Users' Manual

COBHAM

MicroVue and MicroVue Commander User Manual

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4 Change History

Version	Main Changes from Previous Version	Edited By
v1.0	Initial Release	NH/MB
v1.1	Add some advanced features descriptions Add touch screen menu structures	NH
v1.2	Add receiver upgrade information	NH
v1.3	Updated with EMC Results data	MB
v1.4	Add MicroVue Commander information	NH
v1.7	Add back panel figure for software upgrades	NH

5 About this Manual

This manual describes the operation of the domo MicroVue. The manual is divided into three main sections.

- **Getting started and basic operation**

  This section describes to users how to deploy and use a domo MicroVue unit.

- **Advanced operation**

  This section describes the operation of the system in more detail, concentrating particularly on advanced use of the touch screen controller, use the optional recorder and umbilical micro-viewer options.

- **Technical reference**

  This section provides technical specification and control protocol data and will be of interest to those integrating the MicroVue into larger systems.

6 Introduction

The domo MicroVue is a tactical digital video receiver and is part of the domo SOLO4 and SOLO2 product family. The SOLO4 and SOLO2 product range enables the user to build wireless digital microwave video systems. The domo SOLO4 and SOLO2 products have been designed to provide rugged point-to-point links for high quality full frame rate video, and audio, even in non line of sight and urban environments.

Existing analogue systems suffer from impairments such as video noise, loss of colour information and poor image quality when line of sight cannot be maintained, and solutions based on wireless internet standards and PC platforms deliver poor quality video.

The domo SOLO4 and SOLO2 system is a digital system that uses the COFDM modulation technique, which effectively eliminates the problems caused by multipath and reflections.

The SOLO product range allows law enforcement, surveillance and emergency service communities to now receive the highest quality video images, in real time, direct from personnel, buildings and vehicles.

The domo SOLO2 system employs the DVB-T 2K carrier COFDM technology.

The domo SOLO4 system employs a revolutionary narrow band 2.5MHz COFDM technology which demonstrates better propagation for longer range links, and extra bandwidth efficiency. The domo SOLO4 system can also be upgraded to include a 1.2MHz COFDM modulation and MPEG4 compression for excellent range performance.

The MicroVue is a brieface receiver / recorder package for tactical video surveillance operations. Additionally, the MicroVue can be used as a remote video receiver for UAV and UGV applications. The MicroVue combines a domo SOLO Receiver with two diversity down converters and two antennas into one rapidly deployable briefcase kit.

The MicroVue Commander is a basic MicroVue brieface receiver with added PTZ camera control and Telemetry transmitter. This is used in conjunction with the ClearCam deployable periscope camera to provide a complete rapid deployment surveillance link.

A 8.4" colour LCD screen is mounted in the lid. The MicroVue is supplied with comprehensive touch screen control panel for control and setup. The MicroVue is supplied with AC, DC and internal battery power. For unusual installations the internal antennas and down converters can be bypassed and external antennas and down converters fitted.

As standard the domo MicroVue is supplied without a recorder, but can optionally be fitted with the NDT200 recorder, other recorders are available on request. An optional MicroViewing screen connected by umbilical is also available as an option.

The domo narrow bandwidth modulation offers unprecedented spectrum efficiency, while also increasing the system sensitivity and therefore range.

The MicroVue has comprehensive On Screen Display diagnostic capability to show link quality and spectrum and is equipped with video, two voice and data channels. Security of transmission is ensured by the use of Standard ABS encryption or for greater security the optional AES128- or 256-bit encryption algorithms.

Features:

- Comprehensive Demodulation 8 / 7 / 6 / 2.5 and 1.25MHz (optional)
- Maximum Ratio Combining antenna diversity for fade and multipath elimination.
- Lid mounted antennas.
- 8.4" colour monitor in lid.
- AC, DC, internal battery operation.
- Batteries recharged internally.
- Recorder playback on lid monitor.
- Comprehensive On Screen Display (OSD) diagnostics for link analysis, including spectrum analyser.
- 5.5" touch screen in base for device configuration.
- Headphone output.
- Internal AES 128 or 256 encryption.
- Optional NDT Recorder with playback to lid mounted monitor.
- Optional discrete micro-video viewer on umbilical.
- Commander: PTZ camera control

IMPORTANT NOTE

The SOLO4 MicroVue has been specifically designed for government security and law enforcement users, the equipment will tune across frequencies that are only available to licensed government users. Non-government users should employ the equipment restricted to the license exempt bands only typically 1.389 to 1.399GHz and 2.400 to 2.483GHz.

7 Warranty and Support

7.1 Warranty Cover

domo offers a 12 month standard product warranty. During this period, should the customer encounter a fault with the equipment we recommend the following course of action:

- Check the support section of the website for information on that product and any software/firmware upgrades. If fault persists;
- Call our support line and report the fault. If fault persists and you are informed to return the product please obtain an RMA number from the domo support department, and ship the equipment with the RMA number displayed and a description of the fault. Please email the support section the airway bill/consignment number for tracking purposes.
- If you have extended warranty provisions then domo will send an immediate advance replacement to you. Under most circumstances this must be returned once the fault item is repaired.

  Depending on the nature of the fault domo endeavor to repair the equipment and return it to the customer within 14 days of the item arriving at our workshops.

  Obviously it is impossible to cater for all types of faults and to manage 100% replacement part availability, and delays are sometimes inevitable. This is why domo recommend that its customers take out an extended warranty (which includes advanced replacement of faulty items), and/or hold a basic level of spare parts, which can be held by domo on the customer's behalf.

  Please contact domo for details of packages that can be tailored to meet your individual needs, whether they are service availability, technical training, local geographic support or dedicated spares holdings.

8 Safety

8.1 Safe Operating Procedures

- Ensure that the power supply arrangements are adequate to meet the stated requirements of the product.
- Caution: When using the DC input ensure the DC supply is capable of 12V at 8A.
- Caution: The MicroVue is not provided with a mains ON / OFF switch, so when operating on mains supply, ensure that the mains supply socket is easily accessible to the user.
- Caution: Risk of explosion if battery is replaced by an inappropriate type. Battery replacement can only be undertaken by domo personnel who will also ensure safe battery disposal.
- Operate within the environmental limits specified for the product.
- Do not subject the indoor equipment to splashing or dripping liquids.
- Only authorized, trained personnel should open the product. There are no functions that required the User to gain access to the interior of the product.
- The unit is designed only to be operated with the Lid open and front storage pouch removed, to ensure adequate airflow.
- The MicroVue with the lid up, should not be exposed to prolonged rain fall, this will cause damage.

8.2 EMC Approvals

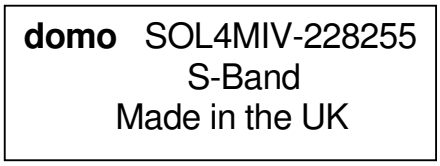
Tested in accordance to EN60950-1:2001

9 Getting Started and Basic Operation

9.1 Which Model do I have?

Each unit in the domo SOLO4 and SOLO2 product range is marked with two panels. These panels can be found below the cable bag in the base of the unit.

- Product Code Panel. Give product code and manufacturers information.
- CE and Serial Number Panel. Gives CE mark and product serial number.



The **domo** product code can be referenced in the table below.

Table 1 MicroVue product codes

Product Code	Product	Accompanying items
SOL4MIV-034047	MicroVue Tactical Receiver 340 to 470MHz	Cables: Control Cable (3 way lemo to 9 way DType) 3m External Control (3way Lemo to 3 way lemo) 3m Audio Cable (phono) Video Cable (BNC) DC Power 2m CD with operating software and manual
SOL4MIV-057067	MicroVue Tactical Receiver 575 to 675MHz	As above
SOL4MIV-115140	MicroVue Tactical Receiver 1.15 to 1.4GHz	As above
SOL4MIV-228255	MicroVue Tactical Receiver 2.28 to 2.55GHz	As above
MICROVDVR	Compact HDD DVR Recorder Option	None Required

Table 2 MicroVue Commander product codes

Product Code	Product	Accompanying items
SOL4MIVC-120045	SOLO4 MicroVue Commander 1.15-1.4 GHz 458 MHz Telemetry transmitter	Cables: Control Cable (3 way lemo to 9 way DType) 3m External Control (3way Lemo to 3 way lemo) 3m Audio Cable (phono) Video Cable (BNC) DC Power 2m CD with operating software and manual
SOL4MIVC-240045	SOLO4 MicroVue Commander 2.28-2.55 GHz 458 MHz Telemetry transmitter	As above
SOL4MIVC-240086	SOLO4 MicroVue Commander 2.28-2.55 GHz 868 MHz Telemetry transmitter	As above
SOL4MIVC-240090	SOLO4 MicroVue Commander 2.28-2.55 GHz 903 MHz Telemetry transmitter	As above

Understanding the domo MicroVue

The domo MicroVue is a tactical microwave receive case incorporating the following principle components.

- Diversity antennas
- Day light viewable 8.4'' LCD viewing screen
- COFDM digital video receiver
- Touch screen control interface
- External Connector Cabinet
- Integral AC / DC and Battery power supply
- Optional NDT recorder

These principle components are highlighted in the photographs below.

