# SLICK SLEUTH
# DETECTION STATION
# SS320

## Installation, Operation, and Maintenance Manual

Revision J

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# 1 DESCRIPTION

The Slick Sleuth Autonomous Detection Station is a remote sensing device for the detection of oil pollution on a water surface. It detects oil by stimulating fluorescence in the oil and then detecting the fluorescence. A short burst of collimated UV light is directed onto the water surface. The resulting fluorescence is filtered and detected by a focused optical system.

The Detection Station is enclosed in a NEMA 4X (IP66) enclosure to provide water-tight integrity and reliability. As an option, the enclosure is provided with ports which allow the user to equip the station with a purge system. The addition of the appropriate purge system makes the station usable in an explosive gas environment. External power is provided to the Detection Station via a cable through a cable fitting. A second cable provides communication to the user's equipment.

The Detection Station makes periodic detections and reports the results through the communication cable on a pre-set period. The period is pre-set at IOS, but may be changed by the user through an external USB serial port.

## SPECIFICATIONS

| | |
|---|---|
| Input Power, AC Models | |
| Input Voltage | 85-264 VAC (Standard)<br>100-240 VAC (Heater installed) |
| Input Frequency | 50/60 Hz |
| Input Current | 0.5 amp typ. (exclusive of heater)<br>6.5amp peak (Heater installed) |
| Input Power, DC Models | |
| Input Voltage | + 11 VDC to +28 VDC |
| Input Current (exclusive of heater) | 370 mA average at 12VDC (full features)<br>2.2A peak at 12 VCC<br>230 mA average at 12VDC (min. features) |
| Input Power (12 Vin) (exclusive of heater) | 4.5W average (full features)<br>2.8W average (min. features) |

NOTE

Input current and power are dependent on operating setup and installed interface. Values listed as "average" represent a 30 second period with 10 pulses/sample and no external indicators or other

| | |
|---|---|
| Operating Temperature | |
| Range (Internal) | -10°C to +60°C |
| Heater option | -20°C to +60°C |
| Weight | 28.5 lb (12.9 kg) |

Communications Interfaces

Equipment Status Relay

| | |
|---|---|
| Configuration: | SPDT |
| Rating: | 10 amps @ 120 VAC, resistive<br>10 amps @ 30 VDC, resistive<br>10 amps @ 277 VAC, resistive<br>½ HP @ 250 VAC<br>1/3 HP @ 120 VAC |

Oil Detect Relay

| | |
|---|---|
| Configuration: | DPDT |
| Rating: | 10 amps @ 120 VAC, resistive<br>10 amps @ 30 VDC, resistive<br>10 amps @ 277 VAC, resistive<br>½ HP @ 250 VAC<br>1/3 HP @ 120 VAC |

0-20ma Current Loop

Source Mode

| | |
|---|---|
| Compliance | 0 - 650 ohms |

Sink Mode

| | |
|---|---|
| Maximum Voltage | 36 VDC |
| Compliance | 0-1000 ohms |

Serial Communications (Independent of external serial ports)

USB 2.0
RS232
RS485 4-wire

# 2 INSTALLATION

## 2.1 UNPACKING

Upon receiving the Detection Station inspect for external signs of shipping damage. If shipping damage has occurred, immediately file a claim with the carrier and contact InterOcean Systems.

> NOTE
> Simple step-by-step instructions to perform the installation and initialization of the Slick Sleuth are provided in the Slick Sleuth Quick Start Instructions in Section 5 to assist the first time user. The installation information that follows in Section 2 is provided for the experienced user and is referenced where appropriate from the Quick Start instructions.
>
> A software utility program is available to facilitate installation and maintenance. IOS strongly recommends that the user obtain a copy of the program for use during installation. The procedure in the Quick Start Instructions have been developed based on the use of the utility program. Instructions for the use of the utility program are provided in Appendix A.

## 2.2 MECHANICAL

The Detection Station mounts vertically above the water surface as shown in the Installation drawing in Section 5. The area beneath the Detection Station, depicted as a cone in the Installation drawing, must be clear of all obstructions to allow the full water surface to be illuminated.

Mounting to the user platform is done using the holes in the tabs on the back of the enclosure.

## 2.3 ELECTRICAL

### 2.3.1 Power

When AC power is provided from an external AC power source the wiring connection is shown in Figure 2. IOS recommends that a 2.0A slo blo fuse (std.) or 8.0A slo blo fuse (heater) be used on the input power.

The Detection Station is either shipped to be powered from external AC or DC power. For DC the wiring connection is shown in Figure 3. The power cable must meet the requirements of the Installation Drawing.

**CAUTION**

Power must not be removed from the Detection Station while the flash is firing. Power can be removed safely by one of two methods: 1) through the serial communication interface set

the unit to Mode = 0 prior to removing power, or 2) remove power immediately after a flash sequence ends.

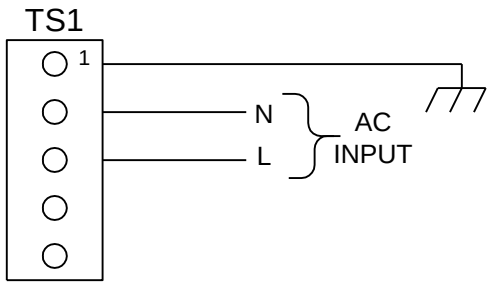



**Figure 2**
**AC Power Wiring**

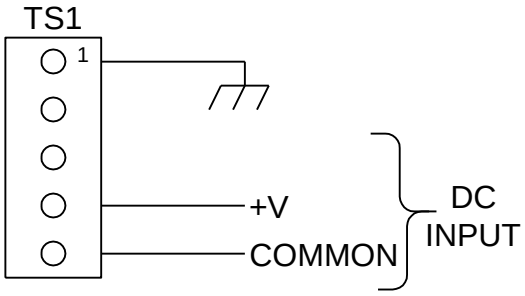



**Figure 3**
**DC Power Wiring**

The power cable must meet the requirements of the installation drawing.

WARNING
DO NOT USE THE INTERNAL POWER SUPPLY TO POWER EXTERNAL EQUIPMENT. DOING SO WILL RESULT IN DAMAGING THE SLICK SLEUTH AND VOID THE WARRANTY.

2.3.2 Interface

For a Detection Station using a current loop communications interface, the communications cable to the user's equipment is a 2-wire 0-20 ma current loop. The wiring connection is shown in Figure 4. The communications cable must meet the requirements of the Installation drawing.

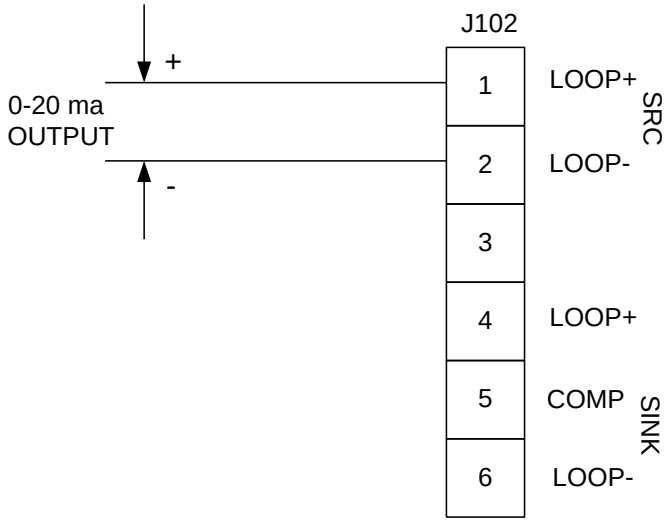
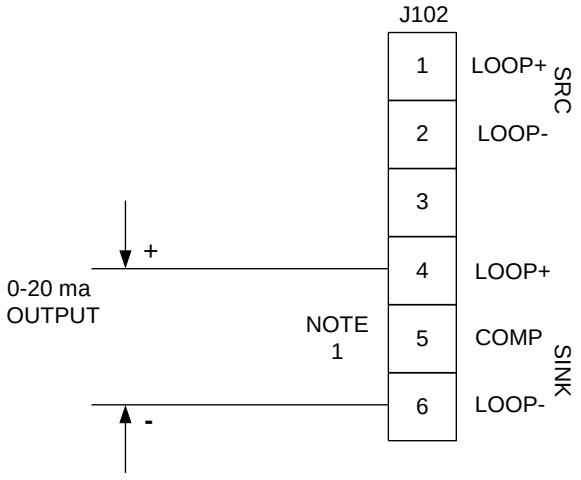



**Figure 4A**
**0-20ma Current Source Output Wiring**




NOTES:

1. The COMP terminal provides 499 ohms compliance as an alternate LOOP connection.

**Figure 4B**
**0-20 ma Current Sink Output Wiring**

For a Detection Station using a relay communication interface, the communications cable to the user's equipment is a 2-9 wire cable (the actual number depends on the user's requirements). The wiring connections are listed below. The communications cable must meet the requirements of the Installation drawing.

Oil Detect Relay

Configuration: DPDT

Termination:

| Terminal | Description |
|---|---|
| J202-1 | Pole 1 |
| J202-2 | Pole 1 NO |
| J202-3 | Pole 1 NC |
| J202-4 | Pole 2 NO |
| J202-5 | Pole 2 NC |
| J202-6 | Pole 2 |

Equipment Status Relay

Configuration: SPDT

Termination:

| Terminal | Description |
|---|---|
| J202-8 | Pole |
| J202-9 | NO |
| J202-10 | NC |

### 2.3.3 Serial Interface

The standard configuration of the Detection Station provides two serial interfaces. For local access, typically for initial setup or periodic maintenance, a USB port is provided on the side of the enclosure. A second serial port is available to the user at J13 on the side of the Detector circuit board.

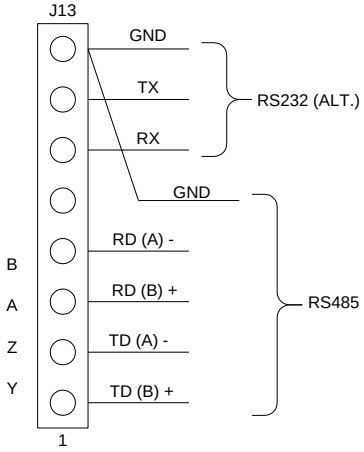



Figure 5
Standard RS485 Wiring

The RS232 connection at J13 is also available to the user as an output in the standard configuration. The port at J13 is only functional as a single port. If requested at the time of order, the port can be configured as a functional RS232 port (typically for use with an RF modem), but the RS485 port will not be available.

As an option, the USB port for local communication can be replaced with an RS232 interface, which will make both RS232 or RS485 (or a second RS232) ports available to the user.

## 2.4 INITIALIZATION

The Detection Station is shipped from IOS configured to operate immediately upon application of power. Only one initialization procedure is required to optimize the performance of the Detection Station. The procedure directs the Detection Station to make measurements to establish the ambient conditions from which the detection threshold can be set.

The measurement, which is referred to as a “baseline” measurement, requires the user to communicate with the Detection Station through the serial communications interface. See Appendix C for the interface definition.

When making the baseline measurement ensure that no oil pollution or other foreign matter is present on the water as it will bias the measurement unfavorably. If however, an oil sheen or some amount of foreign matter is present and is expected to always be present, the baseline should be done to establish the “normal” operating conditions.

The baseline measurement is performed by sending the Baseline ‘I’ command to the Detection Station (ref. Quick Start Instructions Step 7).

The Detection Station responds with three count values. The first count, which is identified in the protocol as the average detection count, is the baseline measurement. Record this value for future reference.

