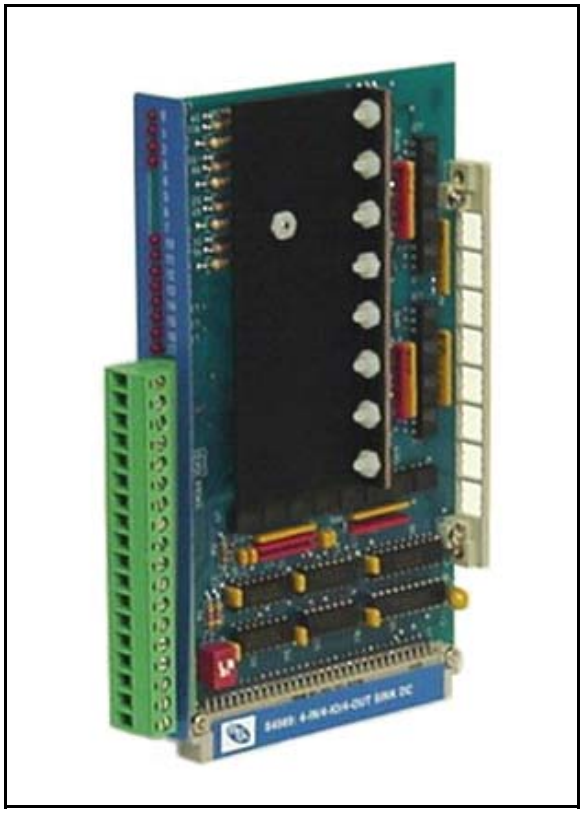
SYSTEMS ELECTRONICS GROUP

SYSTEMS M4500 INDUSTRIAL CONTROLLER

S4569: DIGITAL DC I/O BOARD

4 DIFF INPUTS, 4 BIDIRECTIONAL SINKING I/O AND 4 SINKING OUTPUTS (10-30VDC)



- **Four Differential 10-30VDC High Speed Input Points**
- **Four Bidirectional (input or output) 10-30VDC Sink I/O Points**
- **Four 10-30VDC Sinking Output Points**
- **0.5 Amp Drive Capability on Bidirectional and Output Points**
- **Output Transient Protection (Bidirectional and Output points)**
- **Removable Field Wiring Connector**
- **Optical Isolation**
- **Standard M4500 I/O Form Factor**

General Description

The S4569 is a flexible I/O board for use with the M4500 product family. The board contains four 10-30VDC differential inputs which can be connected as either sinking or sourcing, four 10-30VDC bidirectional I/O points which can independently be connected as sinking inputs or sinking outputs, and four 10-30VDC sinking outputs.

The on/off status of each I/O point is indicated with individual LEDs located on the front of the board. The LEDs provide the status of the actual I/O point (field side) rather than the internal logic status. For the bidirectional I/O and outputs, the LED shows the correct status of the respective point whether or not a load is connected to the point. Input, output and user power wiring is implemented with a removable 18-pin field wiring connector which allows easy board replacement.

The four differential inputs are read in bits 0-3 of the least significant byte (byte 0) of the slot that the board is addressed as. The input status of the four bidirectional I/O points is read in bits 4-7 of this same byte. The output status of the four bidirectional I/O points is mapped in bits 0-3 of byte 1 of the slot that the board is addressed as. The output status of the four output points is mapped in bits 4-7 of this same byte.

Differential Inputs

The input section consists of four isolated differential 10-30VDC high speed inputs which can be connected in three possible ways. As a sourcing type, the input is connected with the (-) input terminal to the return of the power supply, the (+) input terminal is then switched to the (+) of the supply. As a sinking type, the input is connected with the (+) input terminal to the (+) of the supply, the (-) input terminal is then switched to the return of the supply. As a true differential type, the input is driven by a differential line driver type output where the (+) input terminal is connected to the (+) of the driver output, the (-) input terminal is then connected to the (-) of the driver output.

The input is "on" when the voltage at the (+) terminal is greater than +10 volts relative to the (-) terminal. The maximum allowed differential voltage ((+) terminal to (-) terminal) is +30 volts. The input is "off" when the voltage at the (+) terminal is less than +5 volts relative to the (-) terminal. The (+) terminal can driven as much as minus 30 volts relative to the (-) terminal.

