

**modulation
sciences
inc.**

Wired STL[™]

Composite Line Driver/Receiver

FEATURES:

- Transmits composite baseband up to 2,500 feet.
- Allows critical stereo generators and processors to be located in studio.
- Highly immune to RF of all frequencies, including AM, FM, and TV.
- Supports separation and SNR far in excess of most stereo generators.
- One fifth the cost of an STL.
- Easy to install and set-up.
- Connects with inexpensive cable.
- Virtually immune to noise caused by difference in ground potential between driver and receiver locations.
- Rated over a wide temperature range, from 0 to 50 degrees Celsius.
- Driver can be used as a distribution amplifier, providing up to four isolated independent outputs.
- Uses standard connectors — BNC and XLR type.
- Transmits up to 10,000 feet (2 miles). Available on special order.

The Missing Link in FM Stereo Broadcasting

modulation sciences, inc.

Wired STL™ CLD-2500 System Composite Line Driver/Receiver

Send stereo Baseband Over Inexpensive Transmission Lines Up to 2,500 feet (10,000 Feet Special)

Modulation Sciences has evolved a general solution to the problem of separating a stereo generator from its associated exciter. The **Wired STL™** system sends stereo composite baseband over long lengths of inexpensive transmission line. Made up of a driver and a receiver, the **Wired STL™** can easily operate with 2,500 feet of cable. Lengths as great as 10,000 feet are possible on special order.

Extra Versatility

One driver can feed two separate runs of different lengths, each with its own receiver. The driver can also stand alone as a composite distribution amplifier to drive up to four separate coaxial lines.

How it's Done

Technically the CLD-2500 system consists of a high current, balanced, impedance matched driver that couples to twinax line. At

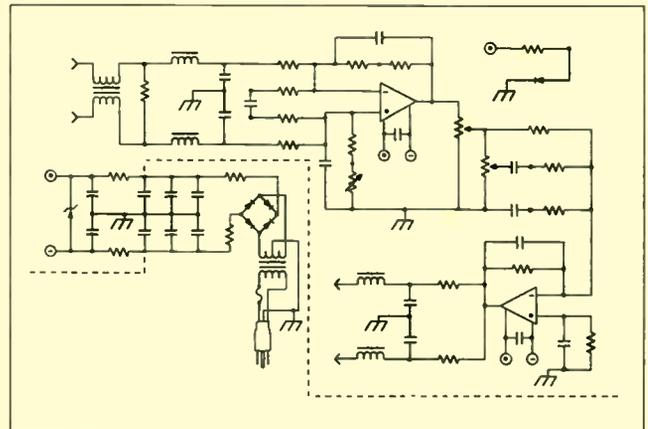


FIGURE 2

the receiver end, the cable is terminated and an active circuit translates the balanced twinax circuit to a coax drive suitable for the short run to the exciter. Figure 1 is a schematic of the driver and Figure 2 is of the receiver.

You Get Greater Freedom of Equipment Location; Improved Reliability and Easier Maintenance

The Composite Line Driver/Receiver fills a great need in FM station operation. Many system problems are solved when composite can be transmitted over long runs of cable. It removes a great restriction on the location of critical equipment within the technical plant. The flexibility that the **Wired STL™** provides can improve the reliability of the station by allowing sensitive equipment to be kept in a controlled environment. This accessibility makes preventative maintenance much easier. It also means that adjustments that affect the air sound can be made more accurately. In some instances, the CLD-2500 may contribute to the physical safety of the technical staff by minimizing their exposure to often hostile transmitter or STL environments.

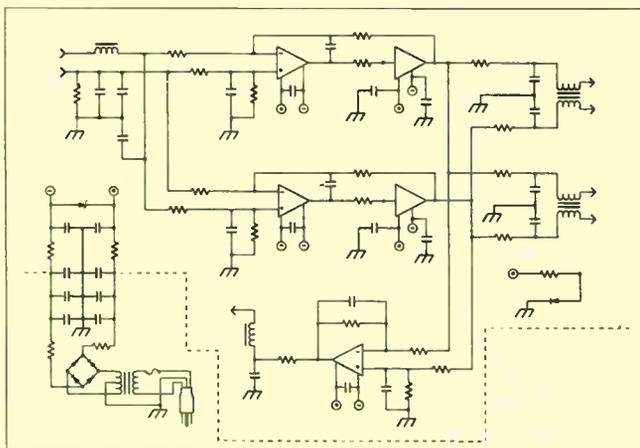


FIGURE 1

Wired STL™ Composite Line Driver/Receiver Systems Specifications

SYSTEM CONFIGURATION: One CLD-2501 composite line driver with one or two CLD-2502 line receivers. Driver can stand alone as a composite distribution amplifier.

