



VIVISUN LOGIC SERIES - I

Electronic Latching



- Momentary
- Local, Remote or Conditional Control
- Automatic Safe Mode Reset



VIVISUN LOGIC SERIES - I

With the introduction of the VIVISUN LOGIC Series-I, the traditional vision and accepted performance of lighted pushbutton switches has changed forever. Switches traditionally require a physical action by an operator and the switch either maintains a latched position or returns to a normal state after a momentary trip. The operator may only control switches within physical reach and the function of a given switch is static. However, with the introduction of the VIVISUN LOGIC Series-I, design engineers may now look at traditional operator interface in a completely different way. A physical action is not always required to initiate the switch. A switch may now be controlled from a remote location allowing a set, reset or cancel from multiple locations outside the physical reach of the operator. The same switch may also function as a momentary or alternate action and depending on conditional inputs it also has the ability to reset to an off or "safe" position.

The VIVISUN LOGIC Series-I switch performs in a similar fashion to traditional magnetic or solenoid latching switches but does not contain failure prone mechanical components, is significantly smaller and requires a fraction of the power. Refer to Table 3 for electrical performance and Figures 4 & 5 for mechanical detail. The LOGIC Series-I is contained within the same mechanical package as the existing VIVISUN 4-Pole or VIVISUN LR3 4-Pole switch.

How it works:

The LOGIC Series contains an integrated electrical circuit that accepts discrete inputs causing the switch to enter a sequence of different operating modes including Set, Reset or Toggle. The switch then responds with conditioned outputs that may be used to perform various system functions. Inputs may originate through external sensors, other switches or even through actuating the LOGIC Series switch which contains two traditional switch poles.

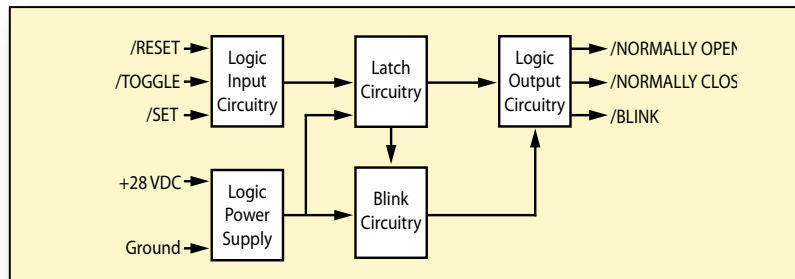
The LOGIC Series is not only effective in simplifying operator interface but is also effective in simplifying complex circuit designs through eliminating external relays and reducing the overall bill of materials.

To further understand the application possibilities refer to Figures 1-3. Figure 1 highlights the local and remote control features as well as blink. It also demonstrates a remote lockout that can override the function of a switch. Figure 2 details a simple safe mode function assuring the system automatically turns off when power is cycled. Figure 3 is a traditional Speaker Mute control.

The VIVISUN LOGIC Series is packaged in a ruggedized MIL-SPEC design with the traditional high quality VIVISUN LED lighting. For details on environmental performance please refer to Table 4 and for lighting performance refer to the VIVISUN Data Sheet No. LED-12-2001-04 Rev. B, LR3-08-12, or 95-1-86-3 Rev. 2.



Logic Module Functional Block Diagram



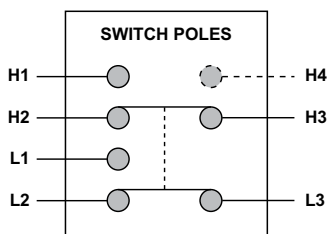
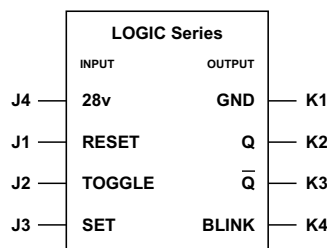
Logic Input Circuitry: provides a reliable diode isolated, buffered, and de-bounced input interface. The inputs are internally pulled up to approximately 18 V. This provides simple reliable operation with either external switches or open drain drivers.

Latch Circuitry: proven reliable latch circuitry that holds the current state and provides the set, reset and toggle features.

Blink Circuitry: Free running 1 hertz square wave generator. This signal is then gated to provide a selectable blink output.

Logic Output Circuitry: provides ground switched open drain output drivers that are both fused and surge protected.

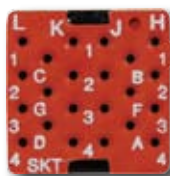
Power Supply: Efficient internal regulated supply that allows the unit to operate reliably on less than 4 mA.



