Model 3000-53
96 SPDT Switch Module
90400530

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Regulatory compliance information

This product complies with the essential requirements of the following applicable European Directives, and carries the CE mark accordingly.

89/336/EEC and 73/23/EEC	EMC Directive and Low Voltage Directive
EN61010-1 (1993)	Electrical Safety
EN61326-1 (1997)	EMC – Emissions and Immunity
Manufacturer's Name:	**Manufacturer's Address**
Giga-tronics, Incorporated	4650 Norris Canyon Road San Ramon, California 94583 U.S.A.
Type of Equipment:	**Model Series Number**
Switching Module	3000-53

Declaration of Conformity on file. Contact Giga-tronics at the following;

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Record of Changes to This Manual

Use the table below to maintain a permanent record of changes to this document. Corrected replacement pages are issued as Technical Publication Change Instructions (TPCI). When you are issued a TPCI, do the following:

1. Insert the TPCI at the front of the manual binder.
2. Remove the pages from the manual binder that are noted in the TPCI.
3. Replace the page(s) removed in the previous step with the corrected page(s).
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TPCI Number	TPCI Issue Date	Date Entered	Comments

Revision History			
Revision	**Description of Change**	**Chg Order #**	**Approved By**
A	Initial Release		
B	Updated		
C	Reformatted 3/12		RCW

Contents

Chapter 1 **Introduction**

1.1 Safety and Manual Conventions

This manual contains conventions regarding safety and equipment usage as described below.

1.1.1 Product Reference

Throughout this manual, the term “Common Core Switching Platform, Series 8800” refers to all models of within the series, unless otherwise specified.

1.1.2 Personal Safety Alert

WARNING: Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

1.1.3 Equipment Safety Alert

CAUTION: Indicates a situation which can damage or adversely affect the product or associated equipment.

1.1.4 Notes

Notes are denoted and used as follows:

NOTE: Highlights or amplifies an essential operating or maintenance procedure, practice, condition or statement.

1.1.5 Electrical Safety Precautions

Any servicing instructions are for use by service-trained personnel only. To avoid personal injury, do not perform any service unless you are qualified to do so.

For continued protections against fire hazard, replace the AC line fuse only with a fuse of the same current rating and type. Do not use repaired fuses or short circuited fuse holders.

Chapter 2 **Configuration Table**

Module 3000-53

PL90400530
Assy 90400530

Schematics

PL85006520
Assy 85006520
SCH85006520

PL85006530
Assy 85006530
SCH85006530

Module 3000-53A

PL90400530-001
Assy 90400530-001

Schematics

PL85003220
Assy 85003220
SCH85003220

PL85003230
Assy 85003230
SCH85003230

Functional Description

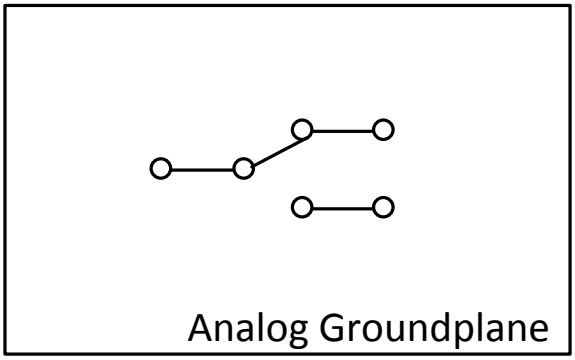
2.1 Introduction

This manual provides the necessary information for the maintenance of the Model 3000-53 General Purpose Switch.

2.2 General Description

This module contains ninety six (96) independently programmable form “C” SPDT Relays (Single Pole Double Throw Relays) for Model 3000-53 and one-hundred forty four (144) independently programmable form “C” SPDT Relays (Single Pole Double Throw Relays) for Model 3000-53A. The interface and mechanical constructions meet the specification of the VXIbus System Specification, Rev: 1.2 <R>and 1.3.