MAXIMUM LINE LENGTH: Belden 9463 (78 ohm) — 2,500 feet
 (Note 1) Belden 9182 (150 ohm) — 4,000 feet (Note 2)
 (Up to 10,000 feet cable of either type with modified receiver)

OVERALL SYSTEM GAIN: Adjustable from 0 to -20 dB

TEST CONDITIONS FOR ALL FOLLOWING SYSTEM SPECIFICATIONS:

INPUT LEVEL: 4 volts Peak to Peak (PP)

GAIN: unity

TWO-TONE INTERMODULATION DISTORTION:

Any two frequencies, 50 Hz to 53 kHz, 1:1 at 4 volts PP total: -70 dB
 Any frequency, 50 Hz to 53 kHz with any frequency 53 kHz to 100 kHz,
 10:1 at 4 volts PP total: -70 dB

BROADBAND NOISE (20 Hz to 100 kHz): 85 dB below 4 volts PP

60 HZ COMMON MODE REJECTION: 95 dB nominal, 70 dB at temperature extremes

60 HZ SHIELD CURRENT NOISE REJECTION WITH 500 FEET OF BELDEN 9463: Shield current: 0.5 A (Note 3)
 Output noise: 66 dB below 4 volts PP

Note 1: This data applies only for use with the specified Belden cables. Contact the factory regarding the use of other type cable.

Note 2: Termination resistors in both driver and receiver must be changed to use 9182 cable.

Note 3: This is an extreme figure. Normally shield currents of only a few milliamps would be expected, in which case output noise resulting from shield current would be insignificant.

SPECIFICATION (Note 4)	DRIVER/RECEIVER ONLY (NO CABLE)	WITH 1,000 FEET OF BELDEN 9463	WITH 2,500 FEET OF BELDEN 9463
FREQUENCY RESPONSE (DC to 53 kHz)	± 0.01 dB	± 0.02 dB	± 0.03 dB
DIFFERENTIAL TIME DELAY RELATIVE to 38 kHz at:			
1 kHz	- 40 nS	+ 10 nS	+ 20 nS
10 kHz	- 10 nS	+ 30 nS	+ 20 nS
19 kHz	- 5 nS	+ 10 nS	- 15 nS
53 kHz	+ 5 nS	+ 10 nS	- 40 nS
STEREO SEPARATION at:			
1 kHz	> 60 dB	> 60 dB	55 dB
15 kHz	60 dB	55 dB	45 dB
(Note 5)			

Note 4: All specifications relating to system with cable were measured with HF compensation control adjusted.

Note 5: Separation figures were calculated from measured amplitude and delay response, assuming an ideal stereo composite input signal.

CLD-2501 and CLD-2502 Composite Line Driver/Receiver Specifications

SIZE: (Note 6)	1.75" (44.5) x 19" (482.6) rack panel with 1.75" (44.5) H x 12" (304.8) W x 5.75" (146.1) D rear housing
POWER:	95 to 130 volts AC, 10 watts max. 190 to 260 volt option available
TEMPERATURE RANGE:	0 to 50 degrees Celsius
RF PROTECTION:	All inputs and outputs RF suppressed, power supply RF suppressed and shielded from main circuitry
POWER INDICATOR:	Green LED

