Kramer Electronics, Ltd.

USER MANUAL

Model:

FC-400

Time Base Corrector/Synchronizer

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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[1] that are clearly defined by function.

Thank you for purchasing your Kramer **FC-400** *Time Base Corrector/Synchronizer*. This product is ideal for:

- Video broadcasting and editing studios
- All post-production uses
- Presentation applications using multi-format sources

The package includes the following items:

- **FC-400** Time Base Corrector/Synchronizer
- Power supply
- Null-modem adapter
- This user manual[2]

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
- Use Kramer high performance high-resolution cables[3]

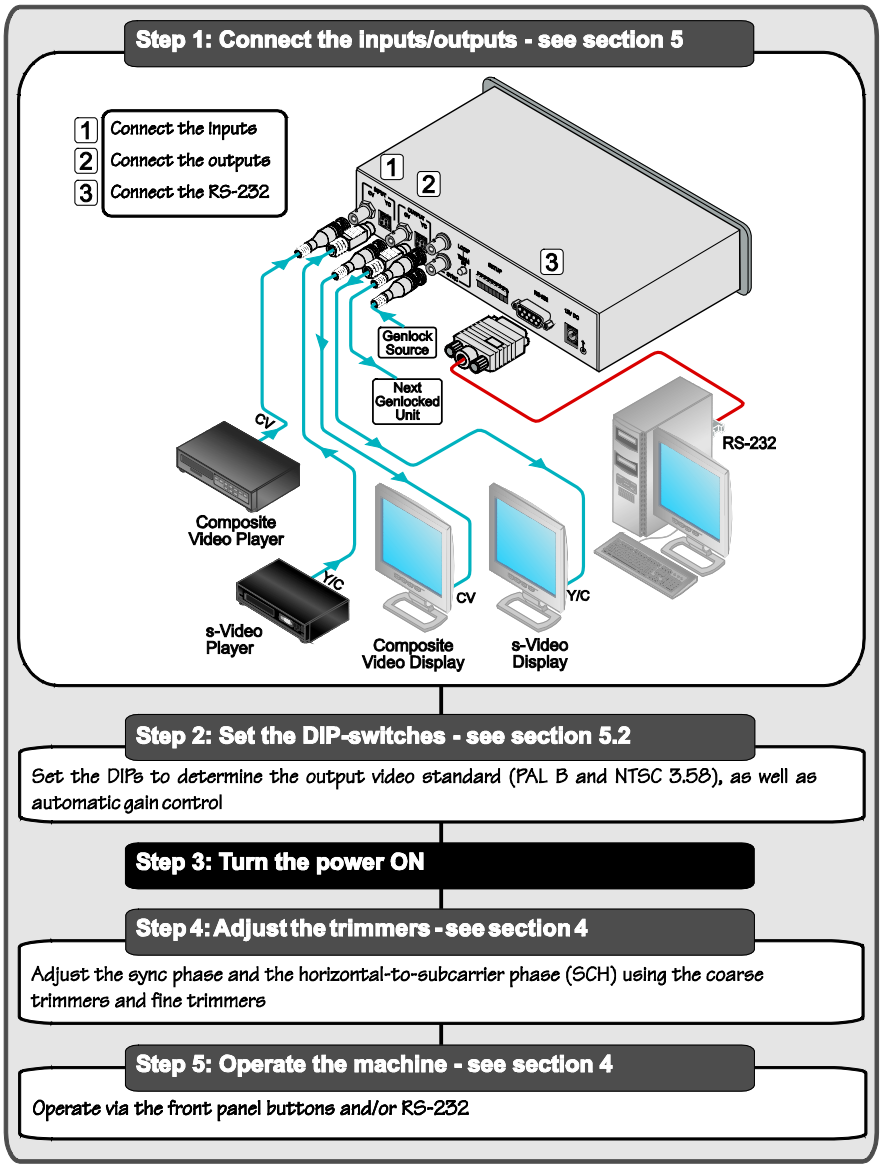
1 GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Matrix Switchers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters; GROUP 11: Sierra Products

2 Download up-to-date Kramer user manuals from our Web site at http://www.kramerelectronics.com

3 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.



