

**SBX-64**  
**SINGLE BUS**  
**CONTROL PANEL**  
**OPERATOR'S MANUAL**



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The SBX-64 is a single bus control panel capable of addressing 64 INPUTS to any one OUTPUT in the Sigma ADX Series switching matrix. The panel is capable of operating in several modes. It can operate in a **FOLLOW** mode, meaning that the same input for all levels will change when a switch is made. It can also operate in a **BREAKAWAY** mode, where only the selected input level will change or **SPLIT** mode where the level(s) can be individually set. Additionally, any input level can be **LOCKED**, preventing it from switching in any mode.

Each remote panel is controlled by the SCI-ADX interface card located in the ADF-64 frame. Connection is made between the BNCs labeled "COMM". This coaxial cable can be up to 1000 feet in length. Additional panels can be added by using BNC "T" connectors to tap off another line to the next panel. The system is capable of handling up to 64 panels in total. The system will allow any mixture of either full matrix or single bus panels. Each panel in a system must have a unique address, and this is accomplished by a dipswitch located at the rear of the control panel. If the control panel cannot establish initial communications with the SCI controller via the COMM line, 00 will be displayed in the level windows and the keyboard will not function.

Green numeric LEDs display the current input levels. If any level is in a preset condition, the respective display window will flash.

The SBX-64 is an intelligent panel in that it will automatically configure itself to the size of the system that the SCI-ADX is configured. See separate information on the SCI-ADX for details for system matrix configuration.

The SBX-64 front panel is divided into 3 sections: LEVEL, SOURCE, and TAKE.

**LEVEL:** Along the top portion of the control panel are four **LEVEL** buttons. This allows selection of any one of the four levels. When no **LEVEL** button has been selected, the panel is operating in a **FOLLOW** mode.

To activate a **LEVEL** requires a single momentary press of the desired level button at which time the respective display will go blank. This operation will allow a **BREAKAWAY** (where only one level is changed). A **SPLIT** (where multiple levels select different sources) may be performed by the selection of each desired **LEVEL** and it's corresponding **INPUT**. After all desired levels are preset, the transaction will be completed by pressing the **TAKE** button.

When a source is selected, it will be displayed (flashing) in the active **LEVEL** window(s). One or more **LEVEL** window may be active at the same time and each can be set for a different source. Once a **LEVEL** is activated and a source selected, another **LEVEL** can be activated and a different source selected for the second level. A second press of any active **LEVEL** will clear the preset mode. Once the input levels are preset, the **TAKE** can be pressed to initiate the switch.

Another feature of the **LEVEL** button is to individually **LOCK** the levels from being changed. The **LOCK** feature only prevents a source from being switched from the specific control panel that is locked. It does not effect another control panel or the serial control of the switcher. To **LOCK** a level, press and hold the desired **LEVEL** button for 2 seconds. The lock must be performed when the control panel is not in the preset condition. The display will initially blank until the 2 seconds have elapsed, then the display will return and the LED incorporated into the **LEVEL** button will be illuminated. This level is now **LOCKED**. It cannot be selected or changed from this panel without canceling the **LOCK** mode. To cancel the **LOCK** mode, press and hold the respective **LEVEL** button for 2 seconds. When unlocked, the LED will go off. One or more levels can be **LOCKED** at the operator's discretion.

**SOURCE:** There are 64 illuminated source buttons on the panel. The LED incorporated into each source button tracks the LEVEL 1 selection. The LEDs only illuminate if the input is within the range of the panel. For example, if the panel is set for sources 1-64, but the Level 1 window is displaying 108, no LED will be on. This may occur if the switch was performed by a different control panel or via the serial port.

The group select DIPswitch, on the rear of the control panel, determines to which group of 64 sources this panel is assigned. This panel can control sources 1-64 or 65-128. Refer to the chart in the next section to select the desired source group assignment.

The SBX-64 will only function with valid source data it receives from the SCI-ADX system control interface module. If SCI-ADX is set for 16 sources, the only SOURCE switches that are functional are 1-16. Another example would be if the SCI-ADX is set for 48 sources and the SBX panel was set to the SOURCE group 1-64, only switches 1-48 would be operational on the panel.

**TAKE:** The red switch on the right side of the control panel is the TAKE button. When pressed, it sends the SCI-ADX a request to change the OUTPUT to the preset condition. The status of the switch request will be transmitted back to the panel by the SCI-ADX. When the control panel receives the updated status, the display will stop flashing and reflect the current status of that output. It should be noted that although the display does not always stop flashing upon the TAKE, the actual switch is made immediately by the SCI. The control panel update is slightly delayed as it awaits the response from the SCI-ADX. If the displays remain flashing after a TAKE is generated, there is possibly a problem with the SCI or the COMM line.

