

NAS

BATTERY GROUND FAULT DETECTOR



OPERATIONS AND MAINTENANCE MANUAL

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Introduction

The NASS Battery Ground Fault Detector (GFD) is another automated package in the suite of automated testing products and systems furnished by North American Signal. The stand-alone unit provides ground detection analysis for up to three separate battery sources. With on-board process control this product provides automated interval testing or manually initiated testing providing true ground readings in accordance with FRA testing requirements. Automated interval testing is field settable in either days (1-127 days) or hours (1-127 hours) by selection of on-board rocker switches. Manual testing is as easy as pushing a button. Inhibit input allows postponement of testing during the automated or manual process until input is disabled preventing unwanted grounding of the system during operation.

Equipped with discrete outputs and LED indicators for ground fault display along with user-friendly terminal menus, the system is easy to use and saves countless hours in the performance of the ground maintenance test. The smart automated test algorithm provides automated control of three discrete 12 Volt 150MA outputs used to interface to an external control contactor or relay that can be used to shut off each battery charger. This feature provides automated ground readings in a power on/off state. Ground fault thresholds are field settable from .10 MA up to 20 MA in .10 MA increments allowing the user to define ground fault alarm thresholds. The GFD can be interfaced via 422 serial network connection to any of the NASS smart field analyzer units to automatically control, capture and record ground test data as part of the automated test and inspection process.

Battery inputs are equipped with 10,000-volt isolation, virtually eliminating false readings due to extraneous surge currents. Additional filtering and data processing provide accuracy to a tenth of a milliamp making this the most accurate ground measurement device available for the specific application. Ground test for each battery source is accomplished in less than 30 milliseconds minimizing exposure to normal system operation.

Fast, flexible and accurate, the NASS GFD allows this labor-intensive maintenance test to be accomplished in a fraction of the time and with increased accuracy.

Have a custom application? That is not a problem for the staff at NASS.

Applications

- Transportation
 - Grade Crossing Locations
 - Interlockings
 - Automatic Signal Locations
 - Defect Detector sites
 - Base Stations

- SCADA System Interface
 - Lift Stations
 - Irrigation Systems
 - Traffic Devices
 - Security Systems

System Components

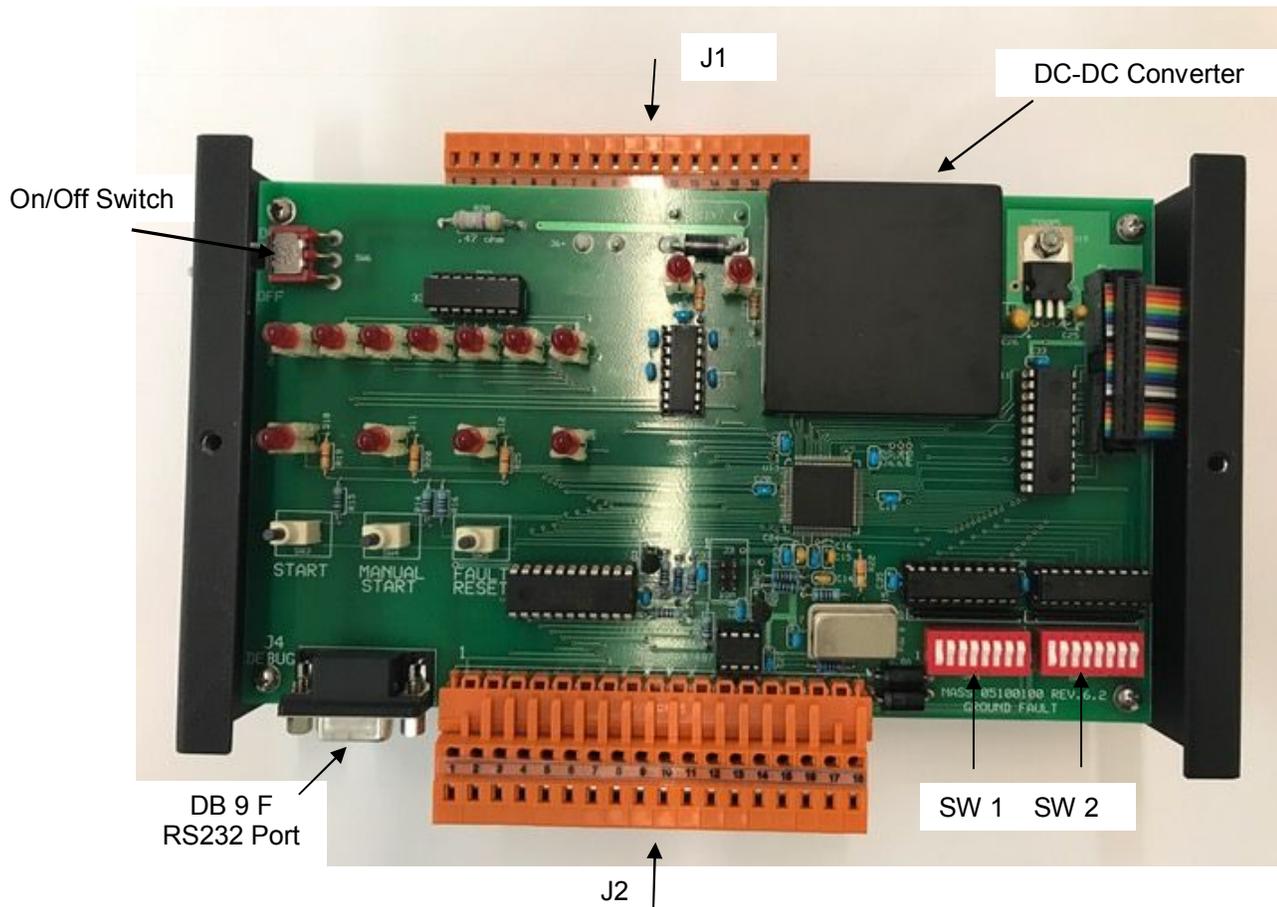
The GFD unit is a modular system equipped with two printed circuit modules, chassis and Wago connector for circuit interface.

