SO.. WHAT *IS* A MULTIPLEXER?

Electronic subsea equipment often requires one or more wired connections. Most require a power source. Others also have data line lines. Lights only have an input control feed for on-off and intensity.. A simple camera, for example, may also have an audio and a video output feed.

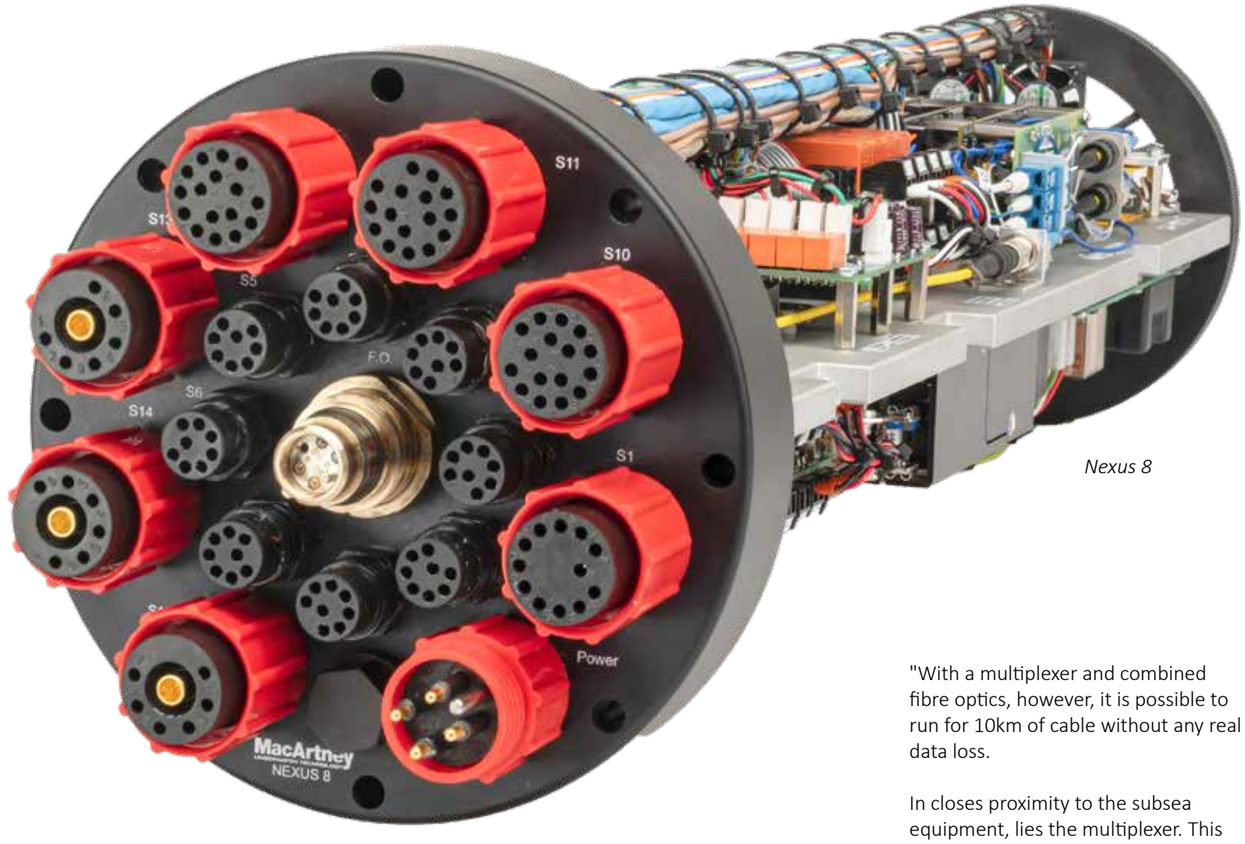
Another consideration when specifying the cable size is calculating data throughput. Equipment such as a large multibeam sonar is not only more power hungry, but also provides a much larger data output. All things being equal, the larger and more complex the device, the larger the cables.

