Signalcrafters TECH, INC

## USER'S MANUAL

# MODEL 2452
# RELAY EXPANDER

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# MODEL 2452 RELAY EXPANDER

## CONTENTS

# 1. GENERAL, FUNCTIONAL

1.1 This manual provides the circuit description, installation instructions, and parts list for Signalcrafters Model 2452 Relay Expander Cards.

1.2 Model 2452 Cards provide plug-in compatibility with Wescom 400 series and Tellabs Type 10 mounting shelves. They are accessories and use slots adjacent to Signalcrafters cards which control them. They can be controlled by either Model 2212 or 2109 microprocessor cards. The 2452 Relay Expanders are "addressable" – up to 64 relays may be driven by one 2212 or 2109 card with appropriate software.

CAUTION: 2109 and 2212 programs made before July 1987 must be updated to "Revision A" or later to properly control the 2452.

1.3 The DTMF addressability of Signalcrafters Models 2212 and 2109 controlling cards allow complex communication networks to be analyzed or controlled.

1.4 To Order, select: Model 2452-0X001 or P/N B02959-0X001.

Relay Card - 0 X 0 0 1

Part Number B02959

| | |
|---|---|
| 1.0" Standard Handle | 0 |
| 0.5" Special Handle | 1 |

Model 2452 is a programmable replacement for the Model 2212R.

# 2. INSPECTION

2.1 Inspect the equipment thoroughly as soon as possible after delivery. Damages should be reported immediately to the shipping carrier.

2.2 Signalcrafters equipment is identified by a part number and suffix label on the board and a model number on the front panel silkscreen.

# 3. MOUNTING

3.1 The Model 2452 Relay Expander Cards are designed to be mounted in existing shelves or apparatus cases – either Wescom 400, Tellabs Type 10, or compatible Signalcrafters shelves and cases.

# 4. INSTALLER CONNECTIONS

4.1 2452 Relay Cards plug into standard 56 pin wire wrap connectors normally used in Wescom 400 Series and Tellabs Type 10 mounting facilities.

4.2 Screw terminals are provided in the Signalcrafters Model 2504 Remote Station and Model 2505 Rack Assembly.

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.

If controlled by a 2212

| 2452 PIN | FUNCTION | 2212 PIN |
|---|---|---|
| 41 | +DC Common | 41 |
| 43 | - Source | 43 |
| 45 | -5 VDC | 45 |
| 53 | Count | 53 |
| 55 | Reset | 55 |

If controlled by a 2109

| 2452 PIN | FUNCTION | 2109 PIN |
|---|---|---|
| 41 | +DC Common | 41 |
| 43 | - Source | 43 |
| 45 | -5 VDC | 45 |
| 53 | Count | 51 |
| 55 | Reset | 53 |

WARNING: ONLY ONE MICROPROCESSOR CARD CAN CONTROL THE 2452.

The ouput relay contacts are located as follows:

| CONNECTION | FUNCTION |
|---|---|
| 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 |
|---|---|---|---|---|
| vwxy*z | sets | vwx | y | z |
| vwxy#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 |

| Latch | Pulse | K1-K4 green | K5-K8 blue | yellow |
|---|---|---|---|---|
| 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>

| 2452 PIN | FUNCTION | 2212 PIN |
|---|---|---|
| 41 | +DC Common | 41 |
| 43 | - Source | 43 |
| 45 | -5 VDC | 45 |
| 53 | Count | 53 |
| 55 | Reset | 55 |

<u>If controlled by a 2109</u>

| 2452 PIN | FUNCTION | 2109 PIN |
|---|---|---|
| 41 | +DC Common | 41 |
| 43 | - Source | 43 |
| 45 | -5 VDC | 45 |
| 53 | Count | 51 |
| 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 tot he 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.