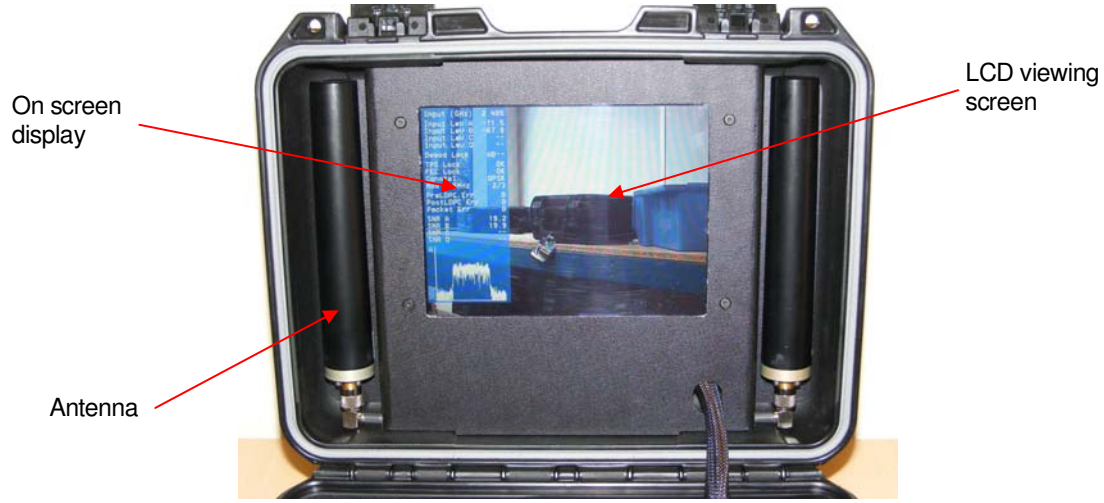


Figure 1 Front view of the MicroVue lid

Figure 2 Top view of the MicroVue base

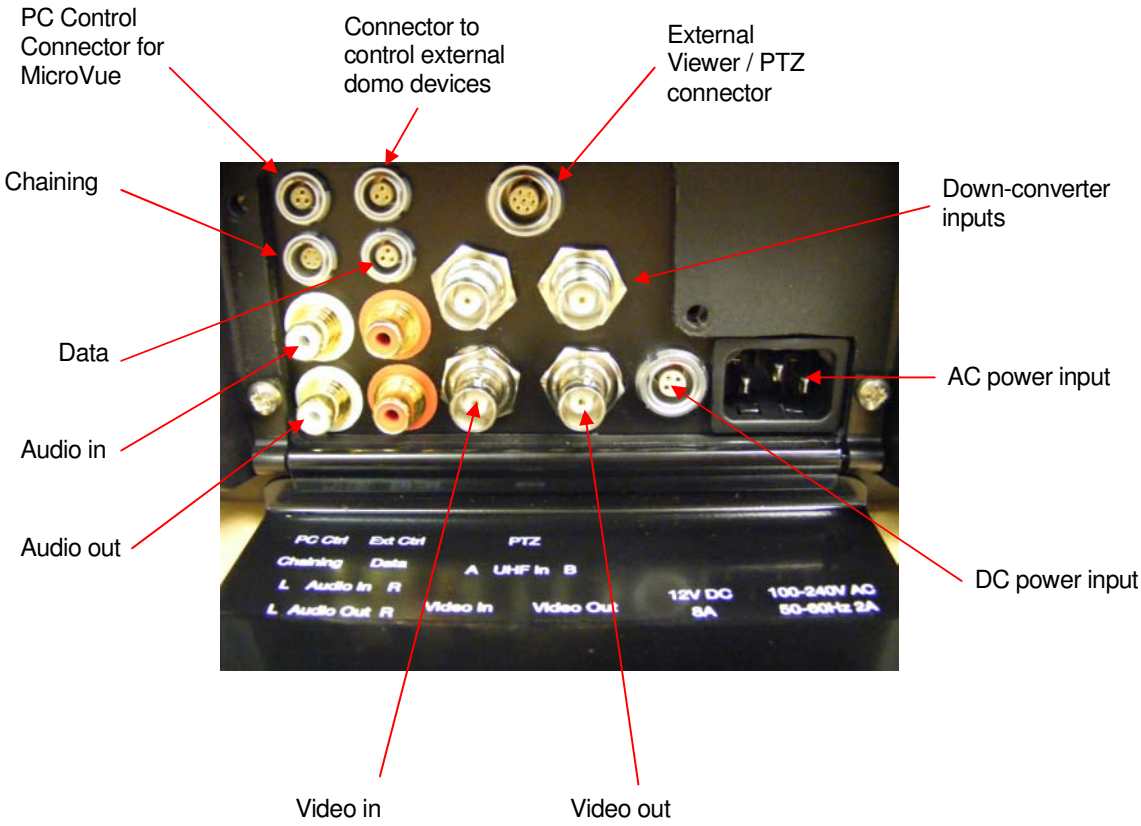


Figure 3 Rear view of MicroVue with external connector cabinet

The **MicroVue Commander** includes all of the basic MicroVue functionality, with the addition of

- a PTZ control panel in the base of the unit, used for controlling the remote periscope camera
- a telemetry transmitter and antenna in the lid, used for sending the camera control commands.

Figure 4 Top view of the MicroVue Commander base (no DVR)

9.2 Basic operation

Powering on the MicroVue

The MicroVue has 3 power supply options

- Internal Batteries
- External DC Input
- External AC Input

The unit is powered on by switching the master power switch into the ON position (marked with a 1). The Power status LED will light Green if power is On or if there is power remaining in the batteries. Note that if the battery is completely exhausted then the LED will not light.

Internal Batteries

The domo MicroVue will automatically switch to using the internal battery supply when neither the external AC nor DC input is connected to a valid supply.

The internal batteries are charged automatically when a valid supply is connected to the external AC or DC input.

Fully charged batteries will power the MicroVue for about 4 hours. See the paragraph 'Charging the domo MicroVue' for charging information.

External DC Input

The domo MicroVue can be powered from an external DC source such as a battery, by connecting the DC connector in the external connector cabinet to a DC source with the following characteristics.

Voltage:	11 to 16V
Current:	max (when charging) 6A (at 12V)
	Typical (when charged) 3A (at 12V)

External AC Input

The domo MicroVue can be powered from an external AC source by connecting the AC connector in the external connector cabinet to an AC source with the following characteristics.

Voltage:	85 to 265VAC

Status LEDs

The status LED's indicate the battery and power status, as outlined in the table below.

Table 3 LED colour codes

LED	Meaning
Power = green	The unit is running.
Power = off	The unit is switched off or the battery is completely exhausted.
Power = flashing green	The batteries are flat and the unit will shut down shortly.
Battery status = solid green	The batteries are fully charged.
Battery Status = red	The batteries are being fast charged by an external source.
Battery Status = orange	Batteries are being preconditioned before fast charge.

Charging the domo MicroVue

The domo MicroVue internal batteries are automatically charged when the MicroVue is connected to an external AC or DC source.

The time required to fully charge the batteries from fully flat is as follows.

Charging when MicroVue powered off: Approximately 1.5 hours

Charging when MicroVue powered on: Approximately 3 hours

Understanding the LCD Viewing Screen

When the unit is switched on, the day light viewable LCD in the lid will power up and display video.

Note: A 'Blue Screen' will be displayed if the MicroVue receiver can not lock to a suitable microwave source.

Note: A translucent OSD (On Screen Display) may be present in the left hand side of the screen, see later section on 'Understanding and Interpretting the On Screen Display' for more details.

Figure 5 Lid of the domo MicroVue with LCD and OSD function

Understanding the Touch Screen Control Interface

In the base of the unit is a touch screen which is used to display and edit the key settings of the domo MicroVue.

On powering on the domo MicroVue, the touch screen will briefly show the domo logo, before defaulting to the 'Main Status Screen' shown in Figure 5 below.

The Main Status Screen has eleven framed buttons (twelve in the case of the Commander) which operate on a touch screen basis. This screen contains all the key settings on a MicroVue, to make the unit controllable from a single page. The touch screen is quite responsive and will react to firm but gentle pressure applied to any of the buttons.

Note: Navigation through the touch screen menu's may be done either by hand or with the back of a pen. However, the touch screen can be damaged if pressed too hard, or pressed with a sharp implement..

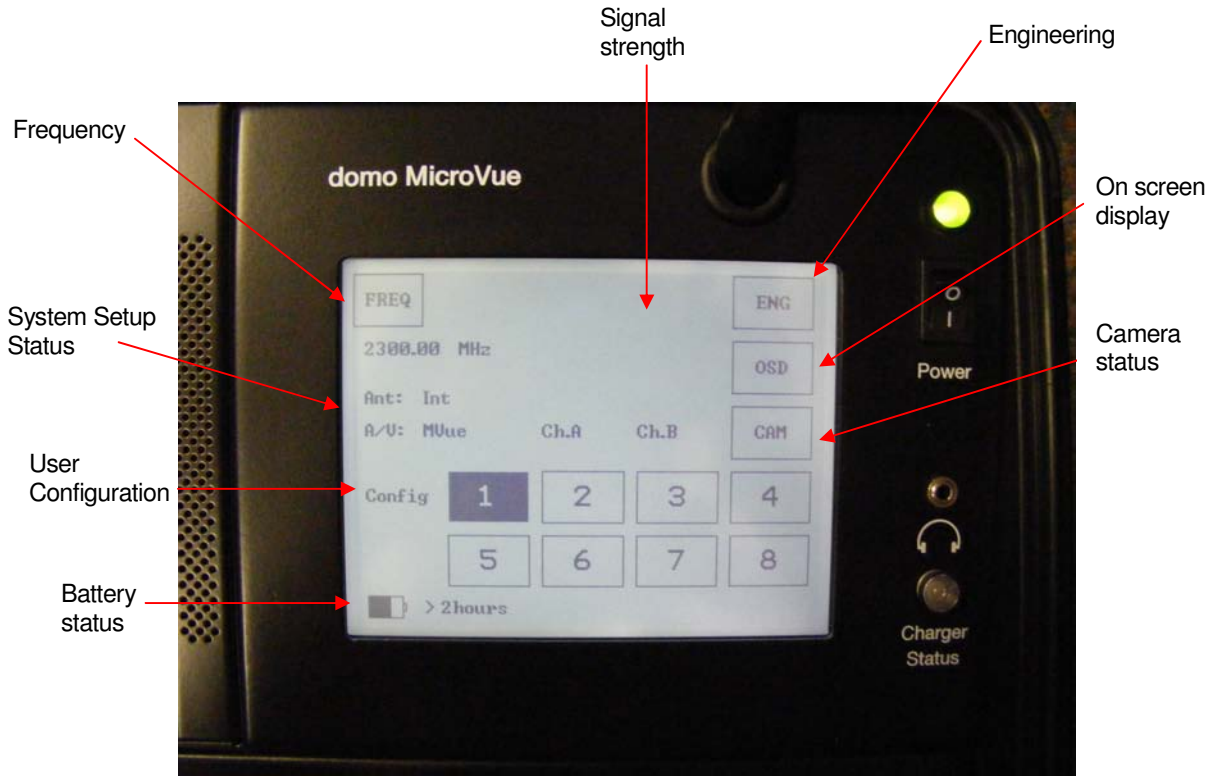


Figure 6 The MicroVue 'Main status screen'

The functions of the fields on the Main status screen are outlined in the table below.

Table 4 Main status screen

Field / Button	Meaning / Use
Configuration	The highlighted button indicates which of the eight stored configurations is currently selected. Pressing a number selects the corresponding configuration from memory. See 'Changing configuration on the domo MicroVue' for more details.
Frequency	This button enables the user to change the received frequency manually. Eg to manually tune the MicroVue
On screen display	This button allows the user to toggle the On Screen Display function between Channel A, Channel B and Off. For detail about the interpretation of the displayed parameters, see the section on 'Using and Interpreting the On Screen Display'.
Battery status	This field indicates the approximate remaining battery life.
System Setup Status	These two status parameters show the setup status of the MicroVue. Ant: Int Indicates Internal Lid mount antennas are in use. Ant: Ext Indicates Externally connected antennas are in use. A/V: MVue Indicates the video on the display is from the MicoVue Receiver A/V: Ext Indicates the video on the display is from the external

	input
Engineering	This button takes the user to the unit's comprehensive setup menu's. See the 'Advanced Operation' section for further details.
Camera status	(Commander only) This button accesses the camera status page. See Figure 10 and Table 7.

Changing Configuration on the domo MicroVue

To simplify the operation of the domo MicroVue, users can pre-program eight 'User Configurations'. In their simplest form these can be thought of in the traditional sense as eight frequency channels. However, the User Configurations actually store all the parameters of the MicroVue and not just its frequency.

The default User Configurations with which the unit is shipped are described in the 'Default Configurations' section at the end of the user guide.

Typically, each User Configuration is pre-programmed with a different receive frequency. The user can then select the required frequency by pressing one of the appropriate 'Config' buttons on the main touch screen, labeled 1 to 8.

The currently loaded User Configuration is shown in black inverse text on the main screen. In the case of Figure 5, this will be config 2.

See the advanced section of the user guide for more information on how to edit the parameters inside the user configurations.

Tuning the domo MicroVue manually

Pressing the 'Frequency' button allows the user to manually tune the received frequency of the domo MicroVue.

Users can select an appropriate frequency by pressing on the numbers in the numeric key pad. Frequency must be entered in MHz.

Errors can be deleted using the 'Clear' button.

When the correct frequency is keyed in, it can be applied by pressing the 'Enter' key.

The 'Back' key returns the user to the 'Main Status Screen' without saving any changes.

Deploying and Operating the domo MicroVue

The domo MicroVue is a tactical digital video receiver, and the following guidelines should be employed when using the equipment.

