

**USER'S MANUAL**

**MODEL 2452**

**RELAY EXPANDER**

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# MODEL 2452 RELAY EXPANDER

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2452 Relay cards draw power from the associated Signalcrafters microprocessor driver card. They are programmable for 12, 24 or 48 VDC operation.

The following tables illustrate the appropriate hookup information for the relay card. Use care to program the card for the proper DC operating voltage prior to hookup. Five wires link the microprocessor card to its relay card.

<u>If controlled by a 2212</u>			<u>If controlled by a 2109</u>		
2452		2212	2452		2109
PIN	FUNCTION	PIN	PIN	FUNCTION	PIN
41	+DC Common	41	41	+DC Common	41
43	- Source	43	43	- Source	43
45	-5 VDC	45	45	-5 VDC	45
53	Count	53	53	Count	51
55	Reset	55	55	Reset	53

**WARNING: ONLY ONE MICROPROCESSOR CARD CAN CONTROL THE 2452.**

The output relay contacts are located as follows:

<u>CONNECTION</u>	<u>FUNCTION</u>
1	K8 Normally Open
3	K8 Normally Closed
4	K8 Common
5	K7 Normally Open
7	K7 Normally Closed
8	K7 Common
9	K6 Normally Open
11	K6 Normally Closed
12	K6 Common
13	K5 Normally Open
15	K5 Normally Closed
16	K5 Common
19	K4 Normally Open
21	K4 Normally Closed
22	K4 Common
23	K3 Normally Open
25	K3 Normally Closed
26	K3 Common
27	K2 Normally Open
29	K2 Normally Closed
30	K2 Common
31	K1 Normally Open
33	K1 Normally Closed
34	K1 Common

## 5. SET-UP

- 5.1 Model 2452 Cards have field-programmable program wires to enhance their flexibility. Each card must be programmed before placing it into service. Use the following information to tailor these features to your application.
- 5.2 All Field-programmable features are changed by program wires. Program wires are EIA color coded. WHEN SHIPPED, THE MODEL 2452 RELAY EXPANDER CARDS ARE PROGRAMMED FOR A SINGLE BANK OF 8 RELAYS. PROGRAM WIRE SETTINGS ARE AS FOLLOWS:

24 VDC Operation		
VA	Brown	24/48
VB	Red	24/48
VC	Orange	12/24

Control Relays 1 to 8		
GROUP	Yellow	+0
K1 – K4	Green	2
K5 – K8	Blue	3

- 5.3 ADDRESS: This programming area is located near U2. Address 0 through 15 may be selected. The yellow wire is set to +0 or +8 (+ means 0 through 7; +8 means 8 through 15). The green wire sets K1 through K4; the blue wire sets K5 through K8; each may be programmed to 0 through 7. Relays 5 to 8 can be made to follow relays 1 to 4 by programming the blue wire to “2 FORM – C”.
- 5.4 CONTROL RELAY: Two different Signalcrafters products can remotely control the Model 2452 Relay Card. These products are the Model 2109 Status Encoder and Model 2212 Loopback Receiver. These are outlined below.
- 5.41 2109 ACK / NAK: This is often used to extend the contact inputs and control outputs of a SCADA system.
- If 2109 dip-switch 3 is ON and 2 is OPEN, the 2109 controls only relays 1 to 8, corresponding to inputs 1 to 8 of the companion 2109.
- If 2109 dip-switch 2 and 3 are ON, the 2109 controls 12 relays, corresponding to inputs 1 to 12 of the companion 2109 – and relay 16 indicates communication failure.
- The 2452 as shipped will only follow inputs 1 to 8 of the companion 2109. A second 2452 is required for this operation: the first to track inputs 1 to 8; the second must have its green program wire changed to 4, and its blue program changed to 5, in order to track inputs 9 – 12 and communications failure.
- 5.42 8 or 64 RELAY CONTROL: To arm manual 8 relay control, choose a normal number for each address digit. To arm 64 relay control mode, program the 2109 for 2212 fourth (yellow) address wire to DTMF \*.

For the 2212, also program the black program wire to 5, and set dip-switch 4 to the right (OPEN). For the 2109, make sure dip-switch 2 is "OPEN".