NOTE: H4 is double break option

QUIK-CONNECT™ Plug Part # 18-440

LOGIC Series-I must be ordered with the connector plug as shown.



A, B, C, D, F, G	Lamp Contacts
L1-L4, H1-H4	Switch Contacts
J1-J4, K1-K4	LOGIC Series Contacts (see description above)

Logic Series Part Numbering

Part Numbering of the LOGIC Series follows Aerospace Optics' standard format.

- LED - XX-YY-YY-YYYY (See LED Data Sheet for definition of remaining "Y" positions)
- LR3 - XX-YY-YY-YYYY (See LR3 Data Sheet for definition of remaining "Y" positions)
- 95 - XX-YY-YY-YYYY (See 95 Series Data Sheet for definition of remaining "Y" positions)
 - XX = "DP" for Indicator LOGIC Series-I
 - XX = "DJ" for 2 Pole Single Break LOGIC Series-I
 - XX = "DK" for 2 Pole Double Break LOGIC Series-I



Logic Module Schematics

Figure 1, presents a large cabin aircraft intercom system utilizing three LOGIC Series switches. The design allows the cockpit or the cabin to initiate a call but only the cockpit can cancel a call. The design has one cabin station but could have multiple cabin stations. When the cabin initiates a call, the CABIN CALL switch blinks until the cockpit responds. Once the call is initiated, only the cockpit can cancel the call or the call can be automatically cancelled if ATC COM is active. This is an example of the lock out feature which assures an internal call does not interfere with flight critical air traffic control communication. The circuit also has an EMERGENCY CALL switch to the cockpit that causes an EMER legend to illuminate in the cockpit and the pilot can acknowledge the emergency call even if ATC COM is active but does not open the channel until ATC COM is cancelled.

Figure 2, is a reset assuring the system automatically reverts to an off or "safe" mode when master power is cycled.

Figure 3, details an aircraft speaker mute function used to silence redundant or repetitive messages on the overhead speaker. The SPEAKER MUTE switch is a VIVISUN LOGIC Series and when actuated it is placed into a set mode that may be cancelled by a reset input provided via a physical actuation of the switch or automatically if the supplemental oxygen switch is selected.

