DMX- NET

SYSTEM LAYOUT GUIDE

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 11/13/99

DMX-NET

The Easy Way to Distribute DMX512 from

Goddard Design Company

Goddard Design's DMX-NET modules provide an elegant means of distributing DMX512 signals throughout a theater or studio. Using DMX-NET modules allows locating DMX512 inputs and outputs in a facility at will. They can significantly increase flexibility and reliability. In many installations they allow you to configure a DMX512 distribution system without using a patch panel or complicated routing switchers.

Using DMX-NET modules instead of conventional distribution amplifiers and passive wall plates allows you to reduce greatly both the number of cables run and the number of field terminations needed. Even in installations where computer controlled crossbar switching is needed, DMX-NET components can simplify the complexity of the required switches while providing greater flexibility.
DMX-NET discourages extensive daisy-chaining - making fault isolation easier and repair time faster. Instead of one DMX outlet in the FOH slot, put in four; a shorted cable will disable only a few color scrollers instead of every FOH unit.

You may have faced a common theatrical requirement - three console locations in one facility. The booth is used for performances, an onstage location is used for focus and work calls, and a location in the orchestra is used for rehearsals. Until now this has meant a complicated solution, allowing only one DMX512 source to drive the network at one time while ensuring that lines connected to unused DMX512 sources are not unterminated stubs. Our DMX-NET input module allows creation of a DMX512 distribution network that may be selectively driven from multiple locations.

At its simplest DMX-NET can be imagined as a distributed optical distribution amplifier. The system provides optically isolated distribution modules, a choice of four types of buffered input modules (more on this later), active terminator/gated buffer cards and a network power supply. Punched stainless steel cover plates for single gang boxes are available.

This booklet has three parts.

- Part one is the DMX-NET overview. This is the same text as our standard data sheet.
- Part two contains some system layout examples. DMX-NET network modules may be used in many ways to meet different distribution requirements. We have illustrated a few of these systems.
- Part three is the **detailed** specifications of the DMX-NET modules. If you are designing a system and need the painful details this is where to find them. If this part isn't light reading, we apologize.
- Part four is an appendix to help calculate the required cable size for your system.

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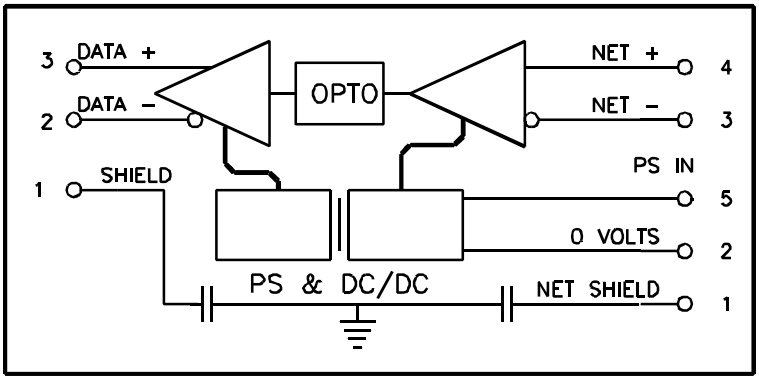
PART ONE - SYSTEM OVERVIEW

Isolated, Buffered DMX512 Output Modules

Each output module has an optically isolated DMX512 output that can drive 32 - EIA485 load units. The modules are short-circuit protected and resistant to electrostatic discharge damage. Up to 32 modules may be connected to a 5-conductor DMX512 distribution bus. The bus provides DMX512 and DC operating power. The module requires a 12 to 24 volt power supply; a fully loaded module draws 95 MA.



BLOCK DIAGRAM FN OUT

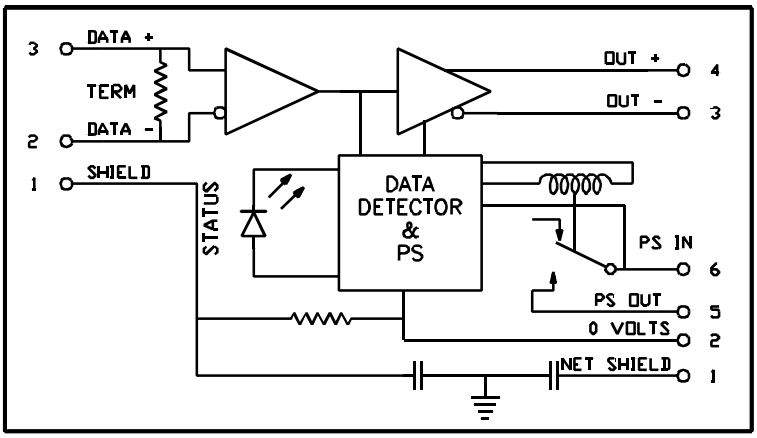
The DMX512 output is on a panel mount 5-pin “XLR” style connector. The output is electrically isolated from the input and frame. A data tally light indicates the presence of signal at the isolated output. Isolation is provided to prevent ground loops and other data problems, and uses an optoisolator designed for data use. Power supply isolation is by way of a transformer coupled DC to DC convertor.

Basic modules are open “ell” frames 2.6" high by 1.54" wide by 1.6" deep. There is an outline drawing on page 14 of this guide. They take up 6.4 cubic inches and are designed to fit in most standard US and UK electrical boxes.

Prepunched cover plates are available for certain common boxes. Custom plates are available - please check factory stock. Those wishing to fabricate custom plates should see the hole punching drawing in part three of this guide.

SYSTEM OVERVIEW - DMX-NET
Input Modules

Our input modules' unique architecture allows you to construct DMX512 distribution systems that may be selectively driven from multiple locations without patch panels.. We offer four different types of input modules. The differences among the module types are the means of determining which DMX512 inputs have priority and whether or not the inputs are optically isolated or not.

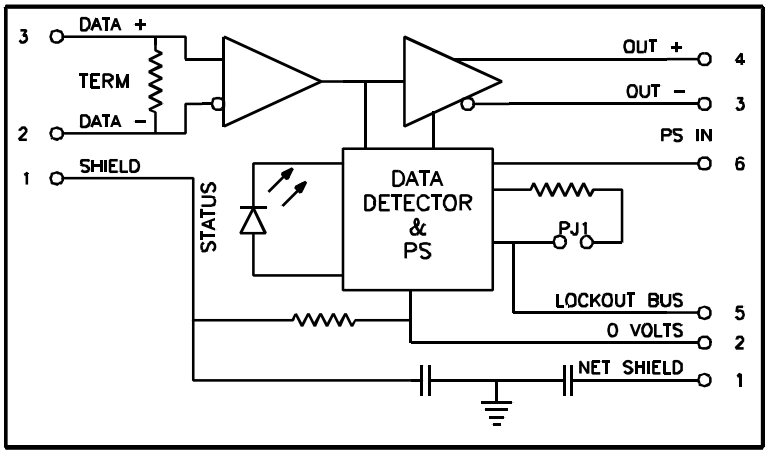


BLOCK DIAGRAM OF FN IN

Part FN-IN The first type of module is prioritized by rank or position. We refer to these as "royal" modules. The highest priority module is always enabled and will drive the network if a DMX signal is supplied to its input. The second level module may drive the network if the highest is unused or "silent." Successively lower priority modules may drive the network only if higher priority modules are silent. Priority is determined by physical position of the module in a daisy chain. The power supply connects directly to the power supply input of the highest priority input module. The power output of that module connects to the next highest priority input module and so on down to the lowest. Each module is equipped with a front panel mounted bicolor LED. When a module is powered up and ready to accept data this LED dimly glows red. If the LED is off, the module is disabled either because a higher priority module is on line, or because the network system is off. If a module is enabled and data is present, the LED will be bright green.

Part FN-IN1 The second type of module is prioritized by order of connection. The first module sensing DMX512 on its input captures the system, locking out all other modules. Other modules are reenabled only when DMX512 transmission from this source ceases. We call these modules "democratic" because they all have the same priority.

You can combine both types of modules in a system; in such cases, "royal" modules have their ranked priority and outrank all "democratic" modules.



