

CONTROL TECHNOLOGY

PHANTOM II

SINGLE PHASE SINGLE QUADRANT CONVERTOR

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INDEX

INTRODUCTION2
PRODUCT OVERVIEW3
TERMINAL INFORMATION4
PRESET POTENTIOMETERS INFO6
OPTION SWITCHES7
COMMISSIONING8
PROBLEM SOLVING INFORMATION11
CONNECTION DIAGRAM13
CIRCUIT DIAGRAM14

INTRODUCTION

This equipment is guaranteed for twelve months from the date of delivery. The terms of this guarantee are valid provided that **CONTROL TECHNOLOGY** is informed of the fact within fourteen days of equipment malfunction and the equipment is returned to the nearest agent with a factory accredited service department. The equipment should be suitably packed and the transport prepaid.

WARNING! THIS EQUIPMENT MUST BE HANDLED WITH THE UTMOST CARE AS DANGEROUS ELECTRICAL POTENTIALS ARE PRESENT WHEN A SUPPLY VOLTAGE IS APPLIED. WHEN PRINTED CIRCUIT BOARD REPAIR OR PART REPLACEMENT IS REQUIRED, ALWAYS ISOLATE ALL SUPPLY VOLTAGES TO THE SYSTEM.

PRODUCT OVERVIEW

The Phantom II series of DC Motor Controllers are high performance units designed for precise, high speed, non-regenerative operation of permanent magnet and shunt wound DC Motors. They are used for speed and torque control where single quadrant operation is required.

One model caters for all the single phase ranges:

230 vac up to 5.5 KW

380 vac up to 7.5 KW

A half controlled thyristor, double diode bridge in isolated packages ensure chassis to mains isolation.

The speed of the DC motor is controlled using linear closed loop circuitry with either armature voltage or tacho generator feedback. The Armature Voltage is isolated from the control circuitry, completes the current loop.

A DCCT derived, current feedback signal, galvanically isolated from the control circuitry, completes the current loop.

Should the motor stall, the user may select a speed / current timed true stall detector.

OTHER STANDARD FEATURES

- * Field supply selectable for 220 vac supply voltages.
- * Open collector outputs, for Zero speed, Current limit and Stall remote signaling.
- * 0 – 5V output for 0 to 100% speed indication.
- * 0 – 1 vdc output for 0 to 100 % current indication.
- * Two speed reference inputs suitable for a wide range of system design requirements.
- * Switch selection of:
 - Stall trip in / out.
 - All current ranges up to 7.5 KW
 - Four tacho feedback ranges.
 - Armature or tacho feedback selection.
 - 380 – 220 armature feedback.
- * 220 or 380 vac supply voltage link selectable .

TERMINAL INFORMATION

1. **OV**.....Analogue Ground
2. **+12v Output**.....Aux. + 12v Output, 10 ma Maximum
3. **-12v Output**.....Aux. – 12v Output, 10 ma Maximum
4. **Current Indication Output**.....0 – 5 vdc for 0 – 100%,Short Circuit protected
5. **Tacho generator feedback**.....Tachogeneration – input
6. **Speed indication output**.....0 – 5 vdc for 0 to 100%, Short Circuit Protected
Maximum load 10 Ma
7. **Slow start speed reference input**.....0 – 12 vdc for 0 – 100%
Ramp rate adjustable on P7
8. **Direct speed reference**.....0 – 12 vdc for 0 – 100%
Unramped Link to 7 for 0 – 5 vdc for 0 – 100%
9. **Current Amplifier**.....Link to terminal 12 for speed Control.
10. **Torque reference input**.....0 – 5 vdc for 0 – 100% torque control.
11. **Slow start speed**.....0 – 12 vdc for 0 – 100%
12. **Speed Amplifier Output**.....Link to terminal 9 for speed control.
13. **Stall reset:**Momentary to 0 vdc at terminal 1 resets a trip
Condition
14. **Stop:**22 vdc supply for internal start relay. Connect to
stop button when internal latch required.Connect
to term.16 via a potential free contact for remote
starting.Also +ve supply for powering loads
connected to terminals 17&18.Maximum load
50 ma.
15. **Common Stop / Start**.....Connected to common Stop 1 Start Circuitry
When latch is required.
16. **Start**.....Internal relay coil. Connect to start button when
internal latch is required.Connect to terminal 14
via a potential free contact for remote starting.
17. **Zero speed Output**.....Open collector Transistor conducts at zero speed.
Maximum load at 24 vdc 25 ma.

- 18. Current limit:**Open collector transistor conducts when drive is in current limit. Maximum load at 24 vdc 25 ma.
- 19. Stall Output:**Open collector transistor,conducts when controller Tripped. Maximum load at 24 vdc 25 ma.

