

5101 Engine Start Monitoring System

Installation Manual

381333-474 F
12/2020



Table of Contents

GENERAL INFORMATION	3
Overview	3
Main Specifications	3
Dimensions 5101-GEN Reference Drawing	4
5101-ATS Reference Drawing.....	4
SYSTEM ARCHITECTURE	5
SYSTEM COMPONENTS/REQUIREMENTS.....	6
Generator Module (5101-GEN) Requirements.....	6
Transfer Switch Module (5101ATS) Requirements.....	6
DESCRIPTION OF OPERATIONS	7
Testing	8
LED Status.....	8
CONFIGURATION and INSTALLATION	9
Steps of Installation	9
SETTINGS	13
5101-GEN Module	13
DIP Switches	13
START-UP CHECKLIST	14
CALIFORNIA PROPOSITION 65 WARNING	15
INDEX.....	16

General Information

Overview

A susceptible location for a control wiring fault is in the long distance wire run between a transfer switch's locations to the generator's location. This wire run could travel through hundreds of feet of conduit in any part of a facility where damage due to construction or other factors could go unnoticed for extended periods. This could result in generators failing to start when called upon by transfer switches during outage conditions.

The ASCO 5101 Engine Start Monitoring System (5101-ATS/5101-GEN) is a system designed to forward engine start signals while continuously monitoring for wiring faults according to the electrical code NEC 700.10. Typically, the transfer switch control circuits use a relay contact to signal the generator to start. The transfer switch engine start contact is connected to the generator using two wires. The generator and transfer switch may be close together or may be a long distance apart. In some cases, a single transfer switch is used with a generator, but in other cases multiple transfer switches may need to start the same generator.

During proper operation, the generator controls detect the relay state and determine if the generator should be started. Depending on the system, the contact may either open or close to signal a start condition. The engine start relay has only two states: open or closed. In the event that a fault occurs in the signal wiring, the generator start function may not function properly.

The 5101 Engine Start Monitoring System uses two modules: (5101-ATS and 5101-GEN) one at each transfer switch and one at the generator. The generator module receives the engine start signal from each ATS module (up to 8 modules) and monitors for any faults in the wiring. If the 5101-GEN receives any engine start signal or if it detects any faults, it will send the start signal to the generator and provide an alarm.

When used with switchgear or power control systems, the 5101 Engine Start Monitoring System should only be applied to the wiring between the transfer switches and gear. The 5101 solution should not be applied between the power control system and generator due to the fact that this is considered part of the generator control wiring and requires many more critical signals to properly operate the generator beyond the traditional two wire engine start (ex. synchronization, breaker control and cranking control signals, etc.).

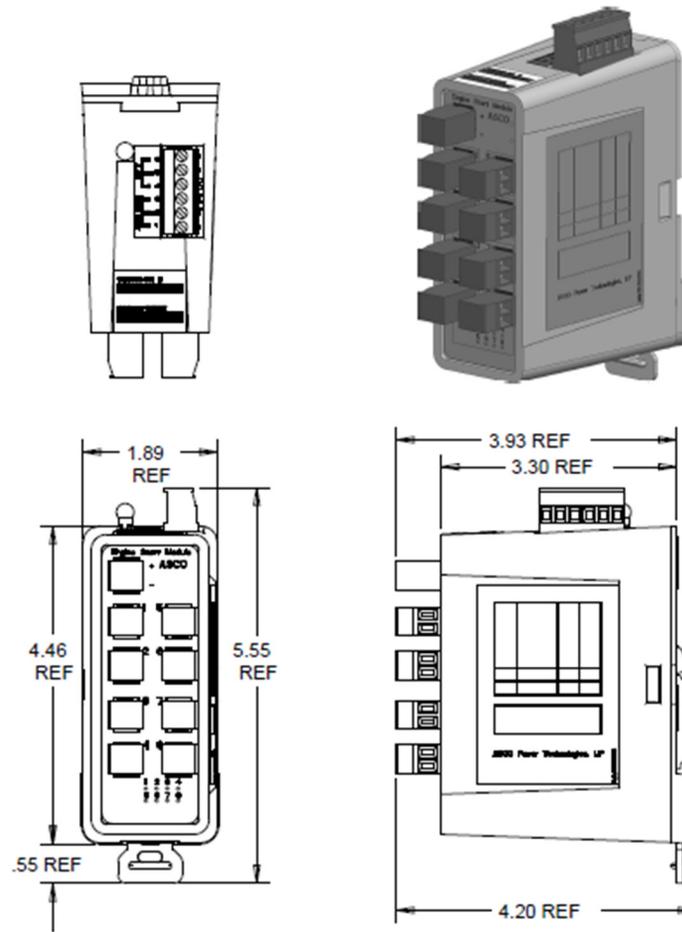
Main Specifications

Parameter	Description
DC Power	9-27V 5W max (Gen- Module) / ATS module does not require power
Internal Ride Through Power	3 seconds minimum
Mounting	35mm DIN rail
Operating Temperature Range	-20°C to 70°C
Maximum Distance	1000 feet one way from ATS to GEN (2000 feet loop)*
Maximum Wire Loop Resistance	Resistance must be less than 100Ω ohms
Generator Module Start Contact	1A 30VDC (Form C)
Generator Module Alarm Contact	1A 30VDC (Form C)
Wire Gauge	12-30 AWG stranded
Wire Type	Must use Class 1 wiring
Certifications	UL Listed