In addition to establishing the baseline during the initialization process, other settings may also be adjusted. For example, the offset (detection threshold = baseline + offset) may be increased or decreased according to the users requirements and desired sensitivity. A small offset will make the Detection Station sensitive to small amounts of oil, but may also increase the probability of false alarms. A large offset will minimize the probability of false alarms but will also increase the amount of oil required to cause a detection. Refer to the Quick Start Instructions in Section 5 and the Theory of Operation in Appendix B for implementation and guidelines.

# 3 OPERATION

## 3.1 REPORTING

Immediately after power is applied the Detection Station begins a periodic detection and reporting cycle at the pre-set period. The period is once every 5 seconds, unless specified otherwise at time of order or changed by the user.

### 3.1.1 Relay Interface

If the Detection Station is configured with relay outputs, three outputs are provided, two to indicate the detection of oil and the third to provide an equipment status indication.

The characteristics of each relay are as follows:

Oil Detect

Function:

The relay is energized when oil is detected as “present”. The determination is based upon background and threshold levels established by the user during routine setup of the Slick Sleuth . The SLICK SLEUTH maintains the relay in its state for the last condition reported until the next detection cycle reporting a change in condition. The oil detect relay is a DPDT relay.

Equipment Status

Function:

The relay is energized when the Slick Sleuth is functioning properly. The equipment status relay is an SPDT.

### 3.1.2 Current Loop Interface

If the Detection Station is configured with a current loop interface, the message transmitted through the current loop interface is formatted in one of the following formats:

**a. Discrete (Yes/No) Output**

Yes/No output means that oil is reported as either ‘present’ or ‘not present’. This determination is based upon background and threshold levels established by the user during routine setup of the Slick Sleuth™

station. There is also an output level to indicate 'fault' status. With the "Yes/No" protocol:

3 mA = Indicates 'Fault' (equipment/power system out of specification or faulty)

6 mA = Indicates 'NO Oil Detected', & 'monitor OK'

20 mA = Indicates 'YES Oil Detected', & 'monitor OK'

The Slick Sleuth™ monitor will maintain output level for the last condition reported, until a new condition is detected and reported at the corresponding output level. During normal operation the monitor will set the output at a nominal 6 mA, and hold the output at 6 mA indefinitely or until a change of conditions. If a positive 'Yes' decision is made, the output is set to a nominal 20 mA and held at 20 mA until there is no longer oil present or until a fault occurs. If oil is no longer present the output returns to a nominal 6 mA.

**b. Scaled Output**

Scaled output means that output is scaled proportionally to the signal strength (amount/type) of oil detected. This detection protocol is for users who want the signal to reflect the actual reading or raw number of "counts". As with both protocols, the monitor maintains output level for the last condition reported until a new condition is detected and reported at the corresponding output level. With the "Scaled Output" protocol:

3 mA = Indicates 'Fault' (equipment/power system out of specification or faulty)

4-20 mA = Output is proportional to the fluorescence signal returned from any oil present – with 4 mA representing 'No Return', and 20 mA (minus offsets) representing 'Full Scale Return'. See Appendix B for a detailed description of the scaling.

**c. Scaled/Corrected Output**

The data format is the same as B) Scaled Output except that the ambient (or background) signal is subtracted from the signal before it is output on the current loop interface. The correction is the baseline measurement made during initialization (Ref. Section 2.4) or as measured by the adaptive baseline, if enabled.

3.1.3 As an option the Slick Sleuth has two external indicators located on the side of the enclosure. One indicator, which is labeled "DETECT", illuminates red when the Slick Sleuth detects oil. The other indicator, which is labeled "STATUS", illuminates green when the Slick Sleuth has power and is operating properly.

## 3.2 HEATER

As an option, the AC-powered Slick Sleuth has an internal heater to allow operation at temperatures below the normal operating temperature range.

## 3.3 SETUP

The Detection Station is setup at the factory and can require a programming change in the field after the unit has been installed and initialized. If setup changes are required, the Detection Station must be setup through the serial interface using the Slick Sleuth utility program (ref. Appendix A).

Features affecting performance that the user may wish to change are the following:

Detection Period

The time interval between periodic reports. Send Command 'P' with the desired time interval (in seconds). Setting the period to less than 5 seconds sets the sample cycle to single sample every 0.5 seconds.

Number of Samples

The number of flashes used in a detection sequence. Increasing the number of samples improves detection reliability. However, it increases power consumption and decreases flash lamp life. Send Command 'B' with desired number of flashes. The default number of samples is 10 (maximum allowed).

Sample Interval

The time interval between flashes in a detection sequence. Send Command 'C' with the desired time interval (100 millisecond steps). The default interval is 01 (100 milliseconds).

Offset

The threshold for detection. The offset added to the baseline is the counts threshold for detection. This is the sensitivity control. Send command 'T' with the desired offset. The default offset is 1000 counts.

Detection occurs when the measured signal exceeds the sum of the baseline (the normal “background”) and the offset (also referred to as “threshold”). Mathematically this is when:

Signal (counts)>Baseline (counts) + offset

For example, if the Baseline measurement is 850 counts and the offset is 1000 counts, detection occurs for any signal greater than 850 + 1000 = 1850 counts.

Mode

The selected mode specifies the type of output(s) that SLICK SLEUTH can provide and whether the SLICK SLEUTH operates autonomously (i.e. the SLICK SLEUTH makes detections on a periodic schedule) or polled (i.e. the SLICK SLEUTH makes detections only when commanded). The following table lists the modes and for reference the associated “healthy” status word.

| Mode | Description | “Healthy” Status Word |
|---|---|---|
| **0** | **Polled** | **0000** |
| **1** | **Autonomous, relay** | **2000** |
| **4** | **Autonomous, current loop discreet output, relay** | **8000** |
| **5** | **Autonomous, current loop scaled output, relay** | **A000** |
| **6** | **Autonomous, current loop scaled/corrected output, relay** | **C000** |

Adaptive Baseline

Automatic correction for ambient conditions. The averaging period in minutes used to compute the correction. Send command ‘M’ with the desired time period in minutes. To disable the adaptive baseline send command ‘M’ with ‘00' as the minutes. To enable enter 01-99 as the minutes.

Adaptive baseline is used when the distance between the Detection Station and the water surface is expected to change significantly over time. Examples are ocean pier installations where tidal flow changes the water level on a daily basis and storm water discharges that intermittently increase the water level**,** as well as stormwater jumps

Probability of Detection

This feature is used to define what (how many positive detection samples) constitute an alarm in order to reduce the probability of false detection and/or provide alarm filtering parameters. Two commands work together to establish a filter that rejects spurious detections due to the potential variability of the monitoring environment. The first command establishes a time window over which the SLICK SLEUTH evaluates detections. The time window is specified in multiples of four samples, from four to ninety-six samples. The second command sets the minimum percentage of samples within the time window required to declare a detection. The percentage can range from 0 to 100 %. Setting the percentage to 0 % disables the feature, allowing the SLICK SLEUTH to declare a detection on any single sample.

As an illustration, an SLICK SLEUTH running at a period of 5 seconds takes 12 samples in one minute. If the user wants to use one minute as the sampling window, 12 is entered as the time window. Entering 25 for the minimum percentage of samples, a 25% probability detection percentage is established. With this setup the SLICK SLEUTH must make at least 3 detections (25% of 12) within one minute before it will report a detection. Selecting 50% would require 6 detections within the one minute window, and selecting 100% would require 12 continuous detections before a detection would be reported by the SLICK SLEUTH.

For more information regarding Probability of Detection refer also to step #9 in the “Quick Start Instructions” within this manual.

## 3.4 Aperture Control

If the baseline measurement made during initialization (Section 2.4) is very high (15,000 counts or higher), the dynamic range of the Slick Sleuth becomes limited. One of two remedial actions should be taken. The first remedial action is to determine if oil pollution or other foreign matter is present in the field of view that would not normally be present. If this is the case, the detection area should be cleaned to remove the undesired source of the high signal counts. The second remedial action is implementation of the Aperture Control Kit provided with the Slick Sleuth. The Aperture Control is used to attenuate and increase dynamic measurement range of the Slick Sleuth to a level where the Slick Sleuth can function with the presence of a high baseline.

Installation and use of the Aperture Control is shown in the Aperture Control Installation drawing provided in Section 5

# 4 MAINTENANCE

## 4.1 PREVENTATIVE MAINTENANCE

IOS recommends that the user institute a preventative maintenance (PM) schedule. Detailed PM guidelines are provided in Appendix E.

## 4.2 LAMP REPLACEMENT

The flash lamp has very long estimated life, on the order of 5 – 6 years under typical operating conditions. In the event that the lamp fails or degradation becomes evident, as evidenced by a status report message (using the Slick Sleuth Utility Program), perform the lamp replacement procedure in Appendix F.

## 4.3 FUSE REPLACEMENT

The flash power supply has a fuse installed which, in the unlikely event of its failure, is easily replaced in the field. The fuse is located in a fuse holder in the upper right hand corner of the flash power supply as viewed from the front of the enclosure. To replace the fuse, follow these steps:

a. Disconnect power to the SLICK SLEUTH. If it is inconvenient to disconnect power, it is imperative that the SLICK SLEUTH be inhibited from sampling. This is done by setting the SLICK SLEUTH to polled mode (Mode 0) using the Slick Sleuth utility program.
b. Twist the cap of the fuse holder ¼ turn CCW and extract the fuse.
c. Replace the fuse with IOS P/N 949010016 or Littlefuse P/N 0218010.HXP (5MM X 2MM, 10A, “slo blo”).
d. Reconnect power to the SLICK SLEUTH or restore the operating mode, as appropriate.

## 4.4 DESICCANT

Many models of the Slick Sleuth have a desiccant canister installed to absorb moisture within the enclosure. If so installed, the canister is located on the inside surface of the enclosure door. The canister is easily monitored for effectiveness, and is easily removed and dried for re-use.

The canister has a see-through, translucent panel in the center of the case. When the desiccant turns pink, it indicates that its saturation point has been reached. To dry the canister for re-use, remove it from the Slick Sleuth and place in a conventional oven at 300° F for 3 hours, then re-install in the Slick Sleuth .

The frequency with which the desiccant should be checked is highly dependent on the environment and the installation. IOS recommends that the desiccant be monitored at least every 3 months, and monthly in a

marine, humid or rainy environment.

## 4.5 TROUBLESHOOTING

The built-in test and status reporting functions of the Detection Station can identify most problems. In order to access the built-in test and status reporting the Detection Station must be locally accessed using the Slick Sleuth Utility Program. See Appendix C for interface definition.

The status report is obtained by sending the 'S' command. The Detection Station responds with the following report:

AA | s XXXX | y | @(carriage return)(linefeed)

XXXX is the status message. Interpretation of the status message is provided below in Section 4.5.1. There are only three problems that can be troubleshot in the field: 1) flash lamp degradation or failure, 2) input power below minimum (e.g. low battery), or 3) dirt obscuring the optics. The first two problems may be identified through the status report, and the latter by visual inspection. Correction of the first and last problems are dealt with in Section 4. Troubleshooting of the input power is covered in a manual supplement (if the power system was supplied by IOS) or is the responsibility of the user.

NOTE:
If battery voltage drops below the minimum required to power the flash assembly, the periodic flash sequence will stop and the reported output counts will be near zero. If the Detection Station is equipped with a current loop interface, the current loop output will be set to 3ma to indicate the fault condition. If the Detection Station is equipped with a relay interface, the status relay will go to the un-energized position.