CLD-2501/Driver		CLD-2502/Receiver
GAIN:	Unity to all outputs	20-turn pot Adjusts gain of both main and test outputs from 0 to -20 dB
HF COMPENSATION:		1-turn trim pot Adjusts high frequency response for cable length
CONNECTORS/LEVELS IMPEDANCES		
INPUT:	Floating BNC connector 1 to 10 volts PP 15 kOhms	D3F (XLR type panel mount female) 1 to 10 volts PP (balanced) Impedance matched to cable type: - Belden 9463 (standard): 78 Ohm - Belden 9182 (special order): 150 Ohm
TEST OUTPUT:	BNC connector 1 to 10 volts PP 200 Ohms	BNC connector 1 to 10 volts PP 1 kOhm
MAIN OUTPUTS:	Two D3M (XLR type panel mount male) 1 to 10 volts PP (balanced) Impedance matched to cable type: - Belden 9463 (standard): 78 Ohm - Belden 9182 (special order): 150 Ohm	BNC connector 1 to 10 volts PP 180 Ohms

Note 6: Dimensions are in inches (millimeters).

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BROADCAST[®] ENGINEERING

October 1982

Field report:

By John Shepler, technical consultant, Rockford, IL

The Modulation Sciences CP-803 FM composite processor

Manufacturer's claims

Modulation Sciences claims that you can sharpen your competitive edge by adding its CP-803 to your compressor/limiter/stereo generator to enhance the stereo composite signal. The claim is for a resulting signal up by 6dB with a

greater dynamic range for a more open sound—all without the breathing, pumping or swishing associated with conventional processing.

These oscillograms show the manufacturer's claimed difference between its CP-803 action

and illegal baseband clipping. Figure 1 shows the 19kHz sine wave riding the crest of the signal at 100% modulation, illustrating that the CP-803 does not clip the pilot. In Figure 2, illegal baseband clipping is shown by the square tops in the oscillogram trace.

