DRAWMER

DS301

DUAL MIDI GATE

OPERATORS MANUAL

CONTENTS

SAFETY CONSIDERATIONS

DRAWMER DS301
Dual MIDI Expander Gate

SAFETY CONSIDERATIONS

CAUTION - MAINS FUSE

TO REDUCE THE RISK OF FIRE REPLACE THE MAINS FUSE ONLY WITH A **FUSE THAT CONFORMS TO IEC127-2.** 250 VOLT WORKING, TIME DELAY TYPE AND BODY SIZE OF 20mm x 5mm.

THE MAINS INPUT FUSE MUST BE RATED AT 80mA WHERE THE MAINS INPUT VOLTAGE SWITCH IS SET TO 230 VOLTS AC. AND 160mA WHERE THE MAINS INPUT VOLTAGE IS 115 VOLTS AC.

CAUTION - MAINS CABLE

DO NOT ATTEMPT TO CHANGE OR TAMPER WITH THE SUPPLIED MAINS CABLE.

CAUTION - SERVICING

DO NOT PERFORM ANY SERVICING. REFER ALL SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING

TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

INTRODUCTION

The DS301 is a highly specified, two-channel expander/gate with greatly enhanced facilities to augment its performance in both creative and corrective applications - in any pro-audio environment. It features integral side-chain filtering, as pioneered in the DRAWMER DS201 gate, and has the benefit of external MIDI triggering and internal dynamic MIDI note generation in response to incoming trigger signals.

When triggered by an external MIDI signal, the DS301 responds differently depending on whether it is set in Expander mode or Gate mode. In Gate mode, a MIDI trigger, on the specified channel and within the specified note range, will trigger the gate regardless of MIDI velocity. But in Expander mode, the effect of MIDI velocity on the dynamics of the audio signal can be varied using the expander ratio control.

The DS301 may also be used to generate a MIDI note each time the gate or expander is triggered from an audio source. Additional information is transmitted as MIDI after-touch following the note-on command. The initial velocity is dependent on the setting of the Attack control in Gate mode or the amount that the expander opens in Expander mode. All MIDI parameters are programmed directly from an external MIDI keyboard or other MIDI controller and may be stored in non-volatile internal memory if required, without the need to access any rear panel switches.

Proprietary VCAs have been used to ensure that the audio signal path is clean enough to satisfy the most discerning of modern recording requirements while the envelope controls have been enhanced to allow the creation of special effects not possible with conventional gates.

Despite the additional features embodied in the DS301, the controls are intuitive and predictable in operation ensuring fast setup in both studio and live sound situations.

GATES AND EXPANDERS

The main difference between a gate and an expander can best be appreciated if we consider the case in which the side-chain controls have been set to their fastest attack and release settings with no hold time. In such circumstances, in Gate mode, a signal falling below the threshold level would be immediately extinguished. However, set to Expander mode, the signal is treated differently. This time, when the signal falls below the threshold level, it is not extinguished but instead subjected to gain reduction according to the ratio setting of the expander. This operates very much like a compressor in reverse; with an expander ratio of 2:1, a 1dB drop in the input signal causes a drop of 2dB in the output signal level. Signals above the threshold are again unaffected, but for signals falling below it, the effect of attenuation is more progressive unless a high expansion ratio is chosen. A gate may be considered to operate in the same way as an expander with an infinite expansion ratio. The differences between gates and expander become less apparent when longer attack and release times are set.

INSTALLATION

The DS301 is designed for standard 19″rack mounting and occupies 1U of rack space. Avoid mounting the unit directly above power amplifiers or power supplies that radiate significant amounts of heat and always connect the mains earth to the unit. Fibre or plastic washers may be used to prevent the front panel becoming marked by the mounting bolts.
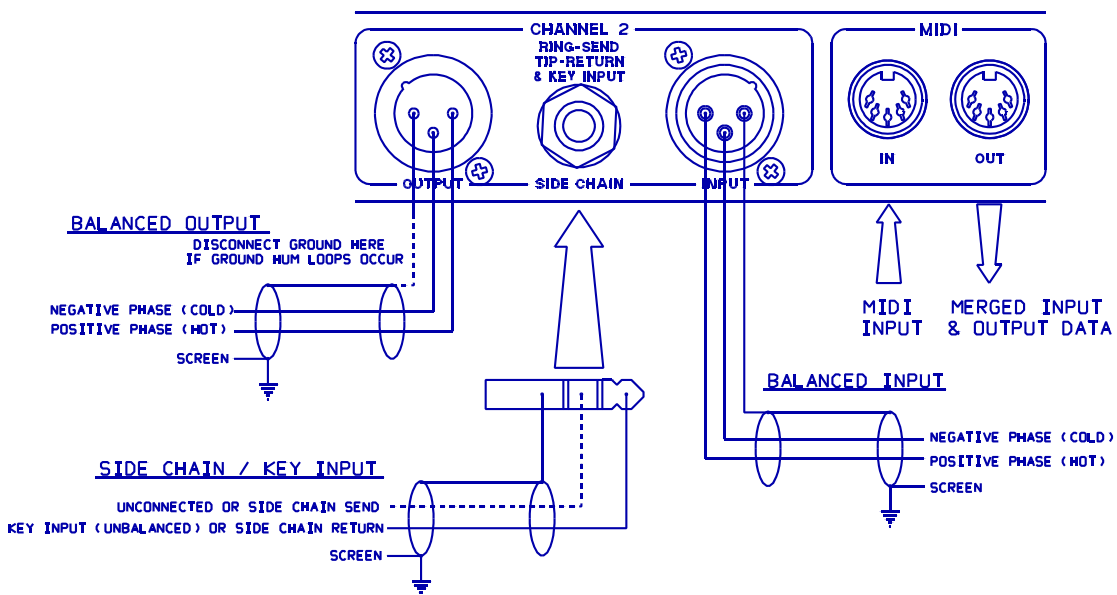
AUDIO CONNECTIONS