### 4.5.1 Status Message

The status word can be interpreted as shown in the table below.

| Status word | Label | Function |
|---|---|---|
| X001 | Batt + low | Battery voltage is below min |
| X002 | +24V low | Flash + 24V Regulated Supply is below min |
| X004 | + 12V low | Regulated + 12V supply below min |
| X008 | - 12V low | Regulated – 12V supply below min |
| X010 | - 5V low | Regulated - 5V supply below min |
| X020 | Flash signal low | Flash light output below min |
| X040 | ADC fault | Analog to digital converter failure |
| X080 | DET fault | Fluorescence detector sensitivity below min |
| X100 | Overtemp | Internal temperature is above specified max |
| X200 | Undertemp | Internal temperature is below specified min |
| X400 | Background high | High ambient light detected, may cause detector sensitivity loss |
| X800 | Ext + 24V | Regulated External + 24V supply below min |

"X" (the first digit) denotes the current operating mode of the system. Operating mode can be 0, 1, 8, A, or C. See 'Mode' in Section 3.3. The remaining three digits provide fault reporting.

As an example, C020 indicates that the unit is operating in mode 6 with a low flash signal status. The status light (if equipped) will be extinguished. If no status light is available the associated Relay outputs (if installed) will signal the fault as listed in Section 2.3.

If the unit is equipped with a 0-20 mA Current Transmitter board any status word other than X000 results in a 3 mA current measurement. Most status faults are flash lamp related. Either the lamp is out of calibration (low or high output), or faulty, or possibly fault lies with some associated component. Contact IOS for further troubleshooting assistance.

If any of the fault reporting digits is something other than that shown in the table, the unit has multiple faults. It is recommended that IOS be contacted for assistance in interpreting the message. Otherwise, refer to the last section of Appendix D for the guidelines on interpreting complex status words.

### 4.6 RECOMMENDED SPARES

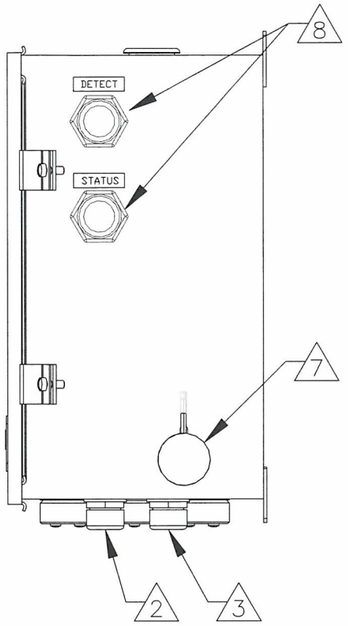
| Qty | Part Number | Description |
|---|---|---|
| 1 | 949034401 | Xenon Flash Lamp |
| 1 | 949010016 | Fuse, 10A, “Slo Blo” |
| 1 | 949030924 | Lamp, LED 24V Red |
| 1 | 949030925 | Lamp, LED, 24V Green |
| 1 | 941860020 | Dessicant Cannister |

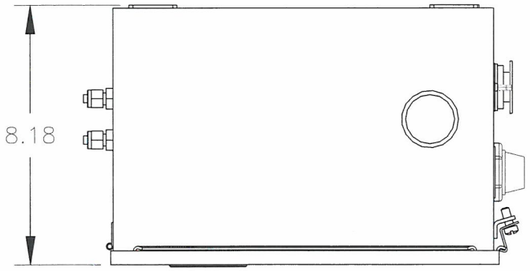
## 5 DRAWINGS

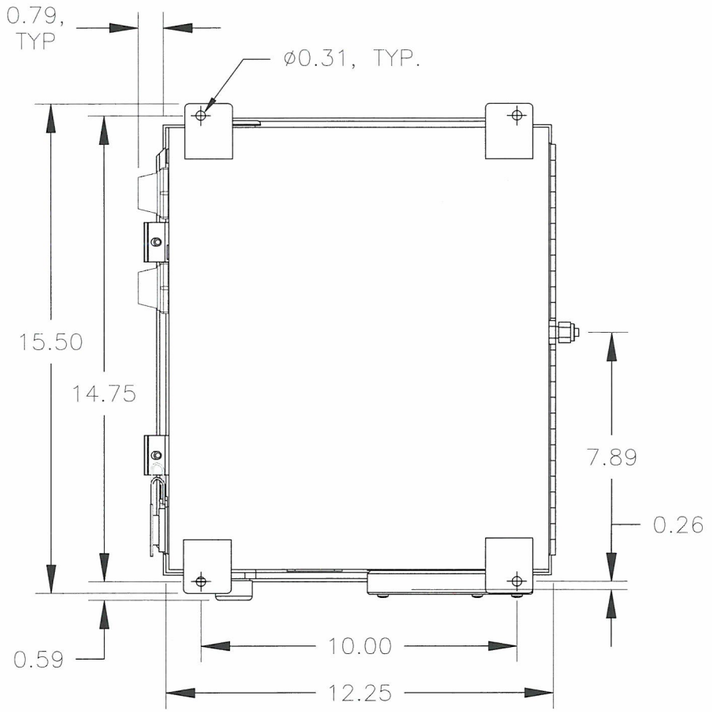
| Drawing No. | Title | Rev |
|---|---|---|
| 73586 0027 | Installation Drawing | D |
| 73586 1092 | Slick Sleuth SS Quick Start Instructions | A |
| 73586 1269 | Aperture Control Installation | A |

DRAWING PATH: DRAFTING SERVER (J):\73586\8300\-0027_D.dwg

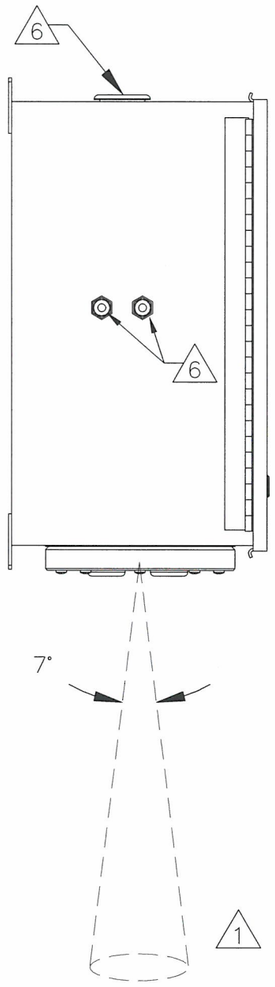
| REVISION | | | |
|---|---|---|---|
| LTR | DESCRIPTION | DATE | APPROVED |
| A | CHANGE POWER RQMT., ECO 5934 | 03/06/12 | VAN BIBBER |
| B | BEZEL CHANGE, ECO 5984 | 09/20/12 | VAN BIBBER |
| C | CHANGE ENTRY CABLE DIAMETERS, ECO 6435 | 01/06/15 | VAN BIBBER |
| D | ADD HEATER REF TO NOTE 4, ECO 6868 | 12/19/17 | Van Bibber |




BACKSIDE VIEW



## NOTES:

1. THE VIEWING ANGLE BENEATH THE DETECTOR MUST BE CLEAR OF OBSTRUCTION WITHIN THE CONE INDICATED.
2. POWER CABLE ENTRY:
   A. THREE CONDUCTOR, 18 AWG MIN.
   B. 0.275 – 0.512 INCH DIAMETER
   C. MAXIMUM CABLE LENGTH 50 FEET. (DC ONLY)
3. INTERFACE CABLE ENTRY:
   CURRENT LOOP
   A. THREE CONDUCTOR SHIELDED, 22 AWG MIN.
   B. 0.275 – 0.512 INCH DIAMETER
   RELAY
   A. 2–9 CONDUCTORS.
   B. 0.275 – 0.512 INCH DIAMETER
4. POWER REQUIREMENT :
   A. SINGLE PHASE AC. 85–264VAC, 50/60HZ STANDARD
   B. SINGLE PHASE AC. 100–240VAC, 50/60HZ WITH HEATER
   C. OPTION 11–28VDC.
5. SIGNAL INTERFACE.
   CURRENT LOOP
   A. 4–20mA, EITHER SELF–POWERED OR LOOP POWERED. (SPECIFIED AT ORDER).
   B. 4–20mA SIGNAL REPRESENTS DETECTED SIGNAL LEVEL, SCALED 0 – FULL INSTRUMENT RANGE.
   C. FAULT SIGNAL: 3.0mA
   RELAY
   A. DPDT, OIL DETECT.
   B. SPDT, DETECTION STATION STATUS.
   SERIAL
   A. RS485
   B. RS232
6. OPTIONAL INERT GAS LINE FITTINGS AND VENT.
7. SERIAL COMMUNICATIONS (USB) INTERFACE.
8. OPTIONAL EXTERNAL INDICATORS.

| | |
|---|---|
| | |
| | |
| N/A | SLICK SLEUTH |
| NEXT ASSY | USED ON |
| APPLICATION | |

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/64 DECIMALS .XX ±.010 .X±.025 .XXX±.005 ANGLES ±1° 1/2°

MATERIAL:

FINISH:

DO NOT SCALE DRAWING

CONTRACT NO.

| APPROVALS | DATE |
|---|---|
| DRAWN BY: A. MANCILLA | 10/25/11 |
| CHECKED BY: | |

InterOcean

InterOcean Systems, Inc.
3738 Ruffin Road
San Diego, CA USA 92123–1799
(858) 565–8400 fax (858) 268–9695

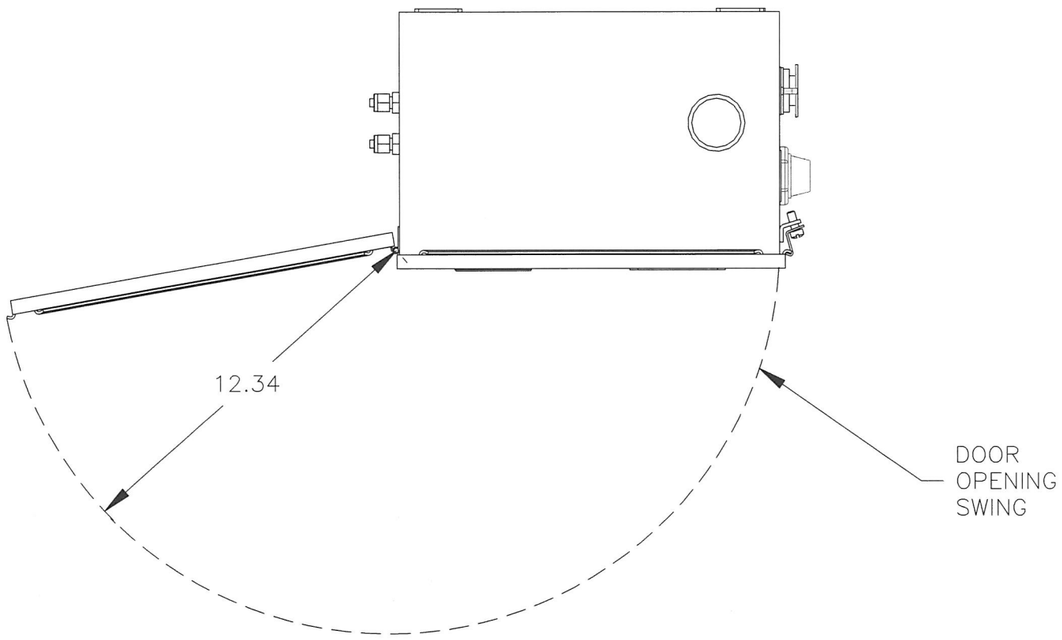
# INSTALLATION DRAWING MODEL SS320 SLICK SLEUTH

