



*MSV-2010*

Digital Video Camera

**Operator Manual**



**TABLE OF CONTENTS**

Page		Page
<b>1</b>	<b>INTRODUCTION .....</b>	<b>5</b>
<b>2</b>	<b>SAFETY PRECAUTIONS – IMPORTANT .....</b>	<b>6</b>
<b>3</b>	<b>SPECIFICATION.....</b>	<b>10</b>
<b>4</b>	<b>OPERATING ELEMENTS, SYMBOLS AND FUNCTIONS.....</b>	<b>11</b>
4.1	<b>VIDEO CAMERA.....</b>	<b>11</b>
4.2	<b>KEYBOARD.....</b>	<b>14</b>
4.3	<b>MONITOR SCREEN DISPLAY.....</b>	<b>16</b>
<b>5</b>	<b>INSTALLATION.....</b>	<b>17</b>
5.1	SETTING UP THE MSV-2010.....	17
5.2	CONNECTING THE CAMERA HEAD.....	17
5.3	CONNECTING PERIPHERAL EQUIPMENT.....	17
5.4	CONNECTING POWER.....	18
5.5	ASSEMBLING THE OPTO-MECHANICAL ADAPTER.....	19
<b>6</b>	<b>OPERATION.....</b>	<b>20</b>
6.1	POWERING UP THE MSV-2010.....	20
6.2	FREE-SPIN/ORIENTATION MECHANISM.....	20
6.3	CENTERING MECHANISM.....	20
6.4	FUNCTION CONTROLS.....	21
6.5	NORMAL OPERATION MODE.....	22
6.5.1	White Balance.....	22
6.5.2	Gain Control.....	22
6.5.3	Brightness Adjustment.....	22
6.6	MENU OPERATION MODE.....	23
6.6.1	Main Menu.....	23
6.6.2	Picture Setting Sub-Menu.....	23
6.6.2.1	Gain.....	23
6.6.2.2	Brightness.....	24
6.6.2.3	Color Red and Blue.....	24
6.6.2.4	Enhance.....	24
6.6.2.5	Shutter Window.....	24
6.6.2.6	Shutter Speed.....	25
6.6.2.7	Freeze Mode.....	25
6.6.3	SCREEN SETTING SUB-MENU.....	25
6.6.3.1	Patient Data.....	25
6.6.3.2	User Window.....	26
6.6.3.3	Clock Display.....	26
6.6.3.4	Copy Mode A.....	26
6.6.3.5	Copy Mode B.....	26
6.6.3.6	PIP Location.....	26
6.6.3.7	Color Bars.....	26
6.6.4	BUTTON SETTING SUB-MENU.....	27
6.6.5	CLOCK SETTING SUB-MENU.....	27
6.6.5.1	Date Style.....	27
6.6.5.2	Year, Month, Day, Hour, Minute.....	28
6.6.5.3	Stop Watch.....	28
6.6.6	DEFAULT SETTING SUB-MENU.....	28

6.7	KEYBOARD OPERATION.....	29
6.7.1	Short Keys.....	29
6.7.2	Short Keys Combination.....	30
6.7.3	Entering Patient Data.....	30
6.7.4	Entering User Window Data.....	31
6.8	MENU SUMMARY.....	32
7	<b>CLEANING.....</b>	33
7.1	CAMERA CONTROL UNIT.....	33
7.2	CAMERA HEAD.....	33
7.3	OPTO-MECHANICAL ADAPTER.....	33
7.4	GLASS WINDOW ON CAMERA HEAD AND OPTO-MECHANICAL ADPTER.....	33
8	<b>DEZINFRECTION AND STERILIZATION.....</b>	34
8.1	DEZINFECTING THE MSV-2010.....	34
8.2	STERILIZING THE CAMERA HEAD AND OPTO-MECHANICAL ADAPTER.....	34
9	<b>MAINTENANCE.....</b>	35
10	<b>TROUBLESHOOTING.....</b>	36

## 1. INTRODUCTION

Congratulations on the purchase of your new MSV-2010 system.

The user-friendly MSV-2010 provides superior quality images. In addition it offers a variety of features such as:

- Capability to hook-up a keyboard directly to the video camera
- Capability to operate and adjust the video camera by on-screen menu
- Capability to display on-screen date and time and operate a stop watch
- Capability to enter and display a patient data (Patient name, ID, age and sex)
- Capability to enter and display additional user data (Comments, doctor name, etc).
- Capability to activate peripheral video equipment (Video printer, VCR, etc)
- Capability to freeze a picture while keeping a live picture-in-picture (PIP) image
- Capability to adjust the window used for automatic shutter control
- Capability to manually change shutter speed
- Capability to adjust image contrast (Enhancement)
- Capability to correct “bad” pixels
- Capability to present color bar chart image for monitor adjustment
- Capability of programmable buttons on the camera head
- Control of the camera functions from keyboard or camera head buttons

In short - you chose the best, and we would like to make sure that you receive the optimal results with the MSV-2010, by using it correctly.

This user manual will help you to install the MSV-2010 and optimally integrate it with other components of your system. It will also instruct you how to operate the MSV-2010, how to keep it clean, sterilize it, will give you maintenance and service guidelines and recommendations, for best performance results.

## 2. SAFETY PRECAUTIONS – IMPORTANT



The following precautions should be always be exercised with the use of all electro-medical equipment to ensure safety to all involved parties – user(s), patient(s), etc.

### 2.1 TRAINING

This equipment should only be used under the supervision of a trained physician in a medical facility. Do not use in other locations or for any other purposes than the intended application.

### 2.2 INSTALLATION

1. This equipment should NEVER be installed or used in areas where the unit could get wet or be exposed to any environmental conditions such as high temperature, humidity, direct sunlight, dust, salt, etc., which could adversely affect the equipment.
2. This equipment should NEVER be installed or used in the presence of flammable or explosive gases or chemicals.
3. This equipment should NEVER be installed, used or transported in an inclined position nor should it be subjected to impact or vibration.
4. For safety reasons, this equipment must be properly grounded. (This equipment should be connected to a three (3)-prong hospital grade receptacle in U.S.A. or Canada).
5. Ensure that all power requirements are met and comfort to those specified on the rating place located on the rear panel.
6. Do not block the air intake vent of this equipment.
7. Do not allow the power cord to become twisted, crushed or pulled taut.
8. When using an isolation transformer for any ancillary equipment, ensure the power requirements of the devices do not exceed the capacity of the isolation transformer. For further information, contact your local MAHE distributor.

### **! WARNING**

Never drop this equipment or subject it to severe impact as it could compromise the functionality and/or safety of the unit. Should this equipment be mishandled or dropped, do not use it. Return it to an authorized MAHE service facility for inspection and repair.

### **CAUTION:**

All devices connecting to the MSV-2010 must be Classified Medical Equipment. Additional information processing equipment connected to the MSV-2010 form a Medical System and the operator must determine that all equipment comply with the appropriate end-product standard (such as IEC 60950 or IEC 60065) and the Standard for Medical System, IEC 60601-1-1.

### 2.3 PRIOR TO USE

1. Confirm that this equipment functions properly and check the operation of all switches, indicators, etc.
2. To prevent electrical shock when used with endoscopes, this equipment is insulated (type BF electro-medical equipment). Do not allow it to be grounded to other electrical devices being used on the patient. Rubber gloves should always be worn to prevent grounding through user(s).
3. Confirm that other devices used in conjunction with equipment function properly and that these other devices will not adversely affect the operation or safety of this equipment. If any component of the endoscopic system is not properly functioning, the procedure should not be performed.
4. To prevent any potential electro-magnetic interference, do not use any kind of cellular phone near the camera.
5. Check and confirm that all cords or cables are connected correctly and securely.

