Digital Fiber Amplifier

D3RF/D3IF Series

D3RF-T□　D3IF-T□
D3RF-TC□4　D3IF-TC□4
D3RF-TD□

Instruction Manual

●Thank you for purchasing D3RF Series. We hope you are fully satisfied with this product and enjoy its performance.
●Carefully read this instruction manual and keep it for future reference.

Carefully read and understand the safety precautions before operation.
The important information is provided to protect your health and property.
Do not apply any other installing or operating procedure other than that discribed in this manual.

Safety Precautions

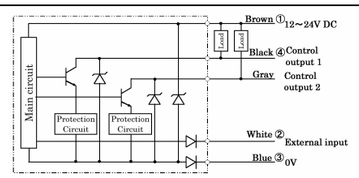
CAUTION

●It is dangerous to wire or attach/remove the connector with the power on. Make sure to turn off the power before operation.
●Make sure to use the product with the protective cover attached and closed.
●Installing in the following places may result in malfunction:
1. A dusty or steamy place.
2. A place generating corrosive gas.
3. A place directly receiving scattering water or oil.
4. A place suffered from heavy vibration or impact.
●The product is not designed for outdoor use.
●Do not use the sensor in transient state after power on (approx. 300ms).
●Do not wire with the high voltage cable or the power line. Failure to do this will cause malfunction by induction or damage.
●The sensor performance or digital display values may depend on the individual units or the condition of detected product.
●This product is not an explosion-proof construction. Do not use the product under flammable, explosive gas or liquid environment.
●Do not use the product in water.
●Do not disassemble, repair, or convert the product. Failure to do this may cause failure, fire, or electric shock.
●Operate within the rated range.

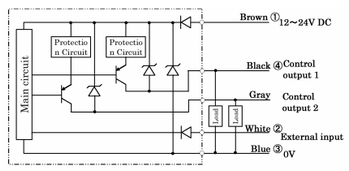
This product cannot be use as a safety device to protect human body.

Input/Output Schematic

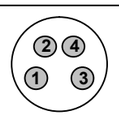
NPN



PNP



Pin layout



1 12-24VDC
2 External Input
3 0V
4 Control output 1

* Gray line (Control output 2) is only for the 2 output type (D3RF-TD).

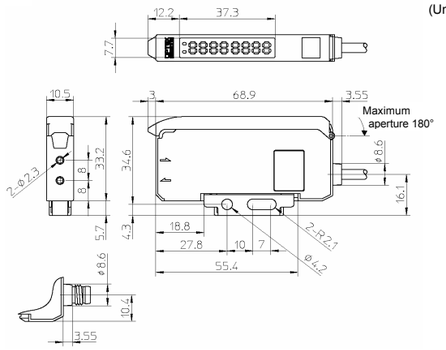
Specifications

Model		Standard type	Moisture sensing type
Cable Type	1 output	D3RF-T (N/P)	D3IF-T (N/P)
	2 output	D3RF-TD (N/P)	-
M8 Connector Type	1 output	D3RF-TC (N/P) 4	D3IF-TC (N/P)4
	2 output	-	-
Power sourse, voltage		12-24VDC±10%including a ripple	
Power consumption	Normal	1 output : 864mW max.(36mA or less / 24V) ,2 output : 936mW max.(39mA or less / 24V)	
	Eco All	1 output : 600mW max.(25mA or less / 24V) ,2 output : 672mW max.(28mA or less / 24V)	
Response Time		1-HS:16μs / 2-FS:70μs / 3-ST:250μs / 4-LG:500μs / 5-PL:1ms / 6-UL:2ms / 7-EL:8ms	
Control output		1 output / 2 output , NPN / PNP Open collector 100mA / 30V or less Load current : 100mA or less , Residual voltage : 1.8V or less	
Output method		Light on / Dark on Switching type in the function	
Short-circuit protection		Incorporated	
Light source		Red LED （632nm）	IR LED （1,450nm）
Indicator light / Display	1 output	Output Indicator light : Orange (Ch 1) / 7 segment 8 digit display	
	2 output	Output Indicator light : Orange (Ch 1 / Ch 2) /7 segment 8 digit display	-
Sensitivity setting		Teaching / Manual adjustment	
Timer function		OFF,On delay timer,Off delay timer,One-shot timer, On delay-off delay timer,On delay-one-shot timer	
Timer time		0.1ms～9.999s	
External input setting		Teach-in, Emitter stop, Synchronous, Counter reset (only for 2 output type)	
Output setting	1 output	Output 1	
	2 output	Output 2	-
Operating temperature /humidity		-25～+55℃/35～85%RH (No freezing and No condensation)	
Store temperature /humidity		-30～+70℃/35～85%RH (No freezing and No condensation)	
Shock resistance		10～55Hz Amplitude 1.5mm 2 hours for each direction of X,Y and Z	
Protective category		IP50	
Material		PC :Cover, Case	
Weight		Cable type : 71g (Including cordes)	
		M8 Connector type : 25g	

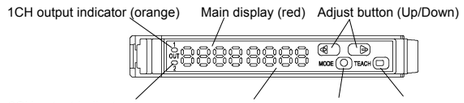
Dimensions

(Unit: mm)

D3RF-T□
D3RF-TD□
D3IF-T□



Display/Indicator/Buttons



*2 output type (D3RF-TD) only

Installing Amplifier

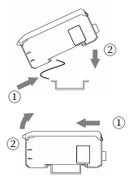
■Mounting and Removing to/from DIN rail

●Mounting of Amplifier Unit

Hook the claw on the connecting side of fiber cable to the DIN rail. Then press down the hook until it locks.

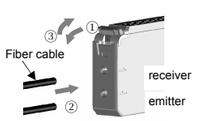
●Removing of Amplifier Unit

Pushing the unit to the direction of ①, hold up the connecting side of fiber cable and remove the unit.



■How to connect the fiber cables

① Open fiber lock lever.
② Insert fiber into holes to stop.
③ Return fiber lock lever until it stops.

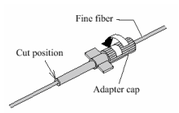


CAUTION

With Coaxial reflection fiber, set single core fiber or white-lined fiber

■How to use Fine fiber

① Turn adapter cap anticlockwise completely, then appropriately insert the fiber.
② Cut the excess fiber with fiber cutter.



