

Compumotor



EMC Installation Information
General Considerations
Applicable to All Digiplan Products

1600.205.01 - January, 1996

Compumotor Division
Parker Hannifin Corporation
p/n 88-015297-01A November 1997



IMPORTANT

User Information

To ensure that the equipment described in this user guide, as well as all the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. Since codes can vary geographically and can change with time, it is the user's responsibility to identify and comply with the applicable standards and codes. **WARNING:** *Failure to comply with applicable codes and standards can result in damage to equipment and/or serious injury to personnel.*

Personnel who are to install and operate the equipment should study this user guide and all referenced documentation prior to installation and/or operation of the equipment.

In no event will the provider of the equipment be liable for any incidental, consequential, or special damages of any kind or nature whatsoever, including but not limited to lost profits arising from or in any way connected with the use of this user guide or the equipment.

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Since Parker Compumotor constantly strives to improve all of its products, we reserve the right to change this user guide and equipment mentioned therein at anytime without notice.

Technical Assistance *Contact your local automation technology center (ATC) or distributor, or ...*

.....
North America and Asia:

Parker Hannifin
Compumotor Division
5500 Business Park Drive
Rohnert Park, CA 94928
Telephone: (800) 358-9070
Fax: (707) 584-3793
FaxBack System: (800) 936-6939
BBS: (707) 584-4059
E-Mail: tech_help@cmotor.com

Europe (non-German speaking):

Parker Digiplan
21 Balena Close
Poole, Dorset
England BH17 7DX
441-202-690-911
441-202-600-820

Germany, Austria, Switzerland:

Hauser Elektronik GmbH
Robert-Bosch-Str. 22
D-77656 Offenburg
Germany
49-781-509-300
49-781-509-176

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EMC INSTALLATION INFORMATION

DIGIPLAN GENERAL EMC PRODUCT PHILOSOPHY

Digiplan products currently fall into three main categories -

- (a) Fully EMC compliant products which incorporate all necessary line filter components
- (b) Rack-based drive systems
- (c) Packaged drives and controllers

The new range of fully-compliant products carry full installation information and are designed to be used either in a standalone fashion or incorporated into a machine cabinet along with other equipment. Since all the necessary protection and filtering is built into the drive, they require few special precautions during installation beyond the correct termination of the motor cable.

Existing category (b) and (c) products were not designed originally for EMC compliance and require specific measures to be taken during installation. These measures vary according to the type of product. Rack-based products in particular require a significant amount of integration before they can be taken into service and fulfil their intended function. They are intended for sale only to competent Systems Integrators and OEMs rather than for direct use by an end-user. They have therefore been classed as components even when supplied with motors, and as such do not need to independently meet the requirements of the EMC directive.

The classification of 'component' implies that the drive module will be built into another machine which will in turn be required to comply with the directive. To the professional systems builder and installer, this requires that the Technical Construction File route is used before the final machine is placed on the market. The ultimate responsibility for ensuring that the EMC requirements are met rests with the systems builder.

It is important to remember that for specific installations, the full protection requirements of the EMC Directive 89/336/EEC need to be met before the system is taken into service. This must be verified either by inspection or by testing. The following EMC installation instructions are intended to assist in ensuring that the requirements of the EMC directive are met. It may be necessary to take additional measures in certain circumstances and at specific locations.

It should be stressed that although these recommendations are based on the expertise acquired during the development of fully compliant products, and on tests carried out on each of the product types, it is impossible for Digiplan to guarantee the compliance of any particular installation. This will be strongly influenced by the physical and electrical details of the installation and the performance of other system components. Nevertheless it is important to follow **all** the installation instructions if an adequate level of compliance is to be achieved.

Safety Considerations

These products are intended for installation according to the appropriate safety procedures including those laid down by the local supply authority regulations. The recommendations provided are based on the requirements of the Low Voltage Directive and specifically on EN60204. It should be remembered that safety must never be compromised for the purpose of achieving EMC compliance. Therefore in the event of a conflict occurring between the safety regulations and the following recommendations, ***the safety regulations always take precedence.***

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GENERAL CONSIDERATIONS APPLICABLE TO ALL PRODUCTS

External enclosures

The measures described in these recommendations are primarily for the purpose of controlling conducted emissions. To control radiated emissions, all drives and rack systems must be installed in a steel equipment cabinet which will give adequate screening against radiated emissions. This external enclosure is also required for safety reasons. With the exception of drive front panels in rack-based units, there must be *no user access* while the equipment is operating. This is usually achieved by fitting an isolator switch to the door assembly. Packaged drives, transformers and filters must be mounted to a conductive panel. If this has a paint finish, it will be necessary to remove the paint in certain areas where specified.

To achieve adequate screening of radiated emissions, all panels of the enclosure must be bonded to a central earth point. The enclosure may also contain other equipment such as motion controllers, and the EMC requirements of these must be considered during installation. Always ensure that drives and rack systems are mounted in such a way that there is adequate ventilation.

AC supply filtering

These recommendations are based on the use of proprietary mains filter units which are readily available. However the full EMC test includes a simulated lightning strike which will damage the filter unless adequate surge suppression devices are fitted. These are not normally incorporated into commercial filters since the lightning strike test can be destructive. This test is normally carried out on the overall system and not on individual components, therefore the surge protection should be provided at the system boundary.

Try to arrange the layout of drive and filter so that the AC input cable is kept away from the filter output leads. It is preferable for the current path to be as linear as possible without doubling back on itself - this can negate the effect of the filter. Mount the filter within 50mm of the drive or transformer, and run the input cable and any earth cables close to the panel.

Motor cables

All motor connections must be made using a high quality braided-screen cable. Cables using a metallised plastic bandage for an earth screen are unsuitable and in fact provide very little screening. There is a problem in terminating to the screen in a mechanically stable manner and the screen itself is comparatively fragile - bending it round a tight radius can seriously affect the screening performance.

There must be no break in the 360° coverage that the screen provides around the cable conductors. If a connector must be used it should retain the 360° coverage, possibly by the use of an additional metallic casing where it passes through the bulkhead of the enclosure. The cable screen must *not* be bonded to the cabinet at the point of entry. Its function is to return high-frequency chopping current back to the drive. This may require mounting the connector on a sub-panel insulated from the main cabinet, or using a connector having an internal screen which is insulated from the connector housing.

Within the cabinet itself, all the motor cables should lie in the same trunking as far as possible. They must be kept separate from any low-level control signal cables. This applies particularly where the control cables are unshielded and run close to the drive or rack system.

Stepper motors

It is preferable to use motors with screw terminations whenever possible. If flying-lead motors are used, it is important that the unshielded leads are converted into a braided-screen cable within 100mm of the motor body. A separate terminal box may be used for this purpose but the braided cable screen must be properly strapped to the motor body. Motors fitted with terminal boxes also allow local selection of series or parallel connection, reducing the cost of the cable running back to the drive.

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Control signal connections

High-quality braided screen cable should be used for control connections. In the case of drives having differential inputs, it is preferable to use cable with twisted pairs to minimise magnetic coupling. This applies to both analogue and digital signals. Control cables leaving the enclosure should have the cable screen returned to a local ground point near the drive. Where screened leads are used in control circuits that are only opto-isolated at one end, the screen must be referenced to earth at the non-isolated end. Where there is isolation at both ends of the connection, earth the screen at the receiving end. This is to give protection against fast transient bursts.

