



MFR-DB User Manual



User Guide for the MFR-DB Dual Optical & Thermal PTZ Camera



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Document History

Version	Date	Change Summary
v1.0	27/11/2020	Initial Release
v1.1	09/12/2021	Environmental Update
v1.2	08/04/2022	Updates to support VISCA and Flir communication protocols
v1.3	18/12/2024	Pinout and additional detail on thermal camera zoom messages

Warranty and Support

All Visual Engineering products are supplied as standard with a 12 month 'Return to Base' warranty.

Please note: Any unauthorised product disassembly, modification or the removal of tamper proof labels will void the warranty.

In the event of a suspected product failure, users should contact the Visual Engineering support team on the telephone number +44 (0) 1206 211842 or please email us at:

support@visualengineering.co.uk

Should the fault persist or if the support team are unable to resolve the fault, it may be necessary to return the equipment.

Equipment should only be returned using the RMA (Returns Management Authorisation) process. Users should contact the support team on the above number and request an RMA number.



Introduction

The MFR-DB is a dual band PTZ camera incorporating both an optical and a thermal camera. Housed in a very rugged environmentally sealed casing it is ideal for use in harsh environments.

It incorporates a Sony HD camera with a 30x optical zoom lens and a 63.7° wide angle of view.

The Flir thermal camera incorporates radiometric technology which delivers high precision temperature monitoring. It supports an 8x digital zoom and spot metering to further optimise the exposure control for each particular scenario.

The HD-SDI video signal output can be user switched between either camera as and when required. The zoom is synchronised between the two cameras, up to the maximum FOV capability of the thermal camera. This allows convenient switching between the two camera views.

Speeds are zoom factor corrected, giving fine control over the entire range of the lens with pan speeds up to 100° per second.

The MFR-DB has absolute position feedback and therefore has the ability to self correct its actual position if external forces act upon it. User presets can be saved allowing PTZ framing and camera racking profiles to be easily recalled.

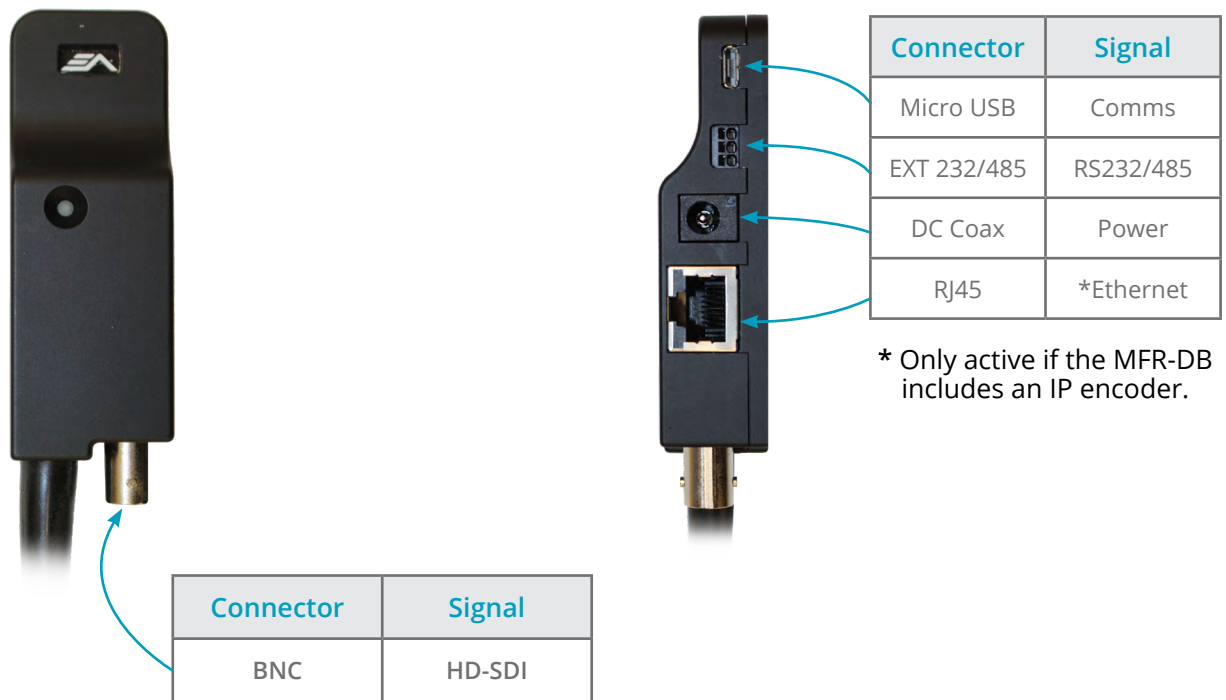
There is the option to have the video output as an encoded ONVIF compliant stream for use in IP networks. Remote control of the camera is through VISCA protocol over USB or a RS232/RS485 serial connection.