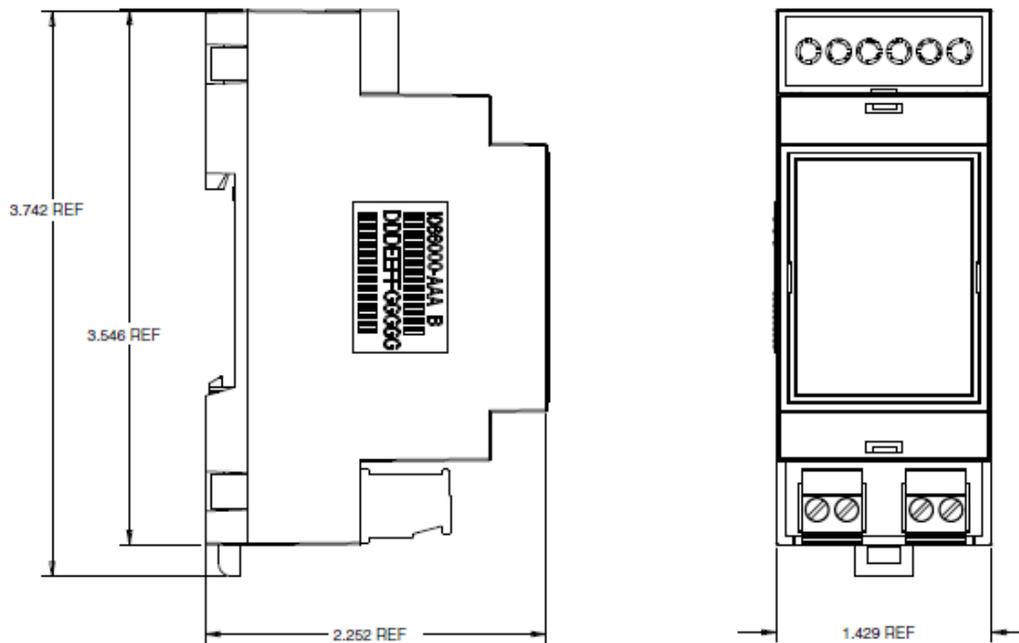
*Contact ASCO Power Technologies for longer distances.

Dimensions

5101-GEN Module Reference Drawing



5101-ATS Module Reference Drawing



System Architecture

Figure 1 shows the overall structure of the 5101 Engine Start Monitoring System, while Figure 2 shows a simplified version of the installation.