## **2.4 DURING USE**

1. To prevent electrical shock, the endoscope and /or any other ancillary device should NEVER be applied directly to the heart.
2. Make sure that contact is made between the patient and this equipment.
3. To avoid damage to the front panel keyboard do not press any keys with any sharp or pointed objects.
4. The light emitted by a Xenon or Metal Halide Light Source is extremely intense. Avoid looking directly at the light exiting the endoscope and/or this equipment.
5. During clinical procedures, avoid unnecessary prolonged use, which could compromise patient/user safety.
6. Continually monitor this equipment and the patient for any signs of irregularities.
7. Do not connect or disconnect the camera head during operation. This may cause unrecoverable damage to the camera head.
8. In the event that some type of irregularity is noted to the patient or this equipment, take the appropriate action to ensure patient safety.
9. If the operation of any of the components of the endoscopic system fails during the procedure and the visualization of the procedure is lost or compromised, place the endoscope in the neutral position and slowly withdraw the endoscope.
10. This equipment should only be used according to the instruction and operating conditions described in this manual. Failure to do so could result in compromised safety, equipment malfunction or instrument damage.
11. To prevent fire or electric shock, do not open or expose the camera control unit to rain or moisture. Refer all servicing to qualified personnel only.

## **2.5 AFTER USE**

1. Refer to the operating instructions supplied with all the components of the endoscopic system to establish the right order in which components should be turned off. Some peripheral devices may have been turned off first to avoid compromising their operation.
2. Wipe all surfaces clean with gauze slightly dampened with alcohol.
3. Be sure connector interfaces and ventilation ports are not allowed wet or splashed with liquids.

## **2.6 STORAGE**

1. This equipment should NEVER be stored in areas where the unit could get wet or be exposed to any environmental conditions such as high temperature, humidity, direct sunlight, dust, salt, etc., which could adversely affect the equipment.
2. This equipment should NEVER be stored in the presence of flammable or explosive gases or chemicals.
3. This equipment should NEVER be stored or transported in an inclined position, nor should it be subjected to impact or vibration.
4. Cords, accessories, etc., should be cleaned and neatly stored.
5. This equipment should be maintained in a clean condition during storage and be ready for subsequent use.

## **2.7 SERVICE**

1. Alterations/modifications to the equipment should NEVER be made. Repairs should only be performed by an authorized MAHE service facility.

## **2.8 MAINTENANCE**

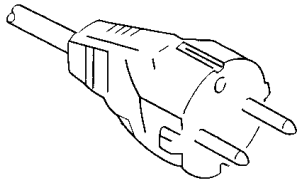
1. Periodically this equipment and any applicable accessories should be inspected for operation and safety.

## **2.9 DISPOSAL**

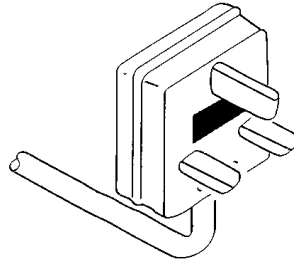
1. The equipment should be returned for disposal to MAHE. Contact your local MAHE representative or service facility.

## POWER REQUIREMENT

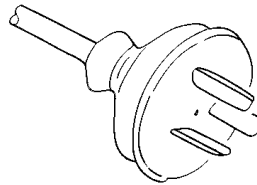
Check the standard power plug configurations that are used in your country. If the appropriate power cord is not included in your product, notify your local MAHE distributor.



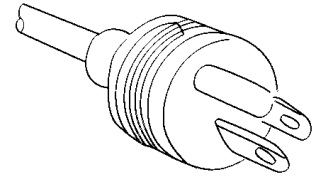
Continental Europe  
(Use a SEV approved  
plug for Switzerland)



U.K.



Australia  
and  
New Zealand



U.S.A. and  
Canada  
(Hospital Grade)

## SYMBOLS ON MARKING



Alternating current



Type BF applied part (Safety degree specified by IEC 601-1)



OFF (Power: disconnection from the mains)



ON (Power: connection to the mains)



Attention, consult accompanying documents



Equipotentiality

## CONVENTIONS

The following conventions have been established for the text of this manual to aid in the identification of potential hazards of operation:



: Could result in death or serious injury.



: May result in minor or moderate injury or property-damage.



: May result in property-damage. Also, advises owner/operator about important information on the use of this equipment.

### 3. SPECIFICATIONS

Item	Specification
Number of Pixels	PAL 795 (H) x 596 (V), approximately 470,000 pixels NTSC 811 (V) x 508 (V), approximately 410,000 pixels
Pick-up Element	Interline transfer CCD 1/3" image sensor
Scanning System	2:1 interlace
Minimum Illumination	Less than 1.5 Lux @ F 1.2
Resolution	470 TV lines (horizontal)
Signal/Noise Ratio	Greater than 46dB @ AGC off
Gain Control	Automatic Gain Control and manual Gain boost
White Balance	Fast auto white balance (less than 1.0 second) Manual RED and BLUE fine tuning
Electronic Shutter	Automatic windowed shutter 1/50 (PAL) or 1/60 (NTSC) to 1/250,000 seconds
Video Outputs	Composite video signal 1.0V ptp @ 75 Ohm Y/C (S-VHS) Y=1.0V, C(Burst)=0.3V ptp @ 75 Ohm R,G,B=0.7V, Sync=2.1V ptp @ 75 Ohm
Power Supply	100-240VAC @ 50/60Hz automatic
Power Consumption	Approximately 20 Watt
Optical Interface	CS or C-mount (C-mount with extension ring)
Regulatory Approvals	IEC 60601-1, IEC 60601-1-2
Equipment Class	Class 1, camera head BF-type
Mode of Operation	Continuous operation
Water Resistant	Camera head connected to cable is fully soak able (Watertight Equipment, Class IPX7), camera control unit - Not Protected Equipment, Class IPX0
Operating Environment Temperature Relative Humidity Air Pressure	+10° to +40° C (50° to 104° F) 30 to 85% 700 to 1060 hPa
Storage Environment Temperature Relative Humidity Air Pressure	-20° to +60° C (-4° to 140° F) 0 to 95% 700 to 1060 hPa
Camera Head Dimensions	33 x 33 x 46 mm
Camera Head Weight	40 g
Camera Control Unit Dimensions	295 (W) x 75 (H) x 253 (D) mm
Camera Control Unit Weight	1.8 kg

## 4. OPERATING ELEMENTS, SYMBOLS AND FUNCTIONS

### 4.1 VIDEO CAMERA

The video camera consists of the camera control unit, camera head and opto-mechanical adapter.

#### 4.1.1 Camera control unit - front panel

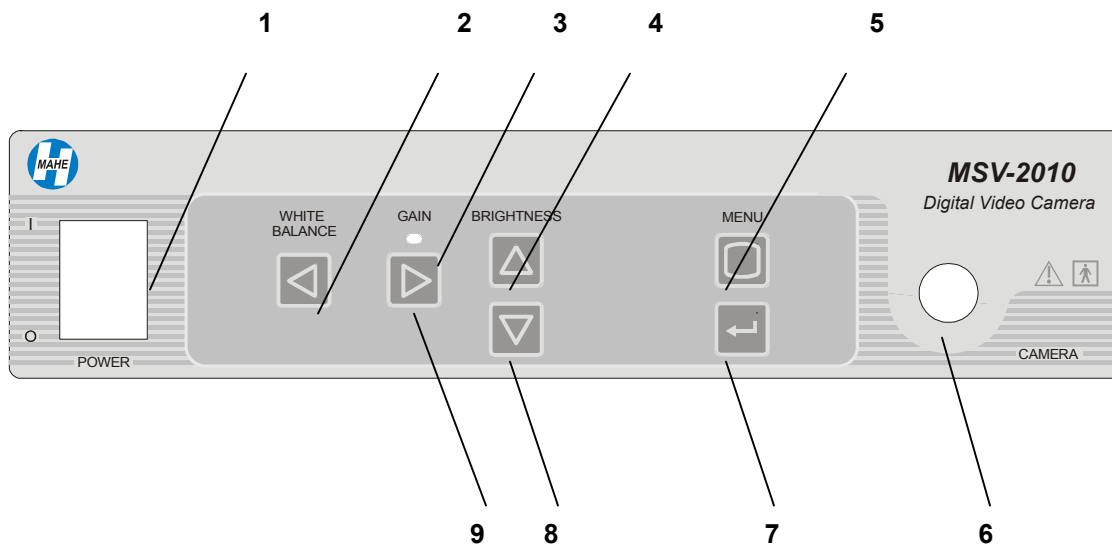


Fig.1 Camera control unit front panel

No	Description
1	Main power switch with neon lamp indicator
2	White balance button for automatic white balance control / Left scroll button in Menu mode
3	Green LED indicating activated Gain function
4	Brightness up button for manual brightness adjustment / Up scroll button in Menu mode
5	Menu button for entering in Menu mode
6	Camera head cable connector
7	Enter button for entering in sub-Menu
8	Brightness down button for manual brightness adjustment / Down scroll button in Menu mode
9	Gain on/off button for boosting low light images / Right scroll button in Menu mode

