



DA1-100-10-5MHz Series of Narrowband or Wideband Distribution Amplifiers



Key Features

- 1-5 MHz wideband Operation. Other band frequencies from 100 kHz to 200 MHz are available
- AGC Level Controlled. Output level remains stable to 0.02 dB even if input varies
- AGC can be disabled if required. Amplifier then has fixed gain. Different gains can be made upon request
- 5 to 40 sinewave outputs. Each output can be independently set to 0 dBm to > +10 dBm (option +20 dBm)
- Alarm monitoring. All outputs have alarm monitoring. Indication by LEDES or rear panel DC outputs
- Ultra low phase noise. Typically, < -140 dBc @ 1 Hz offset. Floor noise to -171 dBc/Hz available.
- Excellent Allan Deviation. 2×10^{-14} at 1 sec, 2×10^{-17} at longer time intervals.
- >90 dB channel isolation and >130 dB reverse isolation. Protects reference input and prevents cross-talk.
- BNC Connectors standard. SMA or TNC or N type connectors optionally available.
- Optional second frequency "Back-up" input. Automatically switched in, if first input fails.
- Optional internal back-up oscillator. Automatically switched in, if external input fails.
- Optional Redundancy (two units with automatic switchover)
- Many other options and customized options. Bespoke design service available.

General Description

The DA1-100-10-5MHz is a 1 to 5 MHz distribution amplifier. It can be used to synchronize from five to forty instruments to a 5 MHz frequency reference input. The reference input will typically be an OXCO, Rubidium, Caesium or Hydrogen Maser Frequency Standard.

The DA1-100-10-5MHz has features not found in any competitive unit. This makes this amplifier the industry's leading 5 MHz distribution amplifier. It has outstanding low phase noise, meaning no additional phase noise will be added to the reference input.

Phase noise is typically <-140 dBc @ 1 Hz offset. This low phase noise enables units to be cascaded for over 1000 outputs.

Amplifier with Gain and Automatic Gain Control (AGC)

Unlike most competitive units, this amplifier accepts inputs from +7 dBm to +20 dBm (-20 dBm to +30 dBm optional) and provides outputs from 0 dBm to > +10 dBm (up to +20 dBm optional). The output will not vary with input variations.

This is very useful when long cable runs are being used or equipment has different input level requirements. The AGC can be disabled, if required, making the unit a fixed gain amplifier. Different gains are available upon request.

Outputs

There are five to forty sinewave outputs depending upon what option is ordered. Each output is completely isolated from the input and each other. Therefore, the reference oscillator connected to the amplifier's input is protected against load variations, short circuits etc. that may be applied to the outputs.

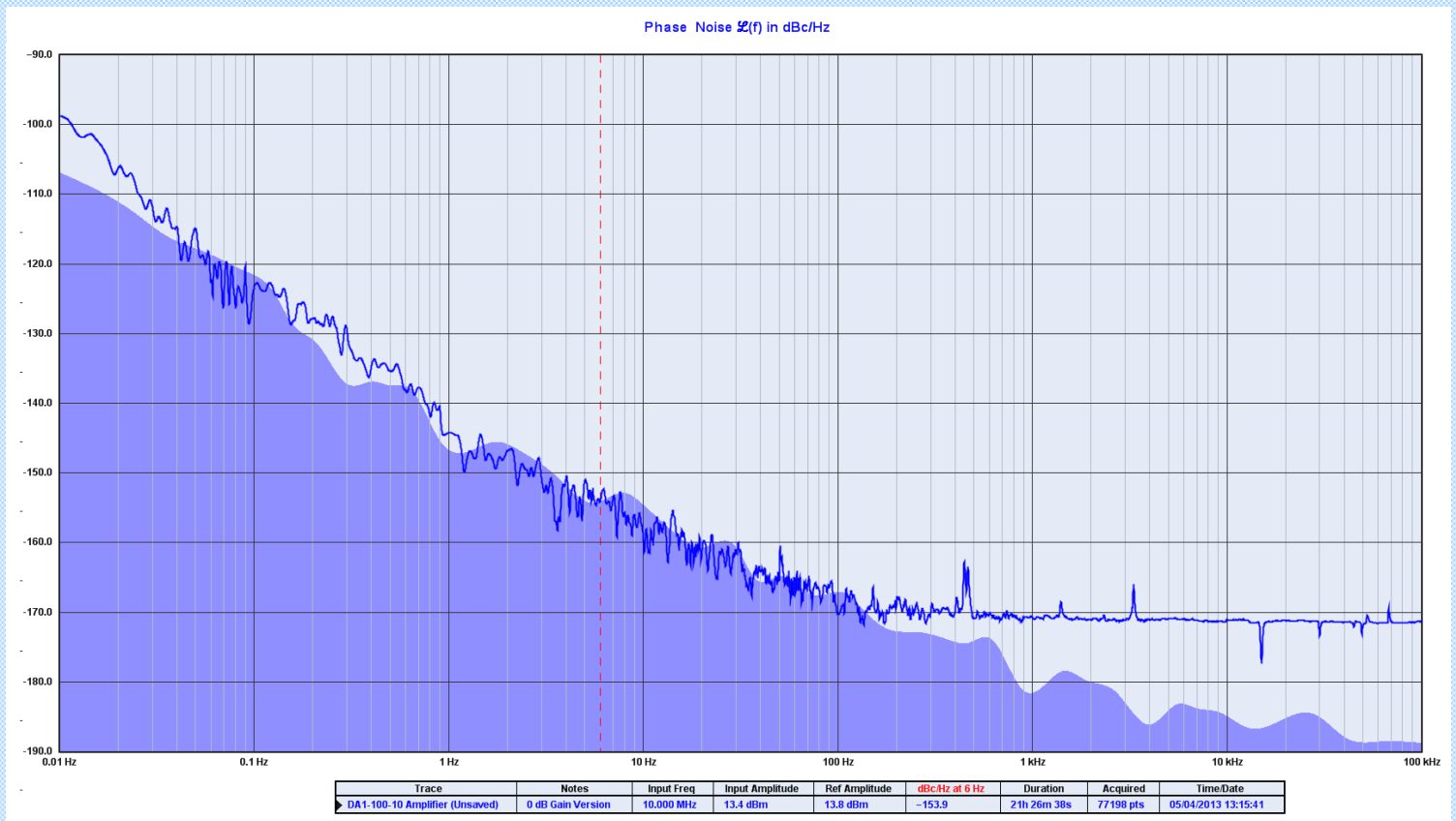
Channel to channel isolation is > 90 dB @ 5 MHz. Output to input isolation is > 130 dB @ 5 MHz

