REPAIR
If poor performance is confirmed (refer SERVICING information on Page 11 of this Manual) you should contact Eaton Power Quality National Service operation. If the unit is to be returned to Invensys for any reason, please obtain a “Return Authorisation” (RA) number first, and mark it clearly on the packaging.

Delivery of packages not marked with an “RA” number may not be accepted by our Inwards Goods Department.

EATON POWER QUALITY
NATIONAL SERVICE
Phone 1300 303 059

Prepaid Fastfix and SOLACARE Service Contracts are available for this product.

When ordering replacement parts, always specify:
1. Part Number and Rating.
2. Serial Number of the unit.
3. Part Number, Description and Quantity required.
4. Original Date of Purchase of the Power Conditioner.
5. Any Special Shipping Instructions.

Parts, orders and all correspondence regarding repairs under the warranty should be addressed to Eaton Power Quality’s Service Department in Melbourne.

Eaton Power Quality Pty Ltd
ACN 054 056 709
13 Healey Road, Dandenong, Victoria 3175
Phone:03-9706 5022 Fax: 03-9794 9150

EATON | Powerware

Eaton Power Quality Pty Ltd

MULTIVOLT 2605 SERIES POWER CONDITIONER 50 Hz

Instruction Manual

Manual # 6M4215 Rev 5
Issue Date: 09/12/04

Made in Australia

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EATON | Powerware
Multivolt 2605 Power Conditioner
Instruction Manual

Eaton Powerware
ACN 054 056 709

This Warranty is subject to Eaton Power Quality Pty Ltd (EPQ) standard Conditions of Sale which govern all sales of products by Eaton Power Quality Pty Ltd.

1. EPQ products, in general, are warranted against failure due to faulty materials and/or workmanship for a period of two years from despatch date (ex EPQ store) as per invoice. The Ferroresonant and 95 Series Power Conditioners and Powerware Dry Type Transformers have an extended warranty - 5 years from date of despatch.

2. If, within the applicable Warranty period, any EPQ product does not meet the warranty specified above, and the product was installed and operated in accordance with Australian standards and EPQ standard installation procedures, EPQ shall thereupon correct any defects due to faulty materials and/or workmanship.

3. Any modification made to the product other than those made by EPQ or its authorised representative may cause the Warranty to be void.

4. For units up to 3kVA that are installed as a portable device, the Warranty covers repair or replacement of defective parts at the factory, or other service locations as nominated by EPQ, provided the unit has been returned by the user packed adequately to prevent shipping damage, and approval has been obtained from EPQ before shipment. All costs associated with the return of the product to EPQ are at the customer's expense.

   For hardwired products 3kVA and above, the Warranty covers on site repair (Metropolitan area, Capital Cities only), during normal working hours, by EPQ technicians or appointed agents. For units installed in remote locations, EPQ may, at its discretion, request the equipment to be recovered and returned to the factory or other nominated service locations. In this case, it is the customer's responsibility to pack the equipment adequately to prevent shipping damages and pay freight charges to the location nominated by EPQ. Approval to return goods must be obtained from EPQ before the goods are despatched.

5. Units returned for in-warranty repairs, which are found not to be defective, will be subject to an inspection and handling charge, plus transportation charges.

6. High grade batteries, designed for Uninterruptible Power Supply (UPS) applications, are supplied by EPQ for use with EPQ UPS equipment. These batteries have a finite life expectancy depending on a number of variables, including rate of discharge, depth of discharge, operating temperature, etc.

7. Providing that the batteries are used within the limits as set out in the battery manufacturer's warranty statement and are provided as an integral part of new equipment, they are guaranteed for two years, from despatch date as per invoice. A copy of this warranty statement is available on request. Batteries provided as spare parts or replacements have a one year warranty. Other optional warranty terms for batteries are available on request.

8. EPQ reserves the right to charge for replacement batteries if within the one year guarantee period replacement batteries are necessary as a result of misuse or misapplication by the purchaser or end user.

