3. With a meter equipped with a diode checker check for a diode between 1TB23 and 1TB21 and that the anode is mounted at 1TB23 end.

- Connect the Circuit Card as per Figure #1.

4. Power up the AC supply and adjust Variac for 92 Vac.rms between 2TB10 & 2TB11. Operating range of the card 115 Vac + 15% (*132Vac*), - 20% (*92Vac*).

POWER SUPPLY CHECKS:

5. ***Measure and record the following points to ACOM (TP13)***

TPxx to ACOM (TP13)	Measured Voltage	Allowable Limits
(a)TP10		+ 17.8 + 3.0 -1.5 Vdc *(high 21.8, low 16.3)*
(b)TP15		- 17.8 + 3.0 -1.5 Vdc *(high 21.8, low 16.3)*
(c)TP11		+ 15.0 ± 0.6 Vdc *(high 15.6, low 14.4)*
(d)TP14		-15.0 ± 0.6 Vdc *(high 15.6, low 14.4)*
(e)TP12		+5.0 ± 0.2 Vdc *(high 5.2, low 4.8)*
(f)U15-PIN 5		-7.5 ± 0.4 Vdc *(high –7.9, low –7.1)*

FIRING POWER SUPPLY VOLTAGE LEVELS:

Points to Measure	Measured Voltage	Allowable Limits
(g)Cathode (+) of Z1 to CPP1K		+ 17.8 + 3.0 -1.5 Vdc *(high 21.8, low 16.3)*
(h)Cathode (+) to Anode of Z1		+8.2 ± 0.4 Vdc *(high 8.6, low 7.8)*
(i)Cathode (+) of Z2 to CPN1K		+ 17.8 + 3.0 -1.5 Vdc *(high 21.8, low 16.3)*
(j)Cathode (+) to Anode of Z2		+8.2 ± 0.4 Vdc *(high 8.6, low 7.8)*

6. ZERO CROSSING ADJUSTMENT (Line Filter elm. Sht. 1):

Probe A: Monitor 2TB-2 to 2TB-4, (isolated with an isolation transformer).

Probe B: Monitor TP3 to ACOM.

- Check that the 60 Hz. Burg jumper JMP3 1 to 2 is installed.
- Adjust P5 until the rising edge of the Square Wave on TP3 is in line with the Zero Crossing of the Sine Wave. Refer to Figure #2.

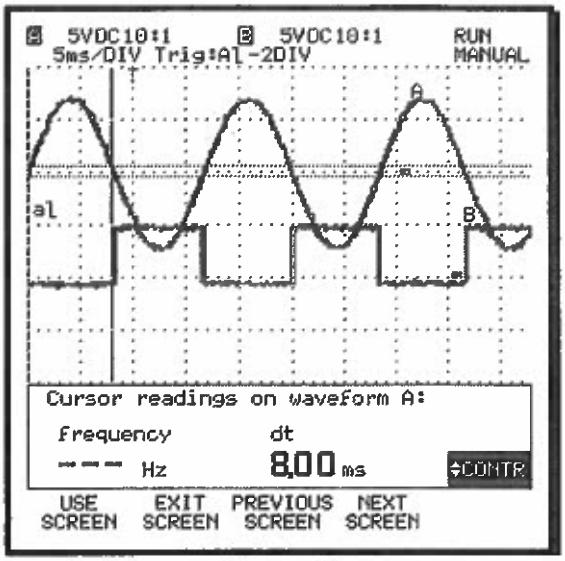


Figure #2

7. PHASE CONTROL MODULATOR (elm. Sht. 2):

Probe A: U15–pin7 to Acom.

Probe B: U15–pin8 to Acom

- Compare the waveforms. Refer to Figure #3.
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NOTE: Peak positive voltage on each circuit must match within 0.2v, if not, check that C33, C34, R64 or R65 are correct. Verify voltages are 180° out of phase ±2°.