Chapter 3 **Block Diagram**



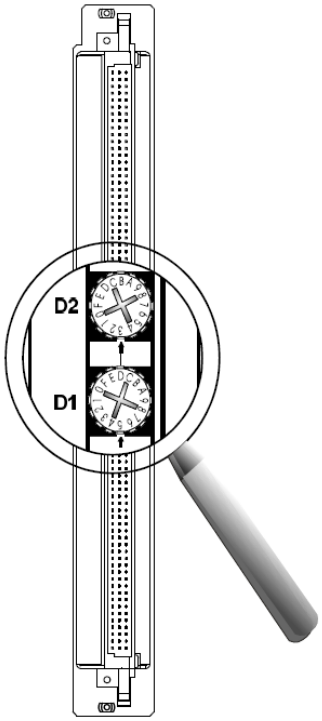
Typical Channel

Chapter 4 Controls and Indicators

The following controls and indicators are provided to select and display the functions of the ASCOR 3000-53 Module's operating environment.

4.1 VXI Logical Address

The Logical Address Switch is dual circular switches, D1 and D2 which are located at the rear of the module. The address can be set to any value between 1 and 255 (decimal) or 1 and FF (hexadecimal), (address 0 is reserved for the resource manager). However, the Module fully supports Dynamic Configuration as defined in ***Section F of the VXI specification,*** address 255 (FF) should be selected only if the Resource Manager also supports Dynamic Configuration.



4.2 LEDs

The following LEDs are visible at the Module's front panel to indicate the

status of the module's operation:

4.2.1 "BUS" LED

This green color LED is normally off and will flash on when the module is addressed by the system.

4.2.2 "PWR" LED

This red color LED is normally on when the Module is Powered up.

Chapter 5 Internal Settings

The following items are inside the module and can be reached by removing the side cover.

5.1 Fuse

The ASCOR VXI 3000-53 uses a 10 Amp fuse in the +5 Volt line and is located on the Mother Board (MB) assembly.

5.2 VXI_{bus} Interrupt Level Selection

The VXIbus interrupt level is set with three bits in the “3Eh” register.

See the section on “A16 ADDRESS SPACE REGISTER DESCRIPTION”.

The interrupt level is factory set to “no interrupt”.

Chapter 6 **Specifications**

Electrical:

Number of Connections:	420 Connections from 140 Form "C" Relays.
Bandwidth:	5 MHz
Maximum Switchable Current:	1.0 A
Maximum Carry Current:	1.0 A with 2 adjacent "open path" pins of isolation.
Maximum Switchable Voltage:	220 Vdc / 220 Vac
Maximum Switchable Power:	30 Wdc
Switching + Setting Time:	20 ms
Relay Life Expectancy:	1 M cycles
Closed Path Resistance:	<0.5 Ohms

Mechanical:

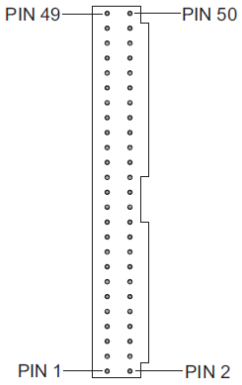
Thickness:	1.200 inches (3000-53) 2.400 inches (3000-53A)
Width:	10.317 inches
Length:	13.78 inches
Weight:	3 lbs. (3000-53) 10 lbs. (3000-53A)

Connector:

AMP 50 pin shrouded header, P/N 2-103166-3

Environmental Specifications

Temperature:	
Operating:	0º to 55ºC
Storage:	- 40º to 75ºC
Relative Humidity:	
Operating:	0 to 90% non-condensing
Storage:	0 to 95% non-condensing
Shock:	Designed to meet 15G, 11 ms.



Chapter 8 **Register Map**

8.1 Features

ASCOR's Model 3000-53 VXI Module is a high density general purpose switch module. This module is ideally suited for Unit Under Test (UUT) set up and power switching applications. The module can be configured with up to 96 form "C" relays Each relay is independently programmable.