Display and Buttons

■Switching display

Display shows as follows according to its mode

Operating (RUN mode)	Setup	Teaching
It shows as example when it's actually detecting object. It goes to this mode after power up.	It switches to this Setup mode by pressing "MODE" button over 3 seconds.	It switches to this Teaching mode by pressing "TEACH" button over 3 seconds.
Ex.) 200 100	Ex.) L--d L on	Ex.) 2Pt 1Pt
Sensing Threshold level	Function Setup Value	Mode of teaching

■Buttons

Buttons work as follows according to its mode

Buttons	Operating (RUN mode)	Setup / Teaching
Adjust (+ UP)	Increase threshold level	Change the Setup function and mode of Teaching
Adjust (- DOWN)	Decrease threshold level	
MODE	Switch to Setup mode	Set the setup
TEACHING	Switch to Teaching mode	Execute Teaching

Setup menu

Basic menu

These are basic menu that to be setup before using.
Please refer Expert menu for further setup function.

Display	Menu	Function
L--d	Output mode	Switch Light ON and Dark ON
rESP	Response speed	Set response speed
dELY	Timer/Delay	Set Timer and Delay
EPrt	Expert mode	Enter to Expert mode (refer Expert menu)
rSEt	Initialize	Initialize setup to default
End	Exit	Exit setup mode

Expert menu

These are menu for function that setup in detail.
Expert menu is available from "Eprt" in Basic menu.

Display	Menu	Function
0rSt	Zero reset	Set main display to 0 (zero).
di SP	Display mode	Set display mode for operating (RUN mode)
Eco	Eco mode	Set Eco mode
turn	Rotation	Rotate the display 180 degree
HYS	Hysteresis	Specify hysteresis percentage
PrcS	Detection mode	Set detection mode (edge/level)
cnt	Counter	Switch ON/OFF Counter and specify UP/DOWN direction
inPt	External input	Set function of external input
ASc	ASC	Set ON/OFF ASC (Automatic Sensitivity Control)
SPor	Emitter Power	Specify Emitter power
Locl	Lock level	Specify level of Key Lock
SAvE	Save	Save the current setup
End EPrt	Exit	Exit expert menu
Loc	Lock	Lock buttons (refer useful function)

Teaching menu

Threshold level can be set by these menu.
Please refer "Teaching".

Display	Menu	Function
2Pt	2 Point Teaching	Set the threshold at the center between with object and without object.
1Pt	1 Point Teaching	Set the threshold at minimum level that can detect object stably with.
thru	Through Teaching	Set the threshold at around 90% of sensing level without object for through beam application.
ZonE	Zone Teaching	Set the threshold at around sensing level ±10%.
Auto	Automatic Teaching	Set the threshold at the center between maximum and minimum level.
P-t	Percent Teaching	Threshold can be set any percentage.
0P-t	Zero % Teaching	Set the threshold at any percentage and execute zero reset.
EndtEch	End of Teaching	Exit Teaching mode.

Basic setup

Press "MODE" button over 3 sec.

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

1. Output mode (Top)

Choose Light ON or Dark ON

L on	ON by sensing light (Light ON) †
d on	ON by blocking light (Dark ON)

2. Response speed (Top)

Choose response speed

1-HS	High Speed	response time:16μs
2-FS	Fast	response time:70μs
3-St	Standard	response time:250μs †
4-LG	Long	response time:500μs
5-PL	Power Long	response time:1ms
6-UL	Ultra Long	response time:2ms
7-EL	Extra Long	response time:8ms

Choose faster mode when detect object moving fast at closer distance. Choose slower mode for detecting object at longer distance. The faster the shorter sensing distance.

3. Timer/Delay (Top)

Set Timer and/or Delay

oFF	OFF †
oFdY	OFF delay timer
ondY	ON delay timer
Shot	One shot timer
onoF	ON delay and OFF delay timer
onSh	ON delay and One shot timer

Timer can be set from 0.1 to 9999ms.

0.1 0.1 ～ 9999 9999

*When choose "onoF" or "onSh", each ON delay/OFF delay and ON delay/One shot timer can be set individually.

4. Expert mode (Top)

Ⓐ Enter to Expert mode (refer Expert menu)

5. Initialize (Top)

Initialize setup to default

no	No initializing †
Init	Setup to default
uSEr	Setup with saved parameters

*"uSEr" is shown only when there is saved parameter by "SAVE" in Expert mode. Refer "Expert mode4-12. Saving user parameter"

End **Exit Basic menu.**

Go back to RUN mode.
*It goes back to RUN mode when there is no button operation for 30 seconds. It can be changed to RUN mode by single action as well. Please refer "Useful function ■Switching to RUN mode by single action"

Setup Threshold manually

At RUN mode, press ◁ or ▷ then, threshold display blinks that shows it can be adjusted. Adjust the threshold by ◁ or ▷ . You can adjust upper and lower threshold when it's Zone Teaching mode.

RUN mode

200 100

Press MODE button or leave for 5 seconds then, it goes back to RUN mode.

Zone Teaching

Lower (Far) → 200 FAr → Press MODE button while "Far" is blinking. → Adjust the threshold

Upper (Near) → 200 nEAr → Press MODE button while "Near" is blinking. → 200 100 → Adjust the threshold

Digital Fiber Amplifier

D3RF Series

D3RF-TM□ D3RF-TDM□
D3RF-TMC□4
D3RF-TS□ D3RF-TDS□
D3RF-TSC□4

Instruction Manual

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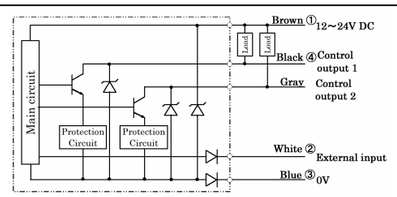
●Do not use the sensor in transient state after power on (approx. 300ms).
●Do not wire with the high voltage cable or the power line. Failure to do this will cause malfunction by induction or damage.
●The sensor performance or digital display values may depend on the individual units or the condition of detected product.
●This product is not an explosion-proof construction. Do not use the product under flammable, explosive gas or liquid environment.
●Do not use the product in water.
●Do not disassemble, repair, or convert the product. Failure to do this may cause failure, fire, or electric shock.
●Operate within the rated range.