Both the input and output XLRs are balanced, the wiring convention being: pin 1 ground, pin 2 hot and pin 3 cold. The system is optimised for +4dBu operation in accordance with pro-audio requirements. For use with unbalanced systems, pin 3 on both the input and output XLRs should be grounded.

Side-chain access is made via stereo jacks wired tip-return, ring-send. The return input may be used on its own for external triggering of the gate. For external key input it is recommended that a stereo jack is used with its ring terminal unconnected.

If earth loop problems are encountered, do not disconnect the mains earth but instead, try disconnecting the signal screen on the cables connecting the DS301 to the patchbay. If such measures are necessary, balanced operation is recommended.

MIDI CONNECTIONS

Two standard 5 pin MIDI sockets are fitted to the rear panel of the DS301. The Input socket should be sent MIDI data from a sequencer, a keyboard or a MIDI controller. This data is always 'echoed' at the MIDI Output socket, rather like a normal MIDI Thru socket on equipment with three MIDI sockets. The MIDI data generated by the DS301 is also transmitted from the Output socket, merged into the MIDI data copied from the Input socket.

POWER CONNECTION

The unit will have been supplied with a power cable suitable for domestic power outlets in your country. For your own safety it is important that you use this cable. The unit should always be connected to the mains supply earth using this cable

The mains fuse should be a class 3 slo-blo type rated at 80mA for 220/240 Volt mains input voltage or 160mA for 110 Volt.

If for some reason the unit is to be used at a mains input operating voltage which is different to that as supplied, the following procedure must be carried out. *(see following diagram)*

> 1: Disconnect the unit from the mains.
> 2: Using a number 1 size pozidrive screwdriver, remove the two self-tapping screws holding the voltage selection switch cover plate on the rear panel.
> 3: Remove the cover plate and slide the switch fully to its opposite end.
> 4: Rotate the cover plate one half turn, (180E) and refit the two screws.
> 5: Replace with a correctly rated fuse for the selected operation voltage.
> 6: Re-connect to mains power source.

CHANGING THE MAINS OPERATING VOLTAGE
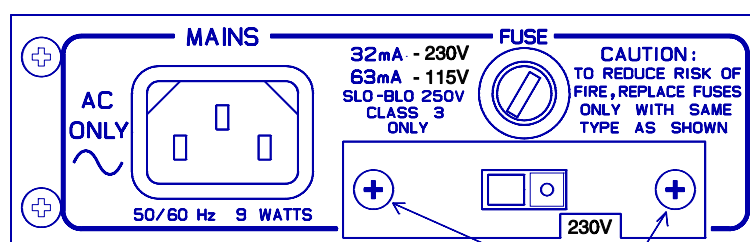


1: DISCONNECT FROM MAINS SUPPLY.
2: REMOVE 2 SELF TAPPING POZIDRIVE HEAD SCREWS
3: REMOVE LOCKING COVER. SLIDE SWITCH ACROSS.
4: ROTATE COVER ONE HALF TURN AND REPLACE.
5: REPLACE FUSE WITH CORRECT VALUE AND TYPE AS SHOWN.
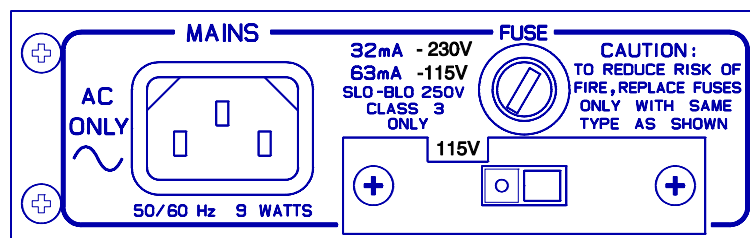
CONTROL DESCRIPTION

Both channels of the DS301 are identical and may be used completely independently or linked for stereo operation. Only one channel is described below, with any link peculiarities shown where applicable.
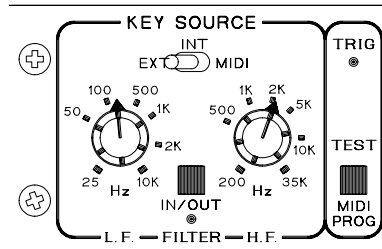
KEY SOURCE

There are three possible triggering sources for the DS301, External, Internal or MIDI. Selection is accomplished via the three-way toggle switch above the Key Source filter controls. For conventional use where the audio input itself is used to trigger the expander/gate, INT should be selected. Alternatively, an external trigger source may be used by feeding it to the 'return' tip of the Side-Chain jack on the rear panel, in this case, EXT should be selected. The third option is MIDI where the unit is triggered from a MIDI source, (refer to MIDI section of this manual).