All power, data and video signals are through the Fischer MiniMax connector on the camera's base. The outer casing is manufactured from aluminium. All external mating surfaces are gasket sealed to maintain its IP67 rating.

Connections

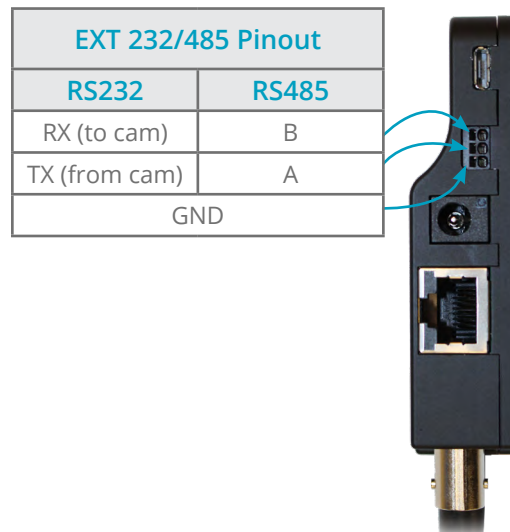
The MFR-DB kit includes a power comms break out cable, part number 110-3562.

The cable assembly connects to the Fischer MiniMax connector on the base of the camera. All signals are then split out to their relevant connectors. The connections are described below.



MFR-DB communications are supported via the micro USB and EXT 232/485 connectors.

The EXT 232/485 connector supports RS232 and RS485 comms, the pinout of the connector is described on the right.



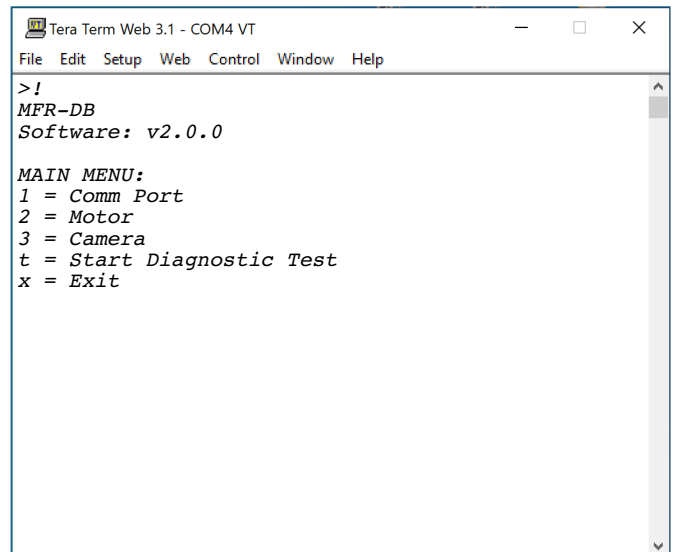
Configuring the Camera

The MFR-DB can be configured for a specific user profile, to include; communication settings, motor control, and camera options. Once configured the camera will retain the settings.

The camera is configured using a menu structure on its control interface which is only accessible at power on. To access the control menu it is necessary to connect the camera to a serial comms software application, such as TeraTerm set to 9600 baud 8n1.

Boot Menu

- Connect the power comms cable to a USB port on a PC.
- Open the PC serial comms application
- Power on the camera, a > character will appear and shortly after a ! character.
- As soon as the ! appears type v e in quick succession.
- The Main Menu shown on the right will then be displayed.
- Select the required option.
- The function options are described in the following tables.



```

Tera Term Web 3.1 - COM4 VT
File Edit Setup Web Control Window Help
>!
MFR-DB
Software: v2.0.0

MAIN MENU:
1 = Comm Port
2 = Motor
3 = Camera
t = Start Diagnostic Test
x = Exit
  
```

Comm Port Options

Comm Port Options		
Sub Menu	Description	Options
Mode	The serial comms standard	RS485, No Parity , RS232, No Parity, RS485, Odd Parity, RS232, Odd Parity RS485, Even Parity, RS232, Even Parity
Baud Rate	The serial comms baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Protocol	The PTZ control protocol	Auto Detect, VISCA, PelcoD, PelcoP
Unit Address	The camera's unit address, this allows several cameras to be connected on the same comms bus	1, 2, 3, 4, 5, 6, 7



