

THREE PHASE CONVERTOR TYPES 545, 546, 547 & 548

PRODUCT MANUAL HA049975

WARNING

NEVER WORK ON THE CONTROLLER, MOTOR,
OR ANCILLIARY EQUIPMENT WITHOUT FIRST
ISOLATING ALL SUPPLIES TO THE SYSTEM.

CONTROLLER WARRANTY

For further details on SSD Controller Warranty and Repair refer to the Standard Conditions of Sale IA058393C.

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INTRODUCTION

All members of the 540 Series of Armature and Field Weakening Controllers accept standard supply voltages in the range 110 to 480 Volts A.C. and provide controlled D.C. output voltages and currents, suitable for powering D.C. Shunt Field motors of up to 200HP (150Kw) rating. The motor Armature Controllers include both regenerative and non-regenerative models.

Non-regenerative Controllers consist of a fully-controlled Thyristor bridge with full transient and overload protection, together with its associated electronic control circuitry and provide accurate speed and/or torque control in one direction of rotation.

Regenerative Controllers consist of two fully-controlled, fully protected Thyristor bridges together with a sophisticated electronic control system and provide full four-quadrant control i.e. controlled acceleration and deceleration, speed and torque in both directions of rotation.

All models of Armature Controller offer a fixed D.C. supply for Field excitation, some applications however require an extended speed or constant horsepower range of control. For these applications the 540 series includes a Field Weakening Controller. This consists of a half-controlled single phase Thyristor bridge with full transient and overload protection, together with its associated electronic control circuitry.

In all members of the 540 series the control circuitry is totally isolated from the power circuitry, thus simplifying the interconnection of controllers within a system and improving operator safety. The control circuitry adjusts automatically to accept supply frequencies in the range 45-65 Hz and possess high immunity to mains borne interference. Those Armature Controllers which employ three phase Main supplies are phase rotation insensitive.

Other standard facilities of the Armature Controllers include Field failure, overtemperature, fuse failure, line and synchronisation loss alarms. The Field Weakening Controllers possess a similar range of protection including Armature over-voltage and Tacho failure/reversal alarms. All Controllers provide external customer enable/inhibit inputs for safety interlocks etc.