Note: If no jack plug is inserted into the side-chain / key-input socket on the rear panel then the INT or EXT switch positions will both route the audio input through the filter section.

FILTER

L.F.: The Low Frequency filter provides a slope of 12dB per octave and is variable from 25Hz to 10 kHz and works by severely attenuating frequencies below the cut-off frequency selected.

H.F.: High Frequency filter provides a 12dB per octave slope and is variable from 200Hz to 35kHz, this filter attenuates frequencies above the selected cut-off value. In other words, when both filters are set, it is the range between the two settings that is allowed to pass.

IN/ : Allows the filters to be switched out of circuit when not required.
OUT   The fastest Attack time of the DS301 is attainable when the filters are switched out, due to the fact that any filter circuit has a slight inherent delay.

TEST

Depressing the test button causes the gate to respond as though it has been triggered from a legitimate source. This is useful in setting up the envelope parameters, particularly in external mode where trigger source input might not always be available, and also for checking the performance of any MIDI equipment that you wish to trigger from the expander/gate. Test is also used when programming the MIDI parameters and this is fully explained in the MIDI section of this manual.

Note: If the DS301 is set to Expander mode and a long attack time is set, then operating Test will only cause a slight change in level, just as an audio trigger would under the same conditions. If the DS301 is set for linked stereo operation, then the left hand Test button will trigger both channels and the right hand channel Test button will be inoperative as an audio trigger.

ENVELOPE
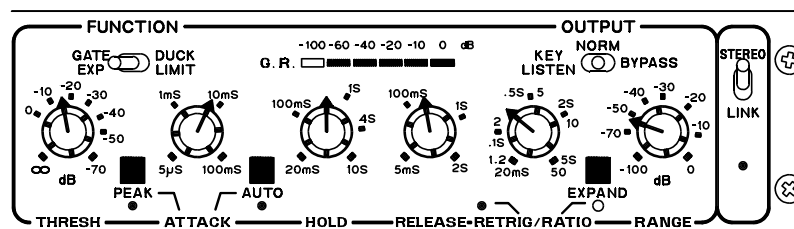
FUNCTION:
The DS301 operates in either Gate or Expander mode and switching from gate to expander by pressing the EXPAND button, a status LED lights to show Expand mode is selected.
Note: The Retrig/Ratio control changes function according to whether gate or expander is selected;
Expander mode, it controls the expansion ratio.
Gate mode, it functions as a retrigger delay time control.

The other control that affects the characteristics of the DS301 is the Function select switch; in Gate mode, it allows the user to select between Gating and Ducking, whereas in Expander mode, the choice is between Expansion and Limiting. Selecting Ducking allows the level of the signal being processed via the main input to have its gain controlled by an external signal fed in at the side-chain input. In Limit mode, the DS301 functions as a basic compressor/limiter.

THRESH:
This control sets the level above which the gate or expander will start to open at a rate determined by the Attack control. Once open, the gate or expander will remain open until the signal falls back below the threshold, after which attenuation will take place at a rate set by the Hold and Release time controls. The only condition under which the gate will refuse to open when these conditions have been met is if the Retrigger control is set to such a high value that the system has not been given time to reset since the last triggering event. The Threshold is continuously variable between -70dB and infinity.

ATTACK:
Sets the rate at which the expander/gate opens once the input signal has exceeded the Threshold set by the user. This is variable from a very fast 5uS to 100mS. One feature implemented in the DS301 is that, in Gate mode, the attack cycle is allowed to complete once triggered, even if the triggering sound is of short duration. The attack starts from the dB level set on the Range control.

PEAK:
The Peak button gives a slight level boost to the leading edge of transient sounds as the gate opens. This can be used to increase the penetration of drums and other percussive sounds.

AUTO:
Selecting Auto disables the Attack control and makes the attack time of the side-chain programme-dependent. Auto is suitable for routine noise elimination or for processing signals with constantly changing dynamics.

HOLD:
Once the signal has fallen back below the threshold, the hold circuit keeps the gate open until the expiry of the time set using the Hold control after which the Release phase is entered. If the Hold time is set to a longer period than the interval between trigger pulses, the gate will remain permanently open.

RELEASE:
The gate or expander closes at the rate set by the Release control. This is fully variable from 5mS to 2S.

EXPAND:
The Expand push button changes the operational mode of the DS301. It also enables either the Retrigger control or the Ratio control. In expand the Ratio control is active using the yellow graticule marks, and the yellow LED is illuminated. In gate mode the Retrigger timer is active using the white graticule marks and the LED above Retrig is illuminated. With stereo link on, the expand switch of channel 1 is the master, forcing channel 2 to operate in the same mode. Note: It is very important to check the setting of Retrig/Ratio control when switching between modes.

RETRIG/RATIO:
In Expander mode, the yellow graticule markings are applicable. This control sets the expansion ratio in the range 1.2:1 to 50:1. A Ratio setting of 1.2:1 causes subtle gain reduction when input signal is below the threshold, e.g if the input signal is 5dB below the threshold setting, the expander circuitry will apply 6dB of gain reduction. On the contrary, a Ratio setting of 50:1 will react almost identically to a gate. In normal expander operation a Ratio of about 3:1 will be a good starting value.
In Gate mode, the white graticule markings apply. The control sets the time that must elapse before the gate will be allowed to retrigger which may be from 5mS to 5S. This ability to inhibit retriggering is incredibly useful in treating sounds closely followed by other high level sounds that would otherwise retrigger the gate.

