

## LIMITED WARRANTY

Your TOV-1 was under constant inspection during assembly to ensure many years of trouble free performance. The TOV-1 is warranted for TWO FULL YEARS from the date of purchase. During this period, your unit will be repaired free of charge should a failure occur due to materials or workmanship. The Warranty does not cover damage due to collision with underwater objects, droppage, or general misuse. It is the responsibility of the operator to make sure the leak detector is working.

# TOV-1

TOWED VIDEO

## OPERATION MANUAL



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## PRESSURE TESTING THE TOV-1

If even a few drops of water is observed in the unit, the leak should be identified and repaired. If the leak point is not obvious (the front dome is almost never the problem, so do not over tighten the dome screws) then the system should be pressure tested. In most cases the leak can be identified by applying a small amount (up to 15 PSI) of pressure to the inside of the TOV and placing the TOV in water while looking for bubbles. A pressure plug is provided in the spares kit for this purpose.

- 1) Remove the black rear dome by removing (3) - 10-32x1/2" OH screws (mark the top hole in the dome before removing).
- 2) Looking into the rear of the TOV-1, locate the black bolt positioned at the top of the rear plate.
- 3) With a 9/16" socket, remove the 3/8" threaded bolt located in step 2.
- 4) Replace 3/8" bolt with the pressure plug provided.
- 5) Pump 15 pounds of air into the housing (do not over-pressurize).  
CAUTION: Use safety glasses when pressure testing.
- 6) Place TOV-1 into water, watch for a steady stream of bubbles.  
NOTE: A few bubbles will come up initially. This is just trapped air.
- 7) If you get a steady stream of bubbles, contact the company and we will supply repair procedures.
- 8) Remove the pressure test valve.
- 9) Replace the 3/8" bolt. Make sure the O-ring is under the head of the bolt. Do not overtighten the bolt.

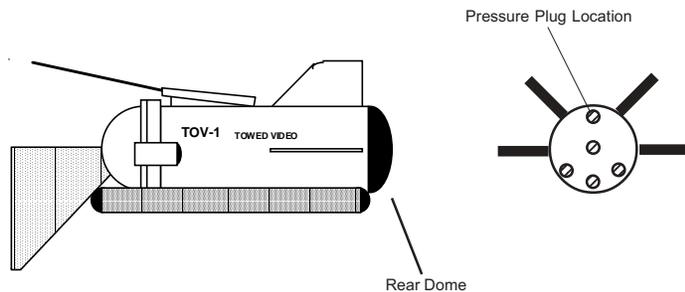


Figure 6

## INTRODUCTION

Underwater video is a new and exciting world for both the diver and non-diver. The TOV-1 may be used to examine possible dive sites, look for salvage, or just to bring the underwater world to the non-diver. In addition, when it is connected to a VCR, it provides a record of the dive site or exploration.

The TOV-1 has been assembled for use as received. The system has been set up for white balance and color at the factory. Your specific situation may require a re-adjustment. To adjust your system, follow the instructions in the camera and lens manuals supplied (see Lens Adjustment on page 6 of this manual).

The TOV-1 is available in both black and white and an optional color model. It may be used with either a monitor or a TV.

## MONITOR/TV

The use of a regular TV is not recommended due to the loss of picture quality when converting the video signal to an RF signal. When using a regular TV, the ANT input must be used which requires an RF adapter. The video quality is dependent upon the characteristics of the RF adapter. A monitor, or a TV with a video input, uses the video signal directly and gives the best quality picture.

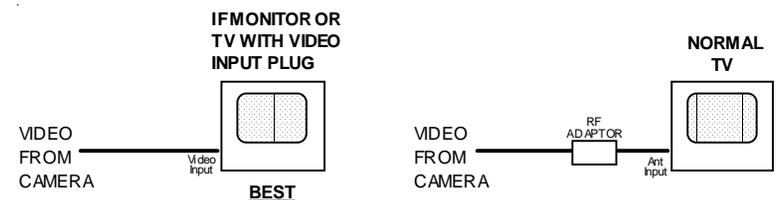


Figure 1

## CONNECTING THE CABLES AND TURNING POWER ON

Before deploying the TOV-1 into the water connect the cables and turn on the power. Check the lights and video picture.

