

# DS-1

Diver Station

## Technical Reference Manual



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## 1. Introduction

Diver station™ model DS-1 is a diver station featuring a keypad and a LCD data display. Some design characteristics of DS-1 are:

- Designed for use in diver applications.
- Housed in a machined aluminum chassis, rated for use at depths up to 1000 feet.
- Includes a 16-key keypad and a 128 x 64 pixel graphic capable liquid crystal display with back light.
- Includes a sonar modem for navigation and communication.
- Powered by internal, rechargeable NiMH batteries.

### Diver stationä Model DS-1 Design Characteristics



Figure 1: Model DS-1 Diver Station

The diver station is housed in a machined aluminum chassis capable of operating at depths up to 1000 feet. A liquid crystal display and a keypad occupy the face of the units. The display can produce both text (8 lines at 16 characters/line) and graphics (128 x 64 pixels). A build-in light provides excellent visibility in darkness. The keypad consists of sixteen keys plus the ON switch. The keys operate by sensing the field of a magnetic pointer (part number DT1-POINT). Located at the units base are two five-pin connectors: an air or gas pressure sensor and a depth sensor. A buzzer on the inside of the unit provides audible alarms and signals.

## 2. Unpacking

Please ensure that your shipment does contain these components.

- Diver station model DS-1
- Two protective caps for connectors, attached to the Diver station connectors.
- A magnetic pointer, part # POINT-D.
- A data cable, part # LINK-V.
- A Connector adapter, part # MAID-D
- A battery charger, part # CHARGE-U.
- A sonar transducer, part number TDCR-D-40.
- This manual

### DS-1 Component List

You will also need a personal computer running Microsoft Windows 95, 98 or NT. If a shipment is incomplete, please immediately contact Desert Star Systems.

## 3. Diver Station Installation

The DS-1 diver station is a multi-function computer for divers. Equipped with a LCD display and keypad, data can be entered and viewed. A sonar transceiver provides communication and navigation functions. Installation of the diver station is straightforward.

### Diver Station Installation

- Charge the battery.
- Configure the diver station.
- Mount Diver station on the diver.
- You're ready to go

There are many ways to mount a diver station. Two approaches are described in this text. However, you may quite possibly find another method that works better for you.

### CAUTION!

If one of the connectors on the diver station is not used, it must be sealed using the supplied connector cap before immersion into water. Failure to do so will result in the destruction of the connector as well as possible leakage and destruction of the diver station. Desert Star Systems is not responsible for damage caused by the failure to apply a connector cap or cable.

### ADVISE

The diver station's internal rechargeable battery lasts for about four to six hours of operation. If the station is to be used for operations exceeding that period, we suggest that you use the external battery case XBAT-D. This battery case holds seven 'D' size cells and extends operational life to 50 to 70 hours. The battery case

is connected to the diver station SONAR connector. The second connector on the battery case connects to the sonar transducer cable. Refer to the accessories section of this manual for details.

Figure 2 shows a diver using the DS-1 station. The gas pressure transducer connects to the optional high pressure hose of the SCUBA rig where it replaces the instrumentation console. The mounting ring at the top of the housing may be used to further secure the unit.

The sonar transducer cable is attached to the SONAR connector. The sonar transducer cable is secured to the high pressure hose using cable ties and follows the hose up to the first stage. From there, the transducer cable is routed down the tank and through the tank strap. A small float is attached to the transducer and lifts it into clear water, one to two feet above the body of the diver.

If such a 'loose' connection is not acceptable, you may also mount the transducer hard against the tank using a 'L' bracket. Consider however that a transducer mounted against the tank or another surface will experience more body and tank shadowing. This may become a problem at longer ranges of operation.



**Figure 2: Diver Station Operated by a SCUBA Diver**

The dive team in figure 3 is using scooters to move around the survey site. Scooters let you move about rapidly and with little effort - thus conserving power and reducing bottom time. They also make for a great platform to mount the diver station.



**Figure 4: A Dive Team with Diver Stations Mounted on a Scooter**

The diver stations external, cable mounted sonar transducer is used for underwater communication and navigation tasks. The sonar transducer is the antenna of the system. Just as is the case with radio and TV antennas, proper placement is required to obtain good reception.

Sonar energy bounces off objects, especially if they contain air such as the lungs of a divers body, a tank or a regulator bubble stream. A 'shadow' is thus created behind the body and a transducer located in that shadow may not pick up sonar energy. It is important to ensure that transducers are placed such that no path blockage will occur. The system can tolerate temporary shadowing, but a permanent blockage will result in loss of navigation and communication capabilities.

When you inhale through a SCUBA regulator, the regulator may generate sonar noise that can affect system operation. The noise dissipates fast with distance. Try to maximize the distance between the sonar transducer and the regulator to minimize interference.

