

# DC 16-Circuit Sink and Source I/O Blocks

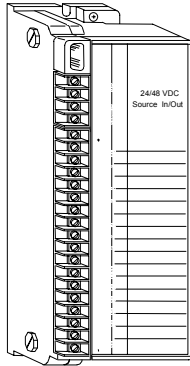
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GFK-1778C

## Description

The **24/48 VDC Source Block** provides current to field output devices. It is suitable for use with 3-wire solid state sensors and electromechanical sensors.

The **24/48 VDC Sink Block**, for use with 3-wire solid-state sensors and electromechanical sensors.



## Features

This block has 16 discrete circuits, each easily configured to be an input, tristate input, or output. Output circuits can be connected directly to input circuits without the use of other components or inversion of logic states.

Control power is tapped off the input/output device voltages wired to the terminals. No separate block power supply is needed.

Configurable features include:

- Output Pulse Test capability
- Selectable Input Filter Time from 10ms to 100ms
- Output powerup defaults
- Output Hold Last State or default
- Blocking diodes and feedback resistors for redundancy applications

The block's advanced diagnostics can pinpoint causes of installation and run-time errors. Diagnostics features of these blocks include:

- Electronic short circuit protection
- Overtemperature protection
- Failed switch detection
- Open wire detection for tristate inputs
- Overload detection and shutdown
- No-load detection

## Using this Datasheet

This datasheet summarizes information about block installation, configuration, and diagnostics. Your primary reference should be the *Discrete and Analog Blocks User's Manual*. It includes detailed instructions for block installation and configuration.

For additional information about systems and communications, including bus specifications, refer to the *I/O System and Communications Manual*.

For details about GMR, please refer to the *GMR User's Manual*.

## Specifications

| Catalog Numbers                             |  |             |           |
|---|--|-------------|-----------|
| Block type                                  | 16 circuit discrete input and output                             |             |           |
| 24/48 VDC 16 Circuit Source I/O Block       | IC66*BRD020  |             |           |
| Terminal Assembly only                      | IC66*TRD020  |             |           |
| Electronics Assembly only                   | IC66*ERD020  |             |           |
| 24/48 VDC 16 Circuit Sink I/O Block         | IC66*BRD021  |             |           |
| Terminal Assembly only                      | IC66*TRD021  |             |           |
| Electronics Assembly only                   | IC66*ERD021  |             |           |
| Block Specifications                        |  |             |           |
| Size (height x width x depth)               | 8.83" (22.44cm) x 3.56" (9.05cm) x 4.42" (11.23cm)               |             |           |
| Weight                                      | 4 lbs. (1.8 kg)  |             |           |
| LEDs (I/O Block)                            | Unit OK, I/O Enabled   |             |           |
| LEDs (each circuit)                         | Individual load side indicators                                  |             |           |
| Block to block Isolation                    | 1500V  |             |           |
| Heat Dissipation                            | 91.5 Watts with 16 outputs on at 2 Amps.                         |             |           |
| Operating voltage                           | 18-56 VDC (24/48 V), 18-30 VDC (24 V)                            |             |           |
| Ripple (maximum)                            | 10%  |             |           |
| Required DC power                           | 150mA typical, 300mA maximum                                     |             |           |
| Power supply dropout time                   | 10ms   |             |           |
| Input Specifications                        |  |             |           |
| For standard input, voltage relative to DC- | <b>Source</b>  | <b>Sink</b> |           |
| Input ON                                    | 24 VDC supply  | 16-24 VDC   | 0-8 VDC   |
|   | 48 VDC supply  | 32-48 VDC   | 0-16 VDC  |
| Input OFF                                   | 24 VDC supply  | 0-7 VDC     | 17-24 VDC |
|   | 48 VDC supply  | 0-14 VDC    | 34-48 VDC |
| Input impedance (typical)                   | 5.6K Ohms (24/48V), 1.8K Ohms (24V)                              |             |           |
| Input processing time (typical)             | 1.7ms (plus selectable filter delay)                             |             |           |
| Selectable input filter times               | 5-100ms  |             |           |
| Input diagnostics                           | Open Wire, Overtemperature, Failed Switch                        |             |           |
| Output Specifications                       |  |             |           |
| Output current (steady state)               | 2 Amps per circuit   |             |           |
| Maximum inrush current                      | 10 Amps up to 10ms   |             |           |
| Block output current                        | 15 Amps at 35°C  |             |           |
| Output OFF leakage current                  | 1.0 mA   |             |           |
| Maximum switching frequency                 | Once per second (high inrush current)                            |             |           |
| Output turn-on delay (maximum)              | 1ms  |             |           |
| Output voltage drop                         | 2.0 volts maximum at 2 Amps inrush                               |             |           |
| Minimum Recommended Load                    | 50 mA with No Load enabled                                       |             |           |
| Output Diagnostics                          | Short Circuit, Overload, No Load, Failed Switch, Overtemperature |             |           |
| Environmental Specifications                |  |             |           |
| Operating Temperature                       | -0° to +60°C (32° to +140°F)                                     |             |           |
| Storage Temperature                         | -40 °C (-40° to +212°F)  |             |           |
| Humidity                                    | 5% to 95% (non-condensing)                                       |             |           |
| Vibration                                   | 5-10 Hz 0.2" (5.08mm) displacement, 10-200 Hz at 1G              |             |           |

