



KRAMER ELECTRONICS LTD.

USER MANUAL

MODEL:

VS-88FO

8x8 3G HD-SDI Fiber Optic
Matrix Switcher

P/N: 2900-300097 Rev 4

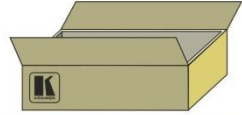


VS-88FO Quick Start Guide

This guide helps you install and use your product for the first time. For more detailed information, go to http://www.kramerelectronics.com/support/product_downloads.asp to download the latest manual or scan the QR code on the left.

Step 1: Check what's in the box

- VS-88FO** 8x8 3G HD-SDI Fiber Optic Matrix Switcher
- 4 Rubber feet
- 1 Power cord
- 1 Quick Start sheet
- 1 Set of rack "ears"



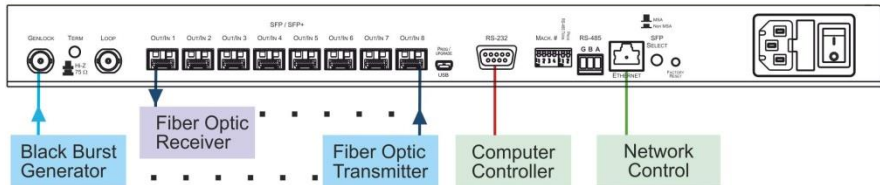
Save the original box and packaging in case your **VS-88FO** needs to be returned to the factory for service.

Step 2: Install the VS-88FO

Mount the machine in a rack (using the included rack "ears") or attach the rubber feet and place on a table.

Step 3: Connect the inputs and outputs

Always switch off the power on each device before connecting it to your **VS-88FO**.



Always use Kramer high-performance cables for connecting AV equipment to the **VS-88FO**.

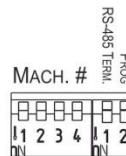
Step 4: Connect the power

Connect the power cord to the **VS-88FO** and plug it into the mains electricity.



Step 5: Set the VS-88FO

Set the machine number and RS-485 termination DIP-switches.



Step 6: Operate the VS-88FO

Operate via the front panel, network, RS-232 or RS-485 controllers.

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1 Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront the video, audio, presentation, and broadcasting professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Products.

Congratulations on purchasing your Kramer **VS-88FO** *8x8 3G HD-SDI Fiber Optic Matrix Switcher*, which is ideal for the following typical applications:

- Professional broadcasting and production studios
- Presentation applications

2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual



Go to http://www.kramerelectronics.com/support/product_downloads.asp to check for up-to-date user manuals, application programs, and to check if firmware upgrades are available (where appropriate).

2.1 Achieving the Best Performance

To achieve the best performance:

- Use only good quality connection cables (we recommend Kramer high-performance, high-resolution cables) to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Do not secure the cables in tight bundles or roll the slack into tight coils
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality
- Position your Kramer **VS-88FO** away from moisture, excessive sunlight and dust



This equipment is to be used only inside a building. It may only be connected to other equipment that is installed inside a building.

2.2 Safety Instructions



Caution: There are no operator serviceable parts inside the unit

Warning: Use only the power cord that is supplied with the unit

Warning: Do not open the unit. High voltages can cause electrical shock! Servicing by qualified personnel only

Warning: Disconnect the power and unplug the unit from the wall before installing

2.3 Recycling Kramer Products

The Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC aims to reduce the amount of WEEE sent for disposal to landfill or incineration by requiring it to be collected and recycled. To comply with the WEEE Directive, Kramer Electronics has made arrangements with the European Advanced Recycling Network (EARN) and will cover any costs of treatment, recycling and recovery of waste Kramer Electronics branded equipment on arrival at the EARN facility. For details of Kramer's recycling arrangements in your particular country go to our recycling pages at <http://www.kramerelectronics.com/support/recycling/>.

3 Overview

The **VS-88FO** is a high-performance matrix switcher for fiber optic signals. It can switch any or all inputs to any or all outputs simultaneously.

In particular, the **VS-88FO** features:

- A maximum data rate of up to 3Gbps, enabling it to be used for standard definition, high-definition and the new 3G high definition serial digital video signals (3G HD-SDI)
- A range of up to 40km (depending on the SFP module used)
- HDTV compatibility
- A single mode SFP (small form-factor pluggable) SDI fiber optic connector for the input and the output
- A looping analog sync for genlock – bi-level and tri-level sync compatible
- Selectable sync signal termination
- Automatic relocking and equalization
- Active input reporting where each input LED on the front panel automatically lights when the unit detects a video signal on that input
- Multiple memory locations that store multiple switches as presets (salvos) to be recalled and executed when needed
- A Take button that executes multiple switches all at once
- Vertical interval switching that synchronizes either to an external reference or to the incoming video in compliance with SMPTE RP-168
- Flexible control options including front panel, RS-232 (K-router™ Windows®-based software is included), RS-485, Ethernet and IR
- Laser Class I acc. 21 CFR 1040 and Class 1 per IEC 60825-1 compliance

The **VS-88FO** is housed in a 19" 1U rack-mountable enclosure, and is fed from a 100-240V AC universal switching power supply.

The unit can be controlled using the front panel buttons or using:

- An **RC-IR3** infrared remote control transmitter (included)
- Remotely, by RS-232 or RS-485 serial commands transmitted by a PC, touch screen system, or other serial controller
- The Ethernet

By default, the **VS-88FO** is controlled using the Kramer 3000 protocol (see [Section 6.1.9](#) for details of how to switch to Protocol 2000 and [Section 9](#) for the relevant protocol commands).

3.1 Defining the SFP

An SFP is a small form-factor pluggable transceiver that is a compact, hot-swappable, input/output transceiver used in data communication and telecommunications networks. The SFP interfaces between communication devices like switches, routers and fiber optic cables, and performs conversions between optical and electrical signals.

The SFP transceiver is specified by the SFP Transceiver Multisource Agreement (MSA), which was developed and is followed by different transceiver manufacturers. SFP transceivers have a wide range of detachable interfaces to multimode/single-mode fiber optics that allows users to select the appropriate transceiver according to the required optical range for the network. The **VS-88FO** supports use of non-MSA (SFP Transceiver Multisource Agreement) video modules and MSA communication modules.

The optical transceiver modules are engineered for exceptional performance in the presence of SDI pathological patterns. The transceivers feature best-in-class optical receiver sensitivity for SMPTE 259M, SMPTE 344M, SMPTE 292M and SMPTE 424M serial rates, to provide superior optical link budget and robustness.

3.2 Defining the VS-88FO 8x8 3G HD-SDI Fiber Optic Matrix Switcher

This section defines the **VS-88FO**.

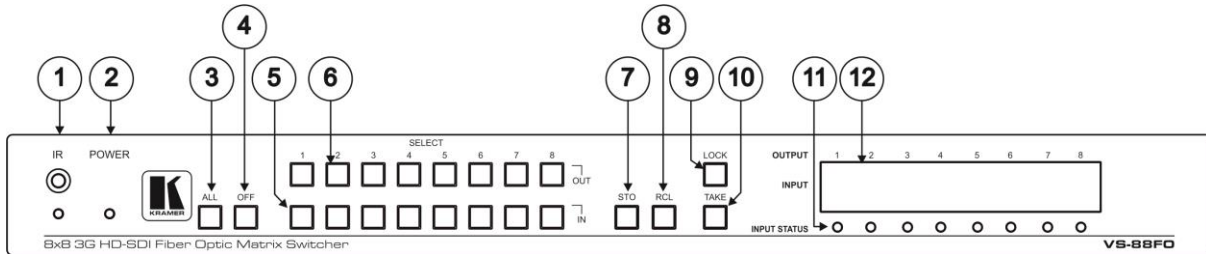


Figure 1: VS-88FO 8x8 3G HD-SDI Fiber Optic Matrix Switcher Front Panel

#	Feature	Function
1	IR Receiver	The yellow LED illuminates when receiving signals from the infrared remote control transmitter
2	POWER LED	Illuminates when the unit is ON
3	ALL Button	Pressing ALL followed by an INPUT button, connects that input to all outputs
4	OFF Button	Pressing OFF+OUT disconnects that output from the inputs; pressing OFF+ALL disconnects all the outputs
5	IN SELECT Buttons	Select the input to switch to the output; long presses on buttons IN 1 to IN 5 change the genlock timing (see Section 5.4)
6	OUT SELECT Buttons	Select the output to which the input is switched; pressing OUT 1+OUT 2 selects Protocol 2000; pressing OUT 1+OUT 3 selects Protocol 3000
7	STO (STORE) Button	Pressing STO followed by an IN/OUT button stores the current setting
8	RCL (RECALL) Button	Pressing the RCL button and the corresponding IN/OUT key under the selected button recalls a setup from the non-volatile memory
9	LOCK Button	A long press toggles activation/inactivation of the front panel buttons
10	TAKE Button	Pressing TAKE toggles the mode between the CONFIRM mode and the AT ONCE mode (user confirmation per action is unnecessary)
11	INPUT STATUS LEDs	Illuminate green when an active input is detected
12	7-segment Display	Displays the selected input switched to the output (marked above each input)