Remember to route control signal connections well away from relays and contactors. Control wiring should not be laid parallel to power or motor cables and should only cross the path of these cables at right angles. Bear in mind that control cables connected to other equipment within the enclosure may interfere with the drive, particularly if they have come from outside. Take particular care when connecting external equipment with the cabinet door open, for instance a computer or terminal; static discharge may cause damage to unprotected inputs.

Ferrite absorber specifications

The absorbers described in these installation instructions are made from a low-grade ferrite material which has high losses at radio frequencies. They therefore act like a high impedance in this waveband.

The recommended components are produced by Parker Chomerics and are suitable for use with cable having an outside diameter up to 10mm. The specification is as follows:

Chomerics part number	H8FE-1115-NC
Outside diameter	17.5mm
Inside diameter	10.7mm
Length	28.5mm
Impedance at 25MHz	80
Impedance at 100MHz	120
Curie temperature	130°C (the device should not be operated near this temperature)

Handling and installing the ferrite absorbers

Take care when handling the absorbers - they can shatter if dropped on a hard surface. For this reason the suggested method of installation is to use a short length of 19mm diameter heat-shrink sleeving. This gives a degree of physical protection while the cable is being installed. The sleeving should have a shrink ratio of at least 2.5:1. Cable ties may be used as an alternative, however they give no physical protection to the absorber.

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EMC INSTALLATION OF PDS, PDX AND PDHX SERIES DRIVES

(not applicable to PDS-E and PDHX-E versions)

Please read this in conjunction with the general considerations applicable to all products.

External Enclosure

Before mounting the drive, remove the paint from the rear face of the lower mounting lug as shown in Fig. 1, and if necessary from the corresponding area on the rear panel of the enclosure. This is to guarantee a good high-frequency connection between the drive case and the cabinet. Use petroleum jelly on the exposed metal to minimise the risk of future corrosion.

Filtering the AC mains supply

PDS and PDX drives incorporate a switch-mode power supply operating directly from the AC input. The substantial filtering effect of a mains isolation transformer is therefore not available, and additional external filtering is required. The solution offered uses two filters in order to control both differential and common-mode emissions. The manufacturer's part numbers for suitable filters are:

1. Ducati S-221-16, available in the UK from R-S Components as 240-731
2. Ducati SFMF-6C, available in the UK from R-S Components as 240-719

Mount the two filters within 50mm of the drive as shown in the diagram, allowing sufficient space for two short jumper cables between them. It may prove easier to fit these cables before the filters are finally mounted. Again ensure that there is no paint on the rear panel behind the filter mounting lugs - it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the first filter, with the earth lead connected to a local earth stud or bus bar. Connect the earth terminal on the case of each filter to the earth stud. Route the supply cable so that it runs close to the rear panel within the cabinet.

3-core 1mm² screened cable (with a braided screen) must be used between the output of the second filter and the input to the drive. Connect the earth wire to the earth stud, and arrange all the earth leads so that they run close to the panel. Expose a short length of the screen and anchor the cable close to the filter with a P-clip. Remove any paint from the panel behind the P-clip. Fit a ferrite absorber over the cable and wire up the power connector - no connection is made to the screen at the drive end. Locate the absorber as close as possible to the connector using heat-shrink sleeving.

Motor connections

Use 5-core 1mm² screened cable for the motor connections. At the drive end, fit a ferrite absorber over the cable before wiring to the motor connector. No connection is made to the cable screen at this end. Locate the absorber as close as possible to the connector using heat-shrink sleeving.

Run the motor cable back to the rear panel and down between the drive and the filters. Expose a short length of braiding and anchor to the rear panel with a P-clip. Note that the motor cable should preferably be kept at least 300mm away from I/O cables carrying control signals.

Termination at the motor must be made using a 360° bond to the motor body, and this may be achieved by using a suitable clamp. Many stepper motors are designed to accommodate an appropriate terminal gland which can be used for this purpose.

Control signal wiring

High-quality braided screen cable should be used for control connections. In the case of the PDS drive which has differential step-direction inputs, it is preferable to use cable with twisted pairs to minimise magnetic

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coupling. No connection is made to the cable screen at the D-connector on the drive. Fit a ferrite absorber close to the D-connector and run the cable back to the rear panel as shown in Fig. 1. Expose a short length of the braided screen and anchor to the rear panel with a P-clip.

The PDX indexer-drive has I/O signals operating at TTL levels and these are unlikely to meet EMC immunity requirements if taken outside the enclosure. Should this be necessary, route the signal via a separate optoisolator which allows the external signal to operate at 24V levels.

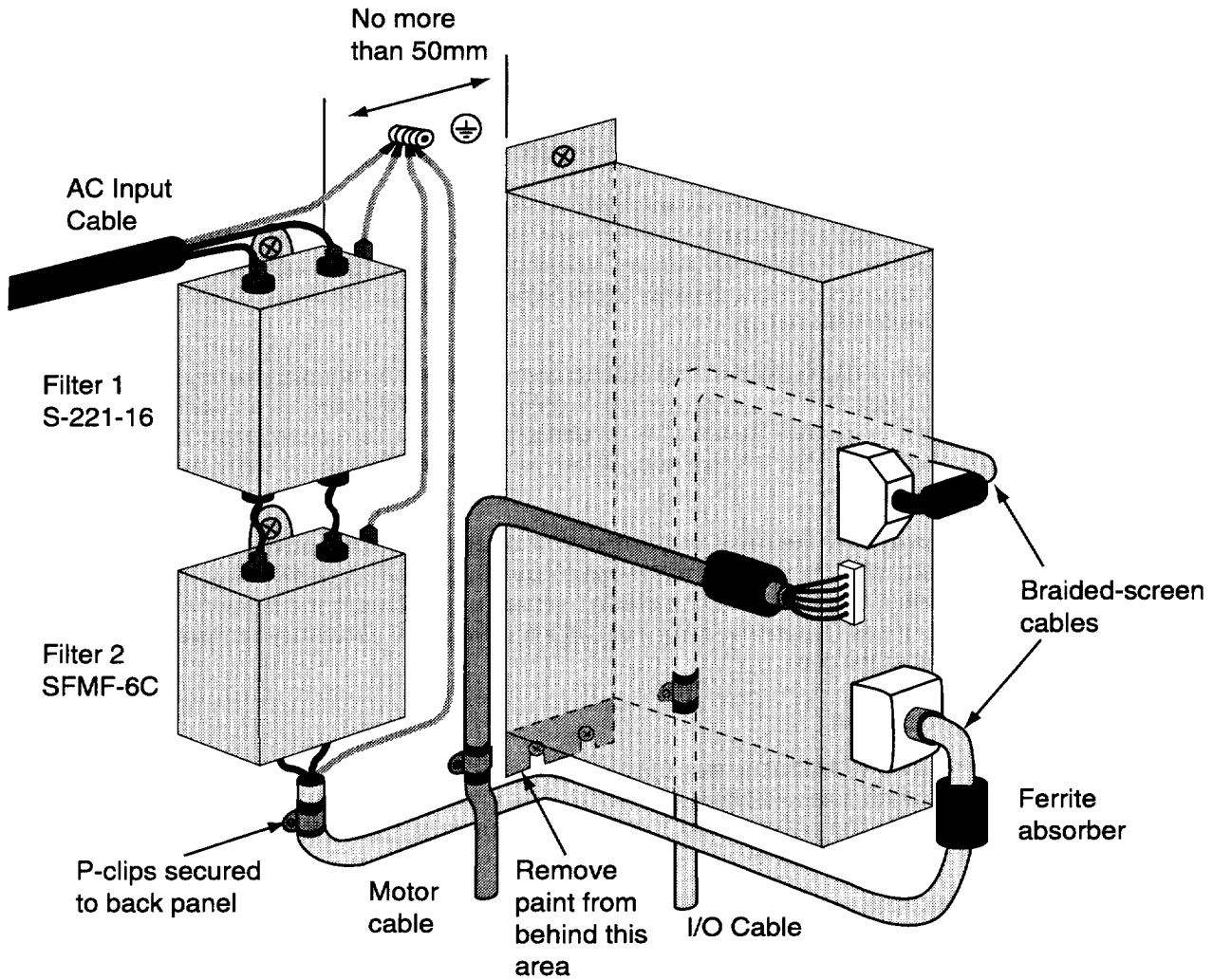


Fig. 1 PDS/PDX/PDHX installation diagram

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EMC INSTALLATION OF BLH AND BLHX SERIES SERVO SYSTEMS

Please read this in conjunction with the general considerations applicable to all products.

