



PIPE & DUCT RECORDING VIDEO BORESCOPE INSPECTION SYSTEM

USER'S MANUAL



DPS16

Please read this manual carefully and thoroughly before using this product.

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INTRODUCTION

Thank you for purchasing General Tools & Instruments' (General's) DPS16 Pipe & Duct Recording Video Borescope Inspection System. Please read this user's manual carefully and thoroughly before using the instrument.

The DPS16 has two components: the H16 Handheld Recording Video Borescope Console and the P16PIP Pipe & Duct Inspection Probe & Reel Set. The H16 is the console of General's DCS1600, DCS1600ART, DCS16HPART and DPS16 video borescope inspection systems.

A thumbwheel on the left side of the H16 allows you to adjust the brightness of the LEDs illuminating the camera at the end of any probe attached to it. The P16PIP probe and reel set included in the DPS16 system is tailored for inspecting water and sewer pipes carrying running water, as well as HVAC ducts.

The H16 also can serve as the console of a general-purpose recording video borescope system with the addition of a compatible probe. See p. 19 for a list and descriptions of six other VGA resolution probes compatible with the H16.

The H16 has three operating modes: Preview, Playback and Menu:

- **In Preview mode**, video framed by the camera's field of view is displayed in real time on the console's LCD. The H16 automatically enters this mode when powered on. A front-panel button allows you to increase the size of a target by 50% (a zoom level of 1.5X) or double it (a zoom level of 2X). The same button allows you to "mirror" video, making it possible to read serial numbers seen and "reversed" by an attached probe with a mirrored viewing tip. The zoom and mirroring functions can be applied at the same time. In Preview mode, real-time video also can be exported through an included video cable to any NTSC- or PAL-format TV monitor with an RCA input jack.

Operating in Preview mode, the H16 also allows you to record inspection videos (at 320 x 240 pixel resolution) and photos (at 640 x 480 pixel resolution) on an included SD memory card by pressing icon-labeled buttons on the console's front panel. The remaining front-panel buttons enable access to Playback and Menu modes.

- **In Playback mode**, you can browse the SD card for saved video and picture files and view the media on the console's LCD or a larger TV monitor. Video clips and photos also can be viewed on a PC in either of two ways: 1) by removing the SD card and plugging it into the computer directly or through a card reader; or 2) by using a supplied cable to connect the H16 to the PC through one of its USB ports. Because videos are saved as .asf files and photos as .jpg files, applications found on most PCs (Microsoft Windows Media Player and Microsoft Office Picture Manager) can open the files. The 4GB SD memory card included in the DPS16 case can store at least 5 hours of video, recorded at an average of 6 Mbytes/minute, in addition to hundreds of photos.
- **In Menu mode**, you use familiar scrolling motions and responses to dialog boxes to navigate a main menu with six submenus. When selected, submenu items execute "housekeeping" functions such as deleting files, setting the date and time, enabling or disabling date and time stamps, choosing any of 27 languages for display indications, selecting an analog video out format and adjusting the console's Auto Power Off trigger.

KEY FEATURES

- Ideal for examining the interior of water pipes, sewer pipes, and HVAC ducts. Especially tailored for 2, 4 and 6 in. I.D. pipes by included probe centering accessories
- 72 ft. (22m) long probe with 1.1 in. (28mm) diameter camera head
- Eight super-bright white LEDs give probe 640 x 480 pixel (VGA) resolution; superior optics yield excellent depth of field of 0.4 in. (10mm) to infinity
- Probe is water-tight to IP68 standard (depth of 33 ft./10m) and flexible enough to make two or more (depending on conditions inside the pipe) 90° bends in a 1.6 in. (40mm) I.D. pipe
- Stainless steel camera head is immune to bathroom toilet cleaner, pipe and drain cleaning chemicals, gasoline, brake/transmission fluid and machine oil
- Steel probe reel is sturdy and dust-tight to IP65 standard. Reel works vertically or horizontally and includes IP55-rated probe length counter and bracket for H16 (DCS1600) console
- 3.5 in. diagonal color LCD for viewing probe video in real time and saved video and pictures later
- Compatible with six other VGA resolution camera-tipped probes from General (see p. 19)
- Thumbwheel for adjusting brightness of camera lighting
- Familiar menu-driven user interface for viewing and recording videos and photos on standard SD memory card (4GB card included) and playing back media on console, TV or PC
- Rechargeable battery with 4-hour capacity
- 1-year limited warranty

SAFETY INSTRUCTIONS

CAUTION!

Never insert any probe attached to the H16 into any structure or space known or suspected to contain live electric wiring

- The DPS16 and H16 are intended for industrial applications only. Do not use a compatible probe for human or any other biological inspections.
- Never insert an attached probe into any flammable gas or liquid (including fuels in an oil, gasoline or diesel tank)
- Do not disassemble the H16 console or P16PIP probe & reel set. Doing so creates a potentially fatal electrical hazard (and voids the warranty as well).

WHAT'S IN THE CASE

The DPS16 comes in a custom hard plastic protective carrying case. Inside the case are:

- The H16 console. The console integrates an LCD monitor, a connector for a high-performance camera-tipped probe from General, and front-panel controls for controlling the camera's lights, adjusting system parameters, and recording and playing back videos and photos captured by an attached probe.
- The P16PIP Pipe & Duct Inspection Probe & Reel Set, including a probe length counter
- One spherical metal ring for centering the probe in 2 in. I.D. pipes
- One brush set for centering the probe in 4 in. I.D. pipes
- One brush set for centering the probe in 6 in. I.D. pipes
- A 5/64-in. Allen wrench for attaching the 2 in. probe centering ring
- A plastic bag containing five spare 5/64-in. Allen screws
- A 4GB SD memory card for the H16
- An AC adaptor/battery charger for a 110/220VAC supply. The adaptor has a 5.5VDC, center-positive output plug.
- An analog video cable for connecting the H16 to a TV monitor. The cable has RCA plugs at one end and a mini-stereo plug at the other end.
- A USB cable with a mini-USB plug on one end and a full-size USB plug on the other end. It can be used to display the contents of the SD card on a computer directly, without removing the card from the H16 console.
- A package of desiccant
- (2) "AAA" batteries for the probe length counter
- This user's manual

PRODUCT OVERVIEW

Fig. 1 below shows the names and locations of all of the controls, ports and jacks of the H16. Table 1 on the next page details how the function of each front-panel button changes with the console's operating mode. Familiarize yourself with the labels, positions and functions of all buttons and connectors before moving on to the Setup Instructions and Operating Instructions.