The TOV-1 system comes complete and ready to operate. Connect the cables as shown on page 3. Plug the camera transformer into the GFI outlet, plug the GFI power cord into a 120 vac power source, and plug the coax connector into a VCR or video monitor. **CAUTION:** Before plugging into 120 vac, be sure the light switch on the side of the ground fault box is turned off (light housings will be damaged if lights are operated out of water for more than five seconds).

When attaching the TOV coax cable to the monitor, be sure to connect to the video input jack on the monitor. If a VCR is used, connect as follows:

TOV-1 hook-up to a VCR:

1. Attach the BNC to RCA adaptor to the TOV video cable connector.
2. Plug the RCA connector into the video input jack on the VCR.
3. You will need a video cable with RCA connectors on it, to connect the VCR to the monitor. Connect this video cable to the video output jack on the VCR and the video input jack on the monitors. It may be necessary to use a RCA to BNC adaptor if you are connecting to a black and white monitor.

Make sure the lights are turned off and plug the system into 120 vac. After a few seconds a picture will appear on the monitor. Turn the light switch on just long enough (five seconds or less) to make sure the lights are working. The lens was adjusted at the factory for proper focus in the water, but be sure to read "Lens Adjustment" on page 6 of this manual.

## PUTTING THE TOV-1 IN THE WATER

After connecting the cables, test the system before putting it in the water. After testing, allow 5 to 10 seconds for the lights to cool before submerging the housing. Be sure to keep all connectors dry and well away from water.

While towing or lowering the camera to the target, always have the system turned on. If a leak should occur, moisture in the housing will activate the leak detector and scramble the picture.

## POWER REQUIREMENT

The TOV-1 is powered by 120 vac. If your boat is not equipped with 120 vac, then you must use a motor generator or an inverter.

A generator should be your first choice. A 500 watt unit is adequate to power the TOV-1. Today's small generators are quiet, lightweight and very portable. They produce "clean" 120 ac voltage and can easily power the complete system including a monitor and VCR.

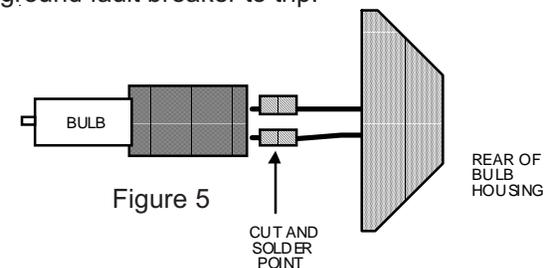
The second choice is an inverter. Inverters convert 12 volts dc to 120 volts ac. To supply the "clean" ac voltage required by video equipment it is necessary to use a "frequency controlled" inverter. These inverters produce an ac voltage that is consistent in amplitude and frequency. These inverters are typically more expensive than a generator.

## MAINTENANCE

The TOV-1 was designed to be maintenance free. After use in salt water, rinse the TOV housing and cable in fresh water. A periodic check of the leak detector should be made. Call the factory at (800) 822-4744 or (508) 822-7330 with any questions.

## BULB REPLACEMENT

Remove the two 4-40x3/8" screws from the rear of the bulb housing (see figure 5). Pull the bulb out the rear of the housing. Cut the wires to the bulb (about 1/2" from the bulb), strip away a minimal amount of insulation, and solder on the replacement bulb. Clean the solder joint and surrounding wires with denatured alcohol or laquer thinner. Form the wires into their final bent position by inserting the light bulb into the yellow housing and positioning the black cap against the housing. Carefully remove the light from its housing taking care not to unbend the wires. Coat the solder splices and surrounding wires with several thin coats of Aquaseal. Wait about one hour between each coat. Let final coat dry overnight and reassemble light housing. If the sealed joint leaks exposing the solder joint to water, it can cause the ground fault breaker to trip.



## LENS ADJUSTMENT

There are two different lenses used on the TOV-1. The B&W camera uses a wide angle 4mm lens with operator adjustable iris (light level) and focus controls. The color camera uses a wide angle 6mm lens with an operator adjustable focus and automatic iris.

The focus control is used to give a sharp focused picture on the monitor. If the picture is not sharp enough then the TOV-1 dome should be removed and the focus ring adjusted. NOTE: There is a big difference in the focus "out of water" vs "in the water". The focus was adjusted at the factory to 6 inches, which is equivalent to several feet underwater. This setting will work for most applications.

The iris control is used to adjust the lens opening, which determines the amount of light allowed to enter the camera. The more light that enters the camera the brighter the picture will be. However, the more the iris is opened (more light), the less "focal length" or "depth of field" (the range or distance that the picture is in focus).