Figure 2 - Auto Reset to Safe Mode

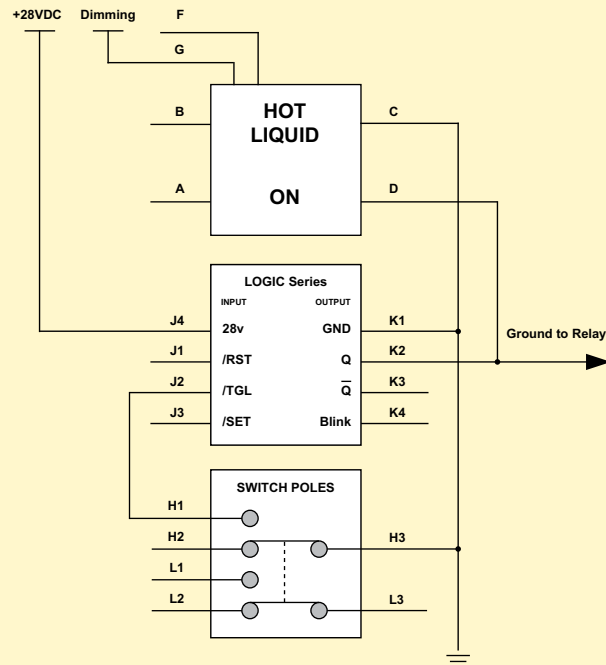


Figure 1 - Large Cabin Communication System

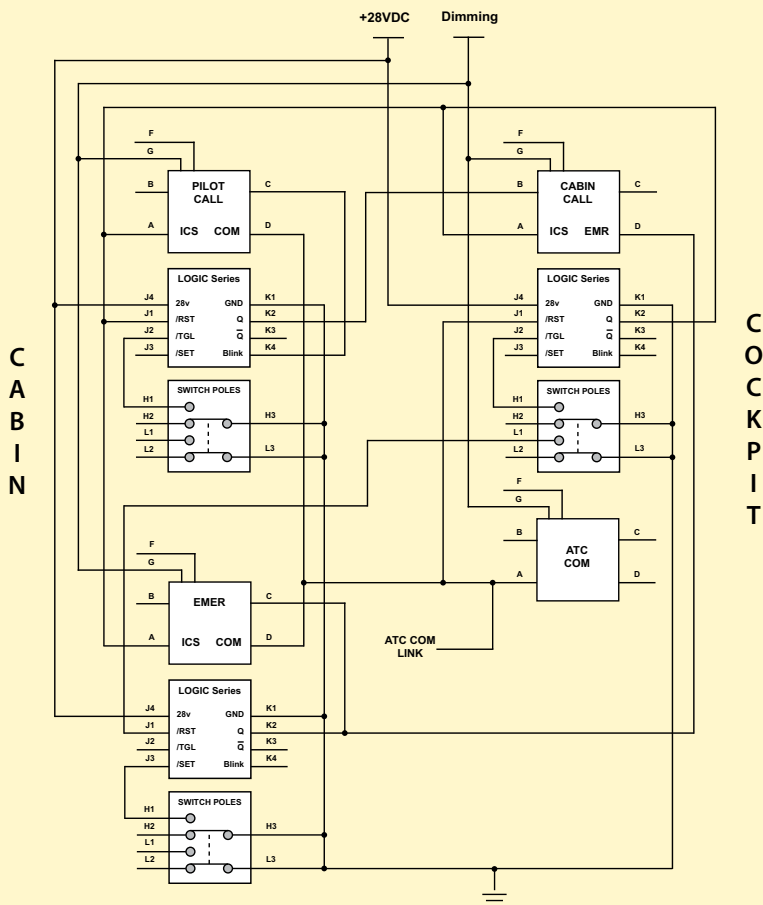
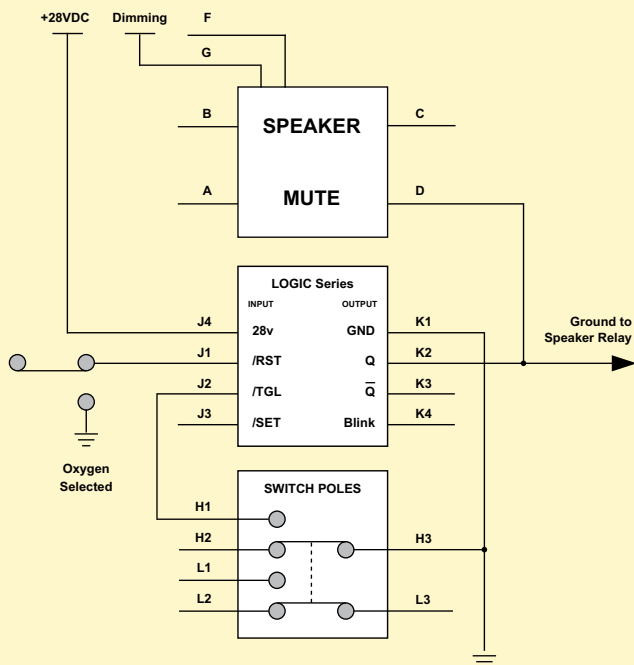


Figure 3 - Speaker Mute Example





VIVISUN LOGIC SERIES - I

Table 1. Logic Series Input and Output Signal Description

Signal name	QUIK-CONNECT Pin Number	Function	Active State	Description
/RESET	(J1)	Input	Low (Ground)	Forces Q OUTPUT to OFF (Open). Forces \bar{Q} OUTPUT to ON (Ground). Forces BLINK to Steady ON (Ground). See Note 1.
/TOGGLE	(J2)	Input		Toggles Q OUTPUT and \bar{Q} OUTPUT. Toggles blink mode. See Note 2.
/SET	(J3)	Input	Low (Ground)	Forces Q OUTPUT to ON (Ground). Forces \bar{Q} OUTPUT to OFF (Open). Initiates the 1Hz blink mode to BLINK Output.
+28 VDC	(J4)	Power	-	Power (+10 VDC to +32 VDC)
GROUND	(K1)	Common	-	Common for Power and Signals
Q OUTPUT	(K2)	Output Note 1	Low (Ground)	Open Drain Output. Forced OFF (Open) by /RESET Input. Forced ON (Ground) by /SET Input. Toggled by Falling Edge of /TOGGLE Input.
\bar{Q} OUTPUT	(K3)	Output Note 1	Low (Ground)	Open Drain Output. Forced ON (Ground) by /RESET Input. Forced OFF (Open) by /SET Input. Toggled by Falling Edge of /TOGGLE Input.
BLINK	(K4)	Output Note 1	Low (Ground)	Open Drain Output: Forced ON (Ground) while /RESET is held Low (Ground).