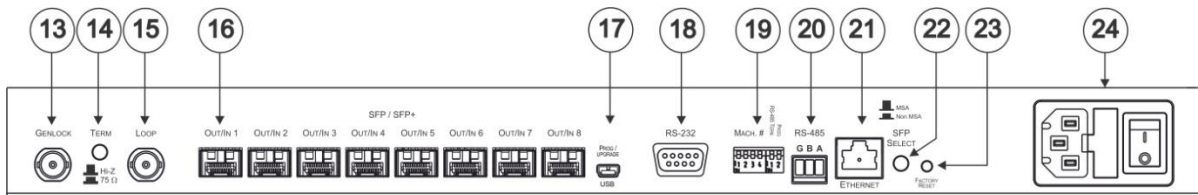


Figure 2: VS-88FO 8x8 3G HD-SDI Fiber Optic Matrix Switcher Rear Panel

#	Feature	Function
13	GENLOCK BNC Connector	Connects to the genlock source
14	TERM HI-Z/75Ω Pushbutton	Press to terminate the genlock source (75Ω) or release for looping
15	LOOP BNC Connector	Connects to a display or the next chained Genlock connector
16	SFP/SFP+ Out/In Receptacles	Holds an SFP module in each OUT/IN receptacle (1 – 8). Each SFP connects a double fiber cable to an input and output
17	PROG/UPDATE USB connector	Connects to a computer to upgrade machine firmware
18	RS-232 9-pin D-sub (F) Port	Connects to the PC or the remote controller
19	MACH # and PROG/RS-485 TERM DIP-switches	MACH # DIP-switches 1-4 set the Machine Number of the unit, PROG DIP-switch enables a microcontroller firmware upgrade, RS-485 TERM DIP-switch terminates the RS-485 line with a 120Ω load
20	RS-485 Terminal Block Port	Pins B (-) and A (+) are for RS-485; Pin G may be connected to the shield (if required)
21	Ethernet RJ-45 Connector	Connects to the PC or other serial controller through computer networking LAN
22	SFP SELECT Button	Press for non-MSA (SFP Transceiver Multisource Agreement) video module; release for MSA communication module
23	FACTORY RESET Button	Press to reset to factory default definitions: IP number – 192.168.1.39, Mask – 255.255.0.0, Gateway – 0.0.0.0 First disconnect the power cord and then connect it again while pressing the Factory Reset button. The unit powers up and loads its memory with the factory default definitions and erases all stored preset
24	Power Connector, Power Switch and Fuse	AC connector enabling power supply to the unit; switch that turns the power to the unit ON (1) and OFF (0)

4 Installing in a Rack

This section provides instructions for rack mounting the unit.

Before installing in a rack, be sure that the environment is within the recommended range:

OPERATING TEMPERATURE:	0° to +40°C (32° to 104°F)
STORAGE TEMPERATURE:	-40° to +70°C (-40° to 158°F)
HUMIDITY:	10% to 90%, RHL non-condensing



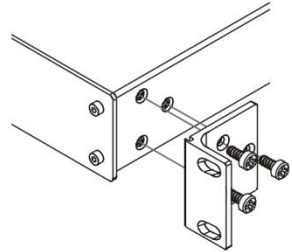
CAUTION!

When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.
2. Once rack mounted, enough air will still flow around the machine.
3. The machine is placed straight in the correct horizontal position.
4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.
5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (3 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note:

- In some models, the front panel may feature built-in rack ears
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions available from our Web site

5 Connecting the VS-88FO

This section describes how to connect the **VS-88FO**. The **VS-88FO** can switch one of the eight fiber optic inputs to any or all of the eight fiber optic outputs, as the example in [Figure 3](#) shows.



Always switch off the power to each device before connecting it to your **VS-88FO**. After connecting your **VS-88FO**, connect its power and then switch on the power to each device.



The customer can replace any SFP module with a standard SFP module but Kramer guarantees correct operation only with Kramer supplied modules.



All SFP modules (up to eight) must be of the same type: either MSA or non-MSA.



Only modules Laser Class I acc. 21 CFR 1040 and Class 1 per IEC 60825-1 are allowed in this product.

The following optional SFP modules are tested and approved for use with the **VS-88FO**:

- SFP-IN/OUT-2KM – SFP Fiber Optic Module SM 2km 3G HD-SDI Tx/Rx
- SFP-IN/OUT-30KM – SFP Fiber Optic Module SM 30km 3G HD-SDI Tx/Rx
- SFP-IN/OUT-40KM – SFP Fiber Optic Module SM 40km 3G HD-SDI Tx/Rx

To connect the VS-88FO, do the following:

1. If SFP modules are preinstalled in your unit, go to step 4 below (and ignore steps 1 to 3). If not, continue with step 2.
2. Insert an SFP module into each IN/OUT slot to be used (see [Section 5.1](#)).
3. Set the **SFP Select** button on the rear panel depending on the type of SFP used. Press in for Non-MSA and release for MSA. The setting is saved after powering the device ON.
4. Connect up to eight fiber optic sources to the IN connectors (for example, 3G HD-SDI video players connected to a Kramer **690T** transmitter).

5. Connect the OUT connectors to up to eight fiber optic acceptors (for example, a Kramer **690R** receiver connected to 3G HD-SDI displays).
 6. Set the Machine # and termination DIP-switches (see [Section 5.2.1](#)).
 7. Optionally, connect:
 - A genlock source to the GENLOCK BNC connector
 - The LOOP BNC connector to the GENLOCK connector of the next unit in the line, and release the TERM button for looping
Push in to terminate the input. Release when the input extends to another unit.
 8. Connect a PC and/or controller (if required), to the RS-232 port (see [Section 5.3](#)), and/or the RS-485 port (see [Section 5.3](#)), and/or the Ethernet connector (see [Section 5.5](#)).
 9. Connect the power cord.
- We recommend that you use only the power cord that is supplied with this machine.

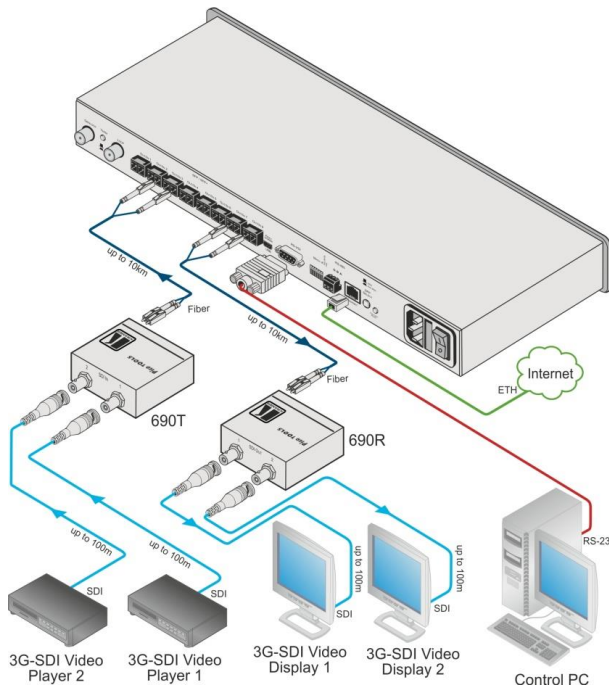


Figure 3: Connecting the VS-88FO

5.1 Installing the SFP Modules

To install an SFP module:

1. Make sure the bail (removal handle) is closed in an upward position as shown in #1.
2. Insert the SFP module in an open slot and push it inward until it clicks.
3. Remove the protective SFP cap from the end of the SFP (#2).

