

CABLE

Airmar offers a wide range of standard cables to meet the market's needs. When selecting a cable, consider the weight of the transducer, the type of installation, the environment in which it will be used, and the transmission loss. See the following table for the most popular cables in our line.

Strength

Cable strength is a function of the number and size of the conductors, jacket material, shielding type, and cable construction. Despite cautions to the contrary, all but the largest commercial transducers are often carried by the cable. For this reason, small diameter cable is not recommended for large transducers. Also, during shipping and handling a large transducer can abrade and cut through the jacket of a small cable.

Cable Routing

The route of the cable from the transducer to the instrument is often through rough holes in the bulkhead. As the cable is pulled through the holes, abrasion can result in cutting through the cable's outer jacket. In transom mount applications, pinching and tearing of the cable may allow the detrimental entry of moisture.

Solvent Resistance

In thru-hull transducers, the cable is usually subjected to bilge water. For long service, a solvent resistant outer jacket is important.

Flexibility

Cable flexibility is a function of the outside diameter, jacket material, and construction. Transom and trolling motor mounted transducer cables are often subjected to repeated flexing at the transducer and connector ends because the instrument and sensor are often removed after use. All Airmar transducer cables use stranded wires to greatly reduce susceptibility to metal fatigue.

Jacket Melt Temperature

This is a factor when molding a connector to a cable. Low melt point jacket materials, such as vinyl, are difficult to mold.



Shielding

Airmar cables use three shielding techniques: aluminum foil wrap with drain wire, tinned braided shield, and tinned spiral shield. Aluminum foil provides very good shielding at a low cost. However, stretching and kinking of the cable also stretches and kinks the wrap which can result in the fine tearing of the aluminum foil. Because of the larger number of copper strands, braided and spiral shields strengthen the cable so it is much less affected by stretching and kinking.

Braided and spiral shields are usually stated in percentage of shielding, i.e., the amount of braid coverage as a percentage of circumferential area. Airmar braided and spiral cables range from 60% to 96% shielded. Some other transducer brands have braided shields, but the coverage can be as low as 35%.

For commercial use, a braided shield and durable jacket material are essential. In recreational applications, aluminum foil provides good shielding. In multiconductor cables, braided shield is a high quality alternative.

Transmission Loss

Input pulse power to the transducer is the product of voltage x current. The cable conductors should be sized such that the cable transmission loss ($\text{current}^2 \times \text{conductor resistance}$) is less than 5% of the input power. The conductor sizes of Airmar cables are listed on the following pages in the table of "Standard Cables" in AWG. Consult a reference text for the resistance data.

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Custom Cables

Airmar can provide custom cables with a choice of:

- Inner conductor colors
- Inner conductor insulation
- Amount of fillers, if applicable
- Braided, spiral, or aluminum foil shield and double shielding
- Outer jacket material, color, and thickness
- Custom marking

Custom cables can be bought economically if your annual usage is 10,000 m (35,000') or more. Below this quantity, the cost increases dramatically. The lead time varies with the business cycle, but it is typically eight to twelve weeks.

Extension Cables

A change in the cable type or length requires a change in the tuning of the echosounder matching network. In most cases, echosounder matching networks are tolerant of modest changes in capacity. Usually the output power of the echosounder does not change by more than 5% when an extension cable of 3 to 4.5 m (10 – 15') is added. A listing of popular extension cables follows this section.

Airmar sells a variety of connectors allowing customers to fabricate their own extension cables. See “Connectors” in this catalog for more information.

Effects of Cable Type and Length on Transducer Impedance

Echosounder transceivers are optimized to a specific impedance which can be represented by a parallel equivalent circuit having a specific resistance and capacitance (or inductance). The piezoceramic element provides a portion of the equivalent parallel capacitance, C_p , and nearly all of the equivalent parallel resistance, R_p . The cable's primary impact is on C_p ; the effect on the R_p is negligible.

The transducer cable type and length that you select may

be different than the standard cable that is listed in the catalog. This changes the C_p , and it can be calculated as follows¹:

Find the standard cable type and length as listed on the product page in this catalog. Next, find the balanced capacity per meter of the standard cable as given on the “Standard Cables” table on the following pages. Multiply the standard cable length by the standard cable's balanced capacity per meter to obtain the total cable capacity.

Find the C_p for a specific frequency, ceramic material, and element diameter on the product page in this catalog². Subtract the total cable capacity from the C_p . This yields the C_p of the piezoceramic element alone. If the answer is negative capacity, it simply means at that frequency the element is inductive; note the minus sign.

For a different cable type and length, turn to the table “Standard Cables” on the following pages and determine the balanced or unbalanced capacity per meter of the new cable depending on whether you are using a balanced or unbalanced transmission line. Multiply the capacity per meter by the new cable length to obtain total cable capacity.

Add total cable capacity to the piezoceramic element capacity to obtain the total C_p of the transducer.