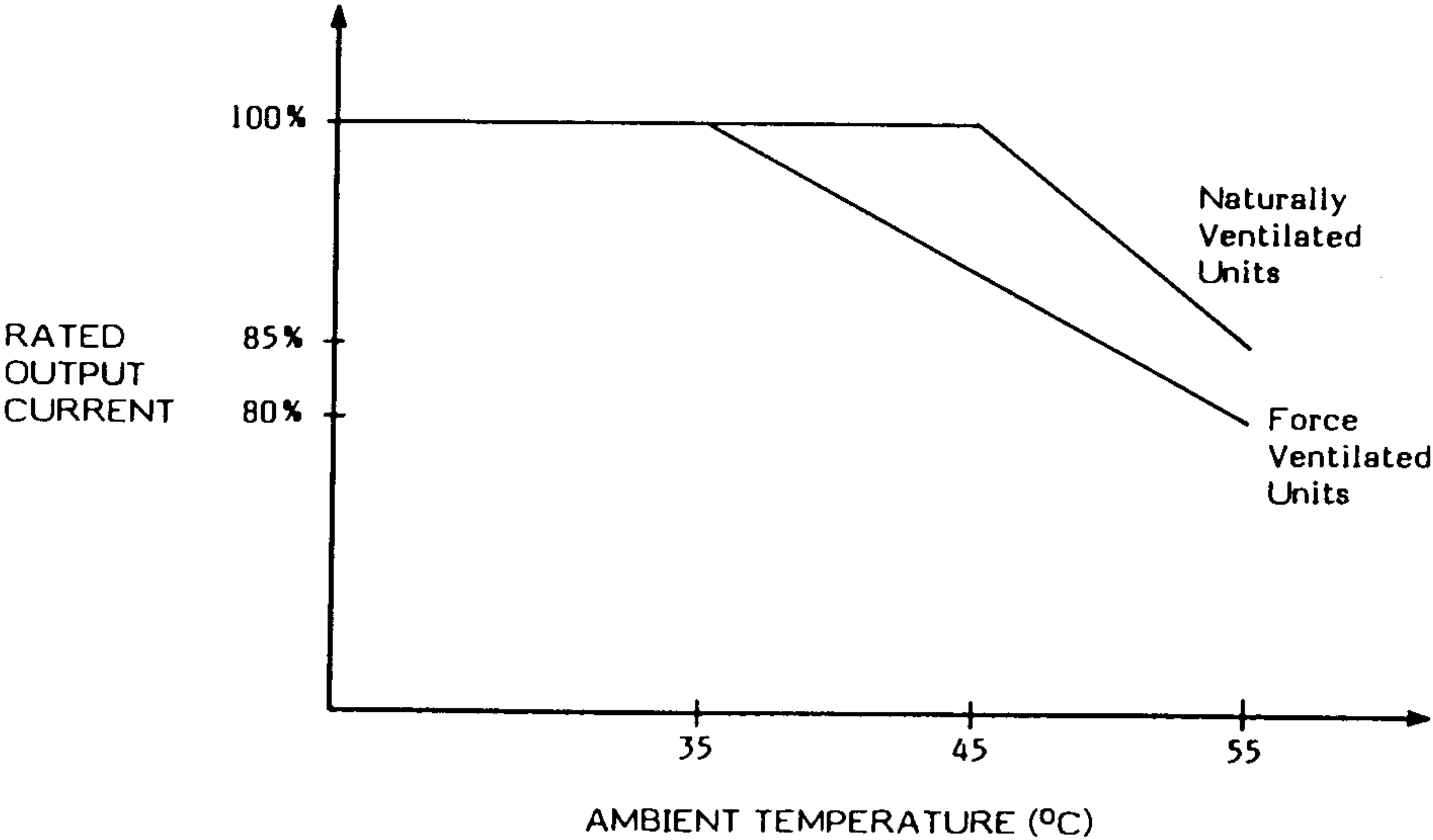
MECHANICAL DETAILS

545 & 546 Convertors:

Mounting Centres:	Vertical - 425mm (or 16.25" GPO rack pitch).	
	Horizontal - 190mm (7.48").	
	<u>Ratings up to 150A</u>	<u>Ratings from 150.1 to 180A</u>
Overall Width:	241mm (9.49")	241mm (9.49")
Overall Height:	445mm (17.52")	560mm (22.05")
Overall Depth:	205mm (8.07")	215mm (8.46")
Weight:	10Kg - 13Kg (22lb - 28.7lb)	14.6Kg (32.2lb)
Minimum Airflow Clearance:	90mm above 90mm below	150mm above 100mm below
Nominal Blower Throughput:	100m ³ /Hour (where fitted)	300m ³ /Hour
Control Terminations:	Plug-on connectors (with retaining catches).	
Power Terminations:	Bus-bars with 8mm screws and captive nuts.	
Access:	Hinge-down / lift-off overall cover. Hinge-down Control Printed Circuit Board (with its own independent covers).	
Storage Temperature and Conditions:	-20°C - +50°C short term (100 hours). 0°C - +50°C long term. Protect from direct sunlight. Ensure dry, corrosive free environment.	

547 & 548 Convertors:

Mounting Centres:	Vertical - 578mm (or 22.75" GPO rack pitch).
	Horizontal - 190mm (7.48").
Overall Width:	290mm (10.4").
Overall Height:	685mm (26.97").
Overall Depth:	280mm (11.2").
Weight:	28kg (66lbs).
Airflow Clearance:	150mm minimum above and 100mm minimum below
Nominal Blower Throughput:	230m ³ /Hour.
Control Terminations:	Plug-on connectors (with retaining catches).
Power Terminations:	Bus-bars with 10mm screws and captive nuts.
Access:	Hinge-down / lift-off Control Circuit cover. Hinge-up / lift-off Fuse and Line Terminal cover. Hinge-down Control Printed Circuit Board (with its own independent covers).