Chassis

The GFD comes equipped with an enclosure chassis used to house electronic circuit modules. Removing the two screws located on each side of the chassis cover accesses the electronic modules and peripherals.

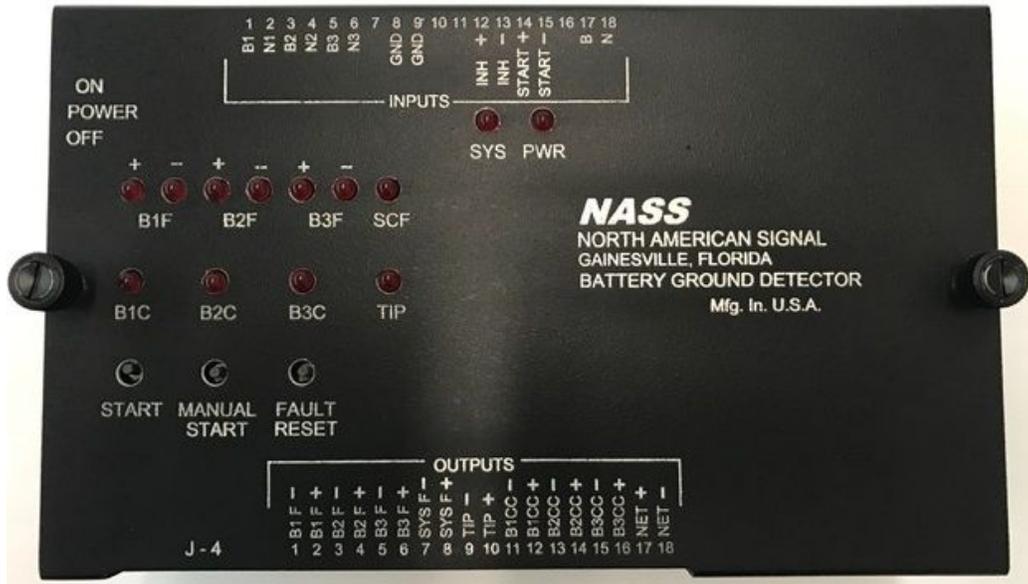
Unit Components

The GFD is equipped with two electronic circuit modules one for handling Inputs the other for output interface. Wago Connectors J1 (Inputs) and J2 (Outputs) provide circuit interface. Devices are shown below.



LED Indicators and Pushbuttons

LED indicators display status of system operation. Chassis cover provides labeling for each indicator. A description of the Indicators and Pushbuttons appears below.