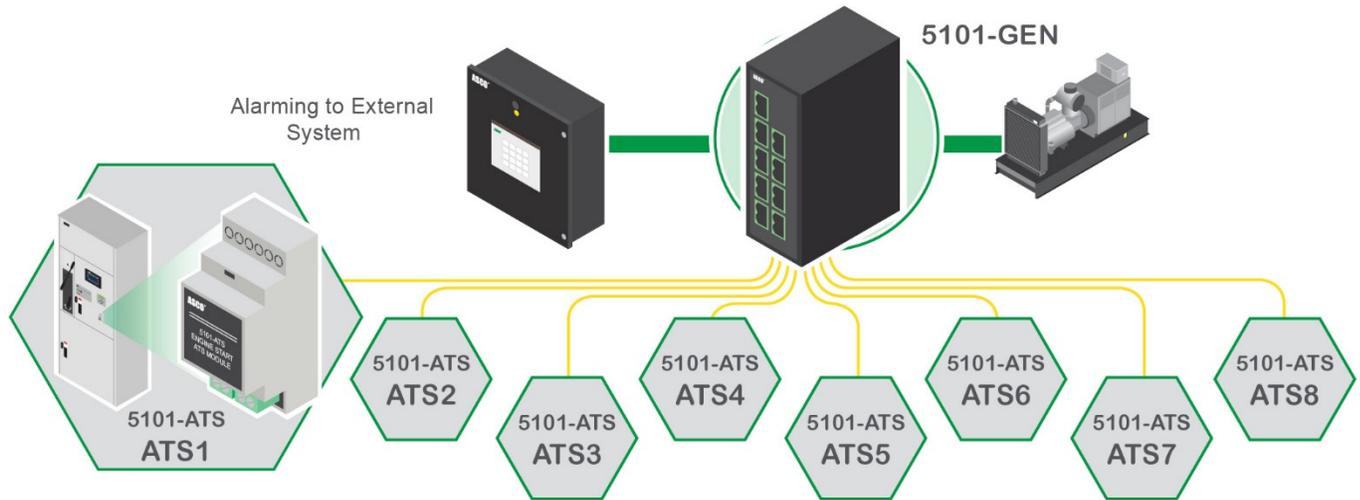


Figure 1. System Block Diagram

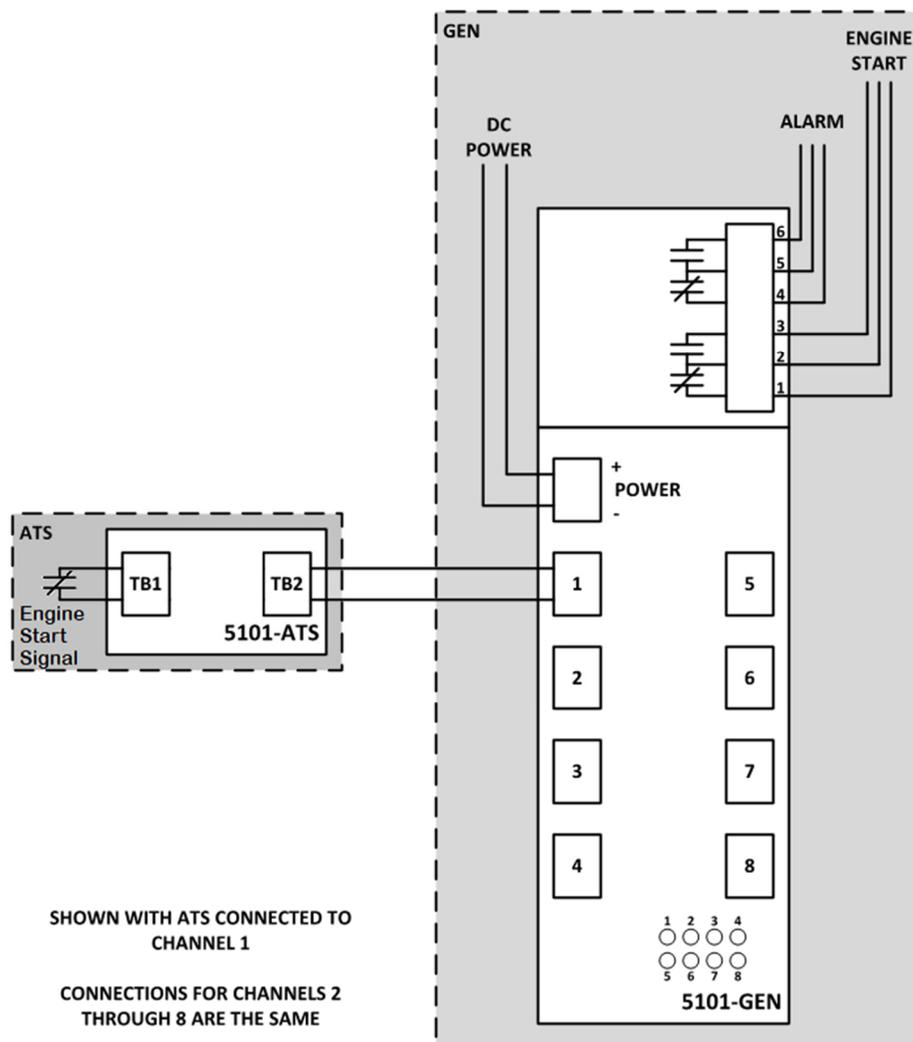


Figure 2. Installation Diagram

System Components/Requirements

- **Generator Module (5101-GEN)**
 - Inputs
 - Requires power from a 9-27Vdc source (usually 12Vdc generator battery)
 - Receives up to 8 individual signals from ATS modules (5101-ATS)
 - Outputs
 - Sends engine start signal to the generator via form C output.
 - Provides alarm signal (form C) in case of fault.
- **Transfer Switch Module (5101-ATS)**
 - Inputs
 - TB1 is connected to the engine start signal relay of the transfer switch controls.
 - Outputs
 - TB2 is connected to a generator module (5101-GEN)

Generator Module (5101-GEN) Requirements

The Generator module (5101-GEN) must be properly wired to the generator and transfer switch module (5101-ATS) for it to operate correctly. The wiring used must be class 1 wiring. The generator module requires 9-27Vdc control power. The module should be fed from the DC voltage available at the generator. The Generator module should be installed in a segregated communications/controls compartment of the generator.

Prior to operation, the DIP switches on the rear of the module must be configured for the applications. I.e. if the application only requires 5 transfer switches, the other 3 available channels in the module should be disabled. By disabling the unused channels, it prevents false alarms from starting the generator. Based on the system, the unit can be used in 2 modes: START ON OPEN or START ON CLOSE. The user must determine which mode to use and program the module accordingly using the S2-2 DIP switch. (See **Settings** for more information.)

The total length of connection wire between the generator module and the transfer switch module shall not exceed 1000 ft. or 100 Ohms. The module is DIN rail mountable and should be used with standard 35mm DIN rail.