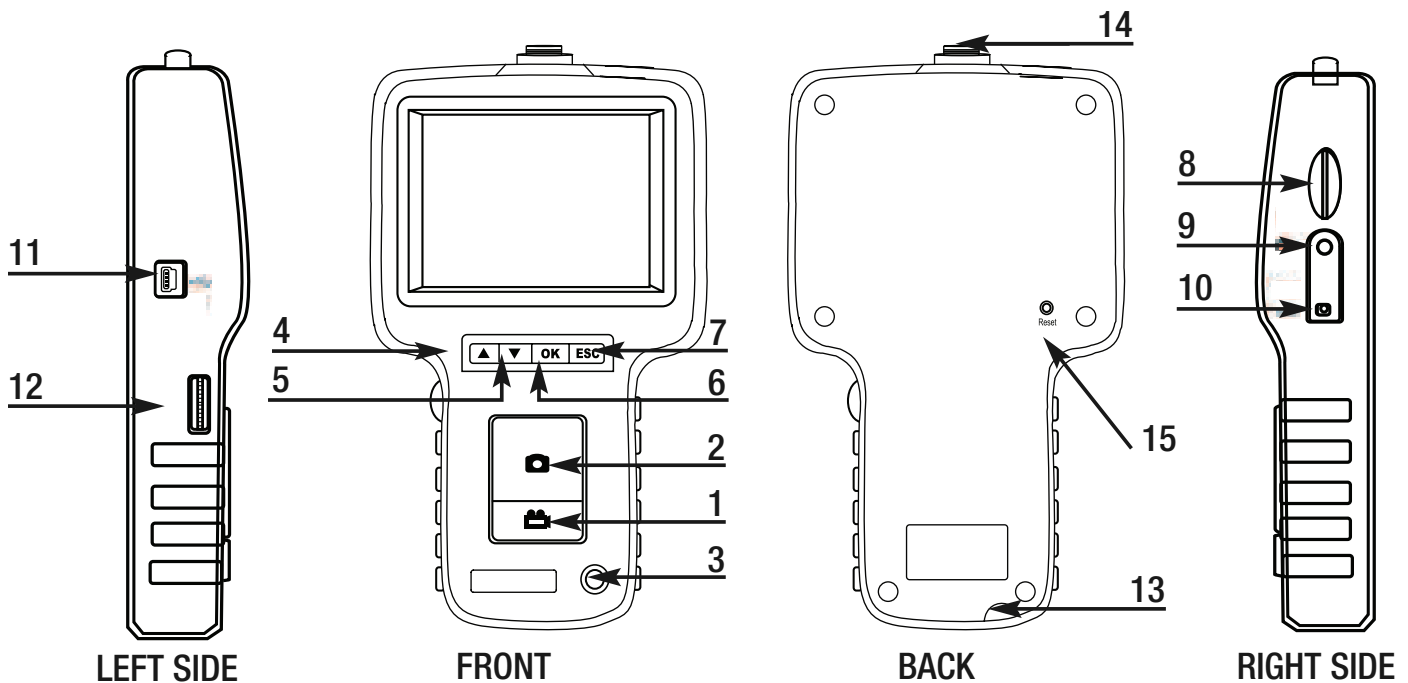


Fig. 1. The controls, ports and jacks of the H16

- | | | | | |
|---|---|-----------------------------------|----|----------------------------------|
| 1 |  | Start/Stop Video Recording Button | 10 | AC Adaptor Jack |
| 2 |  | Snapshot Button | 11 | Mini-USB Jack |
| 3 |  | Power On/Off Button | 12 | Brightness Adjustment Thumbwheel |
| 4 |  | Previous Video/Photo Button | 13 | Hanger Hole |
| 5 |  | Next Video/Photo Button | 14 | Probe Connector |
| 6 | OK | OK Button | 15 | Reset Button |
| 7 | ESC | Escape/Zoom/Mirror Button | | |
| 8 | | SD Card Socket | | |
| 9 | | TV Out Jack | | |

Table 1. The H16's multi-function buttons

Button Label	In Preview Mode	In Playback Mode	In Menu Mode
▲	Switches to Playback mode	Selects next-oldest video or photo	Moves up one line; when setting DATE/TIME , moves back one field
▼	Switches to Playback mode	Selects next-newest video or photo	Moves down one line; when setting DATE/TIME , moves ahead one field
OK	Switches to Menu mode	Pauses/plays video clip	Executes highlighted command
ESC	Pressed briefly , enlarges target by 50% (zooms 1.5X) or by 100% (zooms 2X); Pressed and held , mirrors video	Switches to Preview mode	Switches to Preview mode
	Takes a picture (stores .jpg photo on SD card)	N/A	When setting DATE/TIME , increases value by one unit per button press. Also used to enable/disable superimposition of date and time stamps on photo/video displays.
	Starts/stops recording an .avi video on SD card	Enables deletion of any individual photo or video	When setting DATE/TIME , decreases value by one unit per button pres

Fig. 2 at right shows the key components of the P16PIP. Fig. 3 on the next page details the anatomy of the camera-tipped end of the probe. Familiarize yourself with the names and positions of these components before moving on to the Setup and Operating Instructions.