The 8-relay DTMF manual control sequence is 6 digits only. Digits 1 to 4 must correspond to the address program of the microprocessor card. DTMF \* in the fifth digit causes the corresponding relay to latch ON. DTMF # in the same digit causes the corresponding relay to pulse ON, then latch OFF.

The 64-relay DTMF manual control sequence is 6 digits only, and works as if there were 8 consecutive microprocessor cards (virtual address vwx1 through vwx8), each connected to a bank of 8 relays. The DTMF control and response is listed below:

DTMF	FUNCTION	LOCATION	BANK	RELAY
vwx*y#z	sets	vwx	y	z
vwx*y#z	pulses	vwx	y	z
1001*2	sets	100	1	2
1003*6	sets	100	3	6
1007#3	pulses	100	7	3
1003*A	sets	100	3	all
1005#A	pulses	100	5	all

bank	8		1		2		3	
group "+0" pin	0	1	2	3	4	5	6	7
# relays	57-60	61-64	1-4	5-8	9-12	13-16	17-20	21-24

bank	4		5		6		7	
group "+0" pin	8	9	10	11	12	13	14	15
# relays	25-28	29-32	33-36	37-40	41-44	45-48	49-52	53-56

<u>Latch</u>	<u>Pulse</u>	K1-K4		<u>yellow</u>
		<u>green</u>	<u>blue</u>	
1001*1 to *4	1001#1 to #4	2	2	+0
1001*5 to *8	1001#5 to #8	3	3	+0
1002*1 to *4	1002#1 to #4	4	4	+0
1002*5 to *8	1002#5 to #8	5	5	+0
1003*1 to *4	1003#1 to #4	6	6	+0
1003*5 to *8	1003#5 to #8	7	7	+0
1004*1 to *4	1004#1 to #4	0	0	+8
1004*5 to *8	1004#5 to #8	1	1	+8
1005*1 to *4	1005#1 to #4	2	2	+8
1005*5 to *8	1005#5 to #8	3	3	+8
1006*1 to *4	1006#1 to #4	4	4	+8
1006*5 to *8	1006#5 to #8	5	5	+8
1007*1 to *4	1007#1 to #4	6	6	+8
1007*5 to *8	1007#5 to #8	7	7	+8
1008*1 to *4	1008#1 to #4	0	0	+0
1008*5 to *8	1008#5 to #8	1	1	+0

## 6. TESTING

- 6.1 The following test equipment is required to perform the test procedures outlined below:
1. Oscilloscope with 1 MegOhm or higher input impedance.
  2. Digital multimeter with 10 MegOhm or higher input impedance.
  3. Signalcrafters Model 2106 or 2107 Base Master.
  4. Signalcrafters Model 2109 Status Encoder, with dipswitch 1 ON & 3 OPEN; or 2212 Loopback Receiver with black wire to 5 and dipswitch 4 to the right.
- 6.2 Connect a DTMF source to the 2109/2212:  
DTMF In Tip from 2106/2107 Pin 2 to 2109 Pin 55 or 2212 Pin 28  
DTMF In Ring from 2106/2107 Pin 4 to 2109 Pin 56 or 2212 Pin 23  
  
DTMF Out Tip from 2106/2107 Pin 12 to 2109 Pin 1 or 2212 Pin 1  
DTMF Out Ring from 2106/2107 Pin 13 to 2109 Pin 2 or 2212 Pin 5

Connect the 2452 to the driving microprocessor card:

<u>If controlled by a 2212</u>			<u>If controlled by a 2109</u>		
2452 PIN	FUNCTION	2212 PIN	2452 PIN	FUNCTION	2109 PIN
41	+DC Common	41	41	+DC Common	41
43	- Source	43	43	- Source	43
45	-5 VDC	45	45	-5 VDC	45
53	Count	53	53	Count	51
55	Reset	55	55	Reset	53

Turn on the front panel display power switch. Program the yellow wire to +0, the green to 2, and the blue to 3. Program the brown, red and orange wires corresponding to appropriate power source to the controlling microprocessor card – 12, 24 or 48 VDC. Turn on the appropriate power source.