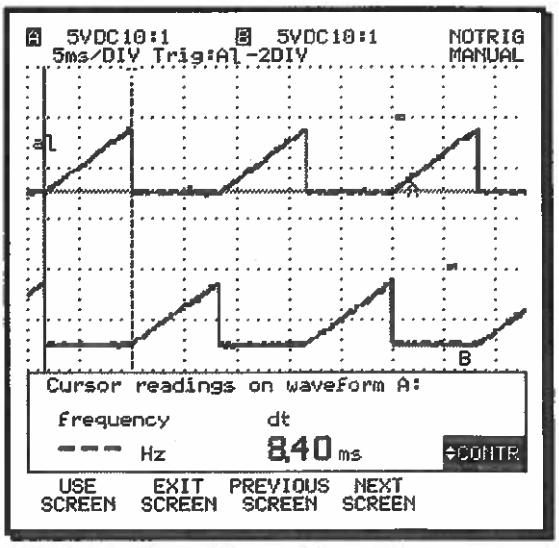


Figure #3

8. CURRENT FEEDBACK (elm. Sht. #1):

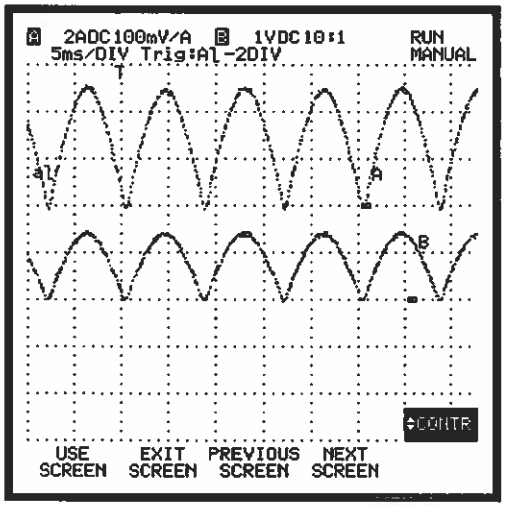
Compare Raw Current Feedback Waveform to Filtered Current Feedback Waveform (elm. Sht. #1):

- Check that the Current Feedback Burden resistor R85 is 291Ω (499 and a 698 Ω, ½ Watt resistors in parallel) and installed between SC11 & SC12.
- With the Current Feedback signal setup as in Figure #1, adjust the Variac to produce a Current Feedback signal of 5 Amps. peak to peak. Measure this signal using a scope and a Fluke 801-110s current probe or equivalent. The current should be such that 2TB8 is Positive.
- Connect the second probe of the scope to CP1. Refer to Figure #4.

Current Feedback at CP4:

$$Vp = \frac{I_{peak}}{\text{Turns Ratio}} * R_{burden}$$

$$Vp = \frac{5}{1000} * 290.98 = 1.45V_{peak}$$



Probe "A" Current Probe Monitoring Current Signal at 2TB-8.

Probe "B" Monitoring Current Feedback Signal at CP1, Probe Shield on TP13 (Com)

Figure #4

To calculate Current Feedback at CP4

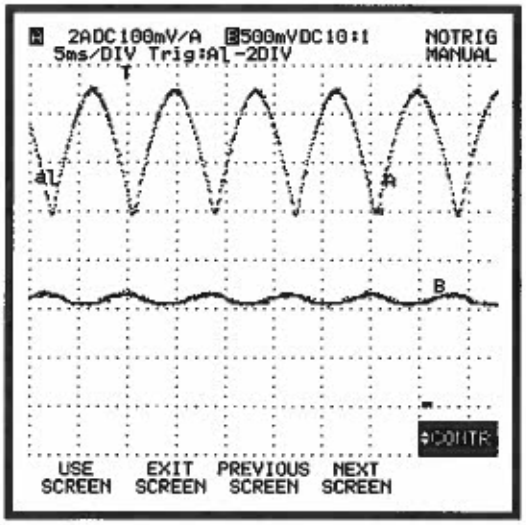
$$\text{Peak Current Feedback Voltage} = \frac{I_{peak}}{1000} * R_{burden}$$

(1000 = turns ratio of U20)

9. ***Compare Raw Current Feedback Waveform to Filtered Current Feedback Waveform (elm. Sht. #1) cont.:***

Adjust the Variac to produce a Current input signal of 5 Amps peak. The output Current Feedback signal at CP4 should be approximately 1.2 Vdc.