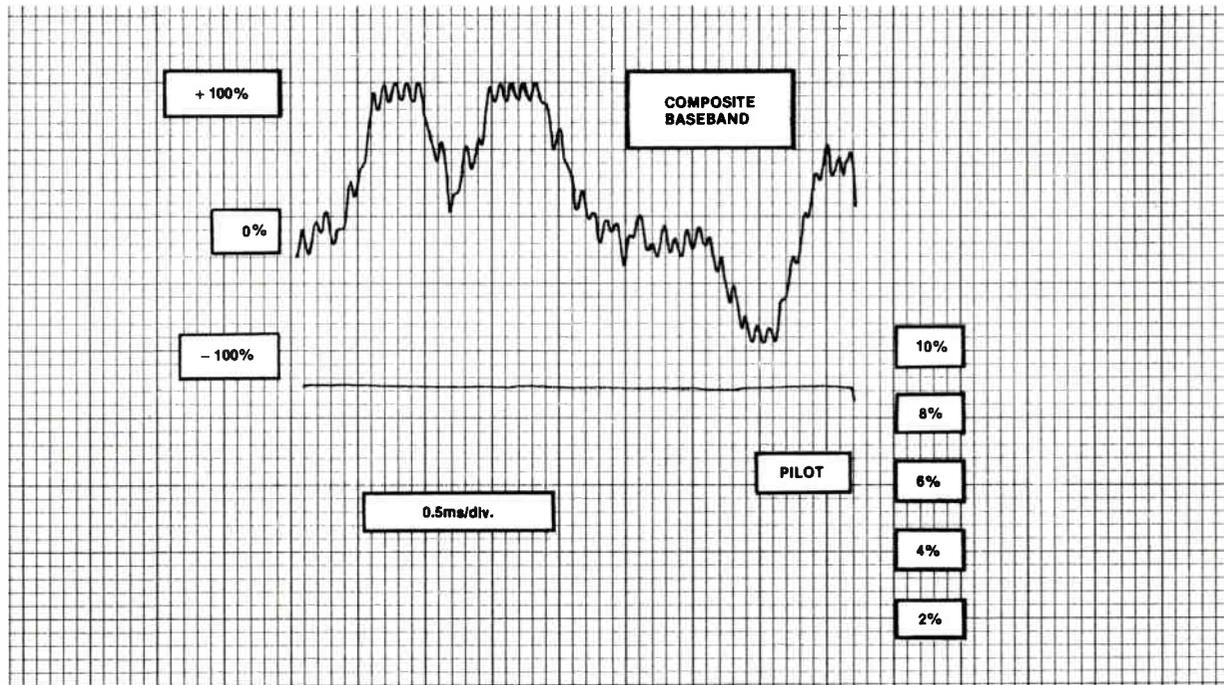


Figure 1. Legal composite processor

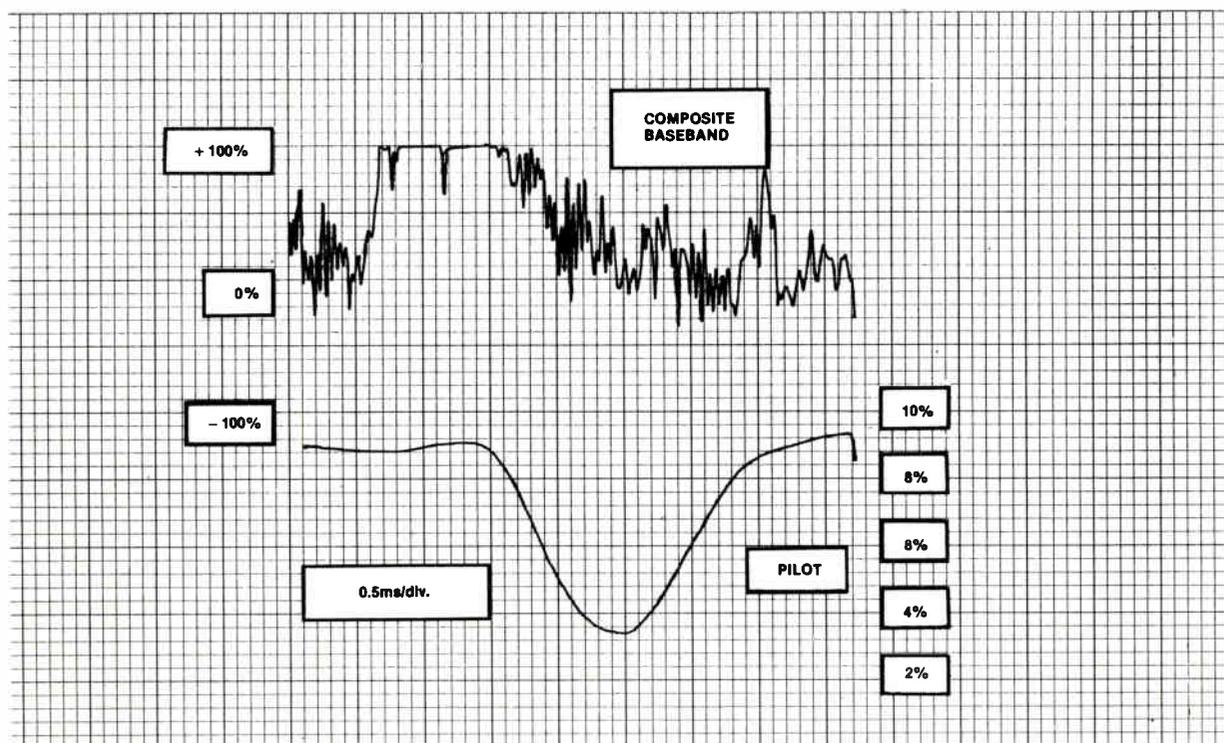
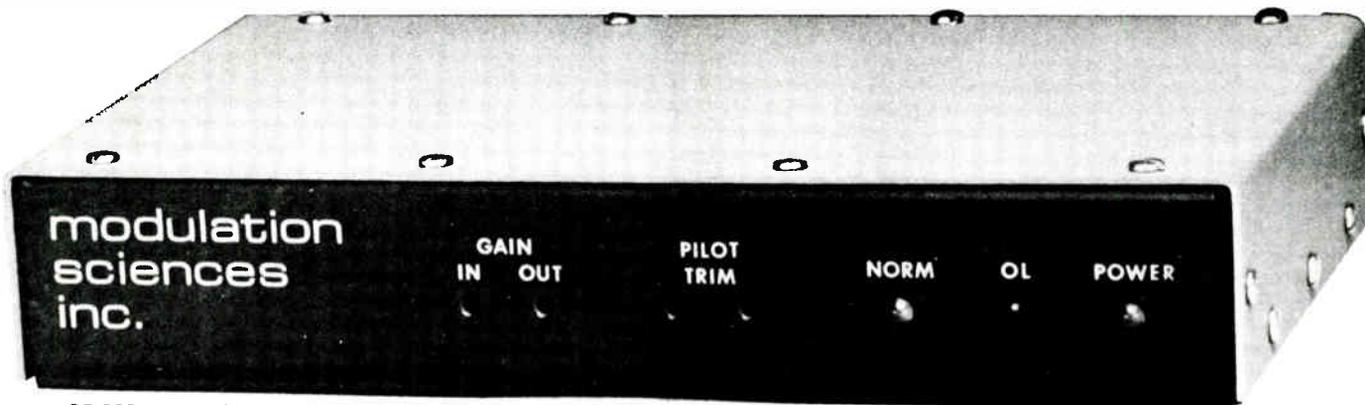