### 4.1.2 Camera control unit - rear panel

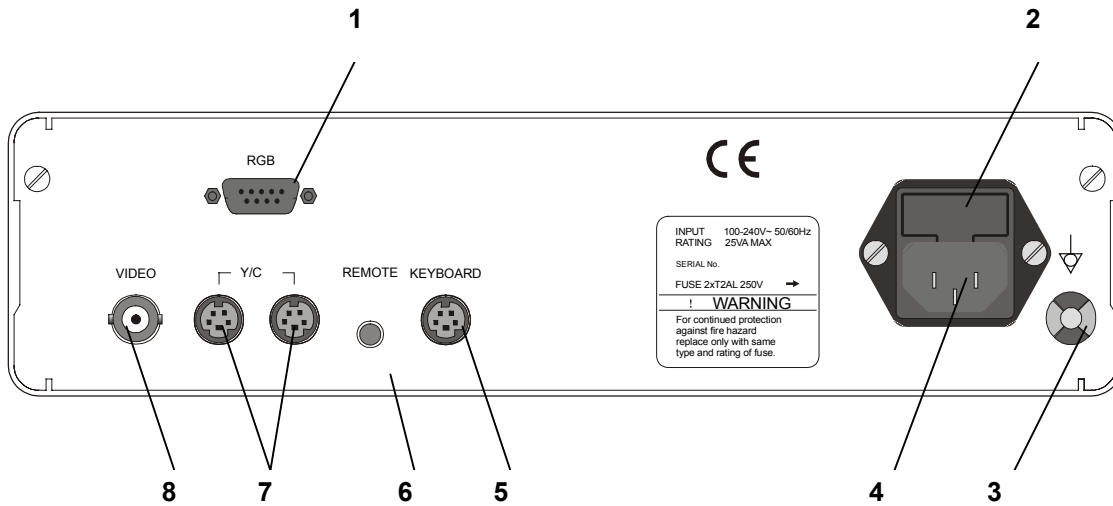


Figure 2. Camera control unit rear panel

No	Description
1	RGBS video output connector (9-pin D-type)
2	Power fuses (type T2A, 250V)
3	Equipotentiality pin (grounding)
4	AC mains power inlet
5	Keyboard connector (6-pin mini DIN type connector)
6	Remote control connector (3.5mm jack) to operate peripheral devices
7	Y/C video outputs (2 x 4-pin mini DIN type connector)
8	Composite video output (BNC connectors)

### 4.1.3 Camera Head and Opto-mechanical Adapter

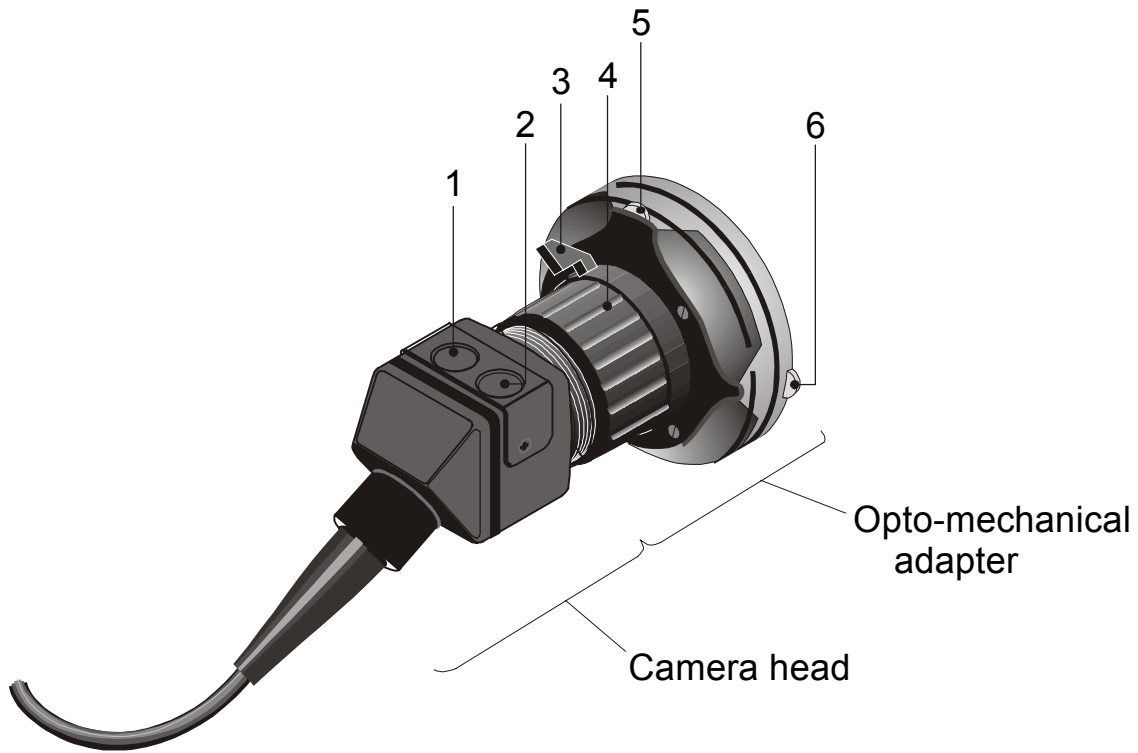


Figure 3. Camera head and opto-mechanical adapter

<b>No</b>	<b>Description</b>
1	“1” button (refer to Section 6.14)
2	“2” button (refer to Section 6.14)
3	Free-spin lock
4	Focus ring
5	Right/left adjustment knob (optional)
6	Up/Down adjustment knob (optional)

## 4.2 KEYBOARD (Optional)

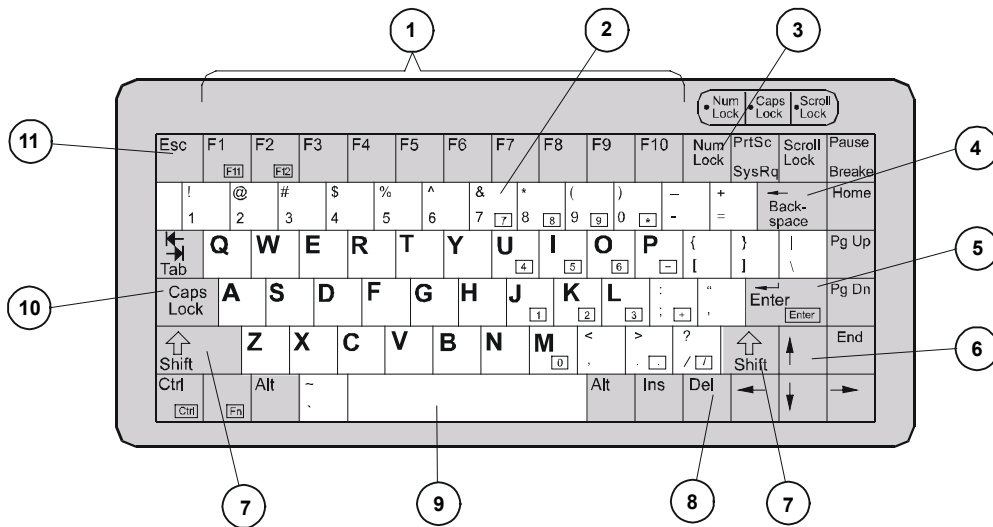


Figure 4. Keyboard

No	Name	Function
1	Function Keys	Refer to Function key indexes
2	Alpha-Numeric keys	Include keys for letters, numbers and special characters (brackets, commas, etc)
3	Num Lock key	Locks function of number keys to print numbers only. Status indicator will light when selected
4	Backspace key	Moves cursor leftward and deletes the character
5	Enter key	Moves cursor to the next field