REF: WARRANTY.DOC Rev 6 Effective Date: February 1, 2001

5.2 REPAIR OR RETURN FOR SERVICE

If the Power Conditioner performance is unsatisfactory and outside of specification, contact the Service Centre (details listed on the back page of this Manual) and advise all the results of tests and observations. Servicing arrangements can then be made. If a Power Conditioner is to be returned to Eaton Power Quality for any reason, please obtain a Return Authorisation Number first, and after ensuring appropriate packaging, mark the “RA” number on it so that it is clearly visible. Packages without this “RA” number may not be accepted by our Inwards Goods Department.

5.3 FIELD REPLACEMENT OF CAPACITORS

Capacitors used in all Power Conditioners are the highest commercial grade. Each one is given a rigid acceptance test upon receipt. Nevertheless, as with all capacitors, there is a certain small percentage of failure. The Eaton Power Quality limited warranty includes free replacement of any capacitor unit which fails within five (5) years of sale - see our Warranty Statement for details. Older units can be replaced at moderate charge.

Where component technical help is available, it may be possible to test and identify defective capacitors in the field, and to make field replacement with new capacitors. In all such cases, advice and co-operation must be requested in advance.

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SECTION ONE - GENERAL DESCRIPTION AND SPECIFICATIONS

1.1. INTRODUCTION

This manual is relevant to POWERWARE 26 Multivolt 50Hz Power Conditioners. These units require no complicated commissioning or maintenance procedures and will provide many years of trouble-free operation. This manual provides descriptive information, operation and maintenance instructions.

1.2 GENERAL DESCRIPTION

The POWERWARE 26 Multivolt 50Hz Power Conditioners provide instantaneous voltage regulation and isolation from both transverse and common mode noise. They also suppress transients, protect from overloads and serve as a portable dedicated line. They are the ultimate in AC power conditioning equipment. Hardwired units, rated 500 to 15000VA, are designed to be permanently installed by qualified electricians.

1.3 SPECIFICATIONS

Operating Temperature Range:	-20^{o} to $+50^{o}$C
Phase:	Single
Frequency:	50 Hz
Input Voltage:	110-415 VAC(Refer Table 3)
Output Voltage:	110-240 VAC (Refer Table 4)
Output Voltage Regulation:	$\pm$5% for an input line variation of $\pm$15%
Output Harmonic Distortion:	Less than 3%
Efficiency:	85% at full load
Dropout:	No loss of output for line loss of 3msec
Common Mode Noise Rejection:	Greater than 120dB
Transverse Mode Noise Rejection	Greater than 60 dB
Safety Approvals:	Designed and built per: VDE 0550 and 0806 specifications Low Voltage Directive 73/23/EEC Electromagnetic Compatibility 89/336/EEC IEC726, IEC76 AS2374, AS2735

1.4 SAFETY NOTICE

High voltages are present inside the Power Conditioner. Do not reach inside the unit when it is energised. To measure voltage, de-energise the unit, connect the meter and then re-energise the unit.

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SECTION FIVE - SERVICING

5.1 SERVICING

Since POWERWARE 26 Multivolt 50Hz Power Conditioners are simple, rugged devices without moving parts or printed circuit boards no adjustments, servicing or maintenance is required in the normal sense. If poor performance is suspected, the user is urged to check the following points immediately.