3 Overview

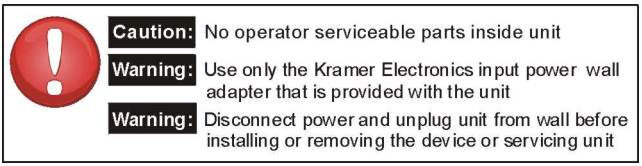
The Kramer **FC-400** is a format converter and TBC. The **FC-400** accepts one input: Composite video or[1] s-Video, and outputs time-base corrected composite video and s-Video. The output may be genlocked to an external reference, or synchronized to the high precision reference timing generator of the **FC-400**.

The **FC-400** features:

- Coarse and fine trimmers for adjusting the sync phase and the horizontal-to-subcarrier phase (SCH)
- Buttons for input selection (CV and Y/C), genlock, and panel lock
- Output video standard selection (PAL B and NTSC 3.58) via the DIP-switches, as well as automatic gain control
  Note: the **FC-400** does not convert between video standards
- Control via the front panel buttons; and remotely, by RS-232 serial commands transmitted by a touch screen system, PC, or other serial controller
- A desktop-sized enclosure and 12V DC power

To achieve the best performance:

- Use only good quality connection cables[2] to avoid interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables).
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **FC-400** away from moisture, excessive sunlight and dust



1 The input is selected by pressing the appropriate input selector button

2 Available from Kramer Electronics on our Web site at http://www.kramerelectronics.com

4 Your FC-400 Time Base Corrector/Synchronizer

Figure 1, Table 1, and Table 2 define the **FC-400** *Time Base Corrector/Synchronizer*.

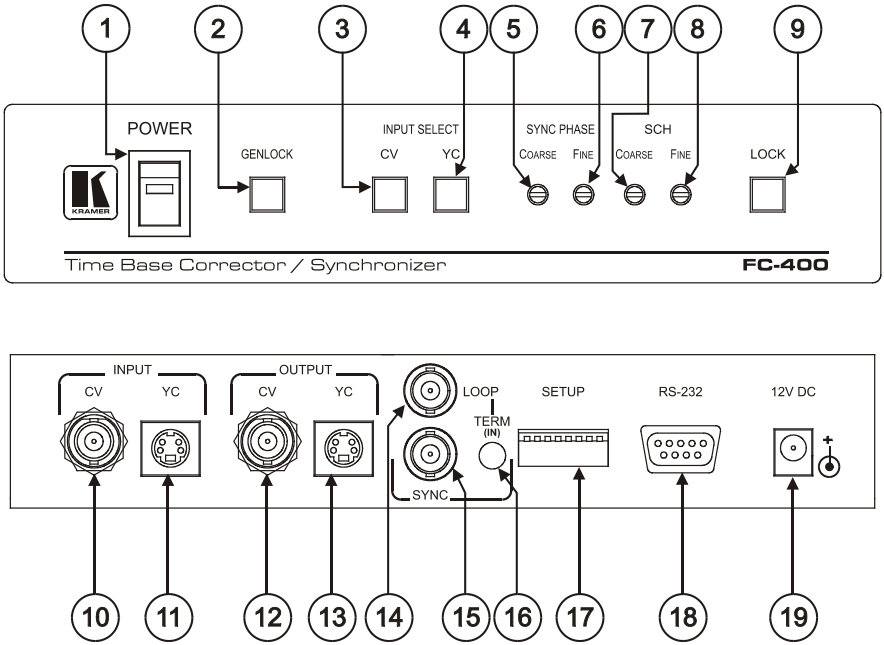


Figure 1: FC-400 Time Base Corrector/Synchronizer

Table 1: Front Panel FC-400 Time Base Corrector/Synchronizer

#	Feature		Function
1	*POWER* Switch		Illuminated switch for turning the unit ON or OFF
2	*GENLOCK* Button		Press to enable GENLOCK operation
3	*INPUT SELECT*	CV Button	Selects the composite video source for conversion
4		Y/C Button	Selects the s-Video source for conversion
5	*SYNC PHASE*	*COARSE* Trimmer	Adjusts[1] the sync phase level
6		*FINE* Trimmer	
7	*SCH*	*COARSE* Trimmer	Adjusts[1] the horizontal-to-subcarrier phase level
8		*FINE* Trimmer	
9	*LOCK* Button[2]		Disengages the front panel buttons