Fig. 2. The key components of the P16PIP

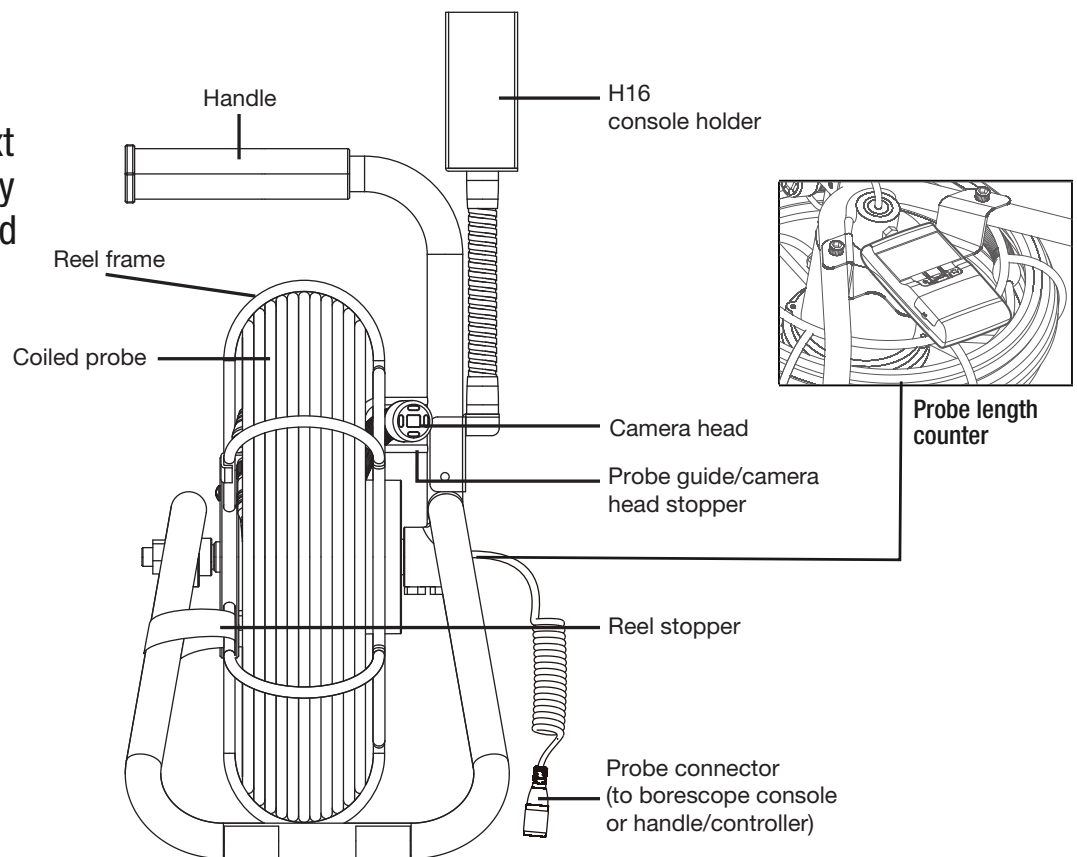
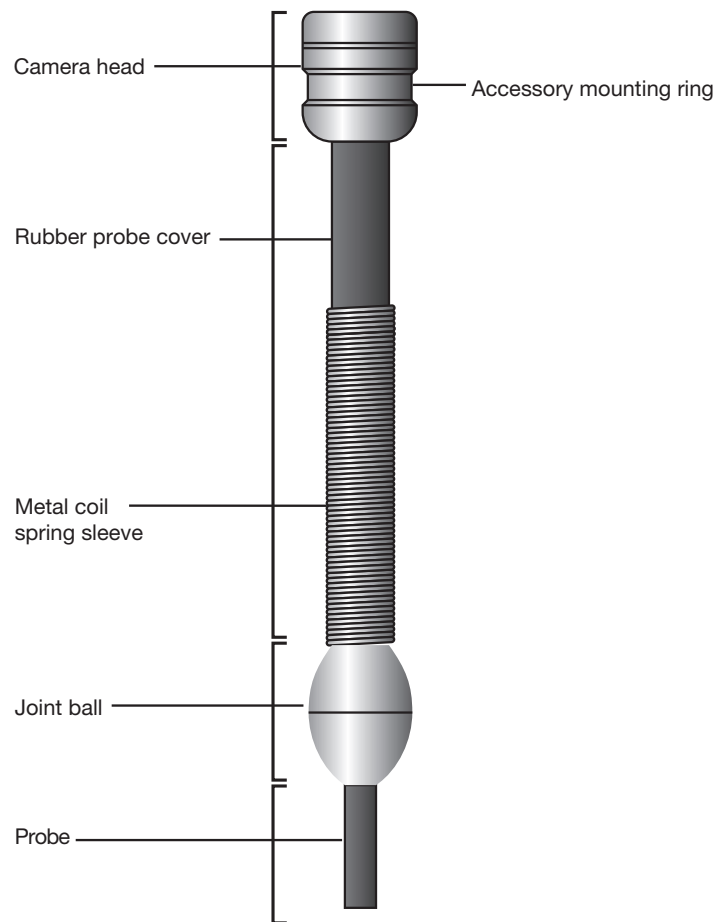


Fig. 3. Structures near the camera-tipped end of the probe



SETUP INSTRUCTIONS

ATTACH PROBE TO CONSOLE

Attach the P16PIP to the H16 by 1) inserting the H16 into the bracket at the top of the P16PIP and 2) plugging the P16PIP's probe connector (see bottom of Fig. 2 on the previous page) into the connector at the top of the console (Fig. 1, Callout 14). The connectors mate in only one way, when the two dots—one on the console's connector and the other under the collar at the end of the probe—are aligned. After you have lined up the dots, push the two connectors together so the alignment keys on opposite sides of the probe's connector slide over the flats of the console's connector. Slide the collar on the probe's connector forward and tighten the collar by turning it clockwise.

You can now remove the protective rubber cap from the camera-tipped end of the probe. It is good practice to replace the cap whenever the probe will not be used for a while. Now is also the time to peel away the plastic film that protects the console's LCD.

To disconnect the probe from the console, turn the collar counterclockwise and pull the probe straight out and away.

CHARGE CONSOLE BATTERY

To power on for the first time, plug one end of the supplied AC adaptor/battery charger into a 110VAC outlet. Then swing the black rubber protective flap away from the right side of the H16 to expose the AC adaptor jack (Fig. 1, Callout 10). Insert the cylindrical plug at the end of the adaptor/charger cable into the AC adaptor jack. This will begin charging the console's battery.

Press the  button on the H16 console and hold it for at least five seconds. The LCD will illuminate. It will first show a color-bar test pattern, and then (briefly) a battery icon at lower left, superimposed on video being captured in real time by the camera at the end of the probe.

Use the thumbwheel on the left side of the console (Fig. 1, Callout 12) to adjust the intensity of the camera's lighting. In a brightly lit room, moving the thumbwheel has a big effect on the brightness of the LEDs at the tip of the probe, but a much smaller effect on the brightness of video on the LCD. The on-screen impact of changing brightness is more pronounced in dark environments.

To power off the H16, press the  button and hold it for at least five seconds.

It will take several hours to fully charge the H16's Lithium-ion battery the first time. **You cannot replace the battery**, which can only be replaced by General-authorized service personnel.

Do not open the case in an attempt to change the battery yourself. Doing so creates a potentially fatal electrical hazard (and voids the warranty as well) with the AC adaptor plugged in.