*Note:*

*In 2002, a heavy user of the DS-1 station from the National Park Service in the Virgin Islands reported that the DS-1 operating range was significantly improved by mounting the sonar transducer a few feet in front of the diver on a pole, rather than floating it above the diver. NPS calls this the narwhale mounting method.*

While divers generally use the DS-1 station, it can also be mounted on a ROV. Figure 5 shows the station secured with Velcro to the top surface of an Outland ROV owned by the U.S. Navy. Note that the sonar transducer is suspended a foot below the ROV. This configuration was used for ship hull inspection. The DS-1 is a good dual-use station if operations are conducted using both ROV and divers. For operation in AquaMap ROV and AquaMap Shiphull mode, the station must communicate through the umbilical. The DS-1 is equipped with a RS-232 interface. While the RS-232 specification does not support long distance communication, in practice umbilicals up to 300 feet have been tested successfully. Due to low bit rates, even longer umbilicals may work. However, once the limit is reached a switch to the VLT series ROV transponders becomes necessary.



**Figure 5: DS-1 Station mounted on an Outland ROV**

**Sonar Transducer Mounting Guidelines For Diver Stations**

- The transducer should not be shielded by a body part or other object. It should not bang against any object.
- Ensure that the transducer does not get caught in the SCUBA regulator's exhaust bubble stream. Adjust the transducer cable length to obtain proper placement.
- The transducer should be placed some distance away from the noise generating SCUBA regulator first and second stages.
- For best performance, the transducer should be upright, with the cable pointing down and the mounting ring pointing up. The communication range will be reduced if the transducer is dragged into a horizontal or near horizontal position.
- Place the transducer flotation device a little distance (6") away from the diver station, to ensure that it does not shield the transducer.
- When using a scooter, mount both the diver station and the sonar transducer on the scooter. Mount the transducer such that it can float a foot or so above the scooter, into clear water.

**3.1. Activating And Operating The Diver Station**

The diver station is operated using the supplied magnetic pointer. Pointing the pointer at a key on the keypad or at the station ON and OFF switches on the left and right side of the housing will trigger that key or switch. After holding the pointer there for one second, the key will be triggered again in 0.5 second intervals. A feedback beep announces that a key has been triggered.

Figure 5 shows the liquid crystal display and the keypad. Most screens have four labels on the bottom, which correspond to the four function keys (**F1..F4**). Just hit the key to select the corresponding 'quick command'. Most other keys on the keypad have multiple functions. The arrow keys are used to select entries from a list or to move around a data field. The **INC** and **DEC** keys are used to increase or decrease the value of a modifiable data field. **PgUp** and **PgDn** allow you to step in increments of ten through a list, or increase or decrease the value of a modifiable data field by ten units. **ENTER** is used to acknowledge a data entry, and in some cases to flip between two or more related data screens. In SmartDive, hitting **MODE** calls up the main selection menu through which all functions can be accessed. The station OFF function (a quick command) can also be accessed via this key.

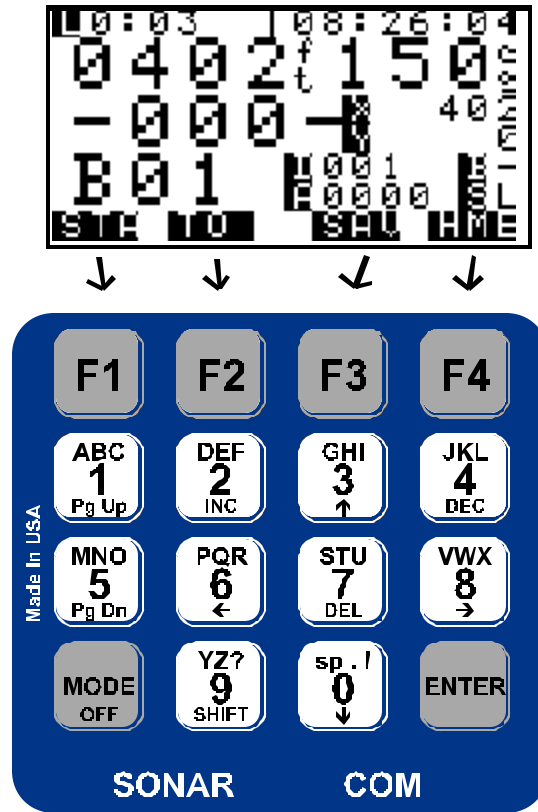


Figure 5: The Diver Station Display and Keypad

**Advise:**

Key sequences you need to know are defined in the appropriate places of this manual. For a complete description of SmartDive operation and the Operation of the DTOS operating system, refer to the technical reference manual.

To activate the diver station, point at the indentation on the left side of the housing. Hold the pointer there until this screen starts appearing on the liquid crystal display.