DERATING CURVES

Altitude Derating: Derate linearly above 500 metres at 5% per 1000 metres up to 5000 metres.

PRODUCT CODE

Three phase convertors, types 545, 546, 547 and 548.

All members of the three phase convertor range can be fully specified using a 20 digit numerical order code. This Product Code appears as the "Model No." on the convertor rating label, an example of which is shown overleaf.

A rating label is attached to each convertor - on the inner surface of the right hand side panel, or on the top cross-member - always check that all specified parameters are correct.

The 20 digits are split into 9 groups or blocks. The function and number of digits in each block is given below:

BLOCK NO.	NO. OF DIGITS	FUNCTION
1	3	Basic product.
2	4	Output current.
3	1	Input power voltage.
4	1	Field convertor configuration.
5	1	Input auxiliary supply voltage.
6	3	Speed feedback calibration.
7	4	Option switch settings.
8	1	Diagnostic option.
9	2	Special options.

The 9 blocks are defined as follows:

Block 1: 3 digits identifying the basic product.

Block 8: 1 digit identifying the On-board diagnostic option.

- 0 - On-board diagnostic unit not fitted.
- 1 - On-board diagnostic unit fitted.

Block 9: 2 digits identifying special options.

- 00 - No special options.
- 01 to 98 - Documented special options.
- 99 - Undocumented special options; specify requirement.

PRODUCT CODE EXAMPLE

In all communications please quote the full Model No. (Product Code) and Serial No. both of which contain important product information. An explanation of a typical Product Code is shown below.

Input Supplies	Power Field(int/ext) Auxiliary	V 50-60Hz V 50-60Hz V 50-60Hz	Motor Connections GA047080U001	Armature Feedback signal at max speed (tacho/armature isolator)	A. Field	A max.
Model No	545-0837-6-2-4-120-1101-1-00		ALWAYS check model number and rating Made in England by SSD Ltd., Littlehampton. Telex 87142			
Serial No						

BASIC INSTALLATION AND WIRING INSTRUCTIONS

A. INSTALLATION

The 540 series motor control units are all designed to mount directly onto a flat surface. They should be fastened by means of 6mm (1/4") bolts or screws through the fixing points at each corner (8mm or 5/16" in the case of 547 and 548 units). These points are in the form of keyholes and slots to simplify fastening or removal.

Please see the relevant installation drawing of this manual for overall dimensions and positions of fixing holes.

NOTE:(i)(a) The vertical height of the fixing centres is compatible with International 19" Standard Cabinet mounting dimensions.

(b) With the exception of 547 and 548 units it is possible to mount two drives side by side in the 19" width of these cabinets.

(ii) The overall dimensions are also convenient for use in Standard NEMA Enclosures.

B. VENTILATION AND COOLING

In normal operation the drive unit needs to dissipate heat and must, therefore, be mounted to permit the free flow of cool air vertically through the circuit board area and over the fuses and heat sink area at the back.

The normal maximum ambient operating temperatures are:

Naturally ventilated unit: 45°C (113°F)

F

- (ii) For Internal A.C. supply from incoming phase connections L1 and L2, connect these wires to the two pins marked "field supply-internal" or "FI".

9. The main power supply is connected to bus bar terminals L1, L2, L3 (L1, L2 in the case of 540 and 541 units). These connections should be made via the correct rated HRC fuses and the normally open contacts of the main contactor.
10. The motor armature should be connected to bus bar terminals A(+) and A(-) (this circuit should be protected by a D.C. rated fuse or D.C. circuit breaker if high energy motor loads are present. If in doubt, consult SSD Engineering Department).
11. For normal operation the speed demand signal is connected to the "Setpoint Ramp Input" terminal A4. This input is scaled so that:-

+10V input = forward speed demand.

-10V input = reverse speed demand.