Refer to GFK-0867 for product standards and general specifications.

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## Compatibility

Any Hand-held Monitor can be used with this block. HHM version IC66\*HHM501 is required to change baud rate configuration or to configure the block for redundancy.

For an IC697 series PLC, the CPU and programming software must be version 2.0 or later. The bus controller must be IC697BEM731C or later.

For an IC600 series PLC, the CPU must be rev. 105 or later. For an IC600 series Plus PLC, rev. 110 or later is required. The programming software must be rel. 4.02 or later. If the bus controller is model IC66\*CBB900, it must be version C or later. For an IC550 series PLC, the CPU must be rev. 3.0 or later. The programming software must be rel. 2.01 or later.

## Block Operation

Each circuit can be configured as an input, a tristate input, or an output. If the block is configured as a combination block, output feedback is provided via the corresponding input references.

## Wiring Changes for GMR Output Groups

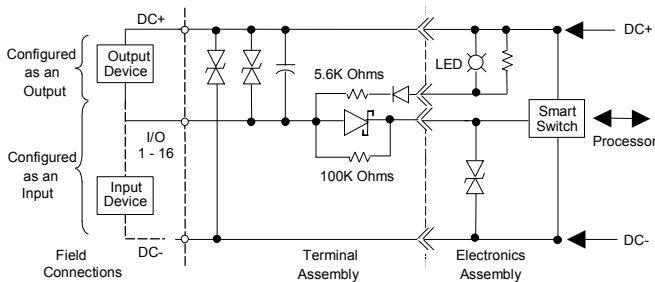
An isolation or blocking diode is incorporated into the Terminal Assembly for every point on these blocks. These internal diodes make it unnecessary to add external diodes in series with outputs, to perform the same blocking/isolation function.

For example, these blocks do not require external diodes in series with "Q16" outputs in "Power feed" applications shown in GFK-1277. External diodes are also not needed in conjunction with the standard external 4700pF capacitor, when these blocks are used in "H", "T" or "I"-pattern GMR Output Groups. The blocking or isolation function is already provided by the diodes in the Terminal Assembly.

External isolation diodes are still needed on common inputs. See GFK-1277 for additional information about using diodes with GMR applications.

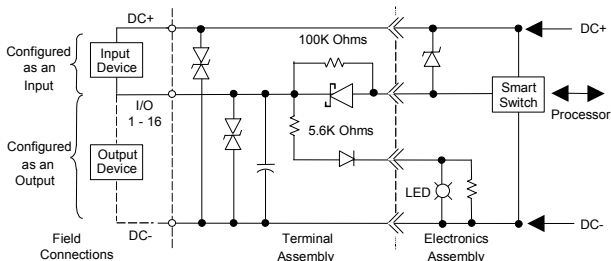
## 16 Circuit DC Sink I/O Blocks

A DC sink block has all output devices connected to the positive (+) side of the power supply. Inputs control the negative (-) side.