External Enclosure

Before mounting the drive, remove the paint from the rear face of the lower mounting lug as shown in Fig. 2, and if necessary from the corresponding area on the rear panel of the enclosure. This is to guarantee a good high-frequency connection between the drive case and the cabinet. Use petroleum jelly on the exposed metal to minimise the risk of future corrosion.

Filtering the AC mains supply

A filter must be installed between the incoming AC supply and the isolating transformer. A suitable filter is Ducati S-221-16, available in the UK from R-S Components as 240-731. Mount the filter within 50mm of the transformer as shown in Fig. 3. Ensure that there is no paint on the mounting panel under the filter mounting lugs - it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the filter, with the earth lead connected to a local earth stud or bus bar. Route the supply cable so that it runs close to the walls of the enclosure. Connect the filter output terminals to the transformer primary, keeping the leads twisted together and as short as possible. Take an earth connection from the stud to the SCN terminal on the transformer, and run this lead close to the AC supply leads (see Fig. 3).

3-core 1.5mm² screened cable (with a braided screen) should be used between the transformer and the input to the drive. Use two cores for the output from the secondary winding and the third core for an earth connection from the stud. Run this cable back towards the mounting panel, expose a short length of the screen and anchor the cable close to the filter with a P-clip. When routing this cable to the drive, keep it well away from the input cable to the filter.

At the drive end, fit a ferrite absorber over the cable and connect the three cores to the drive power connector. Locate the absorber as close as possible to the connector using heat-shrink sleeving. Run the cable back under the drive, expose a short length of the braided screen and anchor to the same mounting panel as the drive using a P-clip. Keep this anchor point close to the drive and if necessary remove any paint from the mounting panel under the clip.

Motor and encoder connections

ML Series motors are being modified to accommodate EMC installation. The modifications include changing the encoder cable to a braided-screen type and fitting different glands to the terminal housing. If it is necessary to adapt an existing motor, the encoder cable should be changed to a 10-pair braided-screen type (Lapp Part No. 0035805) and the terminal box glands changed to suit.

The standard 5-core motor cable fitted to the ML motor is retained. Expose a short length of the braided screen approximately 100mm from the drive connector, and use a P-clip to anchor the cable under the lower front panel screw as shown in the diagram. Run the cable underneath the drive to the rear panel. Note that the motor cable should be kept at least 300mm away from I/O cables carrying control signals.

When routing the cables to the motor, make sure that the motor and encoder cables are kept close together throughout their whole length. Unless the cables are laid alongside each other in trunking, use cable ties every 500mm to anchor the two cables together.

