

Und-Aware™ 400 Series

Above (AG-400-4) and Below (BG-400-4) ground

Set-up and Operating Manual

Preliminary, Spring 2005

Manufactured by:

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2. Unpacking

Each Und-Aware system may ship with any or all of the following:

2.1. Module Pallet

Wooden pallet with corrugated boxes approximately 27" x 15" x 12" inches overall size.

Some boxes will contain ramps and some will contain base assemblies. Additional box for control electronics including LCD display, Undaware control box and multiplexer. Additional box containing air compressor. Additional box containing hose and installation hardware.

Wooden pallet with yellow or black polypropylene ATA rated cases. Typically three cases are supplied of dimension, 26 in x 23 in x 20 in containing the air compressor and cables; 26 in x 25 in x 22 in containing the electronics; and 32 in x 27 in x 25 in containing the imaging hardware, ramps, transition units, etc.

2.2. Control Equipment and Display Pallet

May contain a corrugated box or boxes with system controller or controllers. If two or more systems are purchased and delivered at the same time, a single box approximately 24 x 20 x 20 inches will contain most of the electronics and cables for up to two systems.

There may be one or more monitor boxes per system. Includes power and HD-15 standard RGB cable

Above ground systems typically include transition modules with end mount 3/8 inch bolts and poly female assembly to cable management modules. There may be one or more of these.

Inspection

Inspect to insure all boxes are intact. Pallets are usually plastic wrapped for environmental protection. Notify the manufacturer immediately of any supposed deficiencies in quantities or boxes.

3. Environmental and electrical requirements

Your Und-Aware™ system comprises a viewing/control component and a series of imaging modules. The imaging modules are designed to operate from -30F to 140F with 0-100% humidity. Operation outside these temperature limits may cause various artifacts in the image, but those should not be permanent and the image should return to normal once the temperature is stabilized. The outside components will tolerate virtually any weather element, but should not be allowed to sit in water. Corrosive environments may shorten the life of some components. The viewing/control devices operate from 85-265 volts AC, 50-60 Hz, drawing a maximum power of less than 500 watts.

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Air requirements

All systems have been upgraded to include our patented Air-Wash™ system. You should provide an air supply of less than 145 PSI with a storage capacity of at least 6 gallons. Best effect will be achieved with a system that maintains at least 100 PSI. We ship with all US (110 volt AC) systems a special low current air compressor that can be used on existing 15-amp circuits as available in most control locations.

We recommend a minimum 3/8-inch air supply line be used, as the air retained within the hose acts as a useful reservoir for the air bursts. If a quick disconnect fitting is to be used a minimum 1/4 inch quick disconnect is suggested as the quick disconnect fittings significantly restrict the volume of air flowing through them.

The new AirWash™ design minimizes the amount of air consumed during each cleaning. A 3-burst cleaning cycle is initiated each time the GREEN button on the controller is pressed. Holding down the button will not deplete the air supply.

4. Initial System set-up

4.1. Inventory of equipment

Individual system configurations may contain slightly different hardware. But you should have at a minimum:

- 1 monitor (may be labeled LCD-20UX) with cables to plug into the computer
- 1 control unit (may be labeled ICU-8000)
- 1 computer, custom, may be delivered at time of training
- 2 base assemblies with lights and cameras
- 2 base assemblies for wheel passage
- 8 1-foot ramps and two 2-foot ramps if system is above-ground;
no ramps if system is below-ground
- 2 end/transition modules for above ground system
- 2 thermoplastic surface transition pieces for above ground system
- 1 air compressor for 110 v AC US delivered systems
- 1 yellow 19-pin cable connecting base assembly #1 to the control box (length will vary), standard length is 50 feet.
- 1 control box/computer interface cable with DB-25 plugs on both ends.