With proper care (charging the battery often, and never allowing it to completely discharge), you can expect the H16's battery to last four or five years. A fully charged battery should power at least four hours of operation.

INSERT SD CARD

This step enables the H16 to store video clips and photos. Remove the supplied 4GB SD memory card from its packaging. Discard the packaging, but save the plastic storage case.

Push the SD card into the socket on the right side of the console (Fig. 1, Callout 8). Be sure the card's gold contacts are facing the rear of the unit and enter the socket first. Push in the card until you feel it spring back and you hear a click.

To remove the card later, push it in gently until you hear a click and the card pops out far enough for your fingers to grab.

INSTALL BATTERIES IN PROBE LENGTH COUNTER

1. Lay the P16PIP down horizontally with the probe length counter facing up.
2. Use a small Phillips-head screwdriver to open the battery compartment cover at the bottom front of the probe length counter.
3. Set and cover and screw aside, and take care not to lose the small screw.
4. Install the two included "AAA" batteries in the compartment, using the polarity marks inside it as a guide.
5. Replace the cover and secure it by replacing and tightening the small Phillips-head screw.

OPERATING INSTRUCTIONS – H16

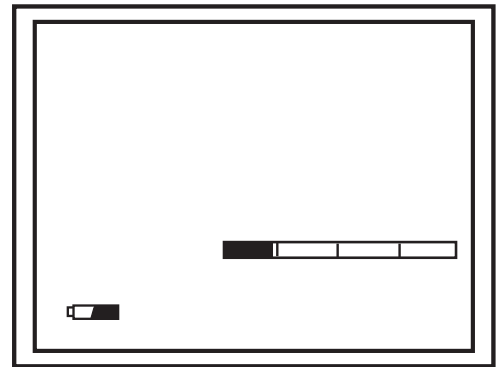
VIEWING LIVE VIDEO ON THE CONSOLE

While the battery charges, General recommends becoming familiar with the H16's controls, indicators and menu options in Preview mode, before taking the unit out into the field. The H16 operates the same way whether powered by its battery or the AC adaptor.

To begin, power off the unit by pressing and holding the  button. Then press and hold the button again to power the console back on. Each time the console is powered on, the screen shown below right will appear briefly. The battery icon at left will be in white and the bars at right will be in green, superimposed on live video captured by the camera probe. Together, the number of bars and the color of the icon represent the H16's two "vital signs"—available memory capacity and battery charge, respectively.

The number of filled-in bars at the right of the screen reflects the amount of data currently stored on the SD card. A full card would produce four bars. The whiter the  icon at lower left, the higher the current level of battery charge. A completely white icon indicates a fully charged battery.

Next, get used to manipulating your probe. Instructions for using the P16PIP probe and reel can be found beginning on p. 14 of this manual.



Finally, note the dual function of the H16 console's **ESC** button in Preview mode:

- **Press the ESC button briefly** and targets will be enlarged by 50% as the camera's field of view is reduced by that amount. This represents a zoom level of 1.5X. The text **+1.5X** will appear at the lower right of the LCD. Press the **ESC** button briefly again to increase the zoom level to 2X and change the on-screen text to **+2.0X**.
- **Press and hold the ESC button** and video will be mirrored horizontally, as shown in the two photos at right. The effect makes it possible to read text or serial numbers "reversed" by an attached probe with a mirrored viewing tip—by undoing the reversal. An icon of a mirror will appear at the lower right of the LCD to indicate that video is being mirrored.



You can mirror and zoom videos at the same time by pressing the **ESC** button briefly, and then pressing and holding the button.

VIEWING LIVE VIDEO ON A TV MONITOR

The DPS16 comes with a video cable for connecting the console to a TV or TV monitor that uses either the NTSC or PAL analog broadcast standard. By making the connection, you can view live video (or saved videos and pictures) on a screen larger than the H16's.

To implement the connection in hardware, insert the stereo mini-plug of the provided cable into the TV Out jack of the H16 (Fig. 1, Callout 9). Then insert the yellow RCA plug at the other end of the cable into the Video in jack of your TV or TV monitor. Be sure to set the TV input to external video.

Real-time videos shown on an external monitor can be zoomed or mirrored by briefly pressing, or pressing and holding, the **ESC** button, just as they can when viewed on the H16's LCD.

To activate the connection in software and begin exporting H16 video to a TV, refer to the instructions for the **TV SYSTEM** and **AV OUTPUT** lines in the "Navigating the Main Menu" section of this manual.

If you want to experience the quality of live video captured by the P16PIP now, skip ahead to the "Operating Instructions – P16PIP" section of this manual. You can always return to the unread sections on recording and playing back videos and pictures, accessing SD card menu content, and navigating the main menu later.

TAKING PICTURES AND RECORDING VIDEOS

To take a picture, make sure the H16 is in Preview mode (with live video appearing on the LCD) and press the  button. Doing so creates a .jpg file of the frame being displayed at that moment and stores it on the SD card. The assigned file name (**PICT0001**, for example), briefly appears in orange at the bottom of the screen to confirm that a picture was taken. The H16 automatically returns to Preview mode after taking a picture.

To record a video, make sure the H16 is in Preview mode and press the  button. Doing so begins creating an .avi video file (with MPEG-4 compression) for storage on the SD card. A red dot and a red running clock appear at the lower left of the screen to confirm that a recording is in progress, and they remain there for the duration of the video. To stop recording, press the  button again. This returns the H16 to Preview mode.

While a video is being recorded, all console buttons other than the  and **ESC** buttons are disabled. Pressing the **ESC** button briefly activates the zoom function; pressing and holding it activates the mirror function. The zoom and mirror effects are both shown on the LCD and included in the recording of video clips.

The H16 will be unable to store videos and pictures if its SD memory card is full, write-protected or damaged. When the instrument senses any of these conditions, it will superimpose the word **FULL** on the screen in Preview mode. To remedy the situation, either replace the full SD card by another card with spare capacity, or delete files individually or in bulk. Instructions for deleting files can be found later in this user's manual.