Table 2. Logic Series Truth Table

Inputs			Outputs		
/SET	/RESET	/TOGGLE	Q OUTPUT	\bar{Q} OUTPUT	BLINK
Low (Ground)	High (Open)	X	Low (Ground)	High (Open)	1 Hz BLINK mode
High (Open)	Low (Ground)	X	High (Open)	Low (Ground)	Steady ON See Note 2
Low (Ground)	Low (Ground)	X	Low (Ground) Note 3	Low (Ground) Note 3	Steady ON See Note 2
High (Open)	High (Open)		TOGGLE State	TOGGLE State	TOGGLE See Note 4

Note 1:

Each Logic Series Output includes a Solid-state driver and an output filter designed to protect the output from transients and overload conditions.

Note 2:

BLINK Output is held Steady ON (Ground) while /RESET is held low. BLINK Output goes OFF (Open) when /RESET returns to the inactive high level. This feature provides essentially three states to the BLINK Output; OFF, ON and BLINK.

Note 3:

Illegal state.

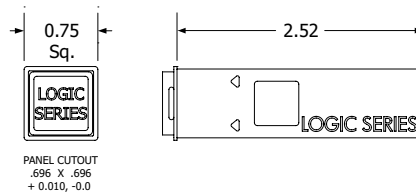
Note 4:

/TOGGLE input causes BLINK Output to switch between 1 Hz Blink state and OFF (Open).

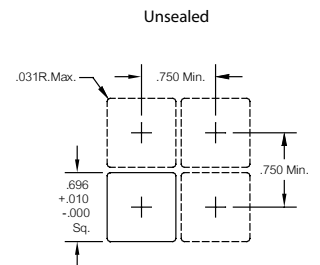
Table 3. Logic Series-I Operating Parameters & Qualification Test Summary

Description	Parameters
Operating Parameters	
Maximum Operating Voltage	+32 VDC
Nominal Operating Voltage	+28 VDC
Minimum Operating Voltage	+18 VDC
Power Supply Input Current	4mA maximum
Reset From Power Loss	5 second maximum @ +25 C
Input Pulse Widths Minimum	
Reset	120 ms
Toggle	45 ms
Set	45 ms
Low Level Input Voltage (V_{IL})	0.4 V dc maximum
Low Level Input Current (I_{IL})	1mA maximum
Note: All signal inputs are diode isolated	
Output Load Capacity	
Resistive	2.0 A
Motor	1.0 A
Lamp	0.8 A
Inductive	0.8 A
Operational Life	500,000 cycles at rated loads
Temperature	
Operating	-55C to +85C
Non-operating	-55C to +85C

Figure 4. Unsealed Switch Dimensions for Vivisun LED and 95⁽¹⁾

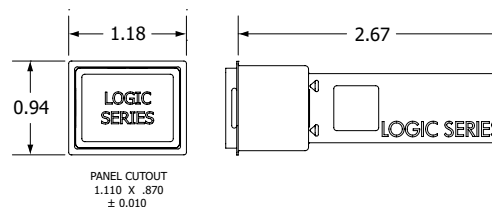


Recommended Mounting Plate Cutout Dimensions for Unsealed Switches⁽¹⁾

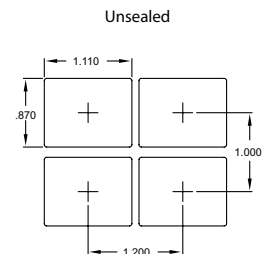


⁽¹⁾ See Data Sheet No. LED-12-2001-04 Rev B. for sealed switch dimensions.

Figure 5. Unsealed Switch Dimensions for Vivisun LR3⁽¹⁾



Recommended Mounting Plate Cutout Dimensions for Unsealed Switches⁽¹⁾



⁽¹⁾ See Data Sheet No. LR3-08-12 for sealed switch dimensions.