Motor Options

Motor Options		
Sub Menu	Description	Options
Auto Position Correction	Whether the camera automatically corrects its actual position if external forces act upon it	Disabled, Enabled
Stall Detection	Detects a stall in the motor drive	Disabled, Enabled
Motor Speed	The speed at which the motors are driven	High, Medium, Low
Hold Torque	The torque force which the camera uses to hold position	High, Medium, Low
Boot Confirmation	Movement of the camera head at power on indicating the initialisation status	Disabled, Enabled

Camera Options

Video Options		
Sub Menu	Description	Options
Output Mode	The output video format	PAL, NTSC, 720p/25, 720p/29.97, 720p/50, 720p/59.94, 1080i/50, 1080i/59.94, 1080p/25, 1080p/29.97, 1080p/50, 1080p/59.94
Digital Zoom	If disabled only optical zoom is allowed, applies only to the optical camera	Disabled, Enabled
On Screen Display	The OSD in the camera's video	Disabled, Enabled
Flip on Tilt	The video picture will automatically invert when the camera head is tilted over the top of its travel	Disabled, Enabled
Zoom Sync	The zoom is synchronised between the two cameras, up to the maximum FOV capability of the thermal camera	Disabled, Enabled

Boot Confirmation

This gives a clear visual confirmation at power on whether or not the MFR-DB Camera has initialised successfully the following hardware is tested during boot sequence:

- Optical Camera Module Comms
- Thermal Camera Module Comms
- Tilt Axle Encoder
- Pan Axle Encoder
- Accelerometer

The feature can be enabled/disabled in the [Motor Options](#) boot menu.

Successful Boot

The camera will emulate a head nod on a successful initialisation, the actual movement sequence is defined as follows:

- Tilt to 0° (Straight Ahead)
- Tilt Down 20°
- Tilt Up 20°
- Return to Start-Up Angle

Boot Fail

If during the boot sequence any hardware faults are detected the camera will emulate a head shake, the actual movement sequence is defined as follows:

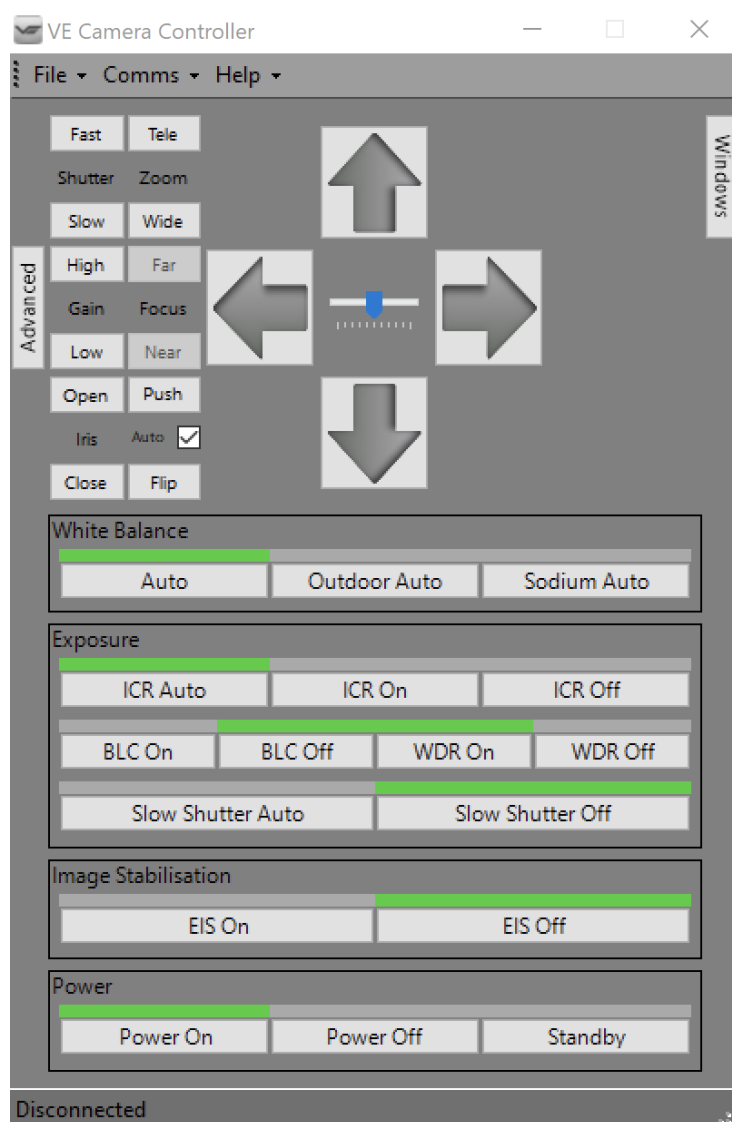
- Pan to 0°
- Pan Left 30°
- Pan Right 60°
- Pan Left 60°
- Pan Right 30°
- Return to Start-Up Angle