POWER TERMINALS

L1 & L2:Main supply terminals.If a live and neutral supply is used connect to neutral to 12.

NB. Only the 2.2 KW version has internal mains fusing, all other Phantom 11's need external high speed fusing.

A+ and A-:DC output from controller to motor armature. Polarity will affect direction of rotataion.

F+ and F-:DC output to field winding.Polarity will affect direction rotation

N:If Link A is inserted, a neutral may be connected to this terminal to supply a 200 volt field,if required. In this case Link B must be disconnected to prevent damage.

EARTH:Connect to Chassis in bottom left hand comer with 5 mm fixing system.

PRE-SET POTENTIOMETER INFORMATION

0% = Fully Counter Clockwise
100% = Fully Clockwise

All quickset positions are given for test purposes only. Damage may occur if full commissioning procedure is not adhered to.

- P1 Current stability. Optimizes the current loop. Rotate CCW for faster response. Excess adjustment may cause instability.
Quickset position: 0 %
- P2 IR compensation. Counters EMF voltages from motor when armature voltage feedback is used.
Quickset position: 0 %
- P3 Current Limit. CCW for minimum torque setting. CW for maximum. Must be readjusted if the motor is changed.
Quickset position: 50 %
- P4 Minimum speed. Sets the minimum speed of the motor with zero speed reference.
Quickset position: 0 %
- P5 S Stab. Optimizes the speed loop. Rotate CCW for faster response. Excess adjustment may cause instability.
Quickset position: 0 %
- P6 Maximum speed. Sets the maximum speed of the motor with 12 vdc speed reference.
Quickset position: 50 %
- P7 Ramp. Controls the rate of deceleration and acceleration of the motor if the slow start speed Reference input is used.
Quickset position: 50 %

OPTION SWITCHES

S1	ON	If the drive is in current limit and the motor is stopped, a five second Timer is activated. On expiration, the drive trips. To reset, remove power from the unit or operate with an external trip reset button.
S2	OFF	The stall trip is disabled but the stall indication LED will still light if the drive is in a stall position.
S2	OFF	Current limited to 4 ADC
S3	OFF	
S2	ON	Current limited to 12 ADC
S3	OFF	
S2	OFF	Current limited to 20 ADC
S3	ON	
S2	ON	Current limited to 30 ADC
S3	ON	

TACHOGENERATOR SCALING

S4	OFF	150 – 180 VDC at full motor speed
S5	OFF	
S6	OFF	
S4	OFF	120 – 150 VDC at full motor speed.
S5	OFF	
S6	ON	
S4	OFF	90 – 12 VDC at full motor speed.
S5	ON	
S6	ON	
S4	ON	60 – 90 VDC at full motor speed.
S5	ON	
S6	ON	
S7	ON	Selects armature feedback.
	OFF	Selects tacho feedback
S8	ON	Selects 310 VDC for armature feedback
	OFF	Selects 180 VDC for armature feedback

LINKING OPTIONS

Link A	Selects terminal N and L1 to be connected to the on board field rectifier. When a neutral is connected to terminal N, a 200 VDC field supply is available at terminals F+ and F-.
Link B	The supply voltage connected to the terminals L1 and L2 supply the on board field rectifier.
220 vac Link	Insert for 220 vac main incoming supply. Remove 380 vac link.
380 vac Link	Insert for 380 vac main incoming supply. Remove 220 vac link.

COMMISSIONING INFORMATION

Although the following information is fairly general, it is assumed that the system being commissioned is a simple speed controller and motor.

Before energizing the controller for the first time choose the correct application connections from the connection diagram using the TERMINAL INFORMATION.

CHECK: Main power supply voltage is correct.

Motor current and voltage ratings are compatible with controller.

The controller has not been mechanically damaged in transit.

All power and control wiring fasteners are tightened adequately.

The motor is free to rotate in either direction and no Personnel or Machinery will be injured or damaged if the motor is rotated at maximum speed.

STARTUP PROCEDURE

1. ISOLATE THE INCOMING MAINS SUPPLY.
2. Ensure correct linking for armature or tacho feedback.
3. Ensure correct switch selection for armature or tacho feedback
4. Turn the pre-set potentiometers to the positions listed below.

P1	0 %	Fully Counter Clockwise
P2	0 %	Fully Counter Clockwise
P3	0 %	Fully Counter Clockwise
P4	0 %	Fully Counter Clockwise
P5	50 %	Midway
P6	0 %	Fully Counter Clockwise
P7	50 %	Midway
5. Select current and tacho scaling on DIP switches to suit the motor. If no tacho is in use Select armature feedback and either 180 or 310 VDC on the DIP switches.
6. Select tripping option with Stall DIP switch.
7. Ensure the fuses are correctly rated. Unplug the motor field DC supply terminal.
8. Switch on the mains Isolator. Measure at the incoming mains supply terminals for the correct voltage.

