

Remote I/O R7 Series

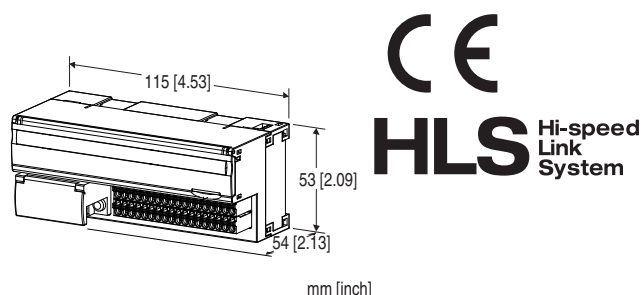
HI-SPEED LINK SYSTEM I/O MODULE

(encoder input, 2 points, non-isolated, tension clamp terminal block)

Functions & Features

- 2 points encoder input module for HLS
- Individual channels, zero adjustment, span adjustment, and scaling can be set with the configurator software (model: R7CON)

HLS is the abbreviation for “Hi-speed Link System” of Step Technica Co., Ltd.



MODEL: R7HL-PA2S[1]-R[2]

ORDERING INFORMATION

- Code number: R7HL-PA2S[1]-R[2]

Specify a code from below for each of [1] and [2].

- (e.g. R7HL-PA2SA7-R/H/C/Q)
- Specify the specification for option code /Q (e.g. /C01/SET)

I/O TYPE

PA2S: Encoder input (speed / position) 2 points (non-isolated)

[1] INPUT

A1: 5 V open collector

A4: 12 V open collector

A7: 24 V open collector

J: RS-422 line driver pulse

POWER INPUT

DC Power

R: 24 V DC

(Operational voltage range 24 V $\pm$ 10 %, ripple 10 %p-p max.)

[2] OPTIONS (multiple selections)

Communication Mode

blank: Full-duplex

/H: Half-duplex

Sensor Excitation

blank: External excitation

/C: Incorporated excitation

Other Options

blank: none

/Q: Option other than the above (specify the specification)

SPECIFICATIONS OF OPTION: Q (multiple selections)

COATING (For the detail, refer to our web site.)

/C01: Silicone coating

/C02: Polyurethane coating

/C03: Rubber coating

EX-FACTORY SETTING

/SET: Preset according to the Ordering Information Sheet (No. ESU-7812-AN)

RELATED PRODUCTS

- PC Configurator cable (model: MCN-CON or COP-US)
 - PC configurator software (model: R7CON)
- Downloadable at our web site.

GENERAL SPECIFICATIONS

Connection

HLS, Power: M3 separable screw terminal (torque 0.5 N·m)

I/O: Tension clamp terminal block

Solderless terminal: Refer to the drawing at the end of the section.

Communication cable

Recommended manufacture: J.S.T. Mfg. Co., Ltd.

Applicable wire size: 0.2 to 0.5 mm² (AWG 26 to 22)

Power

Recommended manufacture: J.S.T. Mfg. Co., Ltd., NICHIFU Co., Ltd.

Applicable wire size: 0.25 to 1.65 mm² (AWG 22 to 16)

Screw terminal: Nickel-plated steel

Housing material: Flame-resistant resin (gray)

Isolation

External sensor excitation type: Input or output or sensor excitation input or encoder excitation input (for R7HL-PA2SAx) to HLS to power to FG

Sensor excitation available type: Input or output or encoder excitation input (for R7HL-PA2SAx) or power to HLS to FG

Zero adjustments: Configurable via R7CON

Span adjustments: Configurable via R7CON

Input range (speed data): Selectable with the front DIP SW

Low-end cutout (speed data): Programmable within 0.1 – 50 %

Conversion data setting: Position data (*), speed data
Selectable with the front DIP SW

(*) Factory default setting

Count mode setting (position data): Quad multiplication
(Mode 3) (*), double multiplication (Mode 2), non-
multiplication (Mode 1), non-multiplication (Mode 0)

Selectable with the front DIP SW

(*) Factory default setting

Status indicator LEDs: PWR, RUN

(Refer to the instruction manual)

Parameter setting: With PC configurator software (model:
R7CON)

- Low-end cutout
- HLS command
- Alarm type
- Alarm setpoint
- Hysteresis
- External latch

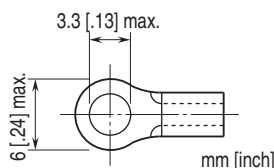
Refer to the instruction manual for detail.

Command: Data type, Latch, Reset, Latch data clear, Reset
data clear, Preset and Alarm output

(For details refer to the instruction manual.)

Configurator connection: 2.5 dia. miniature jack

■ Recommended solderless terminal



HLS COMMUNICATION

Communication mode:

Communication mode option code blank: Full-duplex

Communication mode option code /H: half-duplex

Network cable

- Shield cable

Full-duplex communication:

ZHY262PS and ZHT262PS

(Shinko Seisen Industry Co., Ltd.)

Half-duplex communication:

ZHY221PS (Shinko Seisen Industry Co., Ltd.)

- Dual-shield cable:

ZHY262PBA (Shinko Seisen Industry Co., Ltd.)

Transmission distance / Transfer rate:

100 meters (328 ft)/12 Mbps (default),

200 meters (656 ft)/6 Mbps

(Selectable with DIP switch)

Station address: Rotary switch

(Refer to the instruction manual)

Data allocation:

Position data: 4

Speed data: 2

Terminating resistor: Built-in (Selected with the DIP SW;
factory setting: disabled)

INPUT SPECIFICATIONS

■ Sensor Excitation* (External):

Supply voltage: 24 V DC $\pm 10\%$, ripple 5 %p-p max.

Supply current: 20 mA to 1 A

* Must be supplied since the input circuit also works with it.

Not required when option /C is selected.

When Latch or Reset turns on, its current is added.

Encoder excitation (External source; only for R7HL-PA2SAx)

R7HL-PA2SA1: 5 V DC $\pm 5\%$, 1 A max.

R7HL-PA2SA4: 12 V DC $\pm 5\%$, 1 A max.

R7HL-PA2SA7: 24 V DC $\pm 5\%$, 1 A max.