6	Cursor Movement keys	Up, Down, Left and Right arrows move the cursor to each direction when Num. Lock is Off
7	Shift keys	When caps Lock is Off, holding the Shift key and pressing alpha-numeric key will cause a capital letter or special character pictured on the key to appear on the screen
8	Delete key	Deletes the characters
9	Space Bar	Creates space and deletes a previously typed character
10	Caps Lock key	Caps Lock indicator will light to show Caps Lock selected. When Caps Lock is On, all alpha-bet keys will appear on the monitor screen as capitals
11	Esc key	Return to the normal mode

Note: To get F11 (F12) keys press Fn and F1(F2) simultaneously

### 4.3 MONITOR SCREEN DISPLAY

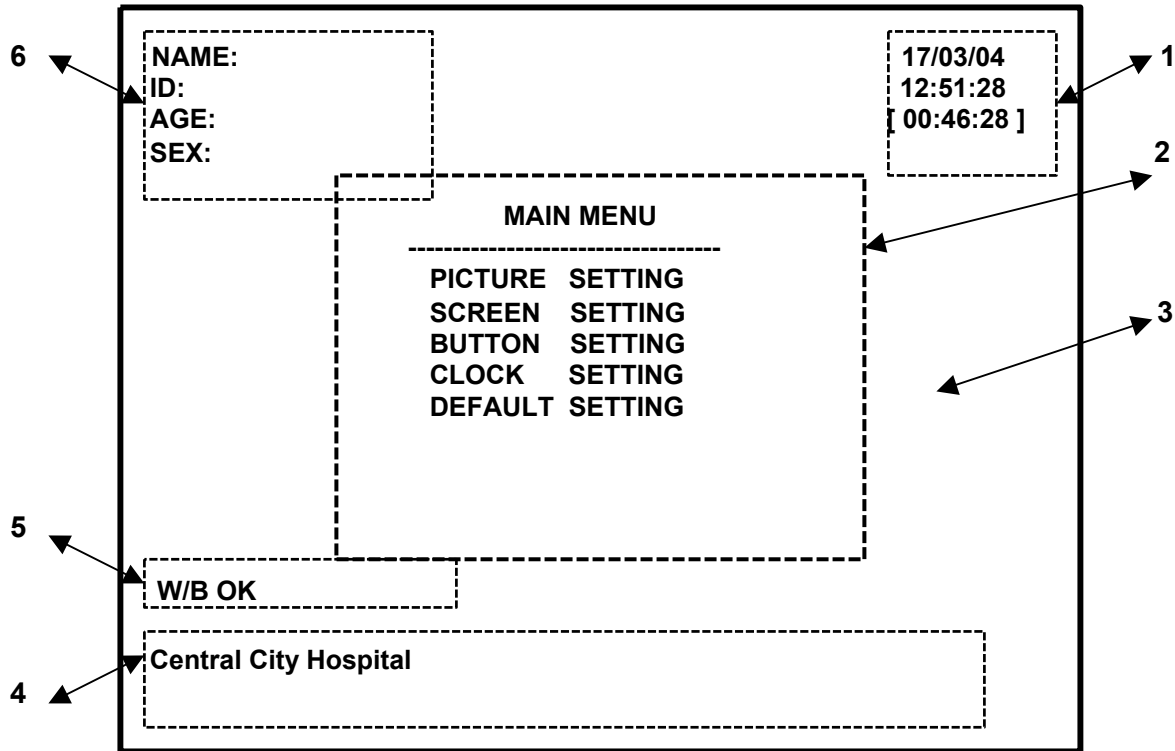


Figure 5. Monitor screen display

No	Display Window	Name	Function
1	Date & Time	Date	Numeric field (Month/Day/Year or Day/Month/Year) or Year/Month/Day
		Time	Military format (Hours: Minutes: Seconds)
		Stop watch	Numeric display [Hours: Minutes: Seconds]
2	Menu	Menu	Area for keyboard and camera head menus
3	Main Screen	Main Screen	Endoscopic image
4	User	User Window	Alpha-numeric two lines field up to full line long
5	Message	Message Window	Alpha-numeric one line field 16 characters long
6	Patient Data	Name	Alpha-numeric field 24 characters long
		ID	Alpha-numeric field 16 characters long
		Age	Alpha-numeric field 3 characters long
		Sex	Alpha-numeric field 1 character long

## 5. INSTALLATION

### 5.1 SETTING UP THE MSV-2010

1. Place the video camera on a stable surface (cart, counter, stand, etc.).

**NOTE** - Avoid places where the video camera may be splashed with liquid.  
 - Absolutely **DO NOT** use in any environment with explosive or flammable gases.  
 - **DO NOT** block the venting grids of the video camera.

2. Make sure the power switch is in OFF position.
3. Plug the power cord into the power source using the three (3) prong plug supplied with the unit.

**CAUTION** - To prevent electric shock, connect power cords of peripheral equipment through medical isolation transformers.

**NOTE** - When using medical isolation transformer, be sure to check that the transformer ratings. Make sure that the power cord is connected to the mains with a three prong plug (In USA use UL2601-1 rated isolation transformers and/or power strips only).

### 5.2 CONNECTING THE CAMERA HEAD

**CAUTION** - When removing the camera head from the camera control unit, grasp the connector area to release the lock mechanism. Pulling the cable could result in damages to the device.

**NOTE** - Do not connect or disconnect the camera head during operation. It may cause unrecoverable damage to the camera head.

To connect the camera head to the camera control unit align the red dot on the camera cable connector with the red dot on the CAMERA jack, located on the left side of the camera control unit front panel. Gently push the connector into the jack.

### 5.3 CONNECTING PERIPHERAL EQUIPMENT

1. The MSV-2010 can be connected to a video monitor via three types of video signals: composite video, Y/C (S-VHS) or RGB.  
 It is possible to connect up to four appliances including the monitor simultaneously to the different video outlets of the MSV-2010: VCRs, Image Processing PCs (via frame grabbers) and/or video printers.
2. Depending on the requirements of appliances you will be using, attach the appropriate cables to the rear panel of the camera control unit. For example, if the monitor requires input from a Y/C cable, attach one end of the Y/C cable to the corresponding connector on the rear panel of the camera control unit and the other end to the monitor.

**NOTE** - For highest quality pictures Y/C or RGB connections are recommended

**CAUTION** - When used in clinical or residential areas near radio or TV units, this equipment may be subjected to radio interference. To avoid adverse electromagnetic effects, **DO NOT** operate this equipment near RF energy equipment.

**CAUTION** - Use the following connection cables provided with the MSV-2010 and use keyboard with appropriate CE Marking.

- Use the part # H10-0015 for the RGB Video Cable. Use of other cables could cause poor images or excessive heat resulting in injury or property-damage.

Name	Description	Length	Qty	Part No
RGB Video Cable	9pin D-type – 4 x BNC	2.0m	1	H10-0015
Y/C Video Cable	4pin Mini Din - 4pin Mini Din	1.5m	1	H10-0037
Remote Control Cable	Mini Jack – Mini Plug	1.5m	1	H10-0038
Composite Video Cable	BNC – BNC	1.5m	1	H10-0039

## 5.4 CONNECTING POWER

1. Connect the AC power cable to the inlet located on the rear panel of the camera control unit.
2. Plug the AC power cable into a wall outlet.

## 5.5 ASSEMBLING THE OPTO-MECHANICAL ADAPTER

1. Attach the opto-mechanical adapter to the camera head by screwing it into the camera head and tighten slightly. Make sure first to insert the semicircular flange on the opto-mechanical adapter into the semicircular socket on the camera head.

**NOTE** - While assembling the opto-mechanical adapter and connecting it to the camera head, please make sure that the free-spin lock on the opto-mechanical adapter (refer to Figure 3) is in its locked position.

## 6. OPERATION

### 6.1 POWERING UP THE MSV-2010

To operate the MSV-2010:

1. Attach the endoscope to the opto-mechanical adapter connected to the camera head (refer to Section 5.5).
2. Attach the light source to the endoscope.
3. Turn on the video camera, monitor and light source. Wait until SETTING list is appeared on the monitor screen. Do not press any front panel buttons or camera head buttons and any keyboard key until date, time and patient data window are appeared on the monitor screen.
4. Use the focus ring of the opto-mechanical adapter to focus the image. The image positioning on the screen can be adjusted by the free-spin/orientation mechanism (refer to Section 6.2) and the optional centering mechanism (refer to Section 6.3), of the opto-mechanical adapter.
5. Perform the white balance procedure (refer to Section 6.5.1).
6. At any time the image can be adjusted using the touch-buttons on the front panel of the camera control unit by:
  - a) Adjusting the brightness level (refer to Section 6.5.3).
  - b) Using gain control (refer to Section 6.5.2).

