

ARORA

Arora Technologies (P) Limited



Operation Manual
Ultrasonic Pulser Receiver
APR-20

1. General Description

The Microprocessor Based Ultrasonic Pulser Receiver Model APR-20 is compatible with other Ultrasonic Instruments and allows great flexibility when configuring systems for high frequency application or for attenuative materials. This is an ultrasonic spike pulser/receiver unit. When combined with an oscilloscope and appropriate transducers it provides a low cost, ultrasonic measurement capability.

Applications include:

- Probe/Transducer Characterization in Research & Development.
- Non-Destructive material testing.
- Flaw Detection
- Thickness Gauging
- Sound Velocity Measurements (for computation of elastic constants)
- Other measurements used to monitor materials or processes

The pulser section of this instrument generates a negative spike pulse, when applied to an ultrasonic transducer, are converted into short ultrasonic pulses. The ultrasonic pulses are received either by the transmitting transducer after partial or total reflection (pulse-echo method), or by a separate receiving transducer (through-transmission method). The voltage signals produced by the transducer, which represent the received ultrasonic pulses, are amplified by the receiver section. The amplified RF signal is available as output for display on an oscilloscope.

2. Unpacking and Inspection

The APR - 20 is designed and manufactured as a precision instrument, and under normal conditions it will provide long, trouble-free service. However, the user should inspect the instrument immediately upon receipt for damage incurred during shipment. Follow the procedure below to ensure the unit is functioning and is in good condition.

1. Unpack electronic unit and visually check it for physical damage.
2. Plug