Note that the four differential inputs are completely isolated from each other as well as from the bidirectional I/O and outputs. Thus each individual input could be driven from a different, non-commoned power source.

Outputs

The output section contains four identical solid state circuits which convert the logic status of bits, written from the M4500 processor, to the appropriate voltage in order to drive user devices such as solenoids, relays, and lamps. Theses standard outputs are powered from a single 10-30VDC power source (+10 to +30VDC connected to (+) terminal of S4569 and the return of the power supply connected to the (COM) of the S4569).

On a given output point, writing a "1" to the point turns the output "on"; writing a "0" turns the output "off". When the output is "on", the voltage at the output is low (approximately zero). When the output is "off", the voltage at the output is high (approximately equal to the user's power supply voltage). An output will "sink" current from the load when "on", thus the outputs are defined as "sinking".

Each output is rated at 0.5 amp DC (continuous) with in inrush (pulsed) current drive capability of 3 amps for 100msec. The sum of all outputs current (including both the four bidirectional I/O and the four standard outputs) cannot, however, exceed 4 amps continuous. The S4569 does not contain output fusing, therefore external fusing at each output point and at the user's Vcc connection point should be provided.

Each output contains a transient suppression circuit which clamps any transient over-voltage to a level that will not damage the output circuitry. This allows solenoids and other inductive loads to be connected directly to an output point without connecting "fly-back" diodes or other surge suppression devices to the load itself. Outputs may be "collector or'd" such that pulling an "off" output low will not damage the output.

Bidirectional I/O Points

The four bidirectional I/O points can individually be used as inputs, outputs, or outputs with feedback. The bidirectional points are powered from the same source as the standard outputs and thus will operate at the same potential as the standard outputs (10-30VDC range).

When used as an input, a bidirectional I/O point will act as a true sinking type input. An active input device (e.g. proximity switch) must be of the NPN type that will pull "low" and sink current when "on". A mechanical switch or contact would be wired between the bidirectional I/O point and the return of the user's power supply such that when it is closed, the input would be pulled "low". Note that the bidirectional I/O points contain a 2.2K pull-up resistor that will pull the I/O point "high" (up to the user's power supply voltage) when the input is "off".

To use a bidirectional I/O point as an input, simply set the corresponding output bit for the I/O point to a "0". The output portion of the I/O point will be "off" and then the point can be driven by an external device to turn the point "on" and "off".

When used as an output, the bidirectional I/O point functions identically as the standard output points (same current ratings, transient suppression, etc.). Writting a "1" to the corresponding output bit of the point turns it "on" (sinks low), writing a "0" turns it "off" (pulls high).

A bidirectional I/O point can also be used as an output with feedback monitoring. The input bit of an I/O point can be read (as if it were an strictly an input) while at the same time the output bit controls the point as an output.

Installation

Prior to installing the S4569, the I/O slot addressing dip switch on the board must be set for the slot the board will be addressed as.

Note: Geographical addressing is not used in the M4500. The slot the S4569 is addressed as is solely defined by the dip switch settings on the S4569 itself not by the slot in the M4500 chassis that the board is placed in. Two poles on the dip switch of the board set the binary slot address of the board as follows:

S4569 SW1 Dip Switch Slot Addressing

2	1	Slot Address
off	off	0
off	on	1
on	off	2
on	on	3

The SW1 Slot address dip switch is located in the upper left hand corner of the component side of the S4569. The respective switch pole is "on" when in either the "on" or "close" position and "off" when either in the "off" or "open" position depending on the type of dip switch used.

To install the S4569 in the M4500 chassis, turn power to the M4500 "off" and remove the cover plate of the M4500 by loosening the captive screws that retain it. Install the S4569 in the respective slot of the M4500, making sure the DIN connector on the S4569 fully mates with the DIN connector in the M4500 motherboard and that the top of the S4569 is seated correctly in the card guides at the top of the M4500. Install the M4500 cover back onto the M4500 making sure the LED's and Field connector protrude through the respective openings in the cover. The M4500 cover will retain the S4569 both from the top and the front, holding the S4569 in place during normal operation. Tighten the captive screws that retain the cover on the M4500. Install the female field wiring connector to the corresponding male connector on the S4569. The S4569 is now installed and ready to run. To remove the S4569, simply perform the previous steps in reverse.

