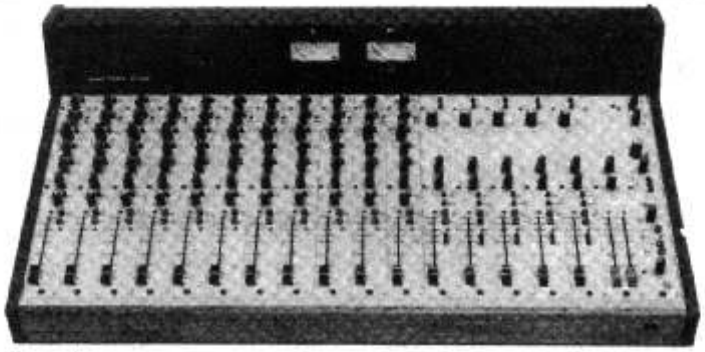
Hugh Ford



Chilton CM Series Audio Mixing Console

The Chilton CM series mixers are small modular units intended for broadcast, film and video work in fixed or portable applications. The CM2 (reviewed here) is a two group unit and the CM4 four-group. Three types of mainframe accept 12, 18 or 24 modules with the four types of module available for the CM2 units being the same width.

The mainframes are constructed from a heavy duty alloy extrusion across the front, with alloy plates at the sides being attached to the sheet steel rear panel and the alloy sheet base which has four feet.

The front and the sides are trimmed in solid teak. The meter bridge at the rear has a dark brown finish and the modules are light cream with black control identifications. Control knobs are colour coded red for gain, blue for equalisation, green for auxiliary and grey for pan, making identification easy at a glance. Also 'fisheye' or what I call 'self illuminating' switches are used for the major switching functions but small black knobs are used for other functions. It is not easy to see the setting of the latter.

At the centre of the meter bridge are two illuminated BBC type peak programme meters (which are optionally the EBU style PPM's or VU meters) underneath which are red LED peak indicators. Whilst both meters may be switched between the L/R buses and the stereo tape returns the right hand meter also monitors the pre-fade listen bus.

To the right of the meter bridge which hinges up from the rear for access to the modules is a small monitoring loudspeaker and its volume control and drive amplifier behind the panel.

Optionally a crystal controlled stop watch may be installed at the left side of the meter bridge.

Four types of module are available for the CM2 mixers consisting of the type M1 mic/line input module, the type M2 master module, the type M3 monitor module and the type M4 stereo line input module which may optionally be fitted with a RIAA corrected piggyback board for gramophone reproduction.

All types of module plug into a mother board which is the width of the base of the mixer. This supplies power and contains all the buses with the master and monitor modules having extra connectors at the rear feeding the meter bridge and two pairs of XLR connectors.

With this exception all connections are an integral part of the modules feeding through holes in the rear panel of the mixer, the modules being secured by the jack sockets feeding through the rear panel and a single screw at the front fitting into threaded holes in the front extrusion.

With the exception of the latest Audiofad faders all components are soldered to the module's printed circuit boards which are tidily laid out with clear component identifications and the minimum of hand wiring. Each module has its own screen opposite the printed circuit board covering almost the complete length of the modules.

First considering the input modules these have separate XLR connectors for the line and microphone inputs. The microphone input is followed by a 48 V phantom powering switch and then a 20 dB pad and a phase reverse toggle switch which feeds the input transformer which is switched by a 'fisheye' switch between the microphone input and an attenuated line input.

Coaxial potentiometers separately control the microphone and line gains followed by a switchable 70 Hz lowpass filter and the equalisers which may be switched in/out with a 'fisheye' switch. The equalisers consist of a high frequency shelving equaliser and a mid peaking equaliser with coaxial cut/boost and frequency knob covering 100 Hz to 1 kHz or 1 kHz to 10 kHz depending upon the setting of a nearby pushbutton switch.

Equalisation is followed by a peak warning LED in the fader area before the unbalanced insert point in the form of a ¼ inch jack at the rear of the input module. There follow level controls for the two auxiliary buses which may be switched pre/post fade, the 'fisheye' channel on/off switch being before the fader but after the feed to the pre-fade listen bus which is activated by another 'fisheye' pushbutton.