This $\pm 10\text{V}$ demand signal can be generated easily from an external potentiometer with its ends connected to the +10V Reference (terminal A11) and the -10V Reference (terminal A12). For non-reversing applications and 2 quadrant controllers 541, 546 & 548 the setpoint input signal only needs to vary from 0 to +10 Volts. Terminal A1 should be used for the 0 Volt connection to the setpoint potentiometer in this case. The setpoint potentiometer should be between 2K and 10K ohms in value. All connections to the setpoint circuit should be by means of screened cable. The screen should be grounded or earthed ONLY AT THE MOTOR CONTROLLER END.

12. The tachogenerator speed feedback signal should be connected with negative to 0v terminal B1 and positive to tacho input terminal B2, (for forward motor rotation). It is important that this signal cable is screened over its entire length. The screen should be grounded or earthed ONLY AT THE MOTOR CONTROLLER END.

190

Clearance for
M6 fixing

425 *

Note: - As an alternative, Convertors
may be mounted on G.P.O.
racking pitch in which case
dimension marked thus *
becomes 412.7 (16.25')

Mounting Details

+ Product Code Dependent: For block
2 codes 1501 to 1800 (Armature currents
greater than 150A) Refer to Outline
Drawing HG049968

DO NOT SCALE

THIRD ANGLE PROJECTION

GENERAL DRAWING PRACTICE TO BS 308 / BS 3939

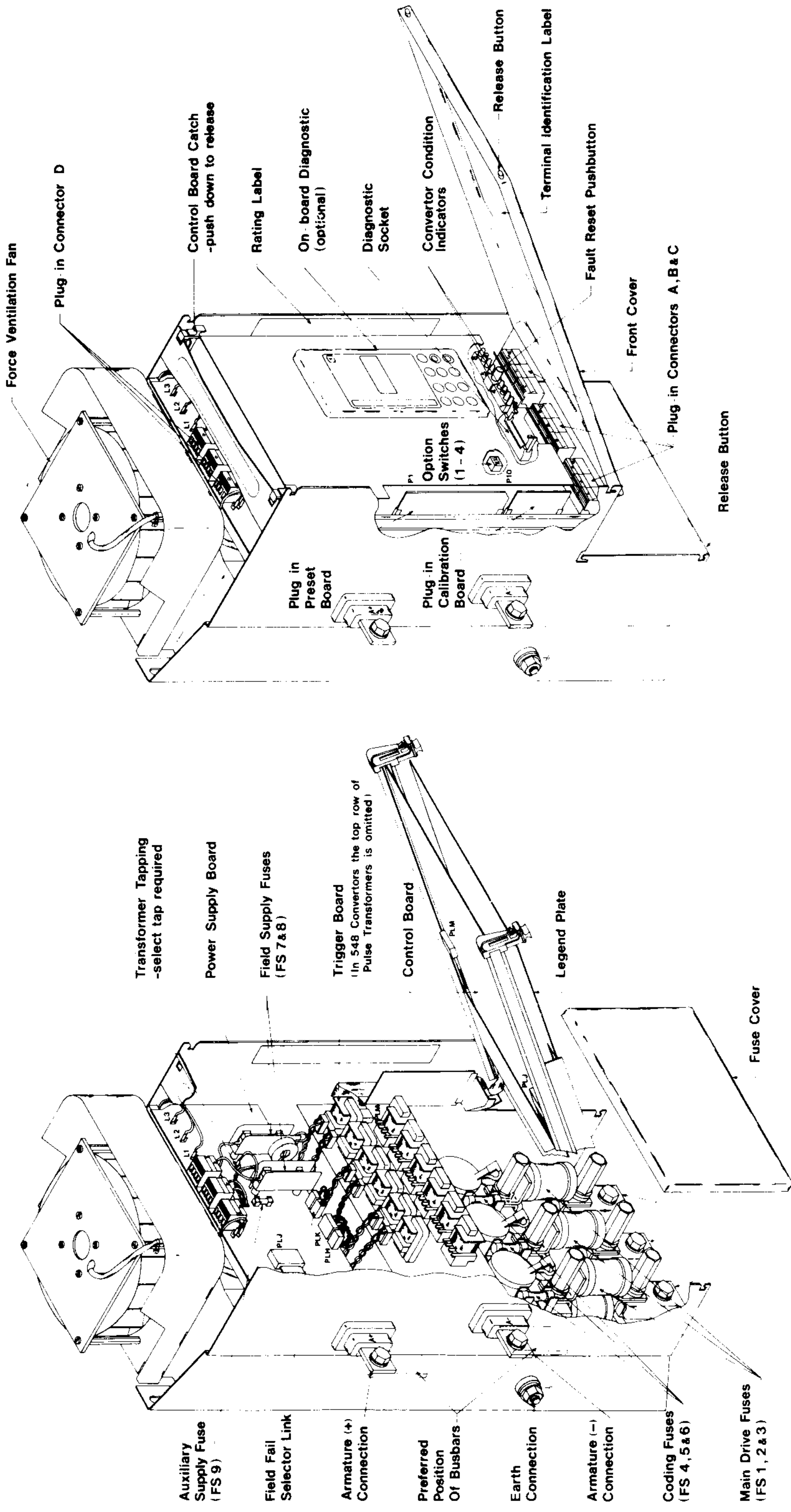
Plug-in Connector D

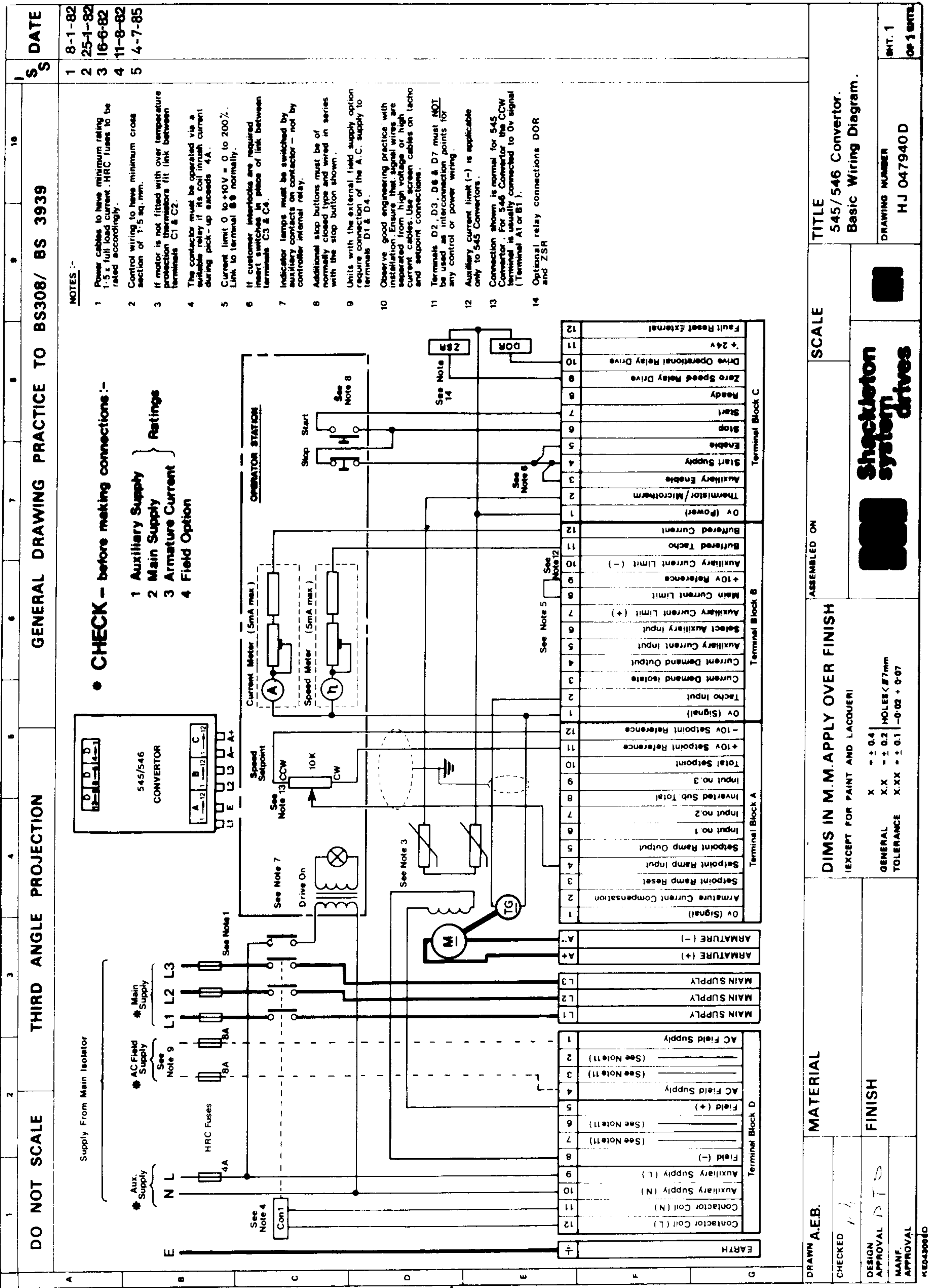
Blowers +
(where fitted)