1 Insert a screwdriver into the small hole and carefully rotate it, trimming the level

2 Press for about 2 seconds to lock/unlock the panel

Table 2: Rear Panel FC-400 Time Base Corrector/Synchronizer

#	Feature	Function
10	*CV* INPUT BNC Connector	Connects to the composite video source
11	*Y/C* INPUT 4-pin Connector	Connects to the s-Video (Y/C) source
12	*CV* OUTPUT BNC Connector	Connects to the composite video acceptor
13	*Y/C* OUTPUT 4-pin Connector	Connects to the s-Video (Y/C) acceptor
14	*LOOP* BNC Connector	Connects to the next genlocked unit
15	*SYNC* BNC Connector	Connects to the genlock source
16	*TERM* Button	Press to terminate the genlock source (75Ω) or release for looping[1]
17	*SETUP* DIP-switches	DIP-switches setup (see section 5.2)
18	*RS-232* Port	Connects to the PC or the remote controller
19	12V DC	+12V DC connector for powering the unit

5 Connecting Your FC-400 Time Base Corrector/Synchronizer

You can use your **FC-400** to convert a composite video or an s-Video signal to composite video and[2] s-Video signals, as the example in Figure 2 illustrates.

To connect the **FC-400** *Time Base Corrector/Synchronizer*, do the following[3]:

1. Connect a composite video source (for example, a composite video player) to the CV INPUT BNC connector.
2. Connect an s-Video source (for example, an s-Video player) to the Y/C INPUT 4-pin connector.
3. Connect the CV BNC OUTPUT connector to a composite video acceptor (for example, a composite video display), and[2] connect the YC 4-pin OUTPUT connector to an s-Video acceptor (for example, an s-Video video display).
4. Connect the LOOP BNC connector to the next **FC-400** genlocked unit (if required) and release the Term button for looping[4].
5. Connect a genlock source to the SYNC BNC connector.
6. Connect a PC or other controller, if required (see section 5.1).
7. Set the DIP-switches (see section 5.2).
8. Connect the 12V DC power adapter (wall transformer) to the 12V DC socket and connect the transformer to the mains electricity.

1 Push in to terminate the input. Release when the input extends to another unit. When a unit is connected via the LOOP connector, the TERM button should be released

2 When only one output is required, connect that output of the FC-400, and leave the other output unconnected

3 Switch OFF the power on each device before connecting it to your FC-400. After connecting your FC-400, switch on its power and then switch on the power on each device

4 Pushed in terminates the input. Release when the input extends to another unit

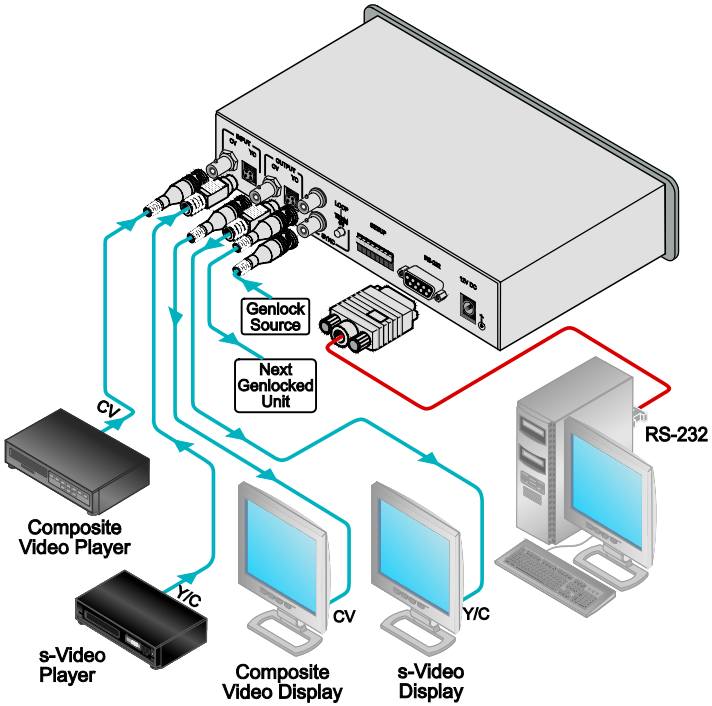


Figure 2: Connecting the FC-400 Time Base Corrector/Synchronizer

5.1 Connecting the FC-400 via RS-232

You can connect to the unit via a crossed RS-232 connection, using for example, a PC. A crossed cable or null-modem is required as shown in method A and B respectively. If a shielded cable is used, connect the shield to pin 5.