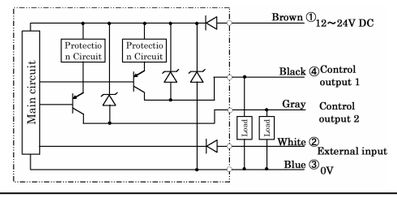
This product cannot be use as a safety device to protect human body.

Input/Output Schematic

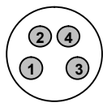
NPN



PNP



Pin layout



1 12-24VDC
2 External Input
3 0V
4 Control output 1

* Slave unit doesn't have the power supply cables (Brown and Blue).
* Gray line (Control output 2) is only for the 2 output type (D3RF-TDM/S)

Specifications

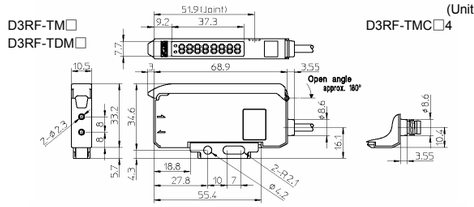
			Model
Cable Type	Master unit	1 output	D3RF-TM (N/P)
		2 output	D3RF-TDM (N/P)
	Slave unit	1 output	D3RF-TS (N/P)
		2 output	D3RF-TDS (N/P)
M8 Connector Type	Master unit	1 output	D3RF-TMC (N/P)4
		2 output	-
	Slave unit	1 output	D3RF-TSC (N/P) 4
		2 output	-
Power sourse, voltage			12-24VDC±10%including a ripple
Power consumption		Normal	1 output : 864mW max.(36mA or less / 24V) ,2 output : 936mW max.(39mA or less / 24V)
		Eco All	1 output : 600mW max.(25mA or less / 24V) ,2 output : 672mW max.(28mA or less / 24V)
Response Time			1-HS：16μs（no interconnection）, 22us（interconnected）/ 2-FS：70us（no interconnection）, 85us（interconnected） 3-ST：250μs / 4-LG：500μs / 5-PL：1ms / 6-UL：2ms / 7-EL：8ms
Control output			1 output / 2 output , NPN / PNP Open collector 100mA / 30V or less Load current : 100mA or less , Residual voltage : 1.8V or less
Output method			Light on / Dark on Switching type in the function
Short-circuit protection			Incorporated
Light source			Red LED（632nm）
Indicator light /Display		1 output	Output Indicator light : Orange (Ch 1) / 7 segment 8 digit display
		2 output	Output Indicator light : Orange (Ch 1 / Ch 2) /7 segment 8 digit display
Sensitivity setting			Teaching / Manual adjustment
Timer function			OFF,On delay timer,Off delay timer,One-shot timer, On delay-off delay timer,On delay-one shot timer
Timer time			0.1ms～9.999s
External input setting			Teach-in, Emitter stop, Synchronous, Counter reset (only for 2 output type)
Output setting		1 output	Output 1
		2 output	Output 2
Number of cross talk prevention			1-HS：2units/ 2-FS・3-ST：4units/ 4-LG・5-PL：8units/ 6-UL・7-EL：12units *1
Operating temperature /humidity			-25～+55℃/35～85%RH (No freezing and No condensation) *2
Store temperature /humidity			-30～+70℃/35～85%RH (No freezing and No condensation)
Shock resistance			10～55Hz Amplitude 1.5mm 2 hours for each direction of X,Y and Z
Protective category			IP50
Protective category			PC：Cover, Case
Weight			Cable type：71g (Including cordes) M8 Connector type：25g

*1 These mean maximum number of units can be prevented cross talk. Response Time of every unit must be set same mode.
*2 Temp./Maximum units interconnected: -25℃～55℃/ 3 units (output current: 100mA max.),
-25℃～50℃/ 8 units (output current: 50mA max.), -25℃～45℃/16 units (output current: 20mA max.)

Dimensions

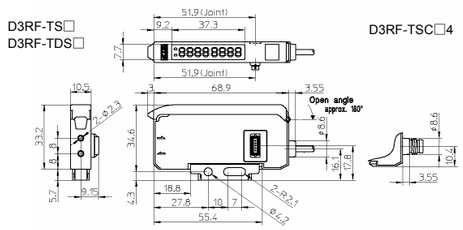
(Unit:mm)

D3RF-TM□
D3RF-TDM□



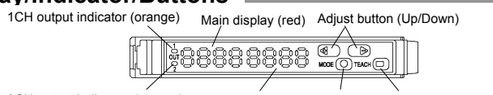
D3RF-TMC□4

D3RF-TS□
D3RF-TDS□



D3RF-TSC□4

Display/Indicator/Buttons



* 2 output type (D3RF-TDM/S) only

Installing Amplifier

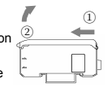
■Mounting and Removing to/from DIN rail

●Mounting of Amplifier Unit

Hook the claw on the connecting side of fiber cable to the DIN rail. Then press down the hook until it locks.

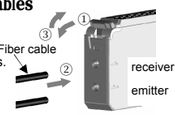
●Removing of Amplifier Unit

Pushing the unit to the direction of ①, hold up the connecting side of fiber cable and remove the unit.



■How to connect the fiber cables

① Open fiber lock lever.
② Insert fiber into holes to stop.
③ Return fiber lock lever until it stops.

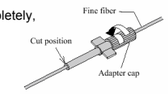


CAUTION

With Coaxial reflection fiber, set single core fiber or white-lined fiber to the emitter. Then set Multi core fiber to the receiver.

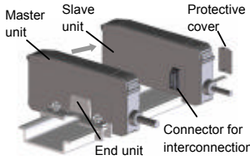
■How to use Fine fiber

① Turn adapter cap anticlockwise completely, then appropriately insert the fiber.
② Cut the excess fiber with fiber cutter.



■Interconnection

Mount each sensor on DIN rail and slide to interconnect one by one. Mount the End Plates at both ends.
* Up to 16 units can be interconnected.



Note

- Confirm that Power supply is OFF while Installation.
- Use DIN rail and End Plates (BEF-EB01-W190) for installation.
- Confirm that environmental temperature is in specification. (refer a note *2 at "Specifications")
- Install the protective cover at the end connector of slave unit.
- Don't remove sensors from DIN rail while it's interconnected. Remove the End plates, slide the sensor and remove one by one from DIN rail.