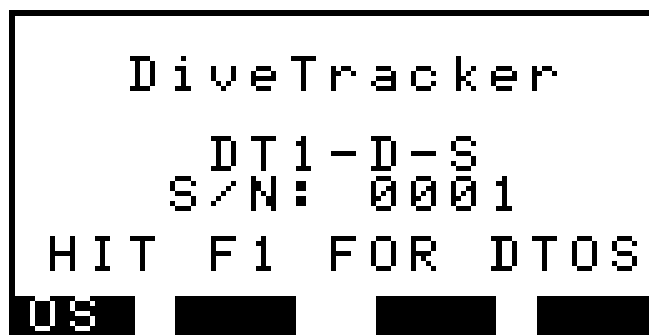


Figure 6: Diver Station Welcome Screen

The welcome screen will remain in place for five seconds. If you do nothing, the diver station will then boot the 'active application'. Just like a PC, the diver station can hold several applications in its memory. The

'active application' is simply the application that has been selected for execution at power-up. This is similar to a PC booting Windows or some piece of software as soon as it is switched on.

The application required for survey operations is SmartDive. If this is your active application, just do nothing. After five seconds the SmartDive dive status screen will appear.

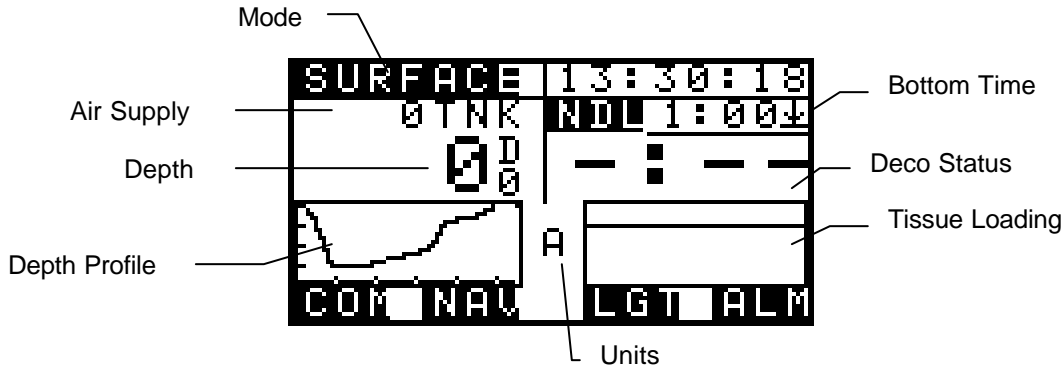


Figure 7: SmartDive Dive Status Screen

If this sequence does not happen, please review the following three sections.

### Adjusting LCD Contrast...

The diver station liquid crystal display has an electronic contrast adjustment. New users will often inadvertently modify the contrast setting such that the display either comes up all dark or 'all white'. Also, LCD contrast will naturally vary with temperature. To adjust contrast 'without seeing the display', switch the diver station OFF and then ON again. Within no more than five seconds after hearing the double-beep, hit the **F1** key. This will interrupt the boot sequence and start the diver station's DTOS 'operating system'. Wait five seconds, then hit the **F1** key again. Contrast cycling will now start. Just watch the screen and hit the **F4** key when you like it. Proceed to the SmartDive application by using the RUN quick command (hit **F3**), or switching the station OFF and ON again.

### Selecting The Active Application...

If you see an unfamiliar screen appearing, your diver station may be running the wrong application. To select SmartDive as the active application, hit **F1** when so prompted by the welcome screen after power-up. Use the cursor keys to highlight the **Select DiveCode** item on the DTOS menu, then hit **ENTER**. You will now see a list showing the contents of each of the station's 16 memory pages. Use the cursor keys to select **SmartDive**, then hit **ENTER** to acknowledge your choice. SmartDive is now selected as the station's active application. You can run it by either using the **RUN** quick command or by switching the station OFF and then ON again.

### Recovering A Locked Station...

If your diver station should ever appear to have 'locked up', or you are just completely lost you may want to use the hardware OFF function. Place the in the indented area on the right side of the unit. This will force the diver station OFF. Switch it ON again and resume operations.

## 3.2. Configuring The Diver Station

Follow these instructions to configure a diver station:

### Configuring A Diver Station

- Connect the Diver station to a serial port of a PC using the supplied data exchange cable and connector adapter. The data exchange cable connects to the station's COM port. When using the STM-10, connect the diver station to the CONFIGURE port. Switch the TRACK/OFF/CONFUIRE switch of the STM-10 to the configure position. Switch the TRACK/CHARGE switch to the TRACK position.
- Power-up the diver station and make sure that SmartDive is running.
- Start the configuration file download process using either the DiveTerm or DiveBase utility on the PC.

Certain parameters such as station ID and receiver sensitivity can also be set directly on the diver station by selecting **Configure** on SmartDive's main selection menu. Doing this may at times be convenient - for example to change the ID of a station. Refer to the SmartDive section in the Technical Reference Manual for details.

### 3.3. Charging The Diver Station Battery

The model DS-1 diver station is equipped with a re-chargeable Nickel Metal Hydride (NiMH) battery. Batteries of this type discharge themselves within a few weeks, and so you might find your station's battery to be low or dead.

The battery is re-charged using a sophisticated fast-charge algorithm which is implemented in the SmartDive™ application. The SmartDive™ application is factory installed on your diver station and selected as the active application.

To charge the battery on a factory new diver station, follow these instructions.