- 6.3 POWER SUPPLY: Verify that the 2452 is receiving source power on pin 43; pin 45 must be 4.8 to 5.2 VDC below pin 41.
- 6.4 Relay operation: Enter the following 6 digit code DTMF code:  
microprocessor card 4 digit DTMF address followed by #A  
for stock 2212: 1590#A  
for stock 2109: 1001#A  
All eight 2452 relays should pulse ON in a one-at-a-time sequence, then OFF.

## 7. SPECIFICATIONS

### 7.1 GENERAL

TEMPERATURE RANGE: -30°C to +70°C operating; -55°C to +85°C storage

DIMENSIONS: Height 5.58” (14.17 cm); Width 1.42” (3.61 cm); Depth 5.53” (14 cm)

WEIGHT: 8 ounces (230 grams)

- 7.2 Model Number: 2452-0X001
- Part Number: B02959-0X001
- Contacts 2.0 amps 30 VDC
- Contacts 0.6 amps 125 VAC

The 2452 is driven by a master 2109 Status Encoder or 2212 Loopback Receiver. It provides eight auxiliary form-C relay contacts and 8 LEDs, indicating relay state. The LED display has an LED power saver switch.

<u>Current drain</u>	<u>12 VDC</u>	<u>24 VDC</u>	<u>48 VDC</u>
LED annunciator power Switch ON	+24 mA	+13 mA	+13 mA
LED annunciator power Switch OFF	+1 mA	+1 mA	+1 mA

## 8. OPTIONS

A02905-00001 Low Profile Handle Kit.

## 9. WARRANTY

- 9.1 Signalcrafters equipment described in this manual is warranted for a period of one year from date of shipment. Signalcrafters will repair or replace any unit which fails during this period due to defective material or workmanship. Unless specifically authorized, all in-warranty repairs will be made at the factory. Unauthorized field modification of the equipment will void the warranty. For repair information, contact Signalcrafters at 800-523-5815 or 973-781-0880.

## 10. CIRCUIT DESCRIPTION

- 10.1 The Model 2452 Relay Expander Card circuit is C18057-00018.

Pin 45 receives -5 volt power from the Signalcrafters controlling microprocessor card.

Pin 43 receives unregulated power from the controlling card.

U1 is a binary counter used to choose which relay (s) are to be set or reset. U3 is a 3 to 8 line converter, which decodes the number U1 has counted to, and turns on the corresponding transistor ..... Q11 – 24, until reset.

When the RESET input (card-edge finger 55) is high: U1 is reset and U3 has its outputs inhibited. When RESET is low, each rising edge of the COUNT input increments U1. To turn on a control transistor on bank “B”, the controlling microprocessor rapidly pulses 8\*B+N counts, holds that count long enough for the relay to (re)set, then proceeds to other functions. “N” is a number from 0 to 7, tabulated below. This process selects ONE transistor in only ONE bank of relays – causing the corresponding relay to (re)set. U4 works the same as U3, providing a second group of four relays, controlled by the blue program wire.

U3 – GREEN WIRE			U4 – BLUE WIRE		
<u>N Counts</u>	<u>Held On</u>	<u>Result</u>	<u>N Counts</u>	<u>Held On</u>	<u>Result</u>

0	Q11	K1 Reset	0	Q15	K5 Reset
1	Q21	K1 Set	1	Q25	K5 Set
2	Q12	K2 Reset	2	Q16	K6 Reset
3	Q22	K2 Set	3	Q26	K6 Set
4	Q13	K3 Reset	4	Q17	K7 Reset
5	Q23	K3 Set	5	Q27	K7 Set
6	Q14	K4 Reset	6	Q18	K8 Reset
7	Q24	K4 Set	7	Q28	K8 Set