| Current drain | 12 VDC | 24 VDC | 48 VDC |
|---|---|---|---|
| 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 torn 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 | | |
|---|---|---|---|---|---|
| N Counts | Held On | Result | N Counts | Held On | Result |

| | | | | | |
|---|---|---|---|---|---|
| 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 |

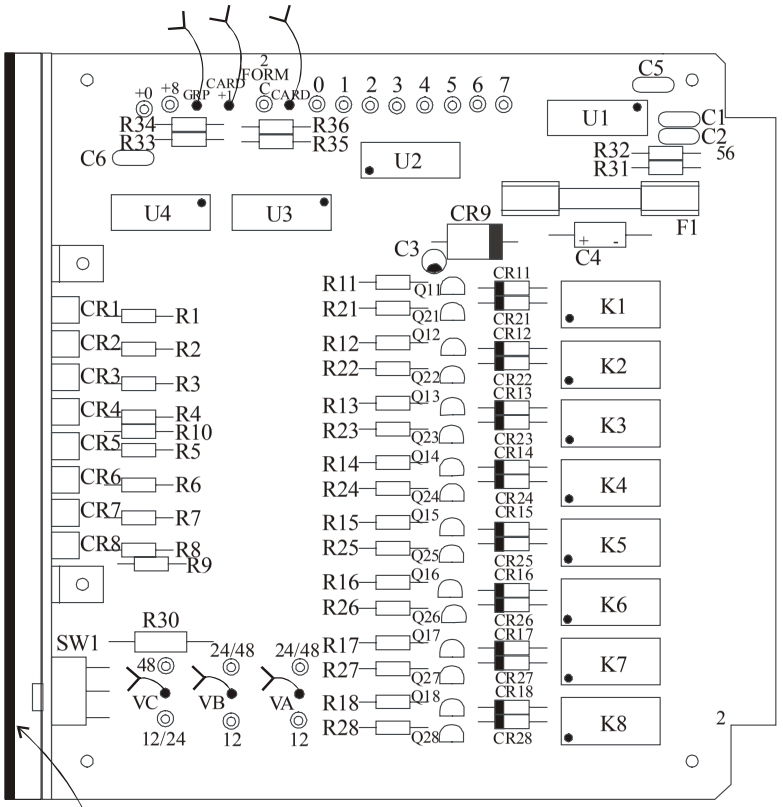
# 11. PARTS LIST

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, ±5% ¼ watt resistors, and ±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.

| Component | Description | Part Number | Quantity |
|---|---|---|---|
| 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, ½ 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

