TT Mains Power Conditioner
Product Manual

Model No: _____

Serial No. _____

Contents:

Manufactured by:

Advance Electronics Ltd
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1.1 Product Description

Affix copy of spec label here

1.2 Unpacking & Siting

Unpacking

Remove the unit from the box and check for external damage. Please advise your supplier and/or carrier if the unit is damaged in any way. Before installation check these four specification parameters are appropriate to your needs:

Input voltage range
Nominal output voltage
Line frequency
Power rating

Also check that the serial number on the unit corresponds with the serial number on the despatch note.

Siting

The unit should be installed as close as possible to the load it is protecting in a well-ventilated location as power ratings assume natural air-cooling.

Larger units can be safely lifted using a forklift when they have been unpacked and removed from the wooden pallet. Some unit can also be craned into position using the lifting eyes, which can be found by removing the cover.

If the unit is of the type that can be fixed vertically using an optional baseplate, ensure that the end containing the terminals or socket is uppermost.

To ensure maximum noise isolation between input and output do not install the input and output wiring through the same conduit or junction box.

Conductors to the critical load should be installed in separate conduit and junction boxes.

1.3 Start up surges

The switch on current surge for a CVT power conditioner consists of two components.

One of these is fixed at about 8 times running current for 5 to 10 mSec.

Superimposed on this will be a 'spike', which will be dependent on where in the cycle the transformer was turned off and where in the cycle it is turned back on.

The spike will be less than 1 mSec and varies from zero to 25 times running current if the supply is low impedance.

The input surge current at switch on is not significantly affected by the output load condition.

The surge current will be substantially proportional to applied line voltage.

Our normal circuit breaker recommendation is to fit a 'Type D' or 'Curve 66' unit which should function without nuisance tripping.

Fuse, earth loop impedance, and cable size suggestions are available on request.

1.4 Fusing

CVT's take large currents at switch on. In general the surge will be twice that of a conventional transformer. The protective fuse must be rated to at least twice the full load running current of the CVT.

Fuses known as 'motor circuit fuse links' in BS88 are ideal for smaller CVT'S. The GEC type 'T' are recommended.

We suggest that installers use a wall-mounted switch fuse arrangement or 'red spot' fittings.

For larger units the best protection is an electric motor magnetic breaker with a slow trip characteristic. These are known as type 'D' or type '4' breakers, USA types have a drop-out curve known as '66'.

Discrimination must be proven under the requirements of the current edition of the IEE Regulations - it remains the responsibility of the installer to ensure that the supply is protected.

We are always pleased to provide assistance in cases of difficulty.

1.5 Check-out/switch-on

Once the power conditioner has been installed, some straightforward checks can be made to confirm that it is operating satisfactorily.

1. Measure output voltage at different load currents (any resistive load can be used). Convenient options includes domestic light bulbs or fan heaters.

2. Test safety earth continuity.

3. Test clean earth continuity and for loops - as applicable.

If the unit is delivering an output voltage to specification then no further checks are necessary.

If not, please contact us with the following information.

1. Model number
2. Actual input voltage and frequency
3. Measured output voltage
4. Load conditions
5. Earthing arrangements

1.6 Some problems met at installation on LARGE Power Conditioners

When large Power Conditioners are installed, it is common practice to test that the unit is supplying an appropriate voltage prior to connecting up the critical load.

Depending on the detail of measurements taken some misleading results can be observed.

1. Primary current seems high -

The primary current at zero output load is significantly out of phase with the input voltage, therefore a wattmeter must be used to measure primary power. Input power at zero load is about 10% of unit rating VA.

2. Output voltage seems high -

The voltage should be a maximum of nominal +8% at nominal input volts. As a load is applied the voltage will reduce.

If an unusual 'motor boating', 'humping' or 'rattling' noise occurs, this is due to marginal instability. Just switch off and on again. If it still persists contact our Sales Office for advice.

1.7 Health & Safety Data

Scope

These notes apply to all ferroresonant transformers.

Construction

The transformer consists of insulated copper wires wound onto an insulated former subsequently assembled onto steel laminations. In addition high voltage capacitors are added into a resonant circuit configuration.

Hazards

High voltage:

The transformer must be correctly installed according to the requirements both of the current edition of the IEE Wiring Regulations and the manufacturers recommendations.

Specifically, proper in-line fusing or other suitable protection must be supplied.