To remove an SFP module:

1. Pull the bail downward to release the SFP (#3).
2. Pull the SFP module out by the bail (#4).
3. If needed, replace the protective cap over the fiber connectors.

Note: When transporting or storing an unconnected device, replace the SFP caps to protect against dust.

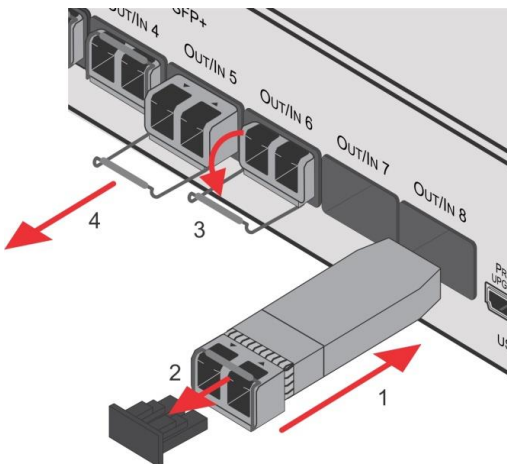


Figure 4: Installing the SFP Modules

5.2 Connecting the RS-232 Port

You can connect to the **VS-88FO** using an RS-232 connection using, for example, a PC. Note that a null-modem adapter/connection is not required.

To connect to the VS-88FO using RS-232:

- Connect the RS-232 9-pin D-sub rear panel port on the **VS-88FO** to the RS-232 9-pin D-sub port on your PC. Use a 9-wire straight cable (only pin 2 to pin 2, pin 3 to pin 3, and pin 5 to pin 5 need to be connected)

5.2.1 Determining the Machine Number

Each unit must be identified by a unique machine number (MACH #). Determine the machine number according to the following table.

- When using a single unit, set the unit to Machine # 1.
- A master unit must be Machine #1.

When connecting more than one **VS-88FO**, set a different Machine # for each unit. The units do not have to be numbered sequentially but each unit must have a unique machine number.

Mach #	DIP-SWITCH			
	1	2	3	4
1 (Single or master unit)	OFF ON	OFF OFF	OFF OFF	OFF OFF
2	OFF	ON	OFF	OFF
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON



After changing the address, reset the device by turning it OFF and ON.

5.2.2 Setting the DIP-Switches

When controlling a unit using the RS-232 or RS-485 ports, set the DIP-switches on the rear of the unit accordingly. [Figure 5](#) defines the DIP-switches.

The default address is 0. All DIP-switches are OFF.

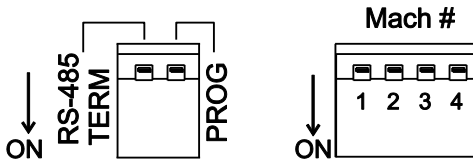


Figure 5: DIP-Switch Settings

DIPS	Function	Description
RS-485 TERM	RS-485 line termination	OFF for no RS-485 line termination ON for RS-485 120Ω line termination
PROG	Firmware update	Set ON only to update device firmware
MACH # 1, 2, 3, 4	Self Address	Sets the MACHINE # (see Section 5.2.1)

The RS-485 TERM DIP-switch is used only when the RS-485 port is connected (see [Section 5.3](#)). The first and last units on the RS-485 line (for example, the controller and the last **VS-88FO**) must be terminated. The units in between must not be terminated.

Set the PROG DIP-switch ON only while updating the unit firmware, otherwise the switch must be OFF.

5.3 Connecting a PC or Controller to the RS-485 Port

You can operate the **VS-88FO** over the RS-485 port from a distance of up to 1200 meters (3900ft) using any device equipped with an RS-485 port (for example, a PC). For successful communication, you must set the RS-485 machine number and bus termination.

To connect a device with a RS-485 port to the VS-88FO:

- On the PC, connect the A (+) pin on the RS-485 port to the A (+) pin on the RS-485 port on the rear panel of the **VS-88FO**
- On the PC, connect the B (-) pin on the RS-485 port to the B (-) pin on the RS-485 port on the rear panel of the **VS-88FO**
- On the PC, connect the G pin on the RS-485 port to the G pin on the RS-485 port on the rear panel of the **VS-88FO**

5.3.1 Setting the Machine Number Switches

To set the MACH # DIP-switches, as shown in [Section 5.2.2](#):

- For a master machine, assign MACH #1 with the address 0 (0000) or 1 (0001) set in the DIP-switches
- For the slave units, assign a unique MACH # from 2 to 15 for each **VS-88FO** slave. The units do not have to be sequentially numbered but they must have unique addresses

5.3.2 Setting the Line Termination

To ensure correct operation, the RS-485 line must be terminated at both ends. The master unit may be located at any part of the line, but when it is at the end of the line, the termination switch must be set ON.

To set line termination, as shown in [Figure 5](#):

- For the **VS-88FO** units located at the ends of the RS-485 line, set the RS-485 TERM DIP-switch ON
- For all other **VS-88FO** units in the middle of the line, set the RS-485 TERM DIP-switch OFF

5.4 Switching Genlocked Video Signals

The genlock feature lets you switch genlocked video signals according to the timing of the GENLOCK reference input.

According to SMPTE RP-168, the sources must be genlocked to the GENLOCK input in order to switch cleanly.

1. Connect the GENLOCK cable.

2. To set the genlock timing, press and hold for 3 seconds the appropriate input button as follows:

To Set	Press and Hold for 3 Seconds	Setting Displayed
1080i @60Hz	IN 1	1080 60H
1080i/p @50Hz	IN 2	1080 50H
720p @60Hz	IN 3	720P 60H
PAL @50Hz	IN 4	PAL 50H
NTSC @60Hz	IN 5	NTSC 60H

Note: When turning the machine ON, the last stored setup is shown in the 7-segment display.

5.5 Connecting via Ethernet

You can connect to the **VS-88FO** via Ethernet using either of the following methods:

- Directly to the PC using a crossover cable (see [Section 5.5.1](#))
- Via a network hub, switch, or router, using a straight-through cable (see [Section 5.5.2](#))

Note: If you want to connect via a router and your IT system is based on IPv6, speak to your IT department for specific installation instructions.

5.5.1 Connecting the Ethernet Port Directly to a PC

You can connect the Ethernet port of the **VS-88FO** directly to the Ethernet port on your PC using a crossover cable with RJ-45 connectors.



This type of connection is recommended for identifying the **VS-88FO** with the factory configured default IP address.

After connecting the **VS-88FO** to the Ethernet port, configure your PC as follows:

1. Click **Start > Control Panel > Network and Sharing Center**.
2. Click **Change Adapter Settings**.
3. Highlight the network adapter you want to use to connect to the device and click **Change settings of this connection**.

The Local Area Connection Properties window for the selected network adapter appears as shown in [Figure 6](#).

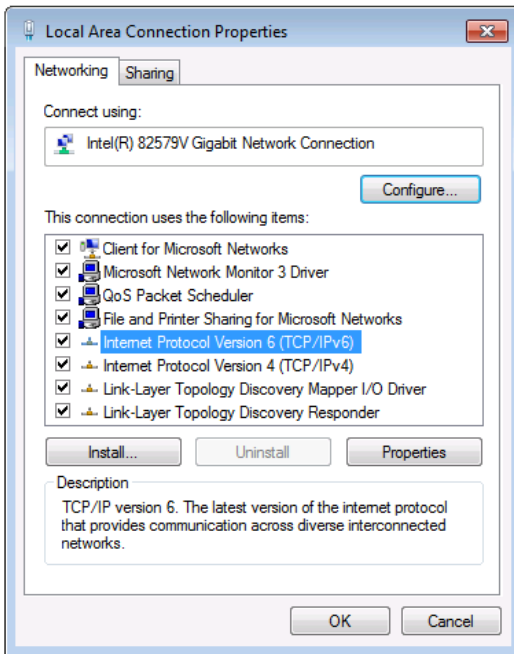


Figure 6: Local Area Connection Properties Window

4. Highlight either **Internet Protocol Version 6 (TCP/IPv6)** or **Internet Protocol Version 4 (TCP/IPv4)** depending on the requirements of your IT system.