Display and Buttons

■Switching display

Display shows as follows according to its mode

Operating (RUN mode)	Setup	Teaching
It shows as example when it's actually detecting object. It goes to this mode after power up. Ex.) 200 100 (Sensing level / Threshold)	It switches to this Setup mode by pressing "MODE" button over 3 seconds. Ex.) L--d L on (Function / Setup Value)	It switches to this Teaching mode by pressing "TEACH" button over 3 seconds. Ex.) 2Pt 1Pt (Mode of teaching)

■Buttons

Buttons work as follows according to its mode

Buttons	Operating (RUN mode)	Setup / Teaching
Adjust (+ UP)	Increase threshold level	Change the Setup function and mode of Teaching
Adjust (- DOWN)	Decrease threshold level	
MODE	Switch to Setup mode	Set the setup
TEACHING	Switch to Teaching mode	Execute Teaching

Setup menu

Basic menu

These are basic menu that to be setup before using.
Please refer Expert menu for further setup function.

Display	Menu	Function
L--d	Output mode	Switch Light ON and Dark ON
rESP	Response speed	Set response speed
dELY	Timer/Delay	Set Timer and Delay
EPrt	Expert mode	Enter to Expert mode (refer Expert menu)
rSEt	Initialize	Initialize setup to default
End	Exit	Exit setup mode

Expert menu

These are menu for function that setup in detail.
Expert menu is available from "Eprt" in Basic menu.

Display	Menu	Function
0rSt	Zero reset	Set main display to 0 (zero).
di SP	Display mode	Set display mode for operating (RUN mode)
Eco	Eco mode	Set Eco mode
turn	Rotation	Rotate the display 180 degree
HYS	Hysteresis	Specify hysteresis percentage
PrcS	Detection mode	Set detection mode (edge/level)
cnt	Counter	Switch ON/OFF Counter and specify UP/DOWN direction
inPt	External input	Set function of external input
coPy	Copy setup	Copy setup to sensors interconnected
AL 0	All Zero Clear/ Reset	Set all display of sensors interconnected to Zero "0"
Atch	All Teaching	Execute Teaching on every sensor interconnected
ASc	ASC	Set ON/OFF ASC (Automatic Sensitivity Control)
SPor	Emitter Power	Specify Emitter power
Locl	Lock level	Specify level of Key Lock
SAvE	Save	Save the current setup
End EPrt	Exit	Exit expert menu

Loc	Lock	Lock buttons (refer useful function)

Teaching menu

Threshold level can be set by these menu.
Please refer "Teaching".

Display	Menu	Function
2Pt	2 Point Teaching	Set the threshold at the center between with object and without object.
1Pt	1 Point Teaching	Set the threshold at minimum level that can detect object stably with.
thru	Through Teaching	Set the threshold at around 90% of sensing level without object for through beam application.
ZonE	Zone Teaching	Set the threshold at around sensing level ±10%.
Auto	Automatic Teaching	Set the threshold at the center between maximum and minimum level.
P-t	Percent Teaching	Threshold can be set any percentage.
0P-t	Zero % Teaching	Set the threshold at any percentage and execute zero reset.
EndtEch	End of Teaching	Exit Teaching mode.

Basic setup

Press "MODE" button over 3 sec.

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

1. Output mode

L--d L on (Top)

Choose Light ON or Dark ON

L on	ON by sensing light (Light ON)	†
d on	ON by blocking light (Dark ON)	

2. Response speed

rESP Stnd (Top)

Choose response speed

1-HS	High Speed	response time:16μs(no slave unit), 22μs(with slave unit)	
2-FS	Fast	response time:70μs(no slave unit), 85μs(with slave unit)	
3-St	Standard	response time:250μs	†
4-LG	Long	response time:500μs	
5-PL	Power Long	response time:1ms	
6-UL	Ultra Long	response time:2ms	
7-EL	Extra Long	response time:8ms	

Choose faster mode when detect object moving fast at closer distance. Choose slower mode for detecting object at longer distance.The faster the shorter sensing distance.

3. Timer/Delay

dELY oFF (Top)

Set Timer and/or Delay

oFF	OFF	†
ofdY	OFF delay timer	
ondY	ON delay timer	
Shot	One shot timer	
onof	ON delay and OFF delay timer	
onSh	ON delay and One shot timer	

Timer can be set from 0.1 to 9999ms.

0.1 ～ 9999

*When choose "on of" or "onSh", each ON delay/OFF delay and ON delay/One shot timer can be set individually.

4. Expert mode

EPrt (Top)

Ⓐ Enter to Expert mode (refer Expert menu)

5. Initialize

rSEt no (Top)

Initialize setup to default

no	No initializing	†
init	Setup to default	
uSEr	Setup with saved parameters	

*"uSEr" is shown only when there is saved parameter by "SAVE" in Expert mode. Refer "Expert mode4-15. Saving user parameter"

End **Exit Basic menu.**

Go back to RUN mode.
*It goes back to RUN mode when there is no button operation for 30 seconds. It can be changed to RUN mode by single action as well. Please refer "Useful function ■Switching to RUN mode by single action"

Setup Threshold manually

At RUN mode, press ◁ or ▷ then, threshold display blinks that shows it can be adjusted. Adjust the threshold by ◁ or ▷ . You can adjust upper and lower threshold when it's Zone Teaching mode.

RUN mode

200 100

Press MODE button or leave for 5 seconds then, it goes back to RUN mode.

Zone Teaching

Lower (Far) → 200 FAr
Press MODE button while "Far" is blinking.
Upper (Near) → 200 nEAr
Press MODE button while "Near" is blinking.

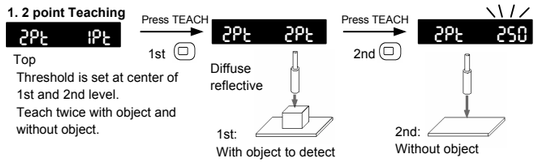
200 100 Adjust the threshold
200 100 Adjust the threshold

Teaching

Press TEACH button for 3 seconds.

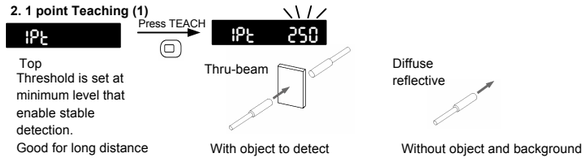
Choose Teaching mode by pressing ◁ or ▷ .
Then, press ▭ to confirm.
When Teaching is done, it goes back to RUN mode after the threshold blinks.
You can refer current sensing level by pressing MODE ○ while teaching.