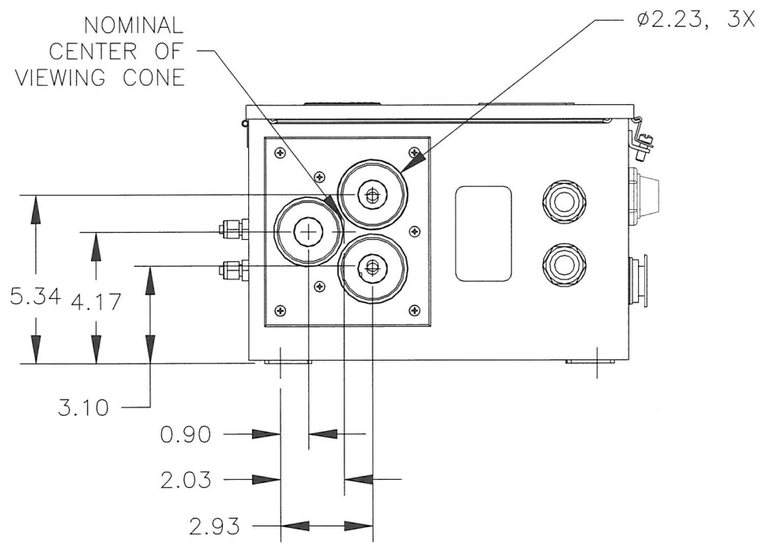
| SIZE | CODE IDENT NO. | DWG NO. | REV |
|---|---|---|---|
| B | 11420 | 73586 0027 | D |

SCALE NTS SHEET 1 OF 2

DRAWING PATH: DRAFTING SERVER (J):\73586\8300\-0027_D.dwg

| REVISION | | | |
|---|---|---|---|
| LTR | DESCRIPTION | DATE | APPROVED |
| | SEE SHEET 1 | | |




UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGLES
±1/64 .XX ±.010 ±1°
.X±.025 .XXX±.005 125

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| SIZE | CODE IDENT NO. | DWG NO. | REV |
|---|---|---|---|
| B | 11420 | 73586 0027 | D |

SCALE NTS

SHEET 2 OF 2

This document is the Slick Sleuth ADS quick start guide. Several steps refer to information in the Slick Sleuth ADS Technical Manual ™ so it is advisable to have the Technical Manual on hand.

| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 1 | Mount the ADS at the desired location. The enclosure is mounted to a vertical surface using the mounting tabs at the back of the enclosure. Mounting dimensions and clearance requirements are provided in the TM.<br><br>Install the ADS above the high-water line. The optimum height above the water surface is highly dependent on the expected range of the surface elevation. Contact InterOcean Systems (IOS) for a recommendation. Call 858-565-8400 (US) or email sales@interoceansystems.com. | Installation drawing<br>Section 5 |
| 2 | Connect the appropriate power to the ADS. The power cable is brought into the enclosure through a cable gland on the bottom of the enclosure. The location of the cable gland and the requirements for the cable are provided in the TM.<br><br>The power cable is terminated at TS1, the five-position terminal strip on the back panel.<br><br>**DO NOT APPLY POWER AT THIS TIME.** | Installation drawing<br>Section 5<br><br>Section 2.3<br>Type — Figure<br>DC — 2<br>AC — 3 |

| | | | | |
|---|---|---|---|---|
| InterOcean Systems, LLC<br>9201 Isaac Street Suite C<br>Santee, CA 92071 | TITLE:<br>SLICK SLEUTH ADS<br>QUICK START INSTRUCTIONS | SIZE<br>A | DWG NO.<br>73586 1092 | REV<br>B |
| | | DO NOT SCALE | SHEET 1 OF 6 | |

| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 3 | Connect the signal interface to the ADS. The signal cable is brought into the enclosure through a cable gland on the bottom of the enclosure. The location of the cable gland and the requirements for the cable are provided in the TM. The signal cable is terminated at J102 or J202 mounted on the circuit card. The termination varies depending upon the type of ADS and user requirements.<br><br><u>Current Loop - J102</u><br>The current loop output of the ADS may be configured for either source or sink operation.<br><br>Source termination<br><br>Sink termination<br><br><u>Relay - J202</u><br>The relay output provides a DPDT relay for oil detection and a SPDT relay for status indication. All terminals are available on J202 to allow the user to configure the system as required.<br><br>The oil detection relay is energized when oil is detected.<br><br>The status relay is energized when the ADS is operating normally. | Installation drawing<br>Section 5<br><br>Section 2.3, Figure 5A<br><br>Section 2.3, Figure 5B<br><br>Section 2.3<br><u>Terminal</u> <u>Description</u><br>J202-1 Pole 1<br>J202-2 Pole 1 NO<br>J202-3 Pole 1 NC<br>J202-4 Pole 2 NO<br>J202-5 Pole 2 NC<br>J202-6 Pole 2<br><br>J202-8 Pole<br>J202-9 NC<br>J202-10 NO |
| 4 | Apply power to the ADS. | |
| 5 | Connect a PC running Windows 7 or later to the external USB port. If this is the first time connecting to an ADS, you may be prompted to install the generic USB serial driver. Follow the Windows' prompts to do so. If the PC has internet connectivity, Windows will automatically install the driver, mitigating the need to manually install the driver. | Appendix C. |

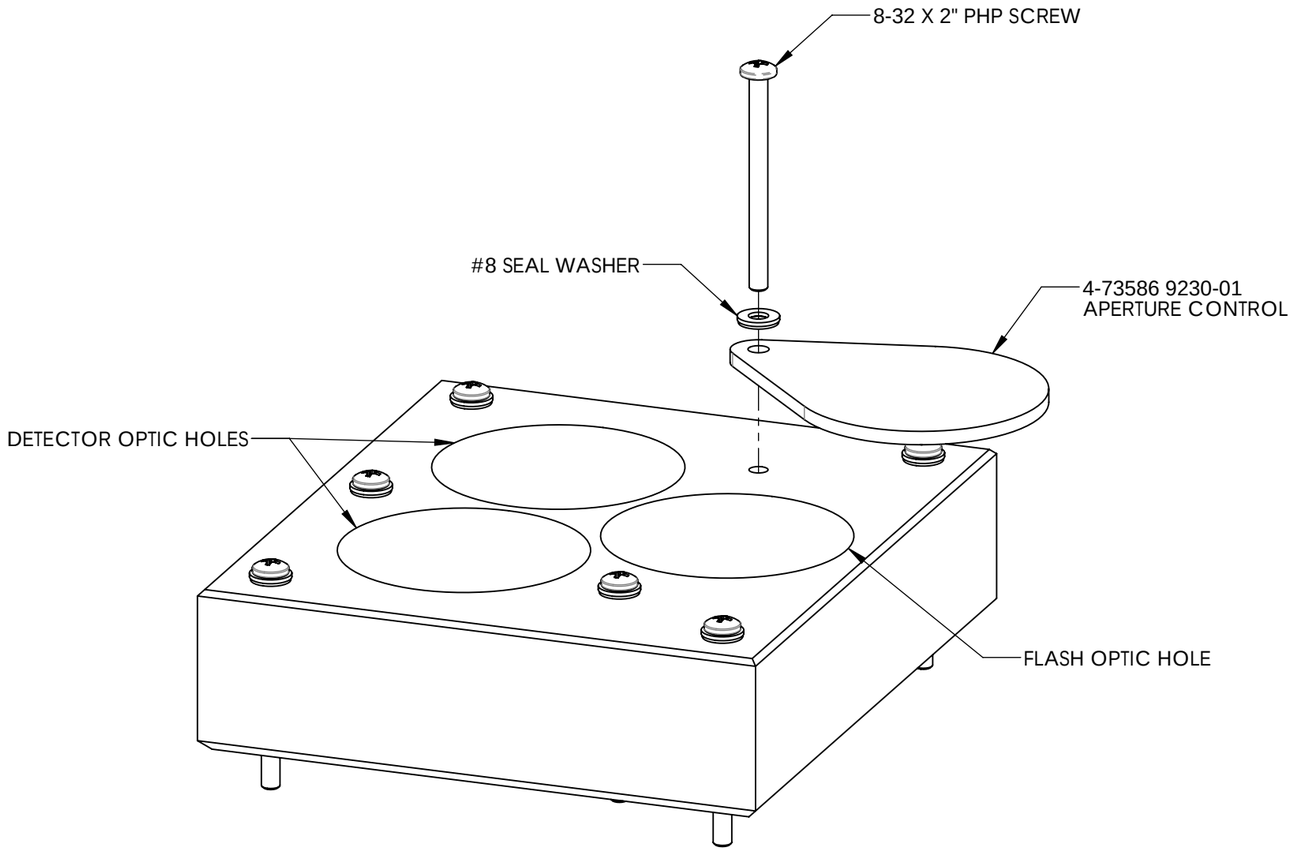
| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 6 | Establish serial communications with the ADS.<br><br>Serial communications with the ADS are accomplished using the utility program provided by IOS, the Slick Sleuth Utility Program. The following procedures have been developed based on the Utility Program.<br><br>Install the Utility Program on the PC by inserting the CD. The installation should start automatically. If it does not, go to the root directory on the CD and launch the installation program, setup.exe. Follow the on-screen installation instructions to complete the installation.<br><br>Launch the Utility Program.<br><br>Select the BAUD rate for communication with the ADS. Unless specified otherwise, the default BAUD rate for the ADS is 9600 baud.<br><br>Select the COM port to be used. There may be a number of COM ports to choose from. You may need to try different COM ports until you have selected the one that responds to the Utility Programs. If in doubt as to the correct COM port, read the rest of this section to aid in making this selection.<br><br>Enter the address (two digits) for the ADS in the Address box, if the ADS has an address other than '***00***'. The default address is '***00***' so this step may not be required.<br><br>Select the 'L' Set Mode command, click 'OK' when asked to enter the mode (do not enter a mode value), then click on the SEND COMMAND button. If the ADS is powered up and connected correctly, the ADS should reply with an answer in the Message Received box. The answer should look similar to this: ***00 L 0 k*** @. The number following the 'L' defines the operating mode of the ADS.<br><br>If the ADS responds, continue with initialization. If the ADS responds with the message "Timeout>>", it will be necessary to determine the reason for the non-response. Verify that the ADS has power, verify the wiring between the PC and the ADS, and verify that the selected COM port is functional and/or choose another COM port until you have selected one that responds.<br>Note: How to Verify or Change a USB Com Port Assignment<br>a. To establish communication between laptop/computer and Slick Sleuth Using the Utility Software, it is necessary to select the correct Com Port.<br>b. Due to differences in Operating Systems (OS), the following steps may vary on different computer OS'.<br>c. Always connect to USB Port before powering on the laptop computer.<br>d. To Begin: Right Click on My Computer and Select Properties OR Select Start menu and Select Control Panel.<br>e. Select System. | Appendix A. |

