

GC-32 GPIO CONTROLLER Programming Manual

Revision History

05/09/12 First release

07/26/12 Added Table of Contents and product front & rear view

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OVERVIEW

The GC-32 controls 32 individual GPOs (relay contact closure outputs) and monitors 32 individual GPIS (opto isolated inputs).

Upon receipt of a GPO control command the GC-32 will turn on or off the specified GPO, or turn all GPOs on or off as specified within the command. The GPO command also details the time that the GPO will stay on. A time of zero (0) will latch the GPO on. Any other time 1 – 255 (x 10ms) will cause the GPO to turn off when the specified time in the command elapses.

A GPI change of state notification will be sent automatically when a GPI change of state is detected. The notification may include one or more GPIS and will contain the affected GPI and its current state. The GPI state is communicated by an incrementing count. An even count indicates that the GPI is off. An odd count indicates that the GPI is on. The count will wrap from its maximum value to zero. If a client is not connected, GPI notifications for that connection will be discarded.

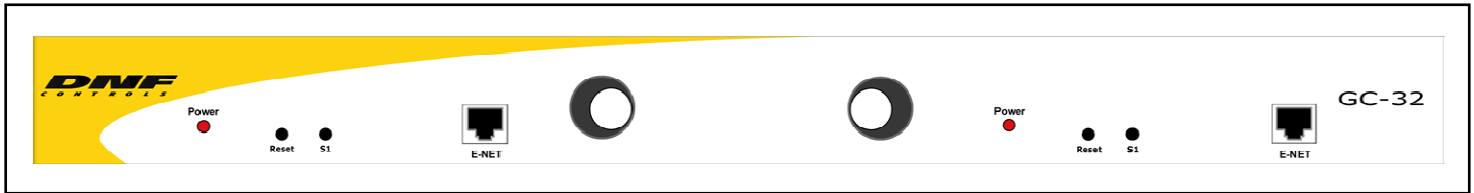
The GC-32 is configured as a server and the 3rd party application is the client. The client will establish a TCP/IP connection to port 50001 or 50002 to control and monitor the GC-

32 GPOs and GPIs. The client is responsible for establishing and maintaining the connection. In the event of a loss of connection, the client is responsible for re-establishing the connection and re-configuring the GC-32, if required.

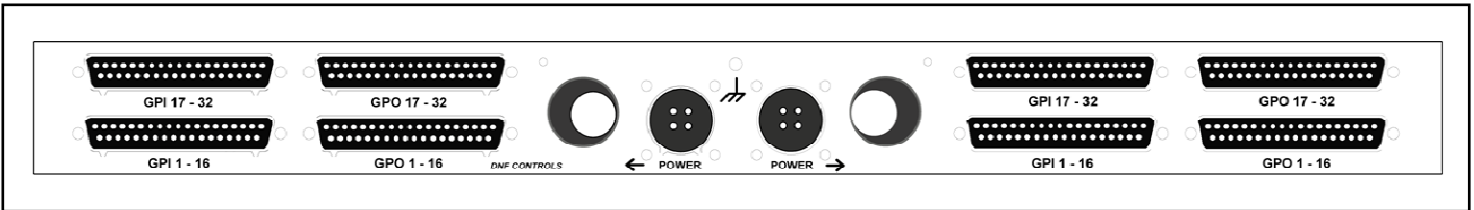
The GC-32 has two programmable operating modes. In Mode 1, all GPIs and GPOs are allocated to the port 50001 connection and identified as GPI 1 to GPI 32, and GPO 1 to GPO 32. In Mode 2, GPIs 1 – 16 and GPOs 1 – 16 are allocated to the port 50001 connection and GPIs 17 – 32 and GPOs 17 – 32 are allocated to the port 50002 connection. The operating mode of the GC-32 may be changed at any time. Changing the operating mode will clear any pending GPI change of state notifications.

The GC-32 can be configured to accept a connection from any IP address on port 50001 or 50002. Or, it can be configured to accept a connection from only the specific IP address for each port indicated on the GC-32's Remote Device Assignment web page.

FRONT VIEW



REAR VIEW



DEFAULT SETTINGS

DEFAULT ETHERNET CONFIGURATION

IP Address: 192.168.10.217
Subnet Mask: 255.255.255.0
Gateway: 192.168.10.1

Use the GC-32's System Configuration web page to change the IP address, subnet, and gateway. See section at the end of this document.

DEFAULT OPERATING MODE

The default operating mode is Mode 1. Use the Set Operating Mode command described below to change the operating mode.