1

IEC power cable for the control box

- 2 IEC power cable for the computer and monitor (may plug into the control box)
- 0 or some 3 ft straight, or 45 degree left or right thermoplastic cable management sections for cable protection as may have been ordered
- 1 kit of clevis pins and steel pipes for above ground non-slide installation

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1 manual – you are reading it (may contain CD and/or additional manual)

NOTE: Computer AC voltage switch is set to 220V when shipping non-CONUS

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4.2. Inside set-up

Place the multiplexer, control unit and monitor in the desired location within the monitoring facility. Plug the monitor and the multiplexer power cords into the control unit, and connect the monitor HD-15 video cable into the monitor connection on the computer. Plug the control unit power cable into an 85-265 volt AC outlet. At this point you should have the set-up screen on the monitor and be ready to follow the operating instructions for the VITS-400 software.

4.3. Outside set-up

Locate the desired installation position and insure there is sufficient clearance for the base assemblies, ramps and transition pieces. Along the direction of vehicle movement, approximately 50 inches will be required, and at right angles to that, with 4 base assemblies and basic transition pieces on each end, roughly 116 inches will be needed.

Once the final position for the modules is chosen, it is important that the clevis pins be properly installed to keep the unit from “walking” in the direction of the traffic, as constant traffic will cause the unit to “creep”. Specific instructions for clevis pin installation are contained later in this manual. Clevis pin access is gained once the Undaware logo top plates are removed.

It should be noted that each 24-inch base module and the ramps are all designed to be “loose” so they can move independently of one another. This assists greatly in installations where the surface is not perfectly flat. If your surface is perfectly flat and you wish to connect the modules together, there are 3/8-inch bolt holes in the ends that allow use of a 1/4 inch bolt and nut assembly (not supplied) to tie the units together. If this method of installation is chosen fewer clevis pins may be needed.

Normal set-up is such that the Undaware logo reads correctly for approaching traffic. With the base assemblies properly placed, remove all four Undaware top plates held in place with six 10-32 torx-plus (T-25) flat-head screws. You can now determine the base assembly that should be closest to the cable entrance, as it will have a yellow breakout box. All other base assemblies are identical differing only in that the farthest assembly from the air supply line will have a plug in the last exposed air fitting.

With the base assemblies in place you can un-coil sufficient length of the number two assemblies’ 8-pin yellow cable and plug it into the number 2 assembly’s break-out box. The cable from assembly number 2 plugs into the unused breakout box hole.

Most systems are supplied with an air hose containing a piece of black vinyl tubing on one end, and a 1/4 inch NPT coupler and quick-disconnect fitting on the other end. The quick-disconnect fitting is for the compressor end, the 5/8 inch vinyl plugs into the assembly Number-one air fitting. When inserting these fittings, insure they seat fully. Push firmly and twist and you will feel the hose “seat” that final 1/4 inch or so. The hose cannot be simply pulled back out. To remove the hose, the grey-collars on the fitting must be squeezed together and the hose is then removed with a pulling, twisting motion.

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Depending on temperature and temperament, getting these fittings to release can at times prove challenging. An open pair of pliers inserted over the hole and pushed against the outside grey collar can often help insure the grey collars are really squeezed fully.

There is a length of dark grey hose supplied in one base assembly. Insert the ends of the hose into the grey-collard fittings and push and twist firmly into place until you feel the hose “seat.” Repeat with the other end and with the additional lengths of hose between the center two base assemblies.

4.4. Final testing

You should now unplug the ICU-8000, connect the 19-conductor cable from the monitoring location, power up everything, and confirm proper operation of the cameras, lights and AirWash™ functions. Pushing the green AirWash button on the control box should cause three short bursts of air to be heard coming from the cameras and lights. If the compressor is not yet connected, three clicks will be heard from each assembly’s air solenoids. Camera images should appear on the monitor and when the light switch is turned on, the lights should come on.

If all is fine, drop the clevis pins into place and screw the LOGO covers back on top of the base assemblies.

5. Theory of operation/System Philosophy

The Und-Aware™ system was designed to fill a void in under-vehicle imaging. While there may be no “perfect” method of imaging a vehicle, VIT has undertaken to take one particular approach and make as effective an implementation as possible. There are five critical areas that must be individually addressed to create an effective imaging system.

5.1. Image Acquisition and Display

To image multiple cameras on a single screen, one must either use a computer with image grabber boards, digital cameras and custom display software or choose the much more economical stand-alone multiplexer. In this scenario one uses NTSC cameras and an NTSC display device. In the NTSC system the highest resolution is nearly that available with digital cameras and has been determined to be quite adequate for most under-vehicle imaging. There is the additional advantage of real-time imaging, allowing greater vehicle thru-put affecting more vehicles scanned per hour.

