Contact Ramco for technical support on D4RF amplifiers

FASTUS

Instruction Manual

D4RF Series



The module address list required for the UC2-IOL IO-Link gateway and the setting file required for the UC1-EC/-EP communication unit, as well as the D4RF series user manual, can be downloaded from the OPTEX FA website.

https://www.optex-fa.com

OPTEX FA CO., LTD.



ank you for purchasing this Digital Fiber Amplifier D4RF. ore using this product, please read this manual carefully to ensure proper use. ad this manual thoroughly, and then keep this manual at hand so that it can be used whenever necessary

Safety Precautions

Safety precautions for ensuring safe operation of this product are displayed as follows

Precautions listed here describe important information about safety. Make sure to follow

Safety Symbols

<u>MARNING</u>	Indicates that any improper operation or handling may result in moderate or minor injury, and in rare cases, serious injury or death. Also indicates a risk o serious property damage.
↑ CAUTION	Indicates that any improper operation or handling may result in minor injury of

	⚠WARNING							
(1)	Do not disassemble, repair, modify, deform under pressure, or incinerate this product. Doing so may cause injury or fire.							
	This product is not explosion-proof and should not be used around flammable or explosive gases or liquids. Doing so may cause ignition resulting in an explosion or fire.							
	Do not use air dusters or any spray that uses flammable gas around the product or on the inside of the product. Doing so may cause ignition resulting in an explosion or fire.							
	Do not install this product in any of the following locations. Doing so may cause a fire, damage, or a maffunction. 1. Locations where dust; salt, iron powders, or vapors (steam) is present. 1. Locations where old or chemical spisates may be counted as the control of the co							
	This is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.							
\Diamond	This product is not intended for use with nuclear power, railways, aviation, vehicles, medical equipment, food-handling equipment, or any application where particular safety measures are required. Absolutely do not use this product for any of these fields.							
\Diamond	This product cannot be used in applications that directly or indirectly detect human bodies for the purpose of ensuring safety. Do not use this product as a detection device for protecting the human body.							
0	What to do in the event of a malfunction such as smoke being emitted from the product If you detect any malfunction including emission of smoke, abnormal smells or sounds, or the product enclosure becoming very hot, immediately stop operating the product and turn off the sensor power. Failar to do so may cause a fire. Repairing the product is dangerous and should in no way be performed by the customer. Contact an OPTEX FA sales representative for repairs.							

△CAUTION

- Make sure to turn the power off before wirring the cable or connecting/disconnecting the connector connecting or disconnecting while energized may damage the product or cause electric shock.
 Avoid using the transient state while the power is on (300 ms). Output could become unstable, causing the transient of the power is on (300 ms).
- Do not place wires with this product near a high voltage cable or power line. Doing so may cause malfuncti
- Do not place where with a may produce were a region or damage by indicated by a continued by a c
- When disconnecting the connector, be careful not to touch the terminals inside the connector, and do n
- When disconnecting the connector.

 Install this product as far away as possible from high-voltage equipment, power equipment, equipment that generates large whiching surges, inverter motors, wielders, or any equipment that can be a source of noise When connecting or disconnecting the cable, make sure to hold it by the connector portion, and do not apply the connecting the cable.

NOTICE

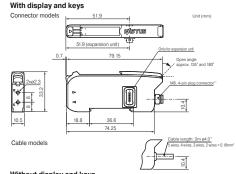
- After carefully considering the intended use, required specifications, and usage conditions, install and use the
 product within the specified ranges.
 All specifications may be changed without notice.
 All specifications and specifications are considered as a specific product material to a specific
- malfunction or failure.

 Do not use this product for the development of weapons of mass destruction, for military use, or for any control or the development of weapons of mass destruction, for military use, or for any control or the control of th

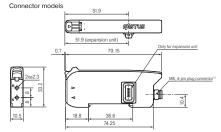
1. Included Items

- This instruction manual

2. Dimensions



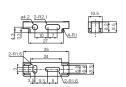
Without display and keys



*1 The D4RF-TM-0 and D4RF-TS-0 are not equipped with connectors or cables

*2 D4RF-S is not equipped with connectors or cables.