1. To convert transducer parallel resistance and capacity to Z , q , and $R - jx$ (series) equivalents, refer to the conversion formulas in Sensor Design Fundamentals.

2. Unless otherwise stated, all transducer impedance data is for a balanced transmission line.

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Standard Cables								
Airmar Cable Type	Description	Wire Gauge (AWG)	Shielding	Capacitance in pf/m (pF/foot)	Outer Jacket Material/Color	Outside Diameter	Conductor Insulation	Usage
C1	Shielded twisted pair	22	Aluminum foil	Balanced: 49 (15) Unbalanced: 91 (28)	PVC Black	5.1 mm (0.20")	Polyethylene	Light Marine
C2	Shielded twisted pair	22	Aluminum foil	Balanced: 90 (27) Unbalanced: 169 (52)	PVC Black	4.2 mm (0.165")	Polyethylene	Light Marine
C9	Four shielded conductors	24	Aluminum foil	N/A	PVC Black	4.2 mm (0.165")	PVC	Light Marine Speed/Temperature
C11	Shielded coaxial type RG58/u	20	95% tinned copper braid	Balanced: N/A Unbalanced: 85 (26)	PVC Black	4.9 mm (0.195")	Cellular Polyethylene	High Quality Recreational
C13	Shielded twisted pair	22	85% tinned copper braid	Balanced: 54 (17) Unbalanced: 85 (26)	TPR Black	5.6 mm (0.220")	Polyethylene	High Quality Light Marine & Commercial
C15	Shielded twisted pair & Four conductors Shield overall	Pair: 22 One conductor: 20 Three cond.: 24	Pair: aluminum foil Overall: aluminum foil & 80% tinned copper braid	Balanced: 126 (38) Unbalanced: 235 (72)	TPR Black	7.0 mm (0.272")	Polyethylene	Scanning Sonar
C18	Eight shielded conductors Shield overall	24	Aluminum foil Coverage: conductors, 200% overall, 150%	Balanced: N/A Unbalanced: 144 (44)	TPR Black	7.1 mm (0.280")	Foamed Polyethylene	Phased Array
C32	Shielded twisted pair & Four conductors Shield overall	Pair: 22 Conductors: 24	Aluminum foil	Balanced: 88 (27) Unbalanced: 177 (54)	TPR Black	6.5 mm (0.255")	Polyethylene	Light Marine TRIDUCER® Multisensor
C33	Shielded twisted pair	20	80% tinned copper braid	Balanced: 87 (27) Unbalanced: 143 (43)	Neoprene Black	6.9 mm (0.270")	Rubber	Commercial
C35	Two shielded twisted pairs & Four conductors Shield overall	Pairs: 22 Conductors: 24	Aluminum foil	Balanced: 104 (32) Unbalanced: 198 (60)	TPR Black	6.9 mm (0.273")	Polyethylene	Dual Element TRIDUCER® Multisensor
C37	Shielded twisted pair	18	85% tinned copper braid	Balanced: 95 (29) Unbalanced: 162 (49)	Neoprene Black	9.5 mm (0.375")	Ethylene-Propylene	Heavy Commercial
C40	Shielded coaxial	20	Aluminum foil Coverage: 150%	78 (24) (Unbalanced)	PVC Black	5.0 mm (0.195")	Cellular Polyethylene	Light Marine
C41	Unshielded twisted pair	16	None	Balanced: 106 (33) Unbalanced: N/A	Neoprene Yellow	9.4 mm (0.370")	Ethylene Propylene Rubber	Acoustic Deterrent System
C43	Shielded twisted pair	14	80% tinned copper braid	Balanced: 108 (33) Unbalanced: 173 (53)	Neoprene Black	10.0 mm (0.395")	Rubber	Heavy Commercial
C44	Three shielded twisted pairs Shield overall	Two pairs: 18 One pair: 22	Pairs: aluminum foil Overall: aluminum foil & 60% tinned copper braid	Balanced: 164 (50) Unbalanced: 308 (94)	TPR/Black	10.8 mm (0.423")	Polyethylene	Commercial Dual Frequency & Dual Beam Width with Temperature Option