Indicators

- **SYS** Self check - flashes 1 cycle per second if processor is operational
- **PWR** Input power - Illuminated if input voltage 9-36 volts DC present
- **B1F+** Illuminated if Battery 1 positive ground fault detected
- **B1F-** Illuminated if Battery 1 negative ground fault detected
- **B2F+** Illuminated if Battery 2 positive ground fault detected
- **B2F-** Illuminated if Battery 2 negative ground fault detected
- **B3F+** Illuminated if Battery 3 positive ground fault detected
- **B3F-** Illuminated if Battery 3 negative ground fault detected
- **SCF** Illuminated if unit does not pass self-check during system testing
- **B1C** Illuminated when battery charger 1 output is present
- **B2C** Illuminated when battery charger 2 output is present
- **B3C** Illuminated when battery charger 3 output is present
- **L-T** Illuminated when unit is running ground test sequence

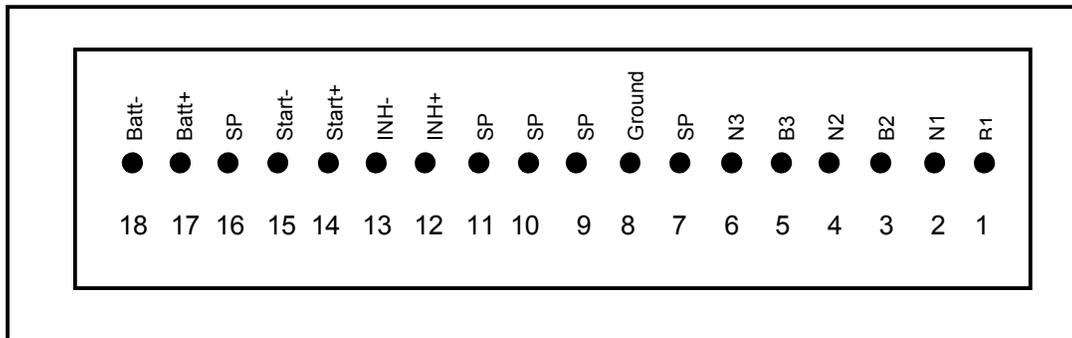
Pushbuttons

- Start** Starts Automated Manual Ground Test Sequence
- Lamp Test** Starts Manual Ground Test
- Fault Reset** Resets fault indicator LED's

Interface Terminals J1 – J2

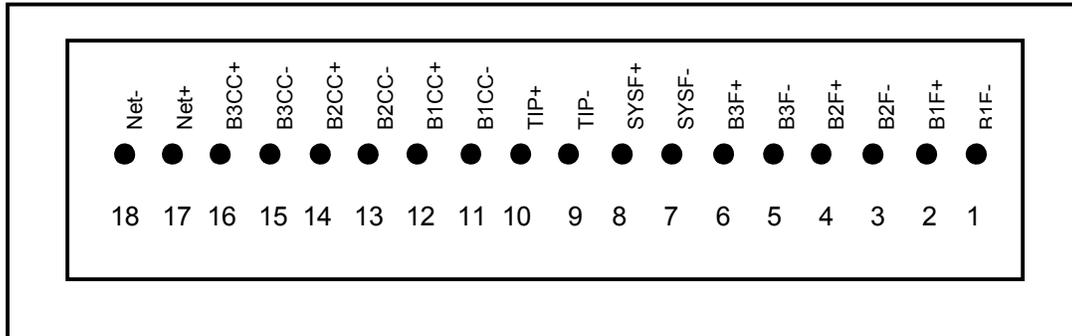
The NASS GFD unit is equipped with two 18-way Wago terminals for circuit interface. Terminal details are shown below.

J1 Input Terminal Connector



- **Battery Input (17-18)** Operating Battery 9-36 volts DC Isolated
- **Start input (14-15)** Digital state high 5-32 volts is used to start ground test
- **INH input (12-13)** Digital state high is used to disable ground test
- **Ground (8)** Earth ground input
- **Battery Inputs (1-6) B1-B3** Battery sources used to conduct test; 9-36 volts DC

J2 Output Terminal Connector



- **Net (17-18)** RS422 Serial Port for interface to NASS Analyzers
- **B3-B1 CC (11-16)** Battery Charger Control 12-volt outputs present during test process for operation or disconnect of Battery Chargers
- **TIP (9-10)** Test in Progress – 12-volt output present during test algorithm process
- **SYSF (7-8)** System Fault – 12 Volt output present if unit fails self-check ground test.
- **B1-B3F (1-6)** Battery 1 - Battery 3 Fault – 12 Volt latched output when ground fault has been detected on specific battery supply.