BLOCK DIAGRAM OF PART FN IN1

NEW at LDI99

Part FN IN3 Optically Isolated Input Module

This module is mechanically and functionally similar to type FN IN1 but provides full optical isolation between the input and the internal network bus. Mechanically it is an open "ell" frame 2.6" high by 1.54" wide by 2.1" deep. Its mounting centers are the same as other modules.

Systems using input modules require a 6-conductor instead of the five wires required for output only systems. The number of input modules on a network is seldom a problem.

Part FN IN SNAP2

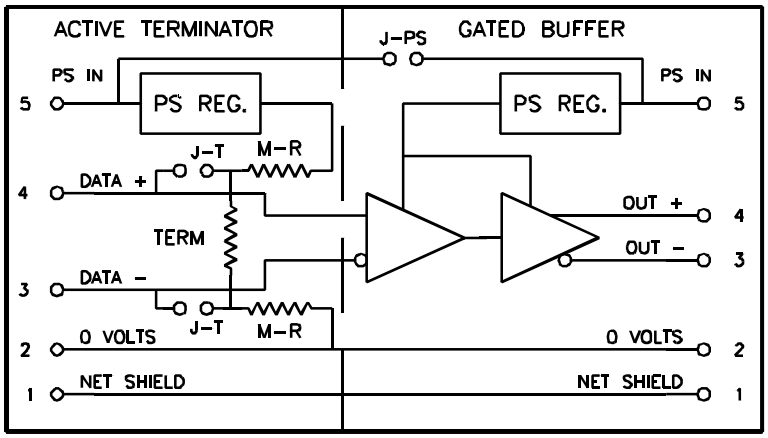
An input module is available which is designed to mount on snap track. It is used for building larger switching systems where components may be cabinet mounted. It is functionally similar to type FN IN1 but provides full optical isolation between the input and the internal bus. Mechanically it is a 3" by 3" PCB with headers to connect to the internal bus and to a separately mounted XLR style connector. Please consult with the factory for more information.

SYSTEM OVERVIEW - TERMINATION /GATED BUFFER CARD & POWER SUPPLIES

DMX-NET AT - Active Termination and Gated Buffer Card

The FN-AT termination and buffer card is a system accessory that may serve several different functions, depending on how it is used.

FN-AT can be used as an Active Termination Card DMX-NET has the line termination requirements like any DMX512 system. More information on termination is in the system layout section of this document.



BLOCK DIAGRAM OF FN AT

If only output modules are used, then only a single resistive termination is required. If input modules are used, the line must be terminated at both extremities. Using the FN-AT card assures that if the internal bus is not driven, then the bus assumes a “marking” or “1" state; without the FN-AT card the state of the internal network bus would be indeterminate. If it is likely that the DMX source will be turned off while power to the output modules is left on, it is a good idea to use the FN-AT card as the terminator.

FN-AT can be used as a Gated Buffer. The card also provides a second power supply regulator and an un-isolated DMX buffer whose output can drive an additional 32 load units. Since its input load is less than one load unit whether or not power supply is present, it may be used as a DMX512 gate by controlling its power input. If a network is zoned, must support more than 32 load units, or be “Y’ed” the FN-AT buffer card is used. If only the termination feature is needed, the output of the buffer is not used.

The FN-AT card is the same size as all other modules, but has no front panel connector. Network connections are made by way of a removable 5-pin screw clamp style header. Buffer output connections are made via a second 5-pin screw clamp style header.

DMX-NET Power Supplies

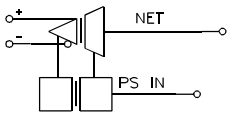
DMX-NET can be powered by any suitable DC power supply. Please see our installation guide for information to calculate the required supply. Simple supplies are available from any good electronics distributor. Goddard Design Co. provides a power supply that is also the master input station and system control unit. This piece is based on our Flexible Optical Splitter line, and is built into a 19" rackmount or table top chassis. Please see our FOS data sheet for full feature descriptions; pricing is based on the ordered features, so please consult the factory.

DMX-NET is a product that is continuing to evolve. Feel free to contact Goddard Design Co. for up to date features. Specifications and prices are subject to change. DMX-NET is available from Goddard Design and selected system integrators.

PART TWO - DMX-NET SYSTEM LAYOUT EXAMPLES

These drawings are simplified. The shielded data pair is illustrated as a single line. Ground and shield wiring are not shown at all.

DISTRIBUTED OUTPUT SYSTEM



FN OUT

The first system shown is a simple output distribution system.

1) A DMX512 signal from a console is bussed to inputs of up to 32 FN OUT modules and installed DMX receivers. DMX-NET modules and conventional installed DMX receivers may be intermixed on the distribution bus in any order.

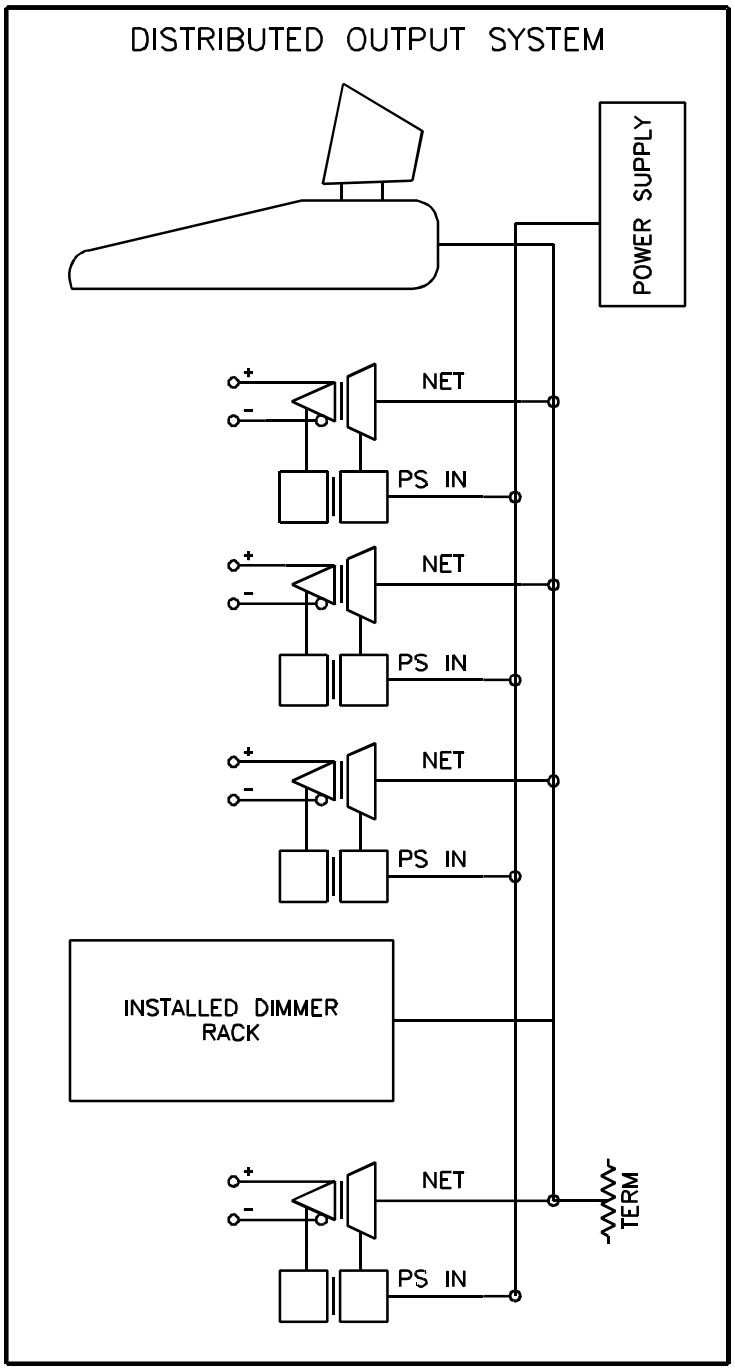
While placing portable DMX devices on the bus is possible it is not recommended. Care must be taken to insure that any device placed on the distribution bus does not compromise the reliability of the system.

2) The last device on line is resistively terminated.

3) Data is distributed point to point. No branches or Y's are allowed.

4) All output modules are connected in parallel to a 12 to 24 volt power supply.

