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**APPLICATION NOTE NO. 59**

revised **February 2010**

**A Load-Bearing Underwater Cable for Hand-Hauled, Real-Time Profiling**

Profiling in real time, from small boats not equipped with a winch, calls for hand hauling a CTD using a load-bearing data cable. Sea-Bird can supply cables up to 300 meters (985 feet) in length that provide a practical way to hand-haul SBE 19 / 19*plus* / 19*plus* V2 SEACAT Profilers or SBE 25 SEALOGGER CTDs, and acquire CTD profile data in real time. In these cases the CTD is powered by its battery, and the cable allows two-way\* RS-232 communications (3 conductors - *transmit, receive, and common*) and bears the weight of the CTD.

The cable is not intended for static working loads above 45 kg (100 lbs); working loads above 18 kg (40 lbs) may be difficult to handle without a winch. The minimum recommended cable bend radius is 10 cm (4 inches) (e.g., 20 cm sheave block nominal diameter). **Use with loads exceeding 45 kg (100 lbs) or cable bend radius less than 10 cm (4 inches) will reduce the cable’s useful life and void the warranty.**

Attached drawings show the cable assembly and wiring details, and include tables of Sea-Bird part numbers for cables of specific lengths:

- Drawing No. 32284 – Standard connector to the CTD and 9-pin connector to the computer
- Drawing No. 32643 – Wet-pluggable connector to the CTD and 9-pin connector to the computer
- Drawing 32821 – Standard connector to the CTD and 4-pin connector to a Seacat / Sealogger RS-232 & Navigation Interface Box (Interface Box PN 90488 or PN 90545)

If the length needed is not listed on the drawing, contact Sea-Bird with the drawing number and desired length (300 meter [985 feet] maximum).



**\* Notes:**

- Communications **from the CTD to a computer** - An SBE 19, 19*plus*, 19*plus* V2, or 25 CTD reliably transmits data over 300 meters (985 feet) of cable to a computer. See the applicable CTD manual for baud rate and real-time output rate limitations.
- Communications **from a computer to the CTD** for instrument setup, data upload, etc. are dependent on the computer serial port hardware and software settings, but are usually reliable over cables up to 300 meters long at low baud rates. Some laptop computers may have inferior serial port hardware, limiting the cable length over which they can transmit. If a computer cannot transmit over a long cable, disconnect the CTD from the long cable and connect to the computer using the shorter I/O cable provided with the CTD.

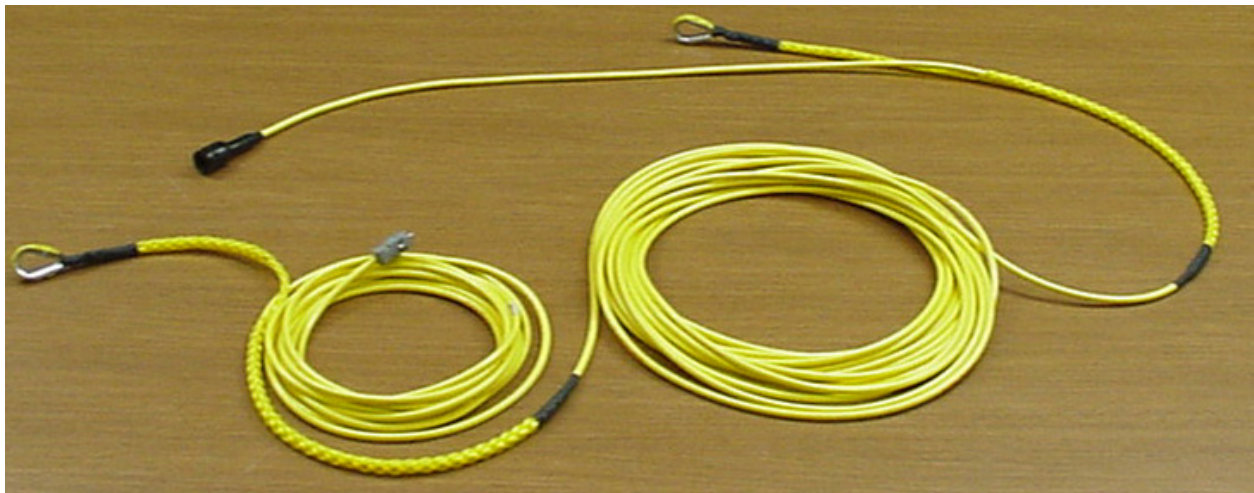
## Using Load-Bearing Cable for Real-Time Data Acquisition with Seasave