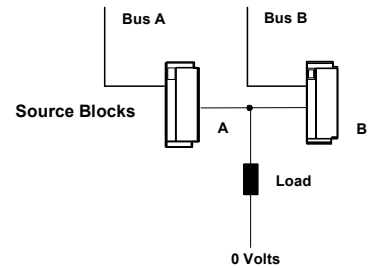
## 16 Circuit DC Source I/O Block

A DC source block has all output devices connected to the negative (-) side of the power supply. Inputs control the positive (+) side.



## GMR 2-Block T Output Group

A T- output group consists of two source-type blocks, connected in parallel on one side of the load. The other side of the load is tied to ground. The two blocks must be connected to two different busses.



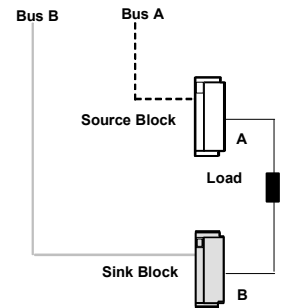
In a 2-block T output group, current to output loads is shared. Therefore, it is not possible to be sure exactly how much power is being provided by each block. If

16-circuit blocks in a 2-block T output group are configured for No Load fault reporting, the minimum connected load that can be used is 100mA.

In a T-output group, the blocking diodes in block IC66\*BRD020 minimize the reverse current into a block that is powered down or not driving the load. The blocking diodes prevent the block from being powered through its I/O points by the other block in the output group.

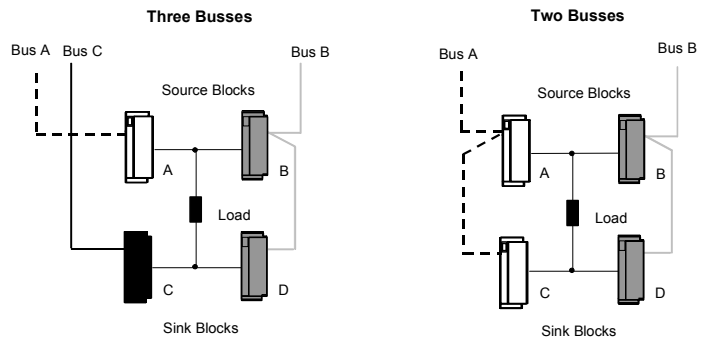
## GMR I-Block Output Group

An I-Block Output Group consists of a source-type block connected to one side of the load and a sink-type block connected to the other side. This type of group is most suitable for redundant shutdown applications. Both blocks in an I-Block Output Group must be either 16-circuit or 32-circuit blocks. The two blocks must be connected to two different busses.



## GMR H-Block Output Group

In an H-Block Output Group, two source-type Genius blocks are connected in parallel on one side of each load and two sink-type Genius blocks are connected in parallel on the other side. An H-Block Output Group requires either two or three Genius busses.



If the blocks are on three busses, one source and one sink block in the group must be on the same bus. The two blocks on the same bus must have different serial bus addresses. If the blocks are on two busses, one source and one sink block are on one bus and the other source and sink block are on the other bus. Any blocks that share a bus must have different serial bus addresses.

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## Configuration Required for Input Autotest

For 24/48VDC blocks in a GMR system, if Input Autotesting for the Input Group is turned ON in the GMR Configuration, then during the Genius configuration of the blocks in the group, the Output Pulse Test feature must be disabled. Otherwise, circuits that would normally pass the Input Autotest are incorrectly reported as having failed. When Output Autotest is disabled, the Input Autotest feature functions correctly.

## Diagnostics

The block always performs its standard diagnostic checks, plus two configurable output diagnostics. The block reports all faults to the Hand-held Monitor, and takes appropriate corrective action.

**Short Circuit Diagnostic (standard)** If the instantaneous current exceeds 10 Amps at turn-on, the block turns the output off. The block attempts to restart the load; if two attempts are unsuccessful, the output circuit is forced off and the block sends a SHORT CIRCUIT message. The cause of the current surge must be removed, then the diagnostic must be cleared from the HHM or the CPU.