- The MicroVue should be operated with the lid up and the internal antennas vertical for best performance.
- **The Telemetry transmit antenna should be attached to the outside of the MicroVue Commander lid (Commander only).**

- The front storage pouch should be removed when the unit is switched on, to prevent obstruction of the fan.
- An open unit with the lid up should not be exposed to prolonged rain fall, as this will cause damage.
- Depending on the RF environment (line of sight or non line of sight) and the power of the transmitter (100mW or 1W), the MicroVue will operate at a range typically 300m to 1km from the target transmitter.
- If the MicroVue is being operated inside a building or vehicle, better results may be achieved by using the external antenna function and deploying the antennas to the outside of the building or vehicle.
- To prevent damage to the MicroVue, it should not be operated too close (within 5m typically, further if the transmitter is greater than 1W in power) of the transmitter.

Operating the MicroVue Commander

The Commander has the added functionality of PTZ camera control via the switch panel in the base. See Figure 7.

Figure 7 Commander PTZ camera control panel

The switch panel functionality is outlined in Table 5.

Table 5 MicroVue Commander switch panel functions

Button	Use
Zoom in	36x optical zoom and 12x digital zoom.
Zoom out	Zooms out
Focus far	Forces the camera to focus on objects in the distance.
Focus near	Forces the camera to focus on objects in the foreground.
Day shot	Forces the camera into day shot mode
Night shot	Forces the camera into night shot mode
Auto focus	Pressing and holding this button for three seconds will make the camera automatically adjust its focus when panning, tilting or zooming.
Auto night shot	Pressing and holding this button for three seconds will

	make the camera automatically switch to night shot mode when light levels fall.
Camera 1	Selects video from camera input 1 on ClearCam.
Camera 2	Selects video from camera input 2 on ClearCam.
Speed	Sets the speed at which the unit pans and tilts. **Note:** If the speed is turned to zero, no panning or tilting will result.
Pan (left-right) arrows	Moves camera through 400° panning range .
Tilt (up-down) arrows	Moves camera through +20° to -40° tilt range.
Control address	Hex switch to select a specific ClearCam to control (see paragraph below).

As shown in Figure 7, the Commander base panel contains a CONTROL ADDRESS rotary hex switch.

This potentially gives the user the ability to control up to 15 remote ClearCam units from one MicroVue.

To do so, the Channel number of the Commander can be changed to match that of the target ClearCam unit. Only that ClearCam will then respond to the PTZ commands sent by the Commander.

By default, this feature is disabled and all ClearCam units are set to Channel 15. **Hence, the Commander has to be set to Channel 15 for the PTZ to work.**

Before switching on, make sure that the **telemetry transmit antenna** has been screwed into the top of the Commander lid.

Using and Interpreting the On Screen Display (OSD)

The MicroVue On Screen Display (OSD) tool is an extremely useful tool for system set-up and diagnostic.

The OSD facility will 'burn' diagnostic data onto the video output for test and set-up purposes. Pressing the OSD button will enable this facility and a diagnostic screen will appear in the video as shown below.

The OSD function has three settings.

Press OSD button once to display OSD for antenna channel A.

Press OSD button again to display OSD for antenna channel B.

Press OSD button again to switch off OSD function.

Figure 8 Received video with OSD on Channel A

The displayed diagnostic data includes a spectrum display, signal to noise data, input power level and frequency. The received spectrum display is useful when checking for interference signals, the SNR indicated signal quality. For more information on use of this facility a domo training course is recommended.

When setting a domo system up the OSD should be used in the following way.

Check Channel is Clear

With the transmitter OFF, check that the channel is empty of interference signals, this is confirmed by ensuring that the reported power in the channel is at –99dBm and that the spectrum is shown as a rounded dome with no obvious spikes or tones.

Check Quality of Link

Switch on the transmitter and confirm that SNR is 6 or greater and that power level is at least –92dBm or greater. This represents approximately a 5dB margin. Failure of the link will occur when the power level reaches –97dBm or the SNR reaches 3dB.

External Connections on the domo MicroVue

The rear equipment cabinet of the domo MicroVue incorporates a number of external connections, as shown in

Figure 3.

- Video Out, for external viewing of receiver video.
- Video In, for viewing an external video source and using the MicroVue as a monitor.
- Audio Out, for connecting external speakers.
- Audio In, for monitoring an external audio source using the MicroVue head phone socket.
- PC Control, for connecting to an external control device (PC), allowing the user to remote control the MicroVue with the current SOLO Control Application.
- Ext Control, for connecting to another domo device and using the MicroVue as a controller.

- Chaining out, with digital clock and data. See Advanced operation section.
- Data, for data output and receiver software upgrading.
- PTZ, for connecting the external micro-video monitoring screen. See Advanced operation section.
- UHF In A and B, for connecting external antennas. See Advanced operation section.

Connecting Composite Video Out

Connect the video output lead to the BNC connector labelled 'Video Out' on the MicroVue to the chosen video display device.

Connector	Signal
Video BNC	75 ohm composite video output, PAL or NTSC software selectable at the transmitter

Typically the video display device will be a high quality monitor.

Connecting Composite Video Input

Connect the video input lead to the BNC connector labelled 'Video In' on the MicroVue to the chosen video source device.

Connector	Signal
Video BNC	75 ohm composite video source, PAL or NTSC software selectable

Typically the video source will be a small colour or black and white CCD camera. This feature is useful when the operation of a camera can be verified prior to installation on site.

Connecting Audio Output

Connect the audio output lead to the phono connectors labelled '**L** Audio Out **R**' on the MicroVue to the chosen audio monitoring device.

Connector	Signal
Audio Phono Plugs	Line level, +7dBu clip level, low impedance source (20 ohm)

Typically the audio output device will be monitoring speakers.

Connecting Audio Input

Connect the audio input lead to the phono connectors labelled '**L** Audio In **R**' on the MicroVue to the chosen audio monitoring device.

Connector	Signal
Audio Phono Plugs	Line level audio Line level -2dBu clip level low impedance source (< 600 ohm)

Connecting to PC Control

The domo MicroVue can be controlled from a PC with the domo Control Application, via RS-232. Connect a domo control cable to any serial port on the PC and plug the Lemo connector into the back of the MicroVue. Start the PC control application. It should now connect to the MicroVue receiver and load all the unit parameters, enabling the user to edit the parameters as before. See 'Control Protocol' section for details of the protocol, baud rates etc.

Connecting to External Control

The domo MicroVue can be used to control other domo devices, eliminating the need to use a PC for setup purposes. Connect the SOLO device to the External Control port and re-power the MicroVue. The added device should now appear in the ENG menu, available for editing. See 'Advanced Operation' section for further details of use.

10 Advanced Operation

The following section should be read by users concerned with the more advanced operation of the domo MicroVue. Topics covered include:

- Advanced Functions of the Touch Screen Controller.
- Advanced features of the ClearCam control page.
- Using the External Antenna Function.
- Using the Monitor Input Function.
- Controlling other domo devices from the MicroVue.
- Using the optional NDT Recorder.
- Using the optional micro-video discrete viewer.
- Connecting the PC Controller.
- Upgrading the MicroVue receiver software.

10.1 Advanced Functions of the Touch Screen Controller

Touch Screen Controller Menu Tree

The menu structure of the MicroVue touch screen controller is shown below. Only the principle menu screens are shown.

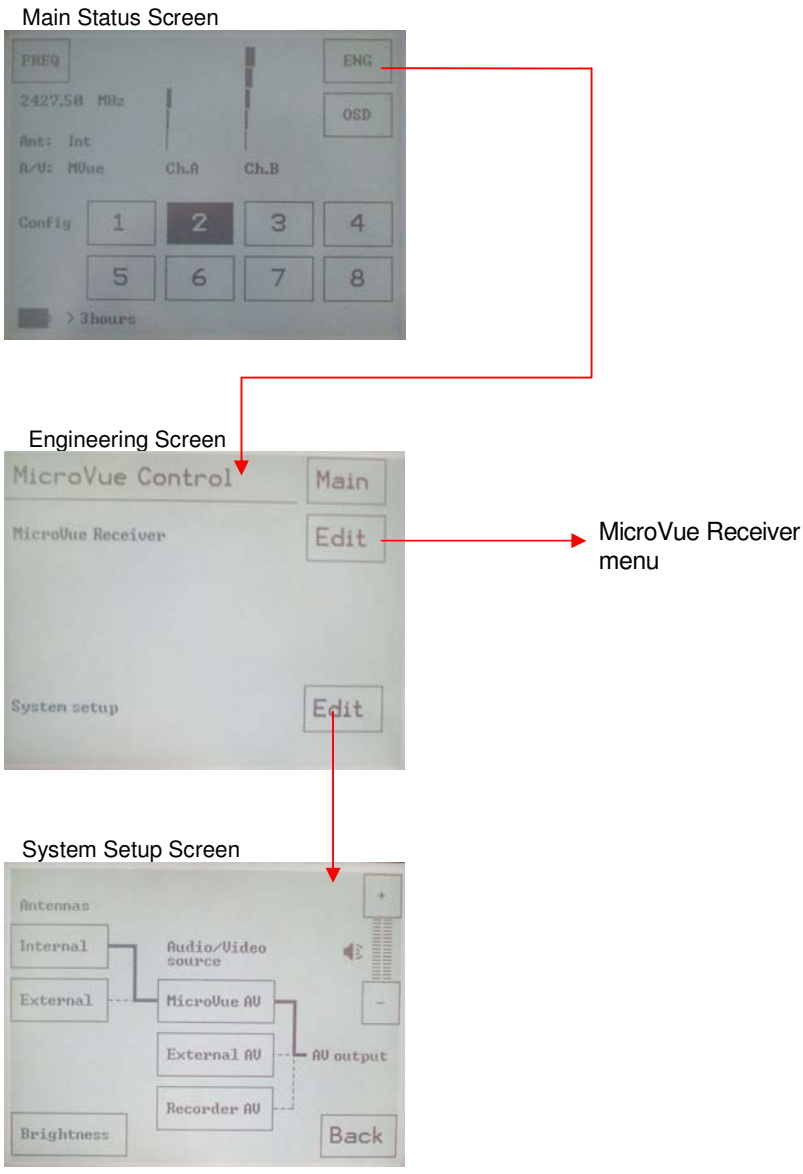


Figure 9 The MicroVue principle screens

Understanding configurations and How to modify them

domo MicroVue equipment features eight user selectable and programmable configurations. These allow the user to store useful default channels for quick selection. By default, all 8 configurations are set to the values which are listed in the Default Configurations section of the handbook.

The 'current config' is defined as the number of the currently selected configuration 1 to 8. The current config can be changed by selecting one of the 8 config buttons in the 'Main status screen', or by editing the 'Current Config' parameter in the MicroVue Receiver menu.

Any modifications made to system settings either using the PC Control application or from the 'MicroVue Receiver Menu' on the touch panel controller will be saved in the current config. All changes are therefore saved permanently.

Receiver menu tree structure

When the 'MicroVue Receiver' menu is accessed, the user has access to the detailed configuration parameters of the device.

The parameters are grouped according to function, as Current config, RF parameters, and Unit parameters. The table below outlines the contents of each of these sub-sections.