RANGE:
This control operates in both modes and sets the maximum amount of attenuation that occurs. The range is from 0dB to 100dB and is useful to reduce the amount of background noise between wanted sounds, but without eliminating it entirely. This is often less obtrusive than using the gate or expander to create absolute silence between sounds.

OUTPUT:
This three-way toggle switch allows the expander/gate to be used Normally or be Bypassed. In its third position, Key Listen, it routes the output of the key filters to the main output so that their effect can be heard during setup. In this way, the filters can be easily set so as to pass the greatest amount of the wanted sound.

G.R. METER:
This six segment LED meter shows the amount of gain reduction taking place at any time. The meters on both channels operate at all times.

STEREO LINK:
In Gate mode, switching Stereo Link On causes both channels to be 'trigger-linked' where trigger pulses at both channels' key inputs are connected together. This facility implies that different control settings can be initiated from a single pulse to create triggered stereo image-shift effects. By setting one channel to Gate and the other to Duck, stereo pan effects are possible.
In Expander mode, the left hand channel becomes the master for perfect stereo tracking. The right hand channel indicator LEDs are extinguished to show that the controls are inoperative.
Note that when Link is switched on, both channels will be set to the same mode as determined by the setting of the left channel expander/gate button.

APPLICATIONS

The DS301 may be used either with or without MIDI to apply dynamic control to an audio signal. In traditional gating applications, the DS301 can be regarded as being functionally similar to the DS201 but with certain valuable enhancements, not least of which is the option to switch to expander mode. In many noise removal applications using the DS301 as an expander will produce a more subtle result on signals at and around the threshold level, particularly if low ratios are used. One important point to keep in mind is that the Retrig/Ratio rotary control is dual function depending on wether gate or expander mode is selected. It is very important to check the setting of this control when switching between modes.

USING THE ENVELOPE CONTROLS
Early gates were either on or off, whereas most modern gates offer some control over their attack and release characteristics in order that a variety of material may be processed without undesirable side-effects such as clicking or gating out slowly decaying sounds. The DS301 offers very comprehensive envelope control allowing it to accomplish a full range of corrective tasks and enabling it to be used in creative applications.

Using Attack: The Attack control on the DS301 has a very wide range; at its fastest, it can open almost instantaneously. Conversely, with signals having a naturally slow or moderate attack, setting the gate attack time too fast can cause clicks, particularly if the threshold has to be set high because of excessive background noise. This is one of the most common misnomers with noise gates, especially when the audio signal being processed is in the lower frequency (eg bass guitar, bass drum). With a high threshold, a low frequency sine wave will be ignored as the signal starts from its zero level point, as this wave climbs towards its peak, the level will suddenly exceed the threshold setting, at this point a very fast attack rate will switch the signal through the noise gate with such a steep (almost vertical) leading edge that the low frequency sound will have a single

high frequency square wave added to its first cycle, in other words a 'click' will be heard. In cases like these, start with a fast attack time and moderate threshold, then gradually lengthen the attack time until the audible click just disappears when the gate opens, or, use the Auto facility which has been designed to compensate for any difficult or changing programme attack time.

Once the gate envelope has been triggered, The attack cycle will continue to completion, even if the incoming trigger source is very short. This can be used to good creative effect by setting a long attack time, and then processing a crash cymbal or percussive sound, the resulting slow-attack envelope will completely change the character of the sound making it appear reversed or 'bowed'.

Auto should always be used when in Expand mode and speech is being processed.

Using Peak: Included in the DS301 is the Peak facility which operates in conjunction with fast attack times to give a few dBs of gain to the leading edge of the sound envelope. This was initially designed to enhance percussive sound and does work particularly well on share and bass drums. The duration of the peak is very short and so it is usually permissible to set a recording level before Peak is made active. In theory, this implies that the tape machine may be overloaded very briefly each time the peak circuit operates, but in practice this is too short to be audible when using analogue recorders. However, digital recorder should be set up with the Peak circuit switched on as they are intolerant of overloads.

The effect of Peak with Expander selected can only be noticed as the expander gain reduction reaches zero, at which point peak produces expected results.

Using Hold: The Hold time control is useful for preventing gate chatter when using fast release times, especially with low frequency inputs; under these conditions, a conventional gate set with its fastest attack and release times will open and close on individual cycles of the input giving rise to a seriously distorted sound. Under normal circumstances, a Hold time of 50mS is adequate to prevent this undesirable effect. Although in expand mode a Hold time of 100mS should be the minimum setting used.

Hold is also instrumental in creating gated reverb or ambience effects. For this application, it is normal to set fast attack and release times and then use the hold control to set the length of the reverb burst. The reverb may be provided by ambience mics in a live room (usually compressed) or may be artificially generated and gated directly from a suitably amplified drum mic fed into the external trigger input of the gate.