- The unit is a C size single slot VXI Module
- Module programming is register based
- All relays are individually programmable.
- The standard module has 48 SPDT form C relays; with an optional 48 SPDT form C relays.
- Capable of switching signals up to 250 volts RMS or DC @ 1 amp.

OPTION A - Daughter Board #2 (85003230)

Option A includes Daughter Board #2 (85003230) to form a 144 SPDT Form C relays.

Each relay is independently programmable.

8.2 Programming

The Model 3000-53 and 3000-53A is a VXI register based module. The switch paths are controlled via ***VXIMAX***™ which is the 16/32 bit data controller. The Model 3000-53 and 3000-53A can be programmed in 16 bit or 32 bit wide data. Through your VXI controller, write the data to the appropriate register as shown on the register map for the relay or relays in the register that is being closed. When the data bit is true, the relay chosen will be closed. The state of the relays in a register can be determined by reading the desired register. The data read back represents the value at the coil of the relay. This allows verification that the program register has correctly controlled the relay coil.

The following register maps are shown in the configurations: 16 bit mode and 32 bit mode. In each section, 16 bit and 32 bit, the register map is organized to show the relay designation in each register. It is followed by the register's functionality and the path connections to the front panel.

For example:
To close relay K15 is to set the register to:
Register 8000h

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

DESCRIPTION: 48 SPDT RELAYS, MOTHER BOARD #1

PCB NUMBER: 85006520 (For 3000-53)

PCB NUMBER: 85003220 (For 3000-53A)

ADDRESS OFFSET: 8000h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K1	K4	K3	K2	K1

ADDRESS OFFSET: 8002h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8004h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

DESCRIPTION: 48 SPDT RELAYS, MOTHER BOARD #1
PCB NUMBER: 85006520 (For 3000-53)
PCB NUMBER: 85003220 (For 3000-53A)
ADDRESS OFFSET: 8000h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K5	K4	K3	K2	K1

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8004h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

REGISTER: 8000h, MODE: 16/32 bit
FUNCTION: Relays K1-16

BIT	CONNECTION	RELAY
0	nc: J1-48 no: J1-50, c: J1-49	K1
1	nc: J1-45, no: J1-47, c: J1-46	K2
2	nc: J1-42, no: J1-44, c: J1-43	K3
3	nc: J1-39, no: J1-41, c: J1-40	K4
4	nc: J1-36, no: J1-38, c: J1-37	K5
5	nc: J1-33, no: J1-35, c: J1-34	K6
6	nc: J1-30, no: J1-32, c: J1-31	K7
7	nc: J1-27, no: J1-29, c: J1-28	K8
8	nc: J1-24, no: J1-26, c: J1-25	K9
9	nc: J1-21, no: J1-23, c: J1-22	K10
10	nc: J1-18, no: J1-20, c: J1-19	K11
11	nc: J1-15, no: J1-17, c: J1-16	K12
12	nc: J1-12, no: J1-14, c: J1-13	K13
13	nc: J1-9, no: J1-11, c: J1-10	K14
14	nc: J1- 6, no: J1-8, c: J1-8	K15
15	nc: J1- 3, no: J1-5, c: J1-4	K16

REGISTER: 8000h, MODE: 32 bit@ BITS 16-31
REGISTER: 8002h, MODE: 16 bit
FUNCTION: K17-32

BIT	CONNECTION	RELAY
0 (16)	nc: J2-48 no: J2-50, c: J2-49	K17
1 (17)	nc: J2-45, no: J2-47, c: J2-46	K18
2 (18)	nc: J2-42, no: J2-44, c: J2-43	K19
3 (19)	nc: J2-39, no: J2-41, c: J2-40	K20
4 (20)	nc: J2-36, no: J2-38, c: J2-37	K21
5 (21)	nc: J2-33, no: J2-35, c: J2-34	K22
6 (22)	nc: J2-30, no: J2-32, c: J2-31	K23
7 (23)	nc: J2-27, no: J2-29, c: J2-28	K24
8 (24)	nc: J2-24, no: J2-26, c: J2-25	K25
9 (25)	nc: J2-21, no: J2-23, c: J2-22	K26
10 (26)	nc: J2-18, no: J2-20, c: J2-19	K27
11 (27)	nc: J2-15, no: J2-17, c: J2-16	K28
12 (28)	nc: J2-12, no: J2-14, c: J2-13	K29
13 (29)	nc: J2-9, no: J2-11, c: J2-10	K30
14 (30)	nc: J2- 6, no: J2-8, c: J2-8	K31
15 (31)	nc: J2-3, no: J2-5, c: J2-4	K32