PROTOCOL DESCRIPTION

The GC-32 command consists of the following components:

Header + command + data

NOTE- The "+" is used for readability only and should not be used in the command

The Header is hexadecimal value 0x44 0x4E 0x46

Dot notation is used in this document to describe concatenated hexadecimal values.

The header is referenced below as 44.4E.46

The command is an 8 bit value and is described below.

Data is one or more 8 bit values, and is specific to each command as described below.

All multi-byte values are formatted as big endian (MSB...LSB).

The GC-32 responds to all commands with an ACK, NAK, or the requested data. If a complete command is not received within 2 seconds, the GC-32 will respond with a timeout error message.

GC-32 RESPONSES

ACK= 0x04

GC-32 response: 44.4E.46.04

NAK= 0x05

GC-32 response: 44.4E.46.05. ee where ee is one of the following error codes.

0x10= Invalid command format

0x11= Invalid command

0x12= Invalid data

0x13= Command timeout error

GC-32 COMMAND SET

Set Operating Mode (Supported on port 50001 and 50002)

Command= 0x30

Data:

0= Select Mode 1

GPOs 1 – 32 and GPIs 1- 32 are allocated to port 50001. All commands on port 50002 that attempt to control or monitor will result in a NAK response

1= Select Mode 2

GPOs 1 - 16 and GPIs 1- 16 are allocated to port 50001.

GPOs 17 - 32 and GPIs 17- 32 are allocated to port 50002.

NOTE- On port 50002, the GPIs and GPOs are numbered 1 – 16 in Mode 2. Use numbers 1 – 16 in all commands. Use of numbers 17 – 32 in commands will result in an Invalid Data error message.

GC-32 will respond with ACK

Read Operating Mode (Supported on port 50001 and 50002)

Command= 0x31

Data:

No data is required

The GC-32 will respond with 44.4E.46.31.ss, where ss is the current operating mode. See Set Operating Mode command for mode values.

GPO Control, Single GPO

Command= 0x60

Data:

GPO# 0x01 through 0x20

GPO State 0x00= OFF
 0x01= ON

GPO On Time 0x01 through 0xFF (Internally, the On Time is multiplied by 10ms)

Send 44.4E.46.60.01.03.00 to latch on GPO #3

Send 44.4E.46.60.01.03.64 to turn on GPO #3 and then automatically turn them off after 1 second.

GC-32 will respond with ACK

GPO Control, All GPOs

Command= 0x61

Data:

0x01

GPO State 0x00= OFF
 0x01= ON

GPO On Time 0x01 through 0xFF (Internally, the On Time is multiplied by 10ms)

Send 44.4E.46.61.01.01.00 to latch on all GPOs

Send 44.4E.46.61.01.01.64 to turn on all GPOs and then automatically turn them off after 1 second.

GC-32 will respond with ACK

GPO Status, Single GPO

Command= 0x70

Data:

GPO# 0x01 through 0x20

The GC-32 will respond with 44.4E.46.70.gg.ss, where gg= the specified GPO number and ss= the GPO's current state.

GPO Status, All GPOs

Command= 0x71

Data:

0x01

The GC-32 will respond with 44.4E.46.71.cc.gg1.ss1.gg2.ss2.....ggN, ssN where cc is the number of GPOs included in the response
gg1 is the GPO number and ss1 is its current status
gg2 is the next GPO number and ss2 is its status
ggN is the last GPO number and ssN is its status

For Mode 1, the GC returns GPO numbers 1 – 32

For Mode 2, on port 50001 and port 50002, the GC return GPO number 1 – 16

On port 50002, GPOs 1 – 16 are physical GPOs 17 – 32

GPI Control, Single GPI

Command= 0x40

Data:

GPI# 0x01 through 0x20

GPI Debounce 0x00 – 0xFF (Internally, debounce time is multiplied by 10ms)

Send 44.4E.46.40.03.0A to set GPI#3's debounce time to 100ms

GC-32 will respond with ACK

GPI Control, All GPIs

Command= 0x41

Data:

0x01

GPI Debounce 0x00 – 0xFF (Internally, debounce time is multiplied by 10ms)

Send 44.4E.46.40.03.0A to set all GPI debounce times to 100ms

GC-32 will respond with ACK

GPI Status, Single GPI Request status for a single GPI

Command= 0x50

Data:

GPI# 0x01 through 0x20

The GC-32 will respond with 44.4E.46.70.gg.xx.yy where gg= the specified GPI number and xx.yy is the GPI's 16 bit count value in MSB..LSB format. An even number indicates that the GPI is currently off. An odd number indicates that the GPI is on. The count will increment each time the GPI changes state.