Fault	Possible Cause
Output Voltage too high.	• The load may be considerably less than full rating (See "Load Regulation" Page 8.) • The load may have a leading power factor.
Output Voltage too low.	• Load power factor may be lagging. • Unit may be slightly overloaded (See "Current Limitation", Page 9.) • Input voltage too low. • Input connections incorrect (See Table 3).
Does not regulate Output Voltage closely.	• Unit may be slightly overloaded (See "Current Limitations", Page 9.) • Actual line voltage swings may be outside the rated range of unit, particularly on low side. • On varying loads, a certain amount of load regulation may be mixed with the line voltage regulating action (See "Load Regulation", Page 8). • Input connections incorrect (See Table 3).
Output Voltage very low.	• Unsuspected or unplanned overloads of substantial size may occur intermittently (motor-starting currents, solenoid inrush currents, etc.) (See "Current Limitation", Page 9.) • One or more capacitor units in regulator may be defective. • Input voltage too low. • Input connections incorrect (See Table 3).
No Output Voltage	• Check power source breakers or fuses. • Check continuity between input terminals and also between output terminals.
Transformer Operating Temperature	• The transformer used in these Power Conditioners is designed to operate at high flux density, and hence, relatively high temperatures. After connection to line for a half hour or so, the transformer core structure may be too hot to touch with the bare hand. This is normal and need give no concern.

NOTE: In case the Power Conditioner is operating but does not appear to have the correct output, it is helpful to apply the following test:

1. Disconnect the working load.
2. Connect a dummy load of lamps, heaters, or other resistive loads substantially equal to the full load rating of the Power Conditioner, directly across its output terminals.
3. Measure the output voltage of the Power Conditioner using a true R.M.S. type voltmeter at the output terminals.

This test will usually establish whether the apparent poor performance is due to a fault in the Power Conditioner or to some peculiarity of the working load.

4.5 EFFECT OF TEMPERATURE

The output voltage will show a small change as the unit warms up to stable operating temperatures at a constant ambient temperature. This change may be about one or two percent, depending on the unit's VA rating. At a stable operating temperature, the output voltage will change slightly with varying ambient temperature. This shift is approximately one percent for each 40^{o}C of temperature change.

4.6 RESPONSE TIME

An important advantage of the POWERWARE principle of static magnetic regulation is its fast response time, compared to other types of AC regulators. Transient changes in supply voltage are usually corrected within 1-1/2 cycles or less; the output voltage will not fluctuate more than a few percent.

4.7 INPUT CHARACTERISTICS

The Power Conditioner transformer includes a resonant circuit which is energised whether it is supplying a load or not. The input current at no load is approximately 35% of the full load primary current. Input power factor will average 0.9 - 1.0 at full load, but may drop to about 0.75 at half load and 0.25 at no load. It is always leading.

4.8 CURRENT LIMITATION

When the load is increased beyond the Power Conditioner's rated value, a point is reached where the output voltage suddenly collapses and will not regain its normal value until the load is partially released. Under short circuit conditions, the load current is limited to approximately 150% of the rated full load value, and the input power to less than 10% of normal. The Power Conditioner will protect both itself and its load against damage from excessive fault currents. Fusing of load circuits is not necessary.

4.9 OPERATION ON MOTOR LOADS

Because of the current-limiting effect described above, special attention should be given to motor applications. In general, the Power Conditioner must have a load rating nearly equal to the maximum power drawn during the starting cycle. This may run from two to eight times the normal (running) rating of the motor. In doubtful cases, it is advisable to measure the actual starting current.

- SECTION TWO - INSTALLATION

2.1 MECHANICAL

Table 1 shows the physical dimensions of the Power Conditioners. These units **MUST** be mounted in either one of two ways:

a) Vertically on a wall with the "THIS SIDE UP" designation facing upwards, or,
b) Horizontally on a flat surface.

In both cases, there must be a **minimum of 600mm** clearance above the unit, plus a **minimum of 300mm** around all sides. Note that the shipping weights of the 10000 and 15000VA units mandate that vertical mounting of these units be on masonry or steel reinforced walls only. The minimum recommended size of mounting bolts is given in Table 2. Ensure that the fixings and support structure will safely support the additional weight.