9. CURRENT LIMIT ADJUSTMENT

This adjustment must be completed as swiftly as possible to prevent damage to the motor armature.

Ensure instruction 7 is completed before the main isolator is switched on.

Fit a DC amp meter in one leg of the armature circuit. Set the speed demand to + 12 VDC. Check That LED 3 (N = O) is illuminated. Press the start button. Check that the LED1 (run) is illuminated. Turn (Current limit potentiometer) clockwise until the DC ammeter indicates the armature current on the motor name plate. Press the stop button.

10. MAXIMUM SPEED ADJUSTMENT

The controller is factory set to accept a 60 VDC per 1000 RPM Tachogenerator.

Set the speed demand to 10 % demand. Press the run button. If the motor accelerates to full speed correct the wiring as follows:

- | | |
|---|-----------------------------------|
| a. Direction correct but motor runs away. | Reverse tacho polarity only. |
| b. Direction incorrect and motor runs away. | Reverse field polarity only. |
| c. Direction incorrect but in control. | Reverse tacho and field polarity. |

If Armature Feedback is selected then the motor will not run away. The direction of the motor may be corrected by reversing the field or armature polarity.

Increase speed demand to + 12 VDC and check that the DC output level listed on the controller nameplate or the maximum armature voltage, whichever is lower, is not exceeded. Adjust on P6 (Max trimpot).

11. Set the minimum speed to the required level on P4 (MIN SPD).
12. Set the deceleration and acceleration of the motor on P7 (RAMP) if the slow start reference input is used.
13. Set the speed demand to the level where the motor is most unstable. Slowly rotate first P5 (Gain 2) Clockwise until the motor is most stable.
NOTE: If Controller is operating on Tacho Feedback Leave P2 (IR comp) fully counter clockwise.

PROBLEM SOLVING INFORMATION

If either a control board or power board fails check all connections to the faulty card for the correct values before replacing the board.

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
AC line fuse blows when power is applied to controller	Wiring faulty or incorrect	Check all power wiring to the load. Correct faulty wiring.
	Motor Faulty.	Repair or Replace motor.
	Power bridge shorted.	Replace power bridge.
AC line fuses blows when motor is started.	Power bridge faulty.	Replace power bridge.
	Motor faulty.	Repair or Replace motor.
	Control board failure causing SCR's to turn fully.	Repair or replace motor board.
AC line blows while motor is running.	Overload	Check motor shunt field for DC supply. Check for mechanical problem. Check motor resistances. Repair accordingly
	Wiring faulty	Check all power wiring to motor Correct wiring fault.
	SCR intermittently faulty	Replace power bridge Repair or replace control board
	Control board failure	
Fuses not blown but motor will not run.	No AC mains supply. No LED's illuminated.	Check incoming mains and repair fault
	Stop start circuit faulty LED 1 does not illuminate.	Repair accordingly
	No speed demand reference.	Repair accordingly
	Control or power board faulty	Repair or replace faulty board

INDICATION	POSSIBLE CAUSE	CORRECTIVE ACTION
Motor rotates when speed demand reference is zero	Power bridge is faulty	Replace faulty power bridge
	Control board faulty	Repair or replace faulty control board
Motor does not attain top speed	Overload	Check motor shunt field for DC supply. Check for mechanical problems. Check motor resistance. Repair accordingly.
	Control board faulty	Repair or replace control board
	SCR failure	Replace faulty power bridge.
Motor runs at fast speed only	SCR failure	Replace faulty power bridge.
	Speed demand reference set at 100%	Repair accordingly.
	Control board faulty	Repair or replace control board
	Feedback circuit fault	Check tachogenerator. Repair or replace control or power board.
Unstable speed	SCR misfiring	Replace power bridge or repair or replace control board.
	Change in load characteristics affecting motor.	Repair or re-adjust accordingly