Finally at the bottom of the module is the 100 mm fader above which is the pan pot feeding the L/R buses. A direct output is provided preceding the pan pot, this again being a ¼ inch jack socket on the rear of the input module.

The stereo line or phono input module has twin unbalanced XLR inputs (balanced optional) which may be followed by the optional phono amplifier and is then followed by a five-position switched level control calibrated ±10 dB, +5 dB and 0 dB.

This section has the red peak LED in the fader area and the 'fisheye' switched feed to the pre-fade listen bus and also feeds the 'fisheye' channel on/off switch. There follow pre-fade feeds to the auxiliary bus send controls and to the stereo fader.

The fader outputs are sent to the auxiliary bus send controls via the pre/post-fade pushbutton in addition to a mono/stereo switch before feeding the L/R buses. Further pushbuttons allow feeds to the left or right buses to be muted.

MANUFACTURER'S SPECIFICATION

Frequency response:	Line/mic in-out ±1 dB 20 Hz to 20 kHz	
Distortion		
Balanced line:	0 dBu	In/out
	0.03%	40 Hz
	0.005%	1 kHz
	0.005%	15 kHz
Balanced mic:	−35 dBu in	0 dBu out
	0.03%	40 Hz
	0.005%	1 kHz
	0.02%	15 kHz
Maximum output:	+20 dBu	600 Ω
	0.03%	40 Hz–20 kHz
	0.01%	100 Hz–10 kHz
Headroom:	20 dB above normal working level	
Noise:	Measured with average sensing RMS calibrated meter −3 dB at 20 Hz to 20 kHz. Equivalent input noise 200 Ω source −128 dBu	
Output noise:	Group faders down −104 dBu. 10 channels assigned unity gain −90 dBu	
Crosstalk (Group L–R):	Channel and group fader at unity −70 dB at 10 kHz line in/out. Maximum mic gain 82 dB. Maximum line gain 32 dB. Line and tape input −30 to +30 dBu at 10 kΩ	
Recommended phone impedance:	400 to 2 kΩ. Source impedance 20 Ω	
Equalisation:	±15 dB at 12 kHz. ±15 dB sweepable 100 Hz to 1 kHz×10 switch 1 kHz to 10 kHz Q1.5±15 dB at 100 Hz	
Filter:	70 Hz highpass 12 dB slope	
Fader:	Conductive plastic: precious metal wipers	
Power supply:	±15 V at 1 A DC. 48 V at 100 mA DC 12 VAC	
Finish:	Solid teak surround, resin sealed and oiled	
Weight:	10/2 approximately 23 kg packed; 16/2, 14/4 approximately 35 kg packed	
Dimensions:	10/2—576×510×210 mm; 16/2, 14/4—846×510×210 mm	
Manufacturer:	Magnetic Tapes Ltd, Chilton Works,	

Unbalanced L/R insert points are provided in the stereo input module for the left and right channels after the switched attenuator but after the peak warning LED.

The master module accepts the inputs for the L/R buses and after summing feeds them to unbalanced left and right insert point jacks before the twin faders feeding the unbalanced (optionally balanced) left and right outputs. These are also summed to provide an unbalanced mono output at a third XLR connector.

Also within the master module is a monophonic unbalanced auxiliary return which is fed to the L/R buses via a level potentiometer and a pan pot.

The fourth type of module, the monitor and talkback module, has at the top level potentiometers for the two XLR unbalanced auxiliary bus outputs which may be fed by pushbuttons to the monitor loudspeaker.

Further down the panel is the slate oscillator frequency switch covering Off, 40 Hz, 100 Hz, 1 kHz, 10 kHz and 15 kHz with a 'on' warning LED. Next to this is the talkback level control fed from the internal talkback microphone. Three locking pushbuttons allow talkback to be fed to the rear XLR unbalanced talkback output or the auxiliary or L/R buses to which the oscillator may also be fed.