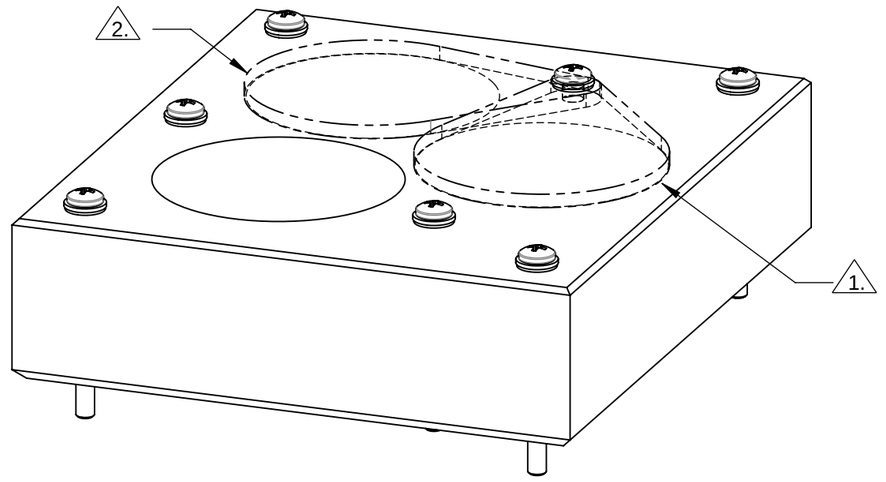
| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 6 (cont.) | f. Select hardware.<br>g. Select Device Manager.<br>h. Open Ports (COM & LPT).<br>i. Make a note of all Com Port assignments, including which one is connected to the Slick Sleuth /USB interface.<br>j. If you cannot determine which Com Port is assigned to Slick Sleuth / USB interface, try disconnecting the Slick Sleuth-USB cable and note which Com Port is no longer assigned.<br>k. This should indicate the Com Port assigned to your Slick Sleuth / USB interface.<br>l. This Com Port number must be selected in the Utility Software in order to establish real-time 2-way communications with a laptop computer.<br>m. Note: Each Slick Sleuth will be assigned a new/unique Com Port number, unless the Com Port assignment is changed by user Device Manager. | |
| 7 | Initialize the ADS and Establish Baseline<br><br>If the 'L' command in step 6 returned a number other than 0, it is necessary to change the mode to facilitate the initialization. If this is the case, follow these steps:<br>1. Record the mode number read in Step 6 (you will need to re-enter it into the ADS at a later step).<br>2. Select the 'L' command and enter 0 when asked to enter the mode.<br>3. Select 'OK'.<br>4. Click on the SEND COMMAND button.<br>5. Observe that the ADS responds with ***00 L 0 k*** @ or a similar response.<br><br>Verify that the water conditions below the ADS are typical (i.e. that there is no oil present or other abnormal conditions). Select the 'I' command, then click on the SEND COMMAND button. This command tells the ADS to make a baseline measurement. Record the response from the ADS for future reference. | |

| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 8 | Read and/or Change the Offset<br><br>The Offset is used to set the Detection Threshold as follows:<br>Detection Threshold = Baseline + Offset<br><br>Read the existing Offset by following these steps:<br>1. Select the 'T' command, then select 'OK' without entering a data value.<br>2. Click on the SEND COMMAND button.<br>3. Observe that the ADS responds with ***00 T XXXXX x*** @ where ***XXXXX*** is the existing Offset.<br><br>To change the Offset to a new Offset (lower for greater sensitivity, higher for lower sensitivity), follow these steps:<br>1. Select the 'T' command and enter the new Offset value (4 digits, including zeroes if necessary).<br>2. Select 'OK'.<br>3. Click on the SEND COMMAND button.<br>4. Observe that the ADS responds with ***00 T XXXXX x*** @ where ***XXXXX*** is the new Offset.<br><br>If the 'L' command had to be used to change the mode in Step 7, restore the factory setup by following these steps:<br>1. Select the 'L' command and enter the previously recorded factory setting when asked to enter the mode.<br>2. Select 'OK'.<br>3. Click on the SEND COMMAND button.<br>4. Observe that the ADS responds with ***00 L X a*** @ where ***X*** is the factory setting you entered. The character (the checksum) following the X may be different from written here. | Section 2.4<br>Section 3.3,<br>Appendix B |

| STEP | INSTRUCTION | TECHNICAL MANUAL REFERENCE |
|---|---|---|
| 9 | Probability of Detection<br><br>The 'd' and 'e' commands are used to lower the probability of falsely detecting an oil slick. These commands work in conjunction with each other to establish a filter that will reject spurious detections due to the variability of the natural environment. The 'e' command is used to set a sample window from 4 to 96 in increments of 4 over which the number of detected events is evaluated. When the number of detected events exceed a percentage of the window size, as set by the 'd' command, the ADS will indicate that a slick has been detected.<br><br>In order to execute the 'd' and 'e' commands the ADS must be in the idle state. This is done by issuing the 'L' command as follows:<br>1.Select the 'L' command and enter 0 when asked to enter the mode.<br>2.Select 'OK'.<br>3.Click on the SEND COMMAND button.<br>4.Observe that the ADS responds with ***00 L 0 k*** @ or a similar response.<br><br>The 'd' command is used to set one of five percentage values from 000, 025, 050, 075 and 100 percent. This function is disabled when the percentage is set to 000. To change the percent window size to a new value, follow these steps:<br>1. Select the 'd' command and enter the new percent value (3 digits, including leading zeroes if necessary).<br>2. Select 'OK'.<br>3. Click on the SEND COMMAND button.<br>4. Observe that the ADS responds with ***00 d XXX x*** @ where ***XXX*** is the new percent.<br><br>The 'e' command is used to set the size of the detection window from 4 samples to 96 samples in increments of 4. To change the window size to a new value, follow these steps:<br>1. Select the 'e' command and enter the new window value (2 digits, including leading zeroes if necessary).<br>2. Select 'OK'.<br>3. Click on the SEND COMMAND button.<br>4. Observe that the ADS responds with ***00 e XX x*** @ where ***XX*** is the new percent.<br><br>Use the 'L' command as described above to put the ADS back into operation under control of the new settings. | 'd' Command<br>Value Percent<br>000 Disable<br>025 25%<br>050 50%<br>075 75%<br>100 100% |
| 10 | Placing the ADS into operation<br><br>Once the baseline, background values and optional parameters have been set, the ADS can be placed into autonomous operation using the 'L' command. | Section 3<br>Appendix A |

| REVISIONS | | | | | |
|---|---|---|---|---|---|
| ZONE | REV. | DESCRIPTION | ECO | DATE | APPROVED |
| N/A | A | INITIAL RELEASE | N/A | 7/27/2018 | |




NOTES: UNLESS OTHERWISE SPECIFIED

1. ROTATE THE APERTURE CONTROL OVER THE FLASH OPTIC HOLE TO DECREASE SENSITIVITY TO DESIRED LEVEL.
2. IF ONLY A SMALL DECREASE WITH FINER CONTROL IS REQUIRED, ROTATE THE APERTURE CONTROL OVER THE DETECTOR OPTIC HOLE.

COMMENTS:
PART NUMBER IS:
4-73586 1269-00

**PROPRIETARY AND CONFIDENTIAL**
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CODE IDENT NO.
7TZT1

DIMENSIONS ARE IN in[mm]
TOLERANCES:
FRACTIONAL: ± 1/32
ANGULAR, MACH: ± 1°
ANGULAR, BEND: ± 2°
.X ± 0.025
.XX ± 0.010
.XXX ± 0.005
125

INTERPRET TOLERANCING PER: ASME Y14.5-1994

MATERIAL
N/A

FINISH
N/A

EST. WEIGHT
N/A

| | NAME | DATE |
|---|---|---|
| DRAWN | MRK | 07/27/18 |
| PROJ ENGR | SVB | 7/27/2018 |
| PROD MGR | | 7/30/2018 |
| OPS/MFG | N/A | N/A |
| CUSTOMER | N/A | N/A |
| QA/QMS | CW | 7-30-18 |
| DOC CTL | MRK | 07/27/18 |
| ENGR MGR | CW | 7-30-18 |

InterOcean
InterOcean Systems, LLC
3738 Ruffin Road,
San Diego, CA 92123

TITLE:
# APERTURE CONTROL INSTALLATION
## SLICK SLEUTH SS320

| SIZE | DWG. NO. | REV |
|---|---|---|
| B | 73586 1269 | A |

DO NOT SCALE | SHEET 1 OF 1

7/27/2018 4:07:44 PM
J:\73586\73586 1269.sld drw

# APPENDIX A

# SLICK SLEUTH UTILITY PROGRAM

**APPLICATION NOTES**
**SLICK SLEUTH UTILITY PROGRAM**
**Version 1.46 February, 2015**

## SOFTWARE INSTALLATION

Operating System: Microsoft Windows 98, 2000, XP, Vista, 7.

Place the program CD in the PC's CD drive.

Click on My Computer and go to the CD drive.

Launch setup.exe and follow the on screen instructions.

## HARDWARE INSTALLATION

The connection to the Slick Sleuth must be done through a cable as described in Appendix C of the Technical Manual.

If the Slick Sleuth has been setup at a different baudrate than the 9600 baud default, click on the appropriate baudrate in the User Baudrate box.

Click on the COM port to be used in the Comm Port box. If the port is not available (in use by another application or is not present), the program will alert the user.

## BEFORE PROCEEDING

Read all instructions in this file before sending commands to the Slick Sleuth. It is also highly recommended that the Quick Start guide be reviewed as it may contain more current information on the operation of the Slick Sleuth.

## BAUDRATE

The default baudrate of the Slick Sleuth is 9600 baud. The Utility Program always starts with this as its baudrate. If the Slick Sleuth has been set to a different baudrate, it will not respond to commands from the Utility Program (as evidenced by the message "Time Out>>" in the Message Received box). To determine the proper baudrate select "19200", then re-send the command. If the Slick Sleuth does not respond (i.e. "Time Out>>"), change the baudrate to another value and repeat this process until the Slick Sleuth responds.

## SENDING COMMANDS

Before commands can be sent to the Slick Sleuth, the address of the Slick Sleuth must be entered in the Address box. Typically every Slick Sleuth has address '00' (a Slick Sleuth in a polled system would be the exception). To change the address, always type a two digit address in the Address box.

NOTE

It is advisable to set the Slick Sleuth mode to 0 (polled) before sending other commands to the Slick Sleuth. Follow the instructions in Steps 6-7 of the Quick Start to set the mode and then restore the factory setup when done.

To send a command follow these steps:

1. Click on the command to be sent.
2. If the command can send a setting to the Slick Sleuth, a box will open requesting the value and providing guidance on the range and format of the value.
3. If the user only wishes to read the setting from the Slick Sleuth, no value is entered and the 'OK' button is clicked.
4. If the user wishes to send a new setting to the Slick Sleuth, a new value is entered and the 'OK' button is clicked.

   NOTE
   If the user chooses to select another command rather than send the selected command, he may simply click on the new command. If the user chooses to change the selected command (e.g. change a mistakenly entered value), click on the "Reset" button and re-enter the command.

5. Click on the SEND COMMAND button.
6. Observe the response from the Slick Sleuth in the Message Received box.

Examples:

A. Read the Offset from the Slick Sleuth:
   1. Click on the 'T' command
   2. A box opens requesting the value. Click on 'OK' without entering a value.
   3. Click on the SEND COMMAND button.
   4. The Slick Sleuth responds in the Message Received box. The number after the 'T' in the response is the offset value.

B. Send a new Offset to the Slick Sleuth:
   1. Click on the 'T' command
   2. A box opens requesting the value. Enter the new Offset and click on 'OK'.
   3. Click on the SEND COMMAND button.
   4. The Slick Sleuth responds in the Message Received box. The number after the 'T' in the response should be the same as the number sent (if the Slick Sleuth accepted the change).

The B, C, and P commands control the measurement timing of the Slick Sleuth. If any one command is entered with a value that conflicts with the other two, the Utility Program will prevent the change and prompt the user to enter an acceptable value. To ensure proper performance, verify that the settings meet the criterion of this equation:

$$P > (( B * C ) / 5) + 2$$

Example:

Flash count = 10
Flash interval = 01
Period = 0015

(( 10 * 1 )/ 5) + 2 = 4
Since 15 > 4 the setup is a valid setup.

If the period (P) is set less than 0005, the above criterion does not apply as B and C values are not used by the Slick Sleuth in the fast, single sample mode.