**Overtemperature Diagnostic (standard)** If the block's internal temperature exceeds 120° C, the block sends an OVERTEMPERATURE message and turns off the circuit to protect its internal electronics.

**Failed Switch Diagnostic (standard)** For an output, Failed Switch is reported if the circuit's switch state is not the same as its commanded state. The block sends a FAILED SWITCH message identifying the failed circuit. The logic state of the circuit is set to OFF. If the output switch has failed shorted (or closed), current flow is not interrupted when the block forces the output state OFF. Action external to the block must be taken to remedy the problem.

Several additional switch faults independent of the output state are detected and reported as Failed Switch faults on both input and output-configured circuits. Examples include loss of communications with the block's internal microprocessor and some internal power supply faults.

Note that in GMR applications, Failed Switch operates differently. See the *GMR User's Manual* for details.

**Open Wire Diagnostic (standard)** Indicates electrical (not mechanical) malfunctions on a tristate input. The circuit must have a non-inductive resistor placed as close as practical to the actual dry contacts (such as across the field device terminals), as shown previously.

**Overload Diagnostic (configurable)** If Overload Shutdown is enabled, the block will turn the output off and send an OVERLOAD message if a load exceeds 2.8 Amps DC continuously for 10ms. currents. Exceeding these limits may cause an overtemperature fault.

A load that requires more than 2 Amps DC can be configured not to shut off at this level or send the OVERLOAD message.

**No Load Diagnostic (configurable)** If a load does not continuously draw 50mA from the output circuit, the block sends a NO LOAD message. A No Load condition may cause an HHM monitoring the block to display 0 for the circuit although there is voltage at the output and the circuit LED is on. This diagnostic should be not be used for circuits on which very small loads (small relays, transformers, or indicating lamps) will draw less than 50 mA. In GMR applications, No Load operates differently. See the *GMR User's Manual* for details.

## Configuration

First, the block must be configured with a Hand-held Monitor to:

- Enter its Device Number (serial bus address).
- Enter its Reference Number (required only for IC600 and IC550 series PLCs only).

In addition, unless all circuits on the block will be inputs, the Block I/O Type must be set to either Outputs or Combination on the *Program Block ID screen*.

**Note:** If a block is configured offline, it must be properly grounded and have a 75 Ohm resistor installed across its Serial 1 and Serial 2 terminals. See the *Discrete and Analog I/O Blocks User's Manual* for instructions.

The rest of the features can be configured either using a Hand-held Monitor, or by sending a Write Configuration datagram to the block from the host.

| Feature              | Circuit or Block | Factory Setting | Selections                       |
|----------------------|------------------|-----------------|----------------------------------|
| Baud Rate            | B                | 153.6 std       | 153.6 std, 153.6 ext, 76.8, 38.4 |
| Block I/O Type       | B                | input           | input, output, combination       |
| Pulse Test           | B                | enabled         | enabled, disabled                |
| Input Filter Time    | B                | 20ms            | 5-100ms                          |
| Circuit I/O Type     | C                | input           | input, output, tristate input    |
| Report Faults        | C                | yes             | yes, no                          |
| Hold Last State      | C                | no              | yes, no                          |
| Output Default State | C                | off             | on, off                          |
| Detect No Load       | C                | yes             | yes, no                          |
| Overload Shutdown    | C                | yes             | yes, no                          |
| BSM Present          | B                | no              | yes, no                          |
| Output Timeout       | B                | 3 bus scans     | 2.5, 10 seconds                  |
| Redundancy Mode      | B                | none            | none, standby, duplex, GMR       |
| Duplex Default       | B                | off             | on, off                          |
| Config. Protect      | B                | disabled        | enabled, disabled                |

## Installation Instructions

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

## Block Mounting

Genius I/O blocks are considered "open equipment" and therefore must be installed within a protective enclosure. They should be located in an area that is clean and free of airborne contaminants. There should be adequate cooling airflow.

The block can be mounted right side up, or upside down. Leave at least 2 inches of space between blocks. Mount the block by drilling two screw or bolt holes for 8-32 hardware. Position the block so that the notches in the upper and lower flanges line up with the mounting holes. Mount the block using 8-32 screws. Use star washers to provide ground integrity.