1. 2 point Teaching



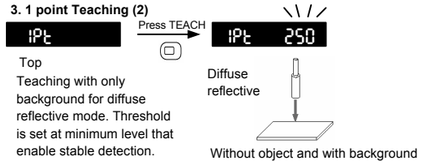
Top
Threshold is set at center of 1st and 2nd level.
Teach twice with object and without object.

2. 1 point Teaching (1)



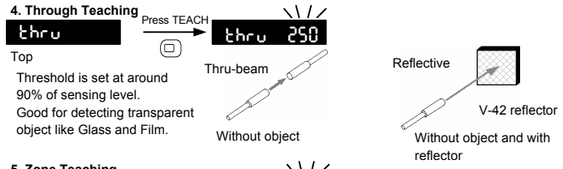
Top
Threshold is set at minimum level that enable stable detection.
Good for long distance

3. 1 point Teaching (2)



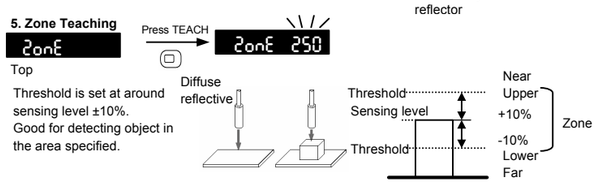
Top
Teaching with only background for diffuse reflective mode. Threshold is set at minimum level that enable stable detection.

4. Through Teaching



Top
Threshold is set at around 90% of sensing level.
Good for detecting transparent object like Glass and Film.

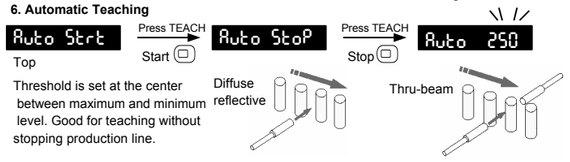
5. Zone Teaching



Top
Threshold is set at around sensing level ±10%.
Good for detecting object in the area specified.

Teaching to be done with object or with only background.
*When Zone teaching is done with only background, threshold level will be set at around +/- 10% from the background.

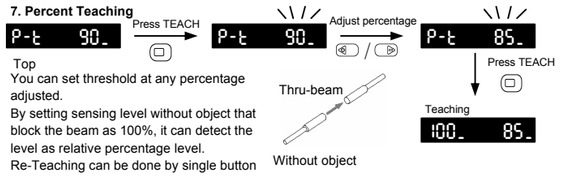
6. Automatic Teaching



Top
Threshold is set at the center between maximum and minimum level. Good for teaching without stopping production line.

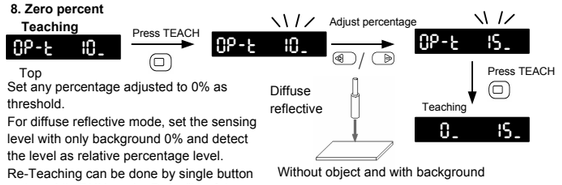
Teaching is executed while object is moving on the production line.

7. Percent Teaching



Top
You can set threshold at any percentage adjusted.
By setting sensing level without object that block the beam as 100%, it can detect the level as relative percentage level.
Re-Teaching can be done by single button action while RUN mode. Refer "Useful function■Fitting in".

8. Zero percent Teaching



Top
Set any percentage adjusted to 0% as threshold.
For diffuse reflective mode, set the sensing level with only background 0% and detect the level as relative percentage level.
Re-Teaching can be done by single button action while RUN mode. Refer "Useful function■Fitting in".

End tEch

Exit the Teaching mode
By pressing TEACH button, it goes back to RUN mode.

Expert mode

Setup parameters for further function.

A From A "Basic menu"

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

4-1.Zero reset — **Set main display to 0 (zero)**

oFF	No action †
on	Reset the main display

Reset the sensing level shown on the main display to zero and shift the threshold shown on the sub display as much as the main display shifted.
This function is not active when percent mode and edge detection mode.

4-2.Display mode — **Choose display mode from following three**

di 9	Digital mode † Ex.) 200 220 (Sensing level / Threshold)
bAr	Bar display mode Ex.) ▮▮▮▮ Bar increases according to sensing level from right
Pct	Percent mode Ex.) 100_ 110_ (Sensing level 100% / Threshold 110%) "_" means it's percentage

4-3.Eco mode — **Set Eco mode**

oFF	No action †
di SP	Power off sub display (green) and darken main display (red).
rESP	Double emitting cycle. Actual response time will be doubled as well.
ALL	Power off sub display, darken main display and double emitting cycle. Actual response time will be doubled as well.Brightness of the display will be changed 20 seconds after the setup.

Current consumption of "Eco ALL" will be 30% less than "Eco oFF".

4-4.Rotation — **Rotate the display 180 degree**

oFF	No action † Ex.) turn oFF
on	Rotate the display Ex.) turn on

This is effective when you have to mount the sensor opposite direction.

4-5.Hysteresis — **Set Hysteresis percentage**

P S † Set from 1% to 40% (P 1 ～ P 40)

Set the hysteresis according to the condition. When it's unstable because of chattering, set bigger percentage. When to detect slight difference, set smaller percentage.

4-6.Detection mode — **Set Detection mode**

Stnd	Detect by sensing level †
Ed_F	Detect UP edge
Ed7_	Detect Down edge
diFF	Differential mode

Set filter level for edge detection

F.Lt 1000	1,000 Hz †	Faster
F.Lt 200	200 Hz	
F.Lt 50	50 Hz	speed of edge detection
F.Lt 20	20 Hz	
F.Lt 5	5 Hz	Slower

Edge detection mode:
Detect changes of sensing level in a certain period.
"Detect UP edge" : Detect the sensing level increasing
"Detect Down edge" : Detect the sensing level decreasing
*Only Automatic Teaching can be executed when edge detection is activated.
*Percent display mode is unavailable when edge detection is activated.
* Only CH1 can be set Edge detection for the 2 output type (D3RF-TDM/S).
*Hysteresis will be fixed to 1% when Edge detection is active.
*Edge detection won't work correctly when the sensing level is saturated or there is no light received.
*Filter to be "Slower" to detect sensing level that swings slower.