GPI Status, All GPIs Request status for all GPIs

Command= 0x51

Data:
0x01

The GC-32 will respond with 44.4E.46.51.cc.gg1.ss1.gg2.ss2.....ggN, ssN
where cc is the number of GPIs included in the response
gg1 is the GPI number and ss1 is its current status
gg2 is the next GPI number and ss2 is its status
ggN is the last GPI number and ssN is its status

For Mode 1, the GC returns GPI numbers 1 – 32
For Mode 2, on port 50001 and port 50002, the GC return GPI number 1 – 16
On port 50002, GPIs 1 – 16 are physical GPIs 17 – 32

GPI Change of State Notification Automatically sent when one or more GPIs change state and a client is connected.

Command= 0x52

The GC-32 will send 44.4E.46.52.cc.gg1.ss1.gg2.ss2.....ggN, ssN
where cc is the number of GPIs included in the response
gg1 is the GPI number and ss1 is its current status
gg2 is the next GPI number and ss2 is its status
ggN is the last GPI number and ssN is its status

For Mode 1, the GC returns GPI numbers 1 – 32
For Mode 2, on port 50001 and port 50002, the GC return GPI number 1 – 16
On port 50002, GPIs 1 – 16 are physical GPIs 17 – 32

CONFIGURATION WEB PAGES

Use a standard web-browser to access the GC-32's web pages.

Click on the GPI Events link to view the current state of all GPIs. The page does not auto-refresh.

GPI CONFIGURATION					
GPI#	GPI Label	User Defined "ON" State	User Defined "ON" Mode	Debounce (*10 ms)	Currently
1	GPI_1	OPTO ON	Latch	1	OFF
2	GPI_2	OPTO ON	Latch	1	OFF
3	GPI_3	OPTO ON	Latch	1	OFF
4	GPI_4	OPTO ON	Latch	1	OFF
5	GPI_5	OPTO ON	Latch	1	OFF
6	GPI_6	OPTO ON	Latch	1	OFF
7	GPI_7	OPTO ON	Latch	1	OFF
8	GPI_8	OPTO ON	Latch	1	OFF
9	GPI_9	OPTO ON	Latch	1	OFF
10	GPI_10	OPTO ON	Latch	1	OFF
11	GPI_11	OPTO ON	Latch	1	OFF
12	GPI_12	OPTO ON	Latch	1	OFF
13	GPI_13	OPTO ON	Latch	1	OFF
14	GPI_14	OPTO ON	Latch	1	OFF

Click on the GPO Actions link to view the current state of all GPOs. The page does not auto-refresh.

GPO CONFIGURATION						
GPO#	GPO Label	User Defined ON State	Operating Mode	Momentary On Time (*10ms)	Group	Currently
1	GPO_1	Relay Closed	Latch	0	None	OFF
2	GPO_2	Relay Closed	Latch	0	None	OFF
3	GPO_3	Relay Closed	Latch	0	None	OFF
4	GPO_4	Relay Closed	Latch	0	None	OFF
5	GPO_5	Relay Closed	Latch	0	None	OFF
6	GPO_6	Relay Closed	Latch	0	None	OFF
7	GPO_7	Relay Closed	Latch	0	None	OFF
8	GPO_8	Relay Closed	Latch	0	None	OFF
9	GPO_9	Relay Closed	Latch	0	None	OFF
10	GPO_10	Relay Closed	Latch	0	None	OFF
11	GPO_11	Relay Closed	Latch	0	None	OFF

Click on the Remote Device Assignment link to view the IP address that is permitted to connect on ports 50001 and 50002. If the IP address is set to 0.0.0.0, then any IP address may connect. The Connection Status column will turn green when a client is connected.

Click on the Login link to make changes to the Remote Device Assignment page. Use the following log-on when prompted: User name: dnfuser
Password: controls

Remote Device Assignment web page

Device #	Remote Device Label	Device Type	Connection Type	Connection Mode	Listen on Port	UDP Attempts	IP Address	Port Number	Heartbeat Rate (seconds)	Connection Status
1	Remote Device 1	Other	TCP/IP	Server Receive/Transmit	50001	3	0.0.0.0	0	5	-----
2	Remote Device 2	Other	TCP/IP	Server Receive/Transmit	50002	3	0.0.0.0	0	5	-----

NOTE:
TCP/IP Server Mode:
GC-32 listens on Port 50001 for connection from Device 1
GC-32 listens on Port 50002 for connection from Device 2

To allow only a specific IP address to connect to the GC-32, enter client's IP address in the column labeled IP Address. Use the Device 1 line for port 50001 and Device 2 line for port 50002.