■ Encoder pulse input

Counter: Linear counter

Open collector

Maximum input frequency

- Position data: 400 kHz (quad multiplication)
- Speed data: 100 kHz

Input pulse, ON/OFF level

- 5 V: Approx. 4 V DC / 4.4 mA, 3 k Ω / 3.3 V, 300 Ω / 1 V
- 12 V: Approx. 10 V DC / 5.7 mA, 3 k Ω / 6.5 V, 400 Ω / 1.8 V
- 24 V: Approx. 22 V DC / 7.8 mA, 3 k Ω / 11.5 V, 300 Ω / 2 V

Pulse phase: A, B and Z

A and B phases are necessary to work.

Phase A/B

- Position data: $\geq 5\ \mu\text{sec.}$ (both ON and OFF)
- Speed data: $\geq 5\ \mu\text{sec.}$ (both ON and OFF)

Phase Z

$\geq 1\ \text{msec.}$

RS-422 line driver pulse

Position data: 4 MHz (quad multiplication)

Speed data: 100 kHz

Receiver: Conforms to RS-422

Pulse phase: A, B and Z

A and B phases are necessary to work.

Phase A/B

- Position data: $\geq 0.5\ \mu\text{sec.}$ (both ON and OFF)
- Speed data: $\geq 5\ \mu\text{sec.}$ (both ON and OFF)

Phase Z

$\geq 1\ \text{msec.}$

Reset input: Discrete input

Number of input: 1 for each channel (2 points)

Common: Positive common

Detecting voltage: Supplied sensor excitation voltage

Detecting current: 5.5 mA per channel (@ 24 V DC)

Detecting levels:

$\geq 15\ \text{V DC}$ (between +24V and RST), $\geq 3.5\ \text{mA}$ for ON

$\leq 5\ \text{V DC}$ (between +24V and RST), $\leq 1\ \text{mA}$ for OFF

Input resistance: Approx. 4.4 k Ω

ON delay time: $\leq 50 \mu\text{sec}$.
OFF delay time: $\leq 500 \mu\text{sec}$.
Pulse width: $\geq 50 \text{ msec}$.
■ Latch input: Discrete input
Number of input: 1 for each channel (2 points)
Common: Positive common
Detecting voltage: Supplied sensor excitation voltage
Detecting current: 5.5 mA per channel (@ 24 V DC)
Detecting levels:
 $\geq 15 \text{ V DC}$ (between +24V and LCH), $\geq 3.5 \text{ mA}$ for ON
 $\leq 5 \text{ V DC}$ (between +24V and LCH), $\leq 1\text{mA}$ for OFF
Input resistance: Approx. 4.4 k Ω
ON delay time: $\leq 10 \mu\text{sec}$.
OFF delay time: $\leq 10 \mu\text{sec}$.

STANDARDS & APPROVALS

EU conformity:
 EMC Directive
 EMI EN 61000-6-4
 EMS EN 61000-6-2
 RoHS Directive

OUTPUT SPECIFICATIONS

■ Alarm Output: Open collector
Number of output: 2 for each channel (4 points)
Common: Negative common
Rated load voltage: 24 V DC $\pm 10 \%$
Max. load current: 0.1 A per point
Voltage drop at ON: $\leq 1.2 \text{ V}$
Leakage current at OFF: $\leq 1 \text{ mA}$
ON delay: $\leq 50 \mu\text{sec}$.
OFF delay: $\leq 500 \mu\text{sec}$.

INSTALLATION

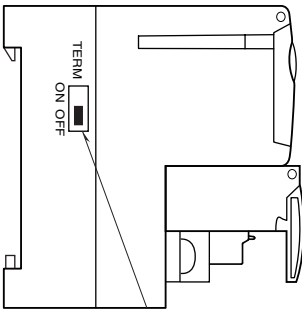
Current consumption
 •DC: Approx. 80 mA
 (Sensor excitation current is added for incorporated sensor excitation type)
Operating temperature: -10 to +55°C (14 to 131°F)
Storage temperature: -20 to +65°C (-4 to +149°F)
Operating humidity: 30 to 90 %RH (non-condensing)
Atmosphere: No corrosive gas or heavy dust
Mounting: DIN rail (35 mm rail)
Weight: 160 g (0.35 lb)

PERFORMANCE

Speed conversion accuracy: $\pm 0.1 \%$
Converted data range
Speed data: 0 – 10000 of the input range
Position data: -2 100 000 000 to +2 100 000 000
Insulation resistance: $\geq 100 \text{ M}\Omega$ with 500 V DC
Dielectric strength:
 • External sensor excitation type: 1500 V AC @ 1 minute
 (Input or output or sensor excitation input or encoder excitation input (for R7HL-PA2SAx) to HLS to power to FG)
 • Sensor excitation available type: 1500 V AC @ 1 minute
 (Input or output or encoder excitation input (for R7HL-PA2SAx) or power to HLS to FG)

EXTERNAL VIEW

SIDE VIEW



Terminating Resistor SW

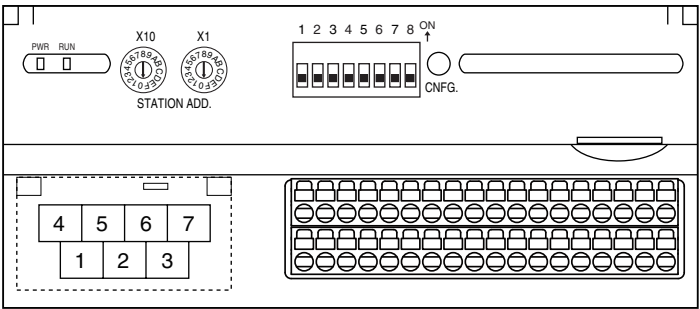
FRONT VIEW

Station Address Setting Rotary SW

Status Indicator LED

Operating Mode Setting DIP SW (SW1)