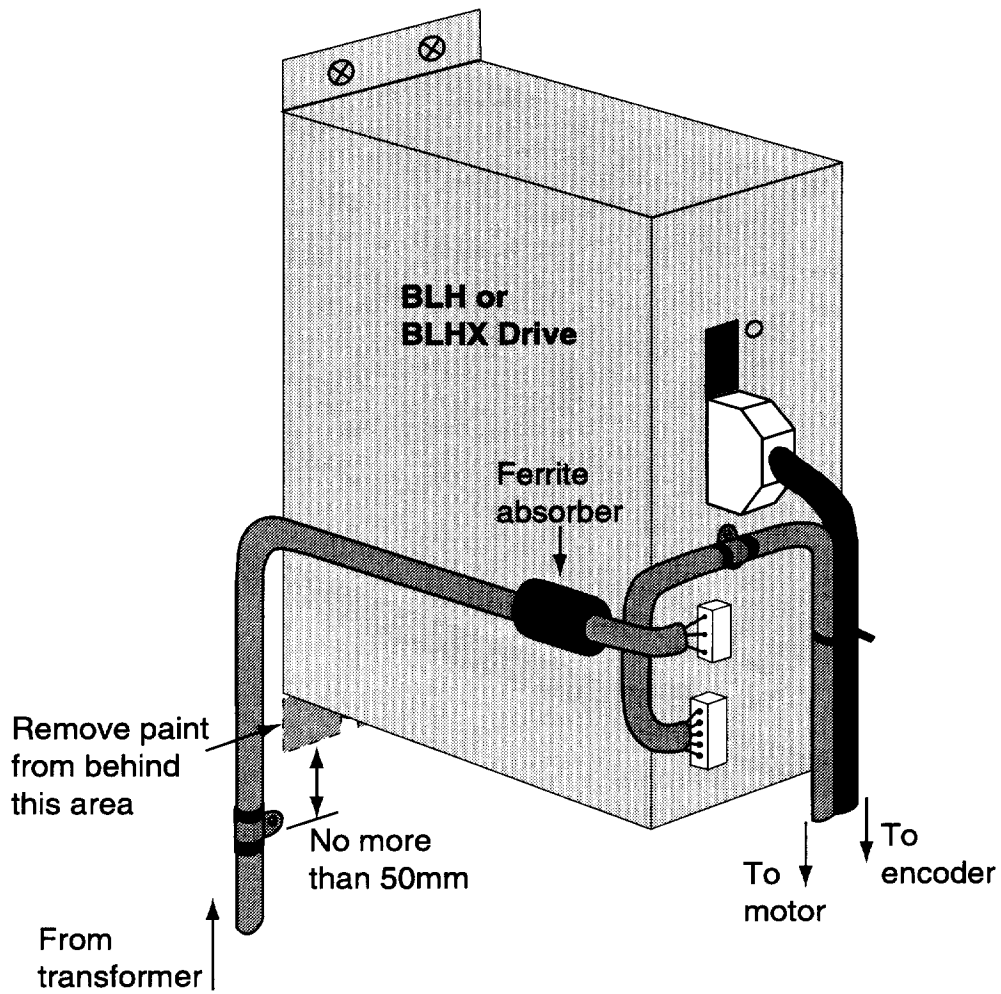


Fig. 2 BLH & BLHX installation

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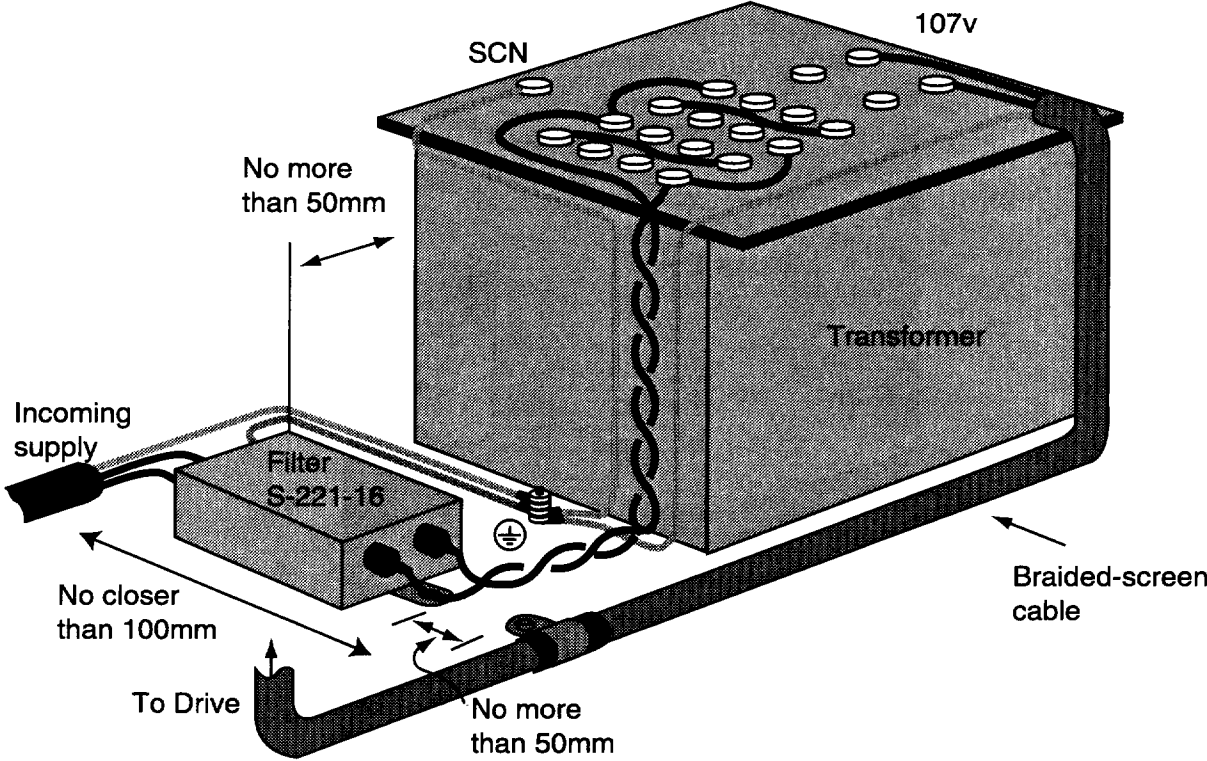


Fig. 3 BLH/BLHX transformer wiring

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EMC INSTALLATION OF PK2, PK3 and PKC SERIES STEPPER DRIVES

Please read this in conjunction with the general considerations applicable to all products.

Filtering the AC mains supply

A filter must be installed between the incoming AC supply and the input to the drive. A suitable filter is Ducati SFMF-6C, available in the UK from R-S Components as 240-719. Mount the filter within 50mm of the drive as shown in Figs 4 & 5. Ensure that there is no paint on the mounting panel under the filter mounting lugs - it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the filter, with the earth lead connected to a local earth stud or bus bar. Route the supply cable so that it runs close to the walls of the enclosure. Connect the earth terminal on the filter case to the earth stud.

Connect the filter output terminals to the AC input on the drive, keeping the leads as short as possible. Take the drive earth connection from the stud.

Motor connections

Use 4-core 1mm² screened cable for the motor connections on PK2 or PK3 drives, and 4-core 1.5mm² cable for the PKC. At the drive end, fit a ferrite absorber over the cable before wiring to the motor connector. Locate the absorber as close as possible to the connector using heat-shrink sleeving.

Run the motor cable down to the mounting panel, expose a short length of braiding and anchor to the panel with a P-clip. The PKC drive also requires a safety earth connection to the motor - take this from the stud or bus bar. Run the safety earth lead alongside the motor lead. Note that the motor cable should be kept away from I/O cables carrying control signals.

Termination at the motor must be made using a 360° bond to the motor body, and this may be achieved by using a suitable clamp. Many stepper motors are designed to accommodate an appropriate terminal gland which can be used for this purpose.

Control signal wiring

High-quality braided screen cable should be used for control connections. In the case of the PK3 drive which has differential step-direction inputs, it is preferable to use cable with twisted pairs to minimise magnetic coupling. No connection is made to the cable screen at the drive itself. Fit a ferrite absorber close to the I/O connector and run the cable down to the mounting panel as shown in the diagrams. Expose a short length of the braided screen and anchor to the panel with a P-clip.

The level at which the I/O operates means that the signals are unlikely to meet EMC immunity requirements if taken outside the enclosure. Should this be necessary, route the signal via a separate opto-isolator which allows the external signal to operate at 24V levels.

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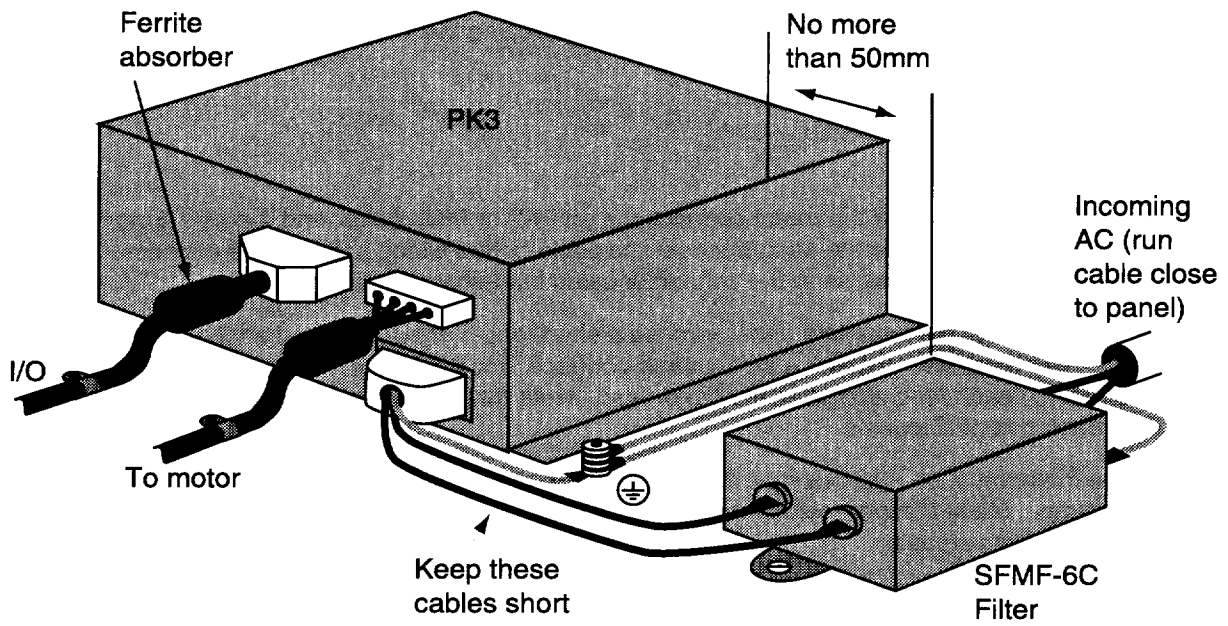