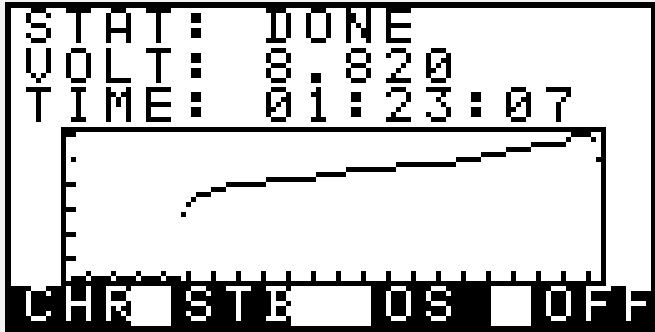
#### Charging The Diver Station Battery

- Remove the protective cap from the COM connector of your station.
- Plug the battery charger (CHARGE-U) cable into the COM connector. Plug the battery charger power cable into a power outlet.
- Activate station by pointing the magnetic pointer at the ON key. If nothing happens or if the station comes on but soon thereafter dies again, the battery may be too depleted to even start the charging algorithm. In this case, let the station sit for about one hour with the battery charger connected. This will allow the battery to be trickle-charged to a level that is high enough to start operations. Now, re-activate the diver station.
- You should see the Diver station™ welcome screen:



```
DiveTracker
DT1-D-S
S/N: 0001
HIT F1 FOR DTOS
US
```

- Wait a few seconds and the diver station should automatically start running the charge code and proceed to charge the battery. You will see this screen:



- Initially the 'STAT' indicator will say 'STANDBY', after a few seconds this will change to 'CHARGE'. The charge cycle itself may take up to two hours. Following this period, a 'DONE' indicator will signal a completed charge cycle.
- The battery is now fully charged. Disconnect the charger and start operations.

**ADVISE**

If your diver station isn't factory new, you might find that an application is selected that does not include a battery charge function. In this case, SmartDive must be selected as the active application before charging can begin.

### 3.4. Interpreting Diver Station Beeper Signals

Diver stations include a beeper that provides acoustic feedback for data entry and an alert if special conditions have occurred. The following table interprets the common signals.

Beeper Signal	What It Means
Single short beep	Used to acknowledge a keypad entry
Double beep	An incorrect keypad entry
Short beep, once per second	The diver station is busy running automatic gain control. Please wait.
Short beep, twice per second	A message has been received. Please view it.
Four short beeps	You'll hear this as a 'hello' when SmartDive™ is started.
A one second beep	SmartDive™ has recognized the presence of the external push-button switch. You will hear this signal the first time you press the switch.

**Figure 8: SmartDive<sup>®</sup> Beeper Signals**

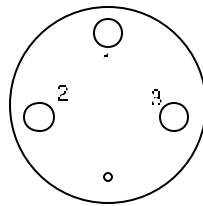
Additional special signals are used when operating with the push-button switch under zero visibility conditions. Please see the SmartDive chapter in the Technical reference Manual for details.

## 4. Diver Station Connectors, Display And Keypad

The diver station features one connector through which it is configured and charged. A second connector accepts the sonar transducer and an optional external battery pack. A LCD and keypad forms the human data interface. There are also a depth sensor and an optional air pressure sensor. All functions are described in detail in this chapter.

### 4.1. The SONAR Connector

This three-pin waterproof connector is located at the base of the unit towards the left side. It is a McArtney type BHMC3F which mates to a model ILMC3M cable connector. The pin out of the connector is shown in figure 9.



- 1: Ground
- 2: External Sonar TX/RX
- 3: External Battery (+9V to +12V)

**Figure 9: Sonar Connector Pin Assignment (Bulkhead)**

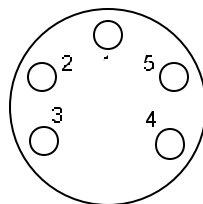
The SONAR connector is normally used to connect the diver station sonar transducer. An external battery pack can also be switched in-line between the DS-1 station and the sonar transducer.

### CAUTION!

Before entering the water, make sure that either a cable or a connector cap (supplied) is inserted in both DS-1 connectors. Submerging the unit with open connectors will damage the connectors and can result in flooding of the unit.

### 4.2. The COM Connector

This five-pin waterproof connector is located at the base of the unit towards the right side. The pin out of the connector is shown in figure 10. . It is a McArtney type BHMC5F which mates to a model ILMC5M cable connector.



- 1: Ground
- 2: Receive Data (RXD)
- 3: Transmit Data (TXD)
- 4: Charger Input
- 5: Not Assigned

**Figure 10: COM Connector Pin out**

The COM connector is not normally used underwater and must be terminated with a dummy plug. On land, this connector accepts the charger and the data exchange cable for station configuration and data download.

### **CAUTION!**

Before entering the water, make sure that either a cable or a connector cap (supplied) is inserted in both DS-1 connectors. Submerging the unit with open connectors will damage the connectors and can result in flooding of the unit.