PC Configurator Jack



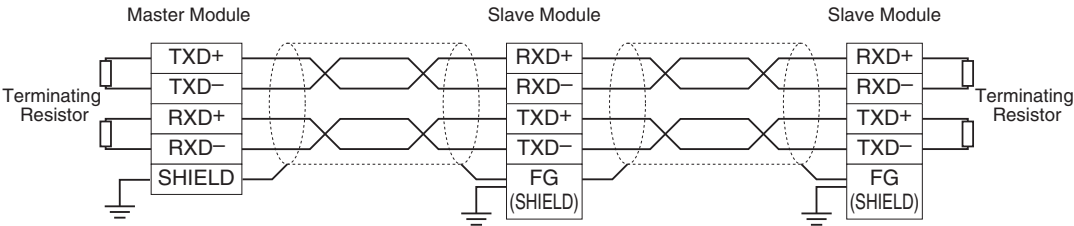
Network, Power Supply Terminals

I/O Terminals

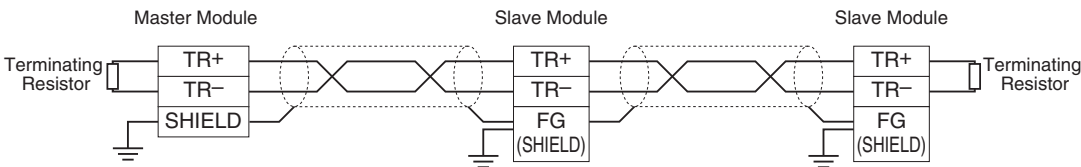
COMMUNICATION CABLE CONNECTIONS

MASTER CONNECTION

Full-duplex communication



Half-duplex communication



Note: Be sure to turn ON the switch of the terminating resistor located at both ends of the modules.

TERMINAL ASSIGNMENTS**■ I/O TERMINAL ASSIGNMENT**

Cable connector: FMC1,5/18-ST-3,5 (Phoenix Contact)

(The cable connector is included in the package)

Applicable wire size: 0.2 – 1.5 mm²; stripped length 10 mm

Recommended solderless terminal

- AI0,25-10YE 0.25 mm² (Phoenix Contact)

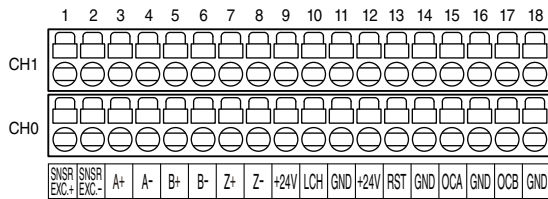
- AI0,34-10TQ 0.34 mm² (Phoenix Contact)

- AI0,5-10WH 0.5 mm² (Phoenix Contact)

- AI0,75-10GY 0.75 mm² (Phoenix Contact)

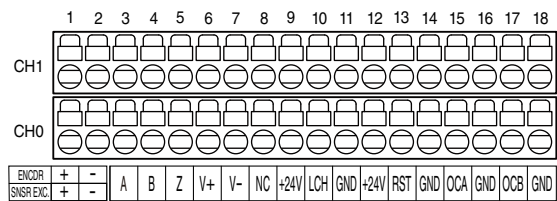
- A1-10 1.0 mm² (Phoenix Contact)

- A1,5-10 1.5 mm² (Phoenix Contact)

■ R7HL-PA2SJ

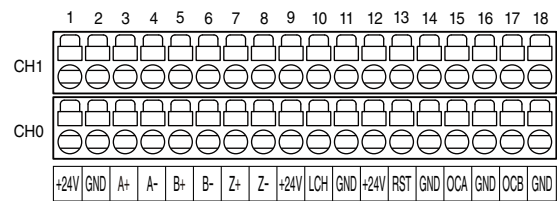
No.	ID	FUNCTION	No.	ID	FUNCTION
CH0	1	SNSR EXC.+	1	SNSR EXC.+	Sensor excitation input +
	2	SNSR EXC.-	2	SNSR EXC.-	Sensor excitation input -
	3	A+	3	A+	CH0 Phase A+
	4	A-	4	A-	CH0 Phase A-
	5	B+	5	B+	CH0 Phase B+
	6	B-	6	B-	CH0 Phase B-
	7	Z+	7	Z+	CH0 Phase Z+
	8	Z-	8	Z-	CH0 Phase Z-
	9	+24V	9	+24V	24V DC
	10	LCH	10	LCH	CH0 Latch input
	11	GND	11	GND	0V
	12	+24V	12	+24V	24V DC
	13	RST	13	RST	CH0 Reset input
	14	GND	14	GND	0V
	15	OCA	15	OCA	CH0 Open collector output A
	16	GND	16	GND	0V
	17	OCB	17	OCB	CH0 Open collector output B
	18	GND	18	GND	0V
CH1	1	SNSR EXC.+	1	SNSR EXC.+	Sensor excitation input +
	2	SNSR EXC.-	2	SNSR EXC.-	Sensor excitation input -
	3	A+	3	A+	CH1 Phase A+
	4	A-	4	A-	CH1 Phase A-
	5	B+	5	B+	CH1 Phase B+
	6	B-	6	B-	CH1 Phase B-
	7	Z+	7	Z+	CH1 Phase Z+
	8	Z-	8	Z-	CH1 Phase Z-
	9	+24V	9	+24V	24V DC
	10	LCH	10	LCH	CH1 Latch input
	11	GND	11	GND	0V
	12	+24V	12	+24V	24V DC
	13	RST	13	RST	CH1 Reset input
	14	GND	14	GND	0V
	15	OCA	15	OCA	CH1 Open collector output A
	16	GND	16	GND	0V
	17	OCB	17	OCB	CH1 Open collector output B
	18	GND	18	GND	0V