1. Communicate with the CTD via the terminal program\* to set up sampling parameters, initialize memory, etc. (see terminal program Help Files).
2. Configure Seasave for real-time acquisition and display (see Seasave Help files).
3. Start the CTD sampling via magnetic switch (or with computer command in the terminal program\* per CTD manual instructions).
4. Deploy the CTD to begin profile.
5. Recover the CTD.
6. Stop the CTD sampling via magnetic switch (or with computer command in the terminal program\*).
7. Communicate with the CTD via the terminal program\* to upload data.

\*Note: Sea-Bird has several terminal programs for communicating with instruments -  
- SBE 19, 19*plus*, and 25: use SEATERM terminal program  
- SBE 19*plus* V2: use SeatermV2 terminal program

## Cable Specifications

- Nominal O.D. 7 mm (0.270 in.)
- Twisted trio of 22 awg conductors
- Pressure-extruded polyurethane jacket, dull, non-slip finish
- Weight in air approximately 50 grams/meter (0.034 lbs/ft)
- Weight in water approximately 4 grams/meter (0.0027 lbs/ft)
- PMG-4FS connector with locking sleeve to CTD and DB-9 serial data connector to computer - Drawing 32284
- MCIL-4FS wet-pluggable connector with locking sleeve to CTD and DB-9 serial data connector to computer - Drawing 32643
- PMG-4FS connector with locking sleeve to CTD and MS3106A-14S-2P connector to Seacat/Sealogger RS-232 & Navigation Interface Box - Drawing 32821
- Mechanical terminations are *Chinese finger trap* type, made from hollow-core, polypropylene rope with stainless thimbles
- Internal Kevlar braid with 180 kg (400 lb) breaking strength
- **Maximum recommended working load 45 kg (100 lbs)**
- **Minimum recommended cable bend radius 10 cm (4 inches) (e.g., a 20-cm sheave block nominal diameter)**