The selected OUTPUT of the control panel can be reviewed by pressing the TAKE key. The OUTPUT will be displayed in the LEVEL 4 window for 2 seconds. This must be done when there are no preset conditions.

**AUTOTAKE:** The panel is also capable of switching without the use of the TAKE switch. This is accomplished by setting S1,7 ON, at the rear of the control panel. Remember to reset power to the control panel whenever the DIP switch configuration is changed. In the AUTOTAKE mode, the transaction is performed at the completion of the source selection.

**OUTPUT:** The panel is capable of addressing any output from 1 to 128. The charts in the following section will show how to set the switches for the desired output.

**ERROR MESSAGES:** There are two possible errors that can occur if the rear panel DIPswitches are not set to a valid configuration.

If the panel is set up for an **OUTPUT** address that exceeds the maximum output value on the SCI-ADX, the illuminated keys will scan rapidly from the right to the left.

If the panel is set up for a **SOURCE** group that exceeds the maximum input value on the SCI-ADX, the illuminated keys will scan rapidly from the left to the right. For example, if the panel is set for Inputs 65-128, but the SCI-ADX is set for Inputs 1-64 or less.

In either case the problem must be corrected at the control panel or the SCI-ADX. Typically this problem will be due to the control panel being improperly configured. The control panel must be turned off and on again before proper operation will begin.

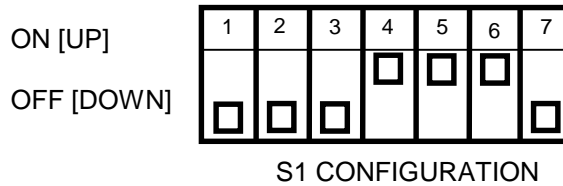
In addition to these error indicators, there is one other potential problem in which the SBX will raise a flag. If for any reason the SBX is unable to communicate with the SCI-ADX, which is the control interface card located in the master frame, the requested input will flash. This is an indicator that there is a communication problem in the system. The most likely cause would be a faulty or disconnected coaxial COMM cable.

### SBX-64 PANEL ADDRESS

When there are multiple control panels in a system, the LOGICAL ADDRESS for each panel must be unique. There are 64 addresses that the COMM port can access. The addresses are set using S1,1-6, accessed at the rear of the control panel. The COMM panel address table follows. Cycle power to the SBX-64 when changes are made to S1.

ADDRESS	S1,1	S1,2	S1,3	S1,4	S1,5	S1,6
1	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	ON	ON	ON	ON
16	OFF	ON	OFF	OFF	OFF	OFF
17	OFF	ON	OFF	OFF	OFF	ON
18	OFF	ON	OFF	OFF	ON	OFF
19	OFF	ON	OFF	OFF	ON	ON
20	OFF	ON	OFF	ON	OFF	OFF
21	OFF	ON	OFF	ON	OFF	ON
22	OFF	ON	OFF	ON	ON	OFF
23	OFF	ON	OFF	ON	ON	ON
24	OFF	ON	ON	OFF	OFF	OFF
25	OFF	ON	ON	OFF	OFF	ON
26	OFF	ON	ON	OFF	ON	OFF
27	OFF	ON	ON	OFF	ON	ON
28	OFF	ON	ON	ON	OFF	OFF
29	OFF	ON	ON	ON	OFF	ON
30	OFF	ON	ON	ON	ON	OFF
31	OFF	ON	ON	ON	ON	ON
32	ON	OFF	OFF	OFF	OFF	OFF
33	ON	OFF	OFF	OFF	OFF	ON
34	ON	OFF	OFF	OFF	ON	OFF
35	ON	OFF	OFF	OFF	ON	ON
36	ON	OFF	OFF	ON	OFF	OFF
37	ON	OFF	OFF	ON	OFF	ON
38	ON	OFF	OFF	ON	ON	OFF
39	ON	OFF	OFF	ON	ON	ON
40	ON	OFF	ON	OFF	OFF	OFF
41	ON	OFF	ON	OFF	OFF	ON
42	ON	OFF	ON	OFF	ON	OFF
43	ON	OFF	ON	OFF	ON	ON
44	ON	OFF	ON	ON	OFF	OFF
45	ON	OFF	ON	ON	OFF	ON
46	ON	OFF	ON	ON	ON	OFF
47	ON	OFF	ON	ON	ON	ON
48	ON	ON	OFF	OFF	OFF	OFF
49	ON	ON	OFF	OFF	OFF	ON
50	ON	ON	OFF	OFF	ON	OFF
51	ON	ON	OFF	OFF	ON	ON
52	ON	ON	OFF	ON	OFF	OFF
53	ON	ON	OFF	ON	OFF	ON
54	ON	ON	OFF	ON	ON	OFF
55	ON	ON	OFF	ON	ON	ON
56	ON	ON	ON	OFF	OFF	OFF
57	ON	ON	ON	OFF	OFF	ON
58	ON	ON	ON	OFF	ON	OFF
59	ON	ON	ON	OFF	ON	ON
60	ON	ON	ON	ON	OFF	OFF
61	ON	ON	ON	ON	OFF	ON
62	ON	ON	ON	ON	ON	OFF
63	ON	ON	ON	ON	ON	ON
64	OFF	OFF	OFF	OFF	OFF	OFF