VA	Part No.	Outline Drawing	DIM A (mm)	DIM B (mm)	DIM C (mm)	DIM D (mm)	DIM E (mm)	DIM F (mm)	DIM G (mm)	DIM H (mm)	DIM J (mm)	APPROX SHIPPING WEIGHT (kg)
500	2605-500M	A	369	161	200	254	232	143	102	10 x 20	25.4	22
1000	2605-1000M	A	465	168	216	254	232	143	158	10 x 20	25.4	32
2000	2605-2000M	B	473	242	287	325	303	124	129	10 x 20	35	54
3000	2605-3000M	B	736	242	287	325	303	175	129	10 x 20	35	77
5000	2605-5000M	B	840	242	287	325	303	244	100	10 x 20	40	112
10000	2605-10KM	C	840	242	598	649	615	244	100	10x20	40	225
15000	2605-15KM	D	840	242	909	960	926	244	100	10 x 20	40	340

Table 1. Dimensions
NOTE: Dimension C includes heat shield around core for all units except 500VA, which has no shield

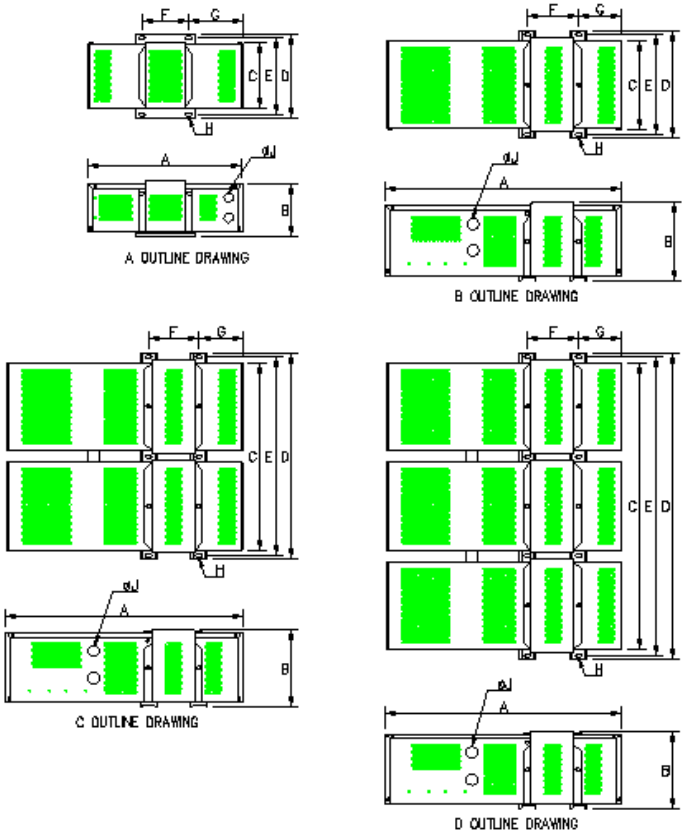

Figure 1 - Power Conditioner Dimensions (Refer to Table 1)
Knockout Locations are typical.

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SECTION FOUR - ELECTRICAL CHARACTERISTICS OF OPERATION

4.1 CHECKING WITH VOLTMETERS

All checks on output voltages should be made with a true R.M.S. voltmeter. Rectifier type voltmeters will not give accurate readings due to the small amount of output harmonic distortion which is present.

4.2 LOAD REGULATION

Changes in output voltage resulting from changes in resistive load from no load to full load (at a 1.0 power factor) are approximately -4%.

4.3 EFFECT OF LOAD POWER FACTOR

The median value of output voltage will vary from the nameplate rating if the load has a power factor other than that for which the regulator was designed. Load regulation will also be greater as the inductive load power factor is decreased. The resulting median values of output voltage will be regulated against supply line changes at any reasonable load or load power factor. Figure 4 illustrates this effect.