5. Click **Properties**.

The Internet Protocol Properties window relevant to your IT system appears as shown in [Figure 7](#) or [Figure 8](#).

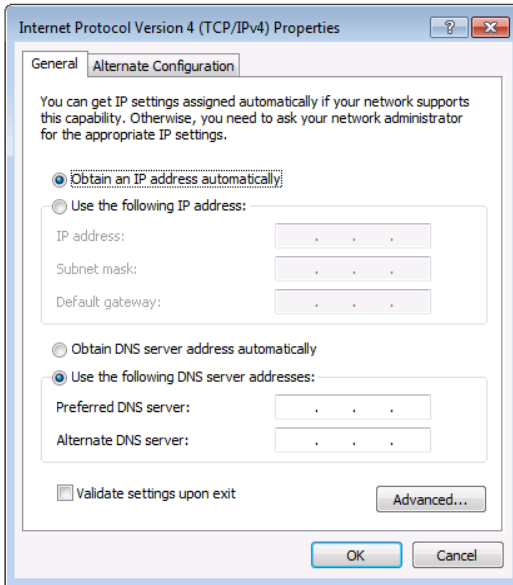


Figure 7: Internet Protocol Version 4 Properties Window

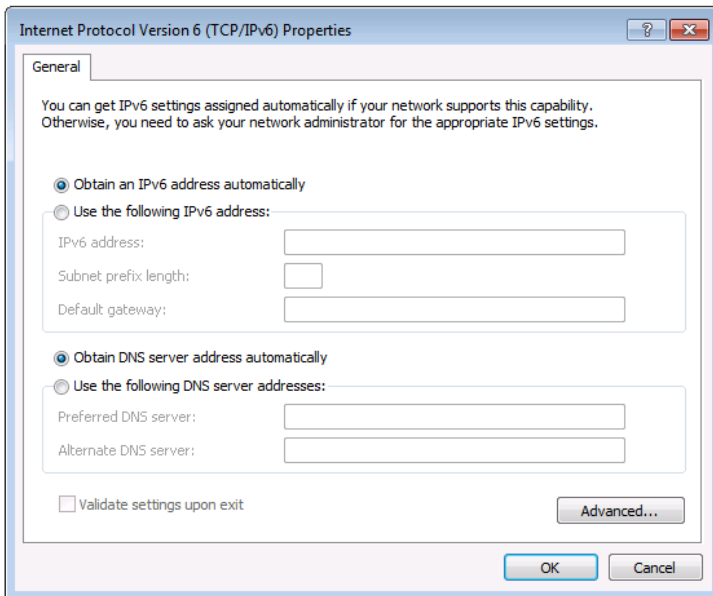


Figure 8: Internet Protocol Version 6 Properties Window

6. Select **Use the following IP Address** for static IP addressing and fill in the details as shown in [Figure 9](#).

For TCP/IPv4 you can use any IP address in the range 192.168.1.1 to 192.168.1.255 (excluding 192.168.1.39) that is provided by your IT department.

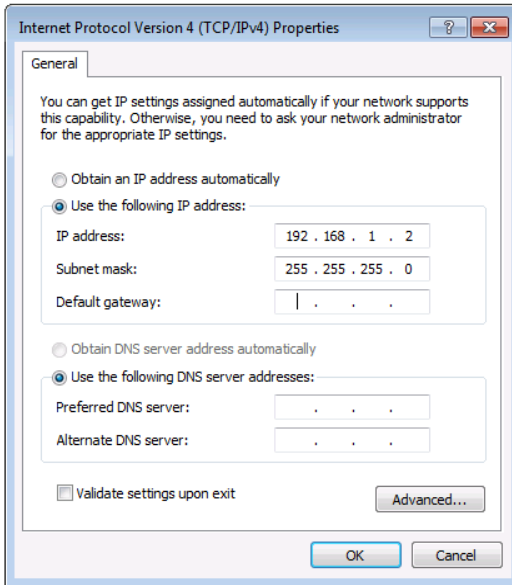


Figure 9: Internet Protocol Properties Window

7. Click **OK**.
8. Click **Close**.

5.5.2 Connecting the Ethernet Port via a Network Hub or Switch

You can connect the Ethernet port of the **VS-88FO** to the Ethernet port on a network hub or using a straight-through cable with RJ-45 connectors.

5.5.3 Control Configuration via the Ethernet Port

To control several units via Ethernet, connect the Master unit (Device 1) via the Ethernet port to the Ethernet port of your PC. Use your PC provide initial configuration of the settings (see [Section 5.5](#)).

5.6 Configuring the Ethernet Port Initially

To initially configure the Ethernet port, download the *K-UPLOAD* Ethernet configuration software (from the Kramer Web site at <http://www.kramerelectronics.com>). Extract the file to a folder and create a shortcut on your desktop to the file.

To configure the Ethernet port:

1. Double-click the desktop icon.

The **K-UPLOAD** screen appears:

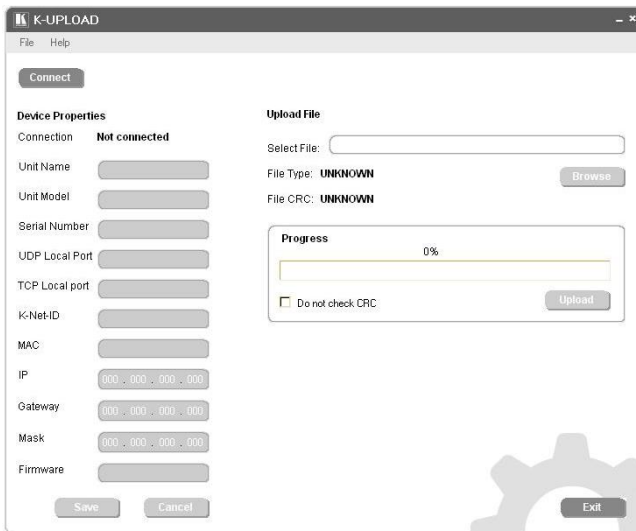


Figure 10: K-UPLOAD Main Screen

2. Click the Connect button.

The Connect screen appears:

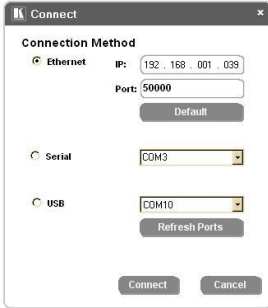


Figure 11: Connect Screen

3. Connect a USB cable from a USB port on the PC to the USB port on the **VS-88FO**. (You can also connect to the PC using the Ethernet or a serial connector).
4. Check **USB** as the connection method and select the COM port from the USB drop down list.
5. Click **Connect**.

The **K-UPLOAD** screen appears as in [Figure 12](#).

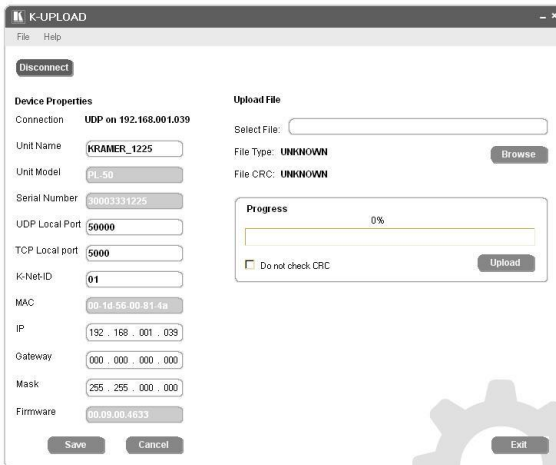


Figure 12: Device Properties Screen

6. If required, make changes and click **Save**. If not, click **Exit**.

5.7 Controlling Using the Ethernet Port

You can control the **VS-88FO** over the RS-232/RS-485 port or the Ethernet using the Kramer **K-Router** application.

