ARGUS

Com10 AZ435
125V 20A Rectifier

010-553-B4

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Power

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Argus Technologies Ltd.

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Com10 AZ435
125V 20A Rectifier

010-553-B4

The following documents and drawings are included in this manual to provide the necessary information required for installation, operation and fault diagnosis of the unit:

- **Warranty Policy:** 048-507-11
- **Important Safety Instructions and Installation:** 010-553-C2
- **Factory Service Information:** 048-527-11

Argus Technologies Ltd. **010-553-B4 Rev E WC**

WARRANTY AND REPAIR INFORMATION

Warranty Policy

Argus Technologies Ltd. warrants all equipment manufactured by it to be free from defects in parts and labor, excluding third party OEM materials (example: air conditioners, batteries), for a period of two years from the date of shipment from the factory. For third party products the OEM's warranty shall apply. The liability of Argus applies solely to repairing, replacing or issuing credit (at Argus' sole discretion) for any equipment manufactured by it and returned by the customer during the warranty period. The terms of the warranty are Ex Works (EXW) from Argus' factory service location.

Argus reserves the right to void the warranty if:

(1) identification marks or serial numbers are removed or altered in any way,
(2) invoice is unpaid, or
(3) defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.

Argus shall not be liable to the customer or other parties for any loss of profits, loss of use, costs for removal or installation of defective equipment, damages or consequential damages based upon equipment failure during or after the warranty period. There shall be no other obligations either expressed or implied. Argus will not honor warranties for batteries and other third party products without prior written Argus authorization.

Freight Policy

Customer is responsible for all shipping and handling charges (COD and freight collect will not be accepted without prior approval from Argus Technologies).

Terms of Payment (North America)

Payment terms are net 30 days subject to prior credit approval. All other orders require payment before shipping.

Terms of Payment (International)

Payment terms are subject to prior approval and are typically through Tele-Transfer.

Return Material Policy

Our RMA policy is designed to ensure prompt, efficient and high quality factory service. A Return Material Authorization (RMA) number must be obtained before products can be accepted for servicing by the Argus factory. For returns to an authorized service center (refer to "Authorized Service Centers" for locations), please consult the individual service center for specific return policies and instructions.

To obtain a RMA number for a factory return, customers must call the appropriate location with the product serial and model number, as well as a brief description of the problem, shipment instructions and billing details.

The original packing container should be used whenever possible. Both the shipping documents and the outside of the box must have the RMA # clearly marked and the product shipped prepaid to the Argus factory service center. Argus will endeavor to repair products within five working days of receipt. Repairs to the returned product are warranted for a period of six months. A service charge may be applied if no fault is found in the returned product. Argus will not accept products without an RMA number.

Business Hours

Argus North American office hours are 7:30 am to 5:00 pm (Pacific Standard Time) Monday to Friday.

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Warning

REFER TO SPECIFIC SAFETY WARNINGS THROUGHOUT THIS DOCUMENT BEFORE PERFORMING OPERATIONS.

DOUBLE POLE / NEUTRAL FUSING.

THERE ARE DANGEROUS VOLTAGES INSIDE THE RECTIFIER UNITS. THEY MUST ONLY BE OPENED AND SERVICED BY QUALIFIED PERSONNEL. LARGE CHARGED CAPACITORS INTERNAL TO THE UNITS MAKE THEM HAZARDOUS TO OPEN EVEN WHEN DISCONNECTED FROM THE MAINS.

UNAUTHORIZED DISASSEMBLY OF THE UNIT VOIDS THE WARRANTY.

About this document

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Revision History

Revision	Date	Action
3	2002/04/01	
3	2002/05/01	Formerly AM435
D (4)	2005/05/16	Archive
E	2005/07/21	Update cover page, header, footer for Argus Technologies Ltd. reissue

Typographical Conventions

This manual includes specification, operation, installation, and maintenance sections.

Warning Icon

WARNINGS CALL ATTENTION TO INSTRUCTIONS THAT MUST BE FOLLOWED PRECISELY TO AVOID INJURY, AND ARE HIGHLIGHTED BY THE WARNING ICON.

Caution Icon

Cautions highlight danger to equipment, but not personnel. A caution icon accompanies cautions.

Technical Details Icon

The operation section includes information about operation of all standard and optional functions. More detailed technical information that may be useful for troubleshooting is also included and is designated by a technical details icon.