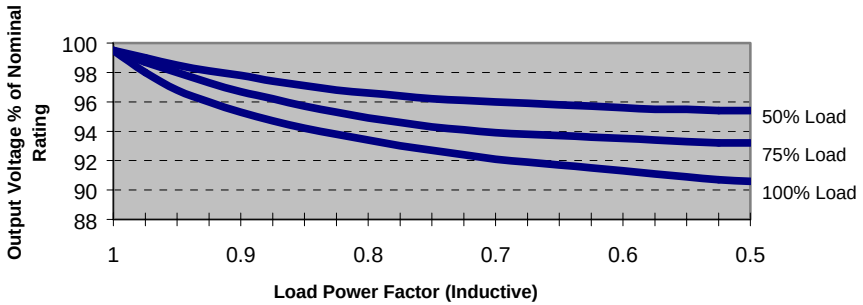

Figure 4 - Change in "Median" Output Voltage versus Load Power Factor at various loads

4.4 USE WITH SWITCHMODE POWER SUPPLIES

If a Power Conditioner is used as a source for a switchmode power supply, a slight amount of ringing may be noticed on the sine wave output of the Power Conditioner at half cycle intervals for a short duration. This ringing occurs at the point when the switchmode power supply current demand drops to zero. The ringing need not be a cause for concern, since it is of relatively low magnitude and frequency. The Power Conditioner has been tested with a variety of switchmode power supplies and it has been determined that the ringing does not affect the DC output, nor has it been found to degrade the components of any switchmode power supply.

2,6 THREE PHASE OPERATION

POWERWARE 26 Multivolt 50Hz Power Conditioners may be used to spread single phase load equipment over three phases, however this configuration is not suitable for the operation of 3 phase equipment, or equipment which is connected phase to phase. Ensure that the Power Conditioner input is connected for the voltage appropriate for the connection used.

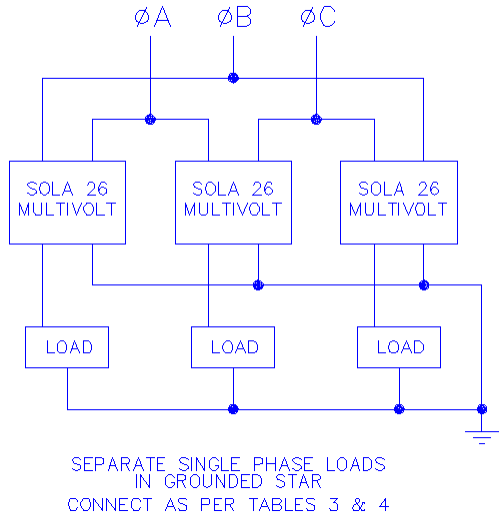

Figure 3. Three Phase Connections

SECTION THREE - PHYSICAL CHARACTERISTICS OF OPERATION

3.1 OPERATING TEMPERATURE

POWERWARE 26 Multivolt 50Hz Power Conditioners are designed to operate in ambient temperatures of -20°C to +50°C. In operation, a temperature rise will occur whether or not the Power Conditioner is supplying a load. This rise may be anywhere in the range of 45-100°C, depending on the Power Conditioner type and rating. The maximum operating temperature at an ambient of 50°C is always within safe operating limits.

3.2 MAGNETIC FIELDS

In almost all applications, this effect may be disregarded. In certain applications, care should be exercised in the orientation of the core with respect to critical circuits, in order to minimise the effect of the magnetic field. Applications requiring care may include:

- Proximity to Monitor and C.R.T.
- Proximity to magnetic storage media

Table 2 shows the recommended bolt sizes for mounting these hardwired units.

Rated VA of Unit	Minimum Recommended Size of Steel Mounting Hardware
500/1000	M6 (4 off)
2000 to 5000	M8 (4 off)
10000	M10 (6 off)
15000	M10 (8 off)

Table 2 - Bolt Sizes

2.2 ELECTRICAL

POWERWARE 26 Multivolt 50Hz Power Conditioners may be configured for different input and output voltages by means of jumpers. The jumpers are connected to the input/output terminal block, which is located beneath an access panel in one end of the unit. Tables 3 and 4 give the proper jumper configurations for different input and output voltages. Figure 2 shows the schematic diagram of the units.