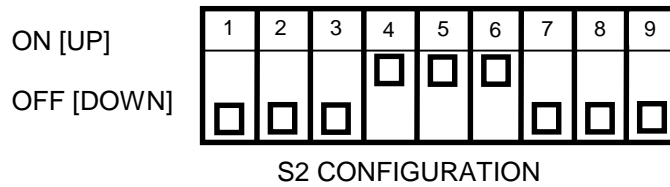
**SWITCH CONFIGURATION**



**AUTOTAKE ENABLE**

When the AUTOTAKE function is enabled, the take will automatically be generated whenever a valid input is selected. Power to the panel must be removed and turned on again for any changes in switch settings.

<b>AUTOTAKE</b>	<b>S1,7</b>
OFF	OFF
ENABLED	ON



	<b><u>SBX-64 SOURCE GROUP SELECT</u></b>	
<b>SOURCE GROUP</b>	<b>S2,1</b>	<b>S2,2</b>
1 - 64	OFF	OFF
65 -128	OFF	ON

**SBX-64 OUTPUT ADDRESS**

ADDRESS	S2,3	S2,4	S2,5	S2,6	S2,7	S2,8	S2,9
1	OFF	OFF	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	OFF	OFF	ON	ON
4	OFF	OFF	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	OFF	OFF	ON	OFF	ON
6	OFF	OFF	OFF	OFF	ON	ON	OFF
7	OFF	OFF	OFF	OFF	ON	ON	ON
8	OFF	OFF	OFF	ON	OFF	OFF	OFF
9	OFF	OFF	OFF	ON	OFF	OFF	ON
10	OFF	OFF	OFF	ON	OFF	ON	OFF
11	OFF	OFF	OFF	ON	OFF	ON	ON
12	OFF	OFF	OFF	ON	ON	OFF	OFF
13	OFF	OFF	OFF	ON	ON	OFF	ON
14	OFF	OFF	OFF	ON	ON	ON	OFF
15	OFF	OFF	OFF	ON	ON	ON	ON
16	OFF	OFF	ON	OFF	OFF	OFF	OFF
17	OFF	OFF	ON	OFF	OFF	OFF	ON
18	OFF	OFF	ON	OFF	OFF	ON	OFF
19	OFF	OFF	ON	OFF	OFF	ON	ON
20	OFF	OFF	ON	OFF	ON	OFF	OFF
21	OFF	OFF	ON	OFF	ON	OFF	ON
22	OFF	OFF	ON	OFF	ON	ON	OFF
23	OFF	OFF	ON	OFF	ON	ON	ON
24	OFF	OFF	ON	ON	OFF	OFF	OFF
25	OFF	OFF	ON	ON	OFF	OFF	ON
26	OFF	OFF	ON	ON	OFF	ON	OFF
27	OFF	OFF	ON	ON	OFF	ON	ON
28	OFF	OFF	ON	ON	ON	OFF	OFF
29	OFF	OFF	ON	ON	ON	OFF	ON
30	OFF	OFF	ON	ON	ON	ON	OFF
31	OFF	OFF	ON	ON	ON	ON	ON
32	OFF	ON	OFF	OFF	OFF	OFF	OFF