R7HL-PA2SAx



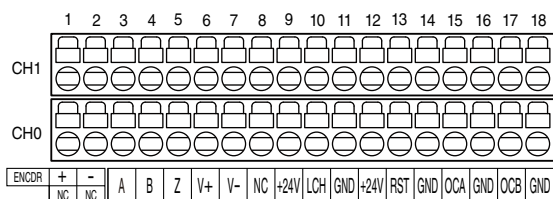
No.		ID	FUNCTION	No.		ID	FUNCTION
CH0	1	SNSR EXC.+	Sensor excitation input +	CH1	1	ENCDR+	Encoder excitation input +
	2	SNSR EXC.–	Sensor excitation input –		2	ENCDR–	Encoder excitation input –
	3	A	CH0 Phase A		3	A	CH1 Phase A
	4	B	CH0 Phase B		4	B	CH1 Phase B
	5	Z	CH0 Phase Z		5	Z	CH1 Phase Z
	6	V+	Encoder excitation output +		6	V+	Encoder excitation output +
	7	V–	Encoder excitation output –		7	V–	Encoder excitation output –
	8	NC	Not used		8	NC	Not used
	9	+24V	24V DC		9	+24V	24V DC
	10	LCH	CH0 Latch input		10	LCH	CH1 Latch input
	11	GND	0V		11	GND	0V
	12	+24V	24V DC		12	+24V	24V DC
	13	RST	CH0 Reset input		13	RST	CH1 Reset input
	14	GND	0V		14	GND	0V
	15	OCA	CH0 Open collector output A		15	OCA	CH1 Open collector output A
	16	GND	0V		16	GND	0V
	17	OCB	CH0 Open collector output B		17	OCB	CH1 Open collector output B
	18	GND	0V		18	GND	0V

■ R7HL-PA2SJ/C



No.		ID	FUNCTION	No.		ID	FUNCTION
CH0	1	+24V	Encoder excitation output +	CH1	1	+24V	Encoder excitation output +
	2	GND	Encoder excitation output –		2	GND	Encoder excitation output –
	3	A+	CH0 Phase A+		3	A+	CH1 Phase A+
	4	A–	CH0 Phase A–		4	A–	CH1 Phase A–
	5	B+	CH0 Phase B+		5	B+	CH1 Phase B+
	6	B–	CH0 Phase B–		6	B–	CH1 Phase B–
	7	Z+	CH0 Phase Z+		7	Z+	CH1 Phase Z+
	8	Z–	CH0 Phase Z–		8	Z–	CH1 Phase Z–
	9	+24V	24V DC		9	+24V	24V DC
	10	LCH	CH0 Latch input		10	LCH	CH1 Latch input
	11	GND	0V		11	GND	0V
	12	+24V	24V DC		12	+24V	24V DC
	13	RST	CH0 Reset input		13	RST	CH1 Reset input
	14	GND	0V		14	GND	0V
	15	OCA	CH0 Open collector output A		15	OCA	CH1 Open collector output A
	16	GND	0V		16	GND	0V
	17	OCB	CH0 Open collector output B		17	OCB	CH1 Open collector output B
	18	GND	0V		18	GND	0V

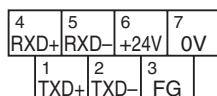
■ R7HL-PA2SAx/C



No.		ID	FUNCTION	No.		ID	FUNCTION
CH0	1	NC	Not used	CH1	1	ENCDR+	Encoder excitation input +
	2	NC	Not used		2	ENCDR–	Encoder excitation input –
	3	A	CH0 Phase A		3	A	CH1 Phase A
	4	B	CH0 Phase B		4	B	CH1 Phase B
	5	Z	CH0 Phase Z		5	Z	CH1 Phase Z
	6	V+	Encoder excitation output +		6	V+	Encoder excitation output +
	7	V–	Encoder excitation output –		7	V–	Encoder excitation output –
	8	NC	Not used		8	NC	Not used
	9	+24V	24V DC		9	+24V	24V DC
	10	LCH	CH0 Latch input		10	LCH	CH1 Latch input
	11	GND	0V		11	GND	0V
	12	+24V	24V DC		12	+24V	24V DC
	13	RST	CH0 Reset input		13	RST	CH1 Reset input
	14	GND	0V		14	GND	0V
	15	OCA	CH0 Open collector output A		15	OCA	CH1 Open collector output A
	16	GND	0V		16	GND	0V
	17	OCB	CH0 Open collector output B		17	OCB	CH1 Open collector output B
	18	GND	0V		18	GND	0V

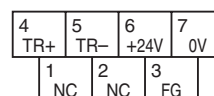
■ NETWORK, POWER SUPPLY TERMINAL ASSIGNMENT

• Full-duplex communication



NO.	ID	FUNCTION, NOTES
1	TXD+	Network (slave, transmission +)
2	TXD-	Network (slave, transmission -)
3	FG	FG
4	RXD+	Network (master, transmission +)
5	RXD-	Network (master, transmission -)
6	+24V	Power input (24V DC)
7	0V	Power input (0V)

• Half-duplex communication



NO.	ID	FUNCTION, NOTES
1	NC	No connection
2	NC	No connection
3	FG	FG
4	TR+	Network
5	TR-	Network
6	+24V	Power input (24V DC)
7	0V	Power input (0V)

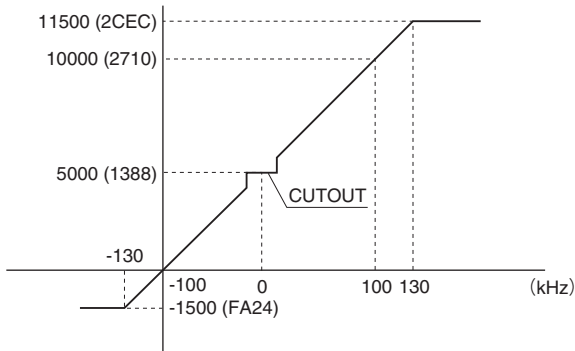
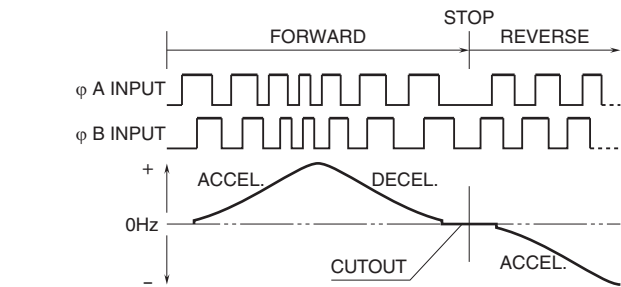
DATA CONVERSION

ENCODER INPUT (speed data)

Encoder input data is converted into digital representations of 0 – 100% proportional to each scaled range.
The converted % values are multiplied by 100 and expressed in 16 bits.
Ovrange input is possible from -15 to +115% of the nominal range.
When the signal exceeds the limit, the data is fixed at -15% or +115% respectively.