Terms and Abbreviations

MCM	Monitoring and Control Module
SELV	Safety Extra Low Voltage; defined as less than 60.0Vdc by EN60950
AZ328	Com10 Series MCM
AZ329/AZ329A	Adapter unit to couple AZ328 into DC systems of 90 to 150V.

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1 Description

1.1 Preface

The AZ435 is a 20A 125V microprocessor controlled switch mode rectifier for use in medium capacity power applications. It offers fully regulated DC output from a power factor corrected AC input. Features include:

- Continuous 2500W output at 50°C
- Flexibility of control, monitoring and adjustments
- Compact
- High efficiency and reliability
- Fan cooled
- Active current share facilities for use with the AZ328 monitoring and control module (MCM)
- All connections made via a single connector at the rear of the unit.

1.2 Technical Description

The power conversion circuit is made up of two stages, a power factor correction (PFC) boost converter, converting sinusoidal input to 393Vdc, and a DC-DC converter, producing a programmable output. These circuits are located on the Motherboard Printed Circuit Board (PCB) along with an auxiliary flyback DC-DC converter that provides power to the control circuits and fan. Switching frequency is 70kHz. Gate drivers for the DC-DC converter are located on a separate PCB. The large magnetic components and electrolytic capacitors belonging to the PFC boost converter and the DC-DC converter are located on the Interlink PCB.

The AC filter (ACF) PCB contains EMI filtering, surge protection and inrush limiting circuits, protection fuses, and the AC detection circuit.

The DC filter (DCF) PCB contains output voltage and current sense circuits and output noise filtering. It also includes circuitry to provide an isolated communications link.

The control circuits for the PFC boost converter and the DC-DC converter and synchronisation between them are located on the Control PCB. An output voltage reference is accepted from the RACOM PCB. A current limit control loop uses the output current signal from the shunt on the DCF PCB. The DCF PCB also contains circuits controlling rectifier shutdown due to over voltage and under voltage conditions.

The microcontroller is located on the RACOM PCB, along with RAM, the EPROM, and non-volatile memory (EEPROM). The microcontroller supplies the DC-DC converter controller with two PWM signals, for voltage reference and current limit reference. It detects the rectifier being locked into the shelf and governs start up by providing signals to enable the converters and close the inrush relay. Fan current is measured. The microcontroller includes an 8 channel ADC, and measures signals representing output voltage, output current, heatsink temperature, fan current, the loop signal, and mains voltage. Two digital inputs from the Control PCB are detected, indicating when the PFC boost converter is operating normally and when the DC-DC converter is operating in current limit.

2 Specification

2.1 Electrical Specification

INPUT	
Voltage Range:	150 to 275Vac (reduced power 150 – 200Vac)
Power:	<2.8kW at rated output, <1.7kW typical
Frequency:	45 to 66Hz
Supply Type:	Single phase
Current:	16A RMS maximum
Inrush:	23A peak maximum
Power Factor:	>0.99 typical, 0.96 worst case
Total Harmonic Distortion:	<3% typical, 5% worst case
Hold Up:	10ms minimum
Efficiency:	>90% typical, 87% worst case
OUTPUT	
Power:	2.5kW, 200 – 275Vac
Current:	20A
Voltage Adjustment Range:	90 to 145Vdc
Default Output Voltage:	124V @ 10A
Load Regulation:	<0.25% typical deviation from set point at half load, 0.5% worst case
Line Regulation:	<0.01% typical, 0.02% worst case
Dynamic Load Regulation:	<2% for 10-90% and 90-10% load change, recover to <1% in <2ms
Line Transients:	<0.5% for transients within operating range
Psophometric Weighted Noise:	<4mV RMS
RMS Noise:	<15mV @ 1MHz flat bandwidth
Wideband Noise:	<150mV pk-pk over 200MHz bandwidth
Temperature Drift:	<100ppm/°C from 0 to 50°C
Active Current Sharing:	With unbalance <5%
PROTECTION	
Overvoltage:	Overvoltage level tracks programmed voltage, plus fixed 150Vdc limit
Current Limit:	Constant current output down to short circuit Current limit adjustable 3 to 20A
Thermal:	Initial power limiting, and shutdown if Overtemperature persists or fan fails
ELECTROMAGNETIC COMPATIBILITY	
Emissions:	Compliant with CISPR 22 (class A) and IEC 61000-3-2 / IEC 555
Immunity:	Compliant with IEC 61000-4-2 (4kV contact) IEC 61000-4-5 (4kV CM and 2kV DM on input, 500V CM and DM on output)
ENVIRONMENTAL CONDITIONS	

Operating Range:	0 to 45°C
Storage Range:	-10 to 70°C
SAFETY:	Complies with EN 60950 1992 amendments 1, 2, 3 and 4 (Hazardous secondary, Class I) UL 1012
ACOUSTIC NOISE:	<55dBA @ 1.5m

Typical conditions referred to above are 230Vac input and 124Vdc 12A output.