Differential mode:
It detects difference of sensing level from the sensor unit next to it at master side.The display shows "1024" when sensing levels are same. When the sensing level is smaller than the sensor unit at master side, the display shows smaller value than "1024". When its bigger, the display shows bigger value than "1024".
* Differential mode is available only for the slave unit (D3RF-TS/TDS).

C B

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

4-7.Counter — **Switch ON/OFF Counter and specify UP/DOWN direction**

oFF	Counter OFF †
uPc	Set counting direction UP
dnc	Set counting direction DOWN

Set counter value from 2 to 9999
*This function is only for "ch2" of the 2 output type (D3RF-TDM/S).
*Threshold of CH1 is used for this function so please change to CH1 when you set threshold.

4-8.External input — **Set function of external input**

rtch	External Teaching †
tESt	Emitting OFF input
Sync	Synchronous input (hold the output)
crSt	Counter reset
Atch	Set Teaching input for all sensor units

*"crSt" is available only on the 2 output type (D3RF-TDM/S)
**"Atch" is available only on the master unit (D3RF-TM/TDM)

4-9.Copy setup — **Copy the master setup to other slave units**

no	No action †
YES	Copy the setup

* "Copy setup" is available only on the master unit (D3RF-TM/TDM)
* The setup of slave unit that is locked by "Key Lock" function won't be changed.

4-10.All Zero Clear/Reset — **Reset the displays of sensor units interconneted to Zero "0"**

no	No action †
clr	Standard mode
YES	Reset display to Zero "0"

The displays of master unit and other slave units interconnected will be reset to Zero "0". The reset functionality is same as "4-1.Zero reset".
* "All Zero Clear/Reset" is available only on the master unit (D3RF-TM/TDM).
* The display of slave unit that is locked as "Lock level 1" won't be changed.

4-11.All Teaching — **Execute Teaching on every sensor interconnected**

no	No action †
YES	Execute All Teaching

Teaching mode of each sensor unit can be independently set.
When one of the master unit and slave units is set as 2 point Teaching, the display of the master unit shows "Atch 2Pt" so press MODE button ○ for 2nd Teaching.
* The Teaching for the slave unit locked as "Lock level 1" by "Key Lock" function will be inactive.
* "All Teaching" is available only on the master unit (D3RF-TM/TDM)

4-12.ASC — **Set ON/OFF ASC (Automatic Sensitivity Control)**

OFF	ASC OFF †
on	Correction speed : Standard
FASt	Correction speed : Fast
Hi9h	Correction speed : Fastest

ASC:
Adjust the threshold according to sensing level that is affected by environmental condition automatically.
It corrects the threshold even when the sensing level changes quickly by cleaning up contamination. This is only for Through Teaching and Percent Teaching.
ASC speed:
"on" : adjust threshold "1" every three seconds
"FASt" : adjust threshold "1" every one second
"High" : adjust threshold "1" every 0.25 seconds
*Edge detection is unavailable when ASC is active.
*ASC is not available after Zone Teaching is executed.
*ASC is not available on CH2 output .

4-13.Emitter power — **Specify emitter power**

1111	Maximum †
111	Three power level can be chosen
11	Minimum

Normally, maximum level is OK. Please lower the emitter power when sensing level is saturated.

4-14.Lock level — **Specify level of Key Lock**

L 1	Lock level 1 † Lock whole Keys (buttons)
L 2	Lock level 2 Lock Keys except Teaching button and buttons for switching percent display and standard level display. Only channel of the 2 output type (D3RF-TDM/S) can be changed.

You can Lock buttons actually by pressing ◁ ▷ 3 seconds at a time.
*External inputs are active on any Lock level.

E D

4-15.Save — **Save the current setup parameters**

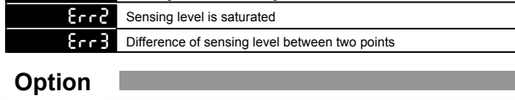
no	No action †
YES	Save the current setup

SAvE no → End EPrt **Exit Expert menu** → EPrt **Go to top of Expert menu**

Note
- Some menu won't be shown depends on the setup. It's not a malfunction.
- Time of pressing buttons to activate not specified on this manual is 0.3 seconds.
- When the parameter value is ready to set, sub display will blink.
- Following parameters of the 2 output type (D3RF-TDM/S) can be specified individually for Output 1 (ch1) and Output 2 (ch2). Other parameters are specified commonly.
  Threshold, Output mode, Timer and its value, Teaching menu

Useful function

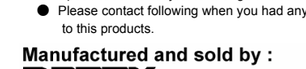
■Switch channel (only for the 2 output type D3RF-TDM/S)
Press ▭ button then, the channel number will be blinking and switch to the channel.



Threshold of CH2 will be copied to CH1 under following condition after external teaching.
This is useful when you want to set single threshold level to both CH1 and CH2.
- ASC and Edge detection are inactive.
- Teaching mode of CH1 is same as CH2.
- Display is showing level of CH2.

*You can switch channel from any setup menu.

■Key Lock
Make the buttons unavailable to prevent operation mistake.
Press ◁ ▷ for 3 seconds to Lock buttons at a time while RUN mode.
Do same to cancel it..



You can choose a Lock level from two in "Expert mode 4-14.Lock level".

■Switching to RUN mode by single action
By pressing ▭ button for 3 seconds in setup menu while sub display is not blinking,

■Switching to percent display by single action
Press ◁ and ▭ buttons at a time then, the display switches to percent display.

You can setup this function at "Expert mode 4-2.Display mode" as well.
Do same to get back to standard display mode.

■Fitting in (set sensing level to "100%"/"0%")
When "Percent Teaching" or "Zero % Teaching" is chosen in Teaching menu, you can set the sensing level to "100%" or "0% by pressing ▷ and ▭ buttons at a time.
This is effective when detection get unstable.

Error

Following are error messages when error occurred while Teaching. Please try again accordingly.

Err1	Sensing level is not enough
Err2	Sensing level is saturated
Err3	Difference of sensing level between two points

Option

End unit
BEF-EB01-W190 (2 pieces)

- Specification is subject to change without notice.
- Please contact following when you had any problems and questions regarding to this products.