COMMAND SUMMARY

| Command | Description | Range |
|---|---|---|
| A | Address - set or read Slick Sleuth address | 00 - 99 |
| B | Flash Count - set or read number of flashes/sample | 01 - 10 |
| C | Flash Interval - set or read interval between flashes (100 msec/unit) | 01 - 99 |
| D | Detection Request - command the Slick Sleuth to take an immediate sample | |
| E | Request Data - request report of last sample taken (generally following the 'D' command) | |
| H | EMI Offset – set or read EMI Offset Correction | 0000 - 9999 |
| I | Set Baseline - command Slick Sleuth to take an immediate sample to establish the baseline | |
| J | Report Baseline - request report of the baseline measurement (generally following the I command) | |
| L | Set Mode - set or read the operating mode. The mode identification is provided in the table below.<br>0 - polled<br>1 - autonomous, with or without relay output only (no current loop)<br>4 - autonomous, current loop discrete output<br>5 - autonomous, current loop scaled output<br>6 - autonomous, current loop scaled and corrected output | |
| M | Enable Adaptive Baseline - disable adaptive baseline or set the time span (min.) | 00 (disable) - 99 |
| P | Autonomous Mode Period - set or read the period for autonomous mode sampling (sec) | 0000 - 9999 |
| S | Request Status - request an immediate status measurement and report. The status word includes the mode identification. The status word representing a healthy Slick Sleuth is listed in the table below for each mode. | |
| T | Send Offset - set or read the offset used for the detection threshold | 0001 - 9999 |
| V | Request Temperature - request report of internal temperature (deg. C) | |
| Y | Flash Threshold – set or read Flash Threshold | 0000 - 0999 |
| d | Detection Probability Percentage – set or read Detection Probability Percentage | 0,25,50,75,100 |
| e | Detection Probability Sample Size (# of samples) – set or read Detection Probability Sample Size | 4,8,12,…,96 |

| Mode | 'Healthy' Status Word |
|---|---|
| 0 | 0000 |
| 1 | 2000 |
| 4 | 8000 |
| 5 | A000 |
| 6 | C000 |

USER ASSISTANCE

If assistance is needed in the use of the Utility Program or in the operation of the Slick Sleuth, contact InterOcean Systems at: 858-565-8400 Phone (U.S) or sales@interoceansystems.com

# APPENDIX B

# THEORY OF OPERATION

The Detection station is a remote sensing device for the detection of oil pollution on any surface, most commonly a water surface. It detects oil by stimulating fluorescence in the oil and then detecting the fluorescence. A short burst of collimated UV light is directed onto the water surface. The resulting fluorescence is filtered and detected by a focused optical system.

The detected fluorescence is digitized by a 15 bit A/D. The fluorescence level for each flash within a sample (typically 10 flashes) are averaged together to reduce noise and improve signal integrity. The result is an integer number in the range of 0 - 32,767 “counts” (engineering units).

The signal measured by the A/D has several components. Figure B-1 illustrates the components. Starting at the bottom of the figure, the Detection Station has some inherent self-noise, typically on the order of 400 counts. The self-noise count is subtracted from all measurements before the measurement counts are reported and/or used for detection and output.

The ambient condition, which can consist of several things but is predominantly unwanted reflection from the water surface, adds to the measurement. When a “baseline” measurement is performed, the level that is recorded and used as a part of a detection algorithm is the level of the ambient condition. Added above the ambient condition (baseline) is the fluorescence from any oil detected.

For purposes of discrete detection (i.e. discrete current loop output, relay, or “Y/N” digital output) a “detection threshold” is established. This is accomplished by inputting an “offset”, a variable that the operator uses to establish the detection threshold and thereby the detector sensitivity. Any count value above the detection threshold is a detection. Mathematically the detection threshold is expressed as:

Detection Threshold = Baseline + Offset

The current loop output has one or more corrections applied to it, dependent on operating mode. In Scaled Output (mode 5) the self-noise is subtracted from the measured counts and then converted to current output. In this case 4 ma out represents the level of the self-noise (400 counts typ in Figure B-1). Full scale output is 32,767 counts minus the self-noise. In Figure B-1 full scale would be 32,767 – 400 = 32,367 counts. In order to maintain a constant relationship between counts (and current output) signal strength, the full scale count for 20 ma output is fixed at 32,767 counts. The result is that full scale output in this mode is slightly less than 20 ma. In the figure the full scale would be:

Full Scale Output = 4 + (32,367/32,767) * 16 ma

= 19.80 ma

In Scaled/Corrected Output (mode 6) both the self-noise and the baseline are subtracted from the measured counts and then converted to current output. In this case 4 ma out represents the baseline level (5,000 counts typ in Figure B-1) plus the self-noise (400 counts typ in Figure B-1). Full scale output is 32,767 counts minus the baseline and the self-noise. In Figure B-1 full scale would be 32,767 – 5,000 – 400 = 27,367 counts. As in Scaled Output, the full scale count for 20 ma output is fixed at 32,767 counts. The result is that full scale output in this mode is less than 20 ma. In the figure the full scale output would be:

Full Scale Output = 4 + (27,367/32,767) * 16 ma

= 17.36 ma

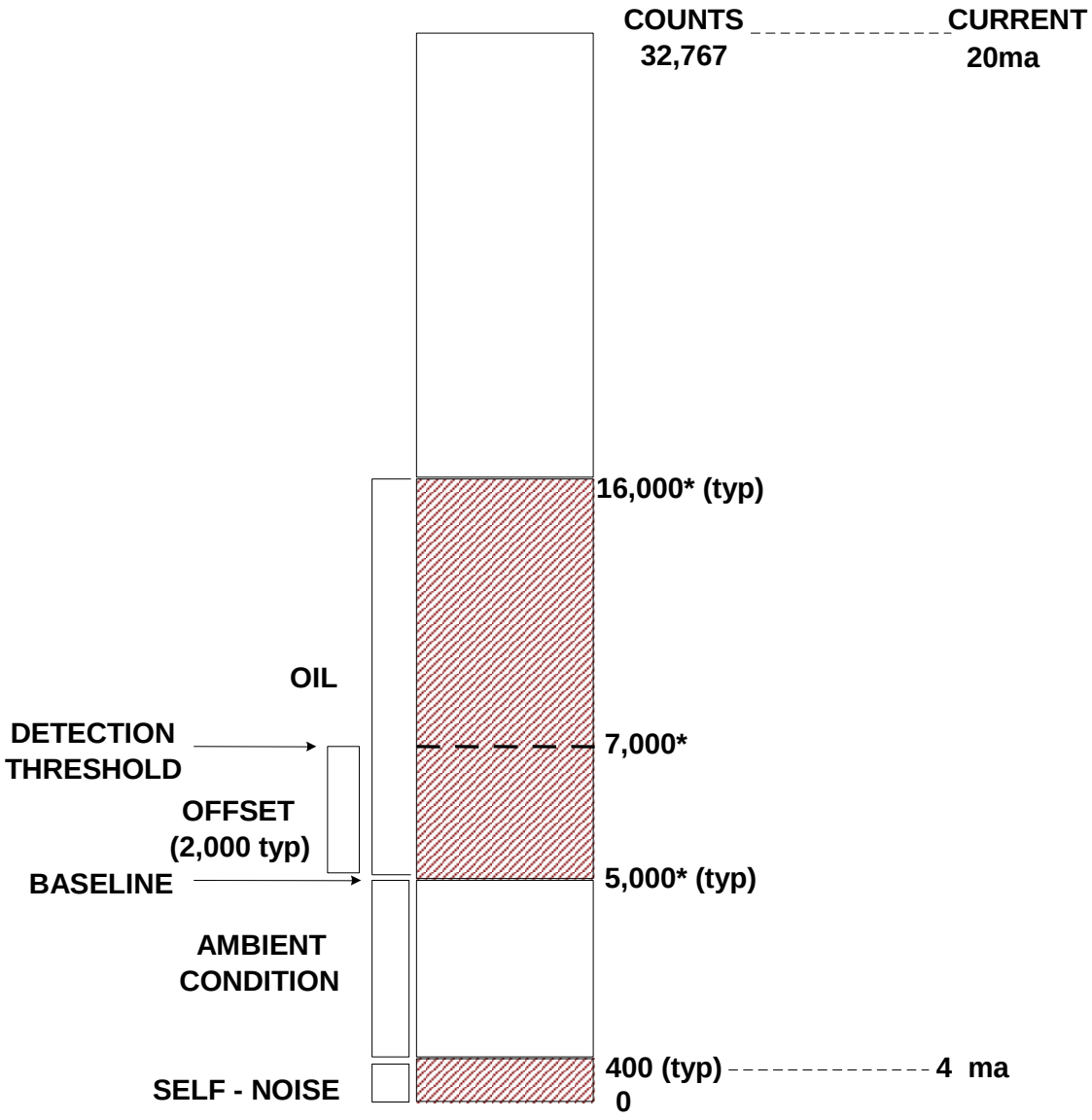



Figure B-1

Detection Output

*counts after self-noise has been subtracted

# APPENDIX C

# EXTERNAL
# SERIAL COMMUNICATIONS INTERFACE

The external serial communications interface is a USB port which communicates through a virtual COM port on a PC. It is typically configured for 9600 baud, 8 bit, 1 stop bit, no parity. The baudrate is programmable and may be set during production as specified by the purchase order. If the buadrate is not specified by the purchase order, the baudrate is set at the default value of 9600 baud.

The interconnect cable between the Detection Station and a PC is a Type A – Type B USB cable. This cable is typically used for peripheral devices such as printers and should be readily available from local sources for PC's and peripherals. The cable may be obtained from IOS by requesting P/N 940012503.

# APPENDIX D

# SERIAL COMMUNICATIONS PROTOCOL
# SLICK SLEUTH

# SERIAL COMMUNICATIONS PROTOCOL
# SLICK SLEUTH

## A. SERIAL COMMUNICATION

A USB serial communications port is located external to the Detection Station. The port provides the user with two capabilities: 1) The ability to change setup parameters and obtain a status report on the health of the Station, and 2) access to the periodic detection report in digital format.

## B. DETECTION STATION FACTORY SETUP

During factory setup the Detection Station accepts simple setup commands for test and configuration. The Detection Station replies with an acknowledgement.

## C. FIELD SETUP

Each Detection Station may be setup in the field as required. Typically all setup (excluding baseline) is done at the Factory prior to shipment and no further setup is required. Baseline measurement must be done at installation to ensure that the detection threshold is set properly.