2.2 Mechanical Specification

Height:	208mm, suits 5 RU shelf
Width:	144mm
Depth:	360mm
Weight:	12 kg
Connection:	Single rear connector
Cooling:	Forced convection; easy access for fan replacement

The above information is valid at the time of publication. Consult factory for up-to-date ordering information.
Specifications are subject to change without notice.

3 Operation

3.1 Front Panel

There are three LEDs and two pushbuttons on the front panel. The three LEDs are Input, Alarms and Comms. Under normal operating conditions, the green Input and Comms LEDs are on and the red Alarm LED is off. The lock holds the rectifier into the shelf and also turns the rectifier on. As long as the rectifier is unlocked, no output is produced. The Reset pushbutton can be used to start the rectifier after a latched shut down, and the Setup pushbutton is used during commissioning of the system including the MCM.

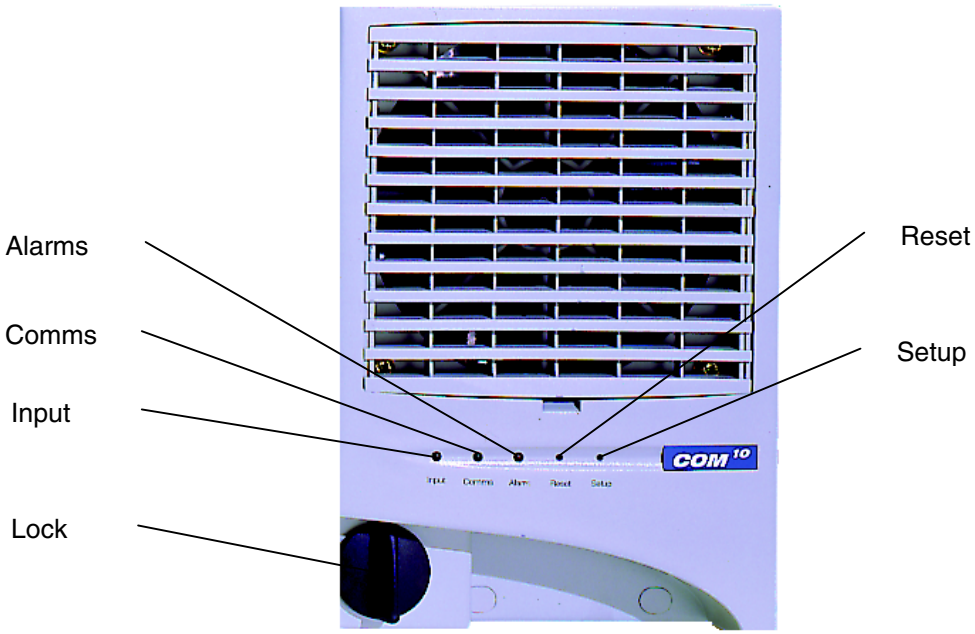

Figure 1–Front panel

3.2 Remote Monitoring and Control

The rectifier is designed for use with the AZ328 MCM, and is mainly operated via this module. It uses the Com10 Series Intelligent Remote Control (IRC) communications protocol.

The rectifier provides to the MCM the following information all of which is available to a local or remote terminal using the IRC protocol:

- Presets
- Alarm status
- AC mains voltage measurement
- DC output voltage measurement
- DC output current measurement
- Rectifier heatsink temperature measurement
- Fan current
- Firmware version
- Current limit

Presets given to the rectifier by the MCM are stored in non-volatile memory, so that if the rectifier powers down and then starts up again, the rectifier will begin to operate with the same parameters as before the power down, even if communication with the MCM is interrupted.

When the rectifier is commissioned, the MCM gives it a unique address. The MCM polls the rectifier at regular intervals to obtain alarm and measurement information. If the rectifier is removed from the shelf or unlocked, the address is discarded. This means that when a rectifier is inserted into a shelf and locked in, it will operate in the No Setup mode, with an output of 124V, until it has been commissioned by the MCM which then sets it to the system voltage. If five minutes have elapsed without communications the output voltage changes to 124V. The start up procedure is described in Section 4.1.