The stereo monitor output at a stereo jack socket has its own level potentiometer and may be muted or fed from the mixer outputs or tape returns or naturally the pre-fade listen bus in which case a green warning LED is illuminated.

Headphone monitoring which has jacks at the front and fear of the mixer has the same feeds but has its own level control and is not muted.

Power for the mixer is derived from a separate power supply via a 6 ft lead fitted with locking connectors at either end. The mains input is via an IEC connector with a miniature on/off toggle switch and a mains fuse unidentified in value. Two red LED's indicate the presence of the +15 VDC supplies with no indicator for the 48 V phantom power supply.

Within the power unit there is a toroidal transformer with a pluggable link selecting 110, 120, 220 or 240 VAC operation. Whilst the printed circuit board holding the power stabilisers has proper component identifications the secondary fuse on this board and one in the base of the power supply are unidentified in value.

Overall the mixer is substantially built and suitable for portable operation and its modular form of construction makes it a versatile small mixing system.

The standard of electronic construction is good and the manual supplied in addition to including basic descriptive information includes board layouts and full circuit diagrams to ease servicing.

Inputs and outputs

The microphone input impedance was satisfactory for microphones with an impedance of 200 Ω or lower being 990 Ω without the nominal 20 dB (actual 21.5 dB) or 1.88 kΩ with the pad in circuit. The nominal 48 V phantom powering was satisfactory with the maximum input level without the pad being −50 dB at the maximum gain or 0 dBm at the minimum gain, the actual gain to the mixer outputs being a ▶

closely matched. **Table 2** shows noise referred to the inputs for a single channel as seen at the main outputs at maximum gain, the microphone input being shunted with 200 Ω.

Whilst the noise performance was very good, some instability was noted at maximum gain or up to about 5 dB below maximum in the master stereo output module. This took the form of an approximately ±300 mV peak to peak output at around 2 MHz. Depending upon the level setting this was at times accompanied
by increased noise. The manufacturer states that this problem is known and depends upon the loading of the mixer. He has introduced modifications, of a very simple nature, to overcome this problem which only occurs in some modules.

No other noise problems were encountered with the equalisers behaving as might be predicted as did the mixing noise. In view of the separate power unit there was no sign of power line hum.

Distortion

Harmonic distortion was measured over various routings including the main outputs and the auxiliary outputs between 20 Hz and 20 kHz using the microphone and line inputs. Under any conditions of gain or routing at any level below clipping the distortion performance was excellent with all harmonic products being below 0.01%.

Intermodulation distortion to the CCIF twin tone method using tones separated by 70 Hz was also excellent with all distortion products being below 0.01% at any frequency below the inbuilt high frequency roll off under any conditions tried.

As shown in **Fig 7** the transmission of a 1 kHz squarewave from the microphone input to the main outputs with the equalisers switched in and in the flat position was almost perfect with the rise time being 5.71 μs and the fall time 5.79 μs.

Other matters

The red peak indicating LEDs on the input modules and under the meters on the meter bridge were very fast in action giving an indication 18 dB below clipping under normal conditions. At the onset of clipping the LED's illuminated in 10 μs and had a most sensible hold time giving a clear indication on the shortest overloads.

The pan pots in the input modules had a +3 dB/−∞ characteristic with the balance control in the stereo input module having a range of +3/−0 dB for either channel. The level control in this module was accurately matched for the two channels offering switched level changes in 5 dB steps over the range ±10 dB.

Crosstalk when feeding one channel at line level with the two adjacent channels set to maximum gain on the microphone inputs was excellent as shown in **Fig 8** with leakage across the channel on/off switches being less than −90 dB up to 2 kHz and then increasing to −70 dB at 20 kHz with the channel faders offering an attenuation in excess of 80 dB up to 20 kHz.

The internal oscillator had low distortion with the harmonics at 100 Hz and 1 kHz being below 0.03% and below 0.1% at the other frequencies. Whilst the flatness of the oscillator was within ±0.1 dB the output level shifted approximately 0.5 dB down for the addition of each bus to the output load, the maximum output level being +9.5 dBm at the main or auxiliary outputs with all outputs driven.