5.2. Imaging resolution

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Having chosen the most economical method of processing and displaying the collected multi-camera images, it is imperative to use a high-resolution color camera to gather at least as much resolution as the display device is able to use. There is no reason to have more camera resolution than can be displayed, but there is definitely a penalty for having too little resolution.

5.3. Lighting the vehicle's underside

5.3.1. How bright is bright enough?

The underside of a vehicle is mostly non-reflective, which is to say, it tends to absorb light. When a camera images an object, it responds to the light reflected back to it from the object. An optically absorptive object – say an object that absorbs 90% of energy within the visible spectrum – will appear only $1/10^{\text{th}}$ as bright as a 100% reflective object. Therefore, if a camera needs 20 foot-candles of light for best signal-to-noise, when imaging a 90% absorptive object, the object will require 200 foot-candles of light illuminating it. Achieving sufficient illumination is critical for proper imaging.

5.3.2. How long will the light last?

Most light sources have a limited life. It is desirable to use a light with as long a life as possible, or use a light that is quick and easy to change, or both. Und-Aware™ uses the brightest, longest life light possible, and allows rapid in-place replacement. The high-intensity white LED's we use are rated at up to 100,000 hours. The units are designed to be highly water resistant so damage as the result of getting wet is highly unlikely.

5.3.3. Does temperature affect the light?

LED's are not sensitive to heat and will come on at full intensity immediately whether they are cold or hot. We have tested functioning LED's in boiling water and frozen into a block of ice and there is not difference in the light emitted. It is best to leave the lights (and cameras for that matter) turned on in extremely cold weather.

5.4. Viewing size

Looking meaningfully at the underside of a vehicle is a challenge under any condition. It would be difficult enough if one had the vehicle raised in the air such that you could walk around at will and look everywhere you pleased. Looking at a single camera or as many as four or even eight cameras requires the image(s) to be as large as practicable. If space were no issue, an inexpensive solution would be to display the image on a 35-inch television. Few security installations can accommodate something that large.

Fortunately, sufficiently large LCD displays are now available and the size increases each year. The LCD20UX display provided with your Und-Aware system is high-resolution and bright and can be supplied with a standard desktop or ceiling/wall mount. For rapid field deployment, or where even an LCD display is not practical, a Head Mounted Display can be used. This provides a virtual 50-inch screen at a viewing distance of 6-feet and can be a valuable alternative display for some situations.

5.5. Lens obstructions-rain

To view the underside of a vehicle, it is obvious the cameras must face upward. This leaves the system open to the effect of anything covering or appearing on the lens cover. As little as a single drop of rain can render a camera useless. This challenge was met with the design of the Air-Wash™ lens cleaning system. Using a highly engineered directed steam of air one can immediately remove most loose impediments and water. For conditions of continuous rain, a second innovative technology allows the water to drain through a multi-use port in the bottom of the camera module thereby minimizing standing water. This feature is now included on the lights as well as the cameras.

6. Initial preparation before deployment of Above Ground system

Before the above ground system is initially deployed some understanding of installation considerations is helpful before engaging in the actual deployment.

6.1. Why four modules

The standard AG-400 system contains four modules, each approximately 2 feet long. Along with the four modules there are a pair of special end transition modules, eight 12-inch wide, long cast aluminum ramps and two 4-foot wide short aluminum ramps. These are supplied as separate pieces for a number of reasons, among them being ease of transport and storage. However, they are also supplied as smaller units because it is nearly impossible to find a 5 ft x 8 ft. perfectly flat surface on which to deploy them.

6.2. It needs to be flat

It is desirable that each module be flat $\pm 1/8$ -inch. Mounting the units on a non-flat surface will cause “rocking,” “twisting,” or “bending.” Flexing will cause premature failure of the structure. Excessive flexing will hasten that process.

6.3. Inspect the deployment site

Therefore, for initial deployment it is imperative to carefully inspect the deployment site. We suggest you carry the base assemblies to the deployment location and lay them down in the intended position.