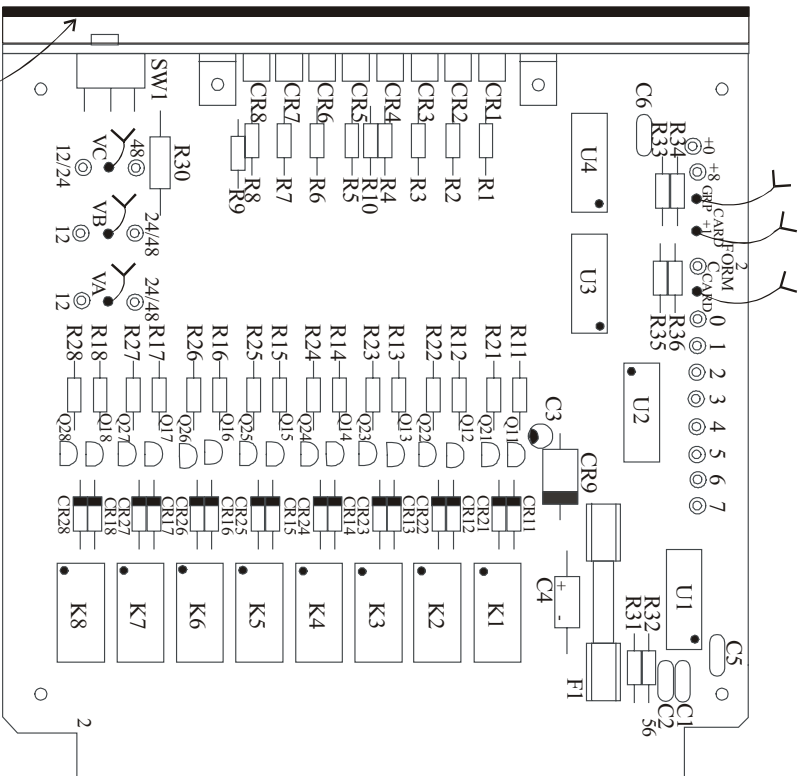
## 11. PARTS LIST

Tighter tolerance components as well as higher voltage capacitors and higher wattage resistors may be substituted for the parts in this list – provided that they are small enough to fit. If not specified,  $\pm 5\%$  1/4 watt resistors, and  $\pm 10\%$  20 VDC capacitors may be used as replacement parts.

11.1 B02959-XXXXX 8x1 Relay Card Circuit C18057-00018

The following components are located on the Model 2452 Relay Expander Card; board assembly C18053-00018.

<u>Component</u>	<u>Description</u>	<u>Part Number</u>	<u>Quantity</u>
R1 – 8	220 ohm	A16923-22002	8
R9, R10	390 ohm	A16923-39002	2
R11 – 18, R21 – 28	3.3 Kohm	A16923-33003	16
R31, R32	10 Kohm	A16923-10004	2
R33 – 36	100 Kohm	A16923-10005	4
R30	2.2 Kohm, 1/2 watt	A16924-22003	1
C1, C2	82 pF Ceramic	A15073-78205	2
C3	47 uF 6V Tantalum	B13006-47606	1
C4	4.7 uF 63V Aluminum	B16787-47563	1
C5, C6	.01 uF Ceramic	A00256-00100	2
Q11 – 18, Q21 – 28	PN2907A Transistor	A17812-00001	16
CR1 – 8	LED	A16422-00001	8
CR9	MPTE-5 Transzorb	A17332-00005	1
CR11 – 18, CR21 – 28	IN4004 Diode	A10279-00001	16
U1	4040 Binary Counter	A14739-04040	1
U2 – 4	74HC138 1/8 Decoder	A14739-74138	3
SW1	Switch	A16183-00001	1
K1 – 8	2 form-C Latching Relay	A17435-01201	8
F1	1/8 Ampere Fuse	A15768-00125	1
	Fuse Clips	A14072-00001	2