Oscillator frequency was rather inaccurate with a nominal 1 kHz being 1020.7 Hz, 15 kHz being 14.580 kHz and 40 Hz (the worst case) being 46.15 Hz.

The peak programme meters were found to have a performance within the British Standard requirements and were aligned such that PPM 5 corresponded to +4 dBm output level at the main outputs.

Summary

This is an excellent little mixer for studio or mobile use. Whilst the facilities are limited, which is desirable for many applications, the mixer is well made both mechanically and electrically. The performance was very good in virtually all respects and the uncluttered modules make the mixer very simple to use.■

TABLE 2

Measurement method	Mic input	Line input	Stereo input
22 Hz to 22 kHz RMS	−129 dBm	−92.5 dBm	−102.5 dBm
A weighted RMS	−131.5 dBm	−95.0 dBm	−105.3 dBm
CCIR weighted RMS	−121.5 dBm	−96.5 dBm	−96.5 dBm
CCIR weighted Quasi-peak	−117.5 dBm	−93.0 dBm	−93.3 dBm
CCIR weighted ARM ref 2 kHz	−128.0 dBm	−98.5 dBm	−98.3 dBm

FIG.5
CHILTON CM SERIES
MID EQUALISER

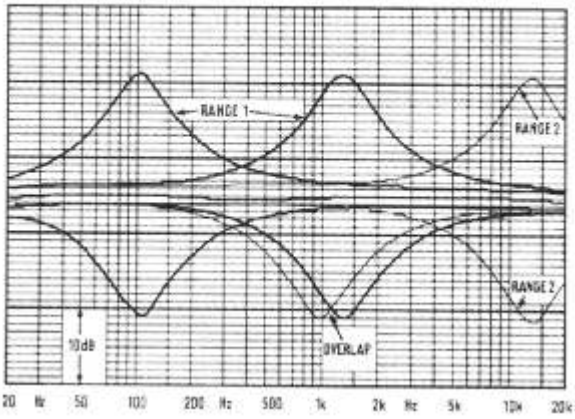


FIG.6
CHILTON CM SERIES
CUT/BOOST

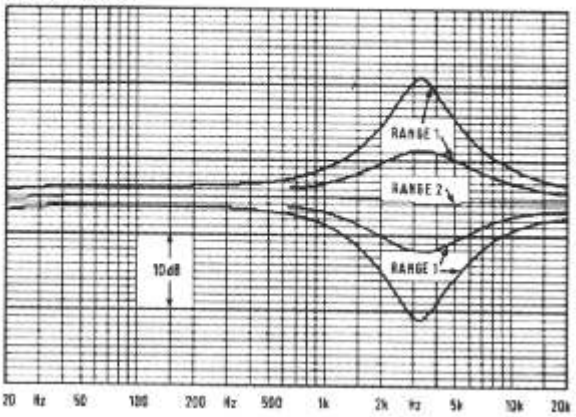


FIG 7
1 kHz SQUAREWAVE

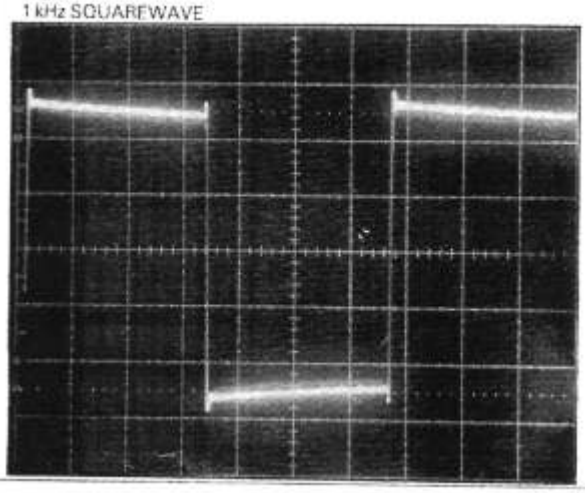


FIG.8
CHILTON CM SERIES
CROSSTALK