REGISTER: 8000h, MODE: 32 bit@ BITS 16-31

REGISTER: 8004h, MODE: 16 bit

FUNCTION: K33-48

BIT	CONNECTION	RELAY
0 (16)	nc: J3-48 no: J3-50, c: J3-49	K33
1 (17)	nc: J3-45, no: J3-47, c: J3-46	K34
2 (18)	nc: J3-42, no: J3-44, c: J3-43	K35
3 (19)	nc: J3-39, no: J3-41, c: J3-40	K36
4 (20)	nc: J3-36, no: J3-38, c: J3-37	K37
5 (21)	nc: J3-33, no: J3-35, c: J3-34	K38
6 (22)	nc: J3-30, no: J3-32, c: J3-31	K39
7 (23)	nc: J3-27, no: J3-29, c: J3-28	K40
8 (24)	nc: J3-24, no: J3-26, c: J3-25	K41
9 (25)	nc: J3-21, no: J3-23, c: J3-22	K42
10 (26)	nc: J3-18, no: J3-20, c: J3-19	K43
11 (27)	nc: J3-15, no: J3-17, c: J3-16	K44
12 (28)	nc: J3-12, no: J3-14, c: J3-13	K45
13 (29)	nc: J3-9, no: J3-11, c: J3-10	K46
14 (30)	nc: J3- 6, no: J3-8, c: J3-8	K47
15 (31)	nc: J3-3, no: J3-5, c: J3-4	K48

DESCRIPTION: 48 SPDT RELAYS, DAUGHTER BOARD #1

PCB NUMBER: 85006530 (For 3000-53)

PCB NUMBER: 85003230 (For 3000-53A)

ADDRESS OFFSET: 8020h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K1	K4	K3	K2	K1

ADDRESS OFFSET: 8022h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8024h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

Register Map, 32 Bit

DESCRIPTION: 48 SPDT RELAYS, DAUGHTER BOARD #1

PCB NUMBER: 85006530 (For 3000-53)

PCB NUMBER: 85003230 (For 3000-53A)

ADDRESS OFFSET: 8020h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K5	K4	K3	K2	K1

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8024h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

REGISTER: 8020h, MODE: 16/32 bit
FUNCTION: Relays K1-16

BIT	CONNECTION	RELAY
0	nc: J4-48 no: J4-50, c: J4-49	K1
1	nc: J4-45, no: J4-47, c: J4-46	K2
2	nc: J4-42, no: J4-44, c: J4-43	K3
3	nc: J4-39, no: J4-41, c: J4-40	K4
4	nc: J4-36, no: J4-38, c: J4-37	K5
5	nc: J4-33, no: J4-35, c: J4-34	K6
6	nc: J4-30, no: J4-32, c: J4-31	K7
7	nc: J4-27, no: J4-29, c: J4-28	K8
8	nc: J4-24, no: J4-26, c: J4-25	K9
9	nc: J4-21, no: J4-23, c: J4-22	K10
10	nc: J4-18, no: J4-20, c: J4-19	K11
11	nc: J4-15, no: J4-17, c: J4-16	K12
12	nc: J4-12, no: J4-14, c: J4-13	K13
13	nc: J4-9, no: J4-11, c: J4-10	K14
14	nc: J4- 6, no: J4-8, c: J4-8	K15
15	nc: J4- 3, no: J4-5, c: J4-4	K16