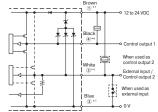
Mounting bracket



3. I/O Circuit Diagram (excluding cable-lass types)

1-output and 1-switchable-output/input models Without output/input wires model

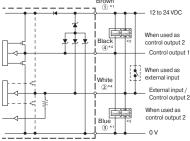
NPN setting

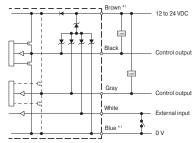


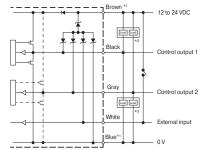
1-output+1-input setting



30 V Main unit





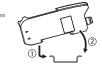


- *1 Power supply wires (Brown1), Blue3) are not equipped on the inter-connection
- *2 When I/O polarity is set to Push-pull and the sensor is connected with plus common circuits. *3 When I/O polarity is set to Push-pull or PNP and the sensor is connected with minus com-
- *4 Input and output wires (White2, Black4) are not equipped on models "Without

4. Installation

Installing the amplifier

- 1 Place the groove on the side of fiber unit holes to the DIN-rail.
- 2 Press down until the hook locks



Contact Ramco for picking the best fiber cable for your application Removing the amplifier

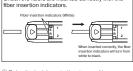
1 Push the amplifier toward the side of fiber unit holes. 2 Lift up the side of fiber unit holes and remove it.



Mounting the fiber unit

1 Slide the lock lever down

2 Insert the fiber wires in the holes to the end. Check the fibers are inserted correctly with the



3 Raise the lock lever to the stop position.

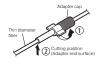
CAUTION

When using a coaxial reflec-tive fiber unit, insert a sinale-core fiber or fiber sheath with a white line on the emitter hole, and multi-core fiber on the receiver hole.



How to use the fiber adapter (Included with the thin fiber units)

- Turn the adapter cap fully counterclockwise to unlock, and then align the ends of adapter pipe and fiber. Turn the cap fully clockwise to lock the adapter.
- ② Cut the fiber at a desired length, using the fiber cutter included in a free-cut fiber unit.



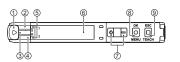
Installing Inter-connection main/expansion units

- 1. Mount each amplifier on the DIN-rail.
- 2. Slide the expansion unit and connect it to the
- inter-connection connector on the main unit. 3. Use the end plates on both sides to secure the amplifiers

CAUTION

- Be sure to turn off the power before performing
- When connecting Inter-connection main and expansion units, be sure to use a DIN-rail and end plates.
- To operate Inter-connection main and expansion units, make sure the ambient temperature to be within the specified range.
- sure to attach the protective cover to connecto
- that are not in use · Do not remove connected amplifiers from the

5. Part Names



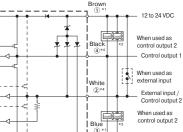
No.	Name	Description
1	Lock lever	Locks and releases the fiber unit.
2	Output 1 indicator (orange)	Illuminates in orange when output 1 is ON.
(3)	Power indicator (green)	Illuminates in green when the power.
4	Output 2 indicator (orange)	Illuminates in orange when output 2 is ON.
(5)	Fiber insertion indicator	Indicates the insertion status of the fiber unit.
6	OLED display ⁻¹	Displays the present receiving light level and threshold, and the parameters during setting.
7	Selection keys (+/- keys)"1	Manually adjusts the threshold, and select menu during setting.
8	OK/MENU key ⁻¹	Selects and sets the parameters.
(9)	ESC/TEACH key'1	Performs teaching, and exit menu during setting.

*1 Not equipped on models "Without display and keys".