**NOTE** - *When the image is being adjusted, text messages appear on the upper line of the message window of the monitor screen display.*

### 6.2 FREE-SPIN/ORIENTATION MECHANISM

1. While using a flexible endoscope, release the free-spin lock of the opto-mechanical adapter (refer to Figure 3) and rotate the endoscope until the arrow in the view field points to twelve o'clock. Then return the free-spin lock to its locked position.
2. When using rigid endoscopes, release the free-spin lock of the opto-mechanical adapter, rotate the endoscope to the required position, then return the free-spin lock to its locked position.

### 6.3 CENTERING MECHANISM

1. When the opto-mechanical adapter has a centering mechanism (optional), it can be used to center the image from a flexible endoscope on the screen.
2. The centering mechanism has two adjustment knobs (refer to Figure 3). When the view field of the flexible endoscope is correctly oriented at twelve o'clock, the knobs are positioned on the top and the right side of the mechanism. Turn these knobs to move the image up or down (right knob) and right or left (top knob) on the monitor.

## 6.4 FUNCTION CONTROLS

The MSV-2010 functions may be controlled from either:

- 1 front panel of the camera control unit;
- 2 keyboard;
- 3 camera head buttons.

### 6.4.1 Function control from the front panel of the Camera Control Unit (CCU)

The CCU front panel buttons have different functions in normal operation mode and in menu mode.

Function control WHITE BALANCE, GAIN and BRIGHTNESS are performed by pressing corresponded buttons on the front panel (refer to Fig.1 and Section 6.5).

Control of all other functions are performed via main menu by using MENU, ENTER,  $\uparrow$ ,  $\downarrow$ ,  $\leftarrow$  and  $\rightarrow$  buttons (refer to Fig.1 and Section 6.6).

1. When the MENU button is being held for approximately two seconds the menu mode shall be activated and the MAIN MENU shall appear on the monitor screen. The selected item shall appear on a green background.
2. Scrolling up and down between the main menu items shall be performed by the  $\uparrow$  and  $\downarrow$  buttons.

Holding the  $\uparrow$  or  $\downarrow$  button for longer than approximately 0.5 second (reference value) shall scroll sub-menu items automatically (0.1 second per step).

3. To open a sub-menu, the green background shall be brought to the selected item and the ENTER button shall be pressed.
4. Scrolling up and down between the sub-menu items shall be performed by pressing the  $\uparrow$  and  $\downarrow$  buttons. The selected item shall appear on a green background. Holding the  $\uparrow$  or  $\downarrow$  button for longer than approximately 0.5 second (reference value) shall scroll sub-menu items automatically (0.1 second per step).

Changing value of a sub-menu item shall be performed by pressing the  $\leftarrow$  or  $\rightarrow$  buttons. Holding the  $\leftarrow$  or  $\rightarrow$  button for longer than approximately 0.5 second (reference value) shall change the item value automatically (0.1 second per step).

### 6.4.2 Function control from keyboard

1. Function control from the keyboard is performed by using F function keys and combination Ctrl+F keys.
2. Pressing some of the F and Ctrl+F keys will call for appropriate function menus. In addition, two sub-menus can be called from the Picture Set menu.
3. Selected menu item is highlighted.
4. To scroll the selected menu item up or down use arrow keys  $\uparrow$   $\downarrow$  of the keyboard.
5. To activate a new menu item, select it by  $\uparrow$   $\downarrow$  keys and press Enter key. The selected item shall appear on a green background.
6. Every time the arrow key is pressed, it scrolls the selection one item up or down. Hold the arrow key for approximately one second to scroll automatically until the key is being held.
7. To escape at any time, press the Esc key.

### 6.4.3 Function control from camera head buttons

1. Function control from the camera head buttons is performed according to the button setting (refer to Section 6.18).

## 6.5 NORMAL OPERATION MODE

Function control in the normal operation mode (WHITE BALANCE, GAIN and BRIGHTNESS) is performed by pressing corresponded buttons on the front panel (refer to Figure 1).

### 6.5.1. White Balance

When operating the system for the first time, or if illumination conditions had changed, or if colors seem to differ from “true” colors, perform a white balance procedure as follows:

1. With the endoscope attached to a working light source and video camera, focus on a white object (such as a white cloth or sheet of paper). Make sure the picture is not saturated by excessive illumination.
2. Press the WHITE BALANCE button on the front panel of the camera control unit (refer to Fig.1) for approximately two seconds, until short beep shall be heard. After at least one second “W/B OK” message shall be appears on the monitor screen and second short beep shall be heard. f white balance routine is not successful the message “W/B FAILED” shall be displayed and a long beep shall be heard
3. When operating from keyboard, press Ctrl + F2 buttons and short beep shall be heard. After at least one second “W/B OK” message shall be appears on the monitor screen and second short beep shall be heard. . If white balance routine is not successful the message “W/B FAILED” shall be displayed and a long beep shall be heard.
4. The white balance setting is stored in the non-volatile memory and there is no need to adjust it again unless the illumination conditions change.

### 6.5.2 Gain Control

In case of a dark or badly illuminated object, the user can activate the gain control to further increase the brightness of the image. When starting the system, the gain control is set to off.

1. To activate the gain control press the GAIN button on the front panel of the CCU (refer to Fig.1). Message GAIN ON will appear on the monitor screen and the GAIN LED will illuminate.
2. To deactivate the gain control, press the GAIN button again. Message GAIN OFF will appear on the monitor screen and the GAIN LED will turn off.

**NOTE** - Using activated gain function adds noise to the obtained image

### 6.5.3 Brightness Adjustment

1. The brightness adjustment enables the user to obtain a brighter or darker image by increasing or decreasing the automatic shutter reference level.
2. Adjust the brightness by pressing one of the BRIGHTNESS buttons on the front panel of the control unit (refer to Figure 1). Press the upper BRIGHTNESS button to increase the brightness. Press the lower BRIGHTNESS button to decrease the brightness. Every time either the upper or the lower button is pressed, the brightness changes incrementally. The message BRIGHTNESS – 5 to BRIGHTNESS + 5 will be appear on the monitor screen indicating the brightness level. Holding the button for approximately one second will change the color intensity level automatically until the button is being held.
3. Each pressing the upper or down BRIGHTNESS button after the maximum brightness has been reached, short beep shall be heard.

## 6.6. MENU OPERATION MODE

Control of functions in the menu operation mode is performed via main menu by using MENU, ENTER, ?, ?, ? and ? buttons on the front panel of CCU (refer to Fig.1 and Section 6.6) or using ENTER, Esc and arrow keys ↑ ↓ ← → of the keyboard (refer to Fig.4).

### 6.6.1. Main Menu

1. Press and hold pressed the MENU button on the front panel of CCU for approximately two seconds or press the Ctrl and F1 keys of the keyboard simultaneously. The MAIN MENU shall appear on the monitor screen. The selected item shall appear on a green background.

#### MAIN MENU

```

-----
PICTURE SETTING
SCREEN SETTING
BUTTON SETTING
CLOCK SETTING
DEFAULT SETTING

```

2. To activate a new menu item, select it by ? ? buttons or ↑ ↓ keys. The selected item shall appear on a green background.
3. To open a sub-menu press Enter button on the front panel or Enter key of the keyboard.

### 6.6.2 Picture Setting Sub-Menu

This sub-menu shall allow checking or changing the following picture parameters.

#### PICTURE SETTING

```

-----
GAIN                OFF
BRIGHTNESS          -1
COLOR RED           +5
COLOR BLUE          -2
ENHANCE             MEDIUM
SHUTTER             FULL
WINDOW
SHUTTER SPEED       AUTO
FREEZE MODE         FIELD

```

#### 6.6.2.1 Gain

GAIN control is activated by ← → key of the keyboard or ? ? buttons on the front panel.