This simple layout can provide multiple isolated DMX512 sources throughout a facility. Each module's output should be treated as if it were a separate DMX system. Each module can drive 32 unit loads. A shorted output cable connected to a module will only affect devices connected to that module's output.



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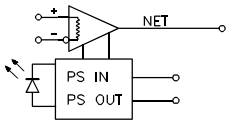
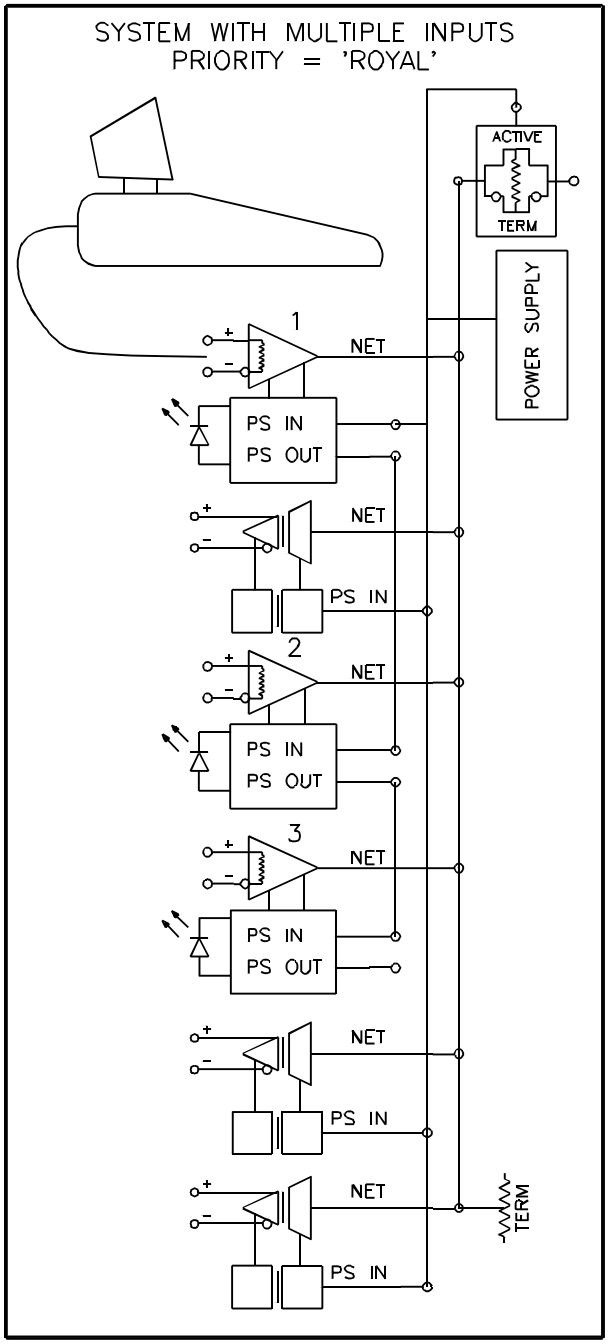
DMX-NET WITH MULTIPLE PRIORITIZED INPUTS

It is often desirable to have several possible console locations spread throughout a theater or studio. Using FN IN modules allows the source of the DMX to be easily moved around a facility.



FN IN

The DMX-NET input module allows the creation of a DMX512 distribution network that may be selectively driven from multiple locations. The unique architecture lets you construct DMX512 distribution systems without patch panels. To assure maximum flexibility we supply two different types of input modules. The difference between these modules is the method of determining which DMX512 input has priority if two active consoles are connected to the network at once.



Using Part FN-IN

The first type of module is prioritized by rank or position. As a shorthand we call these *royal* modules. The priority is determined by physical position of the module in a daisy chain. The power supply input of the input module with the highest priority is connected directly to the power supply. The power output of that module is connected to the next highest priority input module, and from there onto the lowest. Each module is equipped with a front panel mounted bicolor LED. When a module is powered up and ready to accept data this LED dimly glows red. If the LED is off the module is disabled either because a higher priority module is on line or because the network system is off. If a module is enabled and data is present the LED will be bright green.

Unlike audio, or other low frequency applications, DMX512 input connectors cannot simply be wired in parallel with the input plugged into whichever input is presently needed. Such a system would not function as a properly terminated transmission line. Many such systems would include unterminated branch lines that are one of the surest ways to cause DMX512 to malfunction.

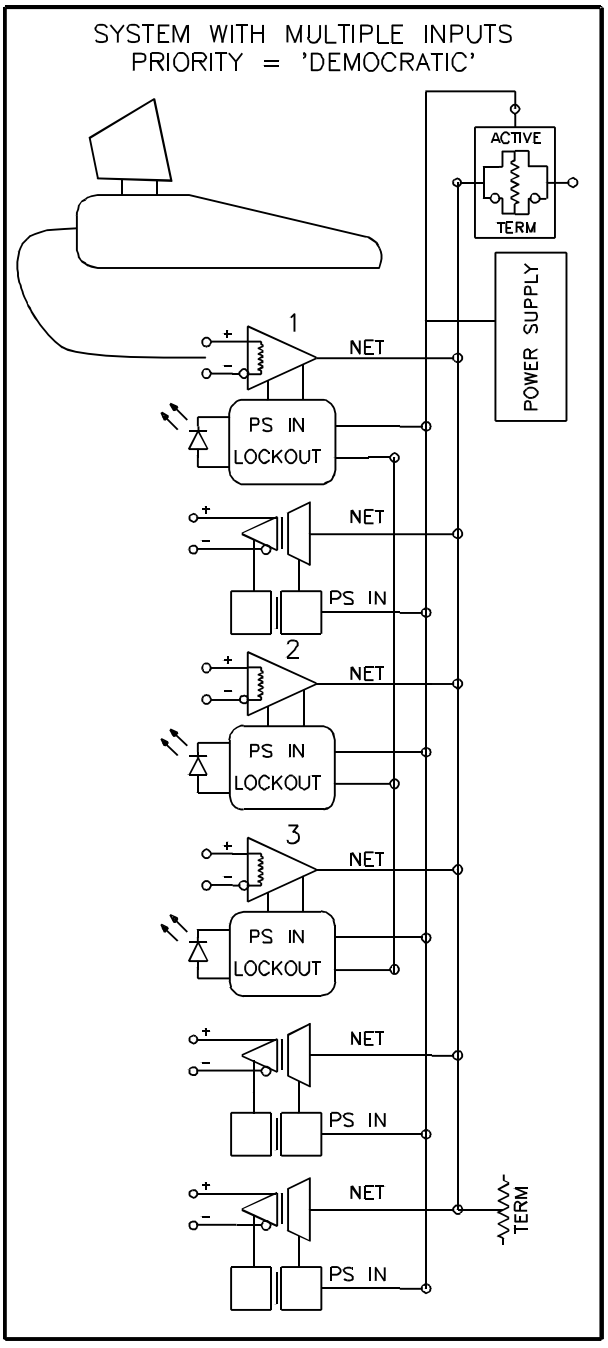
As shown in this layout drawing the input and output modules form a dual terminated EIA485 transmission line. It may be driven at any one point along its length. By buffering the input signal the input modules prevent the cable from the console to input connector from becoming a "Y" in the system. The prioritized switching assures that only one device drives the DMX network.

1) The network is terminated on both ends. One termination is by way of our active termination module. (FN AT) If a Goddard Design power supply is used, the active terminator may be ordered as part of the supply. The active termination module has two functions. First it provides resistive terminations. Second it assures that the network remains in a defined state when none of the input modules is driven. The second termination is simply a resistor.

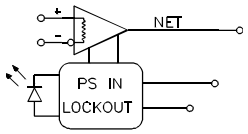
2) The output modules' power supply inputs are all wired in parallel across the power supply. The power supply input of the input module with the highest priority is connected directly to the power supply. The power output of that module is connected to the next highest priority input module, and from there on to the lowest.

3) In the example shown the input marked 1 has the highest priority, the one marked 3 has the lowest priority. If a signal is applied to 1 all other inputs are disabled.

4) Input and output modules may be intermixed in any order along the network. Note that the network bus in this layout is point to point with no branches or "Y's".