Figure 2. Illegal clipper

Field report:

By John Shepler, technical consultant, Rockford, IL

The Modulation Sciences CP-803 FM composite processor



CP-803 composite processor

Composite processing is an FM audio technique that has been surrounded by much controversy. Those who are for it claim that it significantly increases signal loudness with minimal quality losses. Those in opposition claim that it jeopardizes the integrity of the audio and, perhaps, the legality of the station operation.

My own experience is that composite processing has a lot to offer the stereo broadcaster. Be forewarned, however, that this is a high power technique and, unless you have the finesse to keep the genie in the bottle, you could be buying some problems.

Recently, I had the opportunity to field test a new composite processor that is designed to be easily adjusted and that will protect the signal from interference-causing side effects. I'd like to share my findings concerning the Modulation Sciences CP-803 processor.

History of composite processing

FM broadcasters have always been plagued with modulation problems. The 75 μ s pre-emphasis curve tends to create undue sensitivity in high frequency audio material. Crashing cymbals and raspy voices can easily flash the modulation peak indicator. Stereo generator circuits have only made matters worse with low-pass filters that ring and overshoot.

Recent audio processors have come a long way in solving these problems, but they still suffer from one signifi-

cant deficiency—all audio processing is done before the stereo generator. Any discrepancies in the stereo generator, STL receiver/transmitter, or anywhere else between the processor and the FM modulator cannot be corrected.

What is needed is processing on the total or composite stereo signal. This is why composite processors or "clippers" were developed. The composite clipper connects between your stereo generator or STL receiver and the exciter input. Its function is to clip or chop off the minor modulation peaks that limit your modulation level.

Two major benefits result. First, your modulation is solid and can be kept much closer to the 100% level on the modulation meter without flashing the peak indicator. Second, and even more important, a clipped signal sounds cleaner and more "open" than a compressed or peak limited signal given the same amount of processing.

Granted, peak clipping generates harmonic distortion. But processors that play with the dynamics of the audio tend to create a dull, unnatural sound when pushed very hard. Our trusted tool, the wideband limiter, can make a mess out of an otherwise beautiful signal.

The harmonic distortion would not be so bad if the extra frequency components generated did not spread the signal into other channels, inviting an FCC citation. The audible effects are mainly filtered by the receiver circuits

and do not seem to hurt much at low clipping levels. Of course, the temptation for most people is to see how much bite the signal can stand. This may create a raspy edge on voices and music, and is said to turn a receiver's stereo pilot indicator into a disco light show.

The MSI approach

The Modulation Sciences CP-803 composite processor is a recent development designed specifically to correct the problems of modulation splatter, temperature drift and tricky operator adjustments. I was curious to see if the performance of this unit would live up to the claims that were made. Fortunately, Eric Small at MSI was willing to loan me a test unit for a few weeks. I had the eager assistance of engineers Jim Douglas and Bud Walters at WXXO, who helped put the unit through its paces.

Installation of the CP-803 is easy enough. The input and output connectors are BNC types, common to most stereo generators and exciters. In this case, we simply put the MSI unit in the line between an Orban Optimod 8000 processor and a Harris TE-3 exciter equipped with an Optimod input adapter.

The package is small (1 $\frac{1}{4}$ "x12"). It sat on top of the Optimod for the tests. A rack-mount is available, although you might want to think about keeping the adjustments out of the reach of

Continued on page 68

non-engineers, behind a blank panel.