Specifications

Board Size:

Length:	6.50"
Height:	4.25"
Width:	0.80"

Power Requirements (P4500):

+5VDC:	50 milliamps
+12VDC:	0 milliamps
-12VDC:	0 milliamps

Temperature Ranges:

Storage:	0 to 85 degrees C
Operating:	0 to 60 degrees C

Relative Humidity: 5 to 95%

Differential Input Section:

Number of Inputs: 4

Input Voltage:

Vin (on-min):	10.0 volts
Vin (on-max):	30.0 volts
Vin (off-min):	5.0 volts

Input Current (max): 20 milliamps at Vin=30 volts (imped=1.5K)

Input Filter Delay:

min delay:	25 microseconds
max delay:	60 microseconds

Specifications

Output Section (standard and bidirectional I/O):

Number of Standard Outputs:	4
Number of Bidirectional Outputs:	4
Output Voltage:	
Voltage Range:	10-30VDC (sink)
Vout (on-max)	2.0 Volts at Iout = 0.5 amps
Vout (off-min)	VCC-1.5 volts
Output Current:	
Iout (on max - continuous):	0.5 amps DC
Iout (on max - pulsed):	3.0 amps DC (for 100msec)
Iout (off max - leakage):	100 microamps
Output Response Time:	
max on time:	50 microseconds
max off time:	50 microseconds

Bidirectional Input Section:

Number of Bidirectional Inputs:	4
Input Voltage:	
Voltage Range:	10-30VDC (sink)
Vin (on-min):	VCC-10 volts
Vin (off-max):	VCC-5 volts
Input Current (max):	15 milliamps at VCC=30 volts; Vin=0 volts
Input Filter Delay:	
typ delay:	0.50 milliseconds
min delay:	0.35 milliseconds
max delay:	0.80 milliseconds

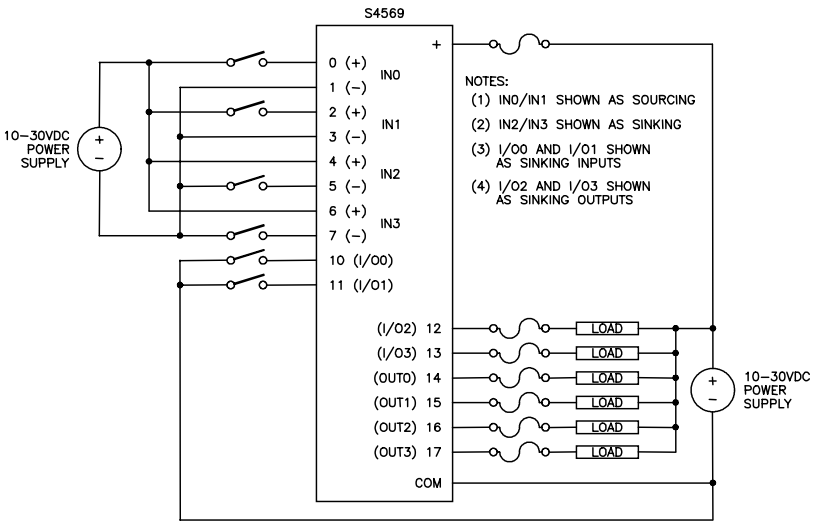


Figure 1
Typical User Wiring

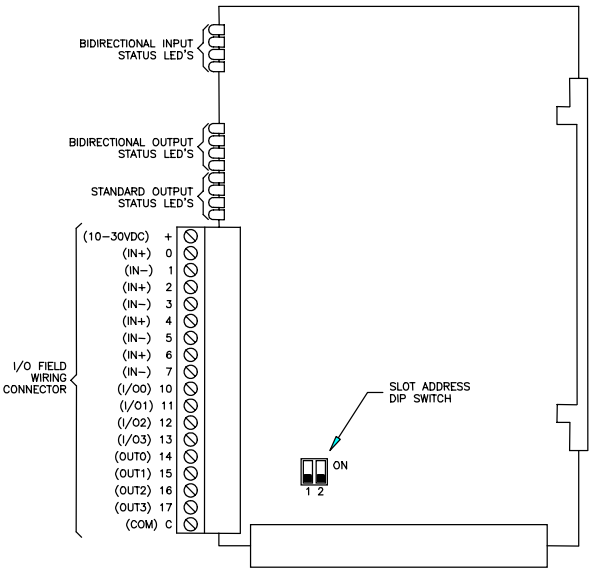


Figure 2
Board Outline