REGISTER: 8020h, MODE: 32 bit@ BITS 16-31
REGISTER: 8022h, MODE: 16 bit
FUNCTION: K17-32

BIT	CONNECTION	RELAY
0 (16)	nc: J5-48 no: J5-50, c: J5-49	K17
1 (17)	nc: J5-45, no: J5-47, c: J5-46	K18
2 (18)	nc: J5-42, no: J5-44, c: J5-43	K19
3 (19)	nc: J5-39, no: J5-41, c: J5-40	K20
4 (20)	nc: J5-36, no: J5-38, c: J5-37	K21
5 (21)	nc: J5-33, no: J5-35, c: J5-34	K22
6 (22)	nc: J5-30, no: J5-32, c: J5-31	K23
7 (23)	nc: J5-27, no: J5-29, c: J5-28	K24
8 (24)	nc: J5-24, no: J5-26, c: J5-25	K25
9 (25)	nc: J5-21, no: J5-23, c: J5-22	K26
10 (26)	nc: J5-18, no: J5-20, c: J5-19	K27
11 (27)	nc: J5-15, no: J5-17, c: J5-16	K28
12 (28)	nc: J5-12, no: J5-14, c: J5-13	K29
13 (29)	nc: J5-9, no: J5-11, c: J5-10	K30
14 (30)	nc: J5- 6, no: J5-8, c: J5-8	K31
15 (31)	nc: J5-3, no: J5-5, c: J5-4	K32

REGISTER: 8024h, MODE: 32 bit@ BITS 16-31
REGISTER: 8024h, MODE: 16 bit
FUNCTION: K33-48

BIT	CONNECTION	RELAY
0 (16)	nc: J6-48 no: J6-50, c: J6-49	K33
1 (17)	nc: J6-45, no: J6-47, c: J6-46	K34
2 (18)	nc: J6-42, no: J6-44, c: J6-43	K35
3 (19)	nc: J6-39, no: J6-41, c: J6-40	K36
4 (20)	nc: J6-36, no: J6-38, c: J6-37	K37
5 (21)	nc: J6-33, no: J6-35, c: J6-34	K38
6 (22)	nc: J6-30, no: J6-32, c: J6-31	K39
7 (23)	nc: J6-27, no: J6-29, c: J6-28	K40
8 (24)	nc: J6-24, no: J6-26, c: J6-25	K41
9 (25)	nc: J6-21, no: J6-23, c: J6-22	K42
10 (26)	nc: J6-18, no: J6-20, c: J6-19	K43
11 (27)	nc: J6-15, no: J6-17, c: J6-16	K44
12 (28)	nc: J6-12, no: J6-14, c: J6-13	K45
13 (29)	nc: J6-9, no: J6-11, c: J6-10	K46
14 (30)	nc: J6- 6, no: J6-8, c: J6-8	K47
15 (31)	nc: J6-3, no: J6-5, c: J6-4	K48

DESCRIPTION: 48 SPDT RELAYS, DAUGHTER BOARD #2

PCB NUMBER: 85003260 (For 3000-53A only)

ADDRESS OFFSET: 8040h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K1	K4	K3	K2	K1

ADDRESS OFFSET: 8042h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8044h

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

DESCRIPTION: 48 SPDT RELAYS, DAUGHTER BOARD #2

PCB NUMBER: 85003260 (For 3000-53A only)

ADDRESS OFFSET: 8040h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K16	K15	K14	K13	K12	K11	K10	K9	K8	K7	K6	K5	K4	K3	K2	K1

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
K32	K31	K30	K29	K28	K27	K26	K25	K24	K23	K22	K21	K20	K19	K18	K17

ADDRESS OFFSET: 8044h

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
K48	K47	K46	K45	K44	K43	K42	K41	K40	K39	K38	K37	K36	K35	K34	K33

MSB

32	32	30	29	28	27	26	25	24	23	22	20	19	18	17	16
n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