Input Range 0 – 100 kHz

Input Value	Input %	Converted Data, Decimal	Converted Data, Hex
-130kHz	-15%	-1500	FA24
-100kHz	0%	0	0
0kHz	50%	5000	1388
100kHz	100%	10000	2710
130kHz	115%	11500	2CEC

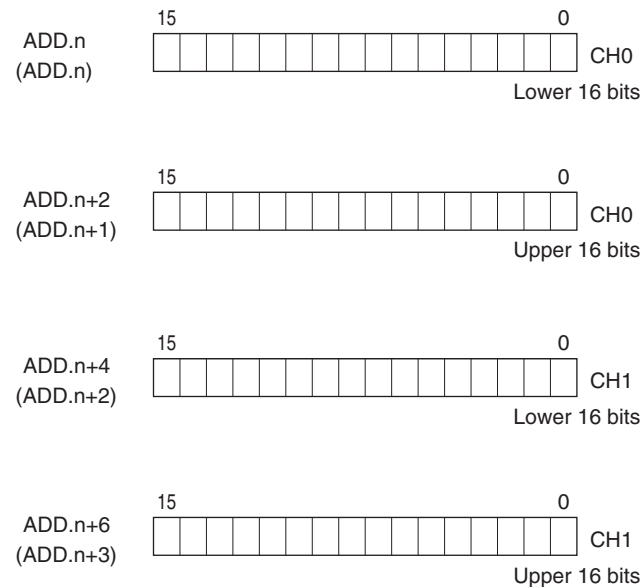


I/O DATA DESCRIPTIONS

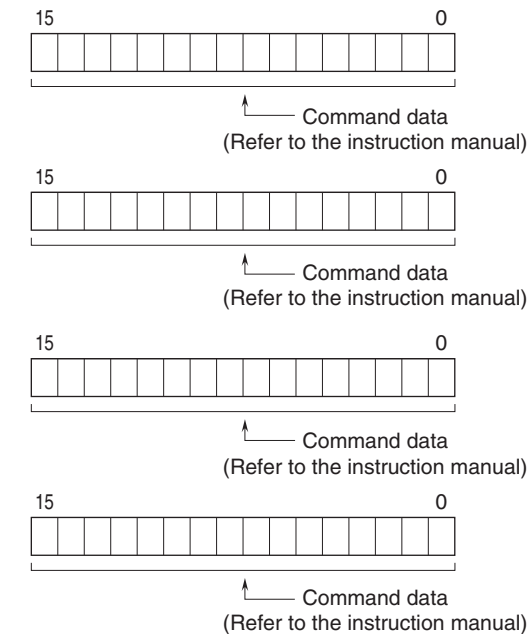
Scaling of encoder input (speed data) is configurable with the configurator software (model: R7CON).
Refer to the software manual for details.

POSITION DATA (Data allocation: 2 for each channel, total 4)

Di area



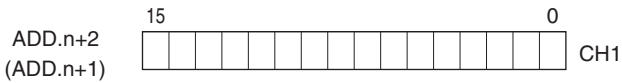
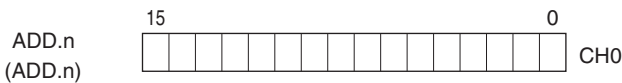
Do area



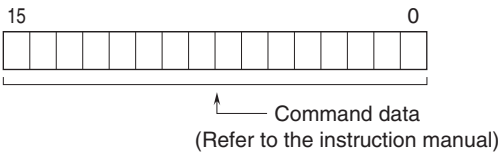
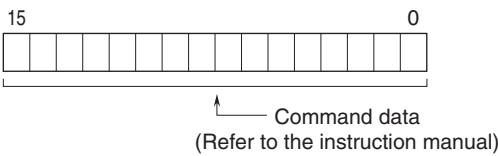
The data is 32-bit binary.
Addresses in parentheses are for half-duplex mode.

■ SPEED DATA (Data allocation: 1 for each channel, total 2)

• Di area

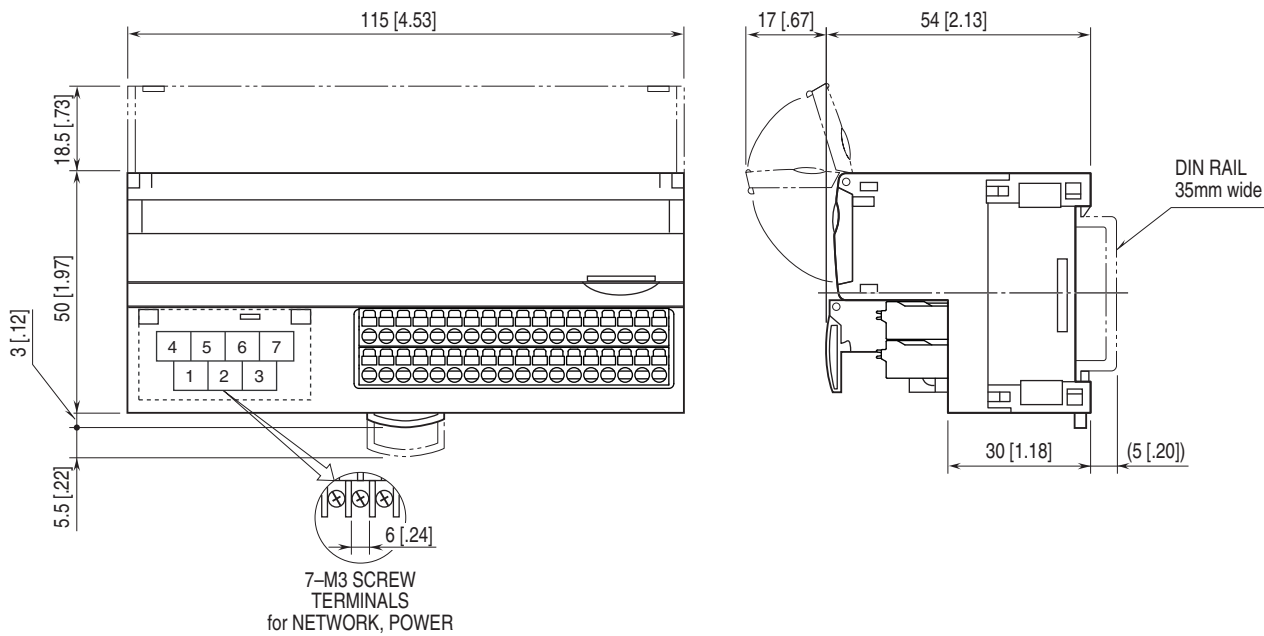


• Do area



Speed data is described in 16-bit binary, which express the frequency range specified with SW1-2 to 1-4 as 10000.
Addresses in parentheses are for half-duplex mode.

