

## Distribution Amplifiers

FS73X series — 5 MHz, 10 MHz, broadband & CMOS distribution amplifiers



FS735/1/4 rear panel with one Broadband 50  $\Omega$  Distribution Amplifier and one 10 MHz Distribution Amplifier side by side.

### FS73X Series Distribution Amplifiers

#### 5 MHz and 10 MHz Distribution

- Amplitude leveling
- Low additive phase noise
- Excellent isolation

#### CMOS Distribution

- High input impedance w/ hysteresis
- High current outputs
- Fast transition times

#### 50 $\Omega$ and 75 $\Omega$ Broadband Distribution

- Flat frequency response
- Large dynamic range
- Low noise

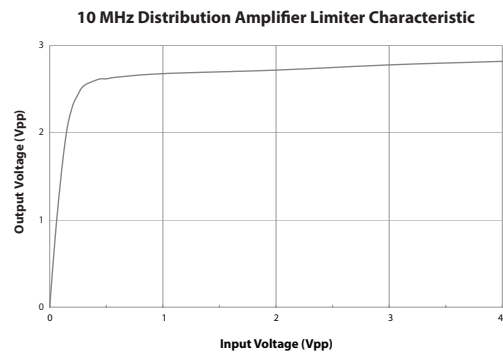
- FS730
- FS735

Introducing the FS730 and FS735 Distribution Amplifier series — 5 MHz, 10 MHz, CMOS, and Broadband models for a variety of applications.

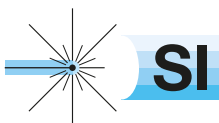
#### 5 MHz and 10 MHz Distribution Amplifiers

The FS730 (benchtop) and FS735 (19" rack-mount) systems distribute low-noise 5 MHz and 10 MHz frequency references. The FS730 has one input and seven outputs, and the FS735 is a dual-amplifier system with two inputs, each with seven outputs. Inputs are AC coupled, and the source impedance is 50  $\Omega$  at 5 MHz or 10 MHz.

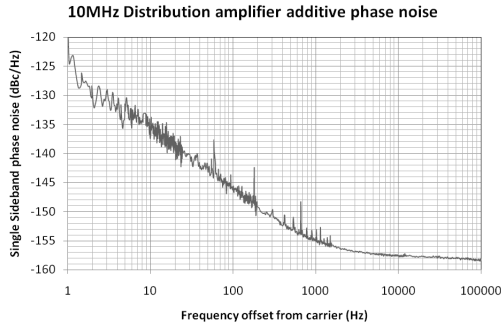
Each input is conditioned by a limiter which provides several advantages: it removes amplitude modulation from the input signal, fixes the output amplitude, and any input noise that



10 MHz distribution amplifier limiter characteristics

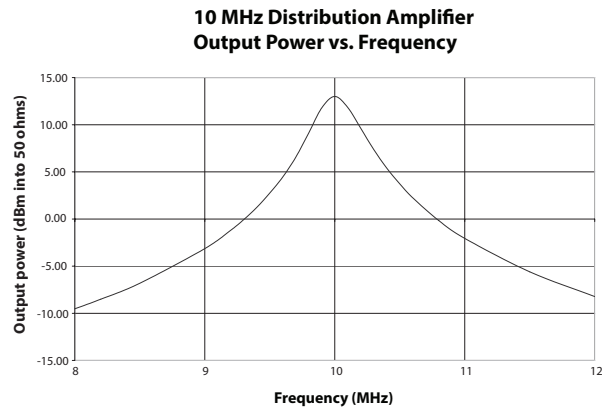


occurs more than 50 mV away from the zero-crossing is blocked. Virtually any waveform with a duty cycle near 50 % may be used as an input.



10 MHz distribution amplifier, additive phase noise

The input limiter is followed by a bandpass filter and a fixed gain amplifier. This signal is passed to seven output amplifiers, each of which is followed by a low pass filter and an output transformer. All of the outputs have 50 Ω source impedance and provide a 1 Vrms (+13 dBm) sine wave into a 50 Ω load.



10 MHz distribution amplifier, output power vs. frequency

There are four indicator LEDs. The “power” LED indicates that the unit has AC power. The “signal” LED indicates that an input signal is present. The “overload” LED indicates that the input signal has excessive amplitude. The “fault” LED indicates one or more of these conditions: no input signal, excessive input signal, no output signal, or low internal DC power supply.

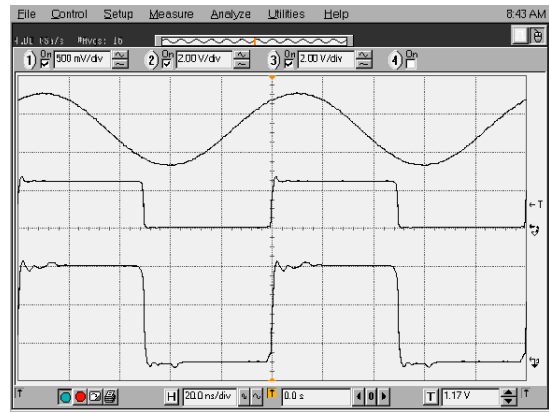
### CMOS Distribution Amplifiers

The FS730 (benchtop) and FS735 (19" rack-mount) systems distribute CMOS level logic pulses. The FS730 has one input and seven outputs, and the FS735 is a dual-amplifier system

with two inputs, each with seven outputs. All inputs and outputs are logic levels.