Input Voltage	Input Terminals (0.5 – 5kVA)	Input Terminals (10 – 15kVA)	Jumpers (0.5 – 5kVA)
110/120	A1 and A2	-	A1-A3 and A2-A4
220/240	A1 and A4	A1 and A2	A2-A3
380/415	A1 and A5	A1 and A3	A2-A3

Table 3. Input Connections

Output Voltage	Output Connections
110	a2 and a3 OR a3 and a4
120	a1 and a3 OR a3 and a5
220	a2 and a4
240	a1 and a5

Table 4. Output Connections
NOTE: 110 or 120V load may be connected between either or both of the terminals listed, however the total nameplate VA of the unit must not be exceeded

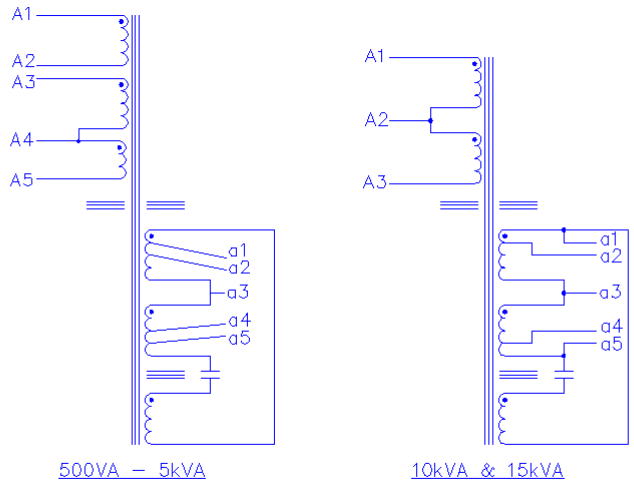

Figure 2. Power Conditioner Schematic

Table 5 shows recommended wire sizes and fuses for the Power Conditioners. This table is not meant to supersede local and national wiring codes and standards. Make certain to adhere to local and national code requirements.

INPUT				OUTPUT	
Part No.	**Rated Voltage**	**Suggested HRC Fuse Size**	**Suggested Minimum Wire Size (mm^2)**	**Rated Voltage**	**Suggested Minimum Wire Size (mm^2)**
2605-500M	110-120 220-240 380-415	10 4 4	1.5 1.0 1.0	110/120 220/240	1.0 1.0
2605-1000M	110-120 220-240 380-415	16 10 6	2.5 1.5 1.0	110/120 220/240	1.5 1.0
2605-2000M	110-120 220-240 380-415	32 16 10	6.0 2.5 1.5	110/120 220/240	4.0 1.5
2605-3000M	110-120 220-240 380-415	50 25 15	10 4.0 2.5	110/120 220/240	6.0 2.5
2605-5000M	110/120 220-240 380-415	63 40 25	16.0 10.0 4.0	110/120 220/240	10.0 4.0
2605-10KM	220-240 380-415	80 50	16 6.0	110/120 220/240	35 16
2605-15KM	220-240 380-415	100 63	25 16	110/120 220/240	70 25

Table 5: Recommended Wire Sizes and Fusing

2.3 MULTIPLE OPERATION

Two or more models of the same rating may be connected with their input and output in parallel. Do not parallel both 220V (a2-a3-a4) and 240V (a1-a3-a5) tappings. This may damage the output windings.

2.4 INPUT POWER SWITCH

Because the Power Conditioners include resonant circuitry that is energised, whether or not the unit is serving a load, it is desirable to install an isolator in the primary circuit. Normally this isolator should be mounted near the Power Conditioner.

2.5 M.E.N. LINK

POWERWARE 26 Multivolt 50Hz Power Conditioners are supplied ready for wiring. As the secondary circuit is floating with respect to ground, we recommend that the secondary circuit be tied to ground at one point only. For 110 and 120V systems, terminal a3 may be linked to earth, for 220 and 240V systems, either terminals a2 or a4, or terminals a1 or a5 may be linked to earth (See Figure 2, Page 5)