EXTERNAL DIMENSIONS & TERMINAL ASSIGNMENTS unit: mm [inch]

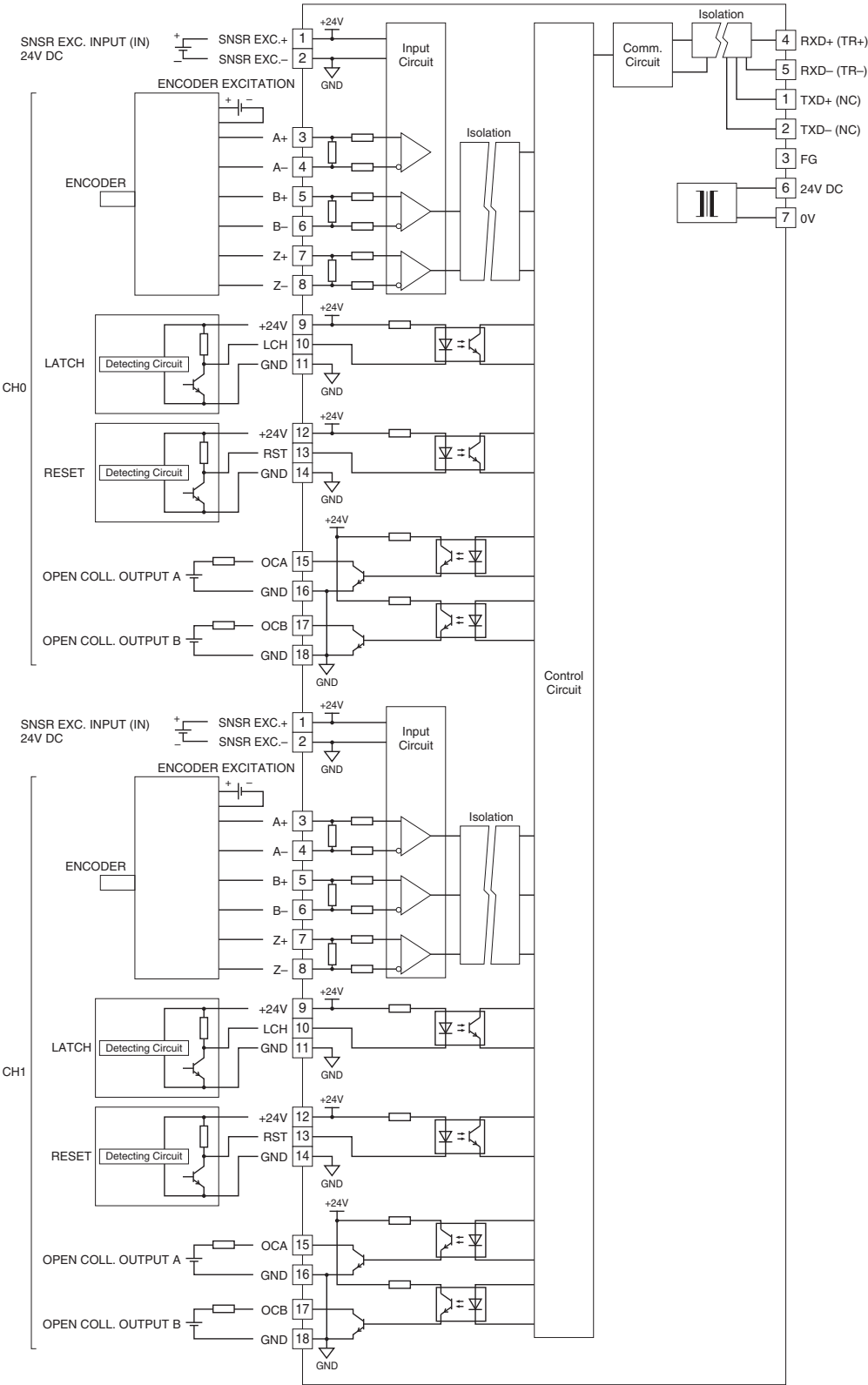


SCHEMATIC CIRCUITRY & CONNECTION DIAGRAM

Note: In order to improve EMC performance, bond the FG terminal to ground.

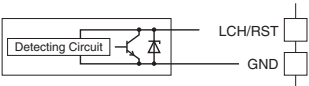
Caution: FG terminal is NOT a protective conductor terminal.

■ R7HL-PA2SJ (RS-422 line driver pulse input, external sensor excitation)