Alarm Threshold Settings (Switch Pack 1)

The GFD is equipped with two switch packs located on the bottom right-hand corner of the top circuit board. Access switches by removing cover. Switch pack 1 is used to set current threshold for system alarms. Max threshold is 20MA. Settings on the switch are in .10 MA increments. Switch values are in Binary and are set by placing the switch in the closed position. Values are as follows:

- SW 1 = 1
- SW 2 = 2
- SW 3 = 4
- SW 4 = 8
- SW 5 = 16
- SW 6 = 32
- SW 7 = 64
- SW 8 = 128

For example, closing Switch 5 provides an alarm threshold of 1.6 MA. ($16 \times .10\text{MA}$). Closing SW 5 and SW 3 [$(16+4) \times .10\text{MA}$] will provide 2.0MA. Values add together. Note the max value setting is 20.0 Milliamps. If switch values greater than this are selected [for example All Closed (255) or 25.5 MA] value will default to 20.0 MA. This should not be an issue, as most values for operation should not exceed 8 MA for most railroad applications.

Automated Test Interval (Switch Pack 2)

The GFD can be set up to run the Ground test sequence automatically on a time interval. Settings can be either hours (1-127) or Days (1-127) depending on switch settings. All switches set to Open disable automated test interval. Switch values are in Binary and are set by placing the switch in the closed position. Values are as follows:

- SW 1 = 1
- SW 2 = 2
- SW 3 = 4
- SW 4 = 8
- SW 5 = 16
- SW 6 = 32
- SW 7 = 64
- SW 8 = Closed = Days / Open = Hours

For example, closing SW 8 and SW 6 will run an automated test every 32 days. Values add together when closed, for example SW 5,4,3,2 closed = $(16+8+4+2) = 30$ Days.

System Operation

The NASS Ground Fault Detector system is a very simple system to operate. When networked and used in conjunction with NASS analyzer units such as the Universal or Micro Data Analyzer, system operation and data can be accessed through the menus on these units. Refer to manuals for these systems for instructions on access to system data. If the unit is configured in stand-alone operation, access to system data is through the RS232 port. Operation description contained in this manual is assuming stand-alone method.

Warning: The system places a ground for a duration of 30 milliseconds on the battery busses to obtain readings. Insure provisions are made for the safe operation of the system prior to tests being made.

The GFD unit allows the user to perform ground tests using two methods. The methods are: **Manual** - when a user performs the test, and **Automated** - when the GFD is configured to perform the test on a predetermined time interval.

Each of the methods runs through an automated test algorithm to obtain ground readings on each of the battery supplies monitored by the unit. The entire test process takes approximately 30 seconds. The **Manual** method involves pushing the Start Test button. When depressed, the unit performs a self-test to obtain a calibrated ground reading, cycles chargers to obtain system ground information with both commercial power on and commercial power off. LED indicators are used to validate the test process along with indication of a system ground fault if ground reading is above a set threshold. NASS recommends utilizing the battery charger outputs to cycle chargers as this method allows the GFD to perform and complete the testing procedure as required. When this method is used the chargers are turned off sequentially for a period of seven seconds each while the ground test is made. Readings for each state are recorded by the unit and displayed until new readings or additional tests are made. The **Automated** test is done at predetermined time interval provides the same sequence of events; the only difference is nobody pushes the button.

In addition to these two methods of automated testing, the unit is equipped with another manual procedure where when the Lamp Test button is pushed the unit takes a ground reading of the battery sources monitored by the unit. This allows maintenance personnel the ability to perform a test at any time under any condition. Battery charger outputs are not controlled in this mode.

With each of these methods, the goal is to reduce the time and increase the accuracy of this maintenance test procedure.



Data Display

Access to system test data is through the RS232 serial port on the unit.

Interface to the DB9 serial port using a standard 9 pin serial cable and a PC equipped with a standard communication package, such as Hyper-terminal or ProComm Plus. Port settings are direct connect Com Port, 19200, N, 8, 1 Flow Control is none.

System data will be displayed as appears below once the connection is made.