PTZ Controller

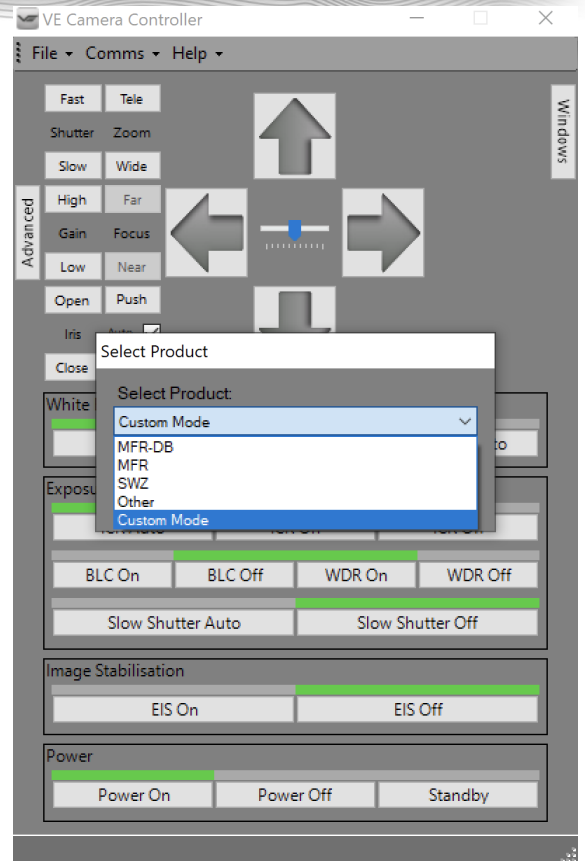
Communication to the MFR-DB camera uses the Sony VISCA protocol.

The camera can be controlled over serial comms using the VE Camera Controller software, which can be downloaded from here:

www.visualengineering.co.uk/supportdownload/9

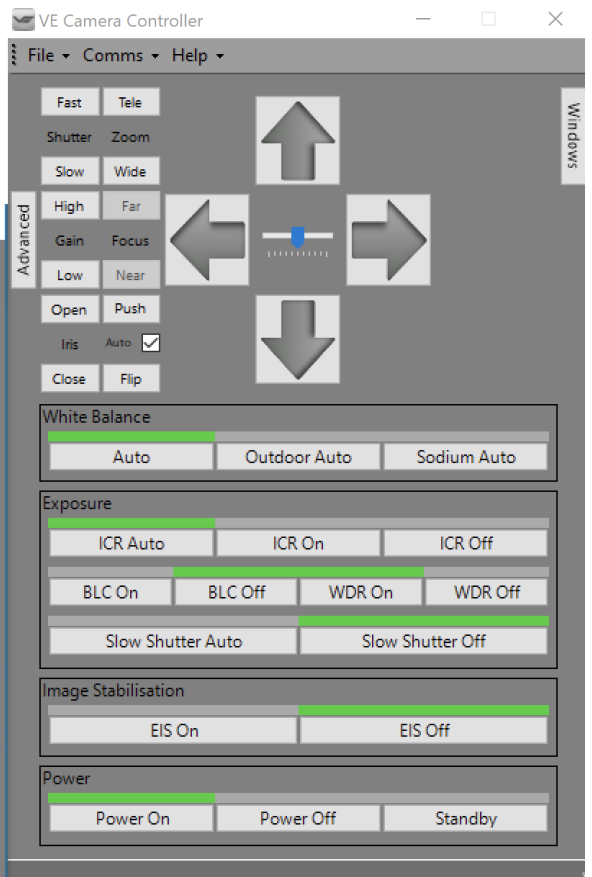
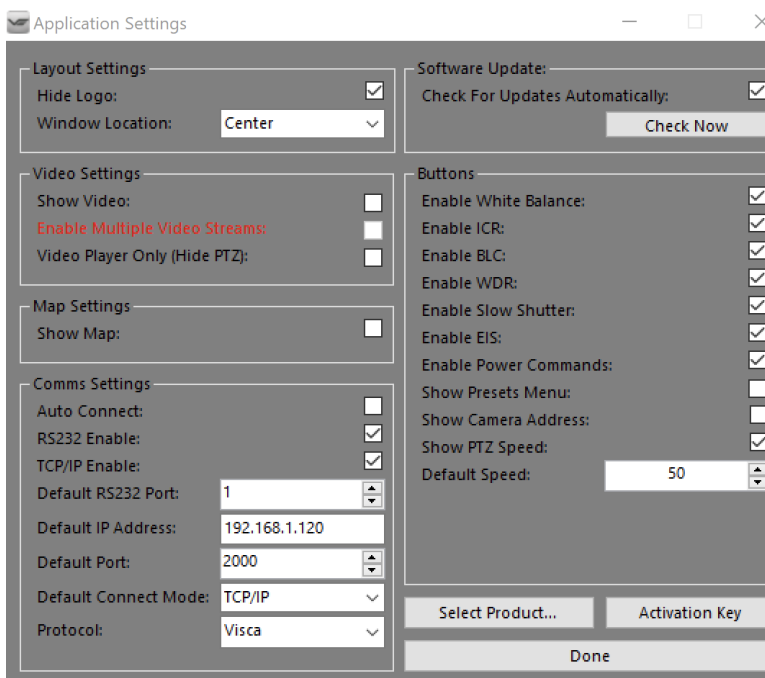