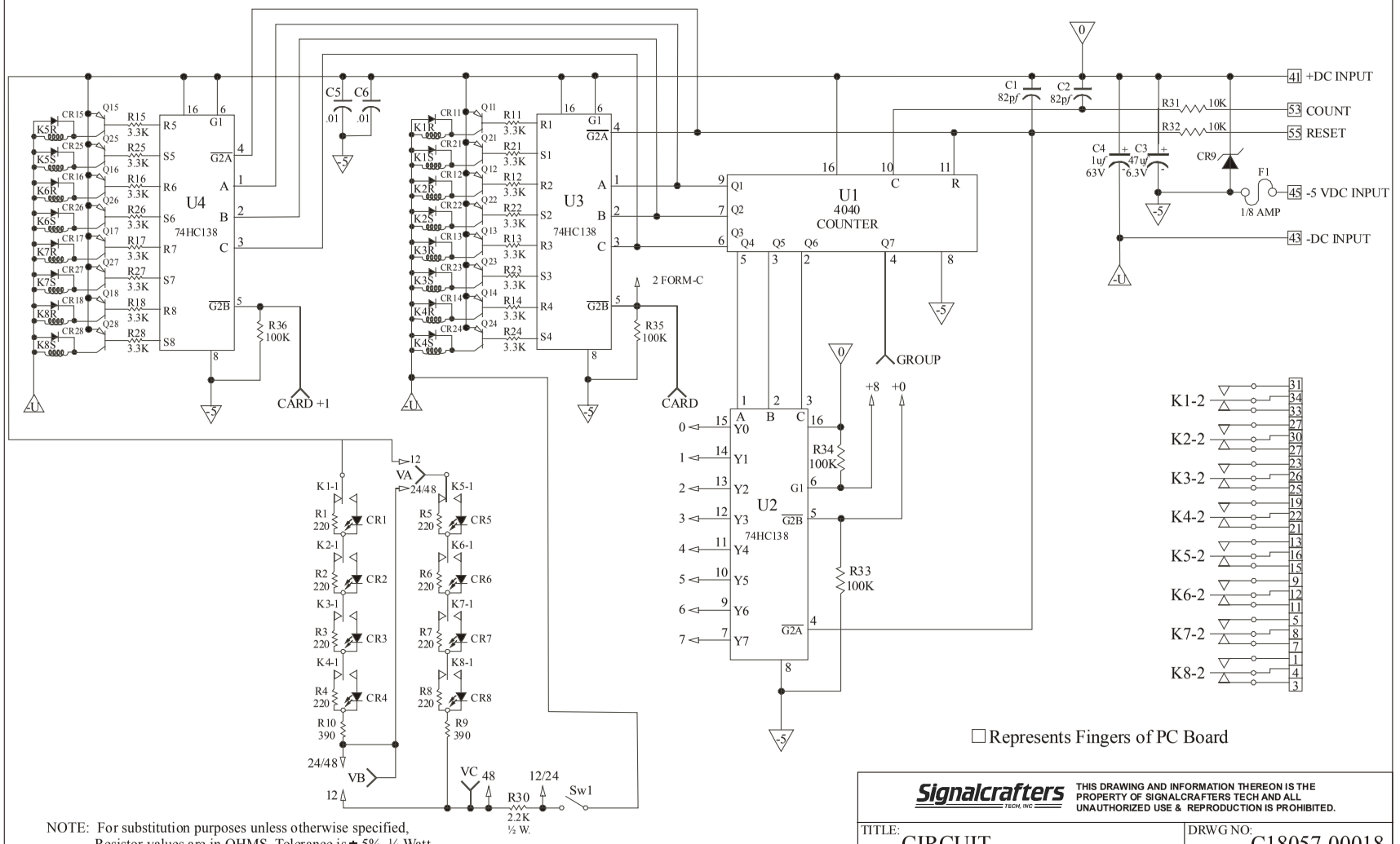


TITLE: RELAY CARD ASSEMBLY

DRWG NO: B18054-00018

| REV | ECN NO | REVISION | BY | DATE |
|---|---|---|---|---|
| 1 | 17782 | REVISED PIN NO'S | TCC | 10-9-87 |
| | | | | |
| | | | | |
| | | | | |

ASSY FIRST USED: B02959 | CODE IDENT: 81840 | SHEET 1 OF 1




☐Represents Fingers of PC Board

NOTE: For substitution purposes unless otherwise specified,
Resistor values are in OHMS, Tolerance is ± 5% ¼ Watt,
Capacitor tolerance is ± 20%, Voltage is 20 VDC minimum.

| SYMBOL | DESCRIPTION |
|---|---|
| CR1-8 | A16422-00001 |
| CR9 | MPTE-5 |
| CR11-18, 21-28 | 1N4004 |
| U1 | 4040 |
| U2-4 | 74HC138 |
| Q11-18, Q21-28 | PN2907A |
| K1-8 | A17435-01201 |
| SW1 | A16183-00001 |
| F1 | 3AG 1/8 AMP S.B. |



TITLE: CIRCUIT

DRWG NO: C18057-00018

| REV | ECN NO | REVISION | BY | DATE |
|---|---|---|---|---|
| 1 | 17783 | REVISED PIN NO'S | TCC | 10-8-87 |
| | | | | |
| | | | | |
| | | | | |

ASSY FIRST USED: B02959 | CODE IDENT: 81840 | SHEET 1 OF 1