The Schmitt trigger inputs have a switching threshold of +1.3 VDC with 0.35 V of hysteresis. The input impedance is 1 kΩ.

Each output has a 50 Ω source impedance with logic levels of 0 and 5.0 VDC. The 50 Ω source impedance will reverse terminate reflected pulses when driving unterminated lines. High impedance loads will be driven to 5 V, and 50 Ω loads will be driven to 2.5 VDC. All of the outputs are driven by separate drivers to provide high isolation. The outputs have fast transition times and very low overshoot. The polarity of each output may be configured with a jumper inside the unit: installing the polarity jumper inverts the corresponding output. As shipped, the outputs are non-inverting.

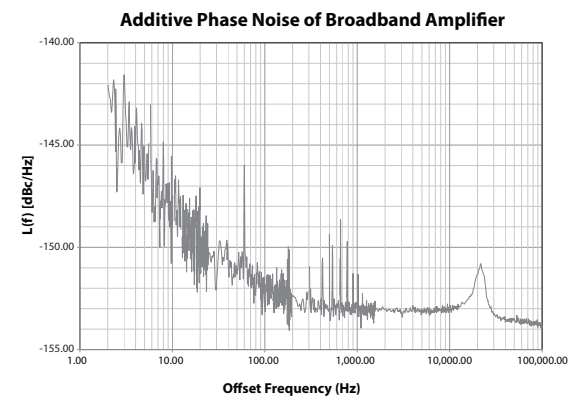


CMOS distribution amplifier, small signal reflection artifacts

There are two indicator LEDs. The “power” LED indicates that the unit has AC power. The “signal” LED will flash for 100 ms on each rising or falling edge seen at the input.

### Broadband Distribution Amplifiers

The FS730 (benchtop) and FS735 (19" rack-mount) systems distribute broadband (DC to 100 MHz) analog signals. The



Broadband distribution amplifier, additive phase noise



FS730 has one input and seven outputs, and the FS735 is a dual-amplifier system with two inputs, each with seven outputs.

The inputs and outputs are DC coupled and each have a 50  $\Omega$  (Opt. 4) or 75  $\Omega$  (Opt. 5) impedance. Applications include the distribution of frequency references, IRIG timing signals, composite video, audio, etc.

There are four indicator LEDs. The “power” LED indicates that the unit has AC power. The “signal” LED indicates that an input signal greater than 300 mV is present. The “overload” LED indicates that the input signal has exceeded  $\pm 2$  V.

## Configuration & Ordering

The FS73x series of products can be configured as a half width, 1U size benchtop instrument (FS730), or as a full-width, 19" rack-mount enclosure (FS735). All connectors on the FS730 are BNC type and are located on the front panel. All connectors on the FS735 are BNC type and are located on the rear panel. An optional 19" rack mount kit (O730RMD) is available for mounting two FS730s side by side in a standard 19" rack.

### Model FS730/x

The **FS730/1** has one 10 MHz input, and seven 10 MHz outputs. The **FS730/2** is identical except the input accepts a 5 MHz reference.

The **FS730/3** CMOS Logic Distribution Amplifier has one input and seven output BNC connectors on the front panel.

The **FS730/4** has one input BNC connector, and seven output BNC connectors on the front panel. All inputs and outputs are terminated with 50  $\Omega$  resistance. The **FS730/5** is identical except the terminations are 75  $\Omega$ .

### Model FS735/x/y

The **FS735/1/1** dual-amplifier system offers two independent 10 MHz reference inputs, each with seven output channels (a total of fourteen outputs). The **FS735/1/2** is identical except one input accepts a 10 MHz reference and distributes seven channels of 10 MHz, and the other input accepts a 5 MHz reference and distributes seven channels of 5 MHz.

The **FS735/3/3** dual-amplifier system offers two independent CMOS reference inputs, each with seven output channels (a total of fourteen outputs).

The **FS735/4/4** 50  $\Omega$  dual-amplifier system offers two independent broadband amplifier inputs, each with seven output channels (a total of fourteen outputs). The **FS735/4/5** is identical except one of the dual-amplifier systems has 50  $\Omega$  termination and the other has 75  $\Omega$  termination.