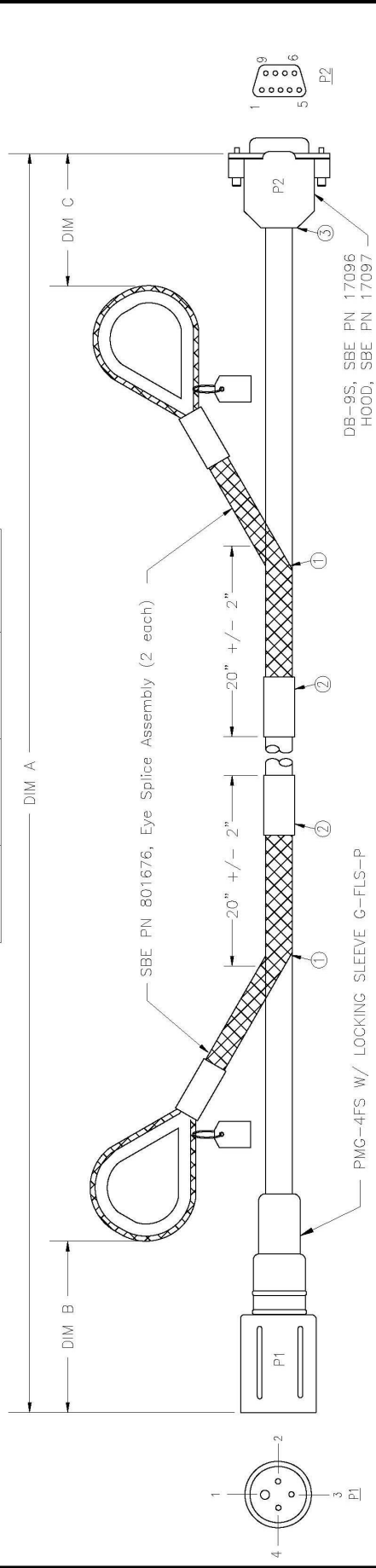


DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.
3.02	A	Redrawn on new template	CB	LRG	
06.02	B	Add 17097, Step 5	DB	KLP	MU
08.02	C	See ECN 726	DB	MU	CB
9.23.02	D	ADJ. QTY & LENGTH	CB	KLP	
10.11.02	E	CHANGED BREAK STRENGTH	CB	KLP	
7.17.06	F	ECN 971, ALT WIRE COLOR	CB	CB	
9.6.2006	G	ECN 991 - Process Change	CB	MU	

P1 PMG-4FS	COLOR	ALT COLOR	P2 DB-9S
PIN 1	WHITE	WHITE	PIN 5
PIN 2	WHITE/BLACK	BLACK	PIN 3
PIN 3	WHITE/RED	RED	PIN 2
PIN 4	--	--	--

**BRAID AND LIFT-EYE INSTALLATION**

- BRING CABLE THROUGH BRAID
- 20" +/- 2 INCHES BEHIND EYE
- 1/2" DIA. HEATSHRINK ADHESIVE TUBING 3", PN 31568
- INSTALL CONNECTOR AFTER INSTALLING BRAIDED SPLICES

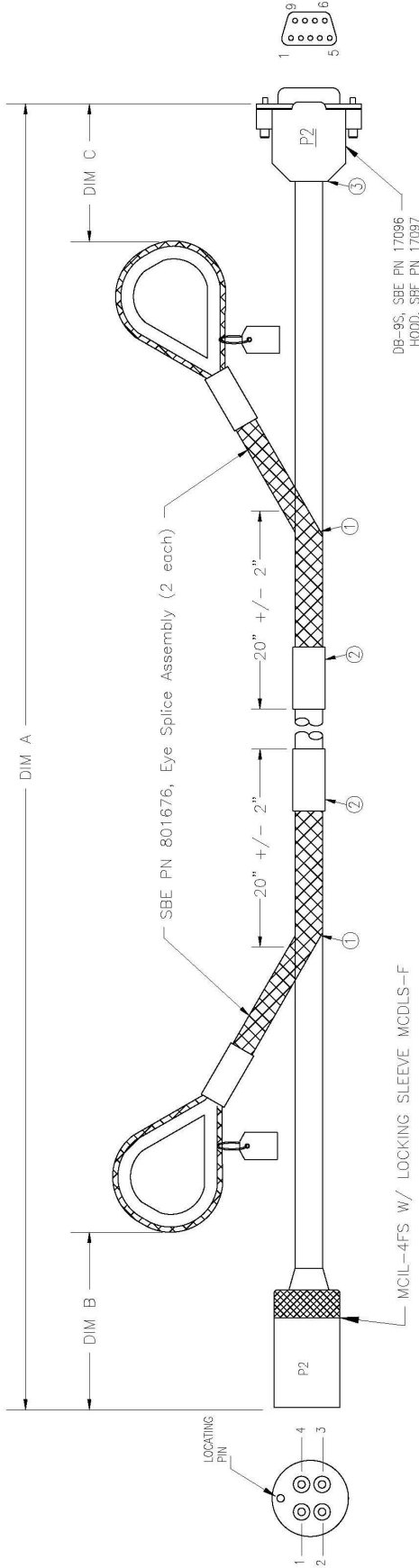


SBE PN	PIGTAIL	DIM A	DIM B	DIM C	SBE PN	PIGTAIL	DIM A	DIM B	DIM C
801140	171283	200 FT	52 IN	20 FT	801833	172476	775 FT	52 IN	20 FT
801148	171301	600 FT	52 IN	20 FT	801885	172546	20 FT	52 IN	6 FT
801150	171284	100 FT	52 IN	20 FT	801886	172547	250 FT	52 IN	20 FT
801153	171306	330 FT	52 IN	20 FT	801910	172602	230 FT	52 IN	20 FT
801293	171543	500 FT	52 IN	20 FT					
801295	171551	165 FT	52 IN	20 FT					
801301	171560	415 FT	52 IN	20 FT					
801304	171581	83 FT	52 IN	20 FT					
801307	171588	985 FT	52 IN	20 FT					
801340	171654	528 FT	52 IN	20 FT					
801352	171681	66 FT	52 IN	20 FT					
801358	171690	660 FT	52 IN	20 FT					
801514	172224	131 FT	52 IN	20 FT					