10. Refer to Figure #5. Check that the ripple is approximately 100 mV dc (± 20mV). Refer to Figure #5A.



Probe "A" Current Probe Monitoring Current Signal at 2TB-8

Probe "B" Monitoring Current Signal at CP4, Probe Shield on TP13 (Com)

Figure #5

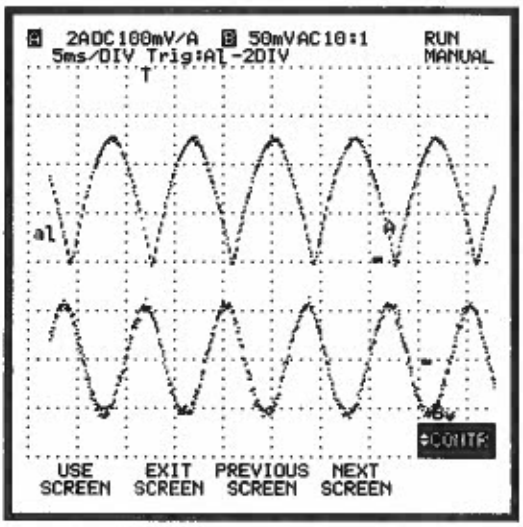


Figure #5A

To calculate Current Feedback at CP4

Current Feedback @ CP4 = .707 * I_{peak} @U15 pin 1 * 1.267

11. ***Verifying Retard Limit Clamp (elm. Sht. #2):***

- Connect a 0 to 10Vdc supply between 1TB1 and 1TB2.
- Adjust the supply for +5Vdc ±0.005V reference at 1TB1.
- While monitoring 1TB3 to 1TB-2 with a meter, check that 1TB3 can be adjusted between 0Vdc and -7.5Vdc (+/- .40Vdc) by adjusting pot P7.

Z P7 fully CW output at 1TB3 to ACOM = -7.5Vdc (high -7.90, low -7.10Vdc).

12. P7 fully CCW output at 1TB3 to ACOM = 0.0Vdc (+/- .005 Vdc).

- Reverse the Reference Voltage at 1TB1 to a negative reference. With 0Vdc between 1TB1and 1TB2, adjust the Retard Limit pot P7 to produce an output of approximately –2.0 Vdc between 1TB3 to ACOM.

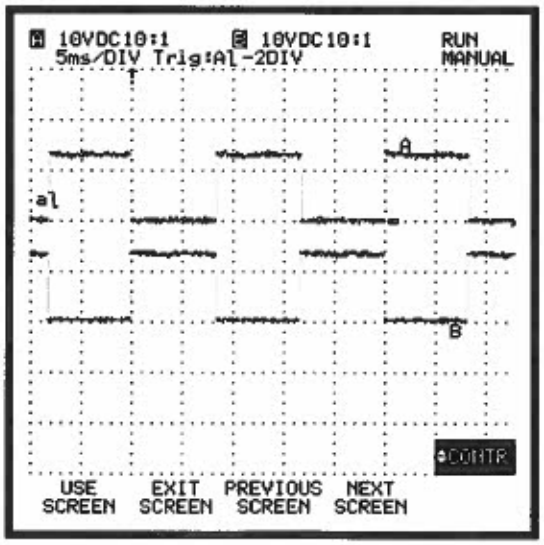
13 Adjust the Reference Supply from 0Vdc to -5Vdc. Check that the output between 1TB3 and 1TB2 tracks the input voltage once the input becomes more negative than the –2.0Vdc set by the Retard Limit Pot P7. If the input is more positive than the level set by the Retard Limit Pot P7 (–2.0Vdc), the output will track the level set by the Retard Limit Pot.P7.

14 Set the Retard Limit Pot P7 to Zero "0". Ship card with P7 set to Zero.

15. ***Checking Gate Pulses (elm. Sht. #3):***

- Connect Scope probed to Gating Circuits (refer to Figure #6). Enable the Firing by jumpering 1TB–9 & 10. Apply a –7.5Vdc reference between 1TB1 & 2 (1TB–1 is Negative). Observe the Gating Pulses on the scope, the pulses should be 8.3 mSec in width and 180^{O} out of phase. Observe, that increasing the reference to greater than -7.5Vdc will not change the pulse width or phase relationship. Decreasing the reference below the –7.5Vdc will decrease the pulse width. At approximately -1.3Vdc the pulses will disappear.

16 With the pulses phased ahead, check that the pulses disappear if the Switch (or Jumper) at 1TB-9 to 1TB-10 is opened.



Probe "A" on CPP1, Gnd on CPP1K.