## COMMAND SUMMARY

| COMMAND BYTE | TYPE | DETECTION STATION RESPONSE | CENTRAL MONITOR/FACTORY SETUP FUNCTION |
|---|---|---|---|
| A | Command | Echo command and address | Normally factory setup; default address is '00', Detection Station accepts 'A' command only if current address is default |
| B | Command | Echo command and count | Send/request flash count |
| C | Command | Echo command and interval | Send/request flash interval |
| D | Command | Echo command | Send request to make reading |
| E | Status | Report last reading | Send request for last reading |
| H | Command | Echo command and EMI Offset | Send/request EMI offset |
| I | Command | Auto baseline measurement and report | Send request for baseline measurement |
| J | Command | Report baseline value | Send request for current baseline value |
| K | Command | Echo command and S/N | Send/request Detection Station S/N |
| L | Command | Echo command and mode | Normally factory setup; set/request operating mode |
| M | Command | Echo command and Adaptive Baseline | Send/request Adaptive Baseline setting |
| P | Command | Echo command and sample period | Send/request autonomous mode sample period |
| S | Status Request | Send self-test status to Central Monitor | Periodic request for status |
| T | Command | Echo command and offset | Send/request offset |
| V | Command | Report Internal Temperature | Send/request for internal temperature |
| Y | Command | Echo command and Flash Threshold | Send/request Flash Threshold |

| | | | |
|---|---|---|---|
| **Z** | **Command** | **Echo command and baudrate** | **Set baudrate** |
| **d** | **Command** | **Echo command and Detection Threshold Percent** | **Send/request Detection Probability Percent** |
| **e** | **Command** | **Echo command and Detection Window Size** | **Send/request Detection Probability Sample size** |

The typical response from an SLICK SLEUTH in the 'Message Received' window of the Utility Program has this form for reference:

AA C XXXX M@

Where:

AA – unit address (typically '00')
C – An echo of the command character sent to the SLICK SLEUTH
XXXX – the data requested by the command
M@ - checksum and end character

The Request Data and Status commands have a response in this form:

AA C X XXXX Y SSSS M@

Where:

SSSS – status word
Y (or N) – detect or no detect (N)

## STATUS REPORT

Equipment status is reported as a four ASCII character representation of a two byte hex-encoded self-test status word. The bits of the status word are encoded as follows:

| BIT | NIBBLE | LABEL | FUNCTION |
|---|---|---|---|
| 0 | 4 | BATT+ LO | Battery voltage below min. |
| 1 | | + 24V LO | Flash + 24V Regulated supply below min. |
| 2 | | +12V LO | Regulated +12V supply below min. |
| 3 | | -12V LO | Regulated –12V supply below min. |
| 4 | 3 | - 5V LO | Regulated – 5V supply below min. |
| 5 | | FLASH SIG LO | Flash light output below min. |
| 6 | | ADC FAULT | Analog to digital converter failure |
| 7 | | DET FAULT | Fluorescence detector sensitivity below min. |
| 8 | 2 | OVERTEMP | Internal temperature above specified max. |
| 9 | | UNDERTEMP | Internal temperature below specified min. |
| 10 | | BKGND HI | High ambient light detected, may cause detector sensitivity loss |
| 11 | | EXT + 24V | Regulated External + 24V supply below min. |
| 12 | 1 | FAULT1 | Reserved |
| 13 | | MODE0 | Three bit representation of autonomous operating mode: |
| 14 | | MODE1 | MODE / MODE2 / MODE1 / MODE0 |
| 15 | | MODE2 | 4-20 discrete / 1 / 0 / 0 |
| | | | 4-20 scaled / 1 / 0 / 1 |
| | | | 4-20 scaled/ corrected / 1 / 1 / 0 |

When any one of bits 0-12 is set, it indicates that a fault has occurred. Bits 13-15 are a 3-bit encoded representation of the operating mode of the detection station.

When status is reported by the detection station it is reported in the following format:

(Nibble 1) (Nibble 2) (Nibble 3) (Nibble 4)

Normal (healthy) operational status is reported as 8000 in the 4-20 discrete output mode, A000 in the 4-20 scaled output mode, and C000 in the 4-20 scaled/corrected output mode.

## Hexadecimal to Binary Conversion Table

| Status Digit (Hexadecimal) | Binary |
|---|---|
| 0 | 0000 |
| 1 | 0001 |
| 2 | 0010 |
| 3 | 0011 |
| 4 | 0100 |
| 5 | 0101 |
| 6 | 0110 |
| 7 | 0111 |
| 8 | 1000 |
| 9 | 1001 |
| A | 1010 |
| B | 1011 |
| C | 1100 |
| D | 1101 |
| E | 1110 |
| F | 1111 |

# APPENDIX E

# PREVENTATIVE MAINTENANCE

**Preventative Maintenance (PM)**
**Slick Sleuth Oil Spill Detection & Alarm Station**

**Every 30 Days, 60 Days, or As Required PM**. *See attached check list for example.*

1) Conduct a thorough physical inspection of Slick Sleuth (SS) sensor.

Check the flash and detector optics for obstructions; i.e. spider webs, salt, water spots, or foreign film. *If necessary* clean optical glass using the following procedure:

i. Use compressed dry air and/or distilled water to flush away any film or debris build-up on surface of recessed glass optics. **Caution**: do not use alcohol or solvent-type cleaning solutions on glass surfaces.
ii. **Caution**: when examining optical tubes and glass surfaces on underside of sensor it is recommended that the unit be stopped (mode 0) to avoid extended direct eye exposure to UV light.
iii. If dirt or impediment is still present after rinsing with distilled water, use lens tissue or a soft clean cloth to wipe away and clean optical glass surfaces.
iv. Use caution not to scratch optical glass.
v. Use caution no oil or fingerprints are left on the detector optics.
vi. Return unit to normal operating mode and setup parameters.

(Section 3.3 of the manual covers this procedure).

Example: compressed dry air, distilled water, non-solvent lens cleaning kit, cotton swabs.

2) Inspect the sample area (water/ground) directly beneath the sensor for any obstructions, contaminants, and abnormalities. Observe area both above, on and below the water line.

3) Inspect all hardware accessories; i.e. indicator (LED) lights, battery box, solar panels, radio hardware, etc., as required.

4) Periodic field assurance test may also be conducted. At a fixed distance (for example ½ meter below sensor) place a sample of oil. If using oil is not an option, a sheet of white paper can be used to simulate oil, or material smeared with oil. For consistency the same type(s) and amount(s) of oil or 'oil simulating' material should be used to test alarm. Place oil beneath the sensor and confirm that local alarm activates, as well as in control room or wherever remote oil alarm output is monitored. Likewise confirm that PLC / externally activated devices such as pumps, valves, skimmers activate accordingly.

5) If any settings are changed using the Utility Program, record changes in instrument record and/or on check list. To check existing settings, select any command (i.e. Offset "T" command). Enter no value (leave blank), click OK, and then Send Command. Existing value is reported in message received window.

**Every 6-Month, 1-Year, or As Required PM.** *See attached check list example.*

6) Conduct thorough physical inspection described in item 1 above. Additionally:

7) Put the unit into mode 0 and power off prior to interior inspection and cleaning.

8) Inspect the cable glands and purge fittings to ensure they are secure.

9) Inspect desiccant packets (moisture abatement) inside enclosure. Replace as necessary.

10) Inspect the door gasket. Check for cracking, tearing, and for proper seal.

11) Inspect enclosure interior for debris (metal shavings from installation, wire strands, loose hardware, etc) and remove as necessary. If dust build-up is present, carefully vacuum interior and/or blow out enclosure using compressed dry air.

12) Clean the enclosure of all debris and particulate matter. Take care not to spray cleaner inside optical tubes. Likewise clean solar panels, battery box, and other system hardware.

13) Perform diagnostic check:
    a. Connect portable computer to the unit.
    b. Using SS Utility Program, put unit into mode 0 ("L" command).
    c. Issue a Status Request command ("S" command).
       The result of a fully functional unit should be 0000. See Figure 1 for Example.
       (If using SS Utility Program Rev 1.40 or later, all indicators should be green)
    d. If a number other than 0000 is present (if diagnostic fault is detected);
       consult the Status Report table in Appendix D (Operations Manual),
       or, refer to the Error Code Conversion Table (section 4.5.1).
    e. Troubleshooting is covered in Section 4.3 of the manual.
    f. For further assistance contact InterOcean Systems: tel.858.565.8400 USA.

14) Issue a "Debug" (1) command to check the flash count.
    a. This procedure is located in Appendix F.
    b. Flash count numbers will be the last 10 numbers in column 4 of the large window on the main screen. The flash count appears below this column See Figure 2 for Example.
    c. calculate a new flash threshold value that is 60% of the flash count number observed in Step b. Enter the new value into the Slick Sleuth by performing the following steps using the Utility Program:

       1. Go to the Real Time Logging window, select 'Factory Setup', then enter the factory password.
       2. Return to the main window.
       3. CLEAR the Commands list.
       4. Select 'Flash Threshold (Y)'.
       5. When the data entry window appears enter the 60% value calculated as the new flash threshold value. Select 'OK'
       6. SEND the new value to the Slick Sleuth

EXAMPLE:

The flash count number observed in Step b. is 785. Calculate the new flash threshold value:

Flash Threshold Value = 60% * 785 = 471

This new value would be entered into the Slick Sleuth using the command sequence in Step c. The value would be entered as '0471'.

15) The anticipated flash lamp life is approximately 2½ - 3 years at the highest sampling rate. Fault alarm will alert user to lamp failure. The lamp can be replaced at that time, or can be treated as a periodic / preventative maintenance item and replaced on a cyclical schedule. Note that if lamp failure is suspected, the first course of action is to perform items 13 and 14 above. If lamp replacement is necessary (either failure or as PM), please refer to Section 4.2 for lamp replacement procedure. This will also direct you to Appendix F for completing the replacement process.

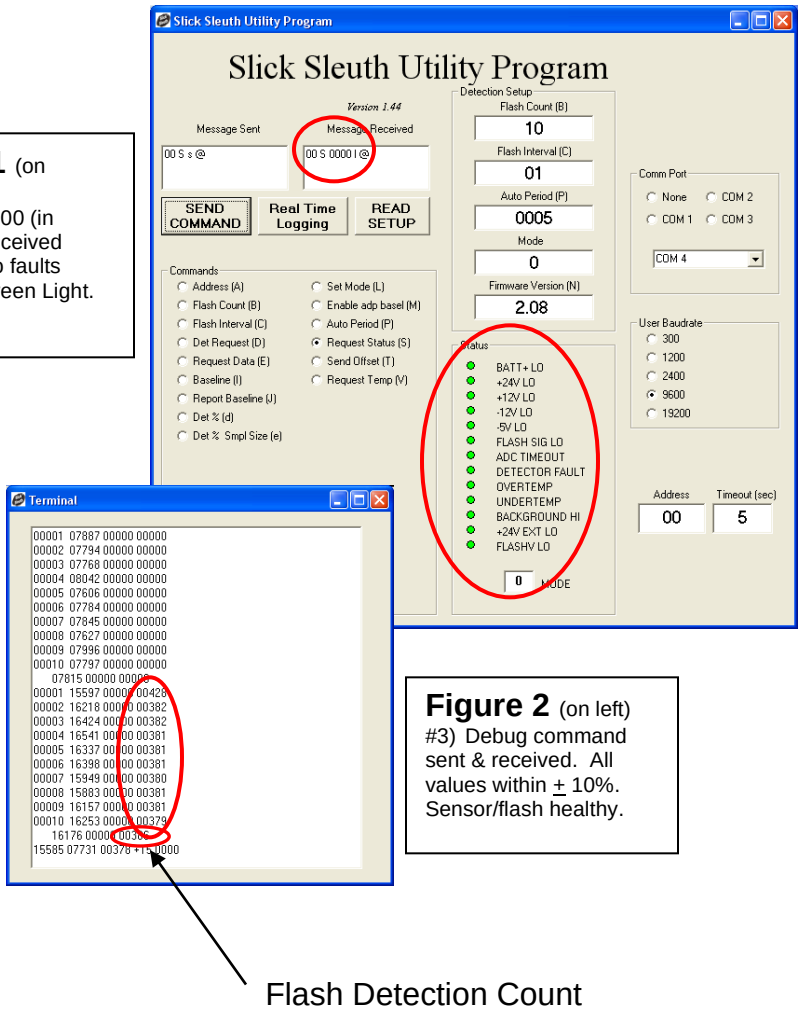



**Figure 1** (on right)
**#1** Status 0000 (in Message Received window). No faults
**#2** Status Green Light. No fault.

**Figure 2** (on left)
#3) Debug command sent & received. All values within ± 10%. Sensor/flash healthy.

Example: PM Checklist & Instrument Record

Slick Sleuth™

## PREVENTATIVE MAINTENANCE CHECK LIST

| | |
|---|---|
| Name: | |
| Date: | |

| | | ✓ | Comments |
|---|---|---|---|
| **Preventative Maintenance - Monthly** | | | |
| **1** | Physical Inspection | | |
| **2** | Inspect Sample Area | | |
| **3** | Inspect Accessories | | |
| **4** | Field Assurance Test (Optional) | | |
| **5** | Settings - Utility Program (Optional) | | |
| **Preventative Maintenance - Semiannually or Annually** | | | |
| **6** | Physical Inspection / Items 1 - 5 | | |
| **7** | Set Mode to "0" | | |
| **8** | Inspect Cable Gland & Purge Fittings | | |
| **9** | Inspect - Door Gasket | | |
| **10** | Inspect - Replace Desiccant Packs | | |
| **11** | Inspect Enclosure | | |
| **12** | Clean Enclosure & Accessories | | |
| **13** | Diagnostic Check | | |
| **14** | Flash Count Check | | |
| **15** | Flash Lamp Check | | |
| **16** | Return to Normal Operationg Mode | | |

| | | | **Record Value** |
|---|---|---|---|
| **Saved Configuration** | | | |
| **S** | Request Status | (i.e. 0000) | |
| **J** | Report Baseline | (i.e. 2500) | |
| **T** | Send Offset | (i.e. 2000) | |
| **L** | Set Mode | (i.e. 4) | |
| **P** | Automous Mode Period | (i.e. 0005 = 5 sec) | |
| **M** | Enable Adaptive Baseline | ( i.e. 00 Disabled / 01 Enabled) | |
| **B** | Flash Count | (i.e. 10) | |
| **C** | Flash Interval | (i.e. 01 = 1 msec) | |

# APPENDIX F

# SLICK SLEUTH LAMP REPLACEMENT INSTRUCTIONS

# SLICK SLEUTH LAMP REPLACEMENT INSTRUCTIONS

References

| | |
|---|---|
| Dwg. No. 735861092 | Slick Sleuth ADS Quick Start Instructions |
| P/N 73586600102 | Slick Sleuth Utility Program, V1.46 |

Procedure

NOTE

The following procedures have been developed based on use of the Utility Program.