If you are controlling a standalone unit using RS-232 or the Ethernet, configure the unit as master (MACH #1), see [Section 5.2.1](#).

5.8 Using the Ethernet Reset Button

To reset Ethernet parameters to the factory defaults:

1. Turn the power switch OFF then, while pressing the FACTORY RESET button, turn the power switch ON.
2. The unit powers up and loads its memory with the factory default definitions.
3. The unit also erases all stored presets, returns to the default Protocol 3000 and indicates “F-rst” on the 7-segment display.

6 Operating the VS-88FO

You can operate your **VS-88FO** using:

- The front panel buttons
- RS-232/RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- The **RC-IR3** infrared remote control transmitter

6.1 Operating the VS-88FO from the Front Panel

Use the front panel buttons to perform the following operations:

6.1.1 Power-On Display

When the **VS-88FO** is powered on, the display briefly shows the 4-digit firmware version number and the genlock timing setting. Then the display changes to its normal operating display.

6.1.2 Using the AT ONCE and CONFIRM Modes

Choose to work in either the AT ONCE or the CONFIRM modes.

In the AT ONCE mode, pressing an OUT-IN combination switches the unit immediately. The AT ONCE mode is faster since execution requires no user confirmation; however there is no protection against pressing a wrong button.

In the CONFIRM mode, the change does not take place until the TAKE button is pressed.

- You can key-in several actions and then confirm them by pressing the "TAKE" button to simultaneously activate the multiple switches
- Every action requires user confirmation. This protects against erroneous switching due to human error (pressing the wrong button)
- Execution is delayed until the user confirms the action

6.1.3 Toggling Between Modes

To toggle between the AT ONCE and CONFIRM modes, do the following:

1. Press the TAKE button to toggle from the AT ONCE mode (in which the TAKE button is not lit) to the CONFIRM mode (in which the TAKE button illuminates).
Actions now require user confirmation and the TAKE button illuminates.
2. Press the illuminated TAKE button to toggle from the CONFIRM mode back to the AT ONCE mode.
TAKE button turns off and actions no longer require user confirmation.

6.1.4 Switching in the AT ONCE Mode

To switch an input to an output in the AT ONCE mode, do the following:

1. Press an OUT SELECT button from 1 to 8 or the ALL button.
The 7-segment display flashes.
2. Press an IN SELECT button from 1 to 8 or the OFF button for immediate switching.
The selected input switches to the selected output. The digits displayed in the 7-segment display the appropriate change.

6.1.5 Switching in the CONFIRM Mode

To switch in the CONFIRM mode, when the TAKE button is illuminated, do the following:

1. Press an OUT-IN combination.
The 7-segment display flashes. (The timeout lasts for 10 seconds).
2. Press the TAKE button to confirm the action.
The 7-segment display stops flashing. The TAKE button stays lit.

To confirm several actions (in CONFIRM mode), do the following:

1. Press each OUT-IN combination in sequence.
The 7-segment display flashes.

2. Press the TAKE button to confirm all the actions.

The 7-segment display stops flashing. The TAKE button stays lit.

6.1.6 Storing an Input/Output Configuration

You can store up to 16 configurations in memory and recall them as presets using the eight IN SELECT buttons and the eight OUT SELECT buttons.

To store the current configuration, do the following:

1. Press the STO button.

The STO button flashes.

2. Press one of the IN or OUT SELECT buttons.

The current configuration is stored in memory at the chosen preset number.

6.1.7 Recalling an Input/Output Configuration

To recall an input/output configuration, do the following:

1. Press the RCL button.

The RCL button flashes.

2. Press the appropriate IN or OUT SELECT button (the button number corresponds to the preset number).

The chosen preset configuration is restored from memory.

Note: Recalling an undefined setup gives an error indication ALL "0".

6.1.8 Locking the Front Panel

Lock the front panel buttons to prevent unwanted key presses from changing the existing setup.

- To lock the front panel, press and hold the LOCK key for three seconds. The LOCK key illuminates and the front panel keys are inactivated
- To unlock the front panel, press and hold the illuminated LOCK key until the light turns off. The front panel keys are activated

6.1.9 Switching Protocols

You can operate the **VS-88FO** using either the KRAMER 2000 or the default KRAMER 3000 serial protocol.

- To choose the Kramer 2000 protocol instead of the default Protocol 3000, press OUT 1 and OUT 2 at the same time.
OUT 1 flashes briefly if the change was made correctly
- To revert to the Kramer 3000 protocol, press OUT 1 and OUT 3 at the same time.
OUT 1 flashes briefly if the change was made correctly

If an error is indicated, retry the previous action or choose a new action.

6.2 Using Serial Commands

To operate the **VS-88FO** using serial commands, Kramer provides free control software that you can download from the Kramer Electronics Web site.

- For an explanation of all KRAMER 3000 commands, see [Section 9](#)
- For an explanation of all KRAMER 2000 commands, see [Section 10](#)

6.3 Using the Infrared Remote Controller

To operate the **VS-88FO** using the **RC-IR3** infrared remote controller, see the User Manual packed with the remote controller.

See also the Kramer Web site: www.kramerelectronics.com.

Note:

- You cannot change genlock timing from the remote control, only from the front panel.
- The IR remote controls only 8 preset configurations equivalent to OUT 1 to OUT 8

6.4 Upgrading the Firmware

The **VS-88FO** uses a microcontroller that runs firmware located in FLASH memory. The latest version of firmware and upgrade instructions can be downloaded from the Kramer Web site at www.kramerelectronics.com and updated in minutes using K-UPLOAD.

The USB port is used for connecting the **VS-88FO** to a PC to transfer the data.

6.5 Changing the Device Parameters

To change the device parameters do the following:

1. Connect a PC to the **VS-88FO** (see [Section 5.3](#)).
2. Open K-UPLOAD (see [Section 5.5](#)).
3. Click the **Connect** button to open the *Connect* window.
4. Choose the appropriate type of connection: Ethernet, Serial or USB, and click **Connect**.
The Connect window disappears and the Device Properties become visible.
5. Change the parameters as required and then click **Save**.

7 Technical Specifications

INPUTS:	8 LC connectors for single mode fiber cable
OUTPUTS:	8 LC connectors for single mode fiber cable
GENLOCK:	1Vpp/75Ω (looping) with termination switch
DATA RATE:	3Gbps per channel
CONTROLS:	Front-panel, RS-232, RS-485, Ethernet, remote infrared
OPERATING TEMPERATURE:	0° to +40°C (32° to 104°F)
STORAGE TEMPERATURE:	-40° to +70°C (-40° to 158°F)
HUMIDITY:	10% to 90%, RHL non-condensing
POWER SOURCE:	Universal, 100-240V AC, 50/60Hz 24VA
DIMENSIONS:	19" x 7" x 1U W, D, H, rack mountable
WEIGHT:	2.6kg (5.7lbs) approx.
ACCESSORIES:	Power cord, rack "ears" and IR remote control transmitter.
OPTIONS:	External remote IR receiver cable
SFP OPTIONS:	SFP-IN/OUT-2KM SFP Fiber Optic Module SM 2km 3G HD-SDI Tx/Rx SFP-IN/OUT-30KM SFP Fiber Optic Module SM 30km 3G HD-SDI Tx/Rx SFP-IN/OUT-40KM SFP Fiber Optic Module SM 40km 3G HD-SDI Tx/Rx Video SFP supports pathological patterns
Specifications are subject to change without notice at http://www.kramerelectronics.com	

8 Default Communication Parameters

RS-232			
Protocol 2000		Protocol 3000 (Default)	
Baud Rate	9600	Baud Rate	115,200
Data Bits	8	Data Bits	8
Stop Bits	1	Stop Bits	1
Parity	None	Parity	None
Command Format	HEX	Command Format	ASCII
Example (Output 1 to Input 1)	0x01, 0x81, 0x81, 0x81	Example (Output 1 to Input 1)	#VID1>1<CR>
Switching Protocol			
P2000 → P3000		P3000 → P2000	
Command	0x38, 0x80, 0x83, 0x81	Command	#P2000<CR>
Front Panel	Press and hold Output 1 and Output 3 simultaneously	Front Panel	Press and hold Output 1 and Output 2 simultaneously
Ethernet			
IP Address	192.168.1.39	TCP Port	5000 or 10001 or 50000
Subnet Mask	255.255.255.0	UDP Port	50000

9 Kramer Protocol 3000

The **VS-88FO** can be operated using serial commands from a PC, remote controller, or touch screen. The unit communicates using the default Kramer Protocol 3000 but can also use Kramer Protocol 2000.