**OUTPUT ADDRESS (CONTINUED)**

<b>ADDRESS</b>	<b>S2,3</b>	<b>S2,4</b>	<b>S2,5</b>	<b>S2,6</b>	<b>S2,7</b>	<b>S2,8</b>	<b>S2,9</b>
33	OFF	ON	OFF	OFF	OFF	OFF	ON
34	OFF	ON	OFF	OFF	OFF	ON	OFF
35	OFF	ON	OFF	OFF	OFF	ON	ON
36	OFF	ON	OFF	OFF	ON	OFF	OFF
37	OFF	ON	OFF	OFF	ON	OFF	ON
38	OFF	ON	OFF	OFF	ON	ON	OFF
39	OFF	ON	OFF	OFF	ON	ON	ON
40	OFF	ON	OFF	ON	OFF	OFF	OFF
41	OFF	ON	OFF	ON	OFF	OFF	ON
42	OFF	ON	OFF	ON	OFF	ON	OFF
43	OFF	ON	OFF	ON	OFF	ON	ON
44	OFF	ON	OFF	ON	ON	OFF	OFF
45	OFF	ON	OFF	ON	ON	OFF	ON
46	OFF	ON	OFF	ON	ON	ON	OFF
47	OFF	ON	OFF	ON	ON	ON	ON
48	OFF	ON	ON	OFF	OFF	OFF	OFF
49	OFF	ON	ON	OFF	OFF	OFF	ON
50	OFF	ON	ON	OFF	OFF	ON	OFF
51	OFF	ON	ON	OFF	OFF	ON	ON
52	OFF	ON	ON	OFF	ON	OFF	OFF
53	OFF	ON	ON	OFF	ON	OFF	ON
54	OFF	ON	ON	OFF	ON	ON	OFF
55	OFF	ON	ON	OFF	ON	ON	ON
56	OFF	ON	ON	ON	OFF	OFF	OFF
57	OFF	ON	ON	ON	OFF	OFF	ON
58	OFF	ON	ON	ON	OFF	ON	OFF
59	OFF	ON	ON	ON	OFF	ON	ON
60	OFF	ON	ON	ON	ON	OFF	OFF
61	OFF	ON	ON	ON	ON	OFF	ON
62	OFF	ON	ON	ON	ON	ON	OFF
63	OFF	ON	ON	ON	ON	ON	ON
64	ON	OFF	OFF	OFF	OFF	OFF	OFF
65	ON	OFF	OFF	OFF	OFF	OFF	ON
66	ON	OFF	OFF	OFF	OFF	ON	OFF
67	ON	OFF	OFF	OFF	OFF	ON	ON
68	ON	OFF	OFF	OFF	ON	OFF	OFF
69	ON	OFF	OFF	OFF	ON	OFF	ON
70	ON	OFF	OFF	OFF	ON	ON	OFF
71	ON	OFF	OFF	OFF	ON	ON	ON
72	ON	OFF	OFF	ON	OFF	OFF	OFF
73	ON	OFF	OFF	ON	OFF	OFF	ON
74	ON	OFF	OFF	ON	OFF	ON	OFF
75	ON	OFF	OFF	ON	OFF	ON	ON
76	ON	OFF	OFF	ON	ON	OFF	OFF
77	ON	OFF	OFF	ON	ON	OFF	ON
78	ON	OFF	OFF	ON	ON	ON	OFF
79	ON	OFF	OFF	ON	ON	ON	ON
80	ON	OFF	ON	OFF	OFF	OFF	OFF
81	ON	OFF	ON	OFF	OFF	OFF	ON
82	ON	OFF	ON	OFF	OFF	ON	OFF
83	ON	OFF	ON	OFF	OFF	ON	ON
84	ON	OFF	ON	OFF	ON	OFF	OFF
85	ON	OFF	ON	OFF	ON	OFF	ON
86	ON	OFF	ON	OFF	ON	ON	OFF
87	ON	OFF	ON	OFF	ON	ON	ON
88	ON	OFF	ON	ON	OFF	OFF	OFF
89	ON	OFF	ON	ON	OFF	OFF	ON
90	ON	OFF	ON	ON	OFF	ON	OFF
91	ON	OFF	ON	ON	OFF	ON	ON
92	ON	OFF	ON	ON	ON	OFF	OFF
93	ON	OFF	ON	ON	ON	OFF	ON
94	ON	OFF	ON	ON	ON	ON	OFF
95	ON	OFF	ON	ON	ON	ON	ON
96	ON	ON	OFF	OFF	OFF	OFF	OFF