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Standard Cables								
Airmar Cable Type	Description	Wire Gauge (AWG)	Shielding	Capacitance in pf/m (pF/foot)	Outer Jacket Material/Color	Outside Diameter	Conductor Insulation	Usage
C47	Shielded twisted pair & Four conductors Shield overall	Pair: 22 Conductors: 24	Aluminum foil	Balanced: 84 (26) Unbalanced: 155 (47)	PVC/Black	6.5 mm (0.255")	Polyethylene	Light Marine TRIDUCER® Multisensor
C48	Six unshielded conductors	22	None	N/A	PVC/Gray	5.3 mm (0.210")	PVC	Communications
C49	Two shielded twisted pairs & Three conductors Shield overall	Pairs: 22 Conductors: 24	Aluminum foil	Balanced: 97 (30) Unbalanced: 188 (57)	TPR/Black	6.5 mm (0.255")	Polyethylene	Dual Element TRIDUCER® Multisensor
C135	Shielded twisted pair & Two conductors Shield overall	Pair: 22 Conductors: 24	Pair: aluminum foil Overall: aluminum foil	Balanced: 84 (26) Unbalanced: 155 (47)	PVC/Black	5.1 mm (0.20")	Polyethylene	Light Marine
C144	Shielded twisted pair & Four conductors with shield	Pair: 22 Conductors: 24	Aluminum foil	Balanced: 90 (28) Unbalanced: 169 (52)	TPR/Black	4.6 mm x 9.1 mm (0.18" x 0.36")	Pairs: polypropylene Conductors: PVC	Thru-hull TRIDUCER® Multisensor
C145	Two shielded twisted pairs & Four conductors with shield	Pairs: 22 Conductors: 24	Aluminum foil	Balanced: 112 (34) Unbalanced: 203 (62)	TPR/Black	4.6 mm x 9.6 mm (0.18" x 0.38")	Polypropylene	Dual Element Thru-hull TRIDUCER® Multisensor
C161	Three shielded conductors & Two conductors Shield overall	24	Three conductors: aluminum foil Overall: aluminum foil	Balanced: NA Unbalanced: 144 (44)	PVC/Black	6.5 mm (0.255")	Three cond.: polyethylene Two cond.: foamed polyethylene	Apelco/ Raytheon Sidelooker® Transducer
C163	Unshielded twisted pair	22	None	NA	PVC/Black	4.2 mm (0.165")	Polyethylene	Power & Communications
C164	Three shielded twisted pairs Shield overall Water blocked	Two pairs: 20 One pair: 14	Pairs: 90% tinned copper braid Overall: 90% tinned copper braid	Balanced: 1st & 2nd pair: 115 (35) Unbalanced: 210 (64) Balanced: 3rd pair: 151 (46) Unbalanced: 276 (84)	Urethane/Orange	16.5 mm (0.65")	Polyethylene	Heavy Commercial
C166	Two shielded twisted pairs & Five conductors Shield overall	One pair: 22 One pair: 24 Conductors: 24	Aluminum foil	Balanced: 84 (26) Unbalanced: 155 (47)	PVC/Black	6.8 mm (0.275")	Polyethylene	Apelco/ Raytheon Sidelooker® Transducer
C172	Two shielded twisted pairs	22	Aluminum foil	Balanced: 112 (34) Unbalanced: 203 (62)	PVC/Black	4.2 mm (0.165")	Polyethylene	Light Marine TRIDUCER® Multisensor, Dual Element Transducer
C189	Two shielded twisted pairs Shield overall	24	Aluminum foil	Balanced: 92 (28) Unbalanced: 167 (51)	PVC/Black	4.2 mm (0.165")	Polyethylene	Smart Sensors
C190	Shielded twisted pairs & Five conductors Shield overall	24	Aluminum foil	Balanced: 78 (24) Unbalanced: 142 (43)	PVC/Black	6.5 mm (0.255")	Polyethylene	Speed/Temp Sensors, Smart sensors

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Extension Cables

To extend the transducer/sensor cable for a quick and easy installation, Airmar manufactures a line of extension cables with molded, waterproof connectors that match the transducer and sounder.

Echosounder Manufacturer	Male & Female Connectors	Cable Length	Airmar Cable Type	Airmar Part Number
Garmin	6-pin Airmar	6 m (20')	C47	33-058-01
Garmin	6-pin Airmar	3 m (10')	C47	33-058-02
Apelco, JRC, Raytheon	7-pin Airmar	6 m (20')	C49	33-323
Apelco, JRC, Raytheon, Simrad	7-pin Airmar	3 m (10')	C32	33-299
Apelco, JRC, Raytheon (Dual beam 200 kHz echosounder)	7-pin Airmar	3 m (10')	C49	33-298
Raytheon/Apelco 265/365	5-pin Apelco 9R	3 m (10')	C162	33-017
Raytheon/Apelco 265/365/470	9-pin Apelco 9R	3 m (10')	C166	33-016
Autohelm (50 Series)	2-pin Airmar	3 m (10')	C2	33-189
Autohelm (50 Series)	5-pin Airmar	3 m (10')	C9	33-190
Apelco, Furuno, Interphase, JRC, Koden, Royal, Si-Tex	8-pin Fujiseimitsu	3 m (10')	C32	33-181
Apelco, Furuno, Interphase, JRC, Koden, Royal, Si-Tex	8-pin Fujiseimitsu	4.5 m (15')	C32	33-186
Apelco, Furuno, Interphase, JRC, Koden, Royal, Si-Tex	8-pin Fujiseimitsu	6 m (20')	C32	33-287
Apelco, JRC, Raytheon	8-pin Fujiseimitsu	4.5 m (15')	C35	33-291
Furuno	10-pin Furuno	4 m (13')	C32	33-203