Transfer Switch Module (5101-ATS) Requirements

The Transfer Switch Module (5101-ATS) does not require any power to operate. The module must have its two terminal blocks (TB1 and TB2) wired correctly. TB1 must be connected to the engine start signal relay of the transfer switch controls. The TB2 should have 2 wires going to the generator module.

Like the generator module, the 5101-ATS is DIN rail mountable and should be used with standard 35mm DIN rail.

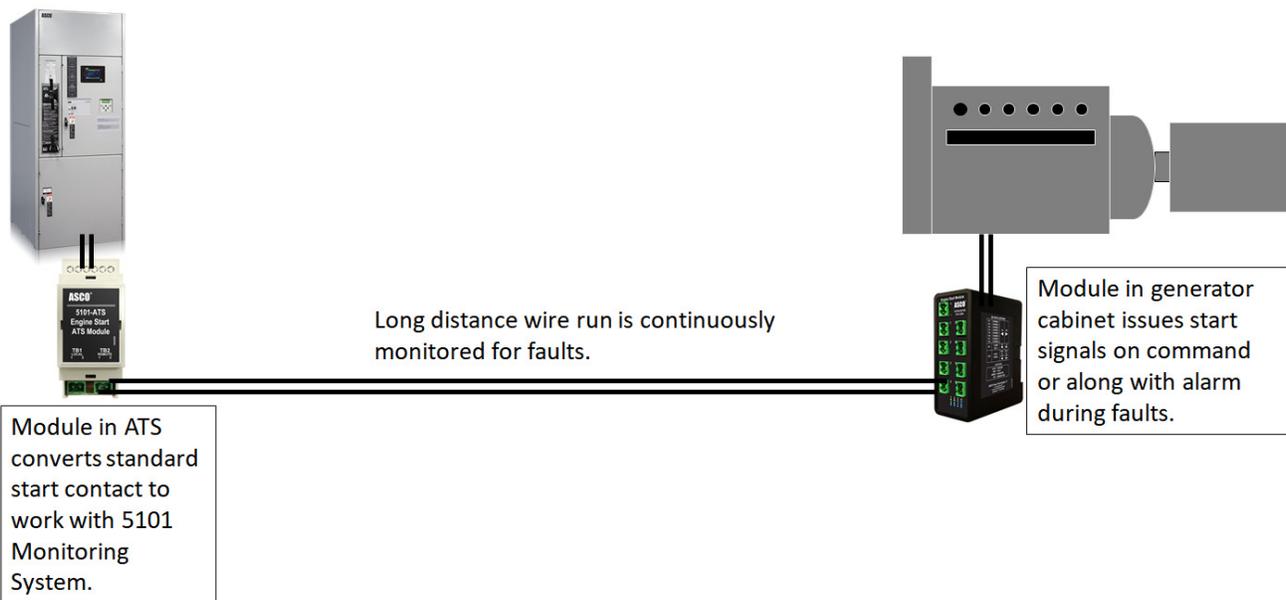
Description of Operations

The 5101 operates using two modules in addition to the traditional engine start contact on a transfer switch and the engine start input at a generator. The first module is the 5101-ATS module which resides near to or within an ATS. The second module is the 5101-GEN module which resides within or near to the generator enclosure. Using these modules allows the system to monitor the integrity of the control wiring between the two modules. Since these modules are extremely close to their terminal points and the long distance run between them is monitored for faults (short or open circuit) they greatly increase the reliability of the system by minimizing the chances that such a fault goes un-noticed.

The system uses a 5101-ATS module placed inside the transfer switch and requires no power. This module connects to the traditional engine start contact (open or close to start) locally within the transfer switch. This module's output (TB2) is then wired to the 5101-GEN module.

The 5101-GEN module requires 9-27Vdc control power from a reliable source (usually generator batteries) to properly operate. It can accept connections from up to 8 5101-ATS modules. The 5101-GEN module's outputs are one Form C output contact used to feed the generator's start input as well as one Form C Alarm contact to feed any external monitoring system.

These two modules work in collaboration to sense the state of the source contact feeding the 5101-ATS module and mimicking its position at the 5101-GEN module. This allows the system to properly start and stop the generator during normal operation with intact wiring, however, should the two modules detect a short or open fault between themselves they shall enter alarm mode by dropping out the alarm contact and generator contact. This ensures that the generator is available should a transfer switch require it while also bringing attention to the fault so that it can be corrected.



Testing

To verify that the 5101 system is working correctly, simulate a fault condition and observe the LEDs change colors (See **LED Description** section). To simulate a fault condition for a channel, either remove the channel's terminal block from the front of the generator module or place a jumper across the channel terminal block. In both cases, the channel's LED should change to RED and the alarm relay should de-energize.

LED Status Description

LEDs on the front of the generator module provide status for each channel. The color of the LED indicates the status of the channel.