VIEWING PHOTOS AND PLAYING BACK VIDEOS

To view a picture or play back a video (or more than one picture or video) on the H16's LCD or a TV monitor, switch the unit out of Preview mode and into Playback mode by pressing the  or  button. In Playback mode, pressing the  button repeatedly recalls all photos and videos from memory in the reverse order in which they were created and stored (in other words, the newest first and the oldest last). Each press of the  button selects the next oldest picture or video. When a video clip is next in line (cued up), an icon of a film strip and the duration of the clip appear at the upper left of the display. As each picture is displayed and each video is cued up, its file name is

shown at the bottom of the screen and its position in the storage queue is shown at upper right. For example, the 10th file of the 35 currently stored on the SD card would be indicated by 10/35. To play a video that has been cued up, press the **OK** button. A ► icon and a running clock will appear on-screen below the playing video. To pause the video, press the **OK** button. This replaces ► by ⏸. To resume playing the video clip, press the **OK** button again.

While each photo and video is on-screen, pressing the  button gives you the option to delete its file. Pressing the button superimposes the word **DELETE** at the lower left of the screen and **[OK]** at the lower right. Press **OK** to delete the file.

Whenever **DELETE** and **[OK]** are shown on-screen, you can use the ▲ and ▼ buttons to navigate to other individual stored files for the purpose of deleting them. To exit the **DELETE** screen, press the **ESC** button.

ACCESSING SD CARD CONTENT

Photos and videos stored on the SD card also can be viewed on a PC. If your computer has an SD card slot, you can remove the card from the H16 and plug it directly into a PC. If your PC does not have an SD card slot, you can purchase a USB SD card reader (Part No. SDRD1) from General.

If you choose to remove the SD card from the console and plug it into a PC, either directly or through a card reader, remember to eject the card from the PC once you are done viewing (and/or copying) the files it contains. Depending on your PC's startup settings, your computer may fail to restart following its next shutdown if the SD card remains inserted. The PC's operating system may try to reboot from the SD card and be unable to do so.

Another option for viewing inspection video and photos on a PC is to use the supplied USB cable to link to the computer. The first time you connect the H16 to a computer in this way, the H16 screen will go dark (except for the white text **MASS-STORAGE MODE**) and you will be prompted that "Driver Software is Being Installed." The final Driver Software Installation dialog box advises that "Your device is ready to use." Your PC's AutoPlay function will then produce a screen pop to notify you that a removable disk has been connected. Double-clicking "Open folder to view files" reveals the contents of that disk to be a folder named "DCIM". Double-clicking the DCIM folder icon reveals a subfolder named "100MEDIA" that contains all the videos and pictures you have saved on the SD card.

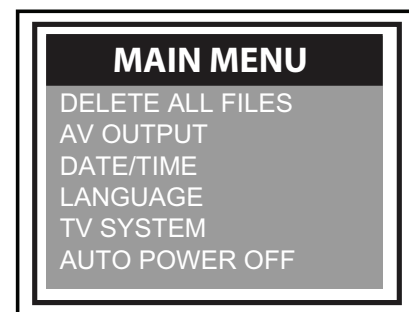
While the USB cable is attached, however, you cannot view real-time videos on the H16's LCD, a TV monitor, or your computer. You cannot even record videos or take photos and store them on the SD card. Disconnecting the cable returns the H16 to Preview mode. The only benefit of using the USB cable is that you do not have to remove the SD card to view its content on a PC.

NAVIGATING THE MAIN MENU

The main menu of the H16 provides access to the following housekeeping and operational functions:

- Bulk and individual file erasure
- Video exporting
- Setting the date and time
- Choosing a display language
- Selecting a TV format
- Enabling/disabling and adjusting the Auto Power Off function

Menu mode has a hierarchical structure and uses prompts and dialog boxes familiar to anyone who has used an Automated Teller Machine (ATM). The only constraint on using the menu is your own response speed. **If no selection is made within 2-1/2 minutes following Menu mode startup, the console will automatically revert to Preview mode.** The same time constraint applies to selections within submenus. **If you do not respond to a prompt (indicated by a flashing word or line of text) within 2-1/2 minutes, the H16 will switch back to Preview mode**—its default operating state.



To access the main menu, press the **OK** button to enter Menu mode. Doing so brings up the screen shown at right.

To navigate the main menu, use the **▲** and **▼** buttons to move up and down until the parameter you wish to change is highlighted in red. Then push the **OK** button to select it and call up its submenu.

The **DELETE ALL** line gives you two options (yes and no) that can be selected using the **▲** and **▼** buttons. The sequence is similar to the previously described procedure for deleting an individual photo or video.

The **AV OUTPUT** line allows you to send the real-time video stream shown on the display unit out through the unit's TV out jack to an NTSC or PAL TV monitor. The H16's display will turn black until you select this option again. Before activating this function, make the physical connection described in the "Viewing Live Video on a TV Monitor" section. If you have forgotten to make the connection, you will be prompted "**NO AVOUT CABLE**" when you attempt to activate this function.

The **DATE/TIME** line allows you to set the H16's calendar and clock. Doing so is necessary only if you wish to keep track of your photo and video files by date and time.

When **DATE/TIME** is selected, the first screen that appears shows the year in red. To decrease the value by one, press the **⏮** button. To increase the value by one, press the **⏭** button. Once you have set the year, advance to the next field—the month—by pressing the **▼** button. Set the month as you did the year, by using the **▲** and **▼** buttons to increase or decrease the value by one unit per button press. Repeat this process until all six date and time fields have been set. Then push the **OK** button to save the settings. To back up from any field to the previous field, press the **▲** button.

The lower line of the **DATE/TIME** screen allows you to choose whether or not to superimpose the date and time on the display in Preview mode. To always superimpose the date and time, navigate down to the lower line until the word **YES** to the right of the word **DISPLAY** is shown in red. Press the **OK** button to save the setting. To NOT superimpose the date and time, when **YES** is shown in red press the **⏮** button to change **YES** to **NO**. Then press the **OK** button to save the setting.

The **LANGUAGE** line of the main menu allows you to view the main menu, as well as the **DELETE** screens for individual photos and videos, in any of 27 languages (see the Specifications section on page 16 for a complete list). Use the **▲** and **▼** buttons to navigate to the language you wish to use and then push the **OK** button.

The **TV SYSTEM** line enables you to choose either **NTSC** or **PAL** formatting of the videos you export to a TV monitor. Press either the ▲ and ▼ button to make your choice and then push the **OK** button to save the setting.

The **AUTO POWER OFF** of the main menu is not visible on the screen that first appears after you press the **OK** button to put the H16 into Menu mode. To show the line, scroll down past the **TV SYSTEM** line. When the **AUTO POWER OFF** line appears, press the **OK** button.