6.4. Positioning is not critical

The ends should not touch each other if the ground is not quite flat. If the mounting surface is perfectly flat, the modules may be bolted to one another.

6.5. Locate the first assembly module

Position the module closest to the guardhouse where the cables will connect to the modules with consideration for how the cables will run. The supplied transition module converts the Und-Aware™ module assembly to a comprehensive cable management system. This allows cables that leave the Und-Aware™ system to be easily protected. The cable management system has straight lengths; 45deg bends both left and right, and sloped ground transition end units, one of which is supplied with each Und-Aware system. Information and all products may be procured from VIT.

6.6. Verify surface flatness

With the three base plates in final position, determine if the surface is flat within allowable limits for each base assembly.

If your surface is not flat enough, you have more work to do. Appendix A addresses surface preparation in greater detail. But first, be aware of vehicle ground clearance.

Minimal vehicle ground clearance in the U.S. is 4 inches. At only 2 1/2 inches height, your Und-Aware system will not hit the bottom of any “street-legal” vehicle; provided it is not moving too fast and “bouncing.” Vehicles with mufflers or items hanging loose under the vehicle may catch and damage either the vehicle or part of your Und-Aware system; although the system design has reduced that likelihood. Your warranty does not cover any damage caused by excessive vehicle speed or a vehicle that is too low, or a vehicle that has dragging components.

6.7. If it's still not low enough-go below ground

Certain installation locations can benefit from a below-ground system, which is flush with the road surface. The Und-aware™ BG-400-4 system is identical to the above-ground minus the ramps, base assemblies one and four and end transition modules. Adequate drainage must be provided so that standing water is removed. This is especially critical in areas where freezing occurs as ice expands and can cause mechanical failure.

7. Now I'm flat

When your surface is prepared, you will need to locate holes for the clevis pin pipes. The clevis pin alignment is covered below and you must read about it before beginning the installation.

7.1. Here's the "hole" concept

Each base assembly has two holes 1/2 inch in diameter equally spaced from the ends, 21 1/2 inches center-to-center. These clevis pins are found underneath the Undaware logo top plate. These holes allow a position stabilizing clevis pin to drop into place into a pipe placed in the ground in a hole you are about to make. When you actually deploy the system, the clevis pins will pass through the base plate and rest in the slightly larger pipe set in the ground. This configuration is designed to allow some movement of the base module, but to not let it "walk" across the ground in the direction of traffic flow as it will try to do.

7.2. Position is everything

Positioning the holes is critical. It may be that the road surface material will allow precise placement of the 7/8 inch by 6 1/2 inch holes, but if precise placement is a challenge the following procedure should make the task easier.

7.3. Mark your territory

With the plates properly positioned, do your best to mark the center of each hole. The pipes you will be inserting are 7/8 inch in diameter by roughly 6 inches long. We recommend you use a masonry drill or whatever may be appropriate to fashion a hole larger than the pipe-perhaps 1 1/4 inch in diameter by 6 1/2 inches deep.

7.4. Insert the black iron pipe

Place the pipe in the hole and pour a filler product appropriate to the substrate material (e.g. quick-crete if the surface is concrete) around the outside of the pipe to near the top of the hole. Some seepage into the bottom of the pipe is allowable as the clevis pin penetrates less than 4 inches into the pipe. Bring the top of the pipe to ride right at the ultimate level of your sub-assembly plate's bottom.

When the filler material is beginning to set, place the base plate back over the holes and slide the clevis pin through the base plate hole and into the pipe. This will precisely position the pipes at the proper on-center spacing.

7.5. With the tops correct, align the pipes

But this does not insure the pipes are perpendicular to the ground. That is to say the tops of the pipes are 21 1/2 inches on-center, but the pipes may be angled differently in their larger hole below ground. To correct this, it is necessary to remove the clevis pins and place the base assembly on top of the base plate. Re-inserting the clevis pins now will cause the pipes to come into proper alignment with each other. We suggest you leave these assemblies in place long enough for the hole filling material to become reasonably firm. If you use the proper filler material and have the right temperature conditions, this should not take long. After the pipes are reasonably well fixed in place, you may remove the base module. Allow the hole filler material to completely harden per the manufacturers instructions. Now, drop the clevis pins into the pipes and you are ready to go.

