

MASS (Appeal) Connectors

The story of how an industry icon came to be and has adapted through the years

By Al Keltz

While they've become one of the most popular and recognized multipin connectors in pro audio, the back-story of how MASS connectors came to have such impact shouldn't be overlooked.

Interestingly, MASS connectors weren't even intended for audio applications; rather, they were originally developed for use in oil exploration. Oil company engineers connected seismographs with miles of cable in areas suspected of containing oil deposits. Explosive charges were then buried along the lines and detonated. The resulting echo signatures were captured by the seismographs and transmitted along multipair cables to a central location.

There, a composite picture of the underlying geological structures could be determined and analyzed for the prospect of containing oil deposits. It was the connecting of these cables that necessitated a large contact count connector.

The characteristics that this connector possessed in oil exploration also made it ideal for multi-channel audio:

- € Rugged and able to withstand many connection cycles.
- € Resist the elements as it would be outdoors and often laying on the ground - exposed to dirt, sun and rain.
- € Hermaphroditic (asexual, genderless) so that any connector could be mated to any other. This eliminated the need to keep track of the usual male/female connector configuration. (Imagine laying out a mile of cable only to find that you're holding onto the wrong end!)
- € Many pins and sockets, 88 each for a total of 176 contacts.

UNIQUE FACTORS

While Whirlwind wasn't the first company to bring MASS connectors to market, they've contributed significantly to their proliferation in audio applications. Back in the late 1970s, several providers began using multipin connectors as a means to provide disconnects for faster and easier setup and teardown.

Whirlwind, already producing the Medusa snakes and getting into microphone splitters, saw the addition of multipin disconnects was a logical addition. Several multipin connector systems were used, but in the early 1980s, a connector

produced at the time by IIT/Cannon had some unique features that gave it the edge.

At the time, these connectors were rather plentiful, and 176 contacts could transport the number of channels required by the use of large format audio mixing consoles that were becoming more popular. The Cannon MASS connector became Whirlwind's standard in 1986, called the W4. A smaller connector was also available with 122 contacts and that was added to the mix a short time later as the W3.

MASS Connectors rapidly became accepted in the industry due to their reliability, capacity to handle a large number of channels and because they were offered as the standard disconnect by Whirlwind, already a dominant player in this field. However, after a few years after the adoption of MASS connectors, the technique used to explore for oil began to change. Satellite imaging was proving to be an accurate and less expensive method of mapping geological structures and began replacing the dynamite/seismograph approach. IIT/Cannon cut back on production but connectors were still available.

And then the unthinkable happened. During transport at the Cannon factory, the tooling for the 44 was dropped from a forklift, causing damage beyond repair. Cannon believed that re-tooling wasn't worth the effort due to the reduction in demand for the connector and the existing supply was deemed sufficient to last until the connector's usefulness had expired. That door slammed shut and in 1989, Cannon abandoned its multipin connectors.



Look familiar? An old-style Whirlwind W4.

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DECISION TIME

Numerous sound companies had invested heavily in the W3 and W4, adopting it as a standard. As a result, MASS systems were available in most locations, making it very easy for touring groups to borrow or rent cables and fan-outs for an emergency replacement or to extend a system for a particular show.

With the Cannon door firmly closed, Whirlwind ventured to set up its own large-format connector production facility, a significant financial risk for a relatively small company. With the original tooling completely destroyed, the company's engineering team had to start from scratch, not only creating the means to produce quality MASS connectors, but ones that would be compatible with the thousands already in use.

After several months of design, prototyping, testing, and more, the first all-Whirlwind W4 quietly rolled into the company's custom shop and then into Whirlwind systems. The switchover produced almost no news in the audio world - which was good news for Whirlwind. And it wasn't long before the W4 design was modified to produce the 122 contact W3.



Need that in solder (left) or crimp style?



On the left, the previous MASS design, with updated version on the right. The arrow indicates extra metal added to the ring to support the rubber locator, tightening the receptacle area.

CRIMP IN THE PLAN

Up to that time, all MASS connectors were solder type, making them difficult (if not impossible) for the average installer to assemble in the field. For this reason, designers were hesitant to specify MASS connectors into installations. Also, if a pin happened to become bent or broken, the entire connector would have to be cut off and a new one soldered on. (There are stories of a few hardy souls that have replaced a solder type pin by prying the face of the connector insert away and disassembling it. Then they reassemble the whole thing pin-by-pin and socket-by-socket - all 176 contacts. Do not try this at home!)

This led Whirlwind to the development of replaceable contact version, necessary if the MASS connector was to be accepted for installs like stadiums, theaters, theme parks and the like. It was a challenging process - the solder connector was a known quantity. But a replaceable contact version would have to be compatible with the mass of MASS connectors already in use.

The project presented a physical challenge. The density of the contacts made it impossible to use a front release design and the required locking clip tolerances would never have been accepted if this connector didn't have to mate with existing solder type MASS connectors.