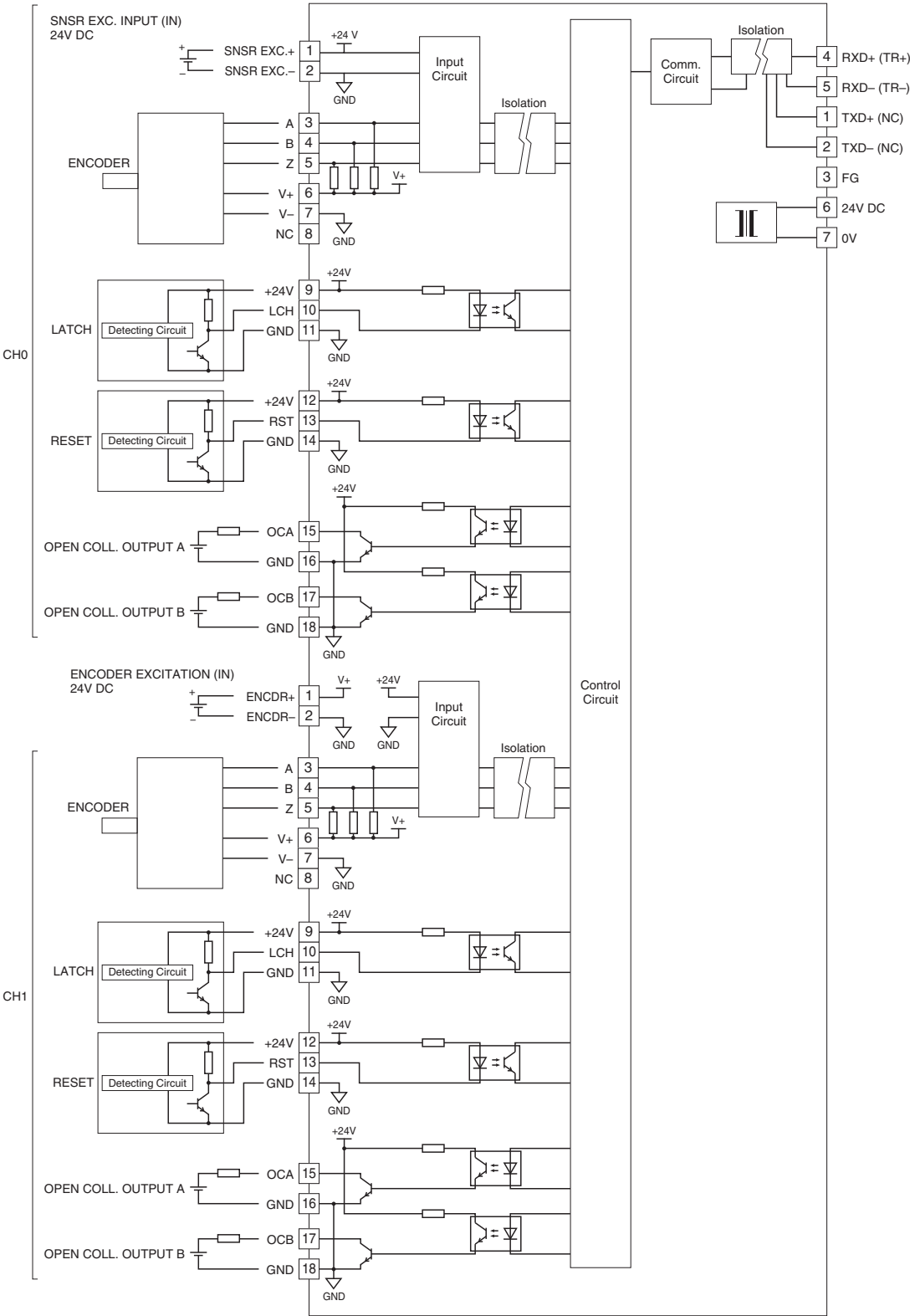


Note 1: Terminal numbers in parentheses are for half-duplex communication model.
Note 2: For encoder input, use shielded twisted pair cable and the shield line must be grounded.

■ 2-Wire Sensor (LATCH/RESET)

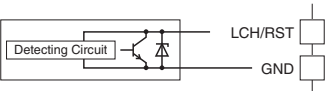


■ R7HL-PA2SA (Open collector input, external sensor excitation)