To leave sub-menu press Esc key or MENU button.

**NOTE** - Using activated gain function adds noise to the obtained image

**NOTE** - When starting the system, the gain control is set to off.

### 6.6.2.2. Brightness

BRIGHTNESS is increased by → key of the keyboard or ? button on the front panel. BRIGHTNESS is decreased by ← key of the keyboard or ? button on the front panel.

The message BRIGHTNESS – 5 to BRIGHTNESS + 5 will be appeared on the monitor screen indicating the brightness level.

Each pressing by the ← → key or ? ? buttons after the maximum or minimum brightness has been reached, short beep shall be heard.

To leave sub-menu press Esc key or MENU button.

### 6.6.2.3 Color Red and Color Blue

After adjusting the white balance, or at any time during operation, the user may wish to fine tune the colors appearing on the monitor.

The intensity of the color is increased by → key of the keyboard or ? button on the front panel. The intensity of the color is decreased by ← key of the keyboard or ? button on the front panel.

The message RED (BLUE) – 20 to RED (BLUE) + 20 will be appeared on the monitor screen indicating the color level.

Each pressing by the ← → key or ? ? buttons after the maximum or minimum color level has been reached, short beep shall be heard.

To leave sub-menu press Esc key or MENU button.

### 6.6.2.4 Enhance

The ENHANCE function provides the user to obtain sharper and clearer image. The ENHANCE feature provides three levels of image enhancement: LOW, MIDDLE and HIGH.

**NOTE** - When the CCU is turned Off, the enhance function will default to the same state which it was in when the CCU was last turned Off.

Each pressing by the ← → key or ? ? buttons changes enhancement level in order: “OFF → LOW → MIDDLE → HIGH → OFF → ...” and reflects setting to image and display current setting.

To leave sub-menu press Esc key or MENU button.

### 6.6.2.5 Shutter Window

The SHUTTER WINDOW function is allowed to select the size of the central part of observation in order to achieve the best image of the observing object.

The shutter window feature provides three sizes of the measuring area: Small, Medium and Full.

Each pressing by the ← → key or ?? buttons changes the window size in order: “SMALL → MEDIUM → FULL → SMALL → ...” and appropriate window size is shown on the monitor screen.

To leave sub-menu press Esc key or MENU button.

### 6.6.2.6 Shutter Speed

The SHUTTER SPEED function is allowed to user select the automatic or manual shutter control.

The shutter speed feature provides automatic speed control and eleven manual settings.

Each pressing by the → key or ? buttons changes the shutter speed in order: “AUTO → Max → 1/100 → 1/250 → 1/500 → 1/1000 → 1/2500 → 1/5000 → 1/10000 → 1/25000 → 1/50000 → 1/100000 → AUTO → ...” and reflects setting to image and display current setting.

Each pressing by the ← key or ? buttons changes the shutter speed in order: “1/100000 → 1/50000 → 1/25000 → 1/10000 → 1/5000 → 1/2500 → 1/1000 → 1/500 → 1/250 → 1/100 → MAX → AUTO → 1/100000...” and reflects setting to image and display current setting.

To leave sub-menu press Esc key or MENU button.

### 6.6.2.7 Freeze Mode

The FREEZE MODE function is allowed to user select the best quality of the frozen picture.

If the endoscopic image is relatively stable, the frozen image in the “FRAME” mode will be clear and sharper. If the endoscopic image is unstable, the frozen image will be clear in the “FIELD” mode.

Each pressing by the ← → key or ?? buttons will change freeze mode.

To leave sub-menu press Esc key or MENU button.

## 6.6.3 Screen Setting Sub-Menu

This sub-menu shall allow checking or changing the following picture parameters.

SCREEN SETTING	
-----	
PATIENT DATA	ON
USER WINDOW	ON
CLOCK DISPLAY	ON
COPY MODE A	FREEZE KEEP
COPY MODE B	COPY SCREEN
PIP LOCATION	RIGHT-UP
COLOR BARS	ON – OFF

### 6.6.3.1 Patient Data

PATIENT DATA area is appeared on the screen by pressing ← → key of the keyboard or ?? buttons on the front panel. Pressing the ← → key or ?? buttons toggles PATIENT DATA area ON and OFF.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.2 User Window

USER WINDOW area is appeared on the screen by pressing ← → key of the keyboard or ? ? buttons on the front panel. Pressing the ← → key or ? ? buttons toggles USER WINDOW area ON and OFF.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.3 Clock Display

CLOCK DISPLAY area is appeared on the screen by pressing ← → key of the keyboard or ? ? buttons on the front panel. Pressing the ← → key or ? ? buttons toggles CLOCK DISPLAY area ON and OFF.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.4 Copy Mode A

COPY MODE A function is intended to select the freeze mode after providing the copy pulse.

In FREEZE KEEP mode frozen image is kept on the screen after the end of copy pulse.

In FREEZE REALIZE mode the image is unfrozen after the end of copy pulse.

Pressing the ← → key or ? ? buttons toggles FREEZE KEEP and FREEZE REALIZE mode.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.5 Copy Mode B

COPY MODE B function is intended to select the copy screen mode. In COPY SCREEN mode the current picture is captured by video printer. In ADD DATA mode the current picture is captured together with the patient data, clock data and user data.

Pressing the ← → key or ? ? buttons toggles COPY SCREEN and ADD DATA mode.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.6 PIP Location

PIP LOCATION function is intended to select location of the sub-screen. the copy screen mode. Each pressing by the → key or ? buttons changes sub-screen location in order: “RIGHT-UP → RIGHT-MID → RIGHT-DN → LEFT-DN → LEFT-MID → LEFT-UP → RIGHT-UP → ...” and display current sub-screen location.

Each pressing by the ← key or ? buttons changes sub-screen location in order: “RIGHT-UP → LEFT-UP → LEFT-MID → LEFT-DN → RIGHT-DN → RIGHT-MID → RIGHT-UP → ...” and display current sub-screen location.

To leave sub-menu press Esc key or MENU button.

### 6.6.3.7 Color Bars

COLOR BARS are appeared on the screen by pressing ← → key of the keyboard or ? ? buttons on the front panel. Pressing the ← → key or ? ? buttons toggles COLOR BARS ON and OFF.

To leave sub-menu press Esc key or MENU button.

### 6.6.4 Button Setting Sub-Menu

This sub-menu allows programming each camera head button individually.

#### BUTTON SETTING

```
-----
BUTTON 1   COPY
BUTTON 2   ENHANCE
```

1. Each pressing by the → key or ? buttons changes the function of each CH button in order: “GAIN → ENHANCE → SHUTTER SPEED UP → SHUTTER SPEED DN → FREEZE → COPY → STOP WATCH → WHITE BALANCE → GAIN →...”.
2. Each pressing by the ← key or ? buttons changes the function of each CH button in order: “GAIN → WHITE BALANCE → STOP WATCH → COPY → FREEZE → SHUTTER SPEED DN → SHUTTER SPEED UP → ENHANCE → GAIN → ...”.

To leave sub-menu press Esc key or MENU button.

**NOTE** -When the button is programmed for ENHANCE: a message with enhance status(ENHANCE OFF ENHANCE LOW, ENHANCE MEDIUM or ENHANCE HIGH) will appear in the message window.

**NOTE** -When the button is programmed for SHUTTER SPEED UP or DN: a message with shutter speed value will appear in the message window, message with manual shutter speed value will remain constantly, message AUTO will disappear after approximately five seconds(reference value)

**NOTE** - When the button is programmed for COPY value: a short beep will be heard when the COPY button is pressed

### 6.6.5 Clock Setting Sub-Menu

This sub-menu allows date and time setting.

#### CLOCK SETTING

```
-----
DATE STYLE   DD/MM/YY
YEAR         04
MONTH        04
DAY          1
HOUR         15
MINUTE       02
STOP WATCH   START
```

#### 6.6.5.1 Date Style

The format for the Date Style is DD/MM/YY, MM/DD/YY or YY/MM/DD (European, American or Japanese style)

DD = Day, MM = Month, YY = Year

1. Each pressing by the → key or ? buttons changes DATA STYLE in order: “DD/MM/YY → MM/DD/YY → YY/MM/DD → DD/MM/YY → ...” and display current setting in the clock display area.
2. Each pressing by the ← key or ? buttons changes DATA STYLE in order: “DD/MM/YY → YY/MM/DD → MM/DD/YY → DD/MM/YY → ...” and display current setting in the clock display area.