CABLE TYPE: FALMAT  
 SBE PN 171285, Pigtails per dwg 32275  
 FM020999SA1 REV. B  
 POLYURETHANE, KEVLAR REINFORCED, 3 CONDUCTOR, 22 AWG.  
 YELLOW JACKET, NOMINAL O.D. = 0.270 IN.  
 100 LBS. WORKING LOAD (45 Kg)  
 4 INCH MINIMUM BEND RADIUS (10 cm)

SEA-BIRD ELECTRONICS, INC			
TOLERANCES	FRACTIONAL	DECIMAL	ANGULAR
	P/N See Table	SCALE NTS	DRAWN BY RWG
		APPROVED BY	
	TITLE Load Bearing Data Cable		
	PMG-4FS to DB-9S		
	DATE 4.26.99	DRAWING NUMBER 32284	REV G

DATE	SYM	REVISION RECORD	AUTH.	DR.	DC.
03.02	A	Add Adhesive Tubing	MJ	CB	
8.29.02	B	CHANGED LENGTH	CB	KLP	
9.23.02	C	ADJ. QTY., LENGTH & PIN CB	CB	KLP	
10.7.02	D	FIXED CONN DWG AND LS DESC	CB	KLP	
10.11.02	E	CHANGED CABLE BREAK STRENGTH	CB	KLP	
9.18.06	F	9.18.06 CHANGE ECN 891 - PROCESS CHANGE	CB	MJ	



CABLE TYPE: FALMAT  
 SBE PN 171285, Pigtails per dwg 32642  
 FM02099SA1 REV. B  
 POLYURETHANE, KEVLAR REINFORCED, 3 CONDUCTOR, 22 AWG.  
 YELLOW JACKET, NOMINAL O.D. = 0.270 IN.  
 100 LBS. WORKING LOAD (45 Kg)  
 4 INCH MINIMUM BEND RADIUS (10 cm)

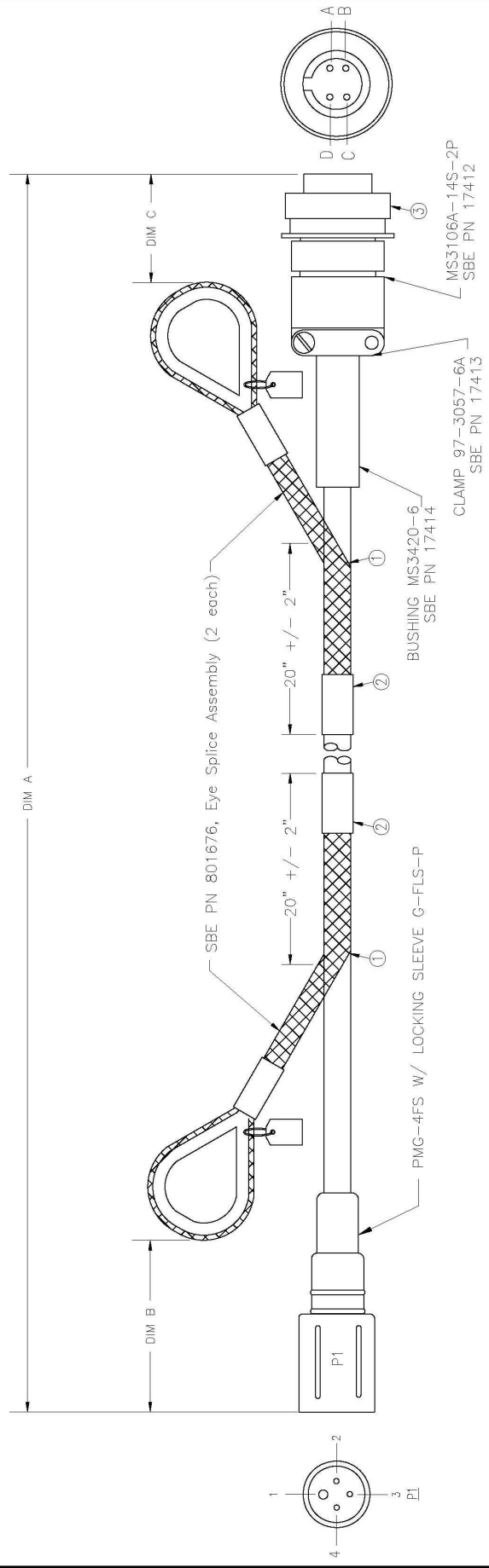
SEA-BIRD ELECTRONICS, INC	
P/N	SEE TABLE
SCALE	NTS
DRAWN BY	MJ
APPROVED BY	
LOAD BEARING DATA CABLE	
MCIL-4FS	
DATE	9.18.2006
DWG NO.	32643
SHEET	1 of 1
REV	F