This section describes:

- How to switch between Protocol 3000 and Protocol 2000 (see [Section 9.1](#))
- Kramer Protocol 3000 syntax (see [Section 9.2](#))
- Kramer Protocol 3000 commands (see [Section 9.3](#))

9.1 Switching Protocols

Protocols can be switched either from the front panel buttons or by transmitting protocol commands.

To switch protocols using the front panel buttons:

- To choose Protocol 2000, press OUT 1 and OUT 2 at the same time
- To choose the Protocol 3000, press OUT 1 and OUT 3 at the same time

To switch protocols using protocol commands:

- To switch from Protocol 3000 to Protocol 2000, send the following command:
#P2000<CR>
- To switch from Protocol 2000 to Protocol 3000, send the following command:
0x38, 0x80, 0x83, 0x81

Note: If you are using Kramer's Windows[®]-based control software it operates only with Protocol 2000. If the **VS-88FO** is set to Protocol 3000, it automatically switches to Protocol 2000.

Download the latest software from our Web site at <http://www.kramerelectronics.com>.

9.2 Kramer Protocol 3000 Syntax

Protocol 3000 communicates at a data rate of 115200 baud, no parity, 8 data bits and 1 stop bit.

9.2.1 Host Message Format

Start	Address (optional)	Body	Delimiter
#	<i>Destination_id@</i>	Message	CR

9.2.2 Simple Command

Command string with only one command without addressing:

Start	Address (optional)	Body	Delimiter
#		Command SP <i>Parameter_1,Parameter_2,...</i>	CR

9.2.3 Command String

Formal syntax with commands concatenation and addressing:

Start	Address	Body	Delimiter
#	<i>Destination_id@</i>	Command_1 <i>Parameter1_1,Parameter1_2,...</i> Command_2 <i>Parameter2_1,Parameter2_2,...</i> Command_3 <i>Parameter3_1,Parameter3_2,...</i>	CR

9.2.4 Device Message Format

Start	Address (optional)	Body	delimiter
~	<i>Sender_id@</i>	Message	CR LF

9.2.5 Device Long Response

Echoing command:

Start	Address (optional)	Body	Delimiter
~	<i>Sender_id@</i>	Command SP <i>[Param1 ,Param2 ...]</i> result	CR LF

CR = Carriage return (ASCII 13 = 0x0D)

LF = Line feed (ASCII 10 = 0x0A)

SP = Space (ASCII 32 = 0x20)

9.2.6 Command Terms

Command

A sequence of ASCII letters ('A'-'Z', 'a'-'z' and '-').

Command and parameters must be separated by at least one space.

Parameters

A sequence of alphanumeric ASCII characters ('0'-'9','A'-'Z','a'-'z' and some special characters for specific commands). Parameters are separated by commas.

Message string

Every command entered as part of a message string begins with a **message starting character** and ends with a **message closing character**.

Note: A string can contain more than one command. Commands are separated by a pipe ('|') character.

Message starting character

'#' – For host command/query

'~' – For machine response

Device address (Optional, for K-NET)

K-NET Device ID followed by '@'

Query sign

'?' follows some commands to define a query request.

Message closing character

CR – For host messages; carriage return (ASCII 13)

CRLF – For machine messages; carriage return (ASCII 13) + line-feed (ASCII 10)

Command chain separator character

When a message string contains more than one command, a pipe ('|') character separates each command.

Spaces between parameters or command terms are ignored.

9.2.7 Entering Commands

You can directly enter all commands using a terminal with ASCII communications software, such as HyperTerminal, Hercules, etc. Connect the terminal to the serial, Ethernet, or USB port on the Kramer device. To enter **CR**, press the Enter key. (**LF** is also sent but is ignored by command parser).

For commands sent from some non-Kramer controllers like Crestron, some characters require special coding (such as, /X##). Refer to the controller manual.

9.2.8 Command Forms

Some commands have short name syntax in addition to long name syntax to allow faster typing. The response is always in long syntax.

9.2.9 Command Chaining

Multiple commands can be chained in the same string. Each command is delimited by a pipe character ('| '). When chaining commands, enter the **message starting character** and the **message closing character** only once, at the beginning of the string and at the end.

Commands in the string do not execute until the closing character is entered.

A separate response is sent for every command in the chain.

9.2.10 Maximum String Length

64 characters

9.2.11 Backward Support

Protocol 2000 is transparently supported by Protocol 3000. You can switch between protocols using a switch protocol command from either platform.

9.3 Kramer Protocol 3000 Commands

9.3.1 Device Initiated Messages

Command	Syntax
---------	--------

Switcher actions:

Video channel has switched (breakaway mode)	VID <input type="text"/> > <input type="text"/>
---	---

9.3.2 Result and Error Codes

	Syntax
Command ran successfully, no error.	COMMAND <input type="text"/> <input type="text"/> OK

Protocol Errors:

Syntax error	ERR001
Command not available for this device	ERR002
Parameter is out of range	ERR003
Unauthorized access (command run without the matching login).	ERR004

9.3.3 Basic Routing Commands

Command	Syntax	Response
Switch video	VID <input type="text"/> > <input type="text"/> , <input type="text"/> > <input type="text"/> , ... Short form: V <input type="text"/> > <input type="text"/> , <input type="text"/> > <input type="text"/> , ...	VID <input type="text"/> > <input type="text"/> , <input type="text"/> > <input type="text"/> , ... <input type="text"/>
Read video connection	VID? <input type="text"/> Short form: V? <input type="text"/> VID? *	VID <input type="text"/> > <input type="text"/> VID <input type="text"/> > <input type="text"/> , <input type="text"/> > <input type="text"/> , ...

Parameter Description:

= Input number or '0' to disconnect output.

'>' = Connection character between in and out parameters.

= Output number or '*' for all outputs.

Examples:

Switch video input 2 to output 4	#V 2>4 <input type="text"/>	~VID 2>4 OK <input type="text"/>
Switch video input 4 to output 2 in machine number 6	#6@VID 4>2 <input type="text"/>	~6@VID 4>2 OK <input type="text"/>
Disconnect video output 4	#AV 0>4 <input type="text"/>	~AV 0>4 OK <input type="text"/>
Switch video input 3 to all outputs	#V 3>* <input type="text"/>	~VID 3>* OK <input type="text"/>
Chaining multiple commands	#V 1>* V 3>4, 2>2, 2>1, 0>2 V 3>9 V ? * <input type="text"/> 1. Switch video from input 1 to all outputs. 2. Switch video input 3 to output 4, video input 2 to output 2, video input 2 to output 1 and disconnect video output 2. 3. Switch video input 3 to output 9 (non-existent). 4. Get status of all video links. Command processing begins after entering <input type="text"/> . A response is sent for each command after processing.	~VID 1>* OK <input type="text"/> ~VID 3>4, 2>2, 2>1, 0>2 OK <input type="text"/> ~VID ERR003 <input type="text"/> ~VID 2>1, 0>2, 1>3, 3>4 <input type="text"/>

9.3.4 Preset Commands

Command	Syntax	Response
Store current connections to preset	PRST-STO <u>PRESET</u> Short form: PSTO <u>PRESET</u>	PRST-STO <u>PRESET</u> <u>RESULT</u>
Recall saved preset	PRST-RCL <u>PRESET</u> Short form: PRCL <u>PRESET</u>	PRST-RCL <u>PRESET</u> <u>RESULT</u>
Delete saved preset	PRST-DEL <u>PRESET</u> Short form: PDEL <u>PRESET</u>	PRST-DEL <u>PRESET</u> <u>RESULT</u>
Read video connections from saved preset	PRST-VID? <u>PRESET</u> <u>OUT</u> Short form: PVID? <u>PRESET</u> <u>OUT</u> PRST-VID? <u>PRESET</u> , *	PRST-VID <u>PRESET</u> <u>IN</u> <u>OUT</u> PRST-VID <u>PRESET</u> <u>IN</u> >1, <u>IN</u> >2,...
Read saved presets list	PRST-LST? Short form: PLST?	PRST-LST <u>PRESET</u> , <u>PRESET</u> , ...