Using Part FN-IN1



FN IN1

The second type of module is prioritized by time of connection. The first module that senses DMX512 on its input captures the system and locks out any other modules. Only if DMX512 transmission from this source ceases are the other modules reenabled. We call these modules '*democratic*' because they all have the same rank or priority.
The wiring topology to use these modules is simpler. All modules are connected directly to the power supply bus. A one wire lockout bus connects to all input modules. This bus should not connect to any other equipment unless you are specifically told to do so by the factory. Termination requirements are the same as with FN IN modules. The network bus in this layout is point to point with no branches or "Y's" allowed.

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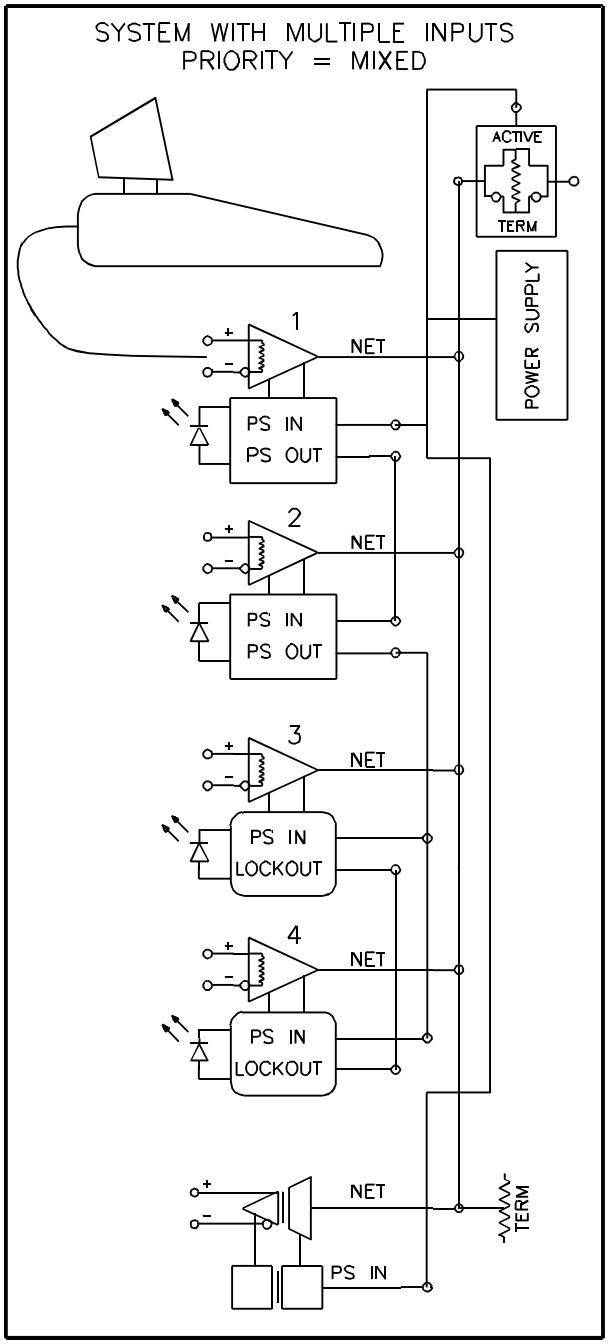
Networks With Mixed Priority

It is possible to built networks with both types of modules. These networks will have a mixture of the two priority systems. An example of such a system might be a TV studio where it was desired that the permanent console in the control room would always have access to the dimmers, while consoles on the studio floor would get access to the dimmers on a first come basis.

The drawing illustrates a system where modules one and two are FN IN modules and modules three and four are FN IN1 modules. In this example module one has the highest priority followed by module two. Modules three and four are equals at the third level of priority.

Modules three and four share a power supply bus that comes from the power out terminal of module two. Modules three and four also have a lockout bus like a democratic system.



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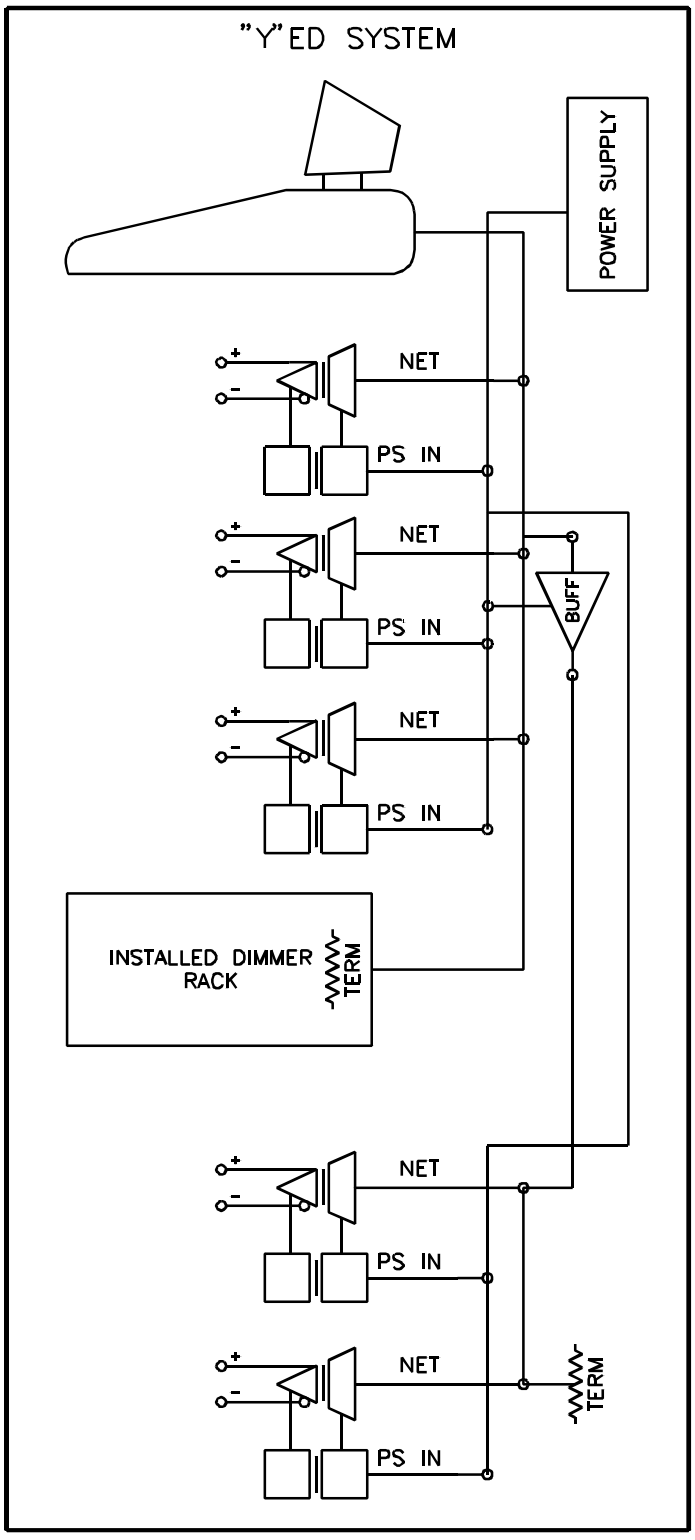
CREATING A DMX-NET SYSTEM WITH BRANCHES

Laying out a distribution system in a totally point to point manner is sometimes difficult. It may require much longer cable runs than could be used if the system could be "Yed" or starred. Consider getting a signal from the back of the house to both the sub-basement and the highest point on the stage house.

A conventional splitter or distribution amp can be placed in the control booth and multiple lines run out. Nevertheless, what if you really want to do the split in an electric box on the upstage wall?

Such a system using our gated buffer module is shown in this layout drawing. The FN AT may be used as either an active terminator or a gated buffer. **Note:** When an AT module is used as a buffer in the middle of a network the termination feature **MUST** be disabled.

Note that the buffered branch is electrically a new DMX512 system and must be separately terminated. The buffering is unidirectional; an input module placed on a buffered branch will not affect the outputs on the main branch. This last fact can sometimes be used to advantage. See the next layout drawing.