Table 6 Receiver menu structure

Receiver Menu Structure	Function
Current config	Indicated the configuration which is currently loaded in the device. All editing being done will be saved to this config.
RF parameters	RF Status Down converter Input frequency Guard interval Bandwidth
Unit parameters	On screen display Descrambling Data Data baud rate Unit name Backlight intensity Power up line standard Input line standard

	Blue screen on fail
	Board serial number
	Board software version
	Board FPGA version
	Recalibrate touch screen

Using the System Setup Menu

The ‘System Setup’ menu in Figure 9 is used to configure MicroVue hardware via the touch screen. In particular, the ‘System Setup’ menu is used to control the following MicroVue hardware functions:

- Selection of Internal and External Antennas. For more information see the section ‘Using the External Antenna Function’
- Selection of external monitor video input. For more information see the section ‘Using the Monitor Input Function’.
- Selection of Recorder Play back function, For more information see the section ‘Using the optional NDT Recorder’.
- Control Headphone audio volume. Headphone volume can be adjusted by pressing the ‘+’ or ‘-‘ buttons.
- The ‘Brightness’ button allows the user to adjust the brightness of the lid LCD and touch screen. When the brightness is selected as OFF, the lid LCD will go completely black, while the touch screen will still function, but without backlight.

When exiting the ‘System setup’ menu by pressing ‘Back’, the current antenna, AV source and volume settings are stored and will be restored after powering up the MicroVue in the future.

10.2 Advanced Functions of the ClearCam Control Page

In the case of the MicroVue Commander, the CAM button on the Main status page gives the user access to the ClearCam settings. See Figure 6.

Pressing this button gives the user access to the Status and Control page of the remote ClearCam unit, shown in Figure 10. Table 7 outlines the available functions on this screen.

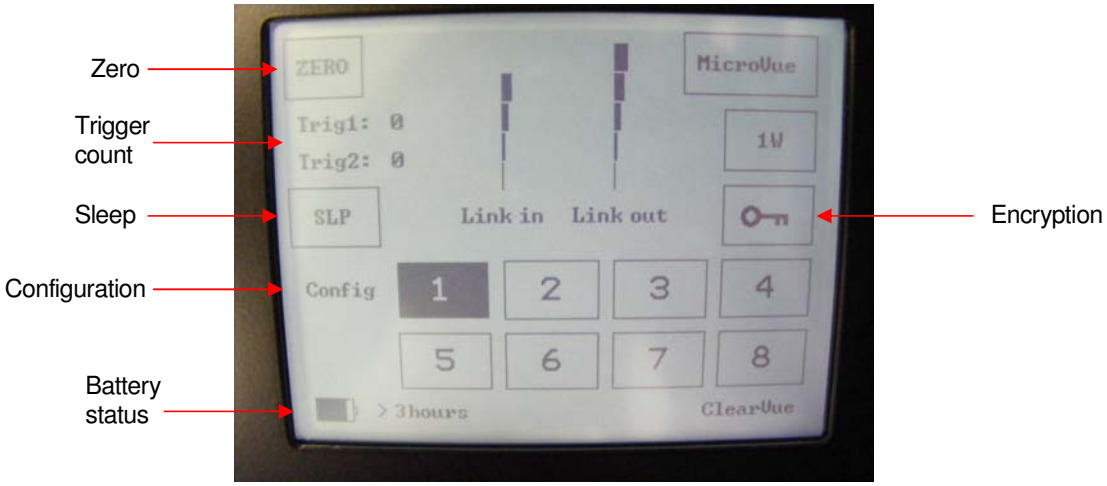


Figure 10 ClearCam status and control page

Table 7 ClearCam status screen

Field / Button	Meaning / Use
Link in	Bar graph indicating the received signal strength on the MicroVue
Link out	Bar graph indicating the received telemetry signal strength on the ClearCam.
Configuration	The highlighted button indicates which of the eight stored configurations is currently selected on the ClearCam. Pressing a number selects the corresponding configuration from memory.
Trigger count	Shows the current trigger count from sensors on the ClearCam.
Zero	Resets the trigger counts to zero.
Sleep	Allows the user to select between Sleep Off, Sleep mode 1 and Sleep mode 2. See Table 8 for details on the sleep modes.
Battery status	This field indicates the approximate remaining battery life on ClearCam.
Encryption	This allows the user to set the encryption of the video transmitted from ClearCam. The MicroVue reciever has to be set to the same encryption key to

	receive video from ClearCam.
1W	This button toggles between 1W and 100mW transmit power on ClearCam. When ClearCam is in 1W mode, the button is inverted.
MicroVue	This allows the user to navigate back to the Main MicroVue status page.

Table 8 ClearCam sleep modes

Mode	Function
Off	Both Solo transmitter and Telemetry receiver on ClearCam are active constantly.
Sleep mode 1	When the ClearCam is put into Sleep mode 1, the Solo transmitter on ClearCam will turn off after a set number of minutes of trigger inactivity. This number is set in the PC control application as Sleep Timeout and can be in the range of 1-9 minutes. The unit can be woken up in two ways: Trigger activity on the ClearCam, or turning sleep OFF in the Sleep menu.
Sleep mode 2	When the ClearCam is put into Sleep mode 2, both the Solo transmitter and Telemetry receiver on ClearCam will turn off after a set number of minutes of trigger inactivity. This number is set in the PC control application as Sleep Timeout and can be in the range of 1-9 minutes. Sleep mode 2 saves the most amount of battery life. Once asleep, the unit can be woken up only through trigger activity on the ClearCam, or via the ClearCam PC control application.

10.3 Using the External Antenna Function.

The MicroVue can be switched to operate from externally mounted antennas, rather than the internal lid-mounted antennas.

This is a useful function particularly if the MicroVue is being operated from inside a building or inside a house where reception is difficult. In this situation the antennas can be mounted outside the house or building then connected via cables to the TNC connections in the connector cabinet on the rear of the MicroVue.

Note: Externally mounted antennas must be connected via domo downconverters. The TNC input on the rear of the unit requires UHF input, so down converters must be used.

Note: A maximum cable length of 5 meters should be used between the external down converter and the MicroVue.

Navigating to the ‘System setup’ screen on the touch screen controller and pressing the ‘External’ antenna button will select the external antenna function.

External antenna operation can be confirmed by looking at the System Setup Status words on the Main Status screen of the touch screen controller. The Antenna option should say “Ant: Ext” (for external).

10.4 Using the Monitor Input Function.

The MicroVue can be used as video and audio monitor, to display external video and audio sources.

Navigating to the ‘System setup’ screen on the touch screen controller and pressing the ‘External A/V’ video button will select the external monitor function.

Monitor operation can be confirmed by looking at the System Setup Status words on the Main Status screen of the touch screen controller. The video option should say “A / V: Ext” (for external).

In this mode video sources connected to the video input on the rear of the unit will be displayed on the LCD screen of the MicroVue. Additionally, audio connected to the audio input will be available on the headphone socket of the MicroVue.

10.5 Controlling Other domo Devices from the MicroVue.

The domo MicroVue can be used to control external domo transmitter and receiver devices, thereby eliminating the need to use a PC for setup purposes.

Connect the control port of the SOLO device to the External Control port of the MicroVue with a 3-way to 3-way Lemo control cable.

Now, re-power the MicroVue. The added device should appear in the ENG menu as ‘External transmitter’ or ‘External receiver’, depending on the type, and will be available for editing.

When the external device editing is complete, remove the device and re-power the MicroVue.

For an external receiver, the menu structure will be identical to the structure outlined in Table 6. For an external transmitter, the menu structure will be as outlined in Table 9. As with the receiver, the transmitter menu structure is divided into sections, according to function.

Table 9 Transmitter menu structure

Transmitter Menu Structure	Function
Current config	Indicated the configuration which is currently loaded in the device. All editing being done will be saved to this config.
Modulation	Modulation output FEC

	Output frequency Guard interval Bandwidth COFDM mode Output attenuation,
Video and audio	Video input standard Resolution Video bitrate Video locked Audio encoder Audio input level
Unit parameters	Unit name Scrambling Sleep mode Chaining Chaining input Chain number Data Data baud rate Backlight intensity Advanced
Unit / Advanced	Board serial number Board software version Board FPGA version Recalibrate touch screen

10.6 Using the optional NDT Recorder.

The NDT200 digital video recorder from Fast Forward Video provides the user with the ability to record currently received video, and play it back through the lid LCD.

For a detailed description of the recorder setup and operation, please refer to the NDT200 and DVR Master user manuals included on the domo CD. Below is a brief outline of the basic recorder functions.

Recording video

- To record video, the recorder should be switched on, with a red blinking LED. Press the red ‘REC’ button to start the recording process.

Playing back video

- Press the LIST soft button to list all the recorded clips currently on the hard drive.
- Either LOAD ALL CLIPS, or scroll down with the circular “iPod style” button to the desired clip and press LOAD.
- Press EXIT to go to the main display screen.
- Now press Play to start playback.
- The DVR will stop playing at the end of the loaded clip(s) if Loop Playback is off, or continue from the first frame if Loop Playback is on.

Offloading and Deleting video

- The NDT200 comes with application software called the DVR Master. This allows the user to set up the device, and also to access the DVR hard drive.
- Begin by following the installation instructions in the NDT200 DVR Master User’s Manual. (This step is omitted subsequently).
- Connect the DVR to the PC with the supplied USB cable, and switch on the DVR. Open the DVR Master application.
- Switch to the DISK tab. Click the ‘Access hard drive using USB’ box to connect the PC to the DVR via USB.
- Now files can be downloaded to the PC using Windows Explorer.
- When the download is complete, untick the ‘Access hard drive using USB’ box. Video can now be deleted with the ‘Delete All Video (Format)’ button. Always use the DVR Master software to delete unwanted video.

10.7 Using the optional micro-video discrete viewer.

Plug the micro-video discrete viewer into its back panel connector and flick the power switch on the micro viewer to On.

Video will be displayed on the screen. The brightness can be adjusted with the wheel at the side of the unit.

After a certain period of inactivity, the micro viewer will go to sleep. Bring the unit out of sleep by touching the PTZ joystick.

Currently, the PTZ option is not yet supported.

10.8 Connecting the PC Controller

Advanced control of the MicroVue system is available by using the PC control applications. This can be achieved by connecting a PC RS-232 port to the 3 pin Lemo control port

Selection of device to control

The MicroVue receiver is controlled by the solo_rx_ctrl.exe application available on the CD delivered with the product. Should the user want to control the MicroVue receiver with the PC, simply connect the PC to the PC Control input of the MicroVue and open the Control Application.

Should an external transmitter or receiver be currently plugged into the External Control port of the MicroVue, and the user has navigated into the 'External Receiver' or 'External Transmitter' menu structure on the touch screen, connecting the PC Control Application at this stage will cause this current device to be edited by the PC application.

Note that exact file names may change as software version information is a part of **domo** file names.

Connecting to the PC

Installation of the control program is as simple as copying it from the CD to a suitable location on the PC. No install shield routine is launched. Note that the controllers generate their own log and initialisation files, so it is best to create a dedicated directory for these applications, perhaps with links to the applications from the desktop of the PC.

Use the supplied cables to connect the chosen COM port(s) of the PC to unit(s) to be configured.

Launch each application in turn by double clicking or using the run command.

Connection with a SOLO product should be automatic, but the user can force selection of the correct COM port using the drop down, followed by the "Connect" button.

Errors such as the following may appear during the connection process if the PC is unable to automatically ascertain which unit is connected to which COM port.

- Error attempting to read invalid address
- Error has occurred during polling, polling has been disabled

For both controllers, changes can be made to the unit configuration using the drop down and data entry fields.

Changes are only applied to the unit when the "Apply" button is clicked.