Parameter Description:

PRESET = Preset number.

OUT = Output in preset to display, "*" for all.

Examples:

Store current video connections to preset 5	#PRST-STO 5 <u>CR</u>	~PRST-STR 5 OK <u>CRLF</u>
Recall video connections from preset 3	#PRCL 3 <u>CR</u>	~PRST-RCL 3 OK <u>CRLF</u>
Show source of video output 2 from preset 3	#PRST-VID? 3,2 <u>CR</u>	~PRST-VID 3: 4>2 <u>CRLF</u>

9.3.1 Operation Commands

Command	Syntax	Response
Set genlock	#GNLCK out,in,type <u>CR</u>	~ nn@GNLCK out,in,status <u>CRLF</u>
Get genlock	#GNLCK? out <u>CR</u>	~ nn@GNLCK out,in,status <u>CRLF</u>

Parameter Description:

out - output number (1 .. max number of outputs)

in - input number (1... max number of inputs)

type - genlock type

- 3 1080@60
- 4 1080@50
- 5 720@60
- 6 PAL
- 7 NTSC

status - genlock status (ON/OFF)

Lock front panel	LOCK-FP <u>LOCK-MODE</u> Short form: LCK <u>LOCK-MODE</u>	LOCK-FP <u>LOCK-MODE</u> <u>RESULT</u>
Get front panel locking state	LOCK-FP?	LOCK-FP <u>LOCK-MODE</u>

Parameter Description:

LOCK-MODE = Front panel locking state:

'0' or 'off' to unlock front panel buttons

'1' or 'on' to lock front panel buttons

Reset device	RESET	RESET OK
Switch to protocol 2000*	P2000	P2000 OK

* Protocol 2000 has a command to switch back to ASCII protocol (like Protocol 3000)

9.3.2 Machine Information Commands

Command	Syntax	Response
Read in/out count	INFO-IO?	INFO-IO: IN <u>INPUTS_COUNT</u> , OUT <u>OUTPUTS_COUNT</u>
Read max preset count	INFO-PRST?	INFO-PRST: VID <u>PRESET_VIDEO_COUNT</u>
Reset to factory default configuration	FACTORY	FACTORY <u>RESULT</u>

9.3.3 Identification Commands

Command	Syntax	Response
Protocol handshaking	# <u>CR</u>	-OK <u>CRLF</u>
Read device model	MODEL?	MODEL <u>MACHINE_MODEL</u>
Read device serial number	SN?	SN <u>SERIAL_NUMBER</u>
Read device firmware version	VERSION?	VERSION <u>MAJOR</u> <u>MINOR</u> <u>BUILD</u> <u>REVISION</u>
Set machine name	NAME <u>MACHINE_NAME</u>	NAME <u>MACHINE_NAME</u> <u>RESULT</u>
Read machine name	NAME?	NAME <u>MACHINE_NAME</u>
Reset machine name to factory default*	NAME-RST	NAME-RST <u>MACHINE_FACTORY_NAME</u> <u>RESULT</u>

***Note:** The machine name is not the same as the model name. The machine name is used to identify a specific machine or a network in use (with DNS feature on).

MACHINE_NAME = Up to 14 alphanumeric chars.

* **Machine factory name** = Model name + last 4 digits from serial number.

9.3.4 Network Setting Commands

Command	Syntax	Response
Set IP address	NET-IP <u>IP_ADDRESS</u> Short form: NTIP	NET-IP <u>IP_ADDRESS</u> <u>RESULT</u>
Read IP address	NET-IP? Short form: NTIP?	NET-IP <u>IP_ADDRESS</u>
Read MAC address	NET-MAC? Short form: NTMC?	NET-MAC <u>MAC_ADDRESS</u>
Set subnet mask	NET-MASK <u>SUBNET_MASK</u> Short form: NTMSK	NET-MASK <u>SUBNET_MASK</u> <u>RESULT</u>
Read subnet mask	NET-MASK? Short form: NTMSK?	NET-MASK <u>SUBNET_MASK</u>
Set gateway address	NET-GATE <u>GATEWAY_ADDRESS</u> Short form: NTGT	NET-GATE <u>GATEWAY_ADDRESS</u> <u>RESULT</u>
Read subnet mask	NET-GATE? Short form: NTGT?	NET-GATE <u>GATEWAY_ADDRESS</u>
Set DHCP mode	NET-DHCP <u>DHCP_MODE</u> Short form: NTDH	NET-DHCP <u>DHCP_MODE</u> <u>RESULT</u>

Read subnet mask	NET-DHCP? Short form: NTDH?	NET-DHCP <u>DHCP_MODE</u>
------------------	--------------------------------	---------------------------

DHCP_MODE =

'0' – Don't use DHCP (Use IP set by factory or IP set command).

'1' – Try to use DHCP, if unavailable use IP as above.

Change protocol Ethernet port	ETH-PORT <u>PROTOCOL</u> , <u>PORT</u> Short form: ETHP	ETH-PORT <u>PROTOCOL</u> , <u>PORT</u> <u>RESULT</u>
Read protocol Ethernet port	ETH-PORT? <u>PROTOCOL</u> Short form: ETHP?	ETH-PORT <u>PROTOCOL</u> , <u>PORT</u>

PROTOCOL = TCP/UDP (transport layer protocol)

PORT = Ethernet port that accepts Protocol 3000 commands

1-65535 = User defined port

0 - Reset port to factory default (50000 for UDP, 5000 for TCP)

10 Hex Table (Protocol 2000)

The following table lists the Hex values for a single machine (MACHINE # 1):

	OUT 1	OUT 2	OUT 3	OUT 4	OUT 5	OUT 6	OUT 7	OUT 8
IN 1	01	01	01	01	01	01	01	01
	81	81	81	81	81	81	81	81
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 2	01	01	01	01	01	01	01	01
	82	82	82	82	82	82	82	82
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 3	01	01	01	01	01	01	01	01
	83	83	83	83	83	83	83	83
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 4	01	01	01	01	01	01	01	01
	84	84	84	84	84	84	84	84
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 5	01	01	01	01	01	01	01	01
	85	85	85	85	85	85	85	85
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 6	01	01	01	01	01	01	01	01
	86	86	86	86	86	86	86	86
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 7	01	01	01	01	01	01	01	01
	87	87	87	87	87	87	87	87
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81
IN 8	01	01	01	01	01	01	01	01
	88	88	88	88	88	88	88	88
	81	82	83	84	85	86	87	88
	81	81	81	81	81	81	81	81

11 Kramer Protocol 2000

The **VS-88FO** is compatible with Kramer's Protocol 2000, version 0.50. This RS-232/RS-485 communication protocol uses four bytes of information as defined below. The default data rate is 9600 baud, with no parity, 8 data bits, and 1 stop bit.

MSB

LSB

DESTINATION		INSTRUCTION					
0	D	N5	N4	N3	N2	N1	N0
7	6	5	4	3	2	1	0

1st byte

INPUT							
1	I6	I5	I4	I3	I2	I1	I0
7	6	5	4	3	2	1	0

2nd byte

OUTPUT							
1	O6	O5	O4	O3	O2	O1	O0
7	6	5	4	3	2	1	0

3rd byte

MACHINE NUMBER							
1	OVR	X	M4	M3	M2	M1	M0
7	6	5	4	3	2	1	0

4th byte

1st BYTE:

Bit 7 – Defined as 0. D – "DESTINATION":
 0 - for sending information to the switchers (from the PC);
 1 - for sending to the PC (from the switcher).
 N5...N0 – "INSTRUCTION"

The function that is to be performed by the switcher(s) is defined by the INSTRUCTION (6 bits). Similarly, if a function is performed using the machine's keyboard, then these bits are set with the INSTRUCTION NO., which was performed. The instruction codes are defined according to the table below (INSTRUCTION NO. is the value to be set for N5...N0).