### 6.6.5.2 Year, Month, Day, Hour, Minute

After DATE STYLE set YEAR, MONTH, DAY, HOUR and MINUTE.

The format for the Time is HH:MM:SS

HH = Hours military notation, MM = Minutes, SS = Seconds

AM hours are expressed as number. Example: 7AM = 07

PM hours are expressed as the hours + 12. Example: 7PM = 7 + 12 = 19.

1. Each pressing by the → key or ? buttons changes YEAR in order: “00 → 01 → ... → 99”  
 Month in order: “01 → 02 → ... → 12”, Day in order: “01 → 02 → ... → 31”,  
 Hour in order: “00 → 01 → ... → 23”, Minute in order: “00 → 00 → ... → 59” and display current setting in the clock display area.
2. Each pressing by the ← key or ? buttons changes YEAR in order: “99 → 98 → ... → 00”,  
 Month in order: “12 → 11 → ... → 01”, Day in order: “31 → 30 → ... → 01”,  
 Hour in order: “23 → 22 → ... → 00”, Minute in order: “59 → 58 → ... → 00” and display current setting in the clock display area.
3. To set the date style and clock the Enter button or Enter key shall be pressed (seconds shall reset to 00).

### 6.6.5.3 Stop Watch

Stop Watch is appeared on the screen below Time field and stars counting by pressing ← → key of the keyboard or ? ? buttons on the front panel.

The stop watch format is: [HH: MM: SS]

HH = Hours, MM = Minutes, SS = Seconds

Pressing the ← → key or ? ? buttons changes stop watch operation in order: “OFF → START → STOP → OFF →...”.

To leave sub-menu press Esc key or MENU button.

### 6.6.6 Default Setting

1. To set the factory default settings, the DEFAULT SETTING item on the main menu shall be selected and the ENTER button or ENTER key shall be pressed.  
 Pressing the ? ? button or ↑ ↓ keys shall restore the current or factory settings alternatively.

```

      DEFAULT SETTING
      -----
      CURRENT SETTINGS
      FACTORY SETTINGS
    
```

2. The FACTORY SETTINGS parameters shall be as follows.

<u>Parameter</u>	<u>Value</u>
Gain	OFF
Brightness	0
Color Red	0
Color Blue	0
Enhance	MEDIUM
Shutter Window	FULL
Shutter Speed	AUTO
Freeze Mode	FIELD
Copy Mode A	FREEZE REL
Copy Mode B	ADD DATA

## 6.7 KEYBOARD OPERATION

### 6.7.1 Short Keys (F)

The following functions shall be assigned to the F keys.

<b>Key</b>	<b>Function</b>	<b>Notes</b>
F1	SCREEN DATA ON/OFF	Toggles patient data, user window data and clock display On and Off
F2	ENHANCE	Cycles image enhancement level through OFF, LOW, MEDIUM and HIGH shown in the message window after word "ENHANCE"
F3	FREEZE	Toggles freeze function on and off
F4	COPY	The copy function is intended to activate image capturing or taping (such as video printer, VCR, etc.) peripheral equipment (please read carefully the instructions for the peripheral equipment). Activates copy function; a short beep shall be heard
F5	STOP WATCH	Cycles stop watch through OFF, START and STOP
F6		
F7	SHUTTER SPEED UP	Increases shutter speed; message window shall show the shutter speed
F8	SHUTTER SPEED DN	Decreases shutter speed; message window shall show the shutter speed
F10	FUNCTION LIST	Turns on list of functions for F keys; the list shall disappear after approximately 10 seconds or if any key is pressed

### 6.7.2 Short Keys combination (Ctrl + F)

The following functions shall be assigned to the Ctrl +F keys combination.

Keys	Function	Notes
CTRL+F1	MAIN MENU	Calls for the MAIN MENU
CTRL+F2	WHITE BALANCE	Initiates white balance routine as per 3.5.1
CTRL+F3	DATA ENTRY	See 3.8.4, 3.8.5
CTRL+F4	CHARACTERS RESET	Resets patient data
CTRL+F10	FUNCTION LIST	Turns on list of functions for Ctrl+F key combinations; the list shall disappear after approximately 10 seconds or if any key is pressed

### 6.7.3 Entering Patient Data

1. New data entry shall be enabled by pressing the Ctrl and F3 keys simultaneously (a blinking cursor shall paint in green the first character of the "NAME" title or the patient name). The patient data shall overwrite the titles. The cursor moves by →← keys after the title is removed. The letters can be modified by character keys, then the cursor moves to the next letter automatically. Modification moves between lines (to the first line character) by ↑↓ keys.

The following patient data may be keyed in from the keyboard:

- a) Patient name - up to 24 characters.
  - b) Patient ID - up to 16 characters.
  - c) Patient age - up to 3 characters.
  - d) Patient sex - 1 character.
2. To leave the entering data mode the Esc key shall be pressed, after that the cursor shall disappear.
  3. To reset the patient data the Ctrl and F4 keys shall be pressed simultaneously, the data characters shall disappear and the titles shall appear

**NOTE** - The patient data shall be stored and shall not be erased after turning the power off.

4. The protocol of character input shall be as follows:
  - a) The cursor shall appear first at pressing Ctrl and F3 keys simultaneously.
  - b) The cursor shall move forward to the next item when ↓ key is pressed, and backward when ↑ key is pressed.
  - c) The cursor shall move within the item by →← keys.
  - d) Space key shall write blank letter in the cursor location, then the cursor shall advance.
  - e) Backspace key shall return the cursor to a front location, shall write blank letter and the cursor shall stay there.
  - f) Delete key shall write blank letter in a location of the cursor and the cursor shall stay there.
  - g) Holding the Shift key and typing an alpha key shall display the capital letter or upper case special character.
  - h) Pressing the Caps Lock key shall cause all alpha keys typed to be displayed as capitals.

If any entry is typed to an item and the number of characters exceeds the number of characters of the item, the cursor shall stop at the last character of the item and display the last character typed.