## **4.3. The Gas Pressure Sensor**

The optional gas pressure sensor is located at the base of the unit. When not in use, the pressure port is terminated with a plug. This sensor measures tank pressure from 0 to 5000 (0 to 340 bar). The accuracy is +/- 50 PSI (+/- 3 bar), although software may display pressure down to single PSI units. If this is done, the least significant digit indicates a 'trend', i.e. allows you to discern a change in pressure but not absolute pressure down to one PSI.

The pressure transducer features a stainless steel separation barrier and can measure gas (air, nitrox etc.) as well as liquid pressure. The transducer is equipped with a SCUBA high-pressure hose compatible thread (1/2" 20UNF).

When SCUBA diving, you can connect Diver station to one of your high pressure hoses where it replaces your standard instrumentation console.

## **4.4. The Depth Sensor**

A second pressure sensor on the base of the unit is available for measuring depth. Depending on your requirements you can select a 100 PSI (224 feet) or 300 PSI (673 feet) model. The greater the range of a transducer, the lesser its accuracy. Thus, you should specify a transducer that matches your maximum encountered diving depth. Figure 11 summarizes the depth vs. accuracy trade-off.

<b>Model</b>	<b>Depth</b>	<b>Accuracy</b>
100 PSI	0-224 feet	+/- 2 feet
300 PSI	0-673 feet	+/- 6 feet

**Figure 11: Depth Sensor Range Vs. Accuracy**

## **4.5. The Diver Station Keypad**

The DS-1's primary data entry device is a 17-key keypad. The keypad does not contain any moving or mechanical parts. It is very rugged and will work reliably at any depth. You operate the keypad using a pencil shaped magnetic pointer (part number POINT-D). Located on the inside of the housing behind each key is a device known as a hall effect sensor. The sensor detects the proximity of the magnetic pointer.

To trigger a key, you must place the magnetic pointer within about 0.1 inch (2.5 mm) of the center of the key. Be aware that a key is triggered by the proximity of the pointer, even if no physical contact occurs. To prevent false triggers, avoid 'skimming' the surface of the keypad as you approach the desired key. Rather, approach the key from above, holding the pointer perpendicular to the surface of the keypad. To indicate a key activation, the station will emit a short 'beep'. Depending on the context, a key may not have any valid function. If you activate such an invalid key, DS-1 will sound a fast triple 'beep' as a warning.

It takes only about 0.3 seconds of pointer proximity to activate a key. If you do not remove the pointer within one second, the station will enter repeat mode, i.e. the key will be triggered in short intervals until you remove the pointer. Each trigger will be marked by a 'beep'.

### 4.5.1. Keypad Layout

The diver station 16-key keypad is shown in figure 12. In addition to these keys, there is also an ON and an OFF switch located on the left and the right side of the station housing.

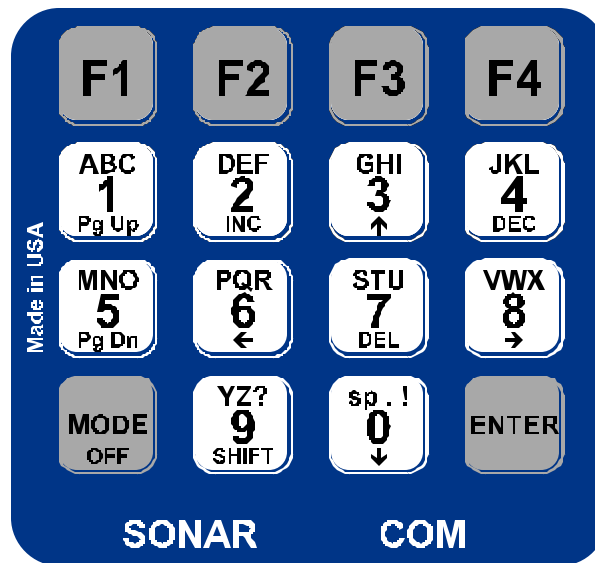


Figure 12: The DS-1 16-Key Keypad

The main body of the keypad is divided into four **function keys** (F1..F4), ten **number keys** (0..9) , the **ENTER key** and the **MODE key**. Each key in each group is defined to have a certain function or set of functions. These functions are explained in the following sections. However, the explanation should be regarded as a guide only. At times constraints demand that a key be 'abused' for a different function. Such a deviation from the norm is explained in the manual for the particular application.

## 4.5.2. The ON and OFF Switches

The **ON** switch is used to activate a diver station, the **OFF** switch forces it off. These magnetic switches are marked by the round indented area on the left side (**ON** switch) and right side (**OFF** switch) of the housing. Like the keys, these switches are operated by using the magnetic pointer. You need to hold the pointer to the switch for about one second to activate the diver station. Switching the diver station **OFF** is normally done through one of the function keys. However, if you lose control of the diver station software and can't switch the unit **OFF**, apply the magnet pointer to the recessed area on the right side of the housing. This will force the diver station off.