2nd BYTE:

Bit 7 – Defined as 1.
 I6...I0 – "INPUT".

When switching (i.e. instruction codes 1 and 2), the INPUT (7 bits) is set as the input number which is to be switched. Similarly, if switching is done using the machine's front-panel, then these bits are set with the INPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

3rd BYTE:

Bit 7 – Defined as 1.
 O6...O0 – "OUTPUT".

When switching (i.e. instruction codes 1 and 2), the OUTPUT (7 bits) is set as the output number which is to be switched. Similarly, if switching is done using the machine's front-panel, then these bits are set with the OUTPUT NUMBER which was switched. For other operations, these bits are defined according to the table.

4th BYTE:

Bit 7 – Defined as 1.
 Bit 5 – Don't care.
 OVR – Machine number override.
 M4...M0 – MACHINE NUMBER.

Used to address machines in a system using their machine numbers. When several machines are controlled from a single serial port, they are usually configured together with each machine having an individual machine number. If the OVR bit is set, then all machine numbers will accept (implement) the command, and the addressed machine will reply.

For a single machine controlled using the serial port, always set M4...M0 = 1, and make sure that the machine itself is configured as MACHINE NUMBER = 1.

Note: All values in the table are decimal, unless otherwise stated.

INSTRUCTION		DEFINITION FOR SPECIFIC INSTRUCTION		NOTE
#	DESCRIPTION	INPUT	OUTPUT	
0	RESET DEVICE	0	0	1
1	SWITCH VIDEO	Set equal to video input which is to be switched (0 = disconnect)	Set equal to video output which is to be switched (0 = to all the outputs)	2, 15
3	STORE VIDEO STATUS	Set as SETUP #	0 - to store 1 - to delete	2, 3, 15
4	RECALL VIDEO STATUS	Set as SETUP #	0	2, 3, 15
5	REQUEST STATUS OF A VIDEO OUTPUT	Set as SETUP #	Equal to output number whose status is required	4, 3
15	REQUEST WHETHER SETUP IS DEFINED / VALID INPUT IS DETECTED	SETUP # or Input #	0 - for checking if setup is defined 1 - for checking if input is valid	8
16	ERROR / BUSY	For invalid / valid input (i.e. OUTPUT byte = 4 or OUTPUT byte = 5), this byte is set as the input #	0 - error 1 - invalid instruction 2 - out of range 3 - machine busy 4 - invalid input 5 - valid input	9, 25
30	LOCK FRONT PANEL	0 - Panel unlocked 1 - Panel locked	0	2
31	REQUEST WHETHER PANEL IS LOCKED	0	0	16
56	CHANGE TO ASCII	0	3 – Protocol 3000I	19
61	IDENTIFY MACHINE	1 - video machine name 3 - video software version	0 - Request first 4 digits 1 - Request first suffix	13
62	DEFINE MACHINE	1 - number of inputs 2 - number of outputs 3 - number of setups	1 - for video 3 - for SDI 4 - for remote panel 5 - for RS-422 controller	14

NOTES on the above table:

NOTE 1 - When the master switcher is reset, (e.g. when it is turned on), the reset code is sent to the PC. If this code is sent to the switchers, it will reset according to the present power-down settings.

NOTE 2 - These are bi-directional definitions. That is, if the switcher receives the code, it will perform the instruction; and if the instruction is performed (due to a keystroke operation on the front panel), then these codes are sent. For example, if the HEX code

01 85 88 83

was sent from the PC, then the switcher (machine 3) will switch input 5 to output 8. If the user

switched input 1 to output 7 using the front panel keypad, then the switcher will send HEX codes:

41 81 87 83

to the PC.

When the PC sends one of the commands in this group to the switcher, then, if the instruction is valid,

the switcher replies by sending to the PC the same four bytes that it was sent (except for the first

byte, where the DESTINATION bit is set high).

NOTE 3 - SETUP # 0 is the present setting. SETUP # 1 and higher are the settings saved in the switcher's memory, (i.e. those used for Store and Recall).

NOTE 4 - The reply to a "REQUEST" instruction is as follows: the same instruction and INPUT codes as were sent are returned, and the OUTPUT is assigned the value of the requested parameter. The replies to instructions 10 and 11 are as per the definitions in instructions 7 and 8 respectively. For example, if the present status of machine number 5 is breakaway setting, then the reply to the HEX code

0B 80 80 85

would be HEX codes

4B 80 81 85

NOTE 8 - The reply is as in TYPE 3 above, except that here the OUTPUT is assigned with the value 0 if the setup is not defined / no valid input is detected; or 1 if it is defined / valid input is detected.

NOTE 9 - An error code is returned to the PC if an invalid instruction code was sent to the switcher, or if a parameter associated with the instruction is out of range (e.g. trying to save to a setup greater than the highest one, or trying to switch an input or output greater than the highest one defined). This code is also returned to the PC if an RS-232 instruction is sent while the machine is being programmed using the front panel. Reception of this code by the switcher is not valid.

NOTE 13 - This is a request to identify the switcher/s in the system. If the OUTPUT is set as 0, and the INPUT is set as 1, 2, 5 or 7, the machine will send its name. The reply is the decimal value of the INPUT and OUTPUT. For example, for a 2216, the reply to the request to send the machine name would be (HEX codes):

7D 96 90 81 (i.e. $128_{dec} + 22_{dec}$ for 2nd byte, and $128_{dec} + 16_{dec}$ for 3rd byte).

If the request for identification is sent with the INPUT set as 3 or 4, the appropriate machine will send its software version number. Again, the reply would be the decimal value of the INPUT and OUTPUT - the INPUT representing the number in front of the decimal point, and the OUTPUT representing the number after it. For example, for version 3.5, the reply to the request to send the version number would be (HEX codes):

7D 83 85 81 (i.e. $128_{dec} + 3_{dec}$ for 2nd byte, $128_{dec} + 5_{dec}$ for 3rd byte).

If the OUTPUT is set as 1, then the ASCII coding of the lettering following the machine's name is sent. For example, for the VS-7588YC, the reply to the request to send the first suffix would be (HEX codes):

7D D9 C3 81 (i.e. $128_{dec} + \text{ASCII for "Y"}$; $128_{dec} + \text{ASCII for "C"}$).

NOTE 14 - The number of inputs and outputs refers to the specific machine which is being addressed, *not* to the system. For example, if six 16X16 matrices are configured to make a 48X32 system (48 inputs, 32 outputs), the reply to the HEX code

3E 82 81 82 (i.e. request the number of outputs)

would be HEX codes

7E 82 90 82

i.e. 16 outputs

NOTE 15 - When the OVR bit (4th byte) is set, then the "video" commands have universal meaning. For example, instruction 1 (SWITCH VIDEO) will cause all units (including data, etc.) to switch. Similarly, if a machine is in "FOLLOW" mode, it will perform any "video" instruction.

NOTE 16 - The reply to the "REQUEST WHETHER PANEL IS LOCKED" is as in NOTE 4 above, except that here the OUTPUT is assigned with the value 0 if the panel is unlocked, or 1 if it is locked.

NOTE 19 - After this instruction is sent, the unit will respond to the ASCII command set defined by the OUTPUT byte. The ASCII command to operate with the HEX command set must be sent in order to return to working with HEX codes.

NOTE 25 - For units which detect the validity of the video inputs, Instruction 16 will be sent whenever the unit detects a change in the state of an input (in real-time).

For example, if input 3 is detected as invalid, the unit will send the HEX codes

10 83 84 81

If input 7 is detected as valid, then the unit will send HEX codes

10 87 85 81.

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P/N: 2900-300097



Rev: 4