8. Execute your cable and hose runs

8.1. Air hose connections and considerations

The end of the Und-aware™ assembly where the cables exit may be sufficiently protected to allow them to lie on the ground. If that is not the case, we suggest procuring the appropriate cable management pieces as needed to provide cable protection. We supply a handy transition module for whatever pieces you need to connect. In the below ground installation, wires are run in conduit below ground level as specified in the installation package supplied with each system.

The cable set you purchased is some specific length (as per your procurement) and contains a yellow wire with diameter of just under 1/2 inch with a connector of just over 1 inch. An air hose is supplied with US systems, complete with fittings, etc. The air connection to the Und-aware™ system is a special quick-disconnect 16 mm black air line mated to a standard 3/8 inch NPT hose fitting. This makes easy connection in the base assembly closest to the guard house and removes the need to wrench fittings inside the Und-Aware unit.

The Air-Wash™ system requires a supply of high-pressure air between 100 and 140 PSI. A special compressor is supplied with each US supplied 110 volt system. This 9-amp rated unit can be used on a standard 15-amp circuit. You may want to locate the compressor outside the monitoring facility, as most units are rather noisy. Remotely locating the air compressor and running a long hose will not reduce the effectiveness of the AirWash function.

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Be careful of the hose and fitting sizes! If a quick disconnect system is needed, use a quick-disconnect fitting on the compressor end only. **Do not** use quick-disconnect fittings on the module end of the system as this will severely limit the air flow and will compromise your AirWash™ effectiveness. All needed fittings are available from VIT, or your local plumbing supplier.

8.2. Electrical wiring – power for the lights

Lights are powered from the control unit included with your system. The lights are controlled from the front panel of the control box installed with the multiplexer and allow the lights to be OFF, ON, or in the center “automatic” mode. In the center position, the lights are triggered by the motion sensor (often called activity mask) contained within certain versions of the software. This is a programmable option within the control box and may or may not be applicable under every circumstance.

8.3. Air-Wash™ control

The Air-Wash™ solenoid is actuated automatically when the green button is pushed. The effect is seen immediately. There are some types of debris that will not remove easily, for instance a glob of mud or grease. It is necessary to physically remove such items with water, window cleaner, a squeegee, or whatever might be appropriate. We supply a special tool with each system to facilitate lens cleaning. It should be used whenever a lens becomes dirty. A buildup of snow must also be removed with a broom when it becomes too deep.

8.4. Camera and light connections within the remote assemblies

The base assembly with the cameras closest to the monitoring location where the cable enters the imaging system is designated as Base Assembly-3. This contains a breakout box into which are installed the 8-pin yellow cables to connect to the center Base Assemblies that contain the cameras and lights. Once the Base Assemblies have been placed in their final installation location, the cables are extended and plugged in.

Camera 1 is generally designated as being farthest from the cable exit end. In a 4-camera configuration only the center four cameras are supplied, so the software views these as cameras 3 through 6. The image on the screen appears as if one were lying on the ground on one’s back with the vehicle passing over one’s feet, moving toward one’s head. You see the left side of the vehicle on your “left,” with the image moving “up.” This is how the screen image appears. To follow this configuration, extend the Base Assembly-2 8-pin cable from the break-out box to the appropriate hole in the Assembly-3 breakout box; the yellow 19-conductor cable and the air hose will pass through base assembly 4.

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8.5. Powering the control unit

The control unit computer and monitor consume very little power; less than 400 watts so it can be plugged into any available AC power source. As with all electronic equipment, AC power circuits should be protected against lightning and power spikes and surges. **NOTE: the AC receptacles on the rear of the ICU-8000 have the same voltage as the mains. Make certain the computer voltage switch is set to the proper voltage for your area.** The ICU-8000 and monitor contain universal power supplies.

8.6. Monitor power and connection

The video monitor may be plugged into the rear of the control unit, or may receive power from any available AC power source. Connection to the control unit is through the HD-15 connector supplied on the monitor. There is no function of “burn” with an LCD monitor, but an image may remain on the screen after prolonged exposure to an unchanging picture. Should this occur, turning the monitor OFF for a period will clear this image. There is no permanent damage.