By default, the **AUTO POWER OFF** function of the H16 is disabled. To enable it, and to choose how quickly to power off the instrument following a period of inactivity, navigate to one of the four options (5, 10, 15 or 30 minutes) and press the **OK** button when the duration you prefer is highlighted in red. To re-disable the function later, enter Menu mode, scroll down to the **AUTO POWER OFF** line, press the **OK** button, select **OFF** and press the **OK** button again to save the setting.

OPERATING INSTRUCTIONS - P16PIP

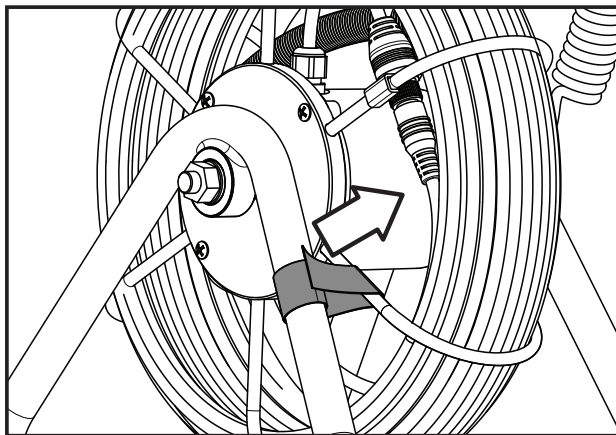
Before inspecting a pipe, determine its inner diameter. Then determine whether that diameter matches the diameter of any of the three included probe-centering accessories: 2, 4 or 6 inches. If your pipe is one of these three sizes, attaching the correct accessory will keep the camera head in the center of the pipe as you push the probe forward. A centered probe will be easier to push forward and produce higher-quality videos and photos as well.

If the inner diameter of your pipe is *not* 2, 4 or 6 in., you can still use the probe to good effect without the benefit of a probe-centering accessory. You may have to exert a bit more effort to keep the camera head from getting hung up on the pipe's sidewalls as you push the probe forward. That is more likely if you use the probe to inspect large pipes or rectangular ducts. In such situations, friction will often cause the camera head to “tuck under” the probe as you push it forward, producing a rear-facing dynamic view of the pipe's interior. When you begin to reel in the probe, however, the metal coil spring sleeve (see Fig. 3 on p. 8) will free the camera head and point it forward. Videos and photos captured during this “return” trip can be just as valuable as forward-facing evidence.

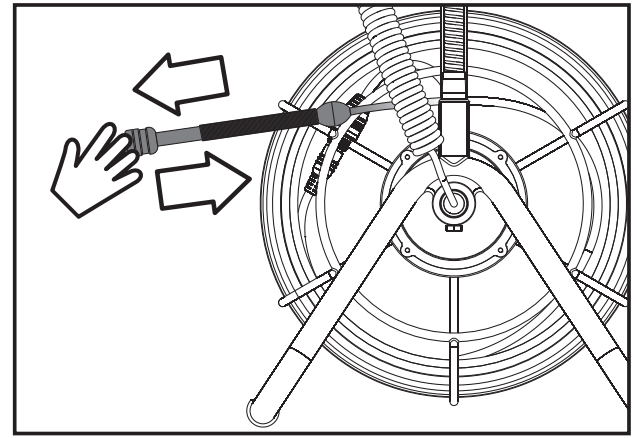
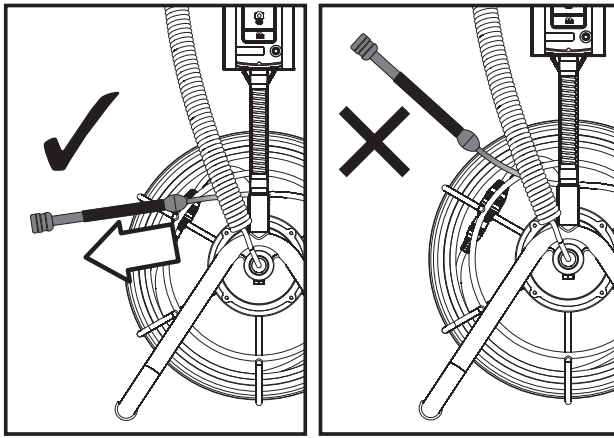
ATTACHING AN ACCESSORY

Before attaching any of the three probe-centering accessories to the probe, “play out” a few feet of the probe from the reel. To do so, first “unlock” the reel by separating (opening) the Velcro closure called the Reel stopper (see Fig. 2 on p. 7 and figure at right).

Once the reel is free to move, grab the probe below the camera head and begin pulling it horizontally, rather than vertically, as shown in the left figure at the top of the next page.

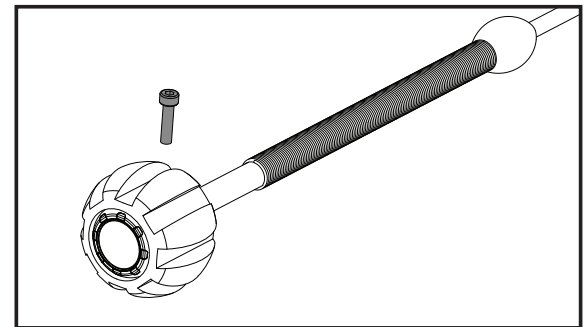
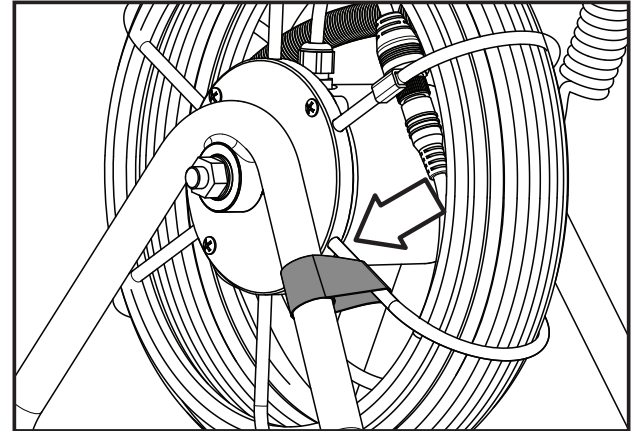


Play out just enough probe for the Joint ball to pass the Probe guide/camera head stopper (see Fig. 2). Then—if this is the first use of the P16PIP or its first use in months—pull and push the end of the probe back and forth a few times (see right figure at the top of the next page) to reduce any friction binding the reel's stationary and moving parts.