Current values, as running in the unit, can be read using the "Refresh" button.

Parameters that are status information only appear in greyed in the application.

Further engineering and configuration controls can be found within the "Options" and "File" drop down menus in the application title bars.

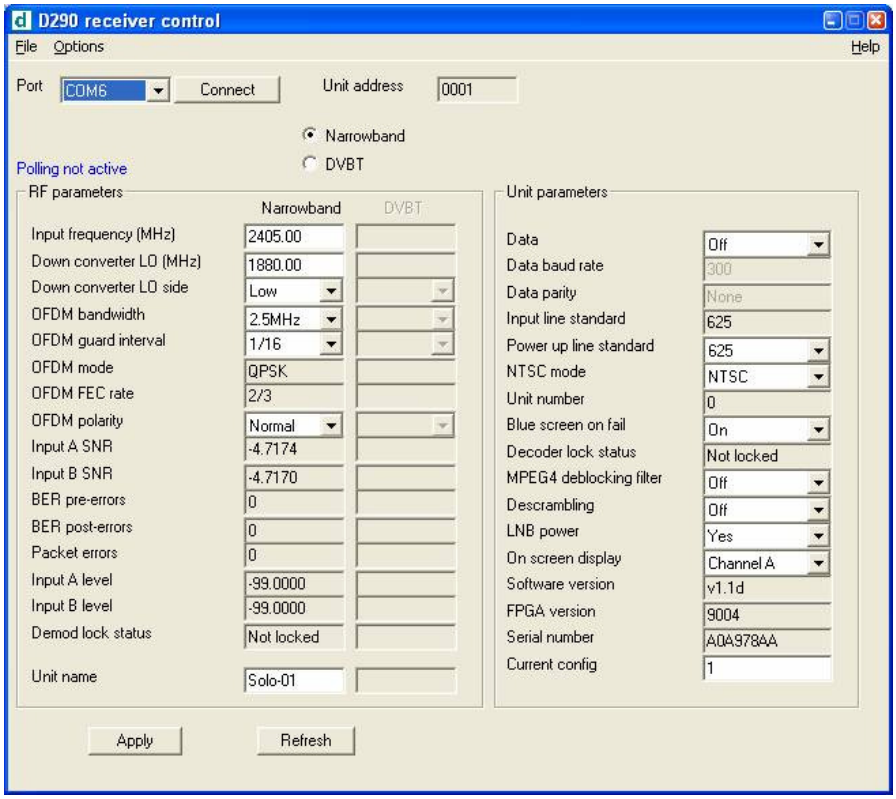


Figure 11 Receiver PC control application

> Note: The terminology DVB-T refers to the 8,7,6MHz wide bandwidth modulation employed in the SOLO2 products. The SOLO4 product is also capable of DVB-T, but this mode is not recommended for normal operation

Narrowband / DVB-T

The MicroVue is capable of receiving transmission in 6/7/8MHz wide DVB-T OFDM only. The SOLO4 receiver is capable of receiving transmissions in Narrowband and DVB-T. For receiving the transmissions from a SOLO2 transmitter the 'DVB-T' radio button should be selected. For receiving the transmissions from a SOLO4 transmitter the 'Narrowband' radio button should be selected.

When the 'Narrowband' radio button is selected, then the 'Narrowband' column of parameters will become highlighted, and can be set.

If the 'DVB-T' radio button is selected, then the 'DVB-T' column of parameters will become highlighted, and can be set.

Input Frequency

The receive frequency can be changed by entering the new desired frequency in this field.

Down converter LO

This field allows definition of the local oscillator frequency in the connected downconverters.

For domo supplied downconverters, this should be set as follows:

- 1880MHz for S band transmissions (2.28 to 2.55GHz)
- 1700MHz for L band transmissions (1.15 to 1.4GHz).

Down converter LO side

This field allows definition of the local oscillator side.

For domo supplied downconverters, this should be set as follows:

- LOW for S band transmissions (2.28 to 2.55GHz)
- HIGH for L band transmissions (2.28 to 2.55GHz)

OFDM Bandwidth

This field displays the width of the received OFDM signal and should be set to 2.5MHz for normal SOLO4 system operation, and should be set to 8MHz for normal SOLO2 system operation.

OFDM Guard Interval

In this field the user selects the guard interval which matches the transmitter. For SOLO4 systems typically a guard interval of 1/16 is used, however on very long range transmissions a guard interval of 1/8 may be employed. For SOLO4 systems typically a guard interval of 1/32 is used, however on very long range transmissions a guard interval of 1/8 may be employed.

OFDM Mode (Status Only)

This field displays the COFDM constellation that is being demodulated at the receiver. In normal operation this will match that selected at the transmitter.

OFDM FEC (Status Only)

This field displays the COFDM FEC (Forward Error Correction) that is being demodulated at the receiver. In normal operation this will match that selected at the transmitter.

Input SNR (Status Only)

For each IF input, the SNR (Signal to Noise Ratio) is reported. Values in the order of 18dB to 22dB represent strong received signals, whilst values in the order of 5dB represent poor received signals which will likely give rise to decoding errors.

BER Pre Viterbi (Status Only)

This figure is for engineering use and gives a representation of the error rate prior to the error correction techniques having been applied in the receiver.

BER Post Viterbi (Status Only)

This figure gives a measure of the bit error rate after error correction techniques have been applied in the receiver. Any numbers greater than 0 in this field indicate the presence of un-correctable errors in the received stream, and thus picture glitching and audio artefacts will occur.

Input Level (Status Only)

This figure indicates the received signal level at the two receiver inputs. Normal Operation will occur when the input level is between –15 and –90 dBm. Signals greater than –15 may be too powerful and cause damage. Signal less than –90dBm may be too weak and cause picture loss (typical link failure will occur between –95 and –99dBm).

Demod Lock Status (Status Only)

This indicates whether the demodulators are successfully locked to the RF signal.

Data

With this ON / OFF control the user can select whether the receiver extracts any data component that may be in the transmitted stream. Such data components are presented at the receiver DATA output port.

Note that current SOLO transmitter products do not physically feature a reciprocal RS232 level DATA input

Data Baud Rate (Status Only)

This field reports the baud rate of any RS232 serial data component that is present and selected in the stream.

Input Line Standard (Status Only)

This field reports the line standard that is currently being, or last was, decoded.

Power Up Line Standard

Using this field the user can select what line standard of video the receiver will output (PAL / NTSC) when the receiver is first powered on and before it has locked to an incoming RF signal.

NTSC Mode

With this control, when running in 525 line mode, the user can select whether the NTSC composite output video has a 7.5 IRE pedestal applied.

Blue Screen on Fail

When the link fails, the user can select between a blue field video output (YES), and a freeze frame (NO) with this option.

Unit Name

This field allows the user to enter an identifier for the service that they wish to receive. This must match that selected at the transmitter for the service to be decoded. The unit name can be constructed of any eight ASCII characters.

Descrambling

If the AES scrambling option has been purchased for the SOLO system in use, then it is possible to encrypt the link. Descrambling must also be enabled at the receiver by selecting AES128 or AES256 in the descrambling field. At this point the user will need to ensure that the correct key is in use at the receiver and this is done by selecting **Options** / **Write AES Key** in the receiver controller.

The key is a 128bit value for AES128 and a 256bit value for AES256, and is entered as 32 or 64 ASCII hexadecimal characters (0...F).

Decoder Lock Status (Status Only)

This field reports whether the video decoder is successfully locked to the incoming digital bit stream.

Current Config

This field allows the user to select which of the 8 memory configs the receiver is operating in. The receiver has 8 stored configurations and the user can move between them by setting the appropriate number in this field. Changes made to other settings by the user will automatically be stored in the configuration number indicated by this field.

Serial Number (Status Only)

This status information is the electronic serial number of the transmitter PCB. This number can be exchanged with domo to purchase extra licensable features, such as upgrades to support AES decryption.

Software Version (Status Only)

This status information describes the version of the software running in the SOLO transmitter product.

FPGA Version (Status Only)

This information is for domo engineering use only.

Chaining

Chaining allows multiple services to be sent via one RF link. A receiver may be connected to a transmitter to form a chaining or relay link. To allow this, the chaining interfaces provided on the first receiver must be connected to the second transmitter. Three modes of operation are supported - no chaining (default), chaining mode, and relay mode. The chaining mode allows two services (remote and local) to be combined. The relay mode allows just the remote service to be transmitted turning off the local service.

For chaining mode to operate correctly, the second unit in the chain must operate at twice the transmit data rate from the first. If the first unit is operating in QPSK rate 2/3 the second unit must operate in 16QAM rate 2/3. If the first unit is operating in QPSK rate 1/3 the second unit must operate in QPSK rate 2/3. The units must have different chaining numbers selected, and the different unit names. For the relay mode to operate correctly the second unit must have the transmit rate greater or equal to the first unit.

Chaining is a licensable feature.

Options

Write License Code – open a further password protected box for entering license codes for the activation of licensable features (e.g. AES descrambling) in the receiver. Contact **domo** for support in applying new licenses as required.

Write AES Key – opens a dialogue box for entering a 128bit AES descrambling key, as 32 ASCII hexadecimal characters (0…F), or a 256bit AES descrambling key, as two 32 ASCII hexadecimal character fields.

Change RS232 address – prompts the user to change the units RS232 address, which can be useful when connecting multiple units together via a multi drop RS485 bus for control purposes.

Engineering – password protected access to further diagnostic tools.

Timeouts – password protected access to change timeouts used during the serial communications between the unit and the controller.

Polling Enabled – selecting this option makes the control application automatically refresh the data presented to the user every few seconds. This can be useful when performing experiments to check transmission performance, but can be disruptive when making configuration changes if “All parameters” is selected from the Polling Options (see below)

Polling Options – presents the user with a choice of receiver parameters to poll, and a frequency at which to do so. Further, selecting a check box allows the polled parameters to be written to file.

Copy Config – allows the user to copy a stored configuration into another selected configuration.

Restore Defaults – restores factory default settings in the receiver.

File

Change Logfile – opens a standard Windows file save dialogue box which allows the user to change the path and name of the log file generated by the application.

Exit – exits the SOLO receiver control application

10.9 Upgrading the MicroVue Receiver Software

Plug the PC control cable into the **Data port** on the back panel. The unit is powered off at this stage. See Figure 16 for the back panel connectors, with the PC control port indicated with an arrow.

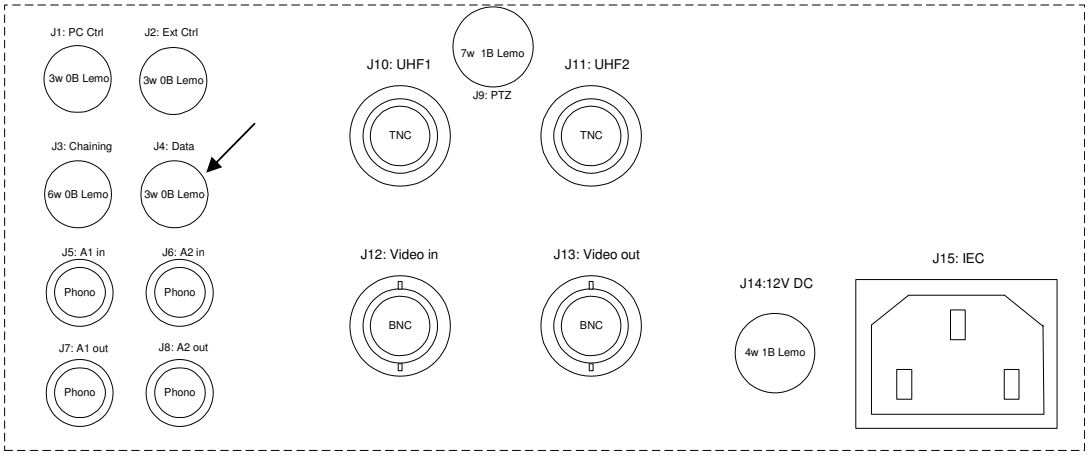


Figure 12 Back panel connectors.