Method A (Figure 3)—Connect the RS-232 9-pin D-sub port on the unit via a crossed cable (pin 2 to pin 3, pin 3 to pin 2, and pin 5 to pin 5) to the RS-232 9-pin D-sub port on the PC.

Note: There is no need to connect any other pins.

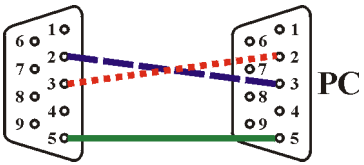


Figure 3: Crossed Cable RS-232 Connection

Hardware flow control is not required for this unit. In the rare case where a controller requires hardware flow control, short pin 1 to 7 and 8, and pin 4 to 6 on the controller side.

Method B (Figure 4)—Connect the RS-232 9-pin D-sub port on the unit via a straight (flat) cable to the null-modem adapter, and connect the null-modem adapter to the RS-232 9-pin D-sub port on the PC. The straight cable usually contains all nine wires for a full connection of the D-sub connector. Because the null-modem adapter (which already includes the flow control jumpering described in Method A above) only requires pins 2, 3 and 5 to be connected, you are free to decide whether to connect only these 3 pins or all 9 pins.

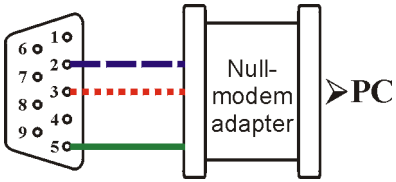


Figure 4: Straight Cable RS-232 Connection with a Null Modem Adapter

5.2 DIP-Switch Settings

*The **FC-400** DIP-switch settings are defined in Table 3 and Table 4:*

Table 3: DIP-switch Settings

DIP-switch		Set as follows:
1	NU	Reserved for future use
2	Output Standard	ON for PAL; OFF for NTSC
3	AGC	ON for enabling automatic gain control OFF for disabling automatic gain control
4	ADDR (RS-232)	For selecting one of two machine addresses (defining the machine address for control)
5, 6, 7	Test Signals	The status of these DIP-switches defines the test signal: see Table 4
8	Pedestal	ON for pedestal of output signal (7.5 IRE offset selection for NTSC) OFF for no pedestal

Table 4: Test Signals

FUNCTION	DIP 5	DIP 6	DIP 7
Black Screen[1]	OFF	OFF	OFF
Blue Screen[1]	OFF	OFF	ON
Horizontal 75% Bar Generator	OFF	ON	OFF
Pulse and Bar Generator	OFF	ON	ON
75% Bar Generator	ON	OFF	OFF
75% Bar Generator	ON	OFF	ON
Split 75% Bar Generator	ON	ON	OFF
Multiburst 5.8 Generator	ON	ON	ON

6 Technical Specifications

Table 5 includes the technical specifications:

Table 5: Technical Specifications[2] of the FC-400 Time Base Corrector/Synchronizer

INPUTS:	1 composite video: 1Vpp/75Ω on a BNC connector; 1 YC: 1Vpp/75Ω (Y), 0.3Vpp/75Ω (C) on a 4-pin connector; 1 SYNC (genlock): looped 75Ω/Hi-Z on BNC connectors
OUTPUTS:	1 composite video: 1Vpp/75Ω on a BNC connector; 1 YC: 1 Vpp/75Ω (Y), 0.3Vpp/75Ω (C) on a 4-pin connector
VIDEO STANDARDS:	PAL B and NTSC 3.58
DIGITAL RESOLUTION:	10 bits
BANDWIDTH (-0.5dB):	5.5MHz
DIFF. GAIN:	1%
DIFF. PHASE:	1Deg.
K-FACTOR:	1%
S/N RATIO:	63dB
LUMA NON-LINEARITY:	1%
CHROMA/LUMA DELAY:	1ns
CONTROLS:	Front-panel and RS-232; SCH phase, SYNC phase, panel lock
POWER SOURCE:	12V DC 270mA
DIMENSIONS:	22cm x 18cm x 4.5cm (8.6” x 7” x 1.8”), W, D, H.
WEIGHT:	1.2 kg. (2.65 lbs.) approx.
ACCESSORIES:	Power supply, null-modem adapter
OPTIONS:	RK-1 19" rack adapter