P1 MCIL-4FS	COLOR	ALT COLOR	P2 DB-9S
PIN 1	WHITE	WHITE	PIN 5
PIN 2	WHITE/BLACK	BLACK	PIN 3
PIN 3	WHITE/RED	RED	PIN 2
PIN 4	--	--	--

BRAID AND LIFT-EYE INSTALLATION  
 ① BRING CABLE THROUGH BRAID  
 20 +/- 2 INCHES BEHIND EYE  
 ② 1/2" DIA. HEATSHRINK ADHESIVE TUBING 3", PN 31588  
 ③ INSTALL CONNECTOR AFTER INSTALLING BRAIDED SPLICES

SBE PN	PIGTAIL	DIM A	DIM B	DIM C
801337	171633	330 FT	52 IN	20 FT
801338	171634	660 FT	52 IN	20 FT
801371	171707	100 FT	52 IN	20 FT
801372	171708	200 FT	52 IN	20 FT
801860	172494	165 FT	52 IN	20 FT

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.
7/06	A	ECN 971, ALT WIRE COLOR	CB	CB	
9.18.06	B	ECN991 - Process Change	CB	MJ	



CABLE TYPE: FALMAT  
 SBE PN 171285, Pigtails per dwg 32275  
 FM02099SA1 REV. B  
 POLYURETHANE, KEVLAR REINFORCED, 3 CONDUCTOR, 22 AWG,  
 YELLOW JACKET, NOMINAL O.D. = 0.270 IN.  
 100 LBS. WORKING LOAD (45 kg)  
 4 INCH MINIMUM BEND RADIUS (10 cm)

SBE PN	PIGTAIL	DIM A	DIM B	DIM C
801442	171551	165 FT	52 IN	20 FT
801443	171808	33 FT	52 IN	20 FT
801865	171284	100 FT	52 IN	20 FT

P1 PMG-4FS	COLOR	ALT COLOR	P2 MS3106A-14S-2P
PIN 1	WHITE	WHITE	PIN A
PIN 2	WHITE/BLACK	BLACK	PIN B
PIN 3	WHITE/RED	RED	PIN C
PIN 4	--	--	--

BRAID AND LIFT-EYE INSTALLATION  
 1 BRING CABLE THROUGH BRAID  
 20 +/- 2 INCHES BEHIND EYE  
 2 1/2" DIA. HEATSHRINK ADHESIVE TUBING 3", PN 31568  
 3 INSTALL CONNECTOR AFTER INSTALLING BRAIDED SPLICES

TOLERANCES	SEA-BIRD ELECTRONICS, INC
FRACTIONAL P/N	SCALE DRAWN BY: KLP
DECIMAL	See Table NTS APPROVED BY:
ANGULAR	TITLE Load Bearing Data Cable PMG-4FS to MS
	DATE 9.18.06 DRAWING NUMBER 32821
	REV B