To program the D300 receiver the TeraTerm Pro emulator program is used.

Start the program, by clicking on  TeraTerm Pro.lnk

Select ***Serial Port*** and choose the port that you are connected to, e.g. ***COM1.***

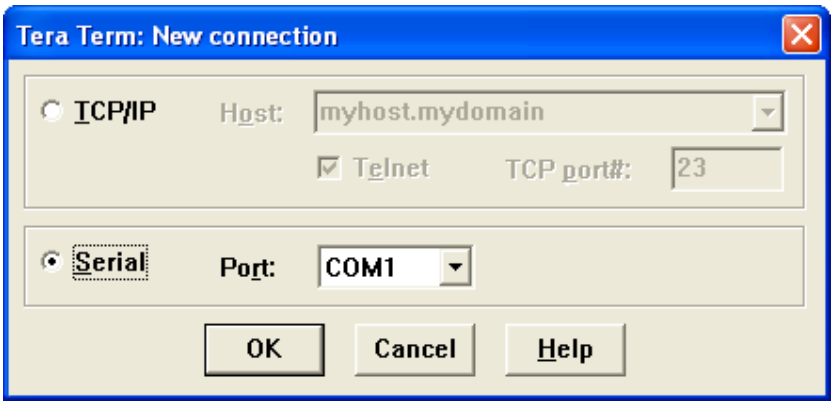


Figure 13 Tera Term New Connection.

Click on ***OK***.

The serial port should be configured to operate at 115.2 kbaud with N,8,1 data structure and no flow control, as shown in Figure 14.

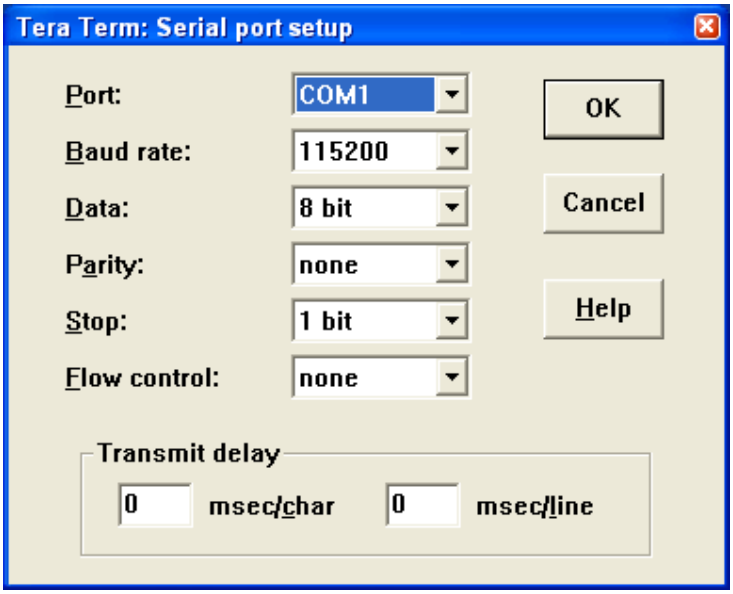


Figure 14 Tera Term serial port setup detail.

Connection to receiver should be made from the serial port of the host PC to the Data connection on the MicroVue back panel.

Re-power the unit.

In Tera Term, the board will display "**d – download**". Press 'd' within 1 second.

The board will next display "Download Code Now:"

Select **File** -> **Send File…** and select the ***d3xx_vx_y.m0*** file

The transfer mode should be set to ASCII by ensuring the **binary** box is **unchecked**. Start the file transfer with the Open button. It is advised that the file first be copied to the local computer hard drive before sending.

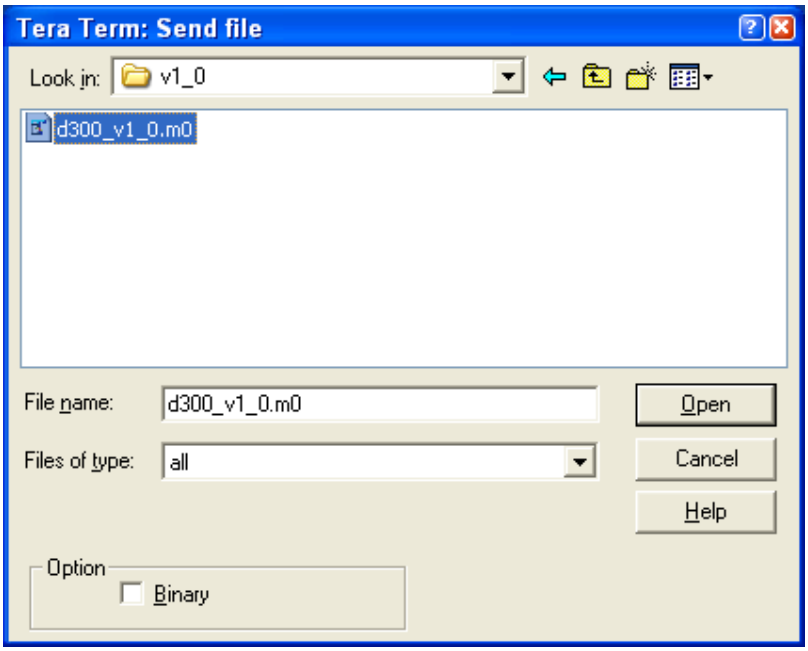


Figure 15 Tera Term send file detail.

The file will now download. This could take up to ten minutes, depending on the size of the file.

When finished the board will display “Programming Flash… Please Wait”. Once the flash is programmed the contents are verified and the following message is displayed “Verifying Flash...”, followed by “Finished” on successful completion.

On completion, the unit requires a power cycle to restart in normal mode.

10.10 Upgrading the MicroVue Control Software

It is also possible to upgrade the control software of MicroVue. To do this the TeraTerm Pro emulator program is used.

Plug the PC control cable into the **PC control port** on the back panel. The unit is powered off at this stage. See Figure 16 for the back panel connectors, with the PC control port indicated with an arrow.

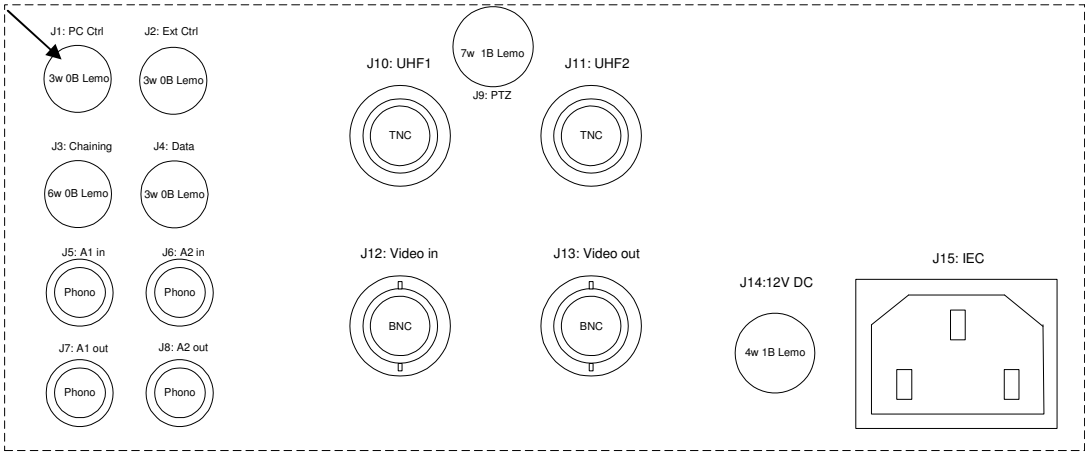


Figure 16 Back panel connectors.

Start the program, by clicking on  TeraTerm Pro.lnk

Select ***Serial Port*** and choose the port that you are connected to, e.g. ***COM1***

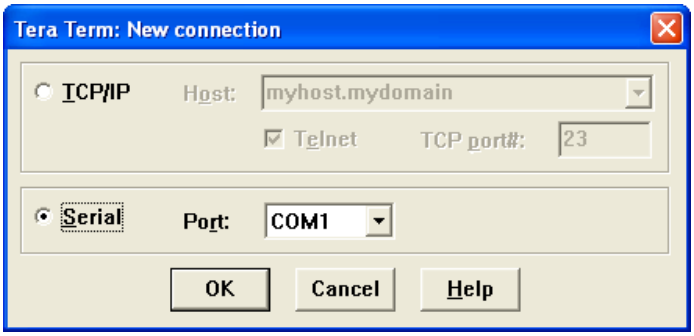


Figure 17 Tera Term New Connection.

Click on ***OK***.

The serial port should be configured to operate at 115.2 kbaud with N,8,1 as data structure and Xon / Xoff flow control. See Figure 18 for the TeraTerm setup.

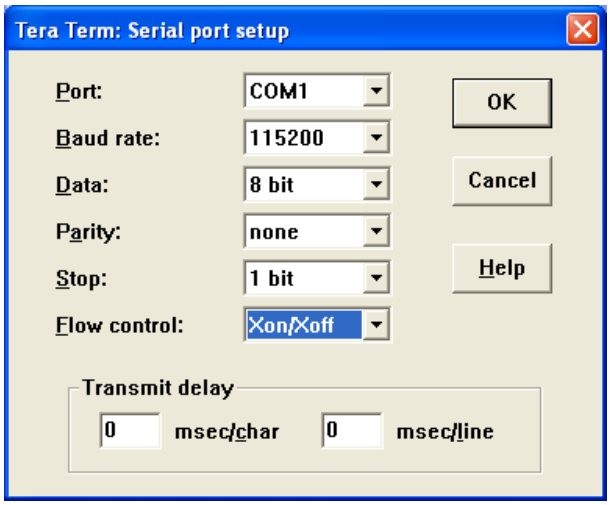


Figure 18 TeraTerm Serial Port Set-up Details

Upon power up, the board will display the page shown in Figure 19.