SHOULD A 200V FIELD BE REQUIRED
ON A 380V CONVERTER THEN
CONNECT NEUTRAL TO N
REMOVE LINK B AND INSERT LINK A

MOTOR FIELD

230/380V SUPPLY

MOTOR ARMATURE

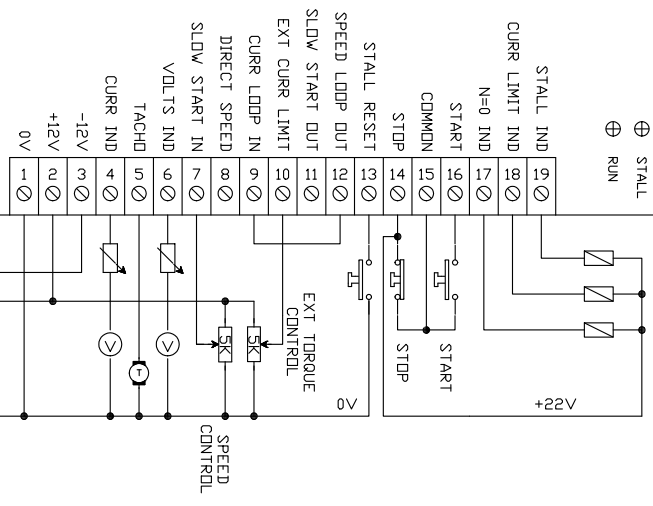
LINK A LINK B

PHANTOM 2 CONNECTIONS

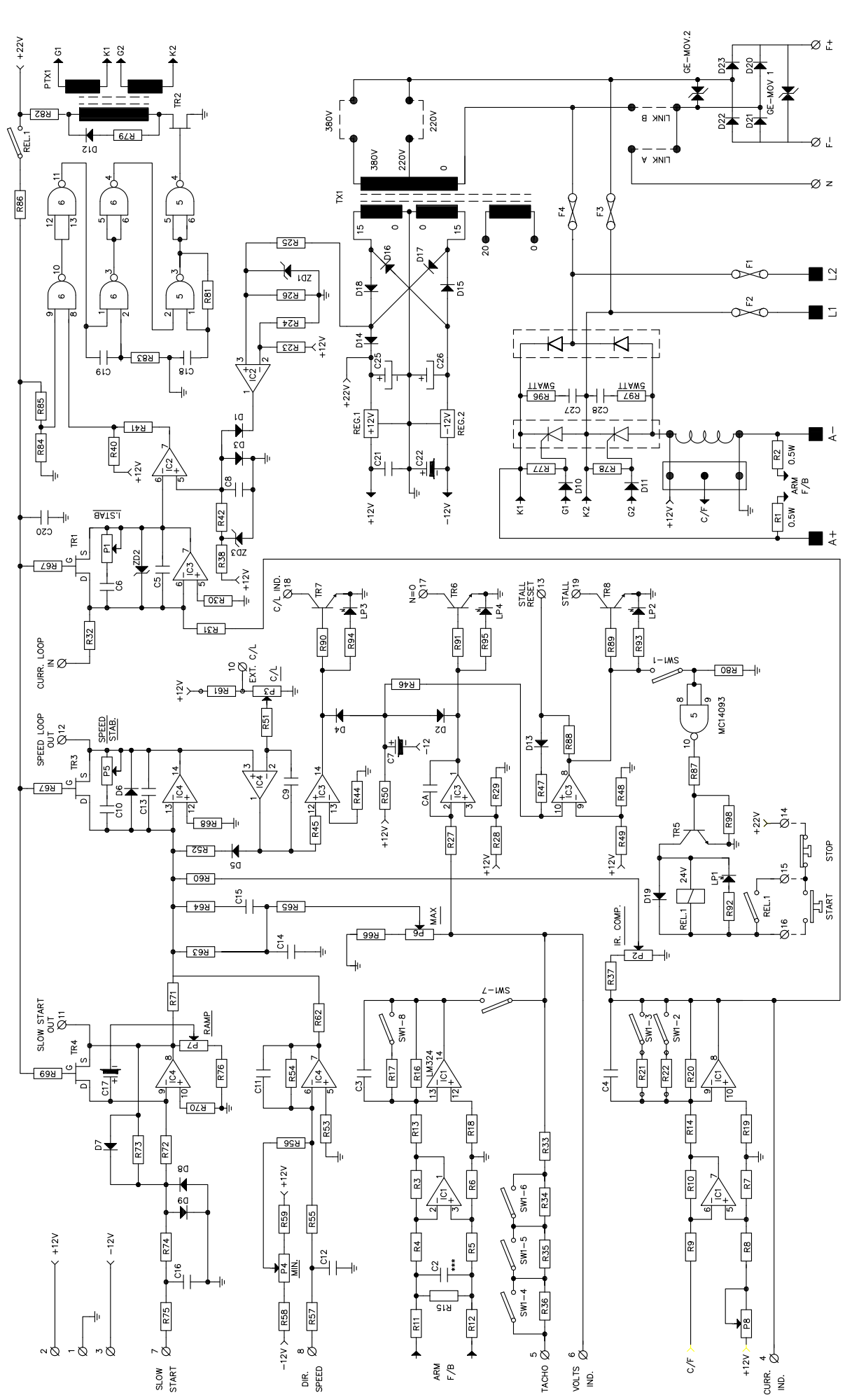
220v 380V

SW 1

P1	P2	P3	P4	P5	P6	P7
I STAB	IR COM	C/L	MIN	SP STAB	MAX	RAMP



FOR CUSTOMER USE MAX 15mA



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DRAWN		REVISION	
CHECKED		DATE	
APPR.			
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