## 4.5.3. The Function Keys

The keys **F1** through **F4** in the top row of the keypad are known as function keys. These keys are used for fast single-stroke entry of commands. The function of each key depends on where you are in a DiveCode™ package. That's why these keys are said to be 'context sensitive'. Figure 13 shows a sample DiveCode™ screen as it appears on the station's liquid crystal display.

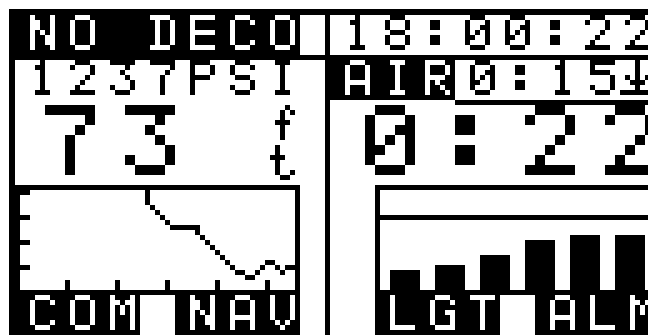


Figure 13: A sample DiveCode Screen

At the bottom of the screen are four **labels**. The labels are associated with **F1** (leftmost label), **F2**, **F3** and **F4** (rightmost label) respectively. Thus, in this example you would hit **F1** to activate the **COM** command, **F2** for the **NAV** command and so on.

The function keys effectively customize the keypad to the current situation and allow you to quickly enter commands.

## 4.5.4. The Number Keys

**0** through **9** are the diver station™'s ten **number keys**. The keys are called **number keys** because each displays a digit prominently at its center.

However, the numbers are really just a secondary function. The primary or default function of each key is indicated in the bottom row of that key, below the number. These keys let you navigate through a DiveCode™ package and control the entry of data.

The primary function of the number keys is associated with the **control mode**, the secondary function (numbers and letters) with the **data entry mode**. By default, Diver station™ is in **control mode** which enables the primary function of these keys. When modifying data fields in a configuration or other menu, the **ENTER** key is used to switch between **control mode** and **data entry mode**. At other times, one of the function keys may be programmed to switch between the modes.

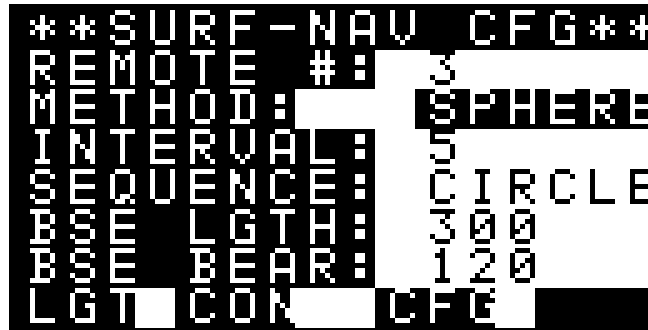


Figure 14: A DiveCode Configuration Screen

#### 4.5.4.1. Control Mode

**Control mode** is the diver station's default mode of operation. In this mode you can jump between several data screens and software functions, select data fields on screen menus and perform many other functions. When operating in **control mode**, the primary function of the number keys as indicated in the bottom row of each key is activated. The keys perform the following functions.

**Keys:** ← ; - ; ® ; -

The arrow keys are used for navigation around a **menu screen**. A sample **menu screen** is shown in figure 14. Use ↑ and ↓ to move between fields located on top of each other, use ← and → to move between fields located side by side.

When you are entering data in a data field, the arrow keys are used to move around the field.

**Keys:** INC; DEC

Some data fields in menu screens have a fixed set of arguments. For example, data transmission speed may either be SLOW, MEDIUM or FAST. Use the **INC** key to select the next greater value (increment), use the **DEC** key to select the next smaller value (decrement).

**Key:** DEL

In data entry mode, the **DEL** key is used to delete the latest entry in the field. When entering letters and numbers, this key will remove the last letter or number and move the cursor one position to the left. If you

are not in data entry mode, this key will delete or 'blank' whatever data field the cursor is currently pointing at. In data fields with a fixed set of possible arguments, the **DEL** key will select the default value of the field.

**Keys: PgUp: PgDn**

These keys will get you to the previous or higher level (**PgUp**) and next or lower level (**PgDn**) screen in any sets of screens. Many configuration menus are multi-screen and you can sequence through the sets of screens with these keys. In DiveCode application software, the keys will move you around the various screens following the hierarchical or sequential configuration of the software.

**Key: SHIFT**

The function of this key is not currently defined.

### **4.5.4.2. Data Entry Mode**

As its name implies, the **data entry mode** is used to modify or enter items in data fields. This may be done to modify an operational parameter of a DiveCode™ package, to enter an observation, define a clear text message for sonar transmission or many other purposes. The **data entry mode** is usually entered by selecting a data field using the arrow and other control keys and then hitting the **ENTER** key. In some cases, software may automatically select the data entry mode as the result of some other actions simply because it is the only valid option.