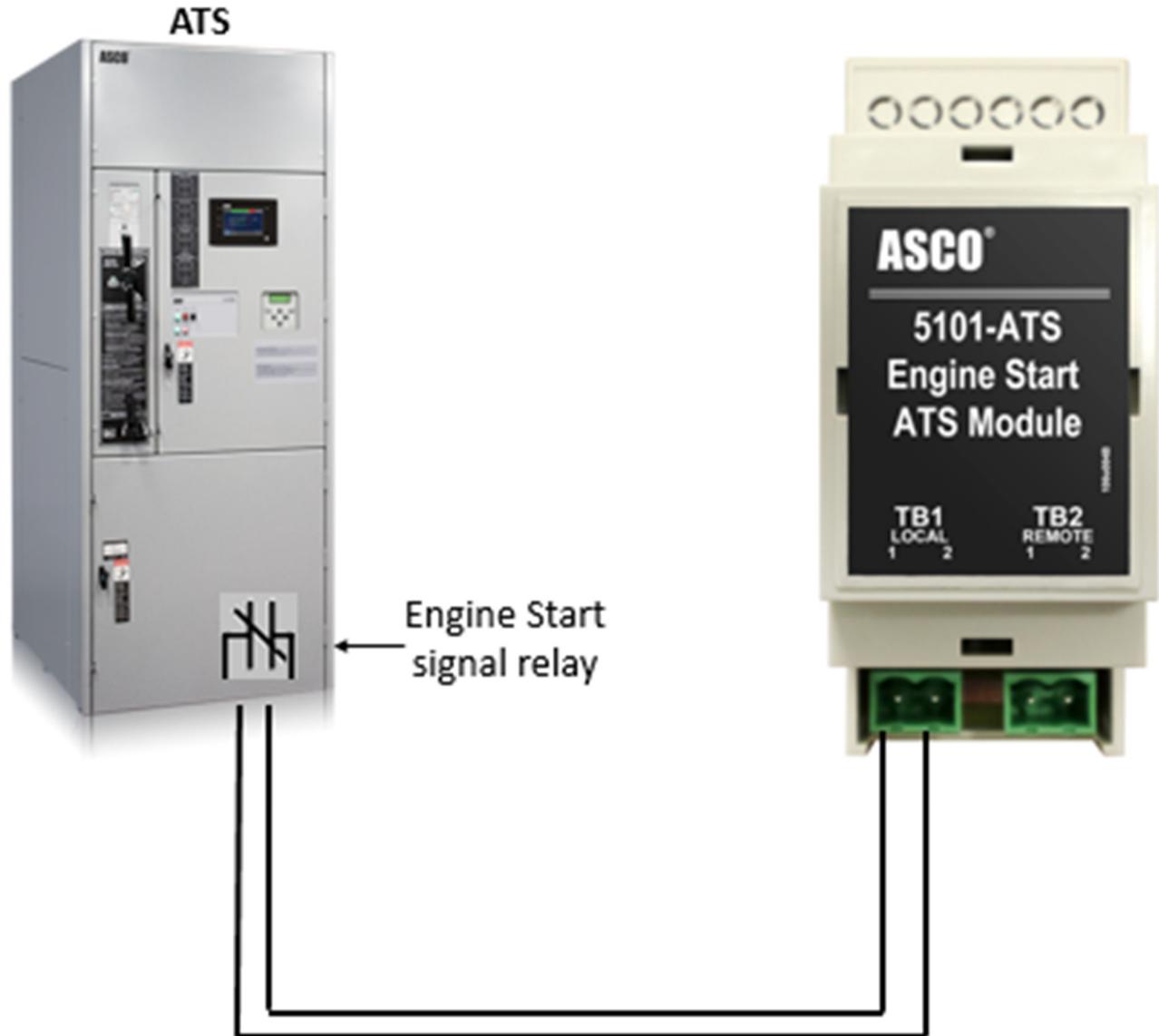
Color	Status Description	Start Output State	Alarm Output State
Blue	Channel is disabled	N/A	N/A
Red	Wiring fault detected	De-energized	De-energized
Green	Engine start is not active – wiring is OK	Energized	Energized
Off	Engine start is active – wiring is OK	De-energized	Energized