Probe "B" on CPN1 GND on CPN1K

17. ***Checking Zero Crossing Detectors*** 1 **&** 2.***(elm Sht*** 4***):***

- Connect a Wavetek or other equivalent Sine Wave Generator between 1TB11 & 1TB12 (high side on 1TB11 Com on 12. Refer to Figure #7).
- Check that 1TB12 and 1TB16 are connected to ACOM.
- Set the Output Frequency to 60 Hz.
- Set the Output Amplitude to 6 Vac peak to peak.
- The output at 1TB13 to 1TB14 should appear like the Waveforms in Figure #7.
- Adjust the Wavetek output to .5V peak to peak 60 Hz. and observe that the output at 1TB13 & 1TB14 remains 6.2V ± 5%, also check that the output at 1TB13 & 1TB14 remain square. There maybe a small amount of rounding of the trailing edge of the waveform (trace "B") as the input voltage amplitude gets near the .5v peak to peak level.
- Repeat the above test for circuit 2 using 1TB17 & 18 (ACOM).

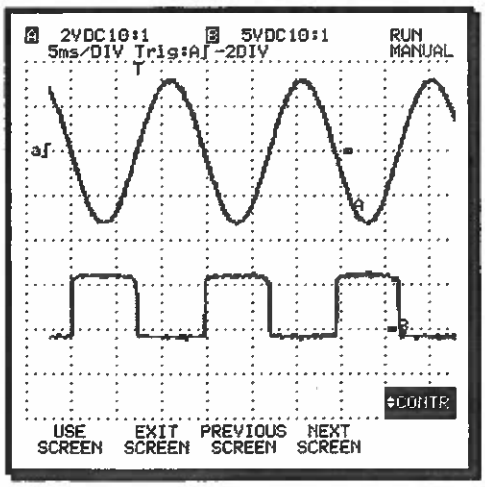


Figure #7

Probe "A" Monitoring 1TB11, Gnd on 1TB12.

Probe "B" Monitoring 1TB13, Gnd on 1TB14.

Assurance Record for 0621L0514 G001 Card

Card Serial #_____ Use √ or value

1. There are no shorts on the power busses _____
2. Resistance measurements
   a. 1TB19 – 1TB21 [5.6K Range 5.32-5.88] _____Ω
   b. 1TB25 – 1TB26 [10K Range 9.9 – 10.1] _____Ω
   c. 1TB27 – 1TB28 [10K Range 9.9 – 10.1] _____Ω
3. Diode check between 1TB23 and 1TB21 (Anode = 23) _____
4. AC set to 92VAC and applied to 2TB10 & 11 _____V AC rms
5. Voltage measurements
   a. TP10 [+17.8, +3.0, -1.5V] _____VDC
   b. TP15 [-17.8, -3.0, +1.5V] _____VDC
   c. TP11 [+15, ±0.6 V] _____VDC
   d. TP14 [-15, ±0.6 V] _____VDC
   e. TP12 [+5.0 ±0.2 V] _____VDC
   f. U15 pin 5 [-7.5 ±0.4V] _____VDC
   g. Cathode of Z1 to CPP1K [+17.8, +3.0, -1.5V] _____VDC
   h. Cathode of Z1 to Anode of Z1 [8.2 ±0.4V] _____VDC
   i. Cathode of Z2 to CPN1K [+17.8, +3.0, -1.5V] _____VDC
   j. Cathode of Z2 to Anode of Z2 [8.2 ±0.4V] _____VDC
6. P5 was adjusted for zero crossing on TP3 (rising edge) _____
7. U15 pins 7 & 8 are as in Fig #3 _____
8. The waveform at CP1 is per Fig#4 _____
9. The waveform at CP2 is as per Fig#5 _____
10. Ripple on CP4 [100 mV± 20 mV _____mV
Z 11. With P7 fully CW 1TB3 to Com [-7.5 ±0.4Vdc] _____VDC
12. With P7 fully CCW 1TB3 to Com [0.0 ±0.005Vdc] _____VDC
13. 1TB3 voltage tracks input after –2.0V is reached _____
14. Pot P7 is set to 0.0 ±0.005VDC _____
15. Waveform at gating circuits is per Fig#6 _____
16. Waveform disappears when 1TB9 and 1TB10 switch is open _____
17. The zero crossing detectors work as in Fig #6 _____

Signed_____Date_____(dd/mm/yyyy)