Each output port can be independently set to any level from 0 to > +10 dBm on the standard unit and outputs to +20 dBm are optional available. The ability to set every output to a different level is very useful when dealing with equipment that has different input level ranges. This is a unique feature of this amplifier not found on any other unit.

Phase Noise

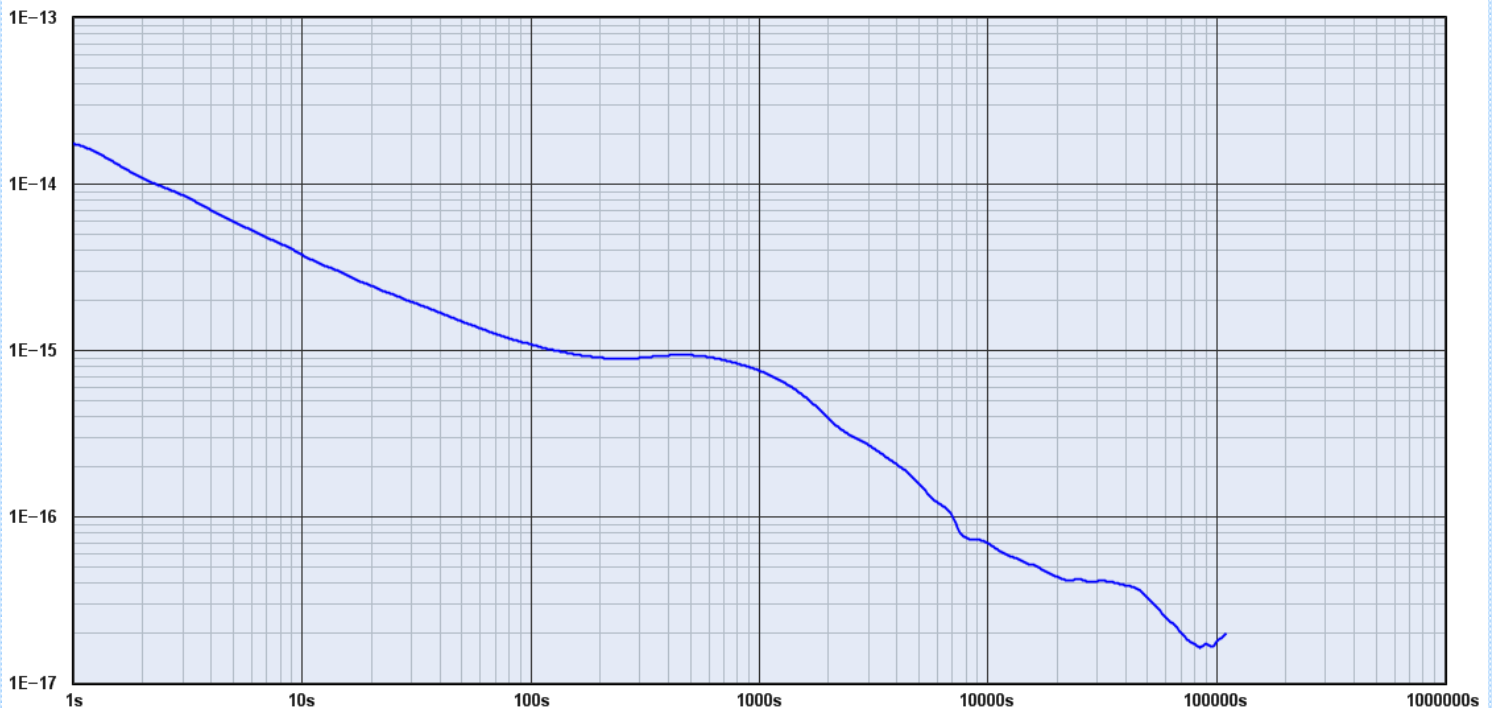
The DA1-100-10-5MHz has very low phase noise and Allan deviation. This enables units to be connected in series without adding any appreciable noise to the reference input. Up to 1000 outputs can be derived from one input using multiple amplifiers, without the need of cascading more than three amplifiers at a time. This keeps the phase noise to a minimum.