3.3 Presets

The following parameters can be communicated to the MCM:

Parameter Name	Parameter Description	Adjustment Range	Factory Setting
Output voltage	Rectifier output voltage.	90 – 145V in steps of 0.1V	124V
Output current limit	Rectifier output current limit.	3 – 20A in steps of 0.5A	20A
Serial number	The unique serial number of the rectifier issued during factory test.	00000000 – ZZZZZZZZ	(as per rectifier)
Network address	The address for communication with MCM or host PC.	1 – 127	128
Fan fail delay	The duration for which the fan fail indication must be present before the Fan Fail alarm is activated.	0.2 – 2.0s in steps of 50ms	500ms
Output over voltage delay	The duration for which the output voltage is above 105% of programmed value (while there is no “No Load” alarm) before the High Output alarm is activated.	5 – 50ms in steps of 5ms	10ms
Communication delay	The interval between polling by the MCM.	0.1 – 30s in steps of 0.1s	20s
Output current limit delay	The duration for which the DC-DC converter current limit signal must be present before the output Current Limit alarm is activated.	50 – 1000ms in steps of 50ms	500ms
Output no load delay	The duration for which the output current must be below 0.8A before the output No Load alarm is activated.	0.15 – 9000s in steps of 0.15s	10 minutes
Input delay	The duration for which the input exceeds specified limits before the AC Fail alarm is activated.	20 – 1000ms in steps of 20ms	100ms
Inrush delay	The delay between start up and the inrush relay closing.	Fixed	2s
Vref slope	Maximum output voltage ramp up slope.	20 – 200V/s in steps of 10V/s	110V/s
Iref slope	Maximum output current ramp up slope.	5 – 40A/s in steps of 1A/s	20A/s

Table A–Parameters / ranges / factory settings

NOTE: *The factory settings are the parameters used while the rectifier is in No Setup mode.*

3.4 Responding to Alarm Conditions

The front panel indicators provide a summary of the condition of the rectifier, while more detailed alarm information can be obtained via the MCM. The following table details the information that can be obtained from the front panel indicators:

Indication	Alarm Name	Meaning
Input LED is OFF	AC Fail	The mains voltage is outside the range 150 to 280Vac, and the rectifier is shut down.
Input LED is flashing	AC Low	The mains voltage is in the range 150 to 180Vac. Output current is limited to 20A for output voltage <125V, and to a level such that maximum output power <2.5kW for output voltage >125V.
Comms LED is OFF	Comms Fail	Communication with the MCM has been interrupted.
Alarms LED is flashing	High Temperature, High Output Voltage, Current Limit or No Load	Any one of these alarms is active. Refer to the MCM for further details.
Alarms LED is ON	Over temperature, Internal DC Bus Fail, Fan Fail, Low Output Voltage or a latched High Output Voltage alarm	Any one of these alarms is active. Refer to the MCM for further details.
All LEDs flashing	Unlocked	The rectifier has input but is unlocked. The rectifier is shut down.
All LEDs flashing in sequence to right	No Setup	The rectifier is receiving power but has not been addressed by the MCM yet, and has therefore not been commissioned. An output voltage of 124V is provided.
All three LEDs on	MICROFAIL	A failure of the micro controller or other related circuitry has occurred.
All LEDs flashing in sequence to left	Pinpoint	Pinpoint command issued by MCM/IRC to identify rectifier.

Table B–Alarm conditions

For further information on the Unlocked and No Setup modes, refer to Section 4.1 Start Up Procedure below.

The following list details the alarm information that can be obtained from the MCM, and provides the appropriate responses.

3.4.1 AC Fail

The mains voltage is outside the range 150 to 280Vac.

The rectifier is shut down for the duration of the alarm.

Check the mains supply. If the supply is within specification, return the unit to the manufacturer.

3.4.2 AC Low

The mains voltage is in the range 150 to 180Vac.

The maximum output current is reduced for the duration of the alarm.

Check the mains supply.

3.4.3 Communications Fail

Communication with the MCM has been interrupted.

If the alarm persists, check the communications wiring between the MCM and the rectifier shelf. Allow 120 seconds for the alarm to clear.

3.4.4 Current Limit

The rectifier is operating in current limit mode.

The rectifier is designed to operate continuously in current limit. The alarm may indicate that the system battery is recharging after a mains failure.