To configure the connection: **File > Select Product**, then select Custom Mode from the drop down menu.

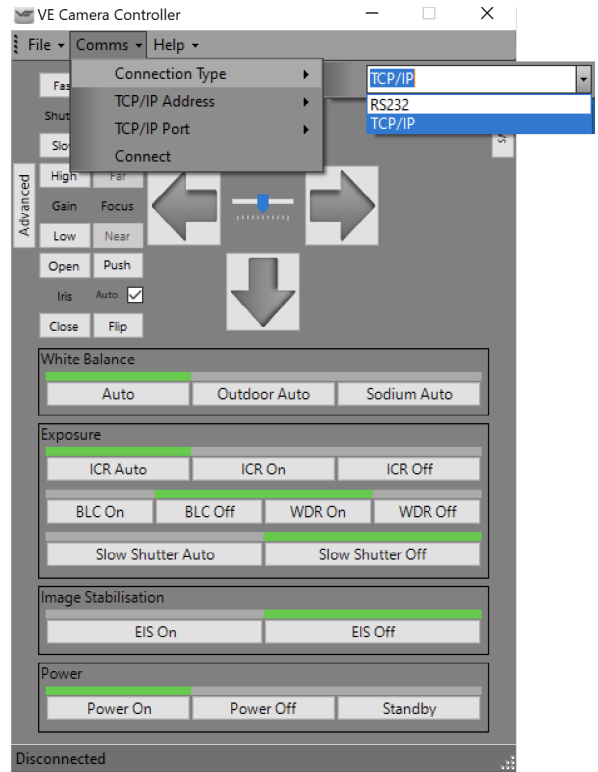


Since the MFR-DB does not support a TCP/IP connection only RS232 communications are supported.

Select the protocol as Visca.

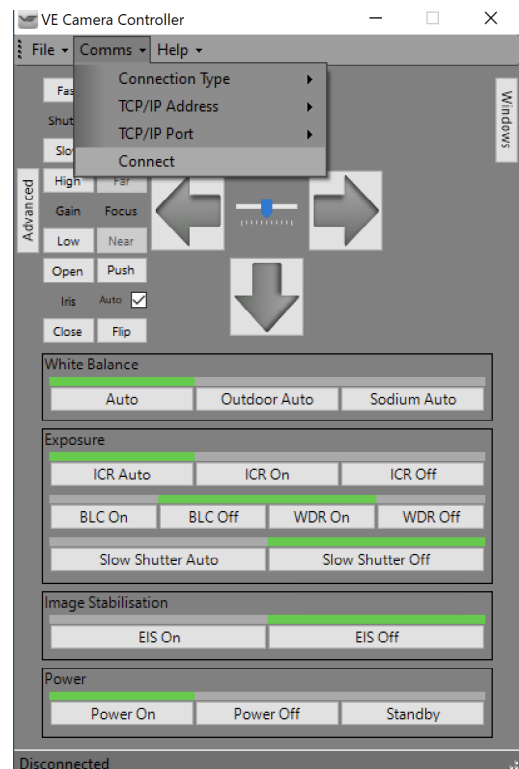


Connect using serial RS232 comms ensure the baud rate matches the setting in [Comm Port Options](#), the default baud rate is 9600.