Once **data entry mode** is enabled, the number keys are used to enter the numbers and letters indicated on them. Depending on the context, these keys may be used to enter numbers only, letters only or both. If either letters only or 'both' is selected, keep the magnetic pointer on a key until the desired symbol appears. After circling through all possible symbols, the key will revert to the first symbol and the sequence will repeat itself.

### **4.5.5. The ENTER Key**

The main function of the **ENTER** key is the selection or activation of an item. For example, when presented by the software with a menu offering several choices for selection, use the arrow keys to point to a specific choice and then the **ENTER** key to activate or select that choice.

When working with user modifiable data fields, the **ENTER** key is used to switch between the **control mode** and the **data entry mode**. In this case, use the arrow and other control keys to point to a data field. By hitting **ENTER** you will put Diver station into **data entry mode** and you can now modify the field contents using the number and letter functions of the number keys. After you entered the desired data, use the **ENTER** key to terminate data entry and return back to the **control mode**.

### **4.5.6. The MODE Key**

The **MODE** key is used to enter the operating mode selection menu of a DiveCode™ package or other software as well as to execute some fundamental diver station functions. Figure 15 shows a sample mode

screen of a DiveCode™ application. At the bottom of the screen are four labels defining the operation of the function keys. The F1 key (LGT) lets you switch the LCD backlighting on or off, the F2 key (CON) allows you to change the LCD contrast. These two functions are always available on the function keys when activating **MODE**. In this particular case, F3 is used to select the DiveCode configuration menu (CFG) while F4 is undefined.



Figure 15: A Sample MODE Screen Of A DiveCode Application

Above the function key labels appear a set of choices that are selected through the arrow and enter keys. In this example, the DATA COLLECTION mode is currently selected. Other choices are OFF which switches Diver station off and EXIT which exits the DiveCode application and returns control to the DTOS operating system. The OFF and EXIT commands are on purpose not available through the function keys to prevent accidental triggering which could have serious consequences while underwater.

## 4.6. The Display

A high-contrast super twist liquid crystal (LCD) display is implemented for data viewing. The display supports both text and graphics mode. The resolution in text mode is 8 lines and 16 characters per line. In graphics mode, the resolution is 64 pixel vertical by 128 pixel horizontal. Figure 16 shows how text in various font sizes and graphics can be mixed on the display.

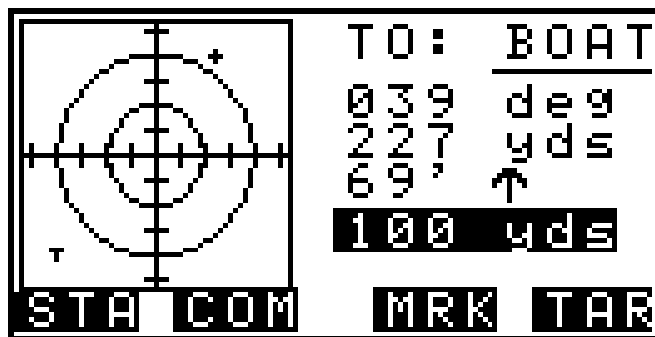


Figure 16: Graphic/Text Display

For easy viewing in darkness, the display includes an LED backlight. The light is switched on and off under software control. Keep the light off when sufficient exterior light is available because the diver station receive mode supply current is nearly doubled by the light (battery life is cut in half).

## 5. The Diver Station 'Operating System'

To switch the DS-1 station on, simply point at the ON key, using the magnetic pointer. The DS-1 welcome screen as shown in figure 2-17 will appear.

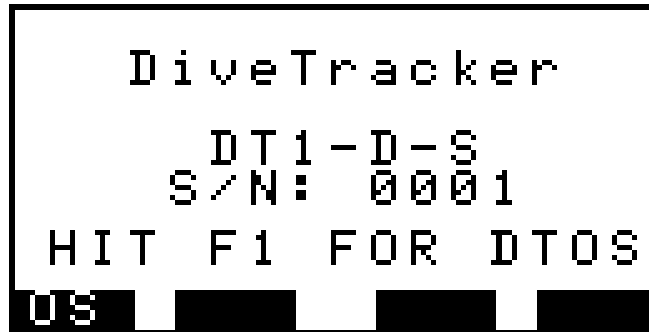


Figure 17: Diver station Welcome Screen

At this point you have two options to proceed.

- You can do nothing. The welcome screen will persist for about five seconds. After that the currently 'selected' application will automatically be activated.
- You can hit the F1 key within five seconds to proceed to station's DTOS operating system.

During normal field operation you would typically do nothing, i.e. you would allow the station to proceed directly to whatever application you selected it to run.

If the system however requires re-configuration of some sort, you would hit <F1> to proceed to DTOS. DTOS is the 'operating system' of the diver station. DTOS performs a variety of administrative or housekeeping functions. The DTOS main screen looks as follows.