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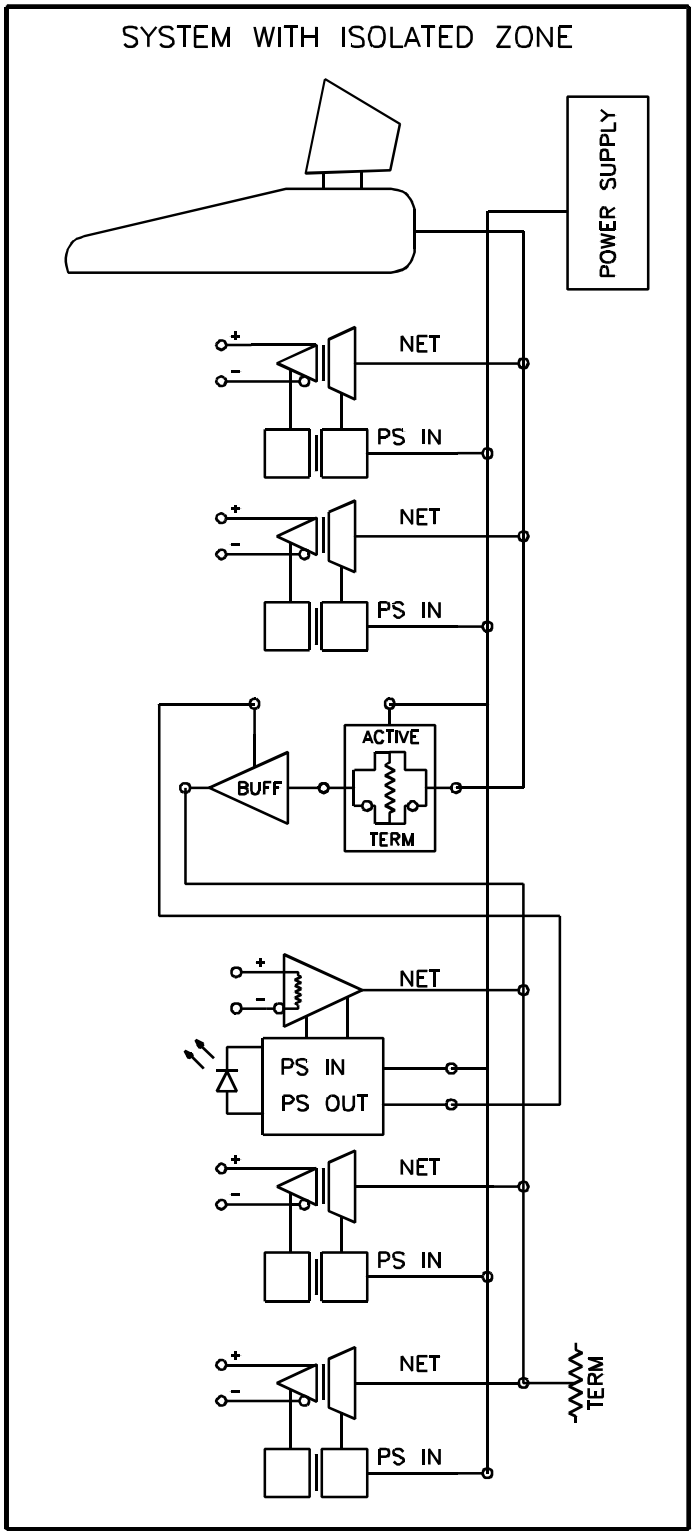
CREATING A ZONED DMX DISTRIBUTION SYSTEM

Allowing a system to be broken into zones is sometimes desirable. A large studio may be broken into two smaller studios for daily use. Or it may be desirable to let an electrician test the color scrollers hung from the grid electrics while the main dimmer rack is still connected to the house console.

This layout drawing is similar to the last one in that it has a buffer branch. The difference is that there is an input module on the branch. The power output of the input module is used to control the gating feature of a FN AT gated buffer. The main system requires a terminator; here it is provided by the termination feature of the FN AT module. When a signal is applied to the branch's input module the branch is disconnected from the main DMX system and driven by the input module. DMX outputs on the main system are not affected.

Note that it would be possible for both branches of the system to have multiple input modules.



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INPUTS AND OUTPUTS ON BRANCHES OF A "Y"ED SYSTEM

The next drawing shows a system with a "Y" branch where input and outputs must be mixed throughout the facility.

Note that the branch is really two unidirectional branches, an input branch and an output branch. The main bus is bi-directional.

The output branch is handled in the same manner as it was in the “DMX-NET SYSTEM WITH BRANCHES” drawing. The input branch is fed back to a hardwired FN IN part. The input modules' priorities are as shown by the numbers next to the modules. To the user the system would appear to function identically to the system on page six.

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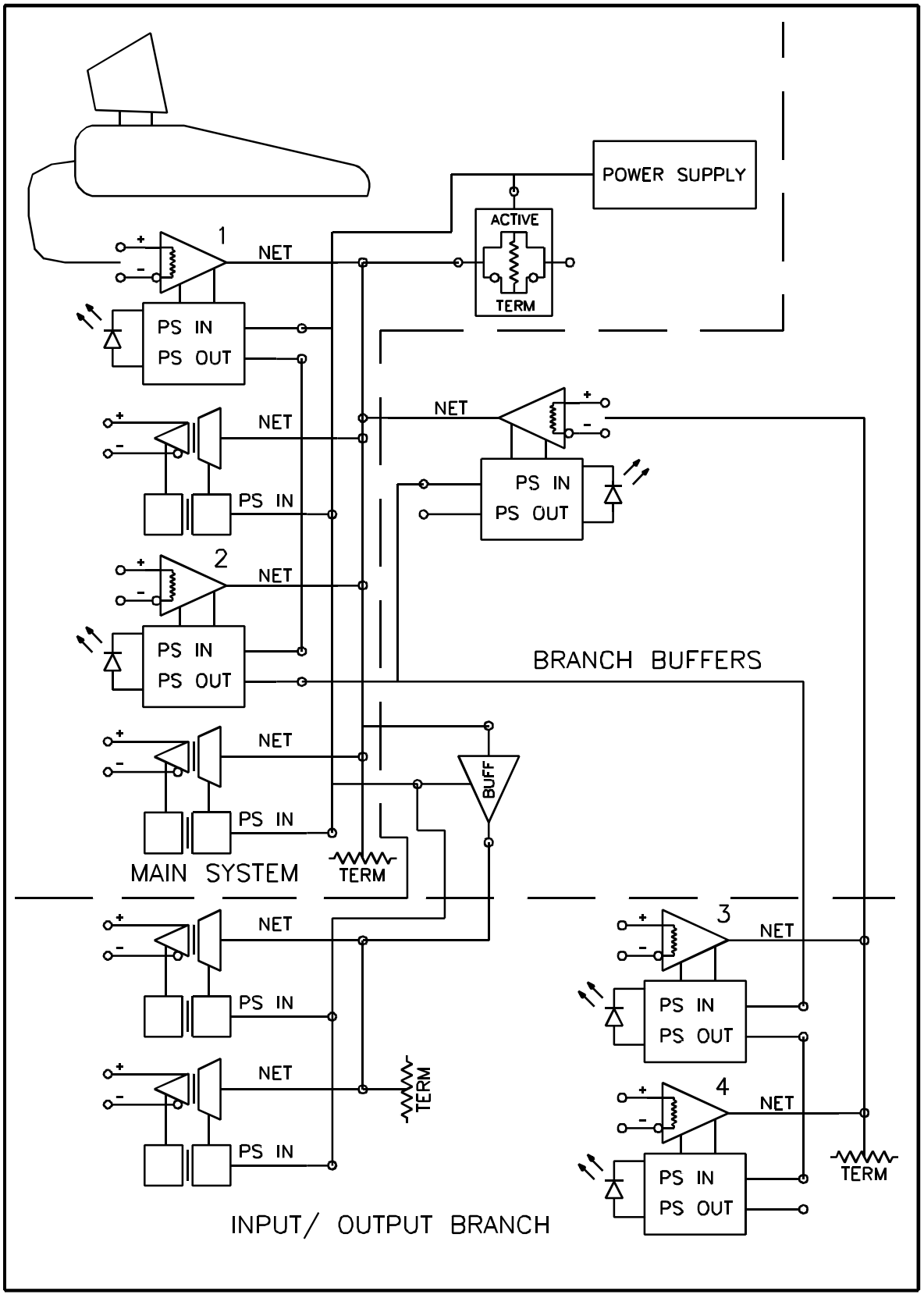

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PART THREE - DMX512 NETWORK MODULES SPECIFICATION

FN OUT - Isolated, Buffered DMX512 Output Module

Each output module provides one optically isolated DMX512 signal output capable of driving 32 EIA485 load units. The modules are short-circuit protected and resistant to damage from electrostatic discharge. Up to 32 modules may be connected to a five-conductor DMX512 distribution bus. The bus provides DMX512 and DC operating power.