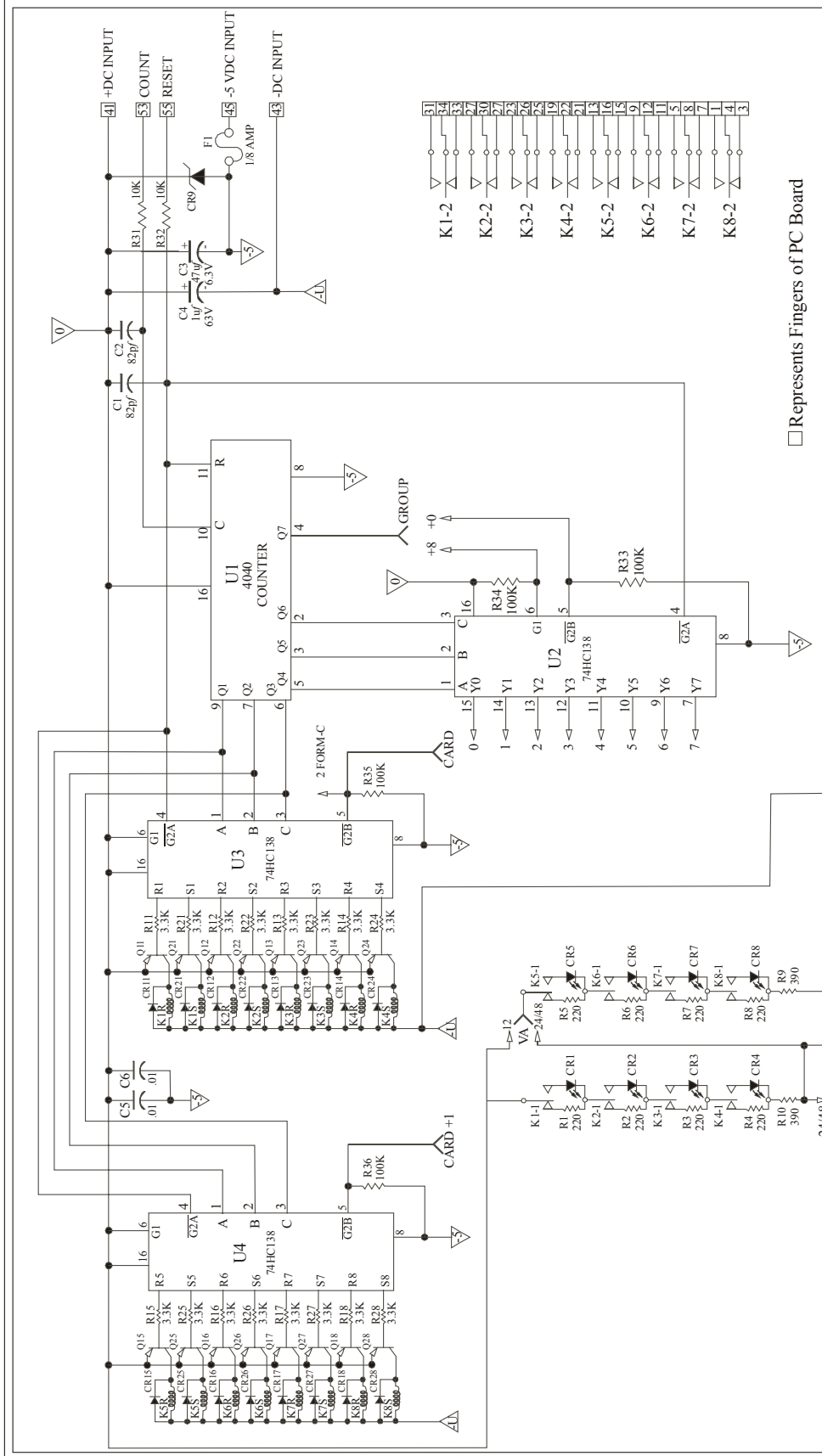


SERIAL NUMBER  
BACK OF FRONT PANEL.

**Signalcrafters**  
TECH, INC.

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TITLE: RELAY CARD ASSEMBLY		DRWG NO: B18054-00018	
REV	ECN NO	REVISION	BY
1	17782	REVISED PIN NO'S	TCC
			DATE
			10-9-87
ASSY FIRST USED: B02959		CODE IDENT: 81840	SHEET 1 OF 1



□ Represents Fingers of PC Board

TITLE:		DRWG NO:	
CIRCUIT		C18057-00018	
REV	ECN NO	REVISION	BY
1	17783	REVISED PIN NO'S	TCC
ASSY FIRST USED:		CODE IDENT:	SHEET 1 OF 1
B02959		81840	1

NOTE: For substitution purposes unless otherwise specified, Resistor values are in OHMS. Tolerance is  $\pm 5\%$  1/4 Watt. Capacitor tolerance is  $\pm 20\%$ , Voltage is 20 VDC minimum.

SYMBOL	DESCRIPTION
CR1-8	A16422-00001
CR9	MPT-5
CR11-18, 21-28	1N4004
U1	4040
U2-4	74HC138
Q11-18, Q21-28	PN2907A
K1-8	A17435-01201
SW1	A16183-00001
FI	3AG 1/8 AMP S.B.