Example: If you open the lens all the way and set the focus for 3 feet, the picture will be very bright and the target will be in focus at 3 feet. If you move the target in to 1 foot or out to 5 feet the picture will start to become blurry (out of focus).

If you close the lens towards C (closed) and leave the focus at 3 feet, the picture will not be as bright but will stay in focus over a much broader range. The picture can be brightened by lighting the target and adjusting the contrast and brightness on the monitor. If you have low light conditions, then open the iris for the brightest picture on the monitor.

Note: The lens is screwed into the camera. In the process of adjusting the lens it may come loose from the camera. If it does, retighten by hand only. Do not overtighten.

## GROUND FAULT BOX

The Ground Fault Box (see figure 2) is hard wired to the 120 vac lights and the Camera Power plugs into it. If even a small electrical leak occurs underwater, the Ground Fault Breaker will trip. If the Ground Fault Breaker trips, call the factory for assistance. Never bypass the Ground Fault Breaker, it is used for safety reasons.

## TOV-1 CABLING FOR B/W SYSTEM

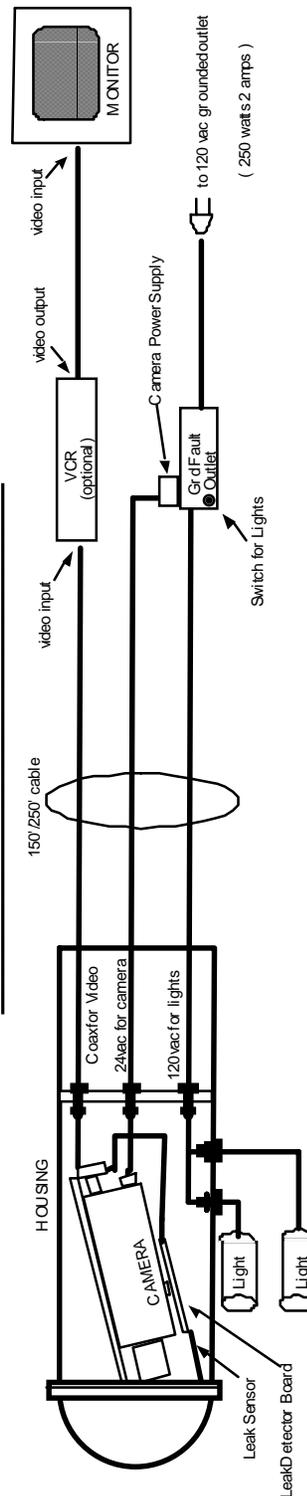
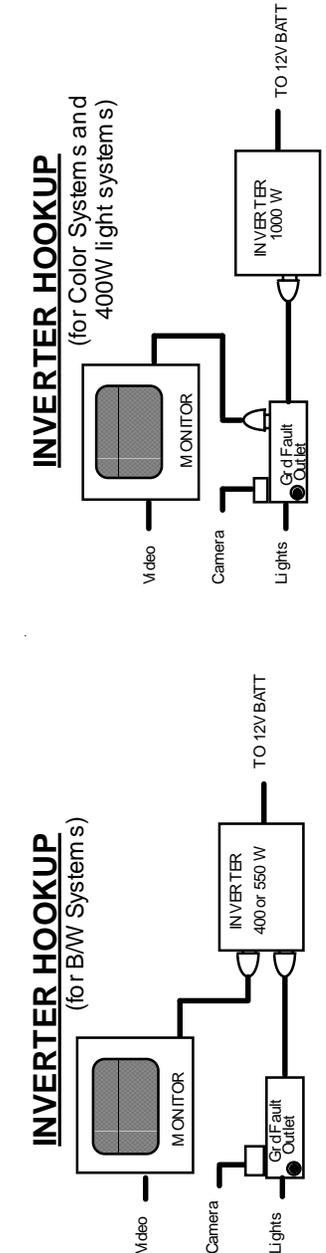


Figure 2



## LEAK DETECTION

The TOV-1 housing is equipped with a leak detector that is designed to alert the operator of a leak problem before any damage can occur.

The leak detector board is mounted under the camera (see figure 4). The leak sensor consists of two wires that are attached to the bottom of the housing near the dome. Any water that enters the camera housing will collect at this point (the housing's low point). When water touches the ends of the two wires, the picture will scramble (see figure 3). The leak system should be periodically tested by removing the front dome and touching the two wire ends with a wet finger.