Fig. 4 PK2 & PK3 installation diagram

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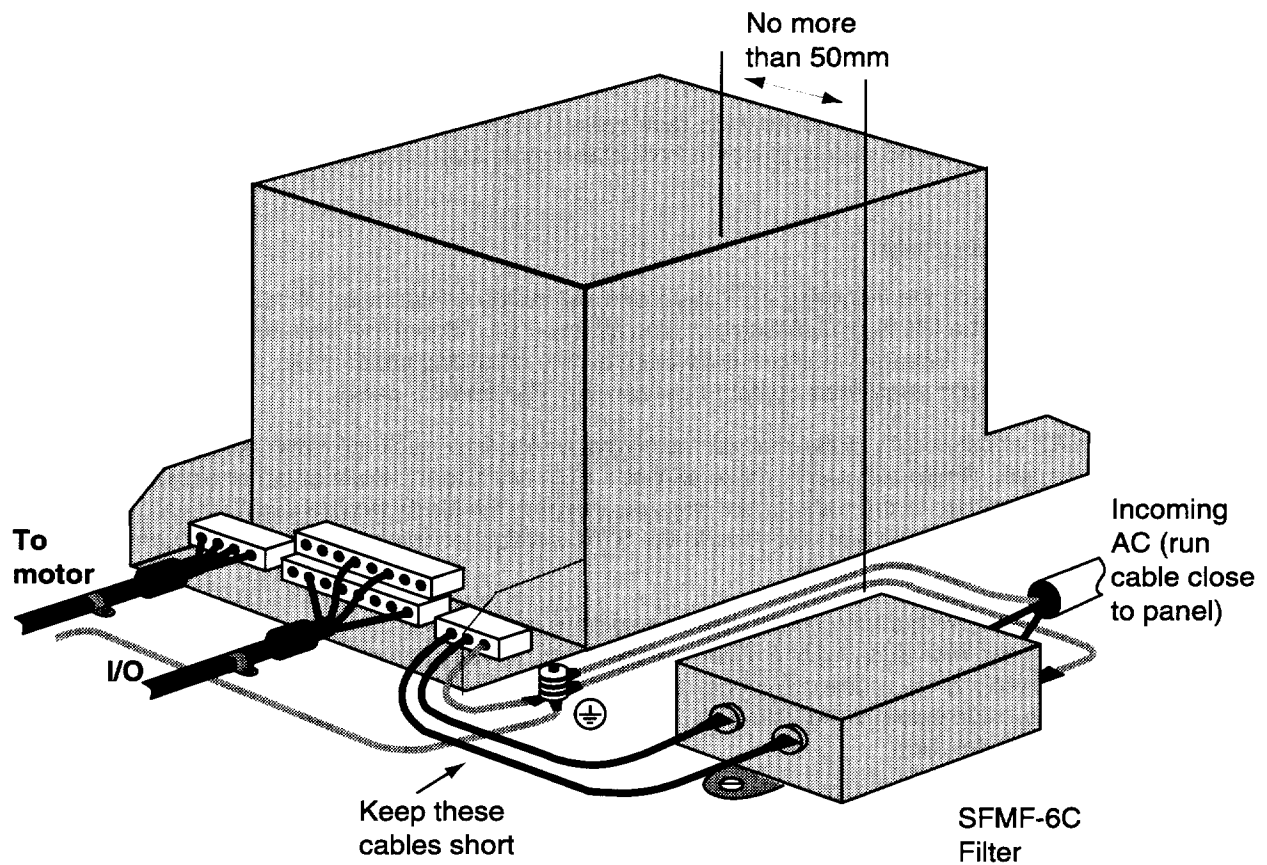


Fig. 5 PKC/PKX installation diagram

EMC Installation Information

EMC INSTALLATION OF SC AND SR SERIES RACK SYSTEMS

Please read this in conjunction with the general considerations applicable to all products.

These racks are designed to house SD series drives and are fitted with opto-isolated motherboards (SC series) or non-isolated motherboards (SR series). The use of the isolated SC series is strongly recommended, particularly if the control signal source is remote from the rack.

For EMC-compliant installation, both these rack systems can be fitted with an earth bonding strip running across the back of the rack (see Fig. 7). This is for the bonding of screened motor leads and transformer feed leads to the rack system. The rack metalwork is also earth-bonded to this tie bar. The tie bar is available from Digiplan Part No. 1408.171.

External enclosure

It is not necessary to fit front panels to the drives if the rack system is wholly contained within the enclosure. However, if a 19" case is used with no door or cover in front of the rack, then all drive front panels must be fitted.

Filtering the AC mains supply

A filter must be installed between the incoming AC supply and the mains transformer. A suitable filter is Ducati S-221-16, available in the UK from R-S Components as 240-731. Mount the filter within 50mm of the transformer as shown in Fig. 6. Ensure that there is no paint on the mounting panel under the filter mounting lugs - it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the filter, with the earth lead connected to a local earth stud or bus bar. Route the supply cable so that it runs close to the walls of the enclosure. Connect the filter output terminals to the transformer primary, keeping the leads twisted together and as short as possible. Take an earth connection from the stud to the SCN terminal on the transformer, and run this lead close to the AC supply leads (see Fig.6).

5-core 1.5mm² screened cable (with a braided screen) should be used between the transformer and the left-hand drive motherboard in the rack (looking at the back of the rack). Use the green wire for the 0V connection. At the transformer end run the cable back towards the mounting panel, expose a short length of the screen and anchor the cable close to the filter with a P-clip. When routing this cable to the rack, keep it away from the input cable to the filter.

At the rack end, fit a ferrite absorber over the cable and connect the appropriate wires to the V_m and 18V AC terminals on the motherboard. Remove the existing M4 brass earth stud, together with the earth wire connecting it to the first motherboard. Next fit the earth bonding strip to the rack end plates using the second hole down from the top. When fitting the bonding strip, use spring washers underneath the nuts and tighten securely - this is to ensure continuity between the bonding strip and the rack metalwork. Connect a new 1.5mm² earth wire from the first motherboard to the M3 fixing close to the M4 stud on the earth bonding strip.

Route the transformer cable over the earth bonding strip and identify the location of the mounting point for the P-clip (refer to Fig. 7). Expose approximately 12mm of the braided screen at this point and anchor the cable to the bonding strip. Locate the absorber 15-25mm from the P-clip using heat-shrink sleeving. Connect the green 0V wire from the transformer to the M3 fixing close to the M4 stud on the bonding strip. Attach a 2.5mm² green/yellow safety earth wire to the M4 stud, and run this wire alongside the screened transformer cable back to the earth stud beside the transformer.

Motor Connections

The recommended gauge for SD drives is 1mm², e.g. Lapp 34805 Use a cable containing five conductors plus the braided screen, the fifth (green) wire being used to provide a safety earth return to the drive.

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Termination at the motor must be made using a 360° bond to the motor body, and this may be achieved by using a suitable clamp. Many stepper motors are designed to accommodate an appropriate terminal gland which can be used for this purpose.

At the rack end, prepare the end of the cable as shown in Fig 8 and fit a ferrite absorber. Anchor the cable screen to the earth tie bar using the P-clip behind the corresponding drive. Connect the four wires from the motor windings to the appropriate terminals on the motor connector (please refer to the SD User Guide). Attach the green (earth) wire to the tie bar adjacent to the P-clip holding the braided screen using a ring terminal. (Terminal 3 on 5-way motor connectors should not be used as a safety earth since the connector can be unplugged without the use of a tool). Ensure that the P-clips grip the exposed screen securely, if necessary by slightly flattening the clip. The P-clip must be fitted directly against the earth bonding strip with a washer under the screw head.