REGISTER: 8040h, MODE: 16/32 bit
FUNCTION: Relays K1-16

BIT	CONNECTION	RELAY
0	nc: J7-48 no: J7-50, c: J7-49	K1
1	nc: J7-45, no: J7-47, c: J7-46	K2
2	nc: J7-42, no: J7-44, c: J7-43	K3
3	nc: J7-39, no: J7-41, c: J7-40	K4
4	nc: J7-36, no: J7-38, c: J7-37	K5
5	nc: J7-33, no: J7-35, c: J7-34	K6
6	nc: J7-30, no: J7-32, c: J7-31	K7
7	nc: J7-27, no: J7-29, c: J7-28	K8
8	nc: J7-24, no: J7-26, c: J7-25	K9
9	nc: J7-21, no: J7-23, c: J7-22	K10
10	nc: J7-18, no: J7-20, c: J7-19	K11
11	nc: J7-15, no: J7-17, c: J7-16	K12
12	nc: J7-12, no: J7-14, c: J7-13	K13
13	nc: J7-9, no: J7-11, c: J7-10	K14
14	nc: J7- 6, no: J7-8, c: J7-8	K15
15	nc: J7- 3, no: J7-5, c: J7-4	K16

REGISTER: 8040h, +, MODE: 32 bit@ BITS 16-31
REGISTER: 8042h, +, MODE: 16 bit
FUNCTION: K17-32, +, +

BIT	CONNECTION	RELAY
0 (16)	nc: J8-48 no: J8-50, c: J8-49	K17
1 (17)	nc: J8-45, no: J8-47, c: J8-46	K18
2 (18)	nc: J8-42, no: J8-44, c: J8-43	K19
3 (19)	nc: J8-39, no: J8-41, c: J8-40	K20
4 (20)	nc: J8-36, no: J8-38, c: J8-37	K21
5 (21)	nc: J8-33, no: J8-35, c: J8-34	K22
6 (22)	nc: J8-30, no: J8-32, c: J8-31	K23
7 (23)	nc: J8-27, no: J8-29, c: J8-28	K24
8 (24)	nc: J8-24, no: J8-26, c: J8-25	K25
9 (25)	nc: J8-21, no: J8-23, c: J8-22	K26
10 (26)	nc: J8-18, no: J8-20, c: J8-19	K27
11 (27)	nc: J8-15, no: J8-17, c: J8-16	K28
12 (28)	nc: J8-12, no: J8-14, c: J8-13	K29
13 (29)	nc: J8-9, no: J8-11, c: J8-10	K30
14 (30)	nc: J8- 6, no: J8-8, c: J8-8	K31
15 (31)	nc: J8-3, no: J8-5, c: J8-4	K32

REGISTER: 8044h, MODE: 32 bit@ BITS 16-31
REGISTER: 8044h, MODE: 16 bit
FUNCTION: K33-48

BIT	CONNECTION	RELAY
0 (16)	nc: J9-48 no: J9-50, c: J9-49	K33
1 (17)	nc: J9-45, no: J9-47, c: J9-46	K34
2 (18)	nc: J9-42, no: J9-44, c: J9-43	K35
3 (19)	nc: J9-39, no: J9-41, c: J9-40	K36
4 (20)	nc: J9-36, no: J9-38, c: J9-37	K37
5 (21)	nc: J9-33, no: J9-35, c: J9-34	K38
6 (22)	nc: J9-30, no: J9-32, c: J9-31	K39
7 (23)	nc: J9-27, no: J9-29, c: J9-28	K40
8 (24)	nc: J9-24, no: J9-26, c: J9-25	K41
9 (25)	nc: J9-21, no: J9-23, c: J9-22	K42
10 (26)	nc: J9-18, no: J9-20, c: J9-19	K43
11 (27)	nc: J9-15, no: J9-17, c: J9-16	K44
12 (28)	nc: J9-12, no: J9-14, c: J9-13	K45
13 (29)	nc: J9-9, no: J9-11, c: J9-10	K46
14 (30)	nc: J9- 6, no: J9-8, c: J9-8	K47
15 (31)	nc: J9-3, no: J9-5, c: J9-4	K48