## Ordering Information

|           |  |
|-----------|--|
| FS730/1   | 10 MHz distribution amplifier (7-ch.) with BNCs on front   |
| FS730/2   | 5 MHz distribution amplifier (7-ch.) with BNCs on front  |
| FS730/3   | 7-ch. CMOS logic distribution amplifier  |
| FS730/4   | 7-ch. broadband 50 $\Omega$ distribution amplifier   |
| FS730/5   | 7-ch. broadband 75 $\Omega$ distribution amplifier   |
| RM1U      | 19" rack-mount for one or two FS730s   |
|           |  |
| FS735/1/1 | Two 7-ch. 10 MHz distribution amplifiers   |
| FS735/2/2 | Two 7-ch. 5 MHz distribution amplifiers  |
| FS735/1/2 | One 7-ch. 10 MHz distribution amplifier, and one 7-ch. 5 MHz distribution amplifier                                  |
| FS735/3/3 | Two 7-ch. CMOS distribution amplifiers   |
| FS735/4/4 | Two 7-ch., broadband 50 $\Omega$ distribution amplifiers   |
| FS735/4/5 | One 7-ch., broadband 50 $\Omega$ distribution amplifier, and one 7-ch., broadband 75 $\Omega$ distribution amplifier |



FS730/4 rear panel



FS735/1/4 front panel

## 5 MHz & 10 MHz Distribution Amplifiers

### Input

|           |  |
|-----------|--|
| Frequency | 5 MHz or 10 MHz, $\pm 1\%$                         |
| Level     | 0 dBm to +16 dBm<br>( $0.6 V_{pp}$ to $4 V_{pp}$ ) |
| Waveform  | Any with $\approx 50\%$ duty                       |
| Impedance | $50 \Omega$ , $\pm 5\%$ at 10 MHz                  |
| Coupling  | Series LC (open at DC)                             |

### Output

|                          |   |
|--------------------------|---|
| Waveform                 | Sine  |
| THD                      | <1 %  |
| Level (50 $\Omega$ load) | $+13 \pm 1$ dBm ( $1 V_{rms}$ , $2.82 V_{pp}$ ) |
| Impedance                | $50 \Omega$ , $\pm 5\%$ at 5 MHz / 10 MHz       |
| Coupling                 | Transformer (short at DC)                       |
| Bandwidth (-3 dB)        | $\pm 200$ kHz (10 MHz)<br>$\pm 100$ kHz (5 MHz) |
| Spurious                 | <-120 dBc within 100 kHz                        |
| Isolation                | >100 dB   |
| Pulling                  | <1 ps   |
| TC of phase              | $\approx -5$ ps/ $^{\circ}$ C                   |

## CMOS Distribution Amplifiers

### Input

|                    |                |
|--------------------|----------------|
| Impedance          | 1 k $\Omega$   |
| Threshold (L to H) | 1.50 VDC       |
| Threshold (H to L) | 1.15 VDC       |
| Transition time    | no restriction |
| Frequency          | DC to 50 MHz   |
| Pulse width        | >5 ns          |

### Output

|                           |                     |
|---------------------------|---------------------|
| Impedance                 | $50 \Omega \pm 5\%$ |
| Levels (high-Z load)      | 0 V and 5 V         |
| Levels (50 $\Omega$ load) | 0 V and 2.5 V       |
| Rise time                 | <1.5 ns             |
| Fall time                 | <1.0 ns             |
| Jitter (rms)              | <10 ps              |
| Delay                     | 9 ns (typ.)         |
| Delay skew                | $\pm 1$ ns (typ.)   |
| Overshoot                 | <5 %                |
| Undershoot                | <5 %                |
| Polarity control          | Internal jumper     |

## Broadband Distribution Amplifiers

### Input

|                    |  |
|--------------------|--|
| Impedance          | $50 \Omega$ or $75 \Omega$ , $\pm 1\%$ |
| Linear range       | $\pm 2$ V                              |
| Damage (DC)        | 5 VDC                                  |
| Damage (1 $\mu$ s) | 100 V                                  |

### Output

|              |  |
|--------------|--|
| Impedance    | $50 \Omega$ or $75 \Omega$ , $\pm 1\%$ |
| Nominal load | $50 \Omega$ or $75 \Omega$             |

### Performance (50 $\Omega$ loads)

|                         |                            |
|-------------------------|----------------------------|
| Gain (50 $\Omega$ load) | $\times 1.00$ , $\pm 2\%$  |
| Gain (high-Z load)      | $\times 2.00$ , $\pm 1\%$  |
| Bandwidth (-3 dB)       | >100 MHz                   |
| Noise at 1 kHz          | <15 nV/ $\sqrt{\text{Hz}}$ |
| Offset                  | <1 mV                      |
| Isolation (10 MHz)      | >100 dB                    |

### General

|            |  |
|------------|--|
| Power      | 10 W, 100/120/220/240 VAC, 50/60 Hz                              |
| Dimensions |  |
| FS730      | 8.3" $\times$ 1.5" $\times$ 8.0" (WHL)                           |
| FS735      | 17" $\times$ 1.5" $\times$ 8.0" (WHL)                            |
| Warranty   | One year parts and labor on defects in materials and workmanship |