Using Release:
Setting the Release control is largely a matter of listening to the effect of the gate or expander as it closes at the end of individual notes or sections of music and speech. If the release time is too fast the material being processed will be cut short. Using the DS301 in circuit before adding any reverb and/or echo can help to cover up this side effect especially where the unprocessed programme source is very noisy and the normal release setting starts to allow too much background noise through.

It is important when processing stereo signals through both channels of the DS301 to use the Stereo Link facility. Failure to do this with different envelope settings may lead to an apparent image shift in the direction of the envelope that closes last (normally with the longest release). However, deliberate image shifts can be created as desired effect by setting radically different attack and release times and not using the Stereo Link.

Using Retrigger:
Retrigger can also be used to create interesting image effects by setting two different time settings on both channels. Another prime example of retrigger use is the treatment of double drum beats where only the first is required, or when the MIDI facilities are being used to replace on-tape drum sounds with MIDI-triggered samples. Longer inhibit times can be used to cause the gate to trigger on alternate drum beats, effectively dividing the tempo of the sound source (eg hi-hats).

USING THE FILTER
Where using multi-mic setups, it is inevitable that unwanted spill from other instruments (or other drums in a drum kit) will reach other microphones, sometimes at quite high levels. This can make it difficult to set a suitable threshold for the gate; if you set the threshold high enough to ignore the background noise or spill, there is a real danger of the gate not opening for wanted, low-level sounds. It was to solve this perennial problem that DRAWMER first devised the side-chain filter.

Essentially, the filter section comprises two filters, one high-pass and one low-pass. These may both be varied over a wide frequency range allowing the user to 'tune in' to the sound that is required to trigger the gate while excluding as much as possible of the unwanted sounds. This is most effective when the unwanted sound occupies a completely different part of the audio spectrum to the wanted sound (such as hi-hat and bass drum), but the precise nature of the filters means that even where quite similar sounds are involved, some improvement can be achieved. The Key Listen facility enables the user to hear the effect of the filters on the trigger source. Remember to switch back to Normal operation once the filters are setup.

Note: Any side-chain filtering which implements high frequency attenuation will also cause a slight delay in the time the gate takes to trigger. Under most circumstances this will be quite imperceptible, but when transient sounds are being processed with the H.F. control set to a very low value, some degradation of the attack transient may become apparent. For this reason, always set the H.F. control to the highest possible value you can get away with when processing percussive sounds.

Using the External Key input provides the most common use for a gate where it is required to 'tighten up' timing of two rhythmical tracks, the classic example being to gate a bass guitar from the bass drum. The bass drum is normally the key input and the bass is the processed audio. Correct settings will ensure that no bass note will occur premature of the bass drum trigger. A less drastic approach is to utilise the range control to reduce the gain of the audio track by only a few dBs when not triggered.

If additional filtering is needed to the side chain of the audio input, it is possible to use the side chain insert jack to 'patch in' extra equalisation, perhaps a graphic or parametric filter. Using the Filter In/Out switch it is also possible to chain the DS301 filters on to the end of any additional external EQ.

It is suggested that most normal types of expansion would not require the use of the DS301 filters, in which case they should be manually de-selected during expansion. They can be used, however, to create a specific effect.

DUCKING

Another use of the side chain is Duck. A side-chain signal exceeding the threshold causes the main signal to undergo gain reduction, the rate and degree being set using the envelope controls and the Range control. This is often used when it is necessary to control the level of background music to make way for a voice over and also in pop and rock mixing where one instrument can be made to give way to another, for example, to drop the level of the rhythm guitar by a few dB during a lead guitar solo. Successful ducking is effective with normally a small gate range difference between the fully open and 'closed' levels.

With the Expand switch depressed, a Function switch setting of Duck causes the DS301 to operate as a basic limiter. The unit was never designed to emulate a full-function compressor limiter, but it is quite capable of handling routine gain control tasks when all other dedicated compressors are already committed. It is recommended that low ratios are used in this application and that release settings greater than 100mS should be used to prevent obtrusive 'chattering'.

MIDI

The MIDI features of the DS301 may be conveniently divided into MIDI triggered and MIDI generating categories, though the same procedure is used for setting the basic MIDI parameters. In MIDI triggered mode, a specific MIDI note or range of notes may be assigned to trigger the DS301, and again, the effect is slightly different depending on whether the unit is set for Gate or Expander operation.

MIDI TRIGGERING

MIDI triggering is only active when the Key Source switch is set to the MIDI position. In Gate mode, any incoming MIDI note on the designated channel, and within the note range specified by the user, will be accepted as a trigger regardless of its velocity or poly-pressure values. The green trigger LED flickers when incoming MIDI data is detected on the correct MIDI channel, and this LED lights solidly for the duration of the MIDI note when the MIDI data is within the specified key range.

In Expander mode, the operation is dependent on the setting of the Ratio control. The volume of the expander responds to the incoming MIDI velocity and also any aftertouch or poly-pressure data that might follow it. The effect of this data is to open up the expander after initial triggering, so a note can be made to start softly and then be increased in level, controlled by MIDI. This mode is valuable in transforming performance data from a MIDI controller into dynamic control of the audio signal being processed.

When a Ratio value of 1.2:1 is set (fully counter clockwise), MIDI velocities varying over the whole possible MIDI range (01 to 07F hex) will only cause a gain change from -10dB to 0dB.