BUS CONNECTOR

The signal connection from the internal distribution bus is by way of a removable five pin screw clamp style header. This allows installed cables to be wired and tested in advance. The modules may be plugged as the last step.

Note: While all output modules require only five conductors, modules may be ordered with either a five-pin or a six-pin bus connector. Modules with six pin connectors have the power supply connection on pin six, while pin five is open. This makes it easier to wire systems using FN IN1 modules. As of October 1998 all FN OUT modules are shipped with six pin bus connectors unless ordered with five pin connectors.

BUS INPUTS, ELECTRICAL

Data Inputs: (Pins 3&4) Each module presents less than one EIA485 load unit to the bus. Data inputs are bypassed to power supply common by 600 Watt 12 volt transient suppression diodes.

Shield: (Pin 1) The module's shield input is an open circuit at DC, but provides local bypassing at RF frequencies. The capacitance to frame is 680 pf.

Power Supply: (Pin 5) The module requires a 12 to 24 VDC power supply. We recommend that a supply of less than 18 volts be used unless a higher voltage is needed for other reasons. A fully loaded module draws 95 MA. A shorted module draws approximately 125 MA. The power inputs are isolated from the output and frame ground. **The power supply must be fully line isolated and the common should be DC grounded only at the supply.**

Power Supply Common: (Pin 2) The power supply common must be a separate conductor that is not connected to the shield except at one point, usually the system power supply.
Distribution Cables: Data cables should be shielded twisted 120 ohm pair rated for EIA485 uses at 250 kilo-baud. The shield is not current carrying and must be connected to power supply common only once in a system, usually at the power supply. Power cables must be sized to ensure that when voltage drops **on both the supply and common lines** are included the power to the module remains above seven volts at all times.

Another **VERY** important parameter, when sizing distribution cable is the voltage drop in the power supply return (common) wire. Any drop in the common return appears as common mode voltage on inputs to these modules. EIA485 has inherent common mode voltage of about two volts and a positive common mode limit of 12 volts. Ground return drops of greater than five volts should be avoided. Ground return drops of more than eight volts will cause unreliable operation.

OUTPUT

The DMX512 output is provided on a panel mount five pin "XLR" style connector. The output is electrically isolated from the input and frame. RF bypassing to frame is provided. A spark gap is provided to discharge ESD pulses predictably. Data outputs are clamped to output common by 600 Watt 6.8 volt transient suppression diodes. A data tally light shows the presence of signal at the isolated output. The input to output propagation delays are typically 150 nanoseconds on the rising edge and 200 nanoseconds on the falling edge.

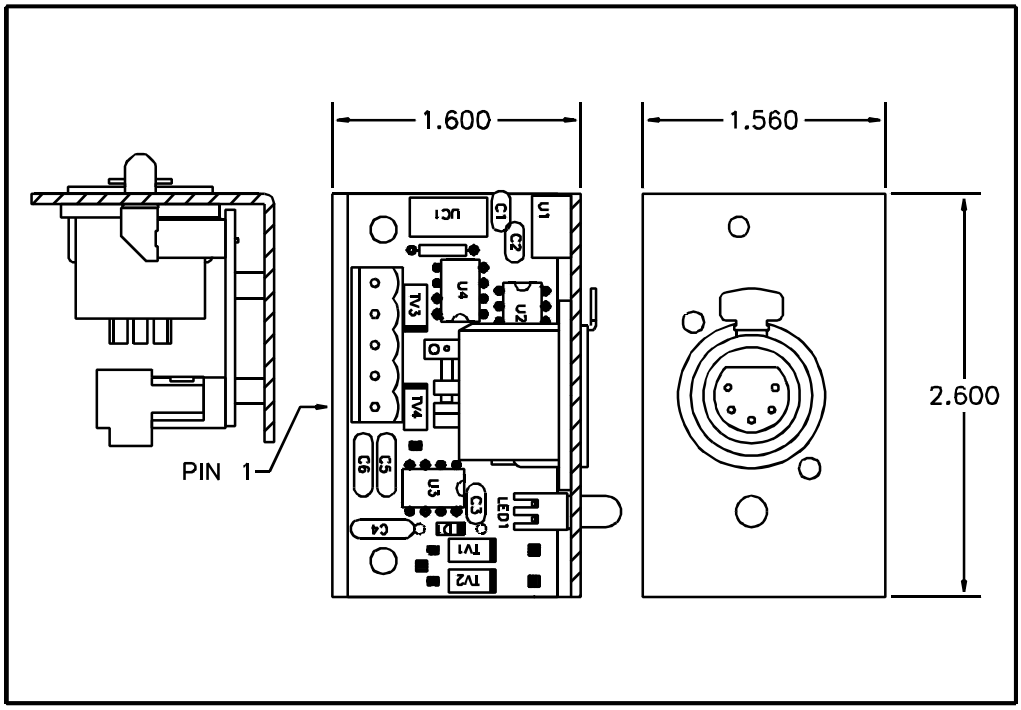
ISOLATION

Input to output signal isolation is provided by an optoislator designed for data use. The power supply isolation is by way of a transformer coupled DC to DC convertor. While the breakdown voltage of the isolation barrier is in excess of 500 volts, isolation is provided to prevent ground loops and other data problems only.

The Modules are not intended to provide AC mains voltage isolation. All lines entering and leaving the modules MUST be low voltage control lines.

MECHANICAL

Modules are open "ell" frames. The dimensions are 2.6" high by 1.56" wide by 1.6" deep. They take up 6.4 cubic inches, and are designed to fit in most standard US and UK electrical boxes. Input and output modules share common mechanical dimensions. FN IN, FN IN1, and FN OUT modules all mount to a front plate by way of the two connector mounting screws. The provided screws are M3 metric machine screws. The pin one orientation is the same. See outline drawing below.



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DMX-NET IN - Input Modules

A DMX distribution system that includes more than one DMX input connector must ensure that only one DMX512 source can drive the network. It must also ensure that lines connected to unused DMX512 sources do not constitute un-terminated stubs. The DMX-NET input module allows the creation of a DMX512 distribution network that may be selectively driven from multiple locations. The unique architecture lets you construct DMX512 distribution systems without patch panels. To assure maximum flexibility we supply two different types of input modules. The difference between these modules is the method of determining which DMX512 input has priority if two active consoles are connected to the network at once.

PART FN-IN

The first type of module is prioritized by rank or position. We refer to these as “royal” modules. The highest priority module is always enabled and will drive the network if a DMX signal is supplied to its input. The second level module may drive the network if the highest is unused or “silent.” Successively lower priority modules may drive the network only if higher priority modules are silent. Priority is determined by physical position of the module in a daisy chain. The power supply connects directly to the power supply input of the highest priority input module. The power output of that module connects to the next highest priority input module and so on down to the lowest.

Each FN IN input module has a terminated line receiver, a data detector, and tri-stateable driver, and a power switch. If no data is present on the input connector, the data detector keeps the tri-stateable driver in a high impedance state, and power supply is routed to lower priority input modules by the power switch. If data is present it is buffered and placed on the internal network by the tri-stateable driver, and the power switch removes power from any lower priority input modules.

INPUT

The input is by way of a standard male five pin "XLR" style connector. The input is terminated by 120 ohms. When the input is left open, it is held in a "marking" state. Inputs are bypassed to power supply common by 600 Watt 12 volt transient suppression diodes.

DATA DETECTOR

The data detector checks for negative going transitions. If the input is held either high or low, the detector will time out and tri-state the output driver. This circuit should reliably receive DMX512 from about four updates a second up to the maximum allowed.

