



# Key Features

- 13 MHz Operation. Other frequencies from 1 MHz to 150 MHz are available.
- AGC Level Controlled. Output level remains stable to 0.02 dB even if input varies from -20 to +30 dBm.
- AGC can be disabled if required. Amplifier then has fixed gain. Different gains can be made upon request
- Five, Ten or Fifteen sinewave outputs. Each output can be <u>independently</u> set to 0 dBm to > +13 dBm.
- Alarm monitoring. <u>All outputs</u> have alarm monitoring. Indication by LEDS or rear panel DC outputs.
- Ultra low phase noise. Typically -134 dBm @ 1 Hz with floor noise to -171 dBc/Hz available.
- 90 dB channel isolation and 130 dB reverse isolation. Protects reference input and prevents cross-talk.
- 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.

### **General Description**

TEST SYSTEMS

The DA1-100-10-13MHz is a 13 MHz distribution amplifier. It can be used to synchronize up to fifteen instruments to a frequency reference input. The reference input will typically be an OXCO, Rubidium, Caesium or Hydrogen Maser Frequency Standard.

The DA1-100-10-13MHz has features not found in any competitive unit. This makes the DA1-100-10-13MHz the industry's leading distribution amplifier.

The DA1-100-10-13MHz has outstanding low phase noise. Therefore the DA1-100-10-13MHz will not add any noise to the reference input.

Phase noise is typically <-134 dBc @ 1 Hz. 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, the DA1-100-10-13MHz accepts inputs from +7 dBm to +20 dBm (-20 dBm to +30 dBm optional) and provides outputs from 0 dBm to > +13 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 have 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, ten or fifteen sinewave outputs. Each output is completely isolated from the input and each other. Therefore the reference oscillator connected to the DA1-100-10-13MHz's input is protected against load variations, short circuits etc. that may be applied to the outputs.

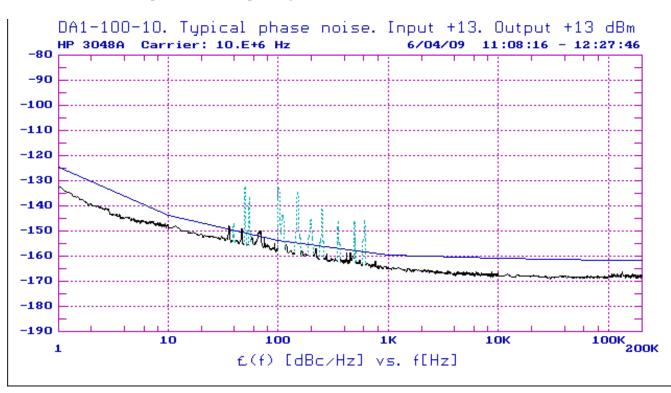
Channel to channel isolation is > 85 dB at 13 MHz. Output to input isolation is > 120 dB at 13 MHz.

Each output port can be <u>independently</u> set to any level from 0 to > +13 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 have different input level ranges. Over 1000 outputs can be obtained without any significant increase in close-in noise.

### **Phase Noise**

The DA1-100-10-13MHz has very low phase noise. This enables units to be connected in series without adding any appreciable noise to the reference input. With only three DA1-100-10-13MHz's in series, up to 1000 outputs can be derived from one input.

A typical plot of phase noise is shown below. The blue line is the DA1-100-10-13MHz's specifications. The light blue lines are line related, spurious outputs. These spurs (50 or 60 Hz) are present in any equipment connected to the AC 115 or 230 VAC supply. The black line is the actual phase noise. The far out noise (offsets > 1 kHz) can even be improved upon by careful selection of the output level and amplifier gain. Floor noise to -171 dBc/Hz is achievable.



#### **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.

### <u>Alarms</u>

<u>Every</u> output has alarm monitoring. Should the RF level drop on any output, an alarm will be raised. Also front panel LED's shows the status of the alarms. The alarm signals are also available on the rear panel.

## **Applications**

The DA1-100-10-13MHz 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**

The DA1-100-10-13MHz is a highly reliable unit. The DA1-100-10-13MHz 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 DA1-100-10-13MHz is CE marked for sale within the EEC.

#### **Options and Other Amplifiers available from Precision Test Systems**

- Fully 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. 10 MHz, input with 5 MHz output. 10 MHz input with 100 MHz output. Any type of multiplication / division can be incorporated.
- Low pass filter on outputs. This reduces the harmonic output.
- Guaranteed phase noise specifications. Measured phase noise specifications supplied with unit.
- Higher output levels, up to +20 dBm.
- Different amplifier gains allowing different input levels from -20 dBm to +30 dBm to be accommodated.
- Additional five or ten outputs, giving fifteen outputs in all
- External DC Power Input. The DA1-100-10-13MHz can also have an external 12VDC input (12 15 VDC). This can be used to provide back up power. If AC power is lost, the DA1-100-10-13MHz will immediately switch to the 12VDC 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 DA1-100-10-13MHz can operate at two different frequencies at the same time. E.g. 1 MHz and 5 MHz, 5 MHz and 10 MHz.