3.4.5 DC Bus Fail

The input section of the rectifier has ceased to provide regulated DC, and the rectifier has entered a latched shut down; i.e., the rectifier will only start after the Reset pushbutton is pressed.

When the alarm first occurs, the rectifier will shut down and then restart after 10 seconds. If the alarm repeats within 20 seconds of shutdown, the rectifier enters latched shut down; i.e., the rectifier will only start after the Reset pushbutton is pressed. Return the unit to the manufacturer. (If the cause of the fault has been identified and fixed, the unit can be restarted by means of the Reset pushbutton or a reset from the MCM).

3.4.6 Fan Fail

The cooling fan is not operating.

The rectifier is shutdown for the duration of this alarm.

Check the fan for obstructions. The alarm will clear once the fan is operating normally. The fan can be replaced as described in Section 5.2 Fan Replacement below.

3.4.7 High Output

The output voltage of the rectifier exceeded the programmed output by 5% while the rectifier was supplying load, or exceeded 150V in any operating situation.

When the alarm first occurs, the rectifier will shut down and then restart after 5 seconds. If the alarm repeats within 15 seconds, the rectifier enters latched shut down; i.e., the rectifier will only start after the Reset pushbutton is pressed.

Return the unit to the manufacturer. (If the cause of the fault has been identified and fixed, the unit can be restarted by means of the Reset pushbutton or a reset from the MCM).

3.4.8 High Temperature

The heatsink temperature exceeded 95°C while output current was greater than 16A. The alarm remains active until heatsink temperature drops below 80°C.

The maximum output current is reduced to 10A for the duration of the alarm.

The alarm may indicate air conditioning failure or extreme weather conditions. If this is not the case and the alarm persists or worsens to an Overtemperature alarm, return the unit to the manufacturer.

3.4.9 Low Output

The output voltage is at least 3% below the programmed output, while the rectifier is not in current limit.

Check that the rectifier has not been disabled from the MCM. Return the unit to the manufacturer if this fault persists.

3.4.10 Micro Fail

A failure of the micro controller or other related circuitry has occurred. The MCM will normally indicate communications failed to the rectifier if communications was previously established.

If the alarm remains after pushing the reset button on the rectifier return the unit to the manufacturer.

3.4.11 No Load

The output current of the rectifier is below 0.8A.

This may indicate a very light load on the system. If the rectifier is found to be sharing poorly, check that the rectifier has not been disabled from the MCM. Use the MCM to check the presets of the rectifier. If the alarm persists, return the unit to the manufacturer.

3.4.12 Overtemperature

The heatsink temperature exceeded 100°C, or the High Temperature alarm has been active for sixty seconds and the temperature is still above 95°C.

The rectifier will reset and restart once the internal heatsink temperature has dropped below 50°C.

The alarm may indicate air conditioning failure or extreme weather conditions. If this is not the case and the alarm persists, return the unit to the manufacturer.

3.4.13 Pinpoint

The pinpoint function has been activated by the MCM through user interaction. The unit's LEDs will continue to display this alarm for 15 seconds and then return to normal.

3.4.14 No Setup

The unit has not been setup with an MCM. The unit will operate at an output voltage of 124V until setup. Refer to Section 4.1 below for the setup procedure.

3.4.15 Unlocked

The rectifier's lock switch is in the unlocked position. The rectifier output is disabled while it is unlocked. This will also reset all operating parameters of the rectifier.

If this switch is unlocked during normal operation communication with the MCM will be interrupted and the rectifier will need to be setup again. Refer to the MCM manual for full set up procedure.

3.5 Current Sharing

The rectifier is capable of operating under active sharing controlled by communication with the MCM, or passive sharing by means of the output impedance of the rectifier. Active current sharing is controlled by the MCM.

3.6 Current Limit

The current limit is normally set to 20A, however under extreme operating conditions the maximum allowable current is reduced as shown in the following table:

Condition	Rectifier operation	Maximum current
Normal operating conditions	Normal	20A
Output voltage above 125V	Constant output power (2.5kW)	2500/Vout A
Heatsink above 95°C	High Temperature alarm active	10A
Mains below 180Vac, output voltage below 125V	Current reduces by –0.2Adc / 1Vac below 200Vac	20A
Mains below 180Vac, output voltage above 125V	Constant output power with reduction of output current by –0.2Adc / 1Vac below 200Vac.	2500/Vout A
Battery current limiting	Output current adjusted by MCM in the range of 3A – 20A	20A

Table C–Conditions of current limit

3.7 Thermal Protection

If the heatsink temperature reaches 95°C and the output current is above 16A, then the rectifier will raise the High Temperature alarm and reduce output current to 10A.