If the motor cable is more than 4 metres long, a separate safety earth connection will be required since the impedance of the 1mm² wire inside the screened cable will be too high. Use a 2.5mm² cable connected to the motor body and terminate it on the tie bar next to the P-clip for that axis. Run this cable close to the screened cable from the motor. If there is no suitable termination point on the motor body, remove the paint from the area of one of the mounting bolts and use an appropriate ring terminal. When a separate safety earth connection is used, the earth wire in the screened cable may be connected to terminal 3 on the 5-way motor connector.

The non-isolated SR rack is fitted with 4-way motor connectors. In this case the safety earth connection is always made to the tie bar.

Control signal wiring

To ensure adequate immunity it is necessary for control circuits leaving the enclosure to be adequately screened, with the screen of the cable bonded back to the tie bar on the rack. Cable with a braided screen should be used, not metallised foil, and should consist preferably of twisted pairs to minimise magnetic coupling. It is strongly recommended to use opto-isolated drive motherboards where the controller is mounted outside the main enclosure.

Where screened leads are used in control circuits that are only opto-isolated at one end, the screen must be referenced to earth at the non-isolated end. When using an SR rack with non-opto-isolated motherboards, bond the screen to the earth tie bar close to the corresponding drive.

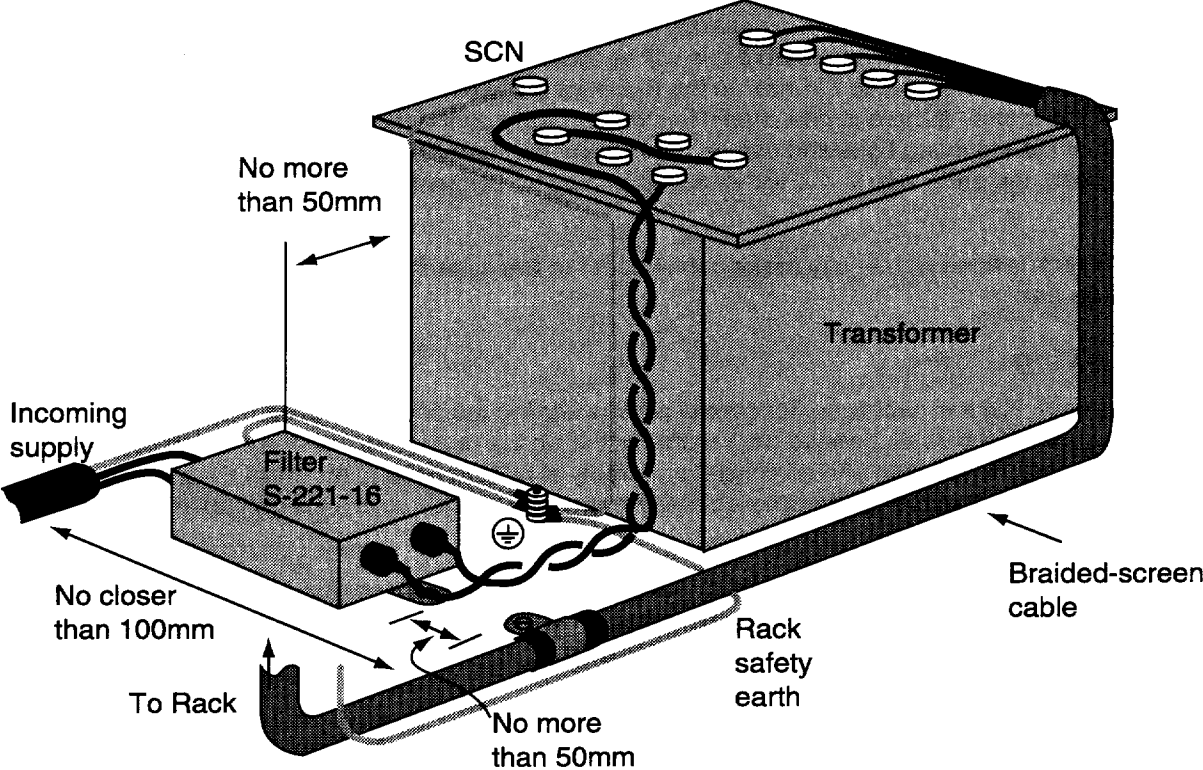


Fig. 6 SR/SC transformer wiring

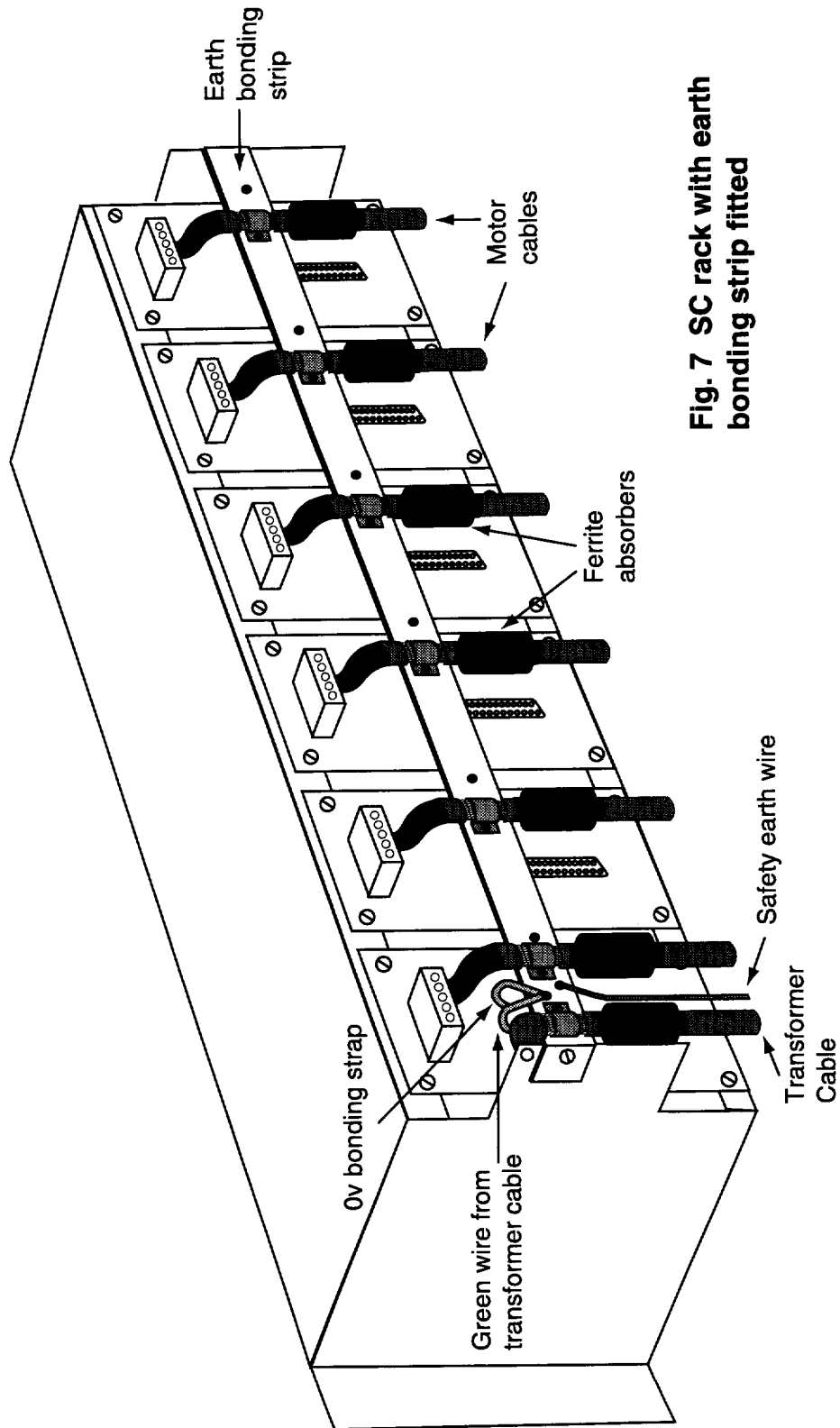


Fig. 7 SC rack with earth bonding strip fitted

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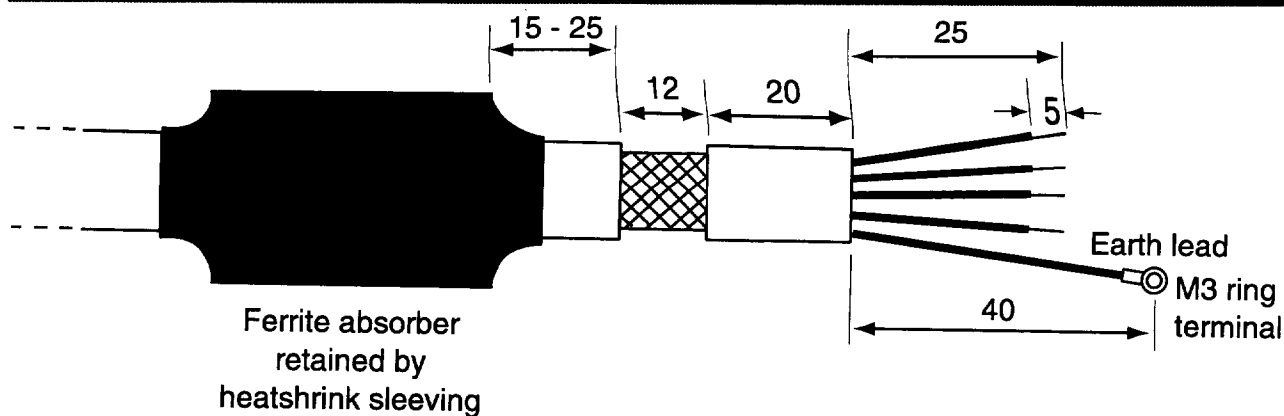


Fig. 8 Motor cable preparation (drive end)

EMC INSTALLATION OF RA and CC SERIES RACK SYSTEMS

Please read this in conjunction with the general considerations applicable to all products.

These racks are designed to house CD series drives and are fitted with opto-isolated motherboards (CC series) or non-isolated motherboards (RA series). The use of the isolated CC series is strongly recommended, particularly if the control signal source is remote from the rack.

For EMC-compliant installation, both these rack systems can be fitted with an earth bonding strip running across the back of the rack (see Fig. 10). This is for the bonding of screened motor leads and transformer feed leads to the rack system. The rack metalwork is also earth-bonded to this tie bar. The tie bar is available from Digiplan Part No. 1408.171.

External enclosure

It is not necessary to fit front panels to the drives if the rack system is wholly contained within the enclosure. However, if a 19" case is used with no door or cover in front of the rack, then all drive front panels must be fitted.

Filtering the AC mains supply

A filter must be installed between the incoming AC supply and the mains transformer. A suitable filter is Ducati S-221-16, available in the UK from R-S Components as 240-731. Mount the filter within 50mm of the transformer as shown in Fig. 9. Ensure that there is no paint on the mounting panel under the filter mounting lugs - it is vital that there is good large-area contact between the filter and the panel.

Connect the incoming AC supply cable to the push-on terminals on the filter, with the earth lead connected to a local earth stud or bus bar. Route the supply cable so that it runs close to the walls of the enclosure. Connect the filter output terminals to the transformer primary, keeping the leads twisted together and as short as possible. Take an earth connection from the stud to the SCN terminal on the transformer, and run this lead close to the AC supply leads (see Fig. 9).

5-core 1.5mm² screened cable (with a braided screen) should be used between the transformer and the power supply motherboard in the rack. A recommended type is Lapp 34905. The green wire is not used and should be cut off (although only 4 cores are actually required, the use of 4-core cable would mean using a green wire as a 'live' conductor). Two of the remaining cores are used for the 19V logic supply and the other two for the 61V motor supply. Note that CD60M and CD80M drives may not require the logic supply and may also use an 86V motor supply. Run the cable back towards the mounting panel, expose a short length of the screen and anchor the cable close to the filter with a P-clip. When routing this cable to the rack, keep it away from the input cable to the filter.