Environmental and Performance Testing

The Logic Series has been developed and tested to meet or exceed the following standards (see Table 4):

RTCA/DO-160F MIL-STD-202G MIL-STD-461E
MIL-PRF-22885G MIL-STD-704D



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Table 4. Logic Series-I Qualification Test Summary

Test Description	Specification	Section	Category	Actual Test Conditions
Temperature and Altitude	RTCA/DO-160F MIL-STD-202G	4 105C 108A	D2 Inductive	-55°C to +85°C, 50,000 feet
Thermal Shock	MIL-STD-202G	107	A	12 cycles -55°C, +85°C
Temperature Variation	RTCA/DO-160F	5	S2	2 cycles -55C / +85C
Humidity	RTCA/DO-160F ⁽¹⁾ MIL-STD-202G	6 106G	B N/A	240 Hours, 65C, >90% RH
Operational Shock and Crash Safety	RTCA/DO-160F ⁽¹⁾ MIL-STD-202G MIL-STD-202G	7 213 212	E B A	20G Acceleration 75G Half-Sine
Vibration	RTCA/DO-160F ⁽¹⁾ MIL-STD-202G	8 204	Z B	10-2000 Hertz, 10G 10-2000 Hertz, 15G peak
Explosive Atmosphere	RTCA/DO-160F MIL-STD-202G	9 109C	A B	
Waterproofness Seal	RTCA/DO-160F ⁽¹⁾ MIL-PRF-22885G MIL-STD-108	10 4.7.20	R Splashproof	15 gal/min, coarse spray, 10 Ft water head nozzle as required
Sand and Dust	RTCA/DO-160F ⁽¹⁾ MIL-STD-202G	12 110	D N/A	Silica media
Fungus Resistance	RTCA/DO-160F MIL-STD-22885G	13 3.5.2	F N/A	Compliance by material selection
Salt Fog	RTCA/DO-160F MIL-STD-202G	14 101	T A	96 hour tests
Magnetic Effect	RTCA/DO-160F	15	A	1° deflection, 0.3m to 1.0m
Power Input Aircraft Power	RTCA/DO-160F MIL-STD-704D ⁽³⁾	16 N/A	B N/A	10 to 32 VDC, 60V surge, 50ms. interrupt s
Polarity Reversal	MIL-STD-404F	5.4.4	A Spike 1	Reversal of positive and negative connections
Spike	RTCA/DO-160F MIL-STD-461C	17 CS06	A Spike 1	Power, 600V, 10us, 50 ohm
AF Conducted Susceptibility	RTCA/DO-160F MIL-STD-461E ⁽²⁾	18 CS101	Z Curve 1	Power Input, 4V P-P, 1-150 KHz
Induced Signal Susceptibility	RTCA/DO-160F	19	CW	10,000V/m, 120A/m, 350-800 Hz
RF Conducted Susceptibility	RTCA/DO-160F MIL-STD-461E ⁽³⁾	20 CS114	W Curve 4	7.5V, 150mA, 10KHz-400MHz
RF Radiated Susceptibility	RTCA/DO-160F MIL-STD-461E	20 RS103	R Curve 4	200V/m, 2 MHz-1GHz, TEMCell
RF Emissions	RTCA/DO-160F MIL-STD-461E	21 RE102		Includes CE101, CE102, RE101 (By analysis)
Damped Sinusoidal Transient	RTCA/DO-160F MIL-STD-461E ⁽²⁾	22 CS116	Cat B3K33 N/A	Waveform 3, 600V, 1 MHz, 10Mhz
Lightning Induced Transient	RTCA/DO-160F	22	Cat B3K33	Waveform 5A, 300V, 120us.
Dielectric Withstanding	MIL-STD-202G	301	N/A	1000 VAC
Electrostatic Discharge	RTCA/DO-160F	25	N/A	15,000V, 150pf, 330 ohms
Fire, Flammability	RTCA/DO-160F	26	C	Behind the panel flammability
Resistive Electrical Endurance	MIL-PRF-22885G	4.7.28.2	N/A	2.0A, 510K cycles
Motor Electrical Endurance	MIL-PRF-22885G	4.7.28.2	N/A	1.0A, 5A Surge, 515K cycles
Lamp Electrical Endurance	MIL-PRF-22885G	4.7.28.2	N/A	0.75A, 7.5A Surge, 517K cycles
Inductive Electrical Endurance	MIL-PRF-22885G	4.7.28.2	N/A	1.0A, 0.2J, 578K cycles
Mechanical Endurance	MIL-PRF-22885G	4.7.29	N/A	High resistance load, 1,115,000 cycles

(1) Testing performed to MIL-STD. DO-160F test deemed equivalent or more severe.

(2) Testing performed to DO-160F. MIL-STD deemed equivalent.

(3) Tested to combined worst case of both MIL-STD and DO-160F.



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