Configuration and Installation

Steps of Installation

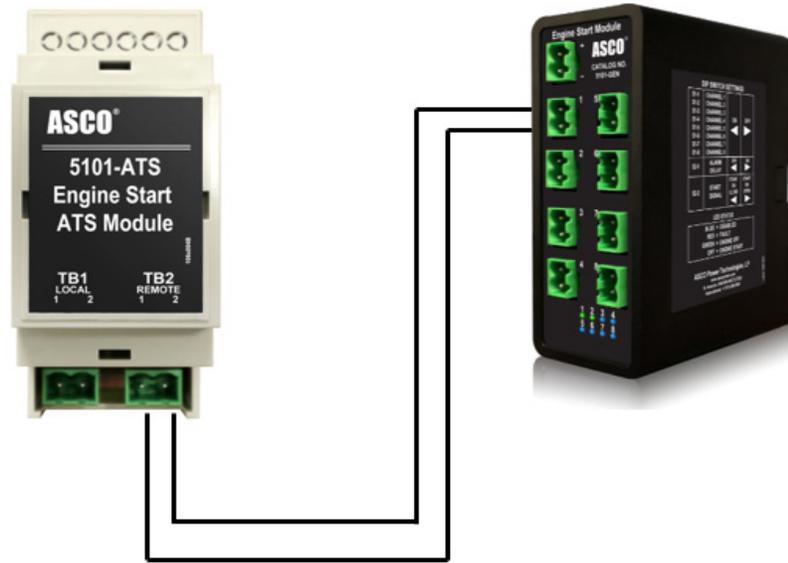
1. Wire ATS Module to Automatic Transfer Switch engine start signal via TB1*.

* Must use Class 1 wiring

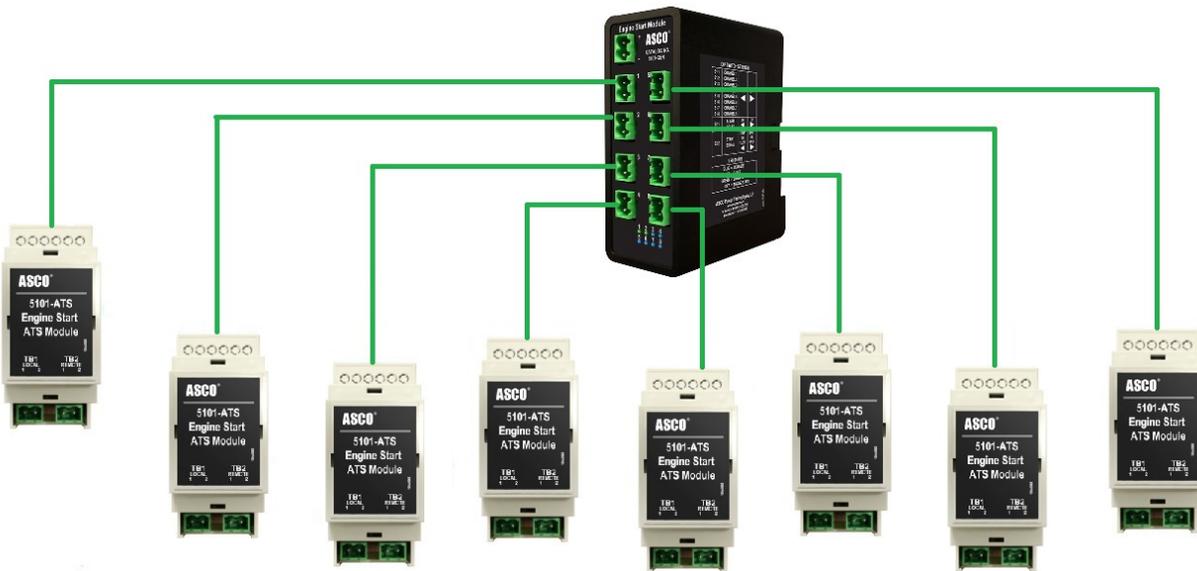


- Wire ATS Module to Generator Module (5101 Gen) via TB2.*

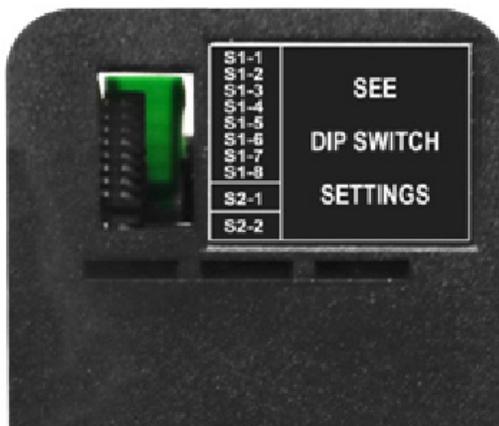
***Installation of the 5101-Gen Module must be in a segregated communications/controls compartment of the generator.**