System Configuration web page

System Configuration

P1 Software Upgrade

Web Upgrade

Set Factory Defaults

Enter Label:

Enter the new IP settings below:

IP Address:
 Gateway:
 Subnet Mask:

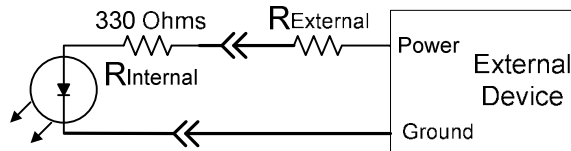
NOTE- You must be logged in to access this web page

Enter a new IP address, Gateway, and Subnet Mask in the boxes provided and then click on Save Config. The GC-32 will automatically reboot.

CONNECTORS- GPI, GPO

GPIO CONNECTORS: 4 x 37-Pin Female (D37F)
GPI 1 – 16, GPI 17 – 32, GPO 1 – 16, GPO 17 - 32

GPI: Opto Isolated Input.
GPI source must provide power to turn on opto-isolator.



Specification for GPI input:

1. Voltage: (Internal resistor only)
 - +3.3V minimum
 - +5V typical
 - +6V maximum
2. Current: (Internal resistor only)
 - 5mA minimum
 - 10mA typical
 - 15mA maximum

For typical 10mA current, if external voltage is higher than +5V, a series resistor is required:

$$R_{ext} = (V_{ext} - 4.5) / 0.01$$

$$V_{ext} = +9V \Rightarrow R_{ext} = 450 \text{ Ohms}$$

$$V_{ext} = +12V \Rightarrow R_{ext} = 750 \text{ Ohms}$$

$$V_{ext} = +24V \Rightarrow R_{ext} = 1950 \text{ Ohms}$$

GPO: Relay Contact Closure Output.
Dry contact closure.

GPO Relay Contacts:

0.5 A @ 125VAC

1.0 A @ 24VDC

1.0 A MAXIMUM CURRENT

A. GPI Connector

Pin #	Function	Pin #	Function
1	Ground	20	Ground
2	GPI #1 Anode (+)	21	GPI #1 Cathode (-)
3	GPI #2 Anode (+)	22	GPI #2 Cathode (-)
4	GPI #3 Anode (+)	23	GPI #3 Cathode (-)
5	GPI #4 Anode (+)	24	GPI #4 Cathode (-)
6	GPI #5 Anode (+)	25	GPI #5 Cathode (-)
7	GPI #6 Anode (+)	26	GPI #6 Cathode (-)
8	GPI #7 Anode (+)	27	GPI #7 Cathode (-)
9	GPI #8 Anode (+)	28	GPI #8 Cathode (-)
10	Ground	29	Ground
11	GPI #9 Anode (+)	30	GPI #9 Cathode (-)
12	GPI #10 Anode (+)	31	GPI #10 Cathode (-)
13	GPI #11 Anode (+)	32	GPI #11 Cathode (-)
14	GPI #12 Anode (+)	33	GPI #12 Cathode (-)
15	GPI #13 Anode (+)	34	GPI #13 Cathode (-)
16	GPI #14 Anode (+)	35	GPI #14 Cathode (-)
17	GPI #15 Anode (+)	36	GPI #15 Cathode (-)
18	GPI #16 Anode (+)	37	GPI #16 Cathode (-)
19	Ground		

Dry Mode:		Wet Mode:	
Pin# 2-9	Anode (+)	Pin# 2-9	Cathode (-)
11-18		11-18	
Pin #21-28	Cathode (-)	Pin #21-28	Ground
30-37		30-37	

B. GPO Connector

Pin #	Function	Pin #	Function
1	Common Bus	20	Ground
2	GPO #1 COMMON	21	GPO #1 N.O.
3	GPO #2 COMMON	22	GPO #2 N.O.
4	GPO #3 COMMON	23	GPO #3 N.O.
5	GPO #4 COMMON	24	GPO #4 N.O.
6	GPO #5 COMMON	25	GPO #5 N.O.
7	GPO #6 COMMON	26	GPO #6 N.O.
8	GPO #7 COMMON	27	GPO #7 N.O.
9	GPO #8 COMMON	28	GPO #8 N.O.
10	Common Bus	29	Ground
11	GPO #9 COMMON	30	GPO #9 N.O.
12	GPO #10 COMMON	31	GPO #10 N.O.
13	GPO #11 COMMON	32	GPO #11 N.O.
14	GPO #12 COMMON	33	GPO #12 N.O.
15	GPO #13 COMMON	34	GPO #13 N.O.
16	GPO #14 COMMON	35	GPO #14 N.O.
17	GPO #15 COMMON	36	GPO #15 N.O.
18	GPO #16 COMMON	37	GPO #16 N.O.
19	Common Bus		