A typical plot of phase noise at 5 MHz is shown below in blue. Note this is an amplifier with 0 dB gain. The standard DA1-100-10-5MHz has 3 to 6 dB of gain which raises the noise by a few dB.



Allan Deviation Plot

The plot below shows the Allan deviation plot of the DA1-100-10-5MHz. Allan Deviation is typically 1.8×10^{-14} for $\tau = 1$ second with the noise floor less than 2×10^{-17} .



Phase Stable with matched outputs

The wide frequency bandwidth allows the outputs to have stable phase. The phase stability is typically 5 ps/°C. Also the delay match between outputs is better than 2.2 ns overall and typically less than 350 ps between groups of five outputs.

Alarms

Every output has alarm monitoring. Should the RF level drop on any output, an alarm will be raised. Also, front panel LED's show the status of the alarms. The alarm signals are also available on the rear panel as DC level outputs.

Applications

The DA1-100-10-5MHz Distribution Amplifier is ideal for use in calibration or standard laboratories, space research, satellite systems, communication systems or anywhere where ultimate performance is needed.

Miscellaneous Information

This amplifier is a highly reliable unit. It is housed in a fully screened 19" rack mount case and operates from a 100 to 240 VAC supply (usable 90 to 260 VAC). The amplifier is CE marked for sale within the EEC. It is guaranteed for three years.

Options and Other Amplifiers available from Precision Test Systems

- Fully DC isolated outputs. Useful in preventing ground loops on long cable runs.
- Squarewave outputs. Either at the same frequency as the input, or at different frequencies.
- Multiplied or divided outputs. E.g. 5 MHz, input with 2.5 MHz output. 5 MHz input with 100 MHz output. Any type of multiplication / division can be incorporated.
- Guaranteed phase noise specifications. Measured phase noise specifications supplied with unit.
- Higher output levels, up to +30 dBm.
- Different amplifier gains allowing different input levels from -20 dBm to +30 dBm to be accommodated.
- Additional outputs. Up to 20 outputs in a 1U case or 40 outputs in a 2U case.
- External DC Power Input. The DA1-100-10-5MHZ can also have an external 12VDC input. This can be used to provide back up power. If AC power is lost, the DA1-100-10-5MHZ will immediately switch to the DC supply.

- Redundancy. Two units operate together. If one unit fails, the outputs are automatically switched to the secondary unit.
- Internal backup oscillator. This oscillator is automatically enabled should the input signal fail.
- Two reference inputs. Each reference input with have five isolated outputs derived from it. So the amplifier can operate at two different frequencies at the same time. E.g. 10 MHz and 5 MHz, 5 MHz and 1 MHz.



Amplifier Rear view (with option 04 TNC Connectors).

Precision Test Systems also manufactures the PTS50 and DA1010 series of distribution amplifiers. These models are lower cost alternatives but still give very good performance.