8.7. Back on the outside

Very little is required to connect all the imaging modules together. Remove the top plates from the modules that have the “Undaware” logo on them. This entails the removal of six 10-32 torx-plus screws—two in the far corners and four common screws along the center of the module. Use a standard T-25 torx-plus wrench (supplied with each system).

With the logo plates removed, you now have access to the channel through which the cables and air hoses run. Unwind as much length as you need of the 8-pin cable to reach base assembly number 3 and plug the cable into the appropriate hole.

There is a length of black 16 mm plastic air hose included base assembly 2.

These hose are removable, but can sometimes be challenging, especially if it is cold and stiff. Nonetheless, it can be removed by sliding the grey plastic collars back against the fitting and holding them there as you rotate and pull the hose. **DO NOT SIMPLY PULL ON THE HOSE.** You will break the fitting. If the hose does not want to come out, you have not completely compressed the collars. A loose fitting pair of pliers slid over the outside of the hose and pressed against the collars can often help.

Slide the Easton brackets over the side bolts connecting base assemblies 1 and 2; and do likewise for the bolts connecting base assemblies 3 and 4. Then slide the 4 foot short ramps into place connecting the center base assemblies.

Slide the 1-foot, long sloping ramps into place along both sides of base assemblies 1 and 4 (for above ground installation).

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Slide the end transition modules into place (as appropriate) and add whatever cable management protective pieces might be needed. Cable management units are available to afford cable protection in 3-foot lengths and also with 45 degree right and left offsets. A final transition to the ground is also provided with each above ground system.

You can now connect the yellow 19-pin connector that has been run from the control location. And then plug in the air hose using the fitting supplied, or whatever you choose to connect to the 16 mm quick-disconnect fitting in Module One.

Test everything before you screw the covers back in place. If the air hose fittings are not done properly air will escape and you will know this from the hissing.

8.8. Set the cameras

The Und-Aware system can be set-up for vehicle flow in either direction. U.S. and other “drive-on-the-right” countries normally have the guard house on the LEFT (drivers’ side). To establish proper camera orientation wherein the image aligns properly on the screen and traffic flow is “upward” install the modules with the word “Und-Aware” properly reading as traffic approaches.

9. Monitoring and control equipment installation

9.1. Concept

Viewing multiple images at the same time necessarily makes each individual image relatively small. We can mitigate that by using as large an imaging system as possible. As space is often a concern, we recommend using an LCD display that is both large in viewing area and small in terms of thickness and “footprint.” As many monitoring rooms have windows, the top of the screen should be mounted as high as possible without blocking too much of the view. The particulars must be worked out for each installation, as every situation is unique. Ceiling and wall mounts are available for the monitor.

The system controller can be installed just below the monitoring screen or off to either side where it can be oriented horizontally or vertically. There are several controls that need to be used frequently, so the controller needs to be handy.

Likewise the keyboard and mouse must be accessible. Recording takes place for each passing vehicle so a “just-scanned” vehicle can have the scan reviewed immediately as slow speed, single-frame, or stop-image. Program upgrades as new features become available are readily accommodated as the computer has been designed to be a separate component of the system.

To playback a just-recorded vehicle, review the instructions provided with the computer control equipment.

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9.2. Watch the light

The latest LCD monitors are quite bright and provide a usable image under all but direct sunlight conditions. For this reason, window treatment is no longer required for most locations, but if treatment is desired, we recommend the 3-M film, which blocks the greatest amount of ambient light plus Infrared and UV. This film is applied to the inside of the window, and does not appreciably block ones' ability to see out, but does block the amount of sunlight coming in. For your convenience this film can be gotten from VIT.

10. Removal of the equipment

Once the initial deployment procedure has occurred, removal and redeployment is much simplified. The following instructions assume the portable cases have been purchased.

10.1. Removal procedure

Remove power to the control unit. This will remove camera power and power to the AirWash™ solenoid.

10.2. Unplug or disconnect the air connection at the compressor.

Be careful—depending upon your installation, there may be high-pressure air that could be dangerous. Make certain of your installation's proper air disconnect procedure.