DATA INDICATOR

The FN IN modules are equipped with a front panel mounted bicolor LED. When a module is powered up and ready to accept data this LED dimly glows red. If the LED is off the module is disabled either because a higher priority module is on line or because the network system is off. If a module is enabled and data is present the LED will be bright green.

CONNECTIONS TO THE INTERNAL BUS

The connections to the DMX distribution bus are by way of a removable six pin screw clamp style header. This allows installed cables to be wired and tested in advance. The modules may be plugged as the last step.

INTERNAL BUSS - ELECTRICAL

The internal net bus is driven by a tri-stateable EIA485 driver. Our driver presents a load to the line of less than one hundredth of a load unit. Therefore, the number of input modules on a network is seldom a problem.
The output data lines are bypassed to power supply common by 600 Watt 12 volt transient suppression diodes.

Shield: (Pin 1) The shield is not current carrying and must be connected to power supply common only once in a system, usually at the power supply. The module's shield input is open at DC, but provides local bypassing at RF frequencies. The capacitance to frame is 680 pf.

Power Supply: (Pin6) The module requires a 12 to 24 VDC power supply. Power cables must be sized to ensure that when voltage drops **on both the supply and common lines** are included the power to the module remains above nine volts at all times. An input module receiving data draws approximately 80 MA. At standby a module draws approximately 20 MA. The power supply inputs are isolated from frame ground. **As with output modules the voltage drop in the ground return is seen by the module as common mode voltage and the same limits apply.**

Power Supply Common: (Pin 2) The power supply common must be a separate conductor that is not connected to the shield except at one point, usually the system power supply.

THE POWER SWITCH

When data is not present, the raw power supply on pin 6 is routed to pin 5. When data is present pin 5 is disconnected. The output from pin 5 is used to power lower priority input modules. It may also be used to power a gated buffer module (FN AT) to create DMX zones. The power switching is by way of a relay. The load on the relay should be kept to one amp or less. (Cable drop will often be a problem before the switch limit is reached.)

PART FN-IN1

The second type of module is prioritized by time of connection. The first module that senses DMX512 on its input captures the system and locks out any other modules. Only if DMX512 transmission from this source ceases are the other modules reenabled. We call these modules *'democratic'* because they all have the same rank or priority. Combined systems using both type of module are possible. In those system *'royal'* modules have their ranked priority and outrank all *'democratic'* modules.

INPUT

The input is by way of a standard male five pin "XLR" style connector. The input is terminated by 120 ohms. When the input is left open, it is held in a "marking" state. The inputs are bypassed to power supply common by 600 Watt 12 volt transient suppression diodes.

DATA DETECTOR

The data detector checks for negative going transitions. If the input is held either high or low, the detector will time out and tri-state the output driver. This circuit should reliably receive DMX512 from about four updates a second up to the maximum allowed.

DATA INDICATOR

The FN IN1 modules are equipped with a front panel mounted bicolor LED. When a module is powered up and ready to accept data this LED dimly glows red. If the LED is off the module is disabled either because a higher priority module is on line or because the network system is off. If a module is enabled and data is present the LED will be bright green.

CONNECTIONS TO THE INTERNAL BUS

The connections to the DMX distribution bus are by way of a removable six pin screw clamp style header. This allows installed cables to be wired and tested in advance. The modules may be plugged as the last step.

INTERNAL BUSS - ELECTRICAL
The internal net bus is driven by a tri-stateable EIA485 driver. Our driver presents a load to the line of less than one hundredth of a load unit. Therefore, the number of input modules on a network is seldom a problem.
The output data lines are bypassed to power supply common by 600 Watt 12 volt transient suppression diodes.

Shield: (Pin 1) The shield is not current carrying and must be connected to power supply common only once in a system, usually at the power supply. The module's shield input is open at DC, but provides local bypassing at RF frequencies. The capacitance to frame is 680 pf.

Power Supply (Pins 2&6) The module requires a 12 to 24 VDC power supply. Power cables must be sized to ensure that when voltage drops **on both the supply and common lines** are included the power to the module remains above nine volts at all times. An input module receiving data draws approximately 80 MA. At standby a module draws approximately 20 MA. The power supply inputs are isolated from frame ground. **As with output modules the voltage drop in the ground return is seen by the module as common mode voltage and the same limits apply.**

LOCKOUT CONTROL LINE
Pin 5 of the data buss is the lockout control line. When none of the FN IN1 modules has a DMX512 input this line is pulled to +5 VDC by a resistor on each module. The first FN IN1 module that senses a DMX input enables its data buss driver and pulls the lockout line to approximately zero volts. This line being low prevents any further module from enabling. Removing a provided jumper disables the pull-up resistor. The pull-up resistor should always be left enabled unless the module is being used in a special installation and you are instructed to remove this jumper by the factory.

Part FN IN3

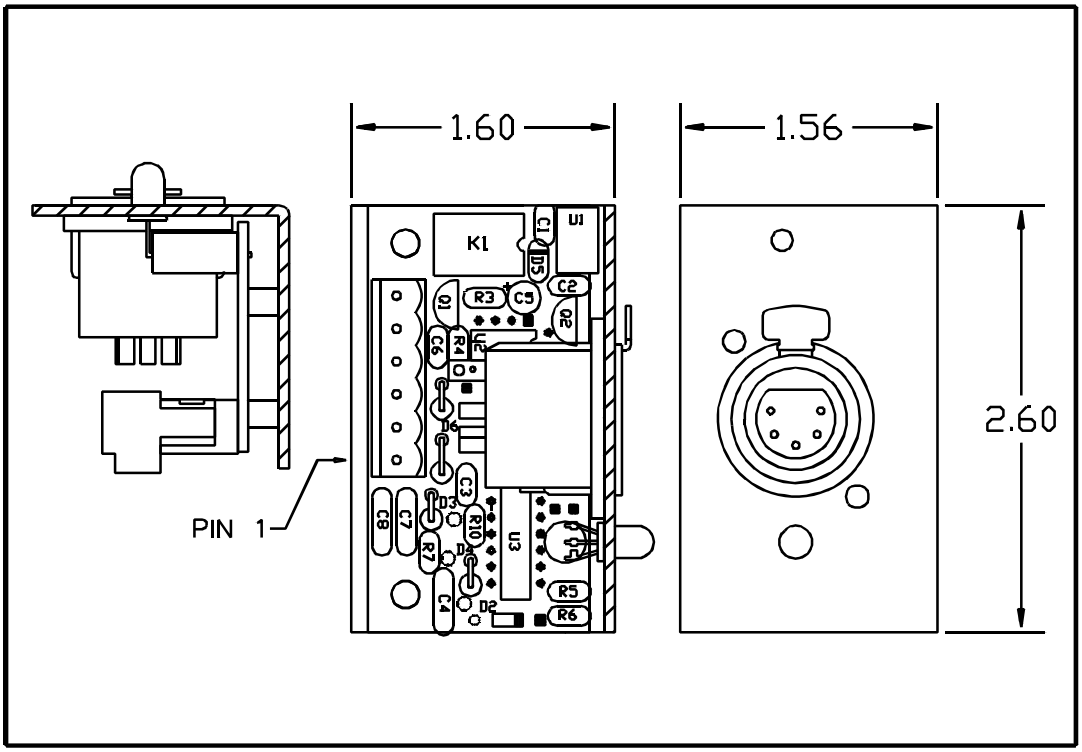
This module offers the advantages of optical isolation for system inputs, guaranteeing that even large distributed systems do not suffer common mode error problems. Functionally the module behaves identically to the FN IN1. The connector layout and bus requirements are the same. The input uses an ESD resistant receiver providing a low capacitance DMX input.

Mechanically the module is 0.5 inches deeper than other modules. It is an open “ell” frame 2.6" high by 1.54" wide by 2.1" deep. Its mounting centers are the same as other modules. The power supply requirements are approximately 90 MA for an input module receiving data, and approximately 50 MA for a module at standby.

FN IN1 modules and FN IN modules may be used in combined systems, for details see the system layout drawings.