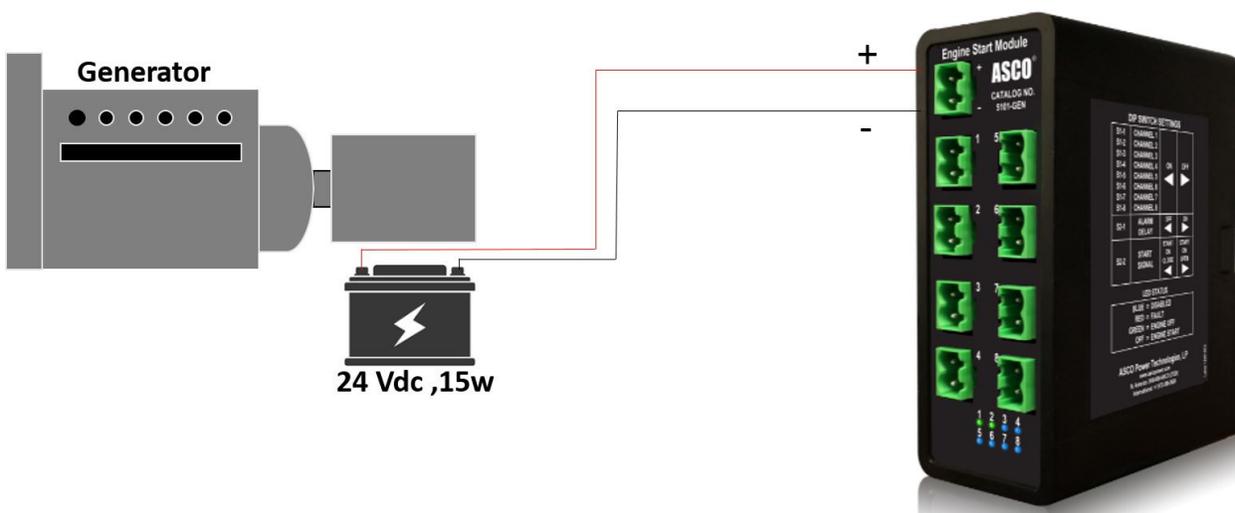
- Repeat steps 1 and 2 for all ATS Modules used.



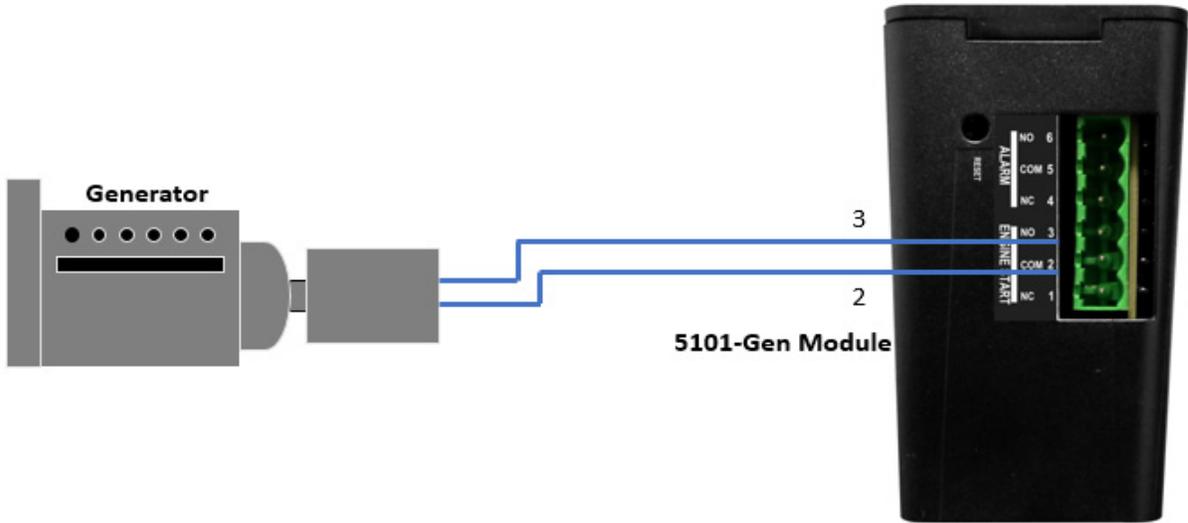
- Confirm and adjust DIP switches as necessary (See **Settings** for more information).



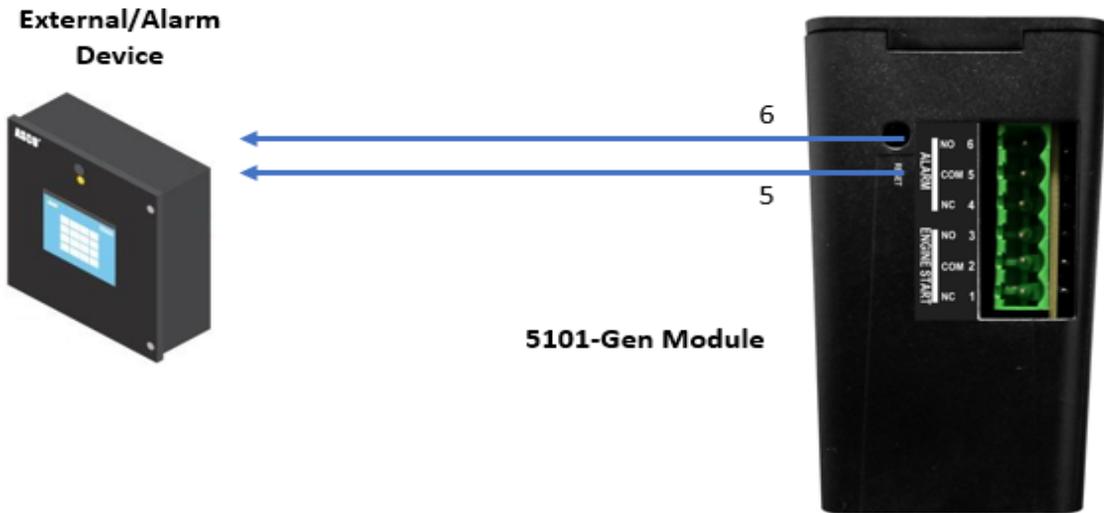
- Wire 5101-GEN to 9-27Vdc power



- 6. Wire desired engine start signal to Generator. NO side of contact will open to signal generator start and NC side of contact will close to signal generator start.