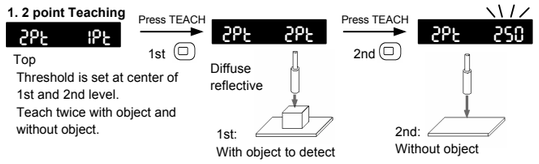
Manufactured and sold by :
OPTEX FA **OPTEX FA CO., LTD.**
600-8815 Kyoto, Shimogyo, Awata Chudoji 93, Japan
TEL. +81-(0)75-325-2920 FAX. +81-(0)75-325-2921
Website:http://www.optex-fa.com

Teaching

Press TEACH button for 3 seconds.

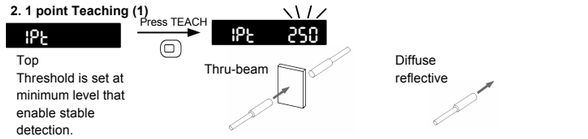
Choose Teaching mode by pressing ◁ or ▷ .
Then, press ▭ to confirm.
When Teaching is done, it goes back to RUN mode after the threshold blinks.
You can refer current sensing level by pressing MODE ○ while teaching.

1. 2 point Teaching



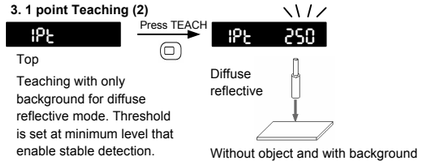
Top
Threshold is set at center of 1st and 2nd level.
Teach twice with object and without object.

2. 1 point Teaching (1)



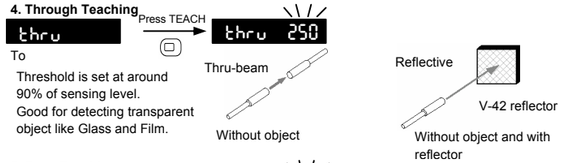
Top
Threshold is set at minimum level that enable stable detection.
Good for long distance

3. 1 point Teaching (2)



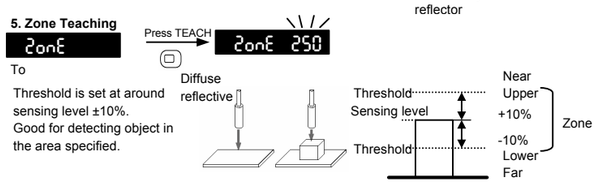
Top
Teaching with only background for diffuse reflective mode. Threshold is set at minimum level that enable stable detection.

4. Through Teaching



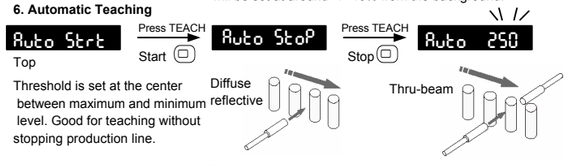
To
Threshold is set at around 90% of sensing level.
Good for detecting transparent object like Glass and Film.

5. Zone Teaching



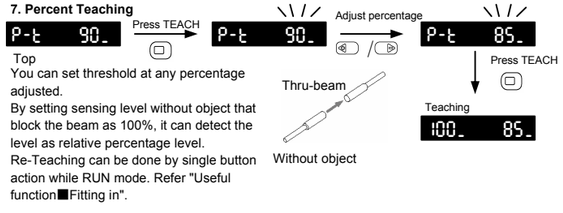
To
Threshold is set at around sensing level ±10%.
Good for detecting object in the area specified.
Without object and with background or with object.
*When Zone teaching is done with only background, threshold level will be set at around +/- 10% from the background.

6. Automatic Teaching



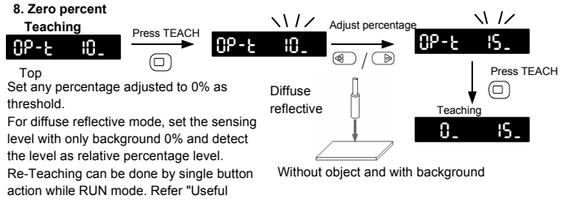
Top
Threshold is set at the center between maximum and minimum level. Good for teaching without stopping production line.
Teaching is executed while object is moving on the production line.

7. Percent Teaching



Top
You can set threshold at any percentage adjusted.
By setting sensing level without object that block the beam as 100%, it can detect the level as relative percentage level.
Re-Teaching can be done by single button action while RUN mode. Refer "Useful function■Fitting in".

8. Zero percent Teaching



Top
Set any percentage adjusted to 0% as threshold.
For diffuse reflective mode, set the sensing level with only background 0% and detect the level as relative percentage level.
Re-Teaching can be done by single button action while RUN mode. Refer "Useful function■Fitting in".

Exit the Teaching mode

End tEch

▭ By pressing TEACH button, it goes back to RUN mode.

Expert mode

Setup parameters for further function.

A From A "Basic menu"

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

4-1.Zero reset — 0rSt oFF

Top

Set main display to 0 (zero)

oFF	No action †
on	Reset the main display

Reset the sensing level shown on the main display to zero and shift the threshold shown on the sub display as much as the main display shifted. This function is not active when percent mode and edge detection mode.

4-2.Display mode — di SP di 9

Top

Choose display mode from following three

di 9	Digital mode †	Ex.) 200 220 (Sensing level / Threshold)
bAr	Bar display mode	Ex.) ▮▮▮▮▯
Pct	Percent mode	Ex.) 100_ 110_ (Sensing level 100% / Threshold 110%)

Bar increases according to sensing level from right
"_" means it's percentage

4-3.Eco mode — Eco oFF

Top

Set Eco mode

oFF	No action †
di SP	Power off sub display (green) and darken main display (red).
rESP	Double emitting cycle. Actual response time will be doubled as well.
ALL	Power off sub display, darken main display and double emitting cycle. Actual response time will be doubled as well.Brightness of the display will be changed 20 seconds after the setup.

Current consumption of "Eco ALL" will be 30% less than "Eco oFF".

4-4.Rotation — turn oFF

Top

Rotate the display 180 degree

oFF	No action †	Ex.) turn oFF
on	Rotate the display	Ex.) turn on

This is effective when you have to mount the sensor opposite direction.

4-5.Hysteresis — HYS P S

Top

Set Hysteresis percentage

P S † Set from 1% to 40%
P 1 (1%) ～ P 40 (40%)

Set the hysteresis according to the condition. When it's unstable because of chattering, set bigger percentage. When to detect slight difference, set smaller percentage.