BATTERY GROUND DETECTOR

BOOT: BOOTGF1
EXECUTIVE: GFD REV.4 11/29/05
CURRENT (ma): 02.00
INTERVAL: 024 HOUR (S)

SW 1 Current Alarm Threshold Setting
 SW 2 Time Interval Setting

Self Check Ground Readings MA +,-

	POWER	S/C	B1+	B1-	B2+	B2-	B3+	B3-	OFFSET	
	ON	11.20	00.00	00.00	00.00	00.00	00.00	00.00	19.99	Latest Test Values
	OFF	11.19	00.00	00.00	00.00	00.00	00.00	00.00	19.99	
	ON	11.20	00.00	00.00	00.00	00.00	00.00	00.00	19.99	Auto Test Data
	OFF	11.16	00.00	00.00	00.00	00.00	00.00	00.00	19.99	
	MANUAL	11.20	00.00	00.00	00.00	00.00	00.00	00.00	19.99	Manual Test Data
	MANUAL	11.20	00.00	00.00	00.00	00.00	00.00	00.00	19.99	Oldest Test Values

The GFD displays six lines of data in two formats. **Automatic**, which obtains values with power on and power off and **Manual** which displays values regardless of power status. Display shows latest test values at the top, with previous or oldest values at the bottom. When new tests are run, data scrolls down with latest being replaced with new test data. Values are displayed in Milliamps for both positive and negative polarities.

Operation

Automated Test Time Interval:

- Set Switch Pack 1 for current alarm threshold.
- Set Switch Pack 2 for timer interval.
- Set and forget it. Data will automatically be captured for display at time interval.

Automated Manual Test

- Set Switch Pack 1 for current alarm threshold.
- Set Switch Pack 2 all switches to open position.
- Push Start button.
- Unit will perform Lamp Test, Self Test, Cycle Chargers, and display data when complete.
- TIP: LED will illuminate for test period and extinguish when test is complete.

Manual Test

- Set Switch Pack 1 for current alarm threshold.
- Set Switch Pack 2 all switches to open position.
- Push Lamp Test button.
- Battery chargers will not be controlled using this procedure.
- TIP: LED will illuminate for test period and extinguish when test is complete.
- Data will display when test is complete.



GFD Ordering Information

The GFD can be ordered as a complete system or by individual parts. Ordering references for each item configuration are listed in the table below.

Item	Unit	Catalog Ref No.
GFD Unit Complete with Chassis	EA	NAS-GFD-01
Chassis Only	EA	NAS-0511-00
Board Set	EA	0510-00-01
Wago Terminal	EA	WG-18

System Installation and Set Up

Initial Site Set Up

When design, module configuration, and interface wiring to external circuitry are complete, the GFD module can undergo operational testing for the application. The system should be tested to insure the function it was designed to perform is operational.

Plug into the unit's 232 port and operate in accordance with instructions for System Menu access.

- ➔ Verify that all battery connections are the proper polarity in accordance with details shown on Terminal Board Configurations.
- ➔ Plug in Wago Connector.
- ➔ Insure Power LED on LED indicator panel is illuminated.
- ➔ Verify that module LED communication is operating in accordance with the details outlined in the Hardware Description section for the module.
- ➔ Verify if operable battery charger outputs operate chargers

Maintenance and Troubleshooting

The GFD system is a robust hardware package designed to operate in the harshest environments. The module has onboard process control and visual LED indicators. Figuring out what to fix if it is broken is as straight forward as using the maintenance menus.

At North American Signal Systems, we try very hard to keep things simple, which includes diagnosing a problem with the unit if it is not functioning correctly. As with any troubleshooting procedure, the first order of business is to assess what the reported problems are and eliminate potential causes.

Visual inspection of the LED indicators on the module is a quick, easy way to assess if the failure is hardware related.

Troubleshooting Checklist

- ✓ **PWR LED not illuminated:** Check input voltage on battery voltage input terminals 17,18 to determine if between 8-40 volts DC. Possible converter failure on motherboard. Replace module
- ✓ **SYS LED not flashing at one and one half second rate on module:** Possible processor failure. Insure power is within specification. Replace module.
- ✓ **Input not functioning:** Check connections and voltage on appropriate Terminal on WAGO. If present and not functioning, faulty input is possible - replace module.
- ✓ **Output not functioning:** Check output voltage on Wago terminal to determine level is at 12 volts and correct polarity when output is required to be operable.
- ✓ **SCF LED On:** Unit failed self-check on input B1 voltage. SCF on data display is approximately 1MA per volt. Verify B1 input voltage is above 5 volts. If present and fails, replace module.