Power is provided from a standard 120Vac line and illuminates a front panel LED. The only other things you have to worry about are the normal and overload indicators and the input and output level adjustments.

Setup was no problem. You adjust the input gain until the normal LED (yellow) starts flashing. Increase the output gain for the highest modulation level you can get without flashing the peak lamp. Once the processor is working, an increase in the input level gets more processing, if desired. Be sure to stay below the point where the red overload LED comes on.

Hot, brassy musical selections with lots of transients will make the processor more active. Mellow selections do not get, or need, as much correction. Don't forget to make sure that your pilot level is at 9% after these adjustments.

Evaluation

How does the CP-803 sound? Very nice, I must say. This is obviously somewhat subjective, because what constitutes good audio is a matter of personal taste. Even so, an A/B comparison with an older design of a composite clipper definitely showed the MSI unit to be cleaner and more open sounding. The stereo separation was also greatly improved. The raw Optimod signal was not nearly as loud without the clipper and needed to be driven harder to sound competitive with other stations.

An interesting effect that I have noticed is that adding the composite clipper actually makes a signal sound more lively than one without it. This is similar to the effect that you get on AM between a processed and non-processed station.

Regarding the interference prevention claims, I must go with statements made by MSI. The operating manual contains copies of legal and technical opinions from attorneys and consulting engineers that this unit will not violate any FCC regulations when operated properly. You can verify this yourself if you have access to a spectrum analyzer or can get an opinion from your own consultant. I will say that no splatter or pilot modulation was apparent in this evaluation.

Construction of the MSI processor gives me both good and bad impressions. The human engineering is great. The adjustments are multi-turn pots, and the indicators are easy to use. The unit also contains a good amount of RF suppression to keep AM audio out of the FM. (I wish all manufacturers would think about this.)

However, I was disappointed in the

packaging. The construction isn't bad, but it isn't great. The container does not do justice to the performance of the unit. Compared to the high class construction of Orban's Optimod, the little MSI processor looks out of place. I expect that most broadcasters would be willing to pay extra for heavy-duty sheet metal and a flashier appearance.

Another drawback is a mystery module in the audio circuit. I hate those things, because you know there is only one place to buy them, and they are usually much too expensive to keep spares. Unfortunately, the potting of components is often necessary if you want good temperature stability, so we will have to grin and bear it. If you are in a fiercely competitive situation and are worried about equipment failures, the only solution is to have redundancy on all equipment, including valuable processing gear.

The instruction manual is also rather weak in technical detail. Being a circuit fanatic, I enjoy digging into the nitty-gritty details of equipment design. The trend of operating manuals for audio equipment, however, seems to be away from detailed circuit explanations and more into operating instructions. Some of this is probably because of the proprietary nature of processing techniques.

Final notes

My overall impression of the MSI CP-803 composite processor was favorable. I believe that this piece of equipment represents another step forward in technology for FM broadcasters and provides another option for those stations dedicated to improving the performance of their audio signals. The efforts toward making this device easy to use and unlikely to generate interference problems will help legitimize a valuable processing technique.

Editor's note:

The field report is an exclusive BE feature for broadcasters. Each will be prepared by the staff of a broadcast station, production facility or consulting firm. The intent is to have the equipment tested on-site. The author is at liberty to discuss his research with industry leaders and to visit other broadcasters and/or the manufacturer to track down pertinent facts.

In each field report, the author will discuss the full applicability of the equipment to broadcasting, including personal opinions on good features and serious limitations—if any.

In essence, these field reports are prepared by the industry and for the industry. Manufacturers' support will be limited to providing loan equipment and to aiding the author if support is requested in some area.

It is the responsibility of **Broadcast Engineering** to publish the results of any piece tested, whether positive or negative. No report should be considered an endorsement by **Broadcast Engineering** for or against a product.

The author, a consultant, conducted the tests reported herein at station WFRL/WXXQ in Freeport, IL, with the cooperation of station engineers Jim Douglas and Bud Walters.

The system covered in this field report is marketed by Modulation Sciences, 99 Myrtle Ave., Brooklyn, NY 11201. Comprehensive product data may be obtained directly from this company.

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