Output voltages can be as high as 440 volts and suitable RCCD protection and proper insulated fittings must be used in accordance with the needs of the application.

The internal capacitors may run at 600 volts AC and are LETHAL when operating.

The capacitors are safe when the unit is switched off
SO LONG AS THE 'CAPACITOR TO WINDING' CONNECTIONS ARE SOUND.

Only authorised and trained personnel should attempt repair.

Temperature

The steel stack of the unit may reach 90 Deg C above ambient in normal air and precautions must be taken when repairing or testing exposed units.

The exposed stack on small units does not reach an unsafe temperature but may feel quite warm to touch.

All units should be well ventilated as power ratings assume natural air-cooling.

Chemicals

Once completed and all solvents have been burned off the transformer is chemically benign.

The capacitors contain paper insulation soaked in transformer oil, which is relatively odorless and harmless to human skin.

Although messy this oil is only found if a capacitor leaks through some internal electrical fault in the capacitor.

If the capacitor is leaking the transformer is faulty and should be switched off.

Historically PCB's have been used in the capacitors but Advance Electronics has not used any since about 1972.

Mass

All the transformers have a high density and suitable precautions should be taken in respect of the size under consideration.

Noise

Audible noise is emitted at different intensities depending on unit size. Levels range 45 - 65 dbA.

2.1 Routine Maintenance

Routine checks should be made to ensure that the ventilation for the power conditioner is adequate.

The unit should be positioned in a well-ventilated location as power ratings assume natural air-cooling.

2.2 Preventative Maintenance

Some larger power conditioners are fitted with fans to assist with cooling.

Under normal circumstances the only preventative maintenance required is the cleaning of fans if fitted.

2.3 Repair

2.3.1 Checking out_

CVT's have no moving parts, however high voltages are present when the unit is operating. (See Health & Safety)

Installation, service and repair should only be attempted by qualified personnel.

General

The CVT is a special type of transformer which incorporates one or more AC capacitors.

Except in special cases, service is limited to cleaning cooling fans, making poor connections good and replacing capacitors.

Arrangement

The transformer windings are on three sections of the lamination.

Winding 1 is generally the primary and may be split into two sections or tapped in one or more places. Winding 1 may have an earth screen.

Windings 2 & 3 are generally referred to as the secondary and may be integrated together and connected to winding 4.

Winding 4 is generally reffered to as the neutralising winding.

The capacitance value is commonly made up from several capacitors, which are connected across the secondary and neutral.

Failure modes

Potential problems are limited to:

Incorrect rating of unit
Incorrect or poor installation connections
Winding open circuit
Winding with short circuit turn
Insulation failure
Capacitor short circuit
Capacitor open circuit

Test gear

Ohmmeter
AC Voltmeter
AC Ammeter
Resisitive load
Small tools to remove covers or plates

Checking out a presumed good unit

The best checkout procedure is a full factory test sheet. This is available to customers for any unit, which they have purchased.

If a summary check is to be made and a suitable resistive load is available (a fan heater is very useful for 240 vac) the following procedure can be adopted:

Check input volts at zero load - should be inside nominal +/- 20%

Check output volts at zero load - should be less than nominal +8%

Check output volts at full load - should be more than nominal -8%

Check capacitor volts - ranges 450-620V rms

2.3.2 Fault Finding

Isolate supply

Check unit has appropriate rating for voltage and frequency to be applied.

Check expected load VA is within rating of unit.

Remove covers.

Check input wiring goes to input

Inspect for loose connections, rectify as necessary.

Inspect for mechanical damage to coils.

Inspect capacitors for leakage of oil.

Check windings are isolated from earth.

The next steps should be taken with appropriate isolation and reconnection of the supply to maintain a safe environment. DO NOT FLASH TEST without checking with your supplier.

Disconnect load

Measure input voltage to CVT

Check supply is inside rating of CVT

Measure input current (should be 1/10 to 1/2 expected full load current)

If no current - remove supply

Check continuity of primary

If excessive current (fuse or breaker opens)

Check sizing of fuse or circuit breaker

If a short circuit turn exists it may blow the fuse, it will get HOT.

If winding seems OK proceed to rest of test.

With input voltage applied

Check output voltage VAC

If zero volts

Check continuity of winding OHMS

If open circuit - unit requires factory repair.