**OUTPUT ADDRESS (CONCLUDED)**

<b>ADDRESS</b>	<b>S2,3</b>	<b>S2,4</b>	<b>S2,5</b>	<b>S2,6</b>	<b>S2,7</b>	<b>S2,8</b>	<b>S2,9</b>
97	ON	ON	OFF	OFF	OFF	OFF	ON
98	ON	ON	OFF	OFF	OFF	ON	OFF
99	ON	ON	OFF	OFF	OFF	ON	ON
100	ON	ON	OFF	OFF	ON	OFF	OFF
101	ON	ON	OFF	OFF	ON	OFF	ON
102	ON	ON	OFF	OFF	ON	ON	OFF
103	ON	ON	OFF	OFF	ON	ON	ON
104	ON	ON	OFF	ON	OFF	OFF	OFF
105	ON	ON	OFF	ON	OFF	OFF	ON
106	ON	ON	OFF	ON	OFF	ON	OFF
107	ON	ON	OFF	ON	OFF	ON	ON
108	ON	ON	OFF	ON	ON	OFF	OFF
109	ON	ON	OFF	ON	ON	OFF	ON
110	ON	ON	OFF	ON	ON	ON	OFF
111	ON	ON	OFF	ON	ON	ON	ON
112	ON	ON	ON	OFF	OFF	OFF	OFF
113	ON	ON	ON	OFF	OFF	OFF	ON
114	ON	ON	ON	OFF	OFF	ON	OFF
115	ON	ON	ON	OFF	OFF	ON	ON
116	ON	ON	ON	OFF	ON	OFF	OFF
117	ON	ON	ON	OFF	ON	OFF	ON
118	ON	ON	ON	OFF	ON	ON	OFF
119	ON	ON	ON	OFF	ON	ON	ON
120	ON	ON	ON	ON	OFF	OFF	OFF
121	ON	ON	ON	ON	OFF	OFF	ON
122	ON	ON	ON	ON	OFF	ON	OFF
123	ON	ON	ON	ON	OFF	ON	ON
124	ON	ON	ON	ON	ON	OFF	OFF
125	ON	ON	ON	ON	ON	OFF	ON
126	ON	ON	ON	ON	ON	ON	OFF
127	ON	ON	ON	ON	ON	ON	ON
128	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Power to the panel must be removed and turned on again after any changes in switch settings.

## THEORY OF OPERATION

### SBC-9632 MICROPROCESSOR PCB

#### 1. POWER SUPPLY

Power to the remote panel is supplied by a 9-12 VDC wall-pack power supply via J1. Polyswitch RT1 provides fault current protection to the wall pack supply and the remote panel. Diode D1 (in combination with RT1) also provides reverse voltage protection should a wrong polarity power supply accidentally be connected to the remote panel. The 9-12 VDC input is regulated to 5 VDC by U4.

#### 2. MICROPROCESSOR, RESET, I/O

All functions of the remote panel are controlled by U1, an 8051-type microprocessor. The microprocessor is complete with a serial port, ram, counters, I/O lines and program storage EEPROM. Y1, C6 and C7 make up the 11.05 MHz oscillator clock for u1.

Port 0 (P0.0-P0.7) and Port 1 (P1.0-P1.7) control the front panel display board.

Switch S1 and S2's status is input to the microprocessor by P2.0-P2.7.

U3 combines the individual microprocessor TXD and RXD lines into a single COMM line. It also provides the necessary drive and level conversion between the microprocessor serial I/O lines and the COMM line interface. Resistors R2 and R3 provide a bias for the COMM input signal comparator. The direction of the COMM line is controlled by P3.7, and is normally in the receive mode except when a panel transaction is made.

U2 provides the reset function to the microprocessor upon three different conditions. The first is a power on reset. The second is at any time the +5 VDC power supply goes below ~4.5 VDC (a brownout condition). Third is when the microprocessor fails to toggle P3.6 in a timely fashion (watchdog). Under normal operation the microprocessor should toggle P3.6 many times per second.

### SYA-9664 DISPLAY PCB

The microprocessor via P1.0-P1.7 controls the front panel through IC U1. U1 is a high density PLD. It is programmed with an address decoder for three 4-bit addressable latches, encoder logic to drive the 7-segment LED displays and decoder logic for the row and digit drive signals.

The segment and row data are buffered by row driver transistors Q1-Q11 and Q28-Q29. The digit data is buffered by column driver transistors Q12-Q27. The display functions by the microprocessor setting up the segment drivers (row) with the data for a digit, and then enabling the appropriate digit (column) driver. Each digit is enabled for 1mS out of 16mS.

The keyboard is scanned by turning off the row drivers and testing the KEYROW lines while the column transistors are turned on one at a time.