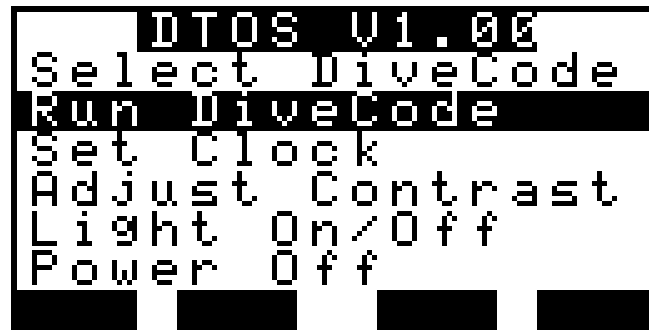


Figure 18: DTOS Main Selection Menu

At this point you can use the up and down cursor keys to select one of the DTOS functions and the ENTER key to execute that function. As a new user, we recommend that you select the DT-TEST application which is stored in the memory pages of your station by choosing the SELECT DIVECODE command. This application allows you to test the hardware of your diver station. After you selected DT-TEST, you would start running it by choosing the RUN DIVECODE command.

Other functions available to you are setting the real-time clock (SET CLOCK), adjusting the LCD contrast (ADJUST CONTRAST), switching the LCD backlighting on or off (LIGHT ON/OFF), or switching Diver station™ off (POWER OFF).

The DTOS functions are explained in detail in the DTOS reference manual. Refer to the SmartDive™ and other application code reference chapters for detailed operation instructions on these items.

## **6. Maintaining The Diver Station**

Your diver station is designed to be rugged and requires very little maintenance. However, please do observe the following points to ensure long and proper operation.

- Rinse the diver station with fresh water after each day of diving or when there are long surface intervals. Pay special attention to the area around the connectors and transducers on the base plate. The diver station chassis is made out of aluminum, the transducers and connectors, screws, mounting ring and other hardware are stainless steel. Even though diver station is hard anodized to minimize corrosion, some will still occur at the points where the two metals meet. This corrosion can be minimized through proper rinsing. Corrosion around this area will rarely be severe enough to affect operation. It may however be a cosmetic consideration.
- Make sure that the holes in the cover plate of the depth transducer do not get blocked by debris. If this should happen, apply a hard stream of water to this area to dislodge the debris. **DO NOT USE A SHARP OR POINTY OBJECT TO PENETRATE THE COVER PLATE HOLES. THIS MAY WELL RESULT IN DAMAGE TO THE SENSITIVE TRANSDUCER MEMBRANE.**
- Take a look at the Diver station screws to ensure none is coming loose. If you see any loose screws, secure them before diving.
- The Diver station chassis is sealed with a number of o-rings. The o-ring rubber has a limited life time. We recommend that you return the diver station to Desert Star Systems every three years for service.

### **Diver Station Maintenance**

## 7. DS-1 Specifications

Size:	205 mm x 87 mm x 41 mm (8.08"x3.42"x1.63") hard anodized aluminum chassis
Weight:	1500 g (3.3 lb) in air, 500 g (1.1 lbs.) in sea water
Operating temperature:	0-50 degrees Celsius
Depth rating:	300 m (1000 feet )of sea water
Data entry:	16-key solid state 'Hall effect' keyboard
Data viewing:	64x128 pixel LCD graphics display with back light
Sensors:	Depth sensor for depths up to 0-200 m , accuracy +/- 2 m Optional SCUBA tank pressure sensor 0-340 bar (0-5000 PSI), accuracy +/- 3 bar (50 PSI) Sea water temperature sensor 0-50 Celsius, accuracy +/- 0.5 Celsius
Microprocessor:	MC68HC11, 1 MHz
Memory:	512 Kbyte of battery backed-up SRAM (for user data) 2.5 Kbyte of volatile SRAM (stack space) 512 Kbyte of permanent FLASH memory (for DiveCode) 24 Kbyte of EPROM (firmware storage)
SONAR connector:	3-pin waterproof connector, provides a link to external omni-directional sonar transducer and external battery.
COM connector:	5-pin waterproof connector, for station configuration, data download and battery charging
Sonar transceiver:	0-60 Watt RMS output in transmit mode RX sensitivity 7 microvolt RMS @ 6 dB S/N 4th order programmable switched capacitor filter Digital frequency synthesis, tunable in 0-100 kHz range, resolution 1.5 Hz
Sonar transducer:	Cable mounted omni-directional transducer. 34-41 kHz,
Sonar range:	100-500 meters communication range, depending on sea conditions
Sonar modulation:	10-channel multi frequency-shift keying (MFSK)
Sonar bitrate:	15 - 150 bits/sec
Sonar Navigation:	Long baseline and short baseline principle plus sensor depth data yields 3D position information Navigation range is 100-500 meters, depending on sea conditions Distance measurements repeatability +/- 0.15 meter (system limit)
Power consumption:	0.7 mW in sleep mode (1 year battery life) 420 mW with sonar modem disabled (18 hours battery life) 840 mW in sonar receive mode (9 hours battery life) Up to 30 W in high-power sonar transmit mode
Battery:	1200 mAh internal NiMH battery, 90 minute fast charge, optional external battery for 50 hour battery life

Note: all specifications are subject to change without notice