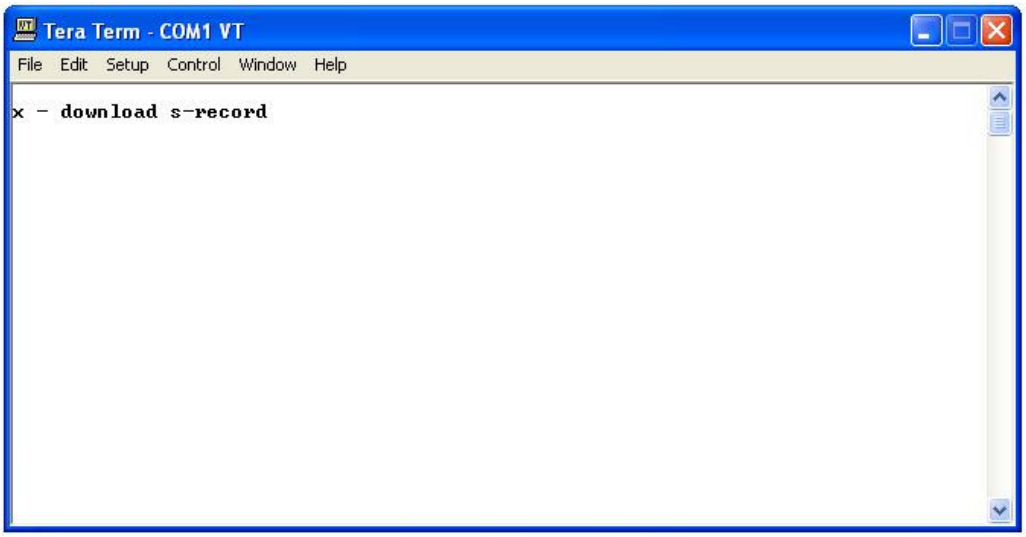


Figure 19 D586 bootloader initialisation

Switch on the unit. Immediately press '**x**' on the PC keyboard to halt the normal boot process. The following line will then appear:

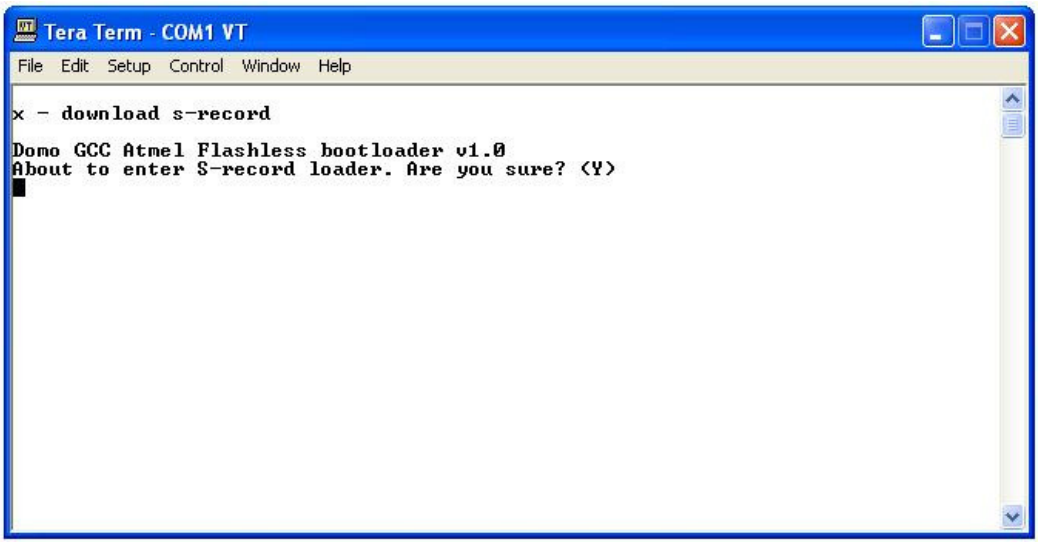


Figure 20 D586 bootloader communication

Press 'Y' to continue. Dots will then appear to indicate the erasing of the device:

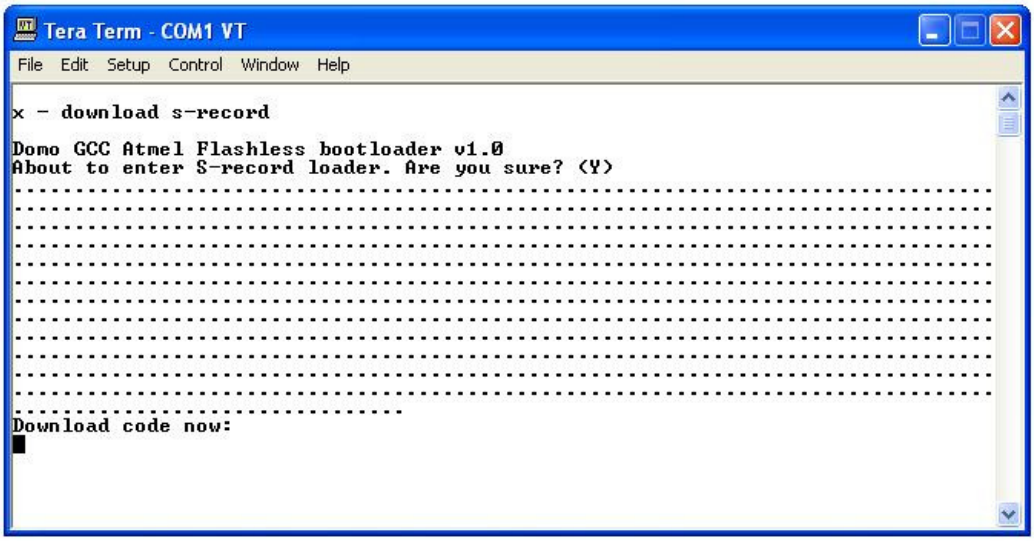


Figure 21 D586 bootloader communication showing erase procedure

After approximately 15 seconds the board will add the line

"***Download code now:***"

To download the code, copy the latest version of the D586 file to a local hard drive.

In Teraterm: Select **File-> Send File…** and select the ***d586_vx_y.all*** file.

Set the transfer mode Option to binary by checking the **binary** box and start the file transfer with the Open button.

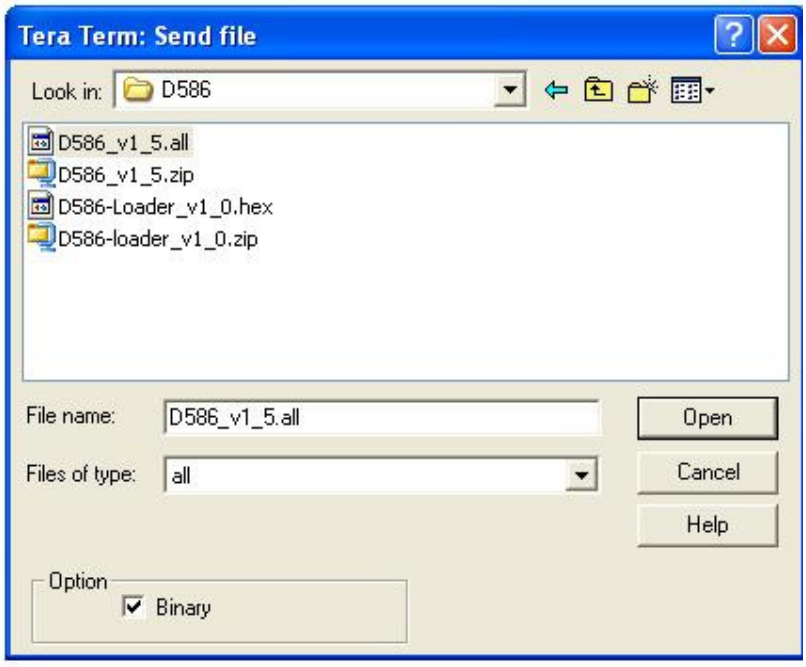


Figure 22 TeraTerm Send File Details

Figure 23 TeraTerm showing downloading code to D586

Once loaded the board will print a series of stars to the screen.

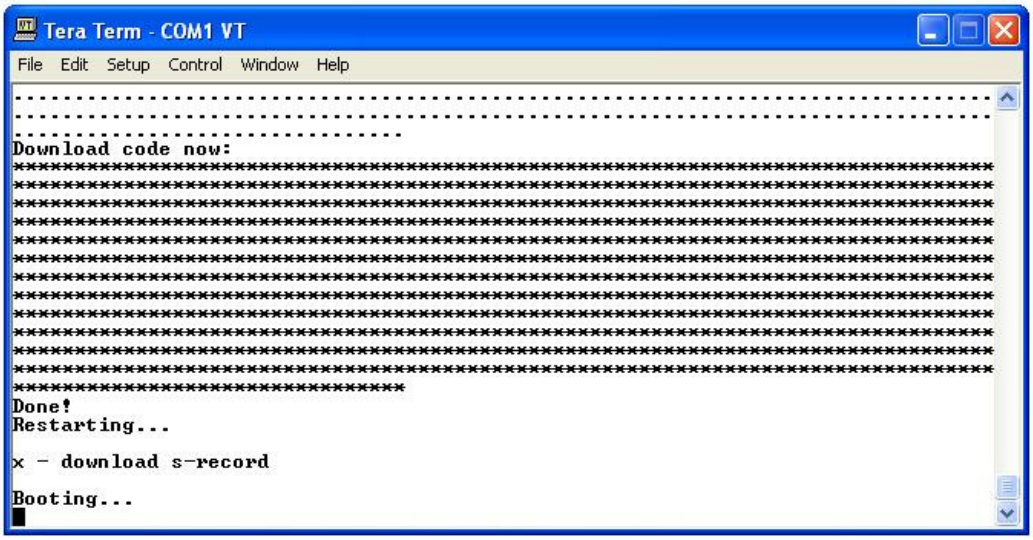


Figure 24 D586 bootloader communication showing Programming Flash

Once this completes, the card will reboot and run automatically.

11 Fault Finding

11.1 MicroVue

Fault	Meaning	Action
Power LED off (even if unit is switched On)	Either the unit is switched off OR the battery is flat	Charge the battery
LCD completely black while the bottom touch screen and power LED is on	LCD backlight has been switched off	Navigate to **ENG/System setup/Brightness** Change brightness to High
Battery not drawing more than 50mA when charging; Fast charge over within minutes; Flattens within minutes during use; Not measuring any volts on battery	Fuse has blown in battery pack	Contact domo

11.2 Touch screen

Fault	Meaning	Action
Touch screen inaccurate	The touch screen calibration has been corrupted	Navigate to **MicroVue receiver/Unit parameters** Scroll to **Recalibrate touch screen** Use the back end of a pencil to press the flashing squares accurately Take care not to press any other area of the touch screen with your hand as you do this
Touch screen not responding	Metal base has been badly distorted and is pressing down on touch screen	Make sure the base chassis is not pressing down hard on touch screen edge by sweeping a piece of paper under the touch screen cutout edge. Paper should not get stuck. If this is the case, contact domo.

11.3 RF and Audio / Video

Symptom	Suggested Action
No RF Link	Check a suitable transmitter RF source is active & on correct frequency. If using Internal Antennas Ensure Micro Control / System Setup / Antennas are set to Internal if user wishes to use internal Antennas. See section 8.1 of this manual If using External Antennas Ensure Down-converters are connected. Ensure antennas are connected to down-converters. Ensure there is no interfering signal. See section 8.2 of this manual. For both Internal and External Antenna Check that the down-converter settings are correct for the frequency band. If swapping between DVB-T mode and Narrowband mode the down-converter settings can have an L-Band default in one mode and an S-Band default in the other mode, See section 8.7 of this manual (Down-converter settings) for the correct settings between L and S-Band.
Poor link performance	Poor performance of the link can occur for the following reasons. • Interference. Should an interfering RF signal occur on the same frequency the performance of the link will be affected. Remove the interferer or move to an alternative frequency. • Unsuitable antennas, or out of band antennas. See the antenna sections for guidance on antenna selection and use. • Reduced transmit power, ensure that the attenuation setting on the transmitter is appropriate for direct output, or for amplifiers connected. If using External Antennas • Receive antenna positioning, were possible mount the receive antennas away from other objects, unobstructed and as high as possible. Poor alignment of directional antennas. • No Diversity operation. Ensure both down converters are operational.
Blue screen at receiver	Switch on the OSD if Demod Lock is not ok then - see "No RF Link" section above. If Demod Lock is OK but Packet errors are not 0 then see section Poor Link Performance above. If the OSD Demod Lock is OK and packet errors are 0 then - Check video is enabled at the transmitter. Check correct unit name is selected at the receiver to match the transmitter.