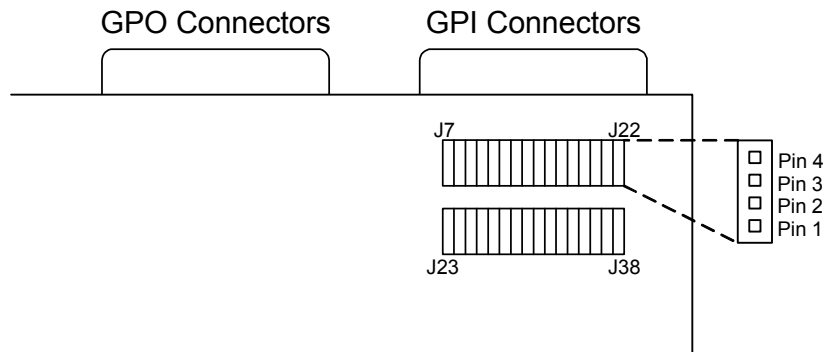
Dry Mode:		Wet Mode:	
Pin# 2-9	GPO Common	Pin# 2-9	GPO N.O.
11-18		11-18	
Pin #21-28	GPO N.O.	Pin #21-28	Ground
30-37		30-37	

CONFIGURE GPIS FOR DRY/WET OPERATION

GPIs are set to Dry operation by default. The GPIs may be set for Wet mode using either a Breakout Panel or using jumpers within the GC-32. To configure the jumpers inside the GC-32:

1. Power down the GC-32 and then remove the top cover.
2. The jumpers for the GPIs are directly behind the GPI connectors, labeled J7 through J38. Each set of jumpers for a GPI consists of 4 pins. See the table below for which GPI corresponds to which jumpers.

GPI	Jumper	GPI	Jumper
1	J7	17	J23
2	J8	18	J24
3	J9	19	J25
4	J10	20	J26
5	J11	21	J27
6	J12	22	J28
7	J13	23	J29
8	J14	24	J30
9	J15	25	J31
10	J16	26	J32
11	J17	27	J33
12	J18	28	J34
13	J19	29	J35
14	J20	30	J36
15	J21	31	J37
16	J22	32	J38



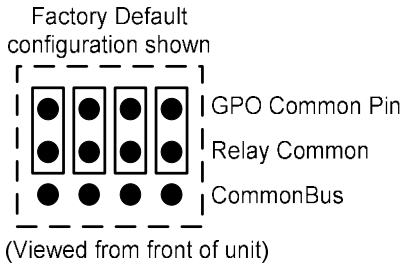
3. For Dry operation, set one jumper across pins 2 and 3. Hang the second jumper off of pin 1.
4. For Wet operation, set one jumper across pin 1 and 2. Set the second jumper across pins 3 and 4.
5. Once all necessary changes to the jumpers have been made, replace the top cover and power up the GC-32.

CONFIGURE GPOS FOR DRY/WET OPERATION

Note: Signal connected to Common Bus is isolated from the GC-32 electronics & power supply.

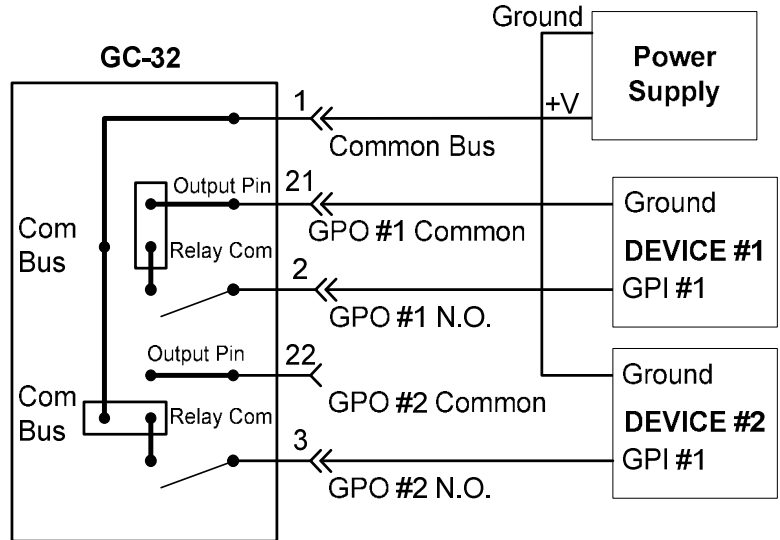
NOTE:

GPO Jumpers located inside GC-32

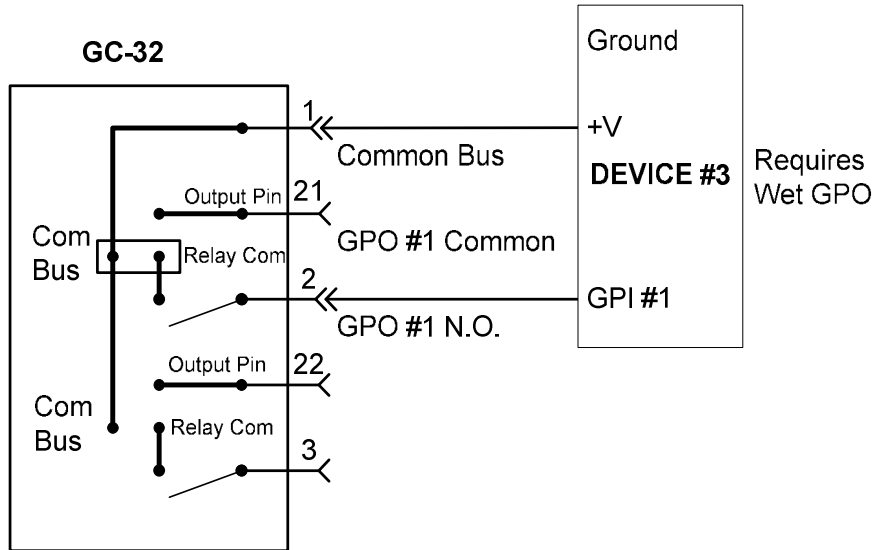


JUMPER	GPO
J40	1
J41	2
J42	3
J43	4
J44	5
J45	6
J46	7
J47	8
J48	9
J49	10
J50	11
J51	12
J52	13
J53	14
J54	15
J55	16
J56	17
J57	18
J58	19
J59	20
J60	21
J61	22
J62	23
J63	24
J64	25
J65	26
J66	27
J67	28
J68	29
J69	30
J70	31
J71	32

EXAMPLE #1- External Power Supply to wet GPOs



EXAMPLE #2- Device supplied power to wet GPOs



LIMITED WARRANTY

DNF Controls warrants its product to be free from defects in material and workmanship for a period of one (1) year from the date of sale to the original purchaser from DNF Controls.

In order to enforce the rights under this warranty, the customer must first contact DNF's Customer Support Department to afford the opportunity of identifying and fixing the problem without sending the unit in for repair. If DNF's Customer Support Department cannot fix the problem, the customer will be issued a Returned Merchandise Authorization number (RMA). The customer will then ship the defective product prepaid to DNF Controls with the RMA number clearly indicated on the customer's shipping document. The merchandise is to be shipped to:

DNF Controls
12843 Foothill Blvd., Suite C
Sylmar, CA 91342
USA

Failure to obtain a proper RMA number prior to returning the product may result in the return not being accepted, or in a charge for the required repair.

DNF Controls, at its option, will repair or replace the defective unit. DNF Controls will return the unit prepaid to the customer. The method of shipment is at the discretion of DNF Controls, principally UPS Ground for shipments within the United States of America. Shipments to international customers will be sent via air. Should a customer require the product to be returned in a more expeditious manner, the return shipment will be billed to their freight account.

This warranty will be considered null and void if accident, misuse, abuse, improper line voltage, fire, water, lightning or other acts of God damaged the product. All repair parts are to be supplied by DNF Controls, either directly or through its authorized dealer network. Similarly, any repair work not performed by either DNF Controls or its authorized dealer may void the warranty.

After the warranty period has expired, DNF Controls offers repair services. Equipment is evaluated and repair price quoted prior to any work performed. DNF Controls reserves the right to refuse repair of any unit outside the warranty period that is deemed non-repairable.

DNF Controls shall not be liable for direct, indirect, incidental, consequential or other types of damage resulting from the use of the product.