Click to connect to the camera.

Once connected the PTZ functions of the software can be used to control the MFR-DB camera.



Camera Communications

Since the MFR-DB incorporates a Sony optical camera the adopted control protocol is Sony VISCA. This standard is used to communicate with the Sony camera, the Flir thermal camera and for PTZ control.

The VISCA command list is used for Sony camera communications, whilst Flir camera communications uses a Flir-Pass-Through format, which incorporates standard Flir protocol commands contained within a VISCA wrapper, as described later.

Standard commands for the Sony camera are detailed in the standard VISCA commands document, available here:

<https://www.visualengineering.co.uk/supportdownload/57>

Additional Commands

Additional commands adopting the VISCA protocol format have been developed by Visual Engineering for use with the MFR-DB camera. These commands also allow control of a limited set of parameters in the Flir thermal camera when using standard VISCA controllers.

Commands such as unit type, video output switching, PTZ control and thermal palette switching are included. The following two tables describe these additional commands.

Additional Inquiry/Command With Response Data				
Cmd Set	Command	Command Packet	Response Packet	Comments
FLIR PASS THROUGH	Flir Cmd	8x 01 04 24 9F 01 <aa> <payload> FF	y0 51 24 9F 01 <bb> <response> FF	<aa> = Cmd Payload Length <payload> = FLIR Command <bb>=Response Payload Length <response> = FLIR Response
UNIT TYPE	Unit Type	8x 01 04 24 92 00 01 FF	Y0 51 24 92 <aa> FF	<aa> = Unit Type 0x11 = MFR-HD 0x12 = MFR-DB 0x13 = MFR-TI
PAN TILT DRIVE	Absolute Position	8x 09 06 12 FF	y0 50 0p 0p 0p 0p 0t 0t 0t 0t FF	<pppp> = Pan Position <tttt> = Tilt Position The value returned is a 16-bit signed integer, the actual angle can be calculated as below where <x> is equal to the value returned. Angle = x/20



Additional Commands			
Cmd Set	Command	Command Packet	Comments
PAN TILT DRIVE	Move	8x 01 06 01 <aa> <bb> <cc> <dd> FF	<aa> = Pan Speed (0x01-0x18)
			<bb> = Tilt Speed (0x01-0x14)
			<cc> = Pan Direction (0x01 = Left, 0x02 = Right, 0x03 = Stop)
			<dd> = Tilt Direction (0x01 = Up, 0x02 = Down, 0x03 = Stop)
PAN TILT DRIVE	Absolute Position	8x 01 06 02 00 00 0p 0p 0p 0p 0t 0t 0t 0t FF	<pppp> = Pan Position <tttt> = Tilt Position The value sent is a 16-bit signed integer calculated as below where <x> is equal to the required angle (-180° to +180°) Value = x*20
	Slew To Cue	8x 01 06 04 00 00 0x 0x 0y 0y FF	<xx> = Percent Of HFOV <yy> = Percent Of VFOV
THERMAL/OPTICAL SWITCH	Set Video Mode	8x 01 04 24 96 01 <xx> FF	<xx> = Mode 0x01 = Optical Camera 0x02 = Thermal Camera
THERMAL COLOUR PALETTE	Set Palette	81 01 04 63 <xx> 01 FF	<xx> = Palette Selection (0x00 - 0x0D)
THERMAL IMAGE FREEZE	On/Off	81 01 04 62 <xx> 01 FF	<xx> = On/Off 0x02 = On (Freeze Image) 0x03 = Off (Real-Time)



Flir-Pass-Through

Control of the Flir camera uses standard Flir protocol commands. In order to maintain a single communications protocol for MFR-DB and to also allow access to the complete Flir command set the Flir protocol is wrapped within a VISCA style packet.

Standard commands for the Flir thermal camera are detailed in the standard Flir commands document, available here:

<https://www.visualengineering.co.uk/supportdownload/58>

Command Packet

The Command Packet invokes a Response Acknowledge followed by a Response Packet, these are described below, all values are hexadecimal.