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At the rack end, fit a ferrite absorber over the cable and connect the appropriate wires to the logic and motor supply terminals on the power supply motherboard. Remove the existing M4 brass earth stud, together with the earth wire connecting it to the power supply motherboard. Next fit the earth bonding strip to the rack end plates using the second hole down from the top. When fitting the bonding strip, use spring washers underneath the nuts and tighten securely - this is to ensure continuity between the bonding strip and the rack metalwork. Reconnect the earth wire from the power supply motherboard to the M4 stud on the earth bonding strip. It is advisable to use the earth terminal on the motherboard screw terminal block for the safety earth connection since it cannot then be removed without using a tool.

Route the cable over the earth bonding strip and identify the location of the mounting point for the P-clip (refer to Fig. 10). Expose approximately 12mm of the braided screen at this point and anchor the cable to the bonding strip. Locate the absorber 15-25mm from the P-clip using heat-shrink sleeving. Connect a separate safety earth wire (2.5mm² green/yellow) from the M4 stud on the earth bonding strip down to the stud beside the transformer. Route this earth wire alongside the screened cable from the transformer to the rack.

Motor Connections

The recommended gauge for CD drives is 1.5mm². Use a cable containing five conductors plus the braided screen, the green wire being used to provide an earth return to the drive. The same type of cable as used for the transformer connection is suitable (Lapp 34905). Termination at the motor must be made using a 360° bond to the motor body, and this may be achieved by using a suitable clamp. Many stepper motors are designed to accommodate an appropriate terminal gland which can be used for this purpose.

At the rack end, prepare the end of the cable as shown in Fig. 8 and fit a ferrite absorber. Anchor the cable screen to the earth tie bar using a P-clip behind the corresponding drive. Ensure that the P-clip grips the exposed screen securely, if necessary by slightly flattening the clip. The P-clip must be fitted directly against the earth bonding strip with a washer under the screw head. Connect the four wires from the motor windings to the appropriate terminals on the motor connector (please refer to the relevant drive User Guide). Connect the green (earth) wire to the tie bar adjacent to the P-clip holding the braided screen. (Terminal 3 on 5-way motor connectors should not be used as a safety earth since the connector can be unplugged without the use of a tool).

If the motor cable is more than 6 metres long, a separate safety earth connection will be required since the impedance of the 1.5mm² wire inside the screened cable will be too high. Use a 2.5mm² cable connected to the motor body and terminate it on the tie bar next to the P-clip for that axis. Run this cable close to the screened cable from the motor. If there is no suitable termination point on the motor body, remove the paint from the area of one of the mounting bolts and use an appropriate ring terminal. When a separate safety earth connection is used, the earth wire in the screened cable may be connected to terminal 3 on the 5-way motor connector.

The non-isolated RA rack is fitted with 4-way motor connectors. In this case the safety earth connection is always made to the tie bar.

Control signal wiring

To ensure adequate immunity it is necessary for control circuits leaving the enclosure to be adequately screened, with the screen of the cable bonded back to the tie bar on the rack. Cable with a braided screen should be used, not metallised foil, and should consist preferably of twisted pairs to minimise magnetic coupling. It is strongly recommended to use opto-isolated drive motherboards where the controller is mounted outside the main enclosure.