Specifications: Ground Fault Detector

Physical:

Chassis: 10" L X 5.5"W X 2.5" D
Environment: -40 to +71 degrees C

Inputs:

2-Isolated Digital Inputs 5-40V DC 3000 volt isolation
3-Isolated Battery Inputs 6-40V DC-10,000 volt isolation

Outputs:

8 Isolated 12 Volt 150MA source

Power:

On board DC-DC Converter Operating voltage 9-36V DC

Serial Ports:

DB9 Serial Female on DIGI 8 card

Terminals:

2-WAGO 18 way plug in connector
Wire size 12 AWG—22AWG



Terms and Conditions of Sale

General

Our sale to you will be solely upon the terms and conditions set forth herein. They supersede and reject any conflicting terms and conditions of yours. Exceptions to any of our terms and conditions must be contained in a written or typed statement received from you. We shall not be deemed to have waived any of our terms and conditions or to have assented to any modification or alteration of such terms and conditions unless such waiver or assent is in writing and signed by an authorized officer.

Prices

Unless otherwise noted on the face thereof, prices are net F.O.B our factory and firm for thirty (30) days. The amount of any applicable present or future tax upon the production, sale, shipment or use of goods ordered or sold will be added to billing unless you provide us with an appropriate exemption certificate.

Warranty

North American Signal Systems (NASS) warrants its products and systems against defects in material and workmanship for a period of One (1) Year from date of shipment. Seller's entire warranty obligation is limited to repairing or replacing any equipment which is returned within the warranty period and which the seller finds to be so defective.

The integrity of NASS products and systems cannot be finally checked until all devices and circuits are connected to form a complete system or an effective portion thereof. Once accepted, NASS's warranty will be limited to parts that have been fully paid for.

Return of equipment to Seller is at Buyer's risk, and expense. Equipment returned to seller must be clearly identified and instructions must be furnished for reshipment to Buyer of the repaired or replaced device. Equipment will be returned to the NASS plant of original manufacture.

Adjustments will not be allowed for products or components which have been subject to abuse, alteration, improper handling or installation, or which have not been operated in accordance with the seller's instructions.

Cancellation of Orders

A cancellation charge will be established on a percentage of completion basis.

Restocking

The seller on equipment returned to NASS for credit/or exchange will charge a restocking fee of 15%.



Credit and Payment

Unless otherwise noted, terms are net 30 days. We may decline to deliver except for cash, or stop goods in transit, whenever for any reason doubt as to your financial responsibility develops. Pro rata payments shall become due with partial shipments. Where you are responsible for delay in shipment of any goods, the date of completion of goods may be treated as the shipment date for purposes of payment. On late payments, the contract price shall be increased by 1 ½ percent per month on the unpaid balance but not to exceed the maximum permitted by law.

Out of Warranty

NASS will repair or replace equipment that is termed out of warranty under the following terms:

- The customer shall return equipment to NASS at customer's expense.
- When the equipment is repaired and returned, customer shall be invoiced for the equipment based on total cost of labor and materials used for repair, test and inspection.

If it is determined by NASS that the repair cost will exceed 50% of the cost of new, NASS will notify the customer prior to the repair being made for direction.

Shipping

Unless you specify otherwise, goods will be boxed or crated, as we deem proper for protection against normal handling.

Routing and manner of shipment will be at our discretion and may be insured at your expense. Delivery of goods to the initial carrier will constitute delivery to you and all goods will be shipped at your risk. A claim for loss or damage in transit must be entered with the carrier and prosecuted by you.

Proprietary Data

Neither you nor any other person shall have any right to or have control over any engineering or production prints, drawings, or technical data which we in our sole discretion may consider proprietary to ourselves.

Software Terms

The following terms apply to products or systems that contain software.

- Subject to the terms and conditions hereof NASS grants you a nonexclusive nontransferable license to use the software at the designated site listed hereof. This license extends wholly to your internal use of the software. The software shall be used only on the platform assigned.
- If the platform is a single personal computer the software may be used by a single user on a single PC system
- If the platform is a local area network the software may be used only on a single local area network at the designated site and in accordance with the number of users designated in the order for the system or as licenses permit.