1 Displayed when no signal is found

2 Specifications are subject to change without notice

7 Communication Protocol

1. RS-232 using NULL MODEM at 9600 baud.
2. Command structure is 4 bytes.

First byte options:

	DEC	HEX	
1	128	80	RESET VIDEO
2	160	A0	READ PARAMETER
3	161	A1	WRITE PARAMETER
4	189	BD	IDENTIFY MACHINE
5	33	21	Set (for the rest of commands)

Second byte is the command type (7 bits + 80 HEX).
Third byte is the parameter value (7 bits + 80 HEX).
Byte 4 is the machine address: can be 98 or 99 (in HEX).

Note:

1. When working in HEX, add 80 to the values in the table.
2. When working in DEC, add 128 to the values in the table.
3. All values in the table are in DEC.

Byte 2	Command Description	Byte 3 (parameter value)
0	INPUT FORMAT	0 - CV 1 - YC 2 - YUV
1	INPUT_STANDARD	0 - PAL B 1 - PAL N 2 - PAL M 3 - NT 3 4 - NT 4 5 - SEC
21	OUTPUT_STANDARD (Read only)	0 - PAL B 3 - NT 3
22	GENLOCK	0 - OFF 1 - ON
23	PANEL_LOCK	0 - OFF 1 – ON
28	GENLOCK_STAT (Read only)	0 – No genlock 1 – Genlock
32	NO_INPUT_DETECT (Read only)	0 – Input detected 1 – No input signal

First byte = I; Second byte = D; Third byte = E

MACHINE TO PC:

----------MACHINE POWER-UP--------
From machine: I = 0; D = 0; E = 0
I = 33; D = 0; E = INPUT FORMAT
I = 33; D = 22; E = GENLOCK STATUS
I = 33; D = 0; E = PANEL LOCK STATUS

----------CHANGE MADE VIA FRONT PANEL KEYS--------

From machine: I = 33; D = PARAMETER NUMBER; E = PARAMETER

PC TO MACHINE:

----------RESET VIDEO (PSEUDO POWER UP) --------
From PC: I = 0; D = 0; E = 0
From machine: I = 0; D = 0; E = 0

----------PARAMETER READ--------
From PC: I = 32; D = PARAMETER NUMBER; E = 0
From machine: I = 32; D = PARAMETER NUMBER; E = PARAMETER

----------PARAMETER WRITE--------
From PC: I = 33; D = PARAMETER NUMBER; E = PARAMETER
From machine: I = 33; D = PARAMETER NUMBER; E = PARAMETER

----------IDENTIFY MACHINE--------

----------MACHINE NAME--------

From PC: I = 61; D = 1; E = 0
From machine: I = 61; D = MACH. NAME HIGH; E = MACH. NAME LOW

----------SOFTWARE VERSION--------
From PC: I = 61; D = 3; E = 0
From machine: I = 61; D = S/WARE VER. HIGH; E = S/WARE VER. LOW

Examples:

1. Select CV input format: H21 H80 H80 H98.
   Unit response: H61 H80 H80 H98.
2. Reset: H80 H80 H80 H98.

LIMITED WARRANTY

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

HOW LONG IS THE WARRANTY

Labor and parts are warranted for seven years from the date of the first customer purchase.

WHO IS PROTECTED?

Only the first purchase customer may enforce this warranty.

WHAT IS COVERED AND WHAT IS NOT COVERED

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed, or on which the WARRANTY VOID IF TAMPERED sticker has been torn, reattached, removed or otherwise interfered with.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

HOW YOU CAN GET WARRANTY SERVICE

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

LIMITATION OF IMPLIED WARRANTIES

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

EXCLUSION OF DAMAGES

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

NOTE: All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

EN-50081:	"Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry"
EN-50082:	"Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment".
CFR-47:	FCC* Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators"

CAUTION!

- Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- Use the supplied DC power supply to feed power to the machine.
- Please use recommended interconnection cables to connect the machine to other components.

  * FCC and CE approved using STP cable (for twisted pair products)

For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found.
We welcome your questions, comments and feedback.

Safety Warning:
Disconnect the unit from the power supply before opening/servicing.

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P/N: 2900-000159 REV 4