8[x]	0x01	0x04	0x24	0x9F	0x01	<aa>	<payload>	0xFF
------	------	------	------	------	------	------	-----------	------

[x] The Unit Address, which can be set in the [Comm Port Options](#) in the boot menu.
 <aa> Command Payload Length
 <payload> Standard Flir Command Payload

Response Acknowledge

[y]0	0x41	0xFF
------	------	------

Response Packet

[y]0	0x51	0x24	0x9F	0x01	<bb>	<response>	0xFF
------	------	------	------	------	------	------------	------

[y] The Unit Address+8.
 <bb> Response Payload Length
 <response> Flir Response



Examples

By way of example the following illustrates how the Flir-Pass-Through mode format and standard Flir commands can be combined into a single VISCA style packet for the MFR-DB-ENC. The examples address a Unit ID of 1, all values are hexadecimal.

VIDEO_MODE - ID 15

GET

Command Packet

81-01-04-24-9F-01-0A-6E-00-00-0F-00-00-F3-8A-00-00-FF

Response Acknowledge

90-41-FF

Response Packet

90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF

SET FREEZE

Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-01-76-43-FF

Response Acknowledge

90-41-FF

Response Packet

90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-01-76-43-FF

SET REAL-TIME

Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF

Response Acknowledge

90-41-FF

Response Packet

90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF

ZOOM

1 x Zoom Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-00-00-00-FF

2 x Zoom Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-04-40-84-FF

4 x Zoom Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-08-81-08-FF

8 x Zoom Command Packet

81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-10-12-31-FF

EZOOM_CONTROL - ID 50

INCREMENT ZOOM BY 1 Command Packet

81-01-04-24-9F-01-0E-6E-00-00-32-00-04-34-FA-00-02-00-01-7E-41-FF

DECREMENT ZOOM BY 1 Command Packet

81-01-04-24-9F-01-0E-6E-00-00-32-00-04-34-FA-00-03-00-01-49-71-FF



Fischer Connector Pin-out

The Fischer connector on the base of the MFR-DB camera is the single interface to all available signals. The pin-out and part numbers of the both connector ends are described in the table below.

MFR-DB Unit Connector - Fischer MR11WL06-0210-BK1-E1AP	
Mating Half Connector - Fischer MP11ZL06-0210-BK1-Z1AS	
Pin	Signal
1	n.c
2	ETHERNET TX-
3	ETHERNET RX+
4	RS232TX/RS485A (Data from camera)
5	DC IN (10~18V)
6	n.c
7	ETHERNET TX+
8	SDI out (Optical/Thermal)
9	Ground
10	ETHERNET RX-
11	RS232RX/RS485B (Data to camera)
12	n.c