205

241

Auxiliary Supply
Fuse (FS9)

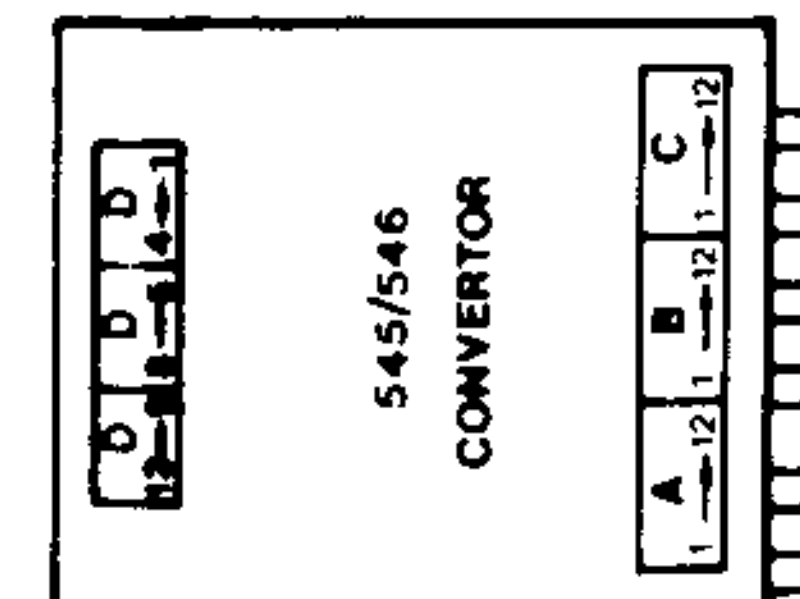


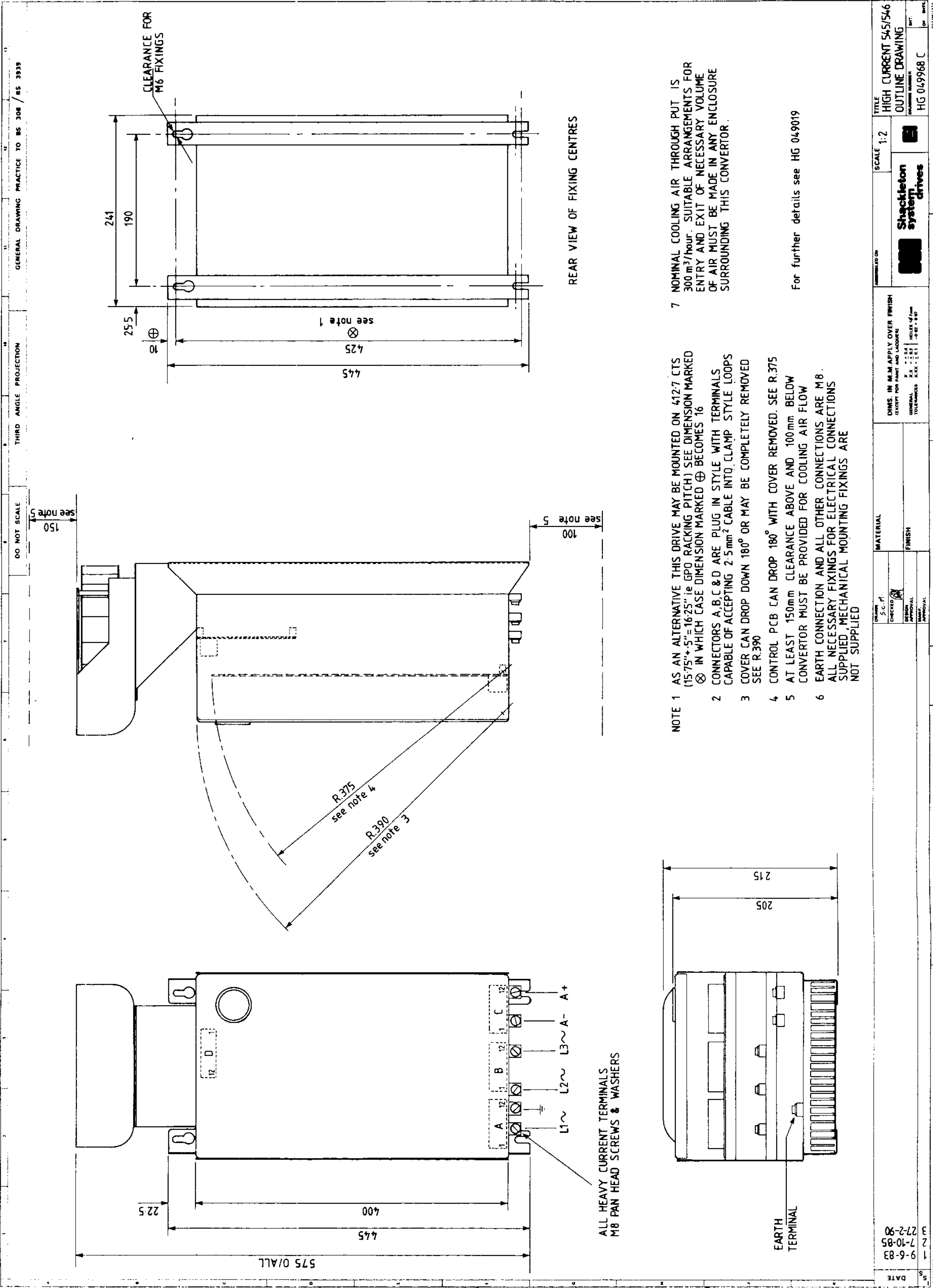


• **CHECK** - before making connections :-

1 Auxiliary Supply
2 Main Supply
3 Armature Current
4 Field Option

Ratings





CONTROLLER TERMINAL DESCRIPTIONS

TERMINAL BLOCK A

A1 0V(SIGNAL)

Zero Volt reference for signal currents only i.e. currents originating from Terminal Blocks A and B. Must not be used as a return point for currents originating from Terminal Block C.

A2 ARMATURE CURRENT COMPENSATION OUTPUT

This output is a Buffered Bipolar Armature Current Feedback Signal of $\pm 1.1\text{V} = \pm 100\%$ Full Load Current.

In Armature Voltage Feedback applications, up to 11% IaRa Compensation can be derived from this Output, adjustable by an external control potentiometer. The control should be a 10K Ohm potentiometer, connected between Terminals A2 and A1, with its wiper connected to Terminal A6 or A7.

This terminal is also used in Field Weakening applications where it is connected directly to Terminal A2 of the Field Controller (Model 5401).

A3 SETPOINT RAMP RESET*

Connect to 0v(Signal) to reset the Setpoint Ramp Output to zero volts, otherwise leave open circuit. The reset is instantaneous and independent of the setting of preset potentiometers P1 and P2.

