VISUAL ENGINEERING MFR-DB Dual Optical and Thermal PTZ Camera Instruction Manual

VISUAL ENGINEERING
INTEGRATED VIDEO SOLUTIONS

MFR-DB April 2022

MFR-DB
User Manual

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

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

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 100º 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.

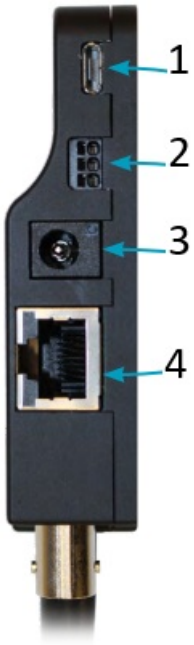
All power, data and video signals are through the Fischer MiniMax connector on the camera's base. The outer casing is manufactured from aluminium. All external mating surfaces are gasket sealed to maintain its IP67 rating.

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.

Connector	Signal
1: BNC	HD-SDI



Connector	Signal
1: Micro USB	Comms
2: EXT 232/485	RS232/485
3: DC Coax	Power
4: RJ45	*Ethernet

* Only active if the MFR-DB includes an IP encoder.

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.

EXT 232/485 Pinout	
RS232	**RS485**
1: RX (to cam)	B
2: TX (from cam)	A
3: GND	

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.

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 it 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

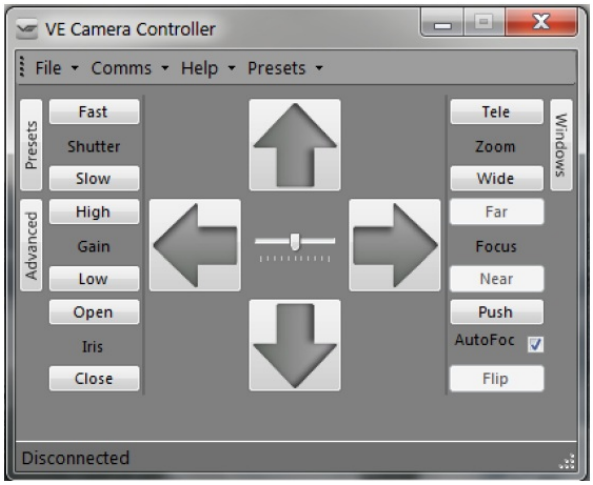
Software Control

The MFR-DB camera's serial communication supports the Sony VISCA protocol.

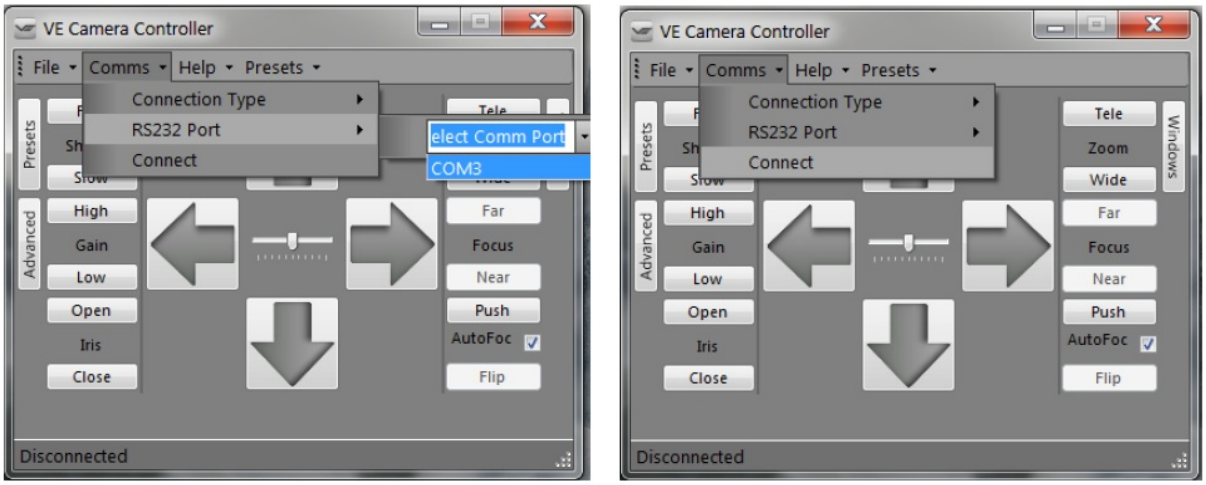
The user may choose to use a software controller of their choice or use the VE Camera Controller. This software application can be downloaded from the Visual Engineering website:

www.visualengineering.co.uk/supportdownload/9

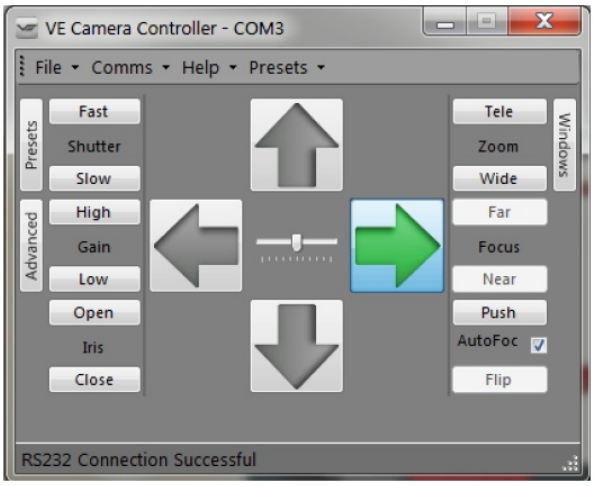
The user should install the Software application on a PC. The screen below shows the software application.



It is necessary to connect the camera to a USB port on the PC. The operating system of the computer will allocate this a COM port number. Once this connection has been made the user can go ahead and connect the application to the COM port. In the example below the port COM3 has been selected.



Once the software application is connected the functions of the software can be used. In the example below the pan right command has been selected. Similar commands for pan left, tilt up & down and zoom functions can also be sent using the intuitive software user interface.



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 tables describe these additional commands.

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)
	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)

Additional Inquiry/Command With Response Data				
Cmd Set	**Command**	**Command Packet**	**Response Packet**	**Comments**
FLIR PASS THROUGH	Flir Cmd	8x 01 04 24 9F 0 1 FF	y0 51 24 9 F 01 FF	= Cmd Payload Length = FLIR Command =Response Payload Length = FLIR Response
UNIT TYPE	Unit Type	8x 01 04 24 92 00 01 FF	Y0 51 24 9 2 FF	= 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	= Pan Position = Tilt Position The value returned is a 16-bit signed integer, the actual angle can be calculated as below where is equal to the value returned. Angle = x/20

Command
Move
Absolute Position

Additional Commands

Command Packet

Comments

<aa> = Pan Speed (0x01-0x18)

8x 01 06 01 <aa> <bb> <cc> <dd> FF

<bb> = Tilt Speed (0x01-0x14)
<cc> = Pan Direction (0x01 = Left, 0x02 = Right, 0x03 = Stop)

<dd> = Tilt Direction (0x01 = Up, 0x02 = Down, 0x03 = Stop)

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

THERMAL COLOUR PALETTE
THERMAL IMAGE FREEZE

Set Video Mode
Set Palette
On/Off

8x 01 04 24 96 01 <xx> FF 81 01 04 63 <xx> 01 FF 81 01 04 62 <xx> 01 FF

<xx> = Mode 0x01 = Optical Camera 0x02 = Thermal Camera
<xx> = Palette Selection (0x00 0x0D)
<xx> = On/Off 0x02 = On (Freeze Image)
0x03 = Off (Real-Time)

Cmd Set
FLIR PASS THROUGH
UNIT TYPE
PAN TILT DRIVE

Additional Inquiry/Command With Response Data

Command

Command Packet

Response Packet

Comments

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 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

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

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] <aa> <payload>

The Unit Address, which can be set in the Comm Port Options in the boot menu. Command Payload Length Standard Flir Command Payload

MFR-DB
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. The examples address a Unit ID of 1, all values are hexadecimal.

VIDEO_MODE – ID 15
VIDEO_MODE 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
VIDEO_MODE 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
VIDEO_MODE 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

MFR-DB
Specifications
Optical Sensor Optical Sensitivity Optical Resolution
Optical SNR Optical Field of View
Optical Zoom Thermal Resolution
Thermal Lens Thermal Field of View
NEdT

April 2022

Specifications

1/2.8″ Type CMOS

Radiometric Technology

< 0.05 Lux, ICR On

Thermal Spot Metering

1920 x 1080 Pixel

Serial Protocol

> 50dB

Serial Comms

63.7°

Pan & Tilt Range

30x

Connector

640 x 512 Pixel

Environmental

9mm

Weight

69° H, 56° V

Dimensions

< 30mK

Casing

As Standard Enabled VISCA
USB, RS232/485 360° Pan, 170° Tilt Fischer MiniMax
IP67 2368 grams ø115 x 206 mm Aluminium

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MFR-DB
Dimensions
Overall Dimensions

April 2022

Base Plate Hole Centres

43

43

75 50

50

50

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Documents / Resources

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References

- visualengineering.co
- visualengineering.co.uk/supportdownload/9
- visualengineering.co.uk/supportdownload/57
- visualengineering.co.uk/supportdownload/58