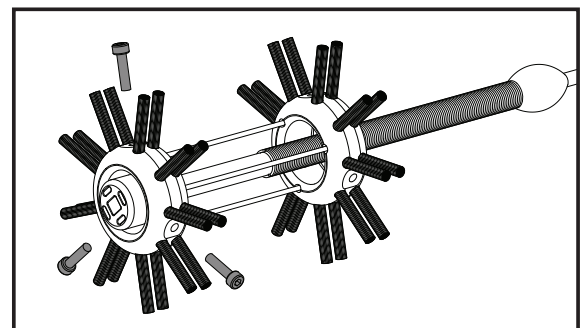
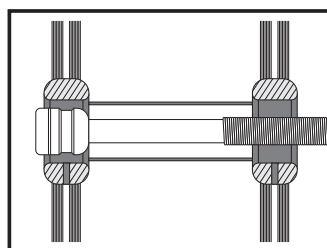
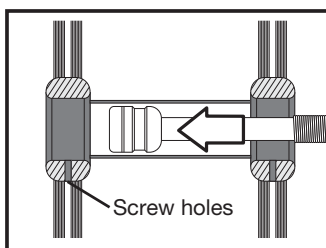


Once you have played out a few feet of probe, lock the reel by fastening the Velcro closure around the reel frame, as shown at right.

You can now attach the 2 in. spherical ring, the 4 in. brush set or the 6 in. brush set to the probe tip. **To attach the ring**, slide its slightly larger open end over the camera head (it fits only one way) until the head protrudes about 1/8 in. past the ring's other opening. In this position, the ring's Allen set screw will line up with the Accessory mounting ring of the camera head (see Fig. 3). Secure the ring to the head by using the included Allen wrench to tighten the screw, as shown at right.



To attach either probe-centering brush set, identify the end with three set screws. Passing the camera head through the *other* end first, slide the probe through the brush set until the camera head protrudes 1/8 in. past the end with the set screws (see figures below). In this position, the three set screws will line up with the head's Accessory mounting ring. Secure the brush set to the head by hand-tightening the screws.



USING THE PROBE LENGTH COUNTER

The probe length counter on the front of the P16PIP can help you gauge the position of the camera head as you feed the 72 ft. long probe into a pipe or duct.

To power on the counter, press and hold the  button for at least 3 seconds.

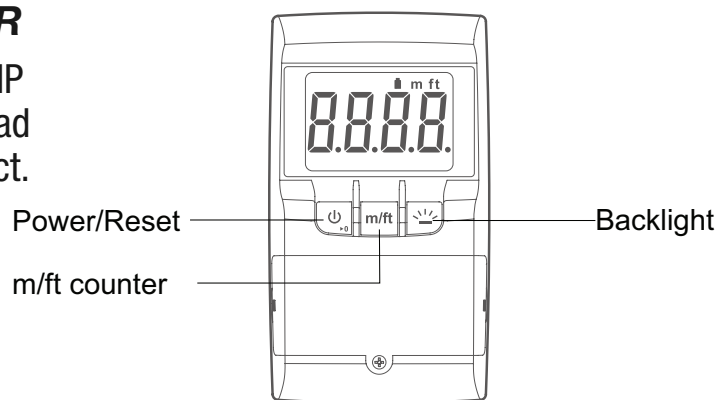
The counter's default measurement unit is meters. **To switch to feet**, press the **m/ft** button.

To reset the counter to 0.0, press (but do not hold) the  button.

To backlight the LCD for 10 seconds, press the  button.

The probe length counter will automatically power itself off if no buttons are pressed during any period of one hour.

When a "Low Battery" icon appears on the LCD, change the two "AAA" batteries that power the counter, following the instructions on page 9.



SPECIFICATIONS

CONSOLE

Display Type	Color TFT LCD
Display Size	3.5 in (89mm) diagonal
Display Resolution	320 by 240 pixels (QVGA)
Video Recording Resolution	320 x 240 pixels (QVGA)
Video File Format	.avi
Photo Recording Resolution	640 x 480 pixels (VGA)
Photo File Format	.jpg
Video Out Formats	NTSC, PAL
Video Frame Rate	30 frames per second (fps)
Compression Format	Compatible with MPEG4
Signal-to-Noise Ratio	42dB or greater
Recording Medium	Standard-size SD card
Interfaces	AV Out, USB 2.0
Languages	English, Spanish, Italian, French, German, Portuguese, Traditional Chinese, Simplified Chinese, Japanese, Danish, Dutch, Polish, Russian, Bulgarian, Turkish, Swedish, Finnish, Norwegian, Estonian, Lithuanian, Latvian, Hungarian, Czech, Slovak, Slovenian, Romanian, Greek

Power Source	Rechargeable 3.7V Li-ion battery
Power Consumption	1.8A @ 5.5VDC
Operating Temperature	-4° to 140°F (-20° to 60°C)
Storage Temperature	-4° to 140°F (-20° to 60°C)
Recharge Temperature	32° to 104°F (0° to 40°C)
Console Dimensions	8.5 x 4.7x 1.4 in. (215 x 120 x 36mm)
Console Weight	13.4 oz (380g)

SPECIFICATIONS

PROBE & CAMERA

Camera Head Diameter	1.1 in. (28mm)
Probe Diameter	0.23 in. (6mm)
Probe Length	72 ft. (22m)
Probe Material	Fiberglass
Camera Light Source	8 white LEDs
Camera Depth of Field	0.4 in. (10mm) to infinity
Camera Field of View	150.8° (diagonal)
Waterproof Depth (IP68)	50 ft. (10m)
Operating Temperature	14° to 158°F (-10° to 70°C)
Weight	4.9 lb. (2.2kg)

REEL

Frame Diameter	11.8 in. (300mm)
Dust and Water Resistance	To IP65 standard
Operating Temperature	14° to 158°F (-10° to 70°C)
Weight	6.6 lb. (3kg)

PROBE LENGTH COUNTER

Number of Digits	3
Resolution	0.1m/0.1 ft.
Accuracy	±0.4m/1.3 ft.
Dust/Water Resistance	IP55
Dimensions	4.33 x 2.44 x 0.95 in. (110 x 62 x 24mm)
Power Source	(2) “AAA” batteries (included)