- If the platform is an embedded device or system, the software may only be used for that single embedded device or system.
- Except with regard to embedded software you may copy the software on the platform identified and make a backup copy of the software for archival purposes.
- Except for the license to use the software as expressly set forth in this agreement all rights, titles and interest in the software shall be retained by NASS. You do not own any copies of the software or any portion thereof. Ownership of the software is retained by NASS. You will not or allow any third party to create a derivative of the work or modify any of the software without the approval of NASS. You will not allow any third party to reverse assemble, decompile, or otherwise reverse engineer all or any portion of the any product or system produced by NASS.

Sales and Service:

The team at North American Signal Systems is available to help you. Please contact our Customer Service Department for inquiries or service repairs. Thanks for being our customer!

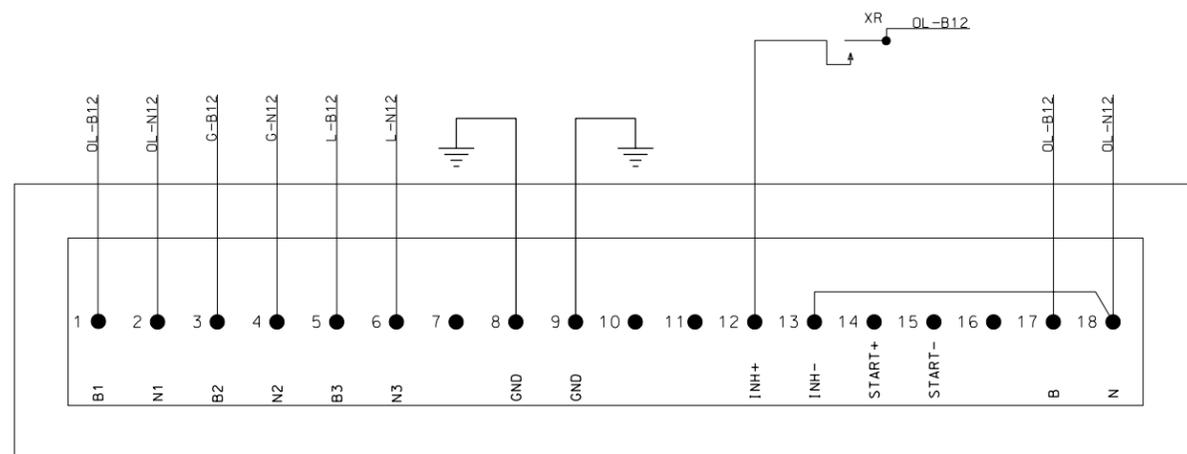
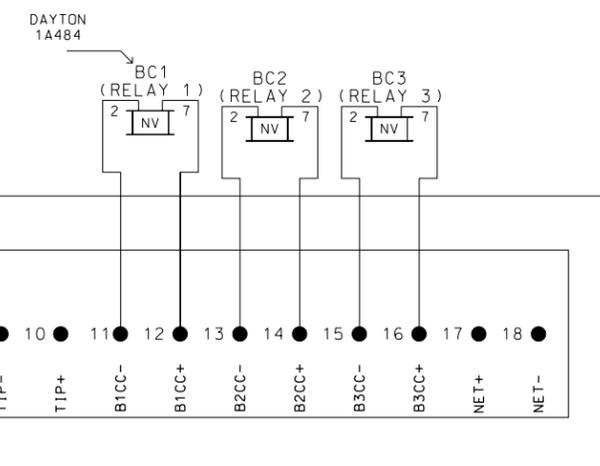
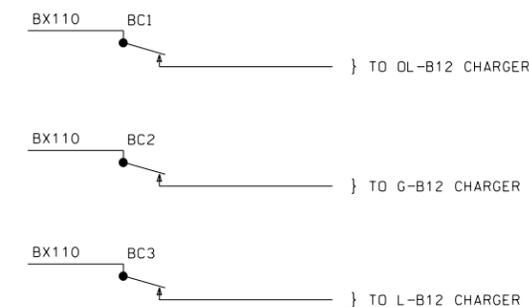
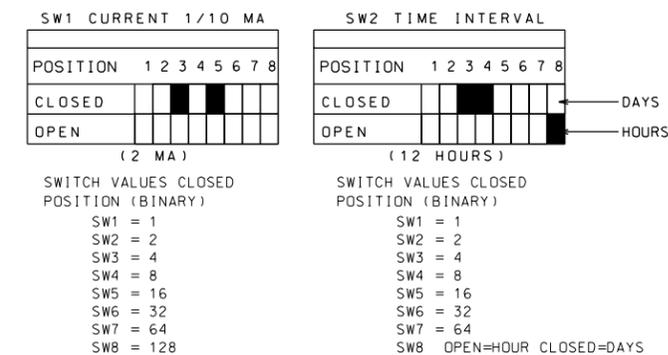
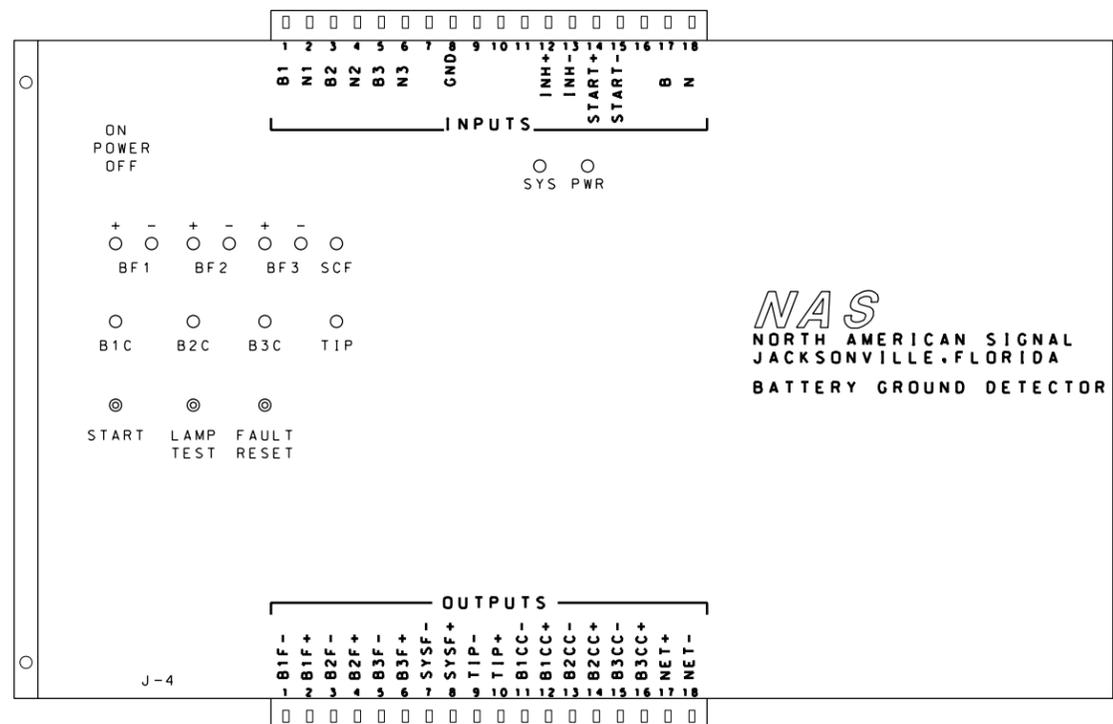
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Appendix

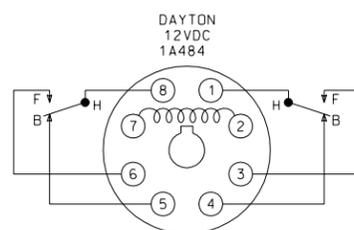
Typical Circuit Interface Drawing

NAS CONTROLLER SOFTWARE CONFIGURATION MANAGEMENT TABLE			
APPLICATION	FILE NAME	DATE	DESCRIPTION
GFD EXEC	GFD_C4.S19	10-14-05	GFD MODULE EXECUTIVE



TOP VIEW INPUTS

BOTTOM VIEW OUTPUTS



DETAIL 1A484

The operation of any circuits and equipment shown herein must be checked by point to point breakdown and complete operational testing of the system (or sections of the system) into which they are connected.

REVISIONS	DR:	NAS/WBY	NORTH AMERICAN SIGNAL, INC. GROUND FAULT DETECTOR TYPICAL	FILE
	DES:	NAS/WBY		
	CHK:			DRAWING NO.
	APPR:			
	DATE:	11-22-05		SH. 1 OF 1

SCALE: NONE