4-6.Detection mode — PrcS Stnd

Top

Set Detection mode

Stnd	Detect by sensing level †
Hd_F	Detect UP edge
Hd1_	Detect Down edge

Set filter level for edge detection

FiLt 1000	1,000 Hz †	Faster ↕ speed of edge detection ↕ Slower
FiLt 200	200 Hz	
FiLt 50	50 Hz	
FiLt 20	20 Hz	
FiLt 5	5 Hz	

Edge detection mode:
Detect changes of sensing level in a certain period.
"Detect UP edge" : Detect the sensing level increasing
"Detect Down edge" : Detect the sensing level decreasing
*Only Automatic Teaching can be executed when edge detection is activated.
*Percent display mode is unavailable when edge detection is activated.
*Only CH1 can be set Edge detection for the 2 output type (D3RF-TD).
*Hysteresis will be fixed to 1% when Edge detection is active.
*Edge detection won't work correctly when the sensing level is saturated or there is no light received.
*Filter to be "Slower" to detect sensing level that swings slower.

C B

Choose the setup value by ◁ and ▷ .
Define the setup by ○ and go back to top of each menu.
"†" is default value.

4-7.Counter — cnt oFF

Top

Switch ON/OFF Counter and specify UP/DOWN direction

oFF	Counter OFF †
uPc	Set counting direction UP
dnc	Set counting direction DOWN

Set counter value from 2 to 9999
*This function is only for "ch2" of the 2 output type (D3RF-TD).
*Threshold of CH1 is used for this function so please change to CH1 when you set threshold.

4-8.External input — inPt rtch

Top

Set function of external input

rtch	External Teaching †
tESt	Emitting OFF input
Sync	Synchronous input (hold the output)
crSt	Counter reset

*"crSt" is available only on the 2 output type (D3RF-TD).

4-9.ASC — ASc oFF

Top

Set ON/OFF ASC (Automatic Sensitivity control)

OFF	ASC OFF †
on	Correction speed : Standard
FASt	Correction speed : Fast
Hi 9h	Correction speed : Fastest

ASC:
Adjust the threshold according to sensing level that is affected by environmental condition automatically.
It corrects the threshold even when the sensing level changes quickly by cleaning up contamination. This is only for Through Teaching and Percent Teaching.
ASC speed:
"on" : adjust threshold "1" every three seconds
"FASt" : adjust threshold "1" every one second
"High" : adjust threshold "1" every 0.25 seconds
*Edge detection is unavailable when ASC is active.
*ASC is not available after Zone Teaching is executed.
*ASC is not available on CH2 output.

4-10.Emitter power — SPor HIGH

Top

Specify emitter power

HIGH	Maximum †	↕ Three power level can be chosen ↕
HI		
LO	Minimum	

Normally, maximum level is OK. Please lower the emitter power when sensing level is saturated.

4-11.Lock level — Locl L 1

Top

Specify level of Key Lock

L 1	Lock level 1 † Lock whole Keys (buttons)
L 2	Lock level 2 Lock Keys except Teaching button and buttons for switching percent display and standard level display.Only channel of the 2 output type (D3RF-TD) can be changed.

You can Lock buttons actually by pressing ◁ ▷ 3 seconds at a time.
*External inputs are active on any Lock level.

4-12.Save — SAvE no

Top

Save the current setup parameters

no	No action †
YES	Save the current setup

Exit Expert menu — End EPrt

Go to top of Expert menu — EPrt

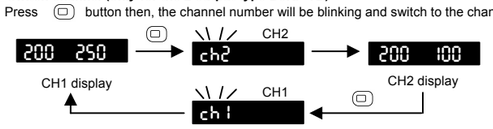
C B

Note
- Some menu won't be shown depends on the setup. It's not a malfunction.
- Time of pressing buttons to activate not specified on this manual is 0.3 seconds.
- When the parameter value is ready to set, sub display will blink.
- Following parameters of the 2 output type (D3RF-TD) can be specified individually for Output 1 (ch1) and Output 2 (ch2). Other parameters are specified commonly.
  Threshold, Output mode, Timer and its value, Teaching menu

Useful function

■Switch channel (only for the 2 output type D3RF-TD)

Press ▭ button then, the channel number will be blinking and switch to the channel.

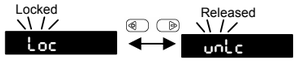


Threshold of CH2 will be copied to CH1 under following condition after external teaching.
This is useful when you want to set single threshold level to both CH1 and CH2.
- ASC and Edge detection are inactive.
- Teaching mode of CH1 is same as CH2.
- Display is showing level of CH2.

*You can switch channel from any setup menu.

■Key Lock

Make the buttons unavailable to prevent operation mistake.
Press ◁ ▷ for 3 seconds to Lock buttons at a time while RUN mode.
Do same to cancel it..



You can choose a Lock level from two in "Expert mode 4-11.Lock level".

■Switching to RUN mode by single action

By pressing ▭ button for 3 seconds in setup menu while sub display is not blinking,

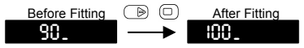
■Switching to percent display by single action

Press ◁ and ▭ buttons at a time then, the display switches to percent display.

You can setup this function at "Expert mode 4-2.Display mode" as well.
Do same to get back to standard display mode.

■Fitting in (set sensing level to "100%"/"0%")

When "Percent Teaching" or "Zero % Teaching" is chosen in Teaching menu, you can set the sensing level to "100%" or "0% by pressing ▷ and ▭ buttons at a time.
This is effective when detection get unstable.

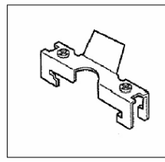


Error

Following are error messages when error occurred while Teaching. Please try again accordingly.

Err1	Sensing level is not enough
Err2	Sensing level is saturated
Err3	Difference of sensing level between two points

Option



End unit
BEF-EB01-W190 (2 pieces)

- Specification is subject to change without notice.
- Please contact following when you had any problems and questions regarding to this products.

Manufactured and sold by :

OPTEX FA CO., LTD.

600-8815 Kyoto, Shimogyo, Awata Chudoji 93, Japan
TEL. +81-(0)75-325-2920 FAX. +81-(0)75-325-2921

Website:http://www.optex-fa.com