DA1-100-10-5MHz SPECIFICATIONS

| Specification Parameter | Specification | Comments |
|--|---|---|
| Input | | |
| Frequency | 1-5 MHz | See model list below for actual frequencies |
| Bandwidth (2-100 MHz) | ± 3 dB | |
| Impedance / Input VSWR | 50 Ω / < 1.5:1 @ 5 MHz | Typically, < 1.2:1 @ 5 MHz |
| Input Level (standard unit) | +7 dBm to + 20 dBm | AGC Controlled. Optional -20 to +30 dBm |
| Gain (standard unit) | 3 dB (optional -5 to +30 dB) | AGC controlled or fixed gain options. |
| Sinewave Outputs | | |
| Output Waveform | Sinewave | 50 Ω BNC Connector on rear panel |
| Output Frequency | Exactly the same as the input | |
| Output VSWR | < 1.15: 1 @ 5 MHz | |
| Output level (individually adjustable) | Adjustable 0 dBm to > +10 dBm | Outputs to +20 dBm optionally available |
| Output Level Stability | < 0.05 dB / °C | Typically, < 0.02 dB / °C |
| Harmonic Distortion (10 dBm input) | -20 dBc | Typically -25dBc (optional; -50 dBc) |
| Spurious Outputs (> 500 kHz) | -125 dBc | Typical |
| Channel to Channel Isolation | > 90 dB @ 5 MHz | |
| Input to Output Isolation | > 130 dB @ 5 MHz | |
| Delay match between outputs | < 2.5 ns (<500 ps / 5) | < 500 ps within group of 5 outputs |
| Temperature Stability of delay | 10 ps/°C | Typically, 5 ps/°C |
| Slave Output | | |
| Slave Output | Passive output derived from input | Level = input level - 7 dB. |
| Allan Deviation (typical @ 5 MHz) | | |
| Allan Deviation | < 4 x 10 ⁻¹⁴ (1 sec) | < 2 x 10 ⁻¹³ at 0.1 sec. Floor < 3 x 10 ⁻¹⁷ |
| Phase Noise for standard unit (typical @ 5 MHz) | | |
| Phase Noise (@ offset frequency) with +10 dBm input and +10 dBm output | @ 1 -135 @10 -148 @100 -157 @1k -163 @10k -165 @100k -166 | This is for a unit with ten outputs and a gain of 3 to 6 dB |
| Phase Noise (@ offset frequency) with +13 dBm input and +13 dBm output | @ 1 -140 @10 -157 @100 -166 @1k -170 @10k -171 @100k -171 | This is for a unit with five outputs and a gain of 0 dB |
| General | | |
| Power (AC) | 100 - 240 VAC (usable 90 - 260) | 50 Watts max |

| | | |
|---|---------------------------------|--|
| Size and weight (5 to 20 outputs) | 483 x 300 x 44 mm and 2.8 kg | Width x Depth x Height |
| Size and weight (20 to 40 outputs) | 483 x 300 x 88 mm and 3.5 kg | Width x Depth x Height |
| Operating / Storage Temperature | -10 to +50 °C / -20 to +80 °C | Humidity < 90% non-condensing |
| Alarm Output | Alarm Outputs on rear panel | |
| Options (not all options can be fitted at the same time) | | |
| Option 01 | Dual changeover alarm relay | Activated in the event of an alarm |
| Option 02A / B | Ground Isolated Input / Outputs | |
| Option 03 | Redundancy | Requires two units |
| Option 04 / 05 / 05B | TNC / SMA/ N type connectors | Replaces standard BNC connectors |
| Option 06 | Guaranteed Phase Noise | Plots supplied with unit |
| Option 07 | UKAS traceable certificate | |
| Option 08 | Increased Output levels | Various options to +20 dBm available |
| Option 09, 09A, 09B, 09C, 09D | Additional sinewave outputs | 20 o/p's in all in 1 U case. 40 outputs in 2U case. AGC range 10-19dBm |
| Option 10 | Squarewave outputs | TTL/CMOS or ECL output levels |
| Option 11 | Divided frequency output | E.g. 2.048 MHz, 1MHz, 100 kHz, 1 pps etc. |
| Option 12 | Multiplied output | E.g. X2, X5, X10, X100. |
| Option 13 | Low Pass filter on output | Improved harmonic rejection |
| Option 14 | External DC input | Nominal 12V external DC. |
| Option 16-XXX | Internal backup oscillator | XXX = frequency in MHz. |
| Option 17-XXX | Different Gain Levels | Customer to advise gain requirement |
| Option 18 | Delete five outputs | Negative option. Reduces price. |
| Option 19 | Second External Input | Automatic switchover if 1 st input is lost |
| Option 20 | Two reference inputs | With two sets of five outputs |
| Option 22 | Additional internal amplifier | Increases sensitivity to -20 dBm |
| Option 23 | Bandwidth optimized | Specify actual frequency bandwidth |
| Option 25 | 2 inputs with 8 outputs each. | Customer special option |
| Option 26 / 26B | Fiber optic input and outputs | |
| Option 27 | Ethernet interface for alarms | |

| Precision Test Systems | | |
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Further information available from www.ptsyst.com. Specifications and features subject to change without notice (090816)