A4 SETPOINT RAMP INPUT*

TERMINAL BLOCK D

D1 AC FIELD SUPPLY
D4 AC FIELD SUPPLY

External A.C. input to the Field Rectifier Bridge. Controllers with Field Options 5 or 6 (Product Code Block 4) require an A.C. input to these Terminals. The actual input required will depend on the Motor Field rating and the Field Rectifier configuration. The input voltage may be calculated as follows:-

For Field Option 5 (Full-wave Rectifier Bridge):-

Required AC input voltage
= 1.1 x Rated Field voltage

For Field Option 6 (Half-wave Rectifier Bridge):-

Required AC input voltage
= 2.2 x Rated Field voltage

In the case of Controllers with Field Options 2 or 3 the supply to the Field rectifier is derived from Line 1 and Line 2 within the drive. Consequently, no input is required at Terminals D1 and D4.

In all Controllers which contain a Field Supply (i.e. Field Options 2, 3, 5 and 6) the A.C. supply to the Field Rectifier is internally fused at 8A (fuses FS7 and FS8). The Field supply configuration of these units can be modified as follows, but ensure that any modifications are entered on the Controller Rating Label:-

Plug-on wire connections from FS7 and FS8 are used to select internal or external A.C. field supply:

- (i) For internal A.C. supply from L1 and L2 connect the wires to the two pins marked "FI".
- (ii) For external A.C. supply via Terminals D1 and D

DIAGNOSTIC CHART 3

DIAGNOSTIC TEST UNIT - VOLTAGE MEASUREMENTS

TEST NO.	DIAGNOSTIC TEST POINT DESCRIPTION	CONDITION	VOLTAGE
1	Internal +15V Supply	Aux. Power ON	+15V $\pm 0.25V$ Max. 100Hz ripple=25mV peak to peak
2	External +10V Supply Note: These supplies are buffered from internal reference supplies and have a maximum output current capability of 25mA.	Aux. Power ON	+10V $\pm 0.1V$ Max. 100Hz ripple=5mV peak to peak
3	External -10V Supply	Aux. Power ON	-10V $\pm 0.1V$ Max. 100Hz ripple=5mV peak to peak
4	Internal -15V Supply	Aux. Power ON	-15V $\pm 0.25V$ Max. 100Hz ripple=25mV peak to peak
5	<u>Drive Enable</u> Enable = +24V(Nominal) on terminal C5 Inhibit = open circuit to terminal C5	Enable Inhibit	+7V $\pm 4V$ $\leq -5V$
6	Motor Thermistor/Microtherm	Motor temperature correct Motor over temperature	+0.5V $\pm 0.5V$ -14V $\pm 1.25V$
7	<u>Field Fail</u> Notes: 1. This signal is interlocked with the internal temperature sensor (force ventilated units only) and the internal ACCT connectors.		

SEMICONDUCTORS

Field Bridge)
 Field Bridge VDR (1 off used).)
 Line VDR (3 off used).)

These items are Product Code dependent -
 select from the chart below:

3-PHASE SUPPLY VOLTAGE OPTION (PRODUCT CODE BLOCK 3)	FIELD BRIDGE PART NUMBER	FIELD VDR. PART NUMBER	LINE VDR. PART NUMBER	
			545 & 546	547 & 548
0 - 110v	CW047521	CK047723	CK047723	CK049159
1 - 115v				
2				
3 - 220v				
4 - 240v	CW047076	CK047692	CK047692	CK049160
5 - 380v				

ISS.	MODIFICATION	CP.NO.	DATE	APPROVAL
1	Initial Issue			
2	Up-dating Part Numbers on pages 44,45 and 46. Up-dating Sales & Service Address List.	2739	16.11.89	GDR
3	Corrections and amendments to pages 2, 5, 7 and 29. Drawing HG049968 now issue 3. Up-dating Sales & Service Address List.	3038	8.5.90	GDR
FIRST USED ON		MODIFICATION RECORD		
		545 Product Manual		
 LITTLEHAMPTON ENGLAND TELEX 87142			DRAWING NUMBER ZZ049975C	SHT. 1 of 1