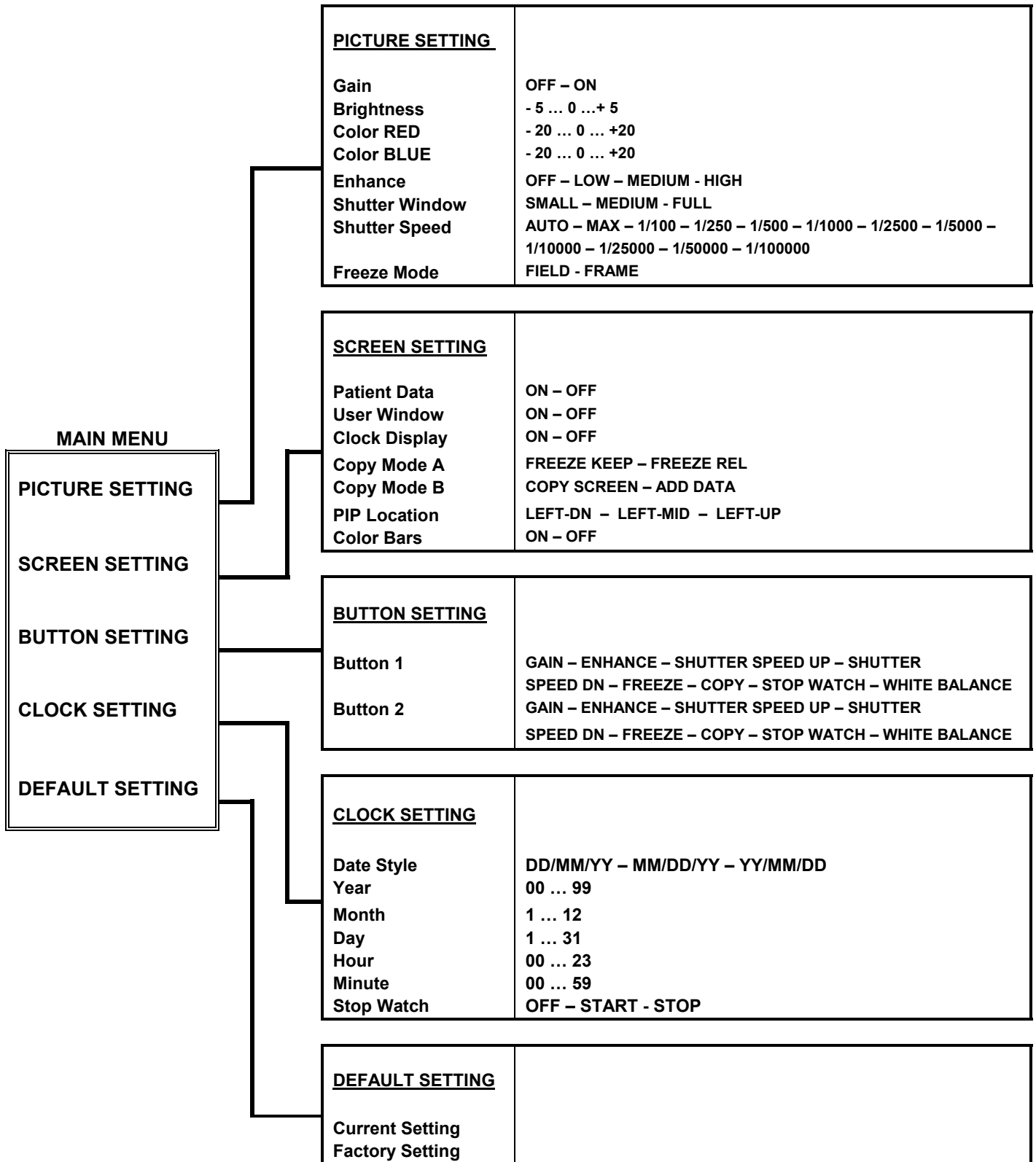
## 6.7.4 Entering User Window Data

1. New data entry shall be enabled by pressing Ctrl and F3 keys simultaneously (see 3.8.4). The cursor shall be brought to the user window by the ↓ key. The ↓ key shall also move the cursor to the second line, the ↑ key shall move the cursor up to the first line.
2. The protocol of character input shall be similar to described in 3.7.1.

**NOTE** - *Resetting the patient data shall not reset the user window data.*

3. The user window data shall be stored and shall not be erased after turning the power off.

## 6.8 MENU SUMMARY



## 7. CLEANING

**NOTE** - Always disconnect the power cable before cleaning the system

### 7.1 CAMERA CONTROL UNIT

1. The camera control unit can be cleaned with any cleaning agents, which is used for external cleaning of electric equipment, according to the instructions given by the manufacturer of the cleaning solution.

Do not allow excessive moisture or liquids to reach direct contact with the camera control unit.

Do not use cleaning agents that are not permitted for use with plastics, such as: Ammonia, Acetone, salty acids (HCl), etc.

The cleaning procedure should be performed while the camera head's cable is connected to the camera control unit. Do not allow cleaning agents, or liquids to enter the camera control unit outlets.

### 7.2 CAMERA HEAD

1. The camera head, with or without the opto-mechanical adapter attached, should be cleaned with Alcohol (70%), or ENZOL Enzymatic Determent, or soap water.

Use a soft cloth or cotton wool for cleaning. Do not use scrubbing material, such as a metal brush, that might scratch the surface.

The cleaning procedure should be performed while the camera head's cable is disconnected from the camera control unit, protected by the connector's protecting cap.

### 7.3 OPTO-MECHANICAL ADAPTER

The opto-mechanical adapter can be cleaned either while separated or attached to the camera head. Use Alcohol (70%), or ENZOL Enzymatic Determent, or soap water to clean the opto-mechanical adapter.

If the opto-mechanical adapter is cleaned while separated from the camera head, make sure that you dried it well, and that there are no loose threads left on the lenses before attaching it to the camera head.

### 7.4 GLASS WINDOWS ON CAMERA HEAD AND OPTO-MECHANICAL ADAPTER

On the front end of the camera head and on both ends of the opto-mechanical adapter there are protecting glass windows.

Spray the glass windows with alcohol (70%) or with an anti-fog solution. Wait 2-3 seconds and dry with a soft cloth.

## **8. DISINFECTION AND STERILIZATION**

### **8.1 DISINFECTING THE MSV-2010**

**NOTE** - *Always disconnect the power cable before cleaning the system*

#### **8.1.1 Camera Control Unit**

1. Use any disinfecting agents which is commonly applied while disinfecting surfaces of electric medical equipment. Such disinfecting agents usually arrive in the form of sprays or damp cloths.
2. Follow the instructions given by the manufacturer of the disinfecting solution.
3. The disinfecting procedure should be performed while the camera head's cable is connected to the camera control unit. Do not allow disinfecting agents, or liquids to enter the camera control unit outlets.

#### **8.1.2 Camera head and opto-mechanical adapter**

1. Use water based solutions, which include the active substance gluteraldehyde (such as CIDEX), or other alkaline substances.
2. Follow the instructions given by the manufacturer of the disinfecting solution.
3. The disinfecting procedure should be performed while the camera head's cable is disconnected from the camera control unit protected by the connector's protecting cap.
4. After soaking in disinfecting solution, dry with soft cloth, in particular any exposed glass windows of the opto-mechanical adapter and camera head.
5. It is recommended to disinfect the opto-mechanical adapter while attached to the camera head, in order to prevent formation of fog between the camera head and opto-mechanical adapter. However, it is also possible to disinfect them separately.
6. It is recommended to use anti-fog solution after completing the disinfecting procedure. Use the anti-fog only on glass surface that was exposed during the disinfections. Follow the anti-fog solution manufacturer's instructions.

### **8.2 STERILIZING THE CAMERA HEAD AND OPTO-MECHANICAL ADAPTER**

1. The camera may not be autoclaved or sterilized with steam!
2. For sterilizing with sterilization solutions follow instruction in paragraph 8.1.2. (Disinfecting of camera head and opto-mechanical adapters).
3. The camera can be sterilized with ETO or Formaldehyde gas. Follow the sterilization instructions given by the manufacturer of the sterilization equipment.

## **9. MAINTENANCE, SERVICING AND REPAIR**

1. Performance of preventive maintenance is not essential. Regular maintenance can, however, contribute to identifying potential problems before they become serious, thus enhancing the instrument's reliability and extending its useful operating life. Maintenance services can be obtained from your local representative or from the manufacturer.
2. Defective items of equipment are to be serviced and repaired exclusively by persons authorized by the manufacturer. All repair work shall employ original manufacturer's parts only.
3. The user can replace fuses, when necessary. Refer to chapter 1(item 10) for location of fuses box and type of fuses. Replace only with identical type of fuses T2A (type Slow Blow 2A).

## 10. TROUBLESHOOTING

<b><u>Problem</u></b>	<b><u>Solution</u></b>
<b>The power indicator (refer to Figure 1) is not lit.</b>	<p>A. Check that the AC power cable is properly connected.</p> <p>B. Check the camera control unit fuses. If necessary, replace with new fuses (type SB 2A).</p>
<b>The power indicator (refer to Figure 1) is lit but the monitor screen is dark.</b>	<p>A. Check that all connections conform to the installation instructions.</p> <p>B. Make sure that the monitor and light source are turned on.</p> <p>C. Check the monitor contrast and brightness controls, and make sure they are correctly set.</p> <p>D. Dismount the camera from the endoscope, and point the camera head towards a light source. If the screen becomes brighter, check the endoscopic equipment.</p>
<b>The picture is monochromatic.</b>	<p>Check that your monitor is of the same standard (PAL or NTSC) as the supplied video camera.</p> <p>B. Check that that Chroma or Color control of your monitor is not set to minimum.</p> <p>C. Check the connection of the video cables on the rear panel of the camera control unit (refer to Figure 2).</p>
<b>The picture is not in focus.</b>	<p>A. Adjust the focus of the endoscope, if exists.</p> <p>B. Focus the opto-mechanical adapter.</p>
<b>The picture is vertically and/or horizontally unstable.</b>	<p>A. Adjust the vertical and/or horizontal controls of the monitor.</p>