	Check scrambling keys are matched.
Reduced Image quality	Image quality is affected by the selected horizontal resolution. The image will become progressively softer for each horizontal resolution below the sharpest resolution of 704 pixels. It is advisable to select a horizontal resolution that matches the resolution of the camera. Image quality is also affected by the video bit rate which can be read from the video bit rate field of the SOLO transmitter controller). The standard setting is 2.3Mb/s. However enabling audio, particularly the high quality audio modes, will reduce the video bit rate substantially. Therefore ensure an appropriate audio mode is selected or audio is fully disabled if not required.
No audio	Ensure audio is enabled at the transmitter (disabled by default).

11.4 Commander link

Symptom	Suggested Action
MicroVue receiver issues	See above section 'RF and Audio / Video'. Ensure that the ClearCam and Commander are on the same config. Contents of configs should always match. The SOLO Transmitter on ClearCam should be set up as follows: • Output frequency: same as on MicroVue • Modulation output: on • Video input: S-video PAL • Data: on • Baud: 9600 • Scrambling: same as on MicroVue
Video received, but no PTZ control	Ensure that the Telemetry transmit antenna is attached to the top of the MicroVue lid. Ensure that the ClearCam and Commander are on the same config. Ensure that the Commander is set to Control Address 15. Make sure the Telemetry Transmitter on the Commander is set up as follows: • Output frequency: same as on ClearCam receiver • Channel width: same as on ClearCam receiver • Data: On, no parity • Baud: 9600 • Scrambling: same as on ClearCam receiver • Data/IP routing: RS232/TTL

12 Connector Pin Outs

12.1 Power: 4-pin 1B LEMO Socket

Pin No	Function
1	12 V
2	12 V
3	GND
4	GND

12.2 RS232 PC Control: 3-pin 0B LEMO Socket

Pin No	Function
1	TX
2	RX
3	GND

12.3 RS232 External Control: 3-pin 0B LEMO Socket

Pin No	Function
1	TX
2	RX
3	GND

12.4 Chaining: 6-pin 0B LEMO Socket

Pin No	Function
1	Clock Out
2	Data Out
3	GND
4	GND
5	N/C
6	N/C

12.5 RS232 Data - 3-pin 0B LEMO Socket

Pin No	Function
1	TX
2	RX
3	GND

12.6 Umbilical Video and PTZ - 7-pin Mini DIN

Pin No	Function
1	Composite Video (Out)
2	Screen Ground - Composite Video
3	+12V
4	Ground (Data & Power)
5	Reserved for Future Use (RX data for telemetry)
6	N/C
7	Reserved for Future Use (TX data for telemetry)

13 Control Protocols

The following section describes the control protocol employed on the RS232 link for controlling the SOLO transmitters and receiver equipment.

Connection details are detailed in previous sections.

Note that only features that are licensed for use in the SOLO units can be controlled. The protocols listed here cover all possible features. Attempting to activate an unlicensed feature will simply result in the command being ignored by the SOLO unit.

13.1 RS232 Control – General Principles

The physical interface is RS232 but this can be converted to RS 485 with an external adapter where multiple units are controlled over one RS 485 bus.

Normal operation involves sending a packet from the control device (normally a PC) to the device being controlled. If the packet satisfies an address integrity check, then the controlled device will action the command and send a reply.

For compatibility with modems an ASCII style protocol is used.

Ports are set for 8 bits, No parity, 1 stop

13.2 Packet Structure Sending (from PC)

ASCII	Value	
STX	02h	Start byte
0-9	30h-39h	4 byte unit address. In range 0-9999
R **m** misc	20h-7Eh	1 byte command type. **r** read, **w** write or
I	20h-7E	1 byte indicator of internal data block
ABC	20h-7Eh	Command –three byte mnemonic
;	3Bh	Separator
PQR	20h-7Eh	Data –Optional, variable length
;	3Bh	Separator
X	20h-7Eh	Sum Check
ETX	03h	End byte

13.3 Packet Structure Reply (from controlled device)

ASCII	Value	
STX	02h	Start byte
0-9	30h-39h	4 byte unit address. In range 0-9999
Z	20h-7Eh	Status BYTE
PQR	20h-7Eh	Data –Optional, variable length
;	3Bh	Separator
X	20h-7Eh	Sum Check
ETX	03h	End byte

The Sum check byte is the summation of all bytes in the packet, not including the start and end bytes. Higher order bytes are ignored and the final byte result is modified to prevent ASCII control characters being sent. Bit 7 (highest) is forced high.

Status byte will indicate command performed OK, or indicate an error.

ASCII	Meaning
1	All OK
E	General error, Command could not be actioned

Typically E will be returned if the message is formatted incorrectly (separators in wrong place) or if commands are in upper case, or if commands do not match against the allowed list of commands, or if the checksum is wrong.

Addresses in the range 0001 to 9998 are for general use. Address 0000 is reserved and 9999 is a broadcast address. i.e. any device will reply to this address. Its reply will contain its own specific address.

All data in the transmitter and receiver is stored as one of 5 data types, Double, String, List, Integer or HexInteger. The data type dictates the contents of the data section of the reply.

- List – 1 byte for sending. Value is hexadecimal coded as ASCII. 2 byte reply. Reply represents index into original choice list. e.g. Reply 02 indicates entry 2 in original list.
- Double - variable length. Reply always contains decimal point and 4 decimal places. Can have 1 to 3 digits before decimal.
- Integer - 6byte reply. integer value with stuffed with preceding zeros. e.g. GOP reply 000012 = GOP length 12
- String - Variable length. Reply is string excluding null terminator
- HexInteger – 8byte Hex reply

13.4 Receiver Command List

Type '1' messages for Tuner / Demod

Description	Type	Block	Command	Data Sent	Data Type
Input Frequency	r/w	1	ipf	This is the frequency received by the antenna. Decimal point allowed.	Double
Down Converter LO	r/w	1	dco	Decimal point allowed.	Double
Down Converter LO Side	r/w	1	los	0=low 1=high	List
OFDM Bandwidth	r/w	1	wid	N.Band Mode 3 = 2.5MHz DVBT Mode 0 = 8MHz 1 = 7MHz 2 = 6MHz	List
OFDM Modulation Mode	r	1	mod	N.Band Mode 0 = QPSK 1 = 16QAM DVBT Mode 0 = QPSK 1 = 16QAM 2 = 64QAM	List
OFDM FEC	r	1	fec	N.Band Mode 1 = 2/3 2 = 1/3 DVBT Mode 0 = 1/2 1 = 2/3 2 = 3/4 3 = 5/6 4 = 7/8	List
OFDM Guard	N.Band Mode r/w DVBT Mode r	1	gua	N.Band Mode 1 = 1/16 2 = 1/8 DVBT Mode 0 = 1/32 1 = 1/16 2 = 1/8 3 = 1/4	List
OFDM Pol	r	1	pol	0 = Normal 1 = Inverted	List
Input SNR A	r	1	snr	Input SNR in dB	Double
Input SNR B	r	1	mer	Input SNR in dB	Double
Input SNR C	r	1	cer	Input SNR in dB	Double
Input SNR D	r	1	dnr	Input SNR in dB	Double
BER Pre Viterbi	r	1	pre	Pre Viterbi x 10-6	Int
BER Post Viterbi	r	1	pos	Post Viterbi x 10-6	Int
Packet errors	r	1	pkt		Int
Lock Status	r	1	loc	0 = Not Locked 1 = Locked	List
Input Level A	r	1	ina	Input Level in dBm	Double
Input Level B	r	1	inb	Input Level in dBm	Double
Input Level C	r	1	Inc	Input Level in dBm	Double
Input Level D	r	1	ind	Input Level in dBm	Double

Type ‘g’ messages for Unit level commands

Description	Type	Block	Command	Data Sent	Data Type
Unit Mode	r/w	g	udm	0 = Narrow Band 1 = DVBT	List
Input Mode	r/w	g	mod	0 = RF Input 8 = Chaining Input	List
LNB Power	r/w	g	lnb	0 = OFF 1 = ON	List
Unit RS232 Address	r/w	g	add	Unit Address 0000 - 9999	Integer
Software Version	r	g	sof	Software Version Number	String
FPGA Version	r	g	fpg	FPGA Version Number	String
Serial Number	r	g	ser	Hex based Serial Number	String
License Code	w	g	lco	License number to enable certain features	List
On Screen Display	r/w	g	osd	0 = Off 1 = Channel A 2 = Channel B 3 = Channel C 4 = Channel D	List

Type ‘e’ messages for Decoder configuration commands

Description	Type	Block	Command	Data Sent	Data Type
Unit Number	r/w	e	ser	Index into List of programs	List
Preferred Unit Name	r/w	e	def	Preferred Unit Name	String
525 Video Format	r/w	e	525	0 = YUV 1 = NTSC 2 = NTSC No Ped	List
625 Video Format	r/w	e	625	0=YUV 1 = PAL	List
Locked	r	e	loc	0 = No 1 = Yes	List
Line Standard	r	e	lin	0 = 625 1 = 525	Integer
Fail mode	r/w	e	fai	0 = freeze 1 = blue	list
Power Up Line Standard	r/w	e	pwr	0 = 625 1 = 525	list
Service Scrambling Status	r	e	scr	0 = Clear 1 =Scrambled	

Type ‘d’ messages for Memory configuration commands

Description	Type	Block	Command	Data Sent	Data Type
Store Current Configuration to Memory	r/w	d	sto	Config Address (1 to 9)	Integer
Load Configuration from Memory into current	r/w	d	loa	Config Address (1 to 9)	Integer
Restore Default Build	r/w	d	def	0 = No 1 = Yes	List
Read number of last config loaded	r	d	las	Config Address	Integer

Type ‘z’ messages for Descrambling commands

Description	Type	Block	Command	Data Sent	Data Type
Descrambling	r/w	z	des	0 = Off 1 = ABS 4 = AES128 5 = AES128+ 6 = AES256 7= AES256+	List
ABS Scrambling Key	w	z	ebs	Alink basic scrambling key	8-digit hex string
AES Scrambling Key – lower 128 bits	w	z	aes	Advanced Encryption Standard – lower 128 bits	32-digit hex string
AES Scrambling Key – upper 128 bits used in AES256 only	w	z	a25	Advanced Encryption Standard – upper 128 bits	32-digit hex string

Type ‘t’ messages for RS232 data pipe commands

Description	Type	Block	Command	Data Sent	Data Type
Data On/Off	r/w	t	dat	0 = Off 1 = On	List
Data Baudrate	r	t	bau	2 = 1200 baud 3 = 2400 baud 4 = 4800 baud 5 = 9600 baud 6 = 19200 baud 7 = 38400 baud 8 = 57600 baud 9 = 115200 baud	List
Data Parity	r/w	t	par	0 = none 1 = even 2 = odd	List

14 Default Configurations

This section tabulates the default configuration settings for domo SOLO products.

Item	MicroVue Config 1 to 4	MicroVue Config 5 to 8
LNB Power	ON	ON
Frequency	2405MHz	1395MHZ
Down converter LO	1880	1700
LO Side	Low	High
Unit Address	0001	0001
Default Service	Solo-01 (SOLO4) Unit 1 (SOLO2)	Solo-01 (SOLO4) Unit 1 (SOLO2)
Video Fail	Blue Field	Blue Field
Data	OFF	OFF
De-Scrambling	OFF	OFF
AES Key	None	None

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