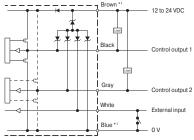
Ramco Innovations www.optex-ramco.com (800) 280-6933 nsales@ramcoi.com







2-outputs and 1-input models



PNP setting or Push-pull

Contact Ramco for picking the best fiber cable for your application

6. Menu List

In case "English" is selected in "Language". 1

	Initial menu	Setting value					
1/3	Language	English, 日本語, 简体中文, Espanol, 한국어	English				
2/3	I/O polarity	NPN, Push-pull, PNP	NPN				
3/3	Display	Std. display, Hold display	Std. display				

	Main menu		Sub menu	Setting value / description	Default value
S1	Output mode (N.O./ N.C.)*3			Light on, Dark on, (N.O./ N.C.)	Light on
S3	Response time	-		Main unit with stand-alone use: 16 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms Main and expansion units connected: 22 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms	250 μs
S4	Timer			Not used, On delay, Off delay, On/off delay, Pulse output, On delay pulse, 1 to 30,000 ms	Not used
S6	Display	P1	Display mode	Value, Percentage, Bar graph, Counter ¹⁴ , Edge ¹⁵	Value
		P2	Hold display	Off, Peak/bottom, Peak, Bottom, Time, On'6	Off
		РЗ	Brightness	10 to 100 % (10% increments)	100 %
		P4	Rotate display	Off, On	Off
		P5	Invert display	Off, On	Off
		P6	Alarm display	Off, On	Off
		P7	Zeroing	Not used, Execute	Not used
		P8	Eco mode	Off, On	Off
		P9	Stretch mode ¹⁷	Off, On - x10, On - x50	Off
		PA	Language	English, 日本語, 简体中文, Espanol, 한국어	English
		PB	To main menu		
37	Detection	D1	Hysteresis	1 to 90 %	5%
		D2	Threshold mode	Standard, Edge height, Not used	Standard
		D3	APC	On, Off	On
		D4	ASC	Off, On - standard, On - fast, On - max	Off
		D5	Emitter power	Max, Mid, Min, Auto	Max
		D6	Counter	Off, On	Off
		D7	Set count'4	1 to 16383	10
		D8	Edge direction'5	Both, Positive, Negative	Both
		D9	Edge offset"s	16 jus : 16 jus to 4,080 jus (Main unit with stand-alone use), 22 jus : 22 jus 15 Golf to 560 jus (Inter-connection units with inter-connection use), 70 jus : 70 jus to 17850 jus, 250 jus : 250 jus to 63750 jus, 500 jus : 0.5 ms to 127.5 ms 1 ms : 1 ms to 250 ms ; 255 ms , 2 ms : 2 ms to 510 ms, 8 ms : 8 ms to 2040 ms	2500 μs
i		DA	Edge hys."5	1 to 9999	5
		DB	To main menu		
88	I/O	01	I/O polarity ¹²	NPN, Push-pull, PNP	NPN
		02	Pin 2 setting ¹²¹⁸	Output 2, Alarm output, Teach input, Emitter off, Counter reset*4, Not used	Output 2
		03	Pin 5 setting ¹²¹⁹	Output 2, Alarm output, Input ack., Not used	Output 2
		04	Pin 2 setting ¹²¹⁹	Teach input, Emitter off, Counter reset*4, Load preset, Not used	Teach input
		05	Lock mode ¹²	Lock all, Lock keys	Lock all
		06	Preset setting	Preset 1 to Preset 5	-
		07	Load preset	Preset 1 to Preset 5	-
		08	To main menu		
39	Information	11	Serial number	Manufacturing time.	1
		12	Firmware ver.	Firmware version.]
		13	Hardware ver.	Hardware version.	
		14	Temperature	Internal temperature in Celsius.	1
		15	Operation time	Operating time after reset.	
		16	Total time	Total operating time.	1
		17	Counter value ¹⁴	Counter value in Counter mode.	
		18	Received light	Value of the light received level diagnosis.]
		19	No. of devices 10	Total number of connected units including the main unit.	
		IA	Device number	Order number of the amplifier from the main unit.	
		IB	Edge peak'5	Displays the edge peak value in Edge peak mode.]
		IC	To main manu		
ŝΑ	All devices	A1	Copy to all	No, Copy to all	No
		A2	Zeroing all	No, Zeroing all	No
		А3	Zero reset all	No, Zero reset all	No
		A4	Set reset all	No, Set reset all	No
		A5	Fct. reset all	No, Fct. reset all	No
		A6	All teach	No, All teach	No
		A7	To main menu		
C	Reset	SB	No		
		SB	Setting reset	7	
		SB	Factory reset	7	
	To run mode	_			