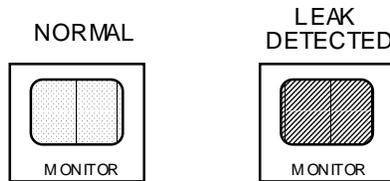


Figure 3

## CAMERA HOUSING ASSEMBLY

The TOV-1 may be disassembled to gain access to the camera and lens by removing the front dome (see figure 4). The dome is held in position by six 6-32x3/4" allen head stainless steel screws. Before removing, mark the top of the dome to insure proper screw alignment when re-installing the dome.

The camera is held in place by two 1/4-20 x 1/2" hex head machine screws located on the top of the camera shelf. To gain access to the camera screws, remove the two 4-40 x 1/4" pan head screws that hold the black ABS shield in place.

Clean the o-ring and seat with a clean cloth before reassembly.

## TOV-1 CAMERA HOUSING ASSEMBLY

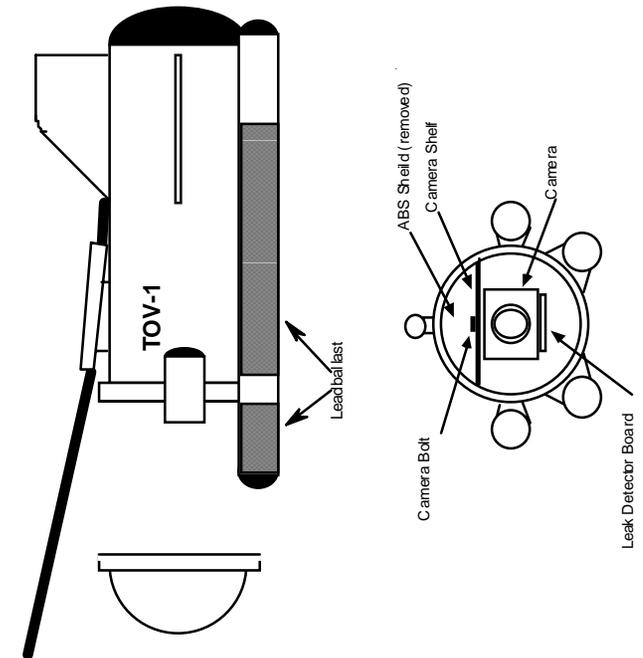


Figure 4

## SPECIFICATIONS

### PERFORMANCE/DESCRIPTION:

- Camera ..... 0.5 lux B&W CCD  
or optional.....2 lux Color CCD
- Lens ..... 4 mm  
or optional.....6 mm auto iris
- Lighting ..... two/four 100w tungsten halogen
- Input voltage ..... 120 vac
- Power consumption ..... 225/425w

### DIMENSIONS/WEIGHT:

- Housing with ballast ... 7"Dx24"L ..... 50 lbs
- Cable ..... .75"x150'/250' ..... 30-45 lbs\*
- Shipping box ..... 24"Wx30"Lx23"H ..... 138/155 lbs\*  
\* varies with cable length

### MATERIALS/COLOR:

- Housing ..... High impact PVC/yellow
- Cable ..... 5 conductor in polypropylene/yellow  
for lights ..... 16-2 SJO  
for camera power ..... 16-2 SJO  
for video ..... RG59

## DEPLOYMENT

The TOV-1 can be towed behind a boat or lowered over the side of the boat for use as a horizontal or vertical drop camera. When towing in deep water it is recommended a downrigger weight or depressor wing be used which will cause the TOV-1 to tow deeper. The slower you tow, the deeper the TOV-1 will go.

When deploying the TOV-1, the boat should be stopped. Lower the TOV-1 to the bottom then slowly raise it to a height which allows a clear picture of the bottom. The TOV-1 camera is tilted downward at a 15 degree angle to give a view off to each side of the TOV-1 and a downward view at the same time. Begin towing at a slow speed. It is recommended that one person be assigned the task of holding the tow cable. If an underwater object is encountered, the person holding the cable can either; a) pull in cable to raise the height of the TOV, b) move the cable to one side of the boat changing the position of the TOV, or c) simply let out cable as the boat is slowed to a stop to avoid a collision.

If straight downward viewing is desired, attach the snap fastner on the tow cable to the ring on the rear of the TOV-1. In this configuration the TOV-1 is held at a steep angle and the tilted camera looks almost straight down at the bottom ( see figure 6 ).