If low resistance

Check for external short across winding

Check capacitors for short circuit, using ohmmeter

If voltage low with respect to specification

Disconnect capacitors from winding

Check for open circuit capacitor with dry battery and voltmeter per sketch.
(Close switch then open, check volts decay slowly)

If unit still has unidentified problem disconnect one end of each winding and

Check continuity of winding 3

Check continuity of winding 4 (if present)

Check continuity of winding 1

If no fault found, request support from your supplier.

If unit is presumed to be operating OK some further checks can be made to increase confidence.

2.5 Recommended Spares

If operating within mainland UK, none. If operating outside UK - one set of capacitors.

A price quotation is available from our sales office; please specify your requirement as follows:

Model No TT 9000**

This unit contains three banks of 3 capacitors.

2 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75705
	description	5µF, 600Vac

Model No TT 12000**

This unit contains three banks of 3 capacitors.

2 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75730
	description	30µF, 600Vac

Model No TT 15000**

This unit contains three banks of 4 capacitors.

3 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75730
	description	30µF, 600Vac

Model No TT 21000**

This unit contains three banks of 5 capacitors.

4 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75720
	description	20µF, 600Vac

Model No TT 24000**

This unit contains three banks of 7 capacitors.

6 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75730
	description	30µF, 600Vac

Model No TT 30000**

This unit contains three banks of 8 capacitors.

7 x Capacitor	part number	75740
	description	40µF, 600Vac
1 x Capacitor	part number	75710
	description	10µF, 600Vac

Model No TT 37500 & TT45000****

These units contain three banks of 10 capacitors.

10 x Capacitor	part number	75740
	description	40µF, 600Vac

If spares are required, we suggest that only a couple are needed rather than a full set since this item has a limited shelf life.

2.6 Notes on Field Replacement of Capacitors

We are occasionally asked to supply replacement capacitors for old CVT's.

Capacitors are subject to two characteristics, which affect the use of these spare components in CVT's.

a. value tolerance
b. physical dimensions

a. Changes in capacitance value will result in differences in the CVT output voltage.

In general terms we expect normal production tolerances in the value of a spare capacitor to make less than a 1% change to the original output voltage nominal setting.

This situation can be improved when a coloured dot is noted on the failed capacitor and it's colour dot is defined at the time of ordering a spare. The output voltage variation expected with CVT's using a spare capacitor of the same colour dot will be less than 0.3%.

b. The physical dimensions of commercial capacitors change over extended periods of time. In general terms our capacitors will be of similar size or smaller.

In case of any anticipated problem we recommend a factory repair for units up to 3 kVA.

2.7 Standard Warranty

If problems are experienced with the unit, please contact our sales office for advice.

All power conditioners are covered by a 12 months warranty.

This period is normally calculated from the date of supply.

Normally we expect the user to return the unit to our factory for repair.

We will repair or re-build the unit at our discretion and return ship it as quickly as possible.

With certain failures site work can be more practical in terms of both cost and time.

In general terms our product is very reliable and once running satisfactorily in an application should cause no further concern.

These notes do not affect any commercial arrangements made with our customers or our legal obligations.

2.8 Warranty Extension

We offer to provide 'Warranty Extension' to any customer who owns and is using a product of our own manufacture.

Warranty Extension provides for free labour and materials as required to bring the operational efficiency of any unit back to our published data sheet specification.

This extension is available on an annual basis only.

Application for Warranty Extension is made by submitting an official Purchase Order detailing the model number, serial number and installation location of the unit. The cost of extension is available on request.

Units with power ratings up to and including 2100 VA must be returned, at customer cost, to our factory for repair.

The unit will be repaired and re-shipped within two working days, return shipping cost to be borne by Advance Electronics Ltd.

Units rated above 2100 VA will be repaired at any UK mainland site at the customers' option within two working days of formal advice of any operational failure. Reasonable access must be provided.

Offshore sites must be discussed with Advance Electronics Ltd prior to submission of application for Warranty Extension.

Customers are required to ensure adequate fan cleaning is carried out on units where circulating or cooling fans are fitted.

We reserve the right to levy an estimate for repairing units, which have seen unreasonable or abusive service. Any such units will only be repaired if the customer undertakes to cover the cost of repair.

We reserve the right to replace units with a new similar item where the total cost of repair exceeds the replacement value.

We reserve the right to inspect any unit prior to acceptance of Warranty Extension responsibility.