OPERATING, MAINTENANCE & TROUBLESHOOTING TIPS – H16

- Never remove the SD card while taking a picture or recording a video. Doing so may damage the card and erase or corrupt the photo or video.
- If the LCD suddenly goes dark, the first two things to check are the integrity of the console's connection to the probe and the charge of the console's battery. The reason for the absence of video also could be that you have forgotten to remove the red rubber cap protecting the probe tip.
- If live video begins to look spotty, streaky or intermittent, the likely reason is an under-charged battery. Plug in the AC adaptor/battery charger immediately.
- Video recording requires an SD card with a fast writing speed. For maximum video quality, General recommends SD cards with a writing speed of 80X or higher.
- If the console “freezes” (pushing buttons has no effect) like a computer, straighten out a paper clip and use one end to press the Reset button on the back of the console (Fig. 1, Callout 15).
- Avoid using corrosive liquids such as alcohol to clean either the LCD or the probe. To clean the camera lens and LEDs, use a cotton swab and a small amount of cleaning solution. To clean the LCD, use the provided cloth, cotton swabs and liquid. To clean the housing of the console, use a soft, dry cloth.
- Operate and store the H16 only in a cool (under 140°F or 60°C), dry, well-ventilated place. Avoid exposing the unit to sunlight for long periods of time.
- To avoid damaging the console, use only compatible probes and accessories.

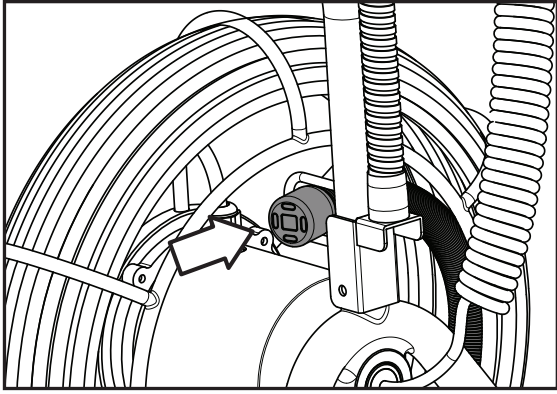
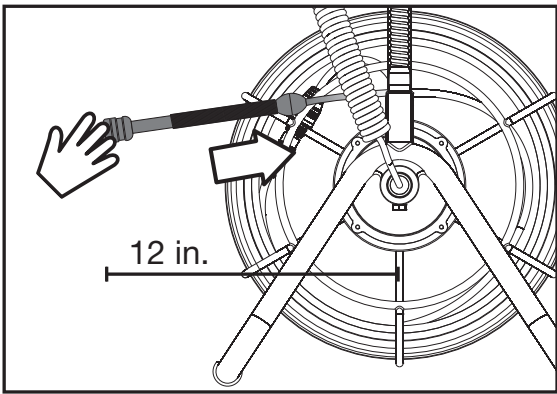
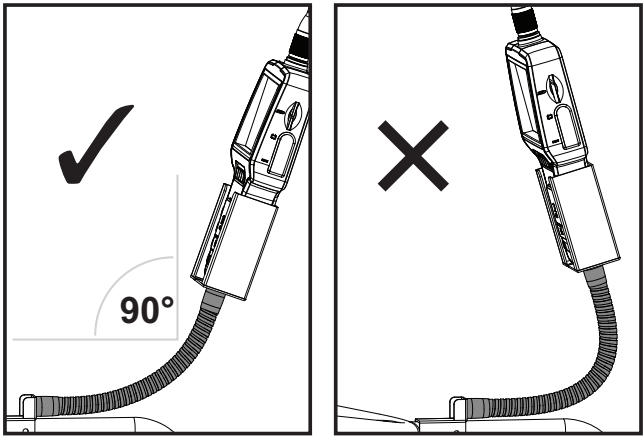
OPERATING & MAINTENANCE TIPS - P16PIP

The reel operates equally well in a horizontal or vertical position.

The bracket for the H16 (DCS1600) borescope console at the top of the P16PIP has a flexible-obedient stem that allows the console's screen to be angled to a comfortable viewing position.

DO NOT BEND this stem at an angle greater than 90° (see figures on next page).

Before attempting to wind the probe back onto the reel, remember to “unlock” the reel by undoing the Reel stopper (see Fig. 2). The most effective way to rewind the probe is to push it onto the reel through the bars of the Probe guide (see Fig. 2) horizontally from a distance of about 12 inches. Continue pushing until the Joint ball has passed through the Probe guide. Stop when the camera head meets the Camera head stopper (see figure at right below).



OPTIONAL PROBES & ACCESSORIES

The table below lists and describes all probes and accessories compatible with the DPS16.

Model No. (SKU)	Description	Camera Head Diameter	Probe Length	Depth of Field
P16HPART	VGA Resolution Articulating Probes	6.0mm (0.23 in.)	1m (3.28 ft.)	0.25 to 12 in. (6.4 to 300mm)
P16HP2ART			2m (6.6 ft.)	
P16HP3ART			3m (9.8 ft.)	
P16181HP	VGA Resolution Probes	5.5mm (0.22 in.)	1m (3.28 ft.)	0.25 to 12 in. (6.4 to 300mm)
P16182HP			2m (6.6 ft.)	
P16183HP			3m (9.8 ft.)	
P16PIP (included with DPS16)	Pipe & Duct Inspection Probe & Reel Set	28mm (1.1 in.)	22m (72 ft.)	0.4 in. (10mm) to infinity
SDRD1	USB SD Card Reader	-----	-----	-----

WARRANTY INFORMATION

General Tools & Instruments' (General's) DPS16 Pipe & Duct Recording Video Borescope Inspection System is warranted to the original purchaser to be free from defects in material and workmanship for a period of one year. Subject to certain restrictions, General will repair or replace this instrument if, after examination, the company determines it to be defective in material or workmanship. The warranty period begins on the date of purchase. You are encouraged to register your product online. General will extend your warranty an additional 60 days if you register at www.generaltools.com/ProductRegistry.

This warranty does not apply to damages that General determines to be from an attempted repair by non-authorized personnel or misuse, alterations, normal wear and tear, or accidental damage. The defective unit must be returned to General Tools & Instruments or to a General-authorized service center, freight prepaid and insured.

Acceptance of the exclusive repair and replacement remedies described herein is a condition of the contract for purchase of this product. In no event shall General be liable for any incidental, special, consequential or punitive damages, or for any cost, attorneys' fees, expenses, or losses alleged to be a consequence of damage due to failure of, or defect in any product including, but not limited to, any claims for loss of profits.

Register now at www.generaltools.com/ProductRegistry to receive a 60-day extension to your warranty.



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