10.3. Unscrew the “Undaware” logo top plates and set them aside.

You now have access to the cables inside the base assemblies, and this may facilitate removal of the ramps.

10.4. Unplug the main cable and air supply.

Unplug all connections from Module One that extend to the additional modules. Remove all black air hoses from the grey collared fittings. Coil the small yellow cable in base assembly 2. Remove the clevis pins, ramps, and end transition modules. At this point, all units are separated. Screw the top plates back on and store the items in the portable cases or wherever.

Coil the large yellow cable running back to the control box and stow the cable in the box with the air compressor.

The LCD monitor, control box, and computer all stow in the yellow case designed for them.

11. Guardhouse operation

Each facility's guardhouse operation will be unique and the prescribed procedures must be followed. There are many possible operational modes of the computer and those are a function of the procedures put in place by the person in charge. Imaging options abound. Grouping of cameras can be configured. An activity mask may be chosen to allow automatic enabling of the automatic "lights-on" or event recording function when movement is detected by the cameras. We will be pleased to talk with the facility manager to discuss operational options including license plate registration, either manual or automatic.

12. Troubleshooting, repair and warranty

Besides typical troubleshooting, the repair of the electronic equipment should be performed by the appropriate factory-trained personnel. The computer, control unit and monitor are warranted by VIT. For repair of the control unit, monitor, base assemblies or affiliated equipment, contact Vehicle Inspection Technologies, 22800 Executive Drive, Unit 100, Sterling, Virginia 20166, USA, phone 703-834-1064. The air supply system will be warranted by the supplier.

13. Periodic and factory maintenance

Each facility should establish a periodic maintenance procedure. No maintenance is needed for the monitor, control unit or computer other than a periodic wipe down with a benign product such as glass cleaner. The base assemblies are cast aluminum and should require no maintenance. The cameras and lights require service only if they fail to work properly. Present policy is to replace the entire top assembly. For someone familiar with this process this should take less than five minutes and replaces the control module, all lights and cameras. There is a flat rate for repair of this module. Likewise, the Air-Wash™ solenoid is field replaceable with a pair of pliers and a socket set. Your system has been carefully engineered to be as maintenance free as possible, with the exception of the cameras and lights needing an occasional wipe-down with a rag or sponge. Contact the manufacturer or your local supplier as needed for additional information.

14. Helpful hints

The process of providing as sophisticated a system as possible sometimes makes available a confusing number of options and adjustments. If we know your specific wants we will do our best to configure the system to work smoothly right out of the box. Even so, someone will need to be able to set such simple tasks as date and time on the computer.

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Often a local system integrator or VIT certified security affiliate will provide these services as part of the installation package. Our software support people are always available and will be pleased to provide trouble-shooting or value-added enhancements to assist with your particular installation. If you are experiencing software or computer issues, please contact VIT's software support team at "3-Soft USA" (703-914-1410) and ask for Und-Aware™ assistance.

If you suspect malfunction of a camera or light unit, contact VIT for assistance if your installer is unable to assist.

Appendix A

Fitting an above ground installation that is too high.

Your Und-aware™ system has been engineered to be as low as possible, but crowns in the road surface, abrupt slopes on either side of the system or surface buildup as a result of flatness preparation may raise the unit too high. If height is an issue, fortunately there is a rental device known as a “concrete plane” that is designed to quickly dig a cutout in concrete or asphalt. For less than \$500 you can rent a device for a day and make a recess of whatever depth you desire. We advise that you set the top of your base plate no lower than 3/8 inch below the road surface unless the slope of the ground will naturally drain away standing water. Positioned this way, the top of the assembly will be less than 4 inches above the road surface.

Oops, my unit has to sit on a “bump.”

If your installation is such that the unit is sitting on a high spot, it may be that a vehicle will have insufficient clearance. For this we recommend a below-ground installation that may be able to be accomplished relatively easily using the device described above.

Just watch drainage and leave a little extra room as appropriate. Your cables can also run underground through conduit. Electrical conduit should be used, not plumbing conduit as electrical conduit has smooth edges. Plastic is fine if code allows as all voltages are under 40 volts DC.