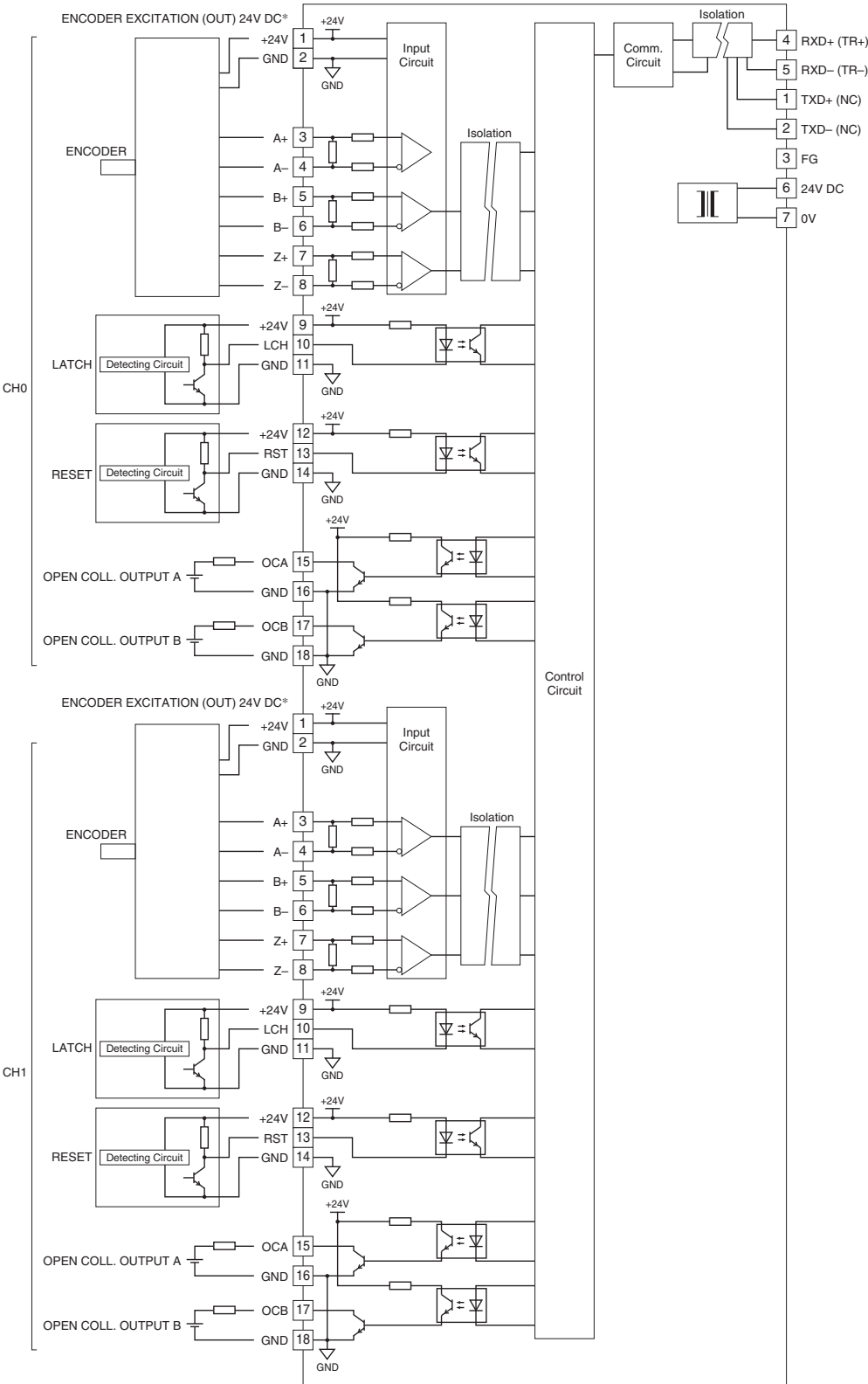


Note 1: Terminal numbers in parentheses are for half-duplex communication model.
Note 2: For encoder input, use shielded twisted pair cable and the shield line must be grounded.

■ 2-Wire Sensor (LATCH/RESET)

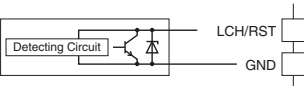


■ R7HL-PA2SJ/C (RS-422 line driver pulse input, sensor excitation available)

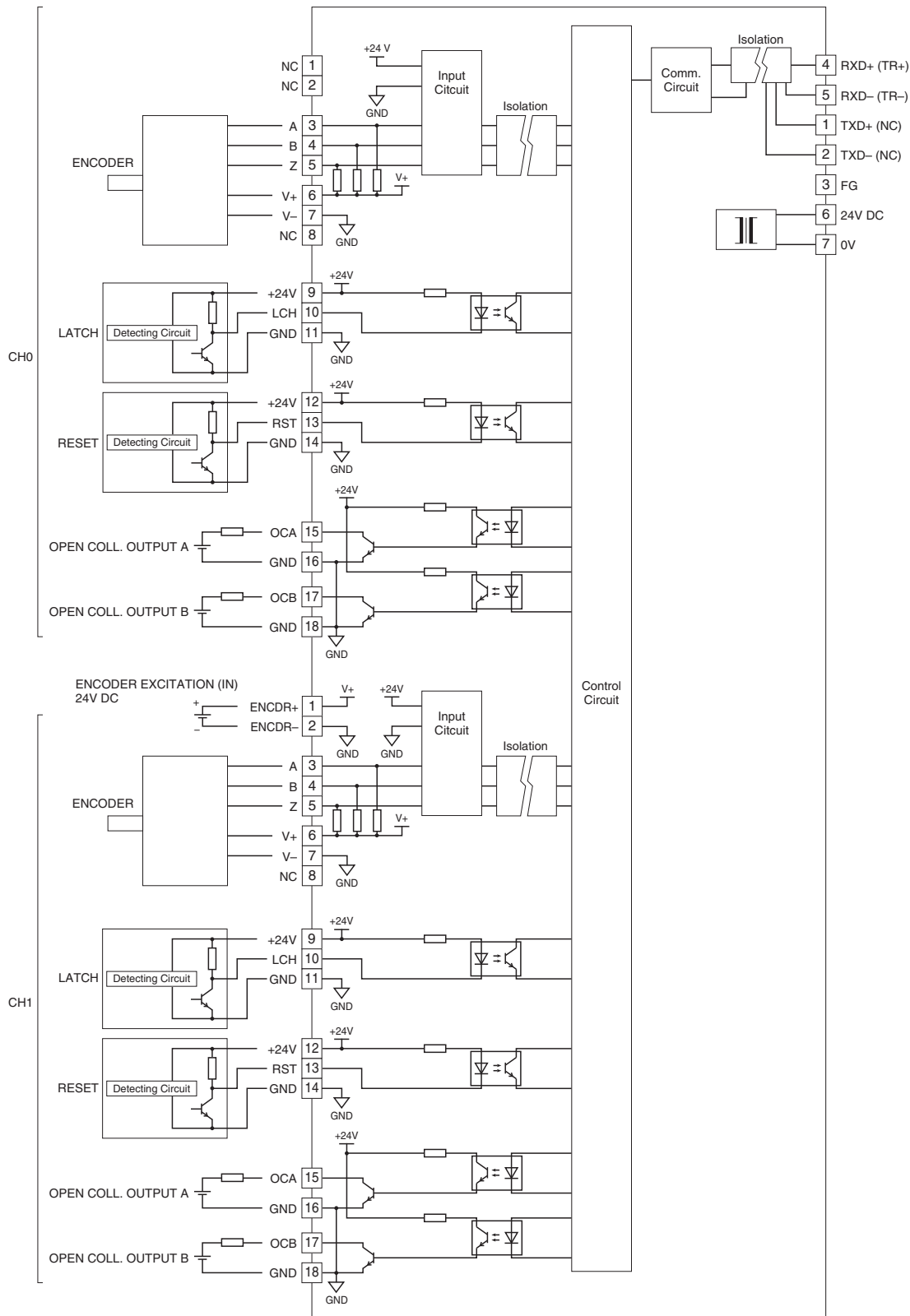


*In case that the encoder's excitation is not 24V DC, prepare an applicable voltage power supply unit.
Note 1: Terminal numbers in parentheses are for half-duplex communication model.
Note 2: For encoder input, use shielded twisted pair cable and the shield line must be grounded.

■ 2-Wire Sensor (LATCH/RESET)

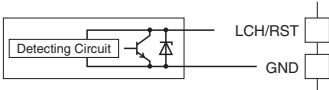


■ R7HL-PA2SA/C (Open collector input, sensor excitation available)



Note 1: Terminal numbers in parentheses are for half-duplex communication model.
Note 2: For encoder input, use shielded twisted pair cable and the shield line must be grounded.

■ 2-Wire Sensor (LATCH/RESET)





Specifications are subject to change without notice.