1.1 Disconnect power to the Detection Station.

1.2 Open the door of the enclosure.

1.3 Locate the flash assembly as shown in Figure 1.

1.4 Remove the two nuts and lock washers securing the flash retainer.

1.5 Loosen the two retaining screws.

1.6 Remove the flash retainer.

1.7 Carefully lift the flash lamp and trigger socket up and out of the flash mount.

1.8 Remove the copper tape securing the braided shield to the xenon lamp.

1.9 Cut the tie wrap that is securing the flash lamp and push the braided shield back.

1.10 Remove the black electrical tape and the copper tape from the lamp and socket.

1.11 Separate the flash lamp from the trigger socket, using care to avoid placing strain on the cable.

1.12 Plug the replacement flash lamp into the trigger socket. Wear cotton gloves or similar handling materials to avoid leaving finger oil or other dirt or residue on the flash lamp.

1.13 Re-assembly is completed in reverse order. Replace the tie wrap around the flash lamp with a new tie wrap.

NOTE

Verify that the braided sleeving over the flash lamp is inserted inside the flash block.

2.1 Cover each optics hole with opaque black electrical tape. Do not let the tape touch the surface of the optics.

2.2 Establish serial communications with the Slick Sleuth using Step 6 of the Quick Start Instructions.

2.3 If the 'L' command returned a number other than 0, it is necessary to change the mode to facilitate this procedure. Write down the number returned in the 'L' command for re-initialization after completion of this procedure, then proceed with the following steps:

1. Select the 'L' command and enter 0 when asked to enter the mode. Select 'OK'.
2. Click on the SEND COMMAND button.
3. Observe that the Slick Sleuth responds with 00 L 0 k @ or a similar response.

2.4 Click on the REAL TIME LOGGING button.

2.5 In the Real Time Logging window click on the Factory Setup button and enter the password '73586'.

2.6 Return to the main window.

2.7 Select the 'H' command and enter 0000 when asked to enter the EMI Offset. Click on the SEND COMMAND button.

2.8 Select the 'D' command. Click on the SEND COMMAND button. Wait for the unit to stop flashing before sending the next command.

2.9 Select the 'E' command. Click on the SEND COMMAND button.

2.10 The 5 digit number reported is the measured EMI offset. Record for reference and note orientation of the trigger socket and lamp.

2.11 Select the 'H' command and enter the number recorded in Step 2.10 when asked to enter the EMI Offset. Click on the SEND COMMAND button.

NOTE

The entered number must be 4 digits in length. For example, if the measured and reported EMI Offset was '00576', enter '0576'.

2.12 Remove the black electrical tape from the optics holes.

3.1 Select the '1' (Debug) command. Click on the SEND COMMAND button.

3.2 Wait approximately 30 seconds for the unit to complete its full self-diagnostics test. The response will appear in the large text box in the upper right corner of the main window.

3.3 Locate the number (the flash detection counts) under the fourth column (just above the

last row). See Figure 2.

3.4 Calculate a number that is 60% of the number read in Step 3.3. Round the number down to a whole integer. Example: the number read in Step 3.3 is 892. Calculating the value, 60% * 892 = 535.2. Rounding down, the number becomes 535.

3.5 Using the utility program, perform the following steps:

3.5.1 Go to the Real Time Logging window and select ‘Factory Setup’. Enter the password ‘73586’.

3.5.2 In the main window select ‘Flash Threshold (Y)’.

3.5.3 When the data entry window appears enter the value calculated in Step 3.4, then click on ‘OK’. For the example in Step 3.4, the value entered would be ‘0535’.

3.5.4 SEND the new value to the Slick Sleuth.

4.1 After a flash lamp is replaced the Slick Sleuth must be re-initialized (See Section 2.4 Initialization). Flash lamps vary in performance, so it is critical that the Detection Station be re-initialized to achieve good performance.

5.1 Select the 'L' command and enter the number recorded in Step 2.3.3 to restore the normal operating mode.

5.2 Click on the SEND COMMAND button.

5.3 Observe that the Slick Sleuth responds with 00 L X a @, and that the Slick Sleuth returns to its normal operating mode. X is the number you entered for the mode. The '00' and the checksum may be different than written here.

PROCEDURE COMPLETE

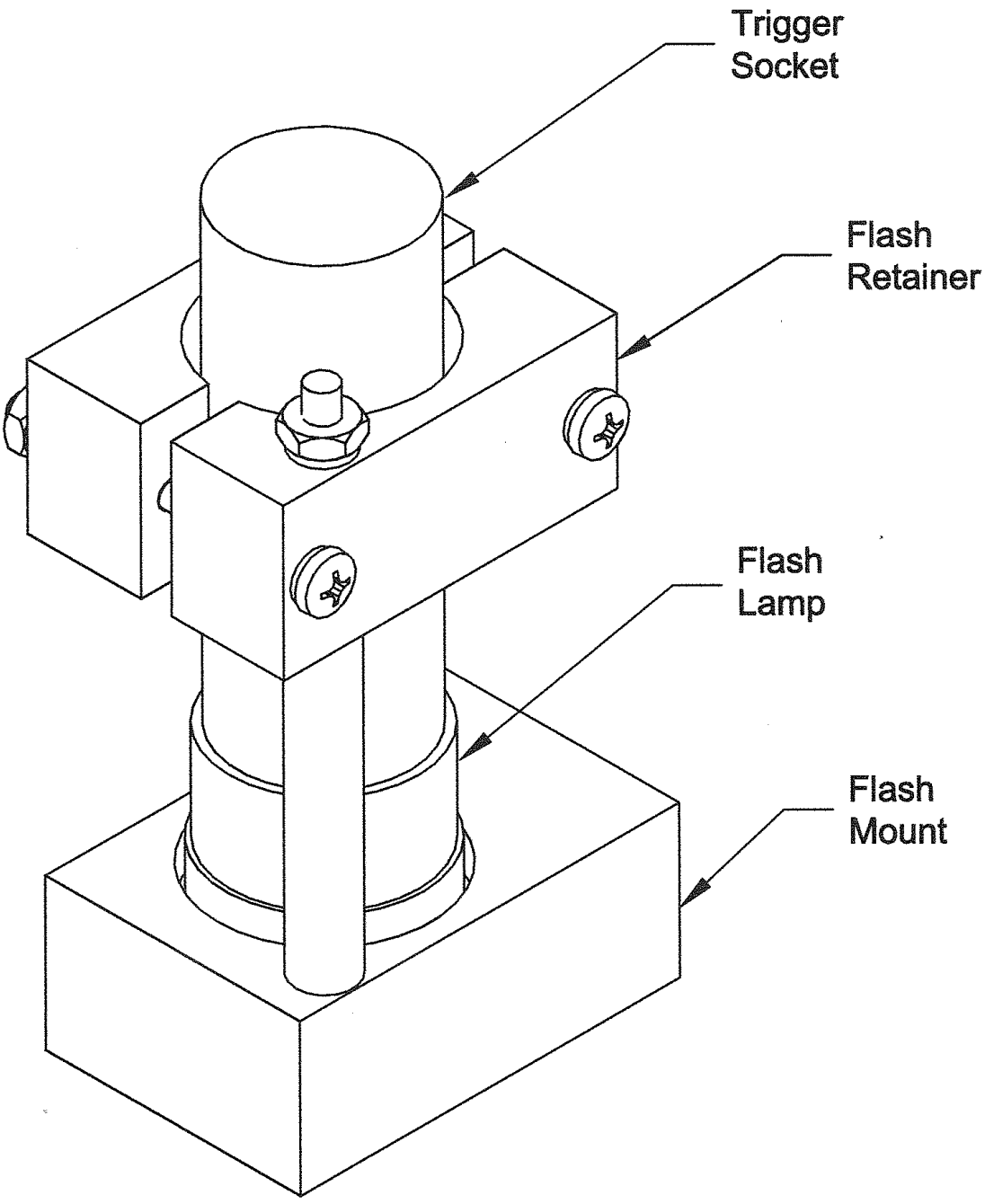
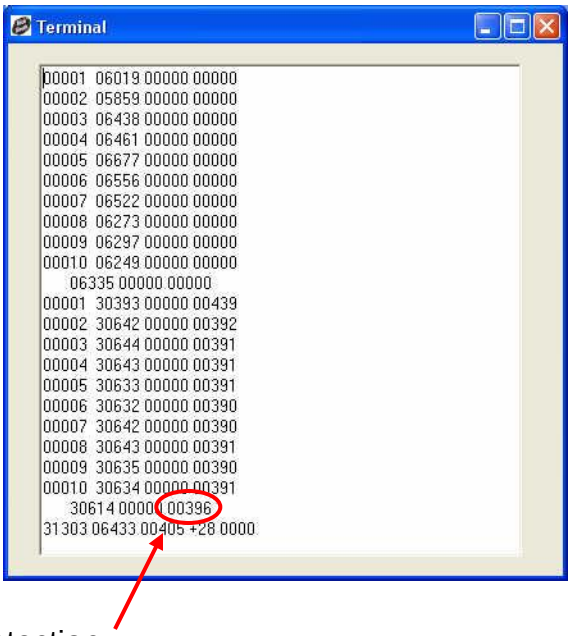



Figure 1
Flash Assembly




Flash Detection Counts

Figure 2

# APPENDIX G

# USB DRIVER INSTALLATION

## INTRODUCTION

The USB port on the SS320 requires drivers to be installed on the connected PC. Generally the drivers supplied by Microsoft are suitable, but depending on the operating system (OS) and the hardware platform the drivers may not perform properly. In this case drivers must be downloaded from the manufacturer of the USB interface hardware and installed to insure proper performance.

## DRIVER INSTALLATION

1. Connect the PC to the Internet and go to ftdichip.com.
2. On the left side of the home window select 'DRIVERS'.
3. Under 'DRIVERS' select 'VCP DRIVERS'.
4. The window that appears is the Virtual COM Port Drivers window. On this window:
    a. Select 'Installation Guides'. Locate the Installation Guide appropriate to the OS of the PC, download and open it.
    b. Return to the Virtual COM Port window and select the driver appropriate to the OS and download it.
5. Follow the instructions in the Installation Guide to install the driver.