When a Ratio value of 2:1 is set, no MIDI input will cause a gain reduction of 100dB. Any MIDI velocities of very low level (eg. 01 to 08 hex) will cause a gain reduction at -90dB, progressively scaling up to the maximum MIDI velocity (07F hex) which will open the expander totally, (no gain reduction at all, 0dB).

With higher ratio settings than 2.5:1, low MIDI velocity notes are effectively ignored, while the maximum ratio will cause the DS301 to respond only to MIDI notes with a maximum velocity value. This dependency on the expansion ratio setting allows the user a great deal of control over the dynamic characteristics achieved.

In either mode, any MIDI triggered events cause a minimum envelope duration of 20mS and a maximum depending on the duration of the input signal and the Hold time setting.

MIDI GENERATION

In Gate mode, the MIDI output note has a velocity determined by the setting of the Attack control. The fastest attack will give a higher velocity while slower attacks will give a lower initial velocity followed by after-touch data that increases to a maximum at the rate set by the Attack control.

In Expander mode, the MIDI output will have a velocity dependent on the amount the expander opens so that by varying the ratio and threshold settings, different degrees of velocity sensitivity may be achieved. If a slow Attack setting is used, the initial velocity is reduced and is followed by after-touch data as in the Gate mode. In general, the Threshold and side-chain controls affect the outgoing MIDI data in much the same way as they normally influence the audio signal.

All MIDI notes generated by the DS301 have a minimum 'note on' period of 20mS and a maximum depending the envelope time settings. The MIDI note will last indefinitely if the Range control is increased towards 0dB after the envelope has be fired, and no further trigger events occur.

MIDI PARAMETERS PROGRAMMING

The DS301 is equipped with a MIDI In socket and a MIDI Out which merges any MIDI data generated by the DS301 with incoming MIDI data. Each audio channel may be set up to respond to a different MIDI note (or notes), each audio channel can send a different MIDI note, and these notes may be on different MIDI channels if required.

To set the basic MIDI parameters, the audio channel being changed must be switched to the MIDI trigger position at the Key Source switch. A MIDI keyboard or other suitable controller should be connected to the MIDI In socket. This MIDI keyboard / controller should be set to transmit on the MIDI channel that you wish the DS301 audio channel to respond to.

PROGRAMME METHOD 1
If it is only required to set the MIDI note (and its channel) that will be output when the DS301 is triggered by an audio signal, or that the DS301 will respond to when triggered via MIDI, the procedure is:-
> Hold down the Test/MIDI button for one second, (with NO MIDI data), the trigger LED will flash slowly. Play the note on the keyboard, then release the button. The DS301 is now set to generate and trigger from that note and channel, whenever the envelope is fired.

PROGRAMME METHOD 2
If it is required to set the MIDI note (and its channel) that will be output when the DS301 is triggered by an audio signal, and set a split range of notes that the DS301 will respond to when triggered via MIDI, the procedure is:-
> Hold down the Test/MIDI button for one second, (with NO MIDI data), the trigger LED will flash slowly. Play the first note on the keyboard, the trigger LED will now flash more quickly. This is the note that will be sent when the envelope is fired. Still holding down the MIDI button, pressing a second key defines the other limit of the split range of notes that will trigger the gate from MIDI.

PROGRAMME METHOD 3
If it is required to set the MIDI note (and its channel) that will be output when the DS301 is triggered by an audio signal, and set a split range of notes that the DS301 will respond to when triggered via MIDI that is not bounded by the MIDI output note, the procedure is:-
> Hold down the Test/MIDI button for one second, (with NO MIDI data), the trigger LED will flash slowly. Play the first note on the keyboard, the trigger LED will now flash more quickly. This is the note that will be sent when the envelope is fired. Still holding down the MIDI button, pressing a second key defines the first limit of the split range. The trigger LED will flash very quickly. Still holding down the MIDI button, pressing a third key defines the other limit of the split range of notes which defines a note range that will trigger the gate from MIDI. After receiving the third note the trigger LED will extinguish.

If only one note is desired to trigger the gate, then the second and third notes played should be made the same.

PARAMETER STORAGE

Unless the new MIDI setting is stored, the DS301 will default to its previously stored setting when the unit is next powered up. If you wish to permanently store this data, set both Key Source switches to the MIDI position, then press both MIDI Prog buttons simultaneously. Data stored in this way is non-volatile and doesn't rely on any form of battery backup. A bright flash of both LEDs will signify that the data was written successfully. If the LEDs do not flash, then this signifies that the new MIDI parameter data matches the data already stored in memory, and a write was un-necessary.

MIDI APPLICATIONS

The application of MIDI with the DS301 is limited only by imagination. The ability to generate aftertouch data in addition to basic MIDI notes and velocity opens up new possibilities for the control of effects units that respond to real-time MIDI control information. For example, a MIDI controlled flange sweep could be triggered from an audio event and then timed using the attack setting on the DS301 set to Gate mode. Conversely, the strength of an effect can be related to playing dynamics using the Expander mode.

One suggested use would be for replacing an existing tape drum track with a MIDI controlled sample player, where the existing track would trigger the Gate if a definite MIDI velocity is required, or trigger the Expander if 'velocity-follows-track' is required. Ironically in this usage, no audio need pass through the unit at all, as the DS301 is only acting as an audio to MIDI convertor.

Another use would be to add velocity to an older MIDI device that didn't have velocity sensing. The Expander would be used to process the audio output from the MIDI device, and the same MIDI data would need to be sent to both the MIDI device and the DS301. In this way, with careful setting of the Ratio control the audio output from the MIDI device would have level adjusted to the current incoming MIDI velocity data.

MIDI SYSTEM EXCLUSIVE

System exclusive instructions can be sent to the DS301 in order to remotely programme or interrogate the user definable MIDI parameters from either a sequencer or MIDI controller. It must be pointed out that if nonsensical data is sent to DS301 via MIDI system exclusive messages, then **garbage results will occur**. Only attempt this method of programming if you are fully conversant with MIDI. For this reason we have insisted on including the checksum data byte, which requires some mathematical calculation. The MIDI messages are listed in the following tables.

MIDI Data To Programme Parameters.

DESCRIPTION	DATA BYTE	HEX	EXPLANATION
System Exclusive	11110000	0F0h	System Exclusive Status Byte
Manufacturers ID	00110010	032h	ID = "Drawmer Electronics"
Device Number	00111111	03Fh	Audio Channel 1 of DS301 = 03Fh Audio Channel 2 of DS301 = 040h
Format Number	00111111	03Fh	Reserved Format Number implies Programme Data follows
Byte Count	00000100	04h	Number of Data Bytes that follow, (Always 4 until future updates)
Data 1 *	0000xxxx	0xh	Ranges from 0 to 0Fh, MIDI Channel for DS301 Audio Channel. (Actual required MIDI Channel -1)
Data 2 *	0xxxxxxx	0xxh	Ranges from 0 to 07Fh, Send Note when DS301 envelope is triggered. (See comments below.)
Data 3 *	0xxxxxxx	0xxh	Ranges from 0 to 07Fh, Lowest Note that DS301 will trigger from.
Data 4 *	0xxxxxxx	0xxh	Ranges from 0 to 07Fh, Highest Note that DS301 will trigger from.
Data Block Checksum (* = included in checksum)	0xxxxxxx	0xxh	Checksum is calculated by:- Adding negated 8 bit data values and ignoring the overflow bits. Only the 7 lowest significant bits must be sent!
End Of Exclusive	11110111	0F7h	Temporary Memory Parameters are updated after this byte. They will need permanently storing if required.

The Trigger LED will flash upon the completion of a valid System Exclusive message. The option to permanently store these parameters is the available, using the previously described method. (see Parameter Storage, page 13)

When the envelope of the DS301 is triggered, a MIDI note is always sent. It is however possible to disable this note sending function by programming a note value of 0 (zero) as the send note number. Obviously this can only be accomplished using System Exclusive Messages and not via a normal MIDI keyboard.

A typical System Exclusive Dump (in Hex) is shown below.

Exclus Status	Drawmer ID	Device #. (Chan 1)	Format	Data Count	MIDI channel 1	Sendnote eg. A3	Low Split eg. E3	High split eg. G#4	Check-sum	End of Exclus
0F0h	032h	03Fh	03Fh	04h	0	045h	040h	050h	02Bh	07Fh
			Check sum is :-		00 +	0BBh +	0C0h +	0B0h +	= 02Bh	

MIDI Data To Request Current Parameters.

DESCRIPTION	DATA BYTE	HEX	EXPLANATION
System Exclusive	11110000	0F0h	System Exclusive Status Byte
Manufacturers ID	00110010	032h	ID = "Drawmer Electronics"
Device Number	00111111	03Fh	Audio Channel 1 of DS301 = 03Fh Audio Channel 2 of DS301 = 040h
Format Number	01111111	07Fh	Reserved Format Number implies Request for Data
End Of Exclusive	11110111	0F7h	Data is sent directly after this byte is received, in the MIDI data dump format shown above.

TECHNICAL SPECIFICATIONS

(All measurements reference +4dBu)

INPUT IMPEDANCE   20K Ohm
MAXIMUM INPUT LEVEL   +20dBu
OUTPUT IMPEDANCE   50 Ohm (balanced)
MAXIMUM OUTPUT LEVEL   +21dBu (balanced)
BANDWIDTH   <20Hz to 22KHz ±1dB
CROSSTALK @ 10kHz   <-86dB

NOISE	Wideband	22Hz - 22KHz	CCIR ARM	IEC A	Q-Pk CCIR
AV	-90dB	-97dB	-98dB	-100dB	-87dB
RMS	-87dB	-96dB	-96dB	-99dB	

DISTORTION	100Hz	1KHz	10KHz
Unity Gain, +4dBu input	0.04%	0.04%	0.05%

POWER REQUIREMENTS   115Volt or 230Volt at 50-60Hz, 15 Watts

FUSE RATING   80mA for 240Volt, 160mA for 120Volt
                           CONFORMING TO IEC127-2

FUSE TYPE   20mm x 5mm, Class 3 Slo-Blo, 250Volt working

CASE SIZE   482mm (w) x 44mm (h) x 200mm (d)

WEIGHT (incl packaging)   4.0 Kgs

BLOCK DIAGRAM
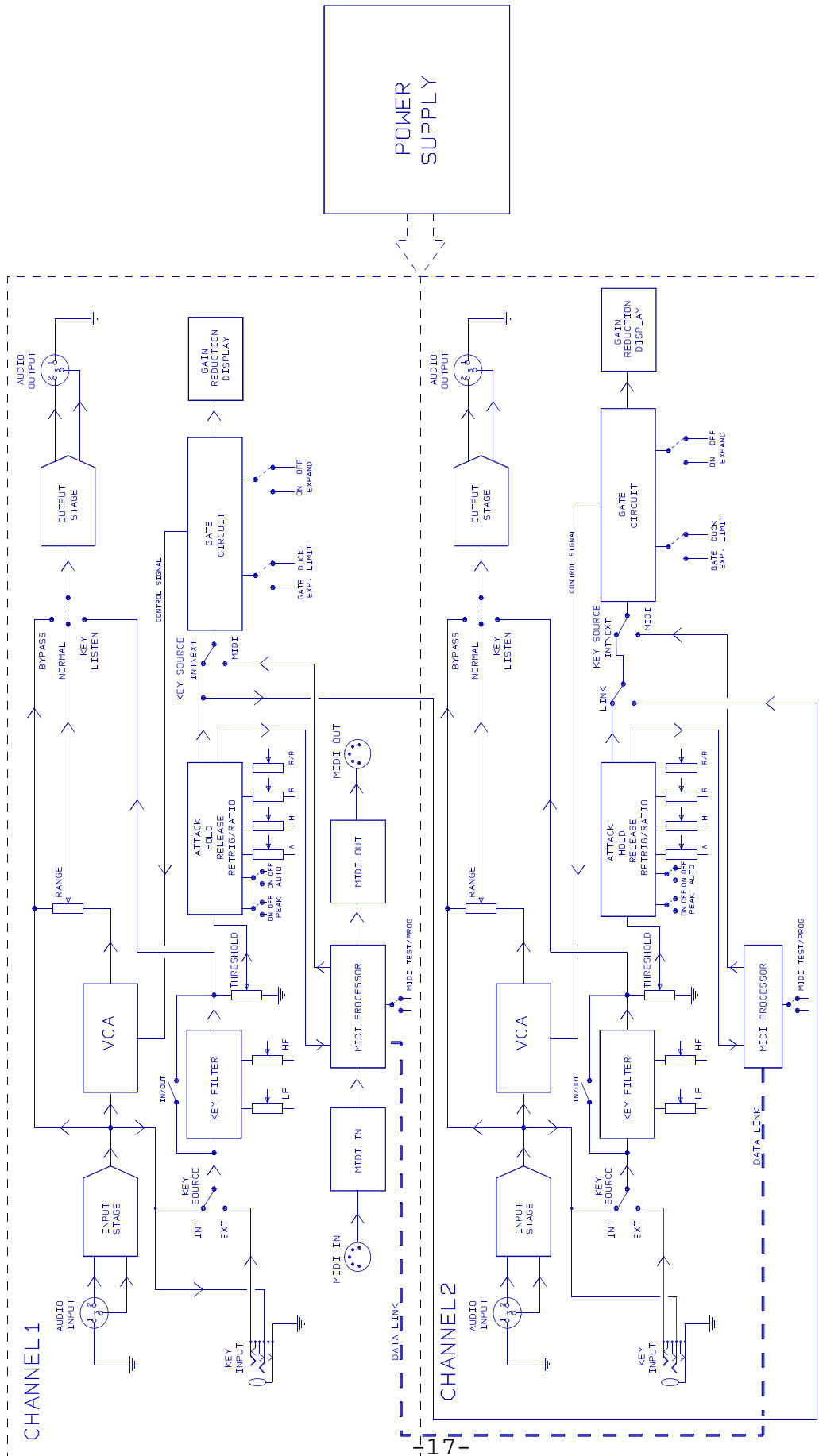
DS301 MIDI IMPLEMENTATION CHART

Date : December 1990   Version : 1.0

FUNCTION	TRANSMITTED	RECOGNISED	REMARKS
Basic Channel	1 - 16	1 - 16	Set to the MIDI channel received from MIDI input when MIDI is programmed.
Mode Default Messages Altered	Mode 3 No No	Mode 3 No No	Mode 3 is 'Omni Off, Poly'
Note Number Velocity Note On Velocity Note Off	C#-2 to F#8 1 to 127 No	C#-2 to F#8 1 to 127 0nnnnnnn	Running Status is used. When 'Expand' Velo = Sig Volume. When 'Gate' Velo = Attack time
Aftertouch Keys Channel	1 to 127 Channel Pressure	1 to 127 Poly & Channel Pressure	Expander swells as pressure is applied to input notes. Transmitted when attack time is slow.
Pitch Bender	No	No	
Control Change	No	No	
Program Change	No	No	
System Exclusive	Yes. (After valid request)	Yes	See System Exclusive Messages (page 14)
System Song pos Common Song sel Tune num	No No No	No No No	
System Clock Real Start Time Cont Stop	No No No No	No No No No	
Aux Local On/Off Mes All notes Off -sages Actv Sense Reset	No No No No	No Yes Yes No	Closes any open envelope Active if received Not echoed to MIDI out socket

Note: The MIDI input socket data is re-sent to the MIDI output socket. Midi data generated by the DS301 is merged into the data stream at the output socket.