DA1-100-10-13MHz Rear view (with option 04 TNC Connectors).

Precision Test Systems also manufacturers the PTS50 and DA1010 series of distribution amplifiers. These models are lower cost alternatives to the DA1-100-10-13MHz but still give very good performance.

| Specification Parameter | Specification                          | Comments                                |  |
|-------------------------|--|---|--|
|                         | Input                                  |   |  |
| Frequency               | 13 MHz                                 | Wideband Frequency Input                |  |
| Bandwidth               | $\pm$ 250 kHz for $\pm$ 1 dB variation |   |  |
| Impedance / Input VSWR  | 50 Ω / < 1.4:1                         |   |  |
| Input Level             | +7 dBm to + 20 dBm                     | AGC Controlled. Optional -10 to +30 dBm |  |
|                         | Sinewave Outputs                       |   |  |
| Output Waveform         | Sinewave                               | $50 \Omega$ BNC Connector on rear panel |  |
| Output Frequency        | Exactly the same as the input          |   |  |

#### DA1-100-10-13MHz SPECIFICATIONS

| Output VSWR                                      | < 1.2: 1 @ 13 MHz  |   |
|--|--|---|
| Output level (individually adjustable)           | Adjustable 0 dBm to $> +10$ dBm                                    | 0  dBm to  +13  dBm with > +10  dBm input         |
| Output Level Stability                           | < 0.05 dB / °C   | Typically < 0.02 dB / °C                          |
| Harmonic Distortion (10 dBm input)               | -25 dBc  | Typically -35 dBc @ 5 MHz                         |
| Spurious Outputs (> 500 kHz)                     | -125 dBc   | Typical   |
| Channel to Channel Isolation                     | > 90 dB @ 13 MHz.  |   |
| Input to Output Isolation                        | > 130 dB @ 13 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  |   |
| Allan Deviation                                  | $< 5 \times 10^{-14} (1 \text{ sec})$                              | Calculated from phase noise                       |
|  | Phase Noise  |   |
| Phase Noise (dBc/Hz)                             | -125 / -144 / -154 / -160 /<br>-161 / -162                         | 1 /10 / 100 /1k /10k/100k Hz offsets              |
| Phase Noise (dBc/Hz) typical with +13            | -130 / -145 / -154 / -162 /  | 1 /10 / 100 /1k /10k/100k Hz offsets.             |
| dB Input and +13 dBm Output                      | -164 / -164  | Options to -170 dBc available.                    |
|  | General  |   |
| Power (AC)                                       | 100 - 240 VAC (usable 90 - 260)                                    | 50 Watts max                                      |
| Size and weight                                  | 483 x 300 x 44 mm and 2.8 kg                                       | Width x Depth x Height                            |
| Ambient Operating Temperature                    | -10°C to +40 °C  |   |
| Alarm Output                                     | Alarm Outputs on rear panel  |   |
| -  | (not all options can be fitted at th                               | e same time)                                      |
| Option 01  | Dual changeover alarm relay  | Activated in the event of an alarm                |
| Option 02A                                       | Ground Isolated Input  |   |
| Option 02B                                       | Ground Isolated Outputs  |   |
| Option 03  | Redundancy   | Requires two units                                |
| Option 09  | Additional five sinewave outputs                                   | 15 o/p's in all. 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, 5 MHz, 1 pps etc.           |
| Option 12  | Multiplied output  | E.g. X2, X5, X10, X100.                           |
| Option 12  | Low Pass filter on output  | Improved harmonic rejection                       |
| Option 14  | External 12VDC input   | Operates from 12.0 to 15.0 VDC                    |
| Option 15  | Internal temperature controlled<br>fan for increased ambient temp. | Allows operation to 50 °C                         |
| Option 16-XXX                                    | Internal backup oscillator   | XXX = frequency in MHz.                           |
| Option 17-XXX                                    | Different Gain Levels  | Customer to advise gain requirement               |
| Option 19  | Second External Input  | Automatic switchover if $1^{st}$ input is lost    |
| Option 20  | Two reference inputs   | With two sets of five outputs                     |
| - <u>r</u> · · · · · · · · · · · · · · · · · · · | Precision Test Systems   | II  |
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