Most underwater vehicles carry a multitude of electronic devices which have to be connected to the surface. This would require a commensurate number of leads to pass possibly thousands of metres through the water column up to the surface. There would also be spare lines to allow other devices to be retrofit.

The alternative is to use a multiplexer.

Instead of, say, 20 lines, the signals are commingled into a single fibre. At its minimum, this would reduce the number of lines required to just two – a power source and a fibre to transmit two-way data signals.

"Generally speaking, a multiplexer is simply a system for combining a number of channels," explained Lars Jørgensen, Head of Product Management at MacArtney. "The idea is that if you attach one end to a piece of subsea equipment, you will get the same data on your topside vessel, transparently. Think of it is a very complicated extension cord."



Nexus 8

Modern multiplexers rely on a fibre optic line.

"For short distances or less complex systems, it is possible to send a multiplexed signal down a copper wire," said Jørgensen, "but this limits the bandwidth of the data that the vehicle is attempting to transmit.

"If the application requires multiple Gigabit Ethernet channels, it is not possible to run that on a long copper long cable and after a few hundred metres, everything becomes more difficult depending on the type of data being transmitted.

"Serial channels can only run up to 1000m while Ethernet equipment has a range of 100m above which, some sort of media converter is required.

"With a multiplexer and combined fibre optics, however, it is possible to run for 10km of cable without any real data loss.

In closes proximity to the subsea equipment, lies the multiplexer. This is normally contained in a pressure housing that allows its use in whatever depth the system is rated for.

Meanwhile, at the surface, the line typically terminates into a 19in rack that can interface data with the topsides and PC systems or connect the Ethernet into the ship's network and distribute it further

NEXUS 8

Recently, Macartney introduced of the most advanced multiplexers in the world, the Nexus 8.

"We produced our first Nexus in 1999," said Jørgensen."It had no video and just serial channels. Since then, however, we have seen a significant shift in market requirements. There is no longer the same amount of sensors using serial connectors and, therefore, moved towards the higher bandwidth type of communication hub. Ethernet systems, driven by the mainstream computer and communications sector, have been adopted by underwater systems.

"In Nexus 8, have increased the number of channels since the early version," continued Jørgensen. "In the standard version there are full serial channels, three Gigabit Ethernet channels and five 10/100 Ethernet channels as well as three HD videos which is all most clients really need.

RELIABILITY

One particular area common to all subsea systems is the need for high reliability. On the surface, if systems fail or need to be modified, it is possible to open up the enclosure and work on the electronics. This not true for underwater systems where it particularly undesirable to open up the bottle enclosure.

"We purpose- design the enclosures to make them watertight under pressure," said Jørgensen. "Opening the bottle means removing the seals and even replacing them increases risk from leakage.

"One way we have worked around this conundrum is to remove the need for opening the bottle. We have discarded regular fuses and instead, made them programmable. We have also made it possible to select what sort of power consumption the user requires before the fuse is triggered.

"We have also managed to make the power management systems programmable. We can basically provide 12, 24 and 48volts on demand as required by different sensors. Alternately, we can feed the full power supply through the bottle and take it out again for a particularly power hungry consumer.

PRESSURE

"At the moment, by manufacturing the casing out of adonised aluminium, the maximum design pressure the bottle is 3000m. We do, however, see a demand for the development of deeper systems.

"This will come from the general desire to explore and record detailed information on the deeper ocean floor but in recent years, there has emerged a new demand for 6000m rated systems in the form of subsea mining

"This is a massive challenge. There are some very good companies out there currently working on taking this next step. Unfortunately, the equipment used subsea gives off a significant amounts of vibration when physically moving soil and extracting minerals from the sea bed, so reliability becomes particularly vital.

"With our philosophy of housing the equipment in a one atmosphere housing, we can increase depth ratings without requiring different types of electronics.