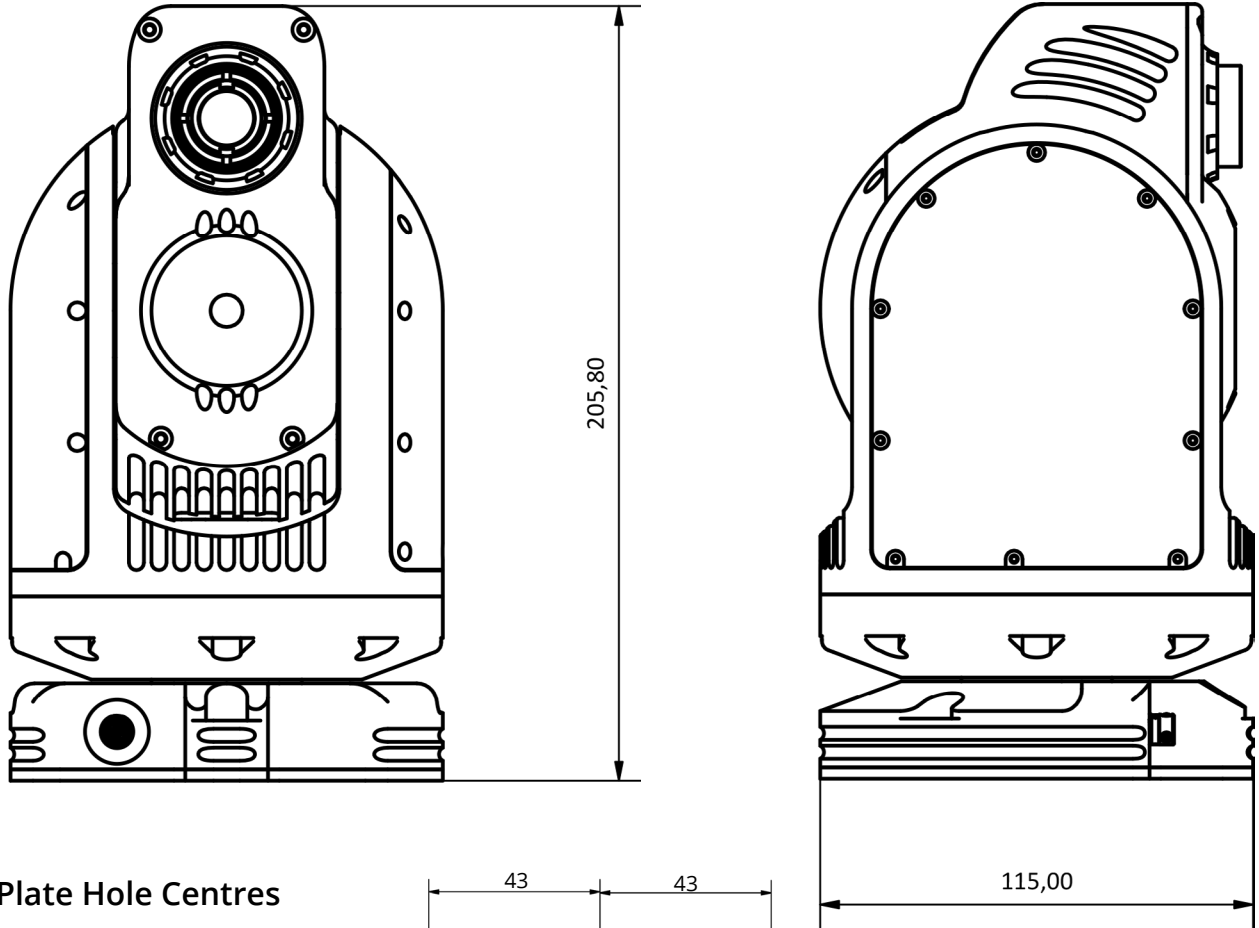
Specifications

Specifications			
Optical Sensor	1/2.8" Type CMOS	Radiometric Technology	As Standard
Optical Sensitivity	< 0.05 Lux, ICR On	Thermal Spot Metering	Enabled
Optical Resolution	1920 x 1080 Pixel	Serial Protocol	VISCA
Optical SNR	> 50dB	Serial Comms	USB, RS232/485
Optical Field of View	63.7°	Pan & Tilt Range	360° Pan, 170° Tilt
Optical Zoom	30x	Connector	Fischer MiniMax
Thermal Resolution	640 x 512 Pixel	Environmental	IP67
Thermal Lens	9mm	Weight	2368 grams
Thermal Field of View	69° H, 56° V	Dimensions	ø115 x 206 mm
NEdT	< 30mK	Casing	Aluminium

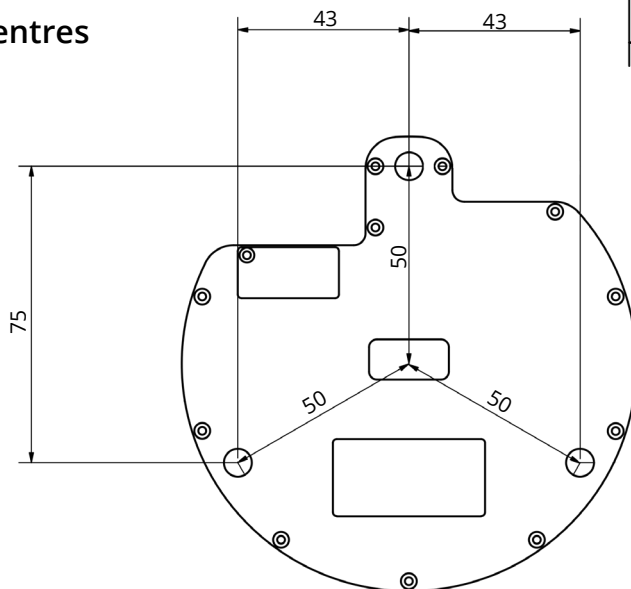


Dimensions

Overall Dimensions



Base Plate Hole Centres



Visual Engineering Technologies LTD

Kemps Farm
Stanway
Colchester
Essex
CO3 8NB
UK



Product specifications subject to change without notice

Tel: +44 (0)1206 211842
Web: www.visualengineering.co.uk
Email: sales@visualengineering.co.uk