Where screened leads are used in control circuits that are only opto-isolated at one end, the screen must be referenced to earth at the non-isolated end. When using an RA rack with non-opto-isolated motherboards, bond the screen to the earth tie bar close to the corresponding drive.

EMC Installation Information

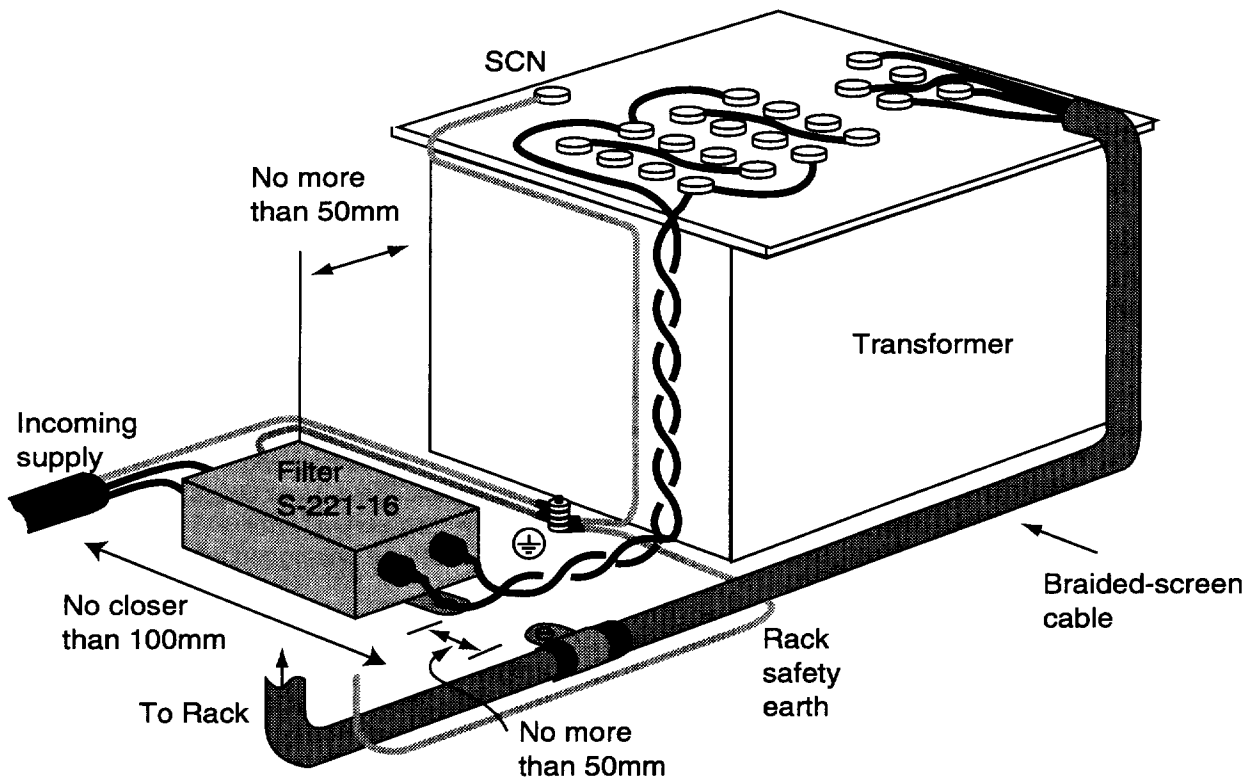


Fig. 9 RA/CC transformer

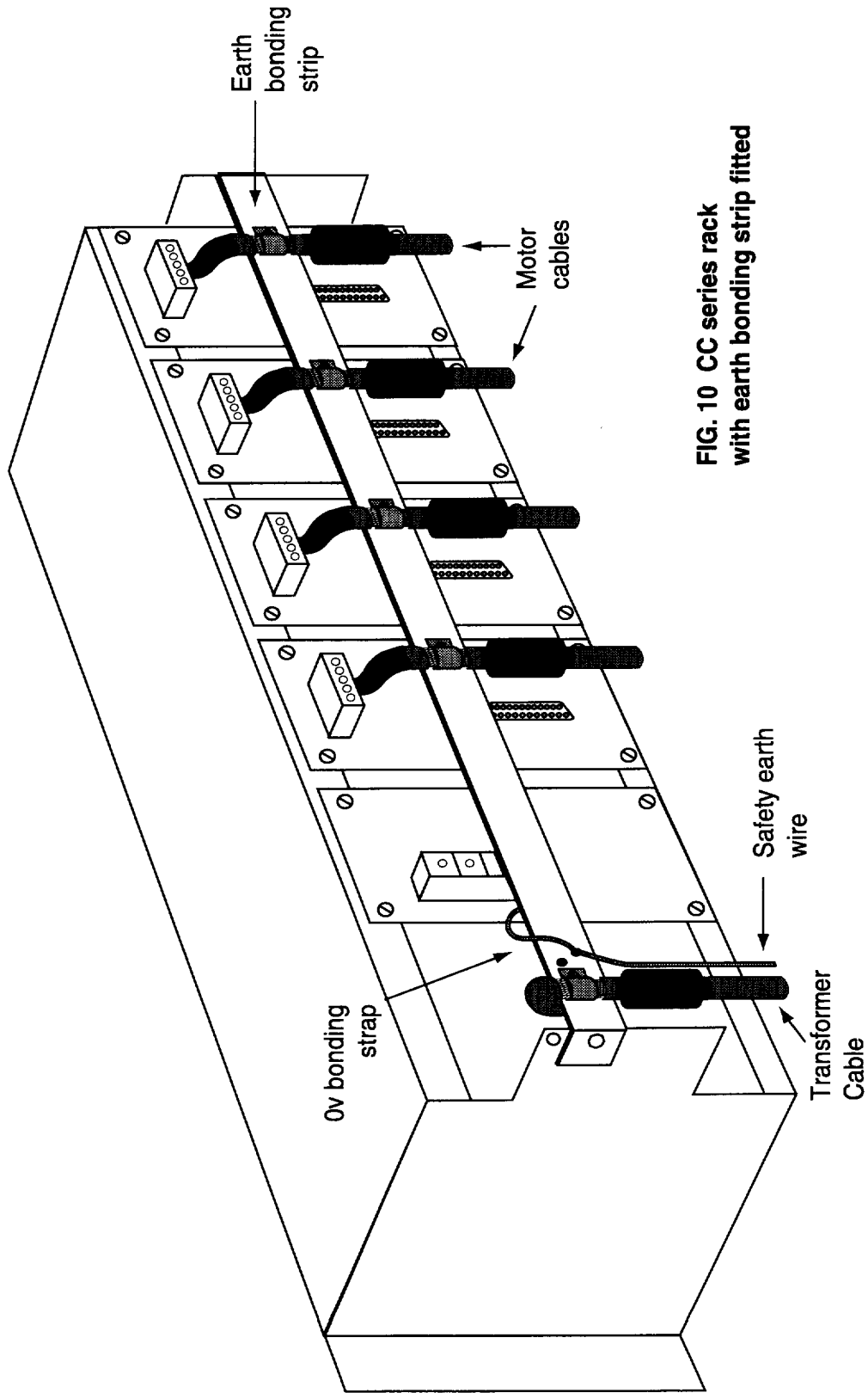


FIG. 10 CC series rack with earth bonding strip fitted