- 7. Wire Alarm signal output to other module/system.



Settings

5101- Gen Module: DIP Switches

The module contains DIP switches in the back which allow the customer to configure the system.



The switches S1-1:8 correspond to channels 1-8 respectively. Toggling left will enable the channel while toggling right will disable it

DIP SWITCH SETTINGS

S1-1	CHANNEL 1		
S1-2	CHANNEL 2		
S1-3	CHANNEL 3		
S1-4	CHANNEL 4	ON	OFF
S1-5	CHANNEL 5	◀	▶
S1-6	CHANNEL 6		
S1-7	CHANNEL 7		
S1-8	CHANNEL 8		
S2-1	ALARM DELAY	◀	▶
S2-2	START SIGNAL	START ON CLOSE ◀	START ON OPEN ▶

LED STATUS

BLUE = DISABLED
 RED = FAULT
 GREEN = ENGINE OFF
 OFF = ENGINE START

ASCOPower Technologies, LP
 www.ascopower.com
 N. America: 800-800-ASCOP (2726)
 International: +1 973-360-3600

Label 1246185A

The S2-1 switch corresponds to the alarm delay. Toggling left will turn it off (instantaneous, no delay) and toggling right will turn it on (3 sec delay).

The S2-2 switch is the reference for the start signals wired into the 5101-ATS modules. This should be set according to the source engine start signals, "Start on Close" if the source signal closes to start the gen and "Start on Open" if the source signal is starting the generator when it opens. All the 5101-ATS modules must follow the same convention.

Setup Checklist

5101-ATS Module

- Validate wiring: ATS engine start signal to TB1
- Validate wiring: 2-wire signal from TB2 to 5101-GEN module.

5101-Gen Module

- Power up: check the module is receiving 9-27Vdc from the generator
- Validate wiring: Signals from 5101-ATS modules
- Validate wiring: Alarm signal to external device.
- Validate wiring: Engine start signal to generator.
- Configure DIP switches for specific needs
- Check for correct LED status (all channels should be either blue or green in idle state)

California Proposition 65 Warning—Lead and Lead Compounds

Advertencia de la Proposición 65 de California—Plomo y compuestos de plomo

Avertissement concernant la Proposition 65 de Californie—Plomb et composés de plomb



WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov



ADVERTENCIA: Este producto puede exponerle a químicos incluyendo plomo y compuestos de plomo, que es (son) conocido(s) por el Estado de California como causante(s) de cáncer y defectos de nacimiento u otros daños reproductivos. Para mayor información, visite : www.P65Warnings.ca.gov.



AVERTISSEMENT: Ce produit peut vous exposer à des agents chimiques, y compris plomb et composés de plomb, identifiés par l'État de Californie comme pouvant causer le cancer et des malformations congénitales ou autres troubles de l'appareil reproducteur. Pour de plus amples informations, prière de consulter: www.P65Warnings.ca.gov

INDEX

A

Alarm Output State 7
Alarm Signal 6, 12, 14
ATS
 Installation 9

C

Configuration 9

D

DC Power 3
Dimensions 4
DIP Switches 6, 11, 13, 14

E

Engine Start Monitoring System
 3, 5

G

Generator Module Alarm Contact
3
Generator Module Start Contact 3

I

Inputs 6
Installation 5

L

LED Status 8, 14

M

Main Specifications 3
Maximum Distance 3
Maximum Wire Resistance Loop 3
Mounting 3

O

Operating Temperature Range 3
Outputs 6

P

Power, 9-27Vdc 6, 7, 11, 14

R

Requirements, 6
 Generator Module 6
 Transfer Switch Module 6
Ride through 3

S

Settings 12
 DIP Switches 13,14
Setup Checklist 14
 5101 ATS Module 14
 5101 GEN Module 14
Start Output State, 9
System Architecture 5
System Block Diagram 5

T

TB1 6, 9, 14
TB2 6, 7, 10, 14
Testing 8

V

Validate Wiring, 14

W

Wire Gauge 3

160 Park Avenue,
Florham Park, NJ 07932-1591 USA
Phone: 1 800 800-2726 (ASCO) for sales or service
www.ascopower.com

©2020 ASCO Power Technologies. All Rights Reserved.

Printed in U.S.A.