- *1: D4RF-MC4/-S are not equipped with OLED display, so all menus cannot be displayed.
- *2: D4RF-TM-0/-TS-0/-MC4/-S are not equipped with output/input wires, so all menus related to output/input cannot be displayed.
- *3: "N.O./N.C." is displayed when "Edge" is selected in "D2 Threshold mode" or when "1-point Zone" or "2-point Zone" is selected during teaching.
- *4: Displayed when "On" is selected in "D6 Counter".
- *5: Displayed when "Edge height" is selected in "D2 Threshold mode".
- *6: Only "Off" or "On" can be selected when "Edge height" is selected in "D2 Threshold mode".
- *7: Displayed when "Standard" or "Not used" is selected in "D2 Threshold mode"
- *8: Displayed on 1-output and 1-switchable-output/input models.
- *9: Displayed on 2-output and 1-input models.
- *10: Displayed on all main units except D4RF-MC4.

7. Specifications

				Standard inte	r-connection		Inter-connection for	communication unit				
Туре			With display and keys		With display and keys		Without disp	lay and keys				
			Main unit	Main unit Expansion unit Main unit Expansion un		Expansion unit	Main unit	Expansion unit				
			Cable type	D4RF-TM	D4RF-TS			-				
	1 output and 1 s	witchable output/input	Connector type	D4RF-TMC4	D4RF-TSC4				_			
	2 outputs and	1 input	Cable type	D4RF-TDM	D4RF-TDS				-			
Model		rt, short-range/high accuracy		D4RF-TDM-Y	D4RF-TDS-Y			_	_			
	Without output		Connector type	D4HI-IDW-I	D4111-1D3-1	-	-	D4RF-MC4	-			
	Cable-less typ		CONNECTION TYPE		-	D4RF-TM-0	D4RF-TS-0	D4HH-WG4	D4RF-S			
Light so		e							D4NF-5			
Light Sc	ource	1.		16 µs, 70 µs, 250 µs, 500 µs,		4-element Red LED (Wavelength: 660nm)						
Respon	se time	Stand-alone use		1 ms, 2 ms, 8 ms	-	-	-	-	-			
		Inter-connection (use	22 µs, 70 µs, 250 µs, 500 µs, 1 ms, 2 ms, 8 ms								
Teach N						2 points, Auto, Through, 1	-point Zone, 2-point Zone	, Manual				
Display		Digital display		Manuslana		r 128 x 22 pixel , Korean, Simplified Chine	an Canainh		-			
		Indicators		Mendiango	ages : English, Japanese	2 x Output ind Power indicator (green): L	icator (orange)	1				
Interfac	e	Control output ¹		NPN/PNP open collecto	r or Push-pull selectable	r ower indicator (green). L	agrits up wrieri power is or					
				by se	etting							
					, 2 outputs : Max. 50mA al voltage 1.8V or less							
		External input			at vortage 1.8v or less itter off or Preset loading*2							
Numbe	r of units with cro	oss talk prevention				s, 250 μs: 4 units, 500 μs: !	9 units. 1 ms: 9 units. 2ms:	12 units, 8 ms; 14 units (inc	cluding main unit)			
Timer fu		, , , , , , , , , , , , , , , , , , ,				y, On/off delay, Pulse outp						
Output	mode					Light ON/Dark ON,	selectable by setting					
Numbe	r of connecable	units				Max.16 units (inc	luding main unit)					
			Minimum bending radius: 4 x Cable diameter 5 wires with 2-outputs and 1-input main models, 4 wires with 1-output and 1-swchable-output/input main models, 3 wires with 2-outputs and 1-input expansion models, 2 wires with 1-output and 1-swchable output/input expansion models, Connector type: M8 4 - jin plug connector		Without cable or connector		Connector type: M8 4-pin connector (For supplying power)	Without cable or connector				
Insulatio	on resistance			Connector type: wo 4-pii	i piug connector	20 Megohm or mo	ore (with 500 VDC)		I			
		Supply voltage		Supplied directly or from communication unit *3 12 to 24 VDC ± 10 % including 10 % ripple (p-p)	Supplied from main unit or communication unit *3 12 to 24 VDC ± 10 % including 10 % ripple (p-p)	Supplied from communication unit *3 12 to 24 VDC ± 10 %	Supplied from communication unit *3 12 to 24 VDC ± 10 %	Supplied directly or from communication unit *3 12 to 24 VDC ± 10 % including 10 % ripple (p-p)	Supplied from communication unit *3 12 to 24 VDC ± 10 % including 10 % ripple (p-			
Rating		Current	Eco mode: Off	792 mW max. (33 m	A or less at 24 VDC, as at 12 VDC)	720 mW max. (30 mA or less at 24 VDC, 49mA or less at 12 VDC)		624 mW max. (24 mA or less at 24 VDC 41 mA or less at 12 VDC)				
			Eco mode: On	696 mW max. (29 n		624 mW max. (26 mA or less at 24 VDC 41 mA or less at 12 VDC)		-				
Warm-u	up time			300 ms								
Applica	ble regulations		EMC	EU EMC directive (2014/30/EU) UK directive EMC (The Electromagnetic Compatibility Regulations 2016)								
			Environment	EU RoHS directive (2011/65/EU) UK RoHS (The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012) China RoHS (MIT Order No. 32)								
Applica	ble standards						347-5-2					
NRTLo	ertification				UL Listed or Re	cognized Components Pro		US and Canada.				
	ny standards			Noise resistance Feilen Level 4 cleared								
Protection circuit				Reverse connection protection, Overcurrent protection								
		Ambient temper		-25 to 55 °C/35 to 85 % RH (no freezing or condensation)								
Enviror	nmental	Ambient illumina		Sunlight: 10000 lx or less, Incandecent light: 3000 lx or less								
resista		Vibration resistance		10 to 55 Hz, Double amplitude 1.5 mm; 2 hours in each of the X,Y and Z directions								
			Shock resistance		Approx. 50 G (500 m/s²) 3 times in each of the X,Y and Z directions							
Motoria	n!	Degree of protect	CHOH									
Material Weight			Cable model: approx.		Housing, cover: PC Approx. 23 q							
Included items			Connector model: approx. 25 g Mounting bracket. Instruction manual									
	ou nems					wiouriting bracket,	monucuun manual					