If the High Temperature alarm becomes active and the heatsink doesn't drop below 85°C after 60s, the rectifier will shut down until the heatsink temperature drops below 50°C (or the Reset pushbutton is pressed) and the Overtemperature alarm will be raised. If the heatsink temperature exceeds 100°C, or 95°C and output current is below 16A and no High Temperature alarm is active, then the rectifier will immediately shut down until the heatsink temperature drops below 50°C.

4 Installation

This section is for the information of qualified service personnel only.

WARNING: DOUBLE POLE / NEUTRAL FUSING

Argus systems and Com10 series rectifiers are designed to maintain compliance with safety standards.

4.1 Start Up Procedure

1. Insert the rectifier into the shelf. The input and output are connected when the rectifier is flush with the shelf. The three front panel LEDs will all flash, indicating the rectifier is unlocked. As long as the rectifier is unlocked, no output is produced.
2. Lock the rectifier into the shelf by turning the lock a quarter turn clockwise. The LEDs will cease flashing together and will flash in sequence to the right. The rectifier is operating in No Setup mode, with an output of 124V.
3. Set up the rectifier from the MCM. Refer to the MCM manual for full set up procedure.
4. The rectifier is now operating according to the presets programmed into the MCM. Check that the green Comms and Input LEDs are on and that the red Alarm LED is off.

5 Maintenance

This section is for the information of qualified service personnel only.

WARNING: DOUBLE POLE / NEUTRAL FUSING

5.1 Rectifier Removal

1. Unlock the rectifier from the shelf by turning the lock a quarter turn anticlockwise. The rectifier shuts down.
2. Slide the rectifier out of the shelf.

5.2 Fan Replacement

This procedure is for the replacement of fan assembly part number 130753. The following procedure will require:

- Flat screwdriver
- 7 mm spanner
- #1 Pozidriv screwdriver.

1. Remove the rectifier from the shelf.
2. Using a flat screwdriver, lever the grill from the front panel, by means of the slot at the bottom edge.
3. Remove the six screws holding the front panel to the rectifier. There are four M4 screws with crinkle and flat washers around the fan opening, and two M3 screws with crinkle and flat washers at the bottom edge of the front panel. Remove the front panel.
4. Unplug the fan cable from connector X42 on the RACOM PCB at the front of the rectifier.
5. Unscrew the four spacers holding the fan to the rectifier, and remove the fan.
6. Fix the replacement fan to the unit with the spacers and their crinkle washers, making sure that the cable reaches X42 on the RACOM PCB.
7. Connect the fan cable to X42. The connector is polarized.
8. Place the front panel onto the front of the rectifier, keeping it vertical.
9. Fasten the front panel with the four M4 screws, crinkle and flat washers and the two M3 screws, crinkle and flat washers.
10. Clip the grill back into place in the front panel.

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FACTORY SERVICE INFORMATION

Technical Support

Technical support staff are available for answering general questions related to installation, operation and maintenance of Argus products. In Canada and the USA, call Argus toll free 7:30 am to 5:00 pm Pacific Standard Time at:

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(+1-888-462-7487)

For emergencies, call +1-888-GO-ARGUS 24 hours a day, seven days a week.
Customers outside Canada and the USA, call +1-604-436-5547 for technical support.

Training

Argus offers various levels of product and technical training. These workshops provide a mix of theory and hands on application for qualified customers. Please consult your sales representative for course schedules, locations and costs, or visit our website at ***www.argusdcpower.com***.

Factory Repair and Servicing

All service, beyond initial adjustments, should be carried out by qualified factory service personnel. For these procedures, please contact Argus Technologies at the locations listed to the right.

Product Returns

Before returning any product for service, please obtain a Return Material Authorization (RMA) number from an Argus factory service representative. The representative will require the model and serial number, as well as a brief description of the problem prior to issuing the RMA number. All material must be pre-authorized before being returned.
See document 048-507-10 "Warranty and Repair Information" for more details.

Moving and Storage

Units must be suitably packed in the original shipping container (or equivalent) prior to re-shipping. The box should be completely enclosed and constructed of wood or double-wall, corrugated cardboard. At least 3" of foam or shock absorbing packing material must surround the unit.

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