Whirlwind engineers decided that the insert would be made of a three-piece assembly. The front piece was made of rubber and provided the face to the connector. The rear would be a solid wafer containing metal clips to hold the pins and sockets. Since the metal clips would hold the contacts, the front rubber face would not expand as it was loaded. A center wafer was sandwiched between the front connector face and the rear wafer to keep the contacts aligned.

Contacts would be inserted and extracted through the rear wafer. All three pieces were housed in a machined aluminum shell and held in place with a C-clip. Special pins and sockets were designed with a small cup on the rear into which the wire was placed and crimped with a standard hand-crimping tool. The contacts



The right way to prep a MASS connector, keeping things organized and secure.



Working in tight quarters balanced by a clean, methodical approach.

could then be pushed into the insert from the rear until they clicked into position. If it became necessary to remove a pin or socket, a small tube like extraction tool was designed to be inserted around the contact and up into the connector shell where it pushed back the metal fingers on the retaining clip, allowing the contact to be pulled back out.

THE BEST LAID PLANS

The first run of about 100 W4RP (replaceable pin) connectors were readied for the rigors of the field... Or maybe not. It quickly became obvious that the design needed work. Out of those first 100 W4s, quite a few experienced problems with the pins and sockets not holding in the insert, so they were immediately recalled for analysis.

The retaining clips weren't holding in the wafer solidly enough. The original design called for some slop in how the pins were secured side to side. The feeling was that they should be free to align themselves when entering the socket. However, the pins had enough movement that they would occasionally miss the socket

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opening entirely and hang up on the rubber face of the opposite connector. Then the mating force would cause the clip to push out.

The design was totally re-thought and resulted in these solutions:

- € Elimination of the playŽ the pins had when secured in the insert.
- € Slight softening the material that the clips were contained in, while increasing the shoulder size for retaining the clip. This caused each clip to have positive biteŽ in the wafer.
- € Redesign of the shape of the pin to round its profile. This made them less sharp and provided more positive entry into the socket. The rubber face of the insert was also hardened so that if a pin touched the opposite face, the pin would deflect down into the socket and be less likely to stick in the rubber.
- € Creation of a cone-shaped opening into the socket, also to

help direct the pin down into the socket.

- € Addition of an extra metal thickness to the shell receptacle area surrounding the insert to eliminate the ability to try and mate the connectors at an angle. Now, the opposite rubber locatorŽ must fit straight down into the narrow receptacle on the opposite face.

Clip failures virtually disappeared overnight. In fact, the improvements were so dramatic that all of the new features were incorporated (except of course for the clips) into the solder-type MASS.

MASS GOES MICRO

Up until 1998, Whirlwind's small-size multipins were the mil-spec W1 (39 pin) and W2 (61 pin). These are still available from a few manufacturers today. However, the pin counts don't fall into normalŽ channel configurations seen in audio systems.

In 1998, the company moved forward on production of the first multipin connectors designed specifically for audio professionals. This connector would have all the features required for audio systems - the same sexlessŽ design found in the MASS connector, and that there would be two sizes, one with 48 contacts and one with 84 contacts. 48 contacts would handle up to 16 channels and be suitable for use as subsnakes or with small mixers. Also, 84 contacts would handle up to 28 channels and be good for use as sub-snakes and 24 channel console snakes with four returns.

These connectors could also have reduced density of pins and sockets, making the design considerations a bit easier than the large MASS connectors. The new W5 (48-pin) and W6 (84-pin) MicroMASS connectors were brought to market in early 1999 and have become a new standard for smaller snake systems and subsnakes. They are only made in replaceable pin versions and the design has proven highly durable.

One unusual issue came up during the design. These connectors are exactly the same size, made that way on purpose so that they can share common parts. However, it could be



State-of-the-art MASS connectors, the result of years of evolutionary improvement.

possible for someone to take a W6 and try to plug it into a W5 if they weren't paying strict attention. The solution was adding a keyŽ to the W6 connector face to eliminate the possibility of getting one type inserted into the other. Also, it was decided that the W6 insert be changed to white and its locking ring to blue so the W5 and W6 would be easier to identify when systems contained cables of both types.

FUTURE SCOPE

New methods of digital audio transmission such as CobraNet are about to change the way live sound is distributed. CobraNet has the capability of transmitting 64 channels of real-time, high quality digital audio over a 100BaseT Ethernet network with extremely low latency. With Gigabit Ethernet becoming more affordable, that figure jumps to 640 channels!

Imagine winding up a few hundred feet of CAT-5 or fiber optic cable at the end of the gig instead of hundreds of pounds of 58 pair multicore. Instead of a system containing hundreds of feet of multicore and many MASS disconnects, there might be one analog split to the monitor console and fiber everywhere else. This year, Whirlwind is introducing its DLS1 laser units for transmitting audio, video and data via Gigabit infrared laser - all the channels you need and no cable at all.

(Live Sound will be featuring an in-depth report on the DLS1 system in an upcoming issue.)

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Choose your weapon.



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