1: The load current and operating temperature are limited by the number of connected units (including inter-connection main unit) as shown in the table below

Number of connected units	1 unit		2 units		3 to 5 units		6 to 16 units*4	
Max. input current of main unit	152 mA		144 mA		360 mA		1152 mA	
No. of control output per unit	1	2	1	2	1	2	1	2
Max. load current per output	100 mA	50 mA	20 mA	10 mA	20 mA	10 mA	20 mA	10 mA
Upper limit of ambient temperature	55 °C		55 °C		50 °C		45 °C	

- *2: Preset loading selectable only on 2-output and 1-output models.
- *3: For details on supplying power from the communication unit, refer to the instruction manual of the respective communication unit.
 *4: When 6 or more units connected and used as UL certified product, use the product under the conditions shown in the table below.

Number of connected units	6 to 8	units	9 to 16 units		
Max. input current of main unit	576	mA	1152 mA		
No. of control output per unit	1	2	1	2	
Max. load current per output	20 mA	10 mA	20 mA	10 mA	
Upper limit of ambient temperature	45 °C		40 °C		

This device complies with part 15 of the FCC Rules.

Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

*This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Support for the China RoHS directive

For details on the support for the China RoHS (the Administrative Measure on the Control of Pollution Caused by Electronic Information Products), see the following website.

https://www.optex-fa.com/rohs_cn/

OPTEX FA CO., LTD.

[Headquarte

91 Chudoji-Awata-cho, Shimogyo-ku, Kyoto 600-8815 JAPAN TEL +81-75-325-1314 FAX +81-75-325-2936