MECHANICAL

Mechanically both the FN IN and the FN IN1 modules are the same size as the FN OUT module. Input modules have a 6-pin connector instead of the 5-pin used on the Output modules. The pin one orientation is the same. See outline drawing above. FN IN, FN IN1, and FN OUT modules all mount to a front plate by way of the two connector mounting screws. The provided screws are M3 metric machine screws.



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FN AT - ACTIVE TERMINATION AND GATE BUFFER CARD

The DMX-NET AT termination and buffer card is a system accessory. The card may serve several different functions depending on how it is used.

FN-AT used as an ACTIVE TERMINATION CARD

As with any DMX512 system DMX-NET requires proper line termination. For details on termination and system layouts see the system layout drawings. If only output modules are being used, termination may involve simply installing a 120-ohm resistor on the header of the module electrically farthest from the DMX source. If input modules are being used, the line must be terminated at both extremities. When using input modules it is possible that all of the input modules will be tri-stated because there is no source of DMX. Without the FN AT card the state of the internal network bus would be indeterminate. To maintain DMX standard compatibility one termination network must assure that when no source drives the internal bus it assumes a "marking" or "1" state. The FN AT does this. Even in simple output distribution systems if it is likely that the DMX source will be turned off while power to the output modules is left on, it is a good idea to use the FN AT as the termination.

The card provides a power supply regulator, a termination resistor, and a marking network. The marking network provides a differential marking signal of approximately 170 millivolts on a 32-load unit network rising to 220 millivolts on a one load unit network. The active termination feature may be disabled if only the buffer feature is needed.

FN AT used as a GATED BUFFER
The card also provides a second power supply regulator and an un-isolated DMX buffer. The buffer's output can drive an additional 32 load units. Since its input load is less than one load unit whether or not power supply is present, it may be used as a DMX gate by controlling its power input. If a network must be zoned, support more than 32 load units, or be "Y'ed" a FN AT buffer card is used. See the sample system layouts for examples. If only the termination feature is needed, the output of the buffer is not used.

Mechanically FN AT is the same size as all other modules, but it has no front panel connector. Network termination connections are made by way of a removable five pin screw clamp style header. Buffer output connections are via a second 5-pin screw clamp style header. Both pin outs are identical to the FN OUT.

POWER SUPPLY REQUIREMENTS

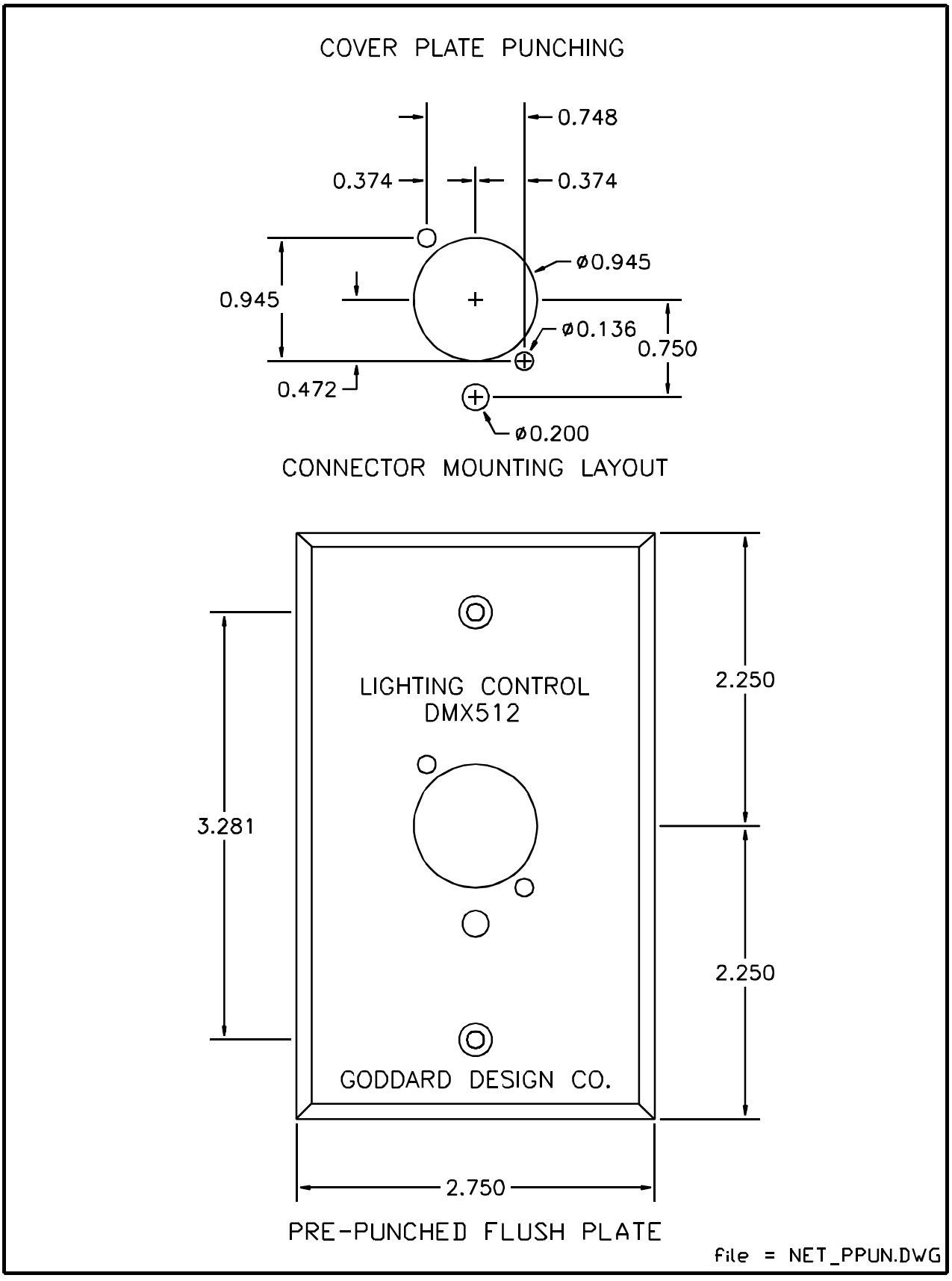
All DMX-NET modules have on board power supply regulators. Because of this the requirements on the main power supply are quite relaxed. Use of unregulated supply is possible. We recommend that all supplies have electronic current limiting. Since most current limited supplies are also regulated most suitable supplies will also be regulated.

All power supply outputs must be fully isolated AC power mains. All power supplies should be chosen for high reliability and should be of robust construction. They must be able to withstand ESD discharges to 8KV. The power supply's common terminal (zero volts) should be earth grounded at the supply. This should be the only point that power supply common is grounded.

While any supply of between 12 volts and 24 volts could be used in some systems, the actual power supply voltage must be picked to compensate for cable drop at worst case loading. But as has already been pointed out the common wire drop will dictate the wire size and so simply raising the power supply voltage will not allow use of smaller conductors. As a general rule we do not think that supplies of greater than 18 volts are needed.

DMX-NET - Cover Plates

Prepunched cover plates are available for certain common boxes. Custom plates are available. Please check current stock. The drawing below indicates hole punching for those wishing to fabricate their own cover plates.



PART FOUR - Appendix
FIGURING THE VOLTAGE DROP

To figure the approximate voltage drop in the power supply conductors you need to know the worst case current flowing in each run of power supply conductors. The voltage drop in any particular run of power supply wire is equal to:

The current in amps, times the length of the cable in thousands of feet, times the ohms per thousand feet.

For a 300-foot cable of 22 gauge wire, carrying a current of 250 milliamps, the drop is .300 x .250 x 16.46 = 1.24 volts.

This voltage drop occurs in both the supply wire and the common return wire. Therefore the effective power supply voltage has been reduced by 2.48 volts and the ground - the common mode voltage - has been increased by 1.24 volts. The voltage drop to the module farthest from the power supply is the sum of all the voltage drops in all of the runs between that module and the power supply.

COPPER WIRE RESISTANCE TABLE

WIRE GAUGE AWG	OHMS per thousand feet at 25°C
26	41.62
24	26.17
22	16.46
20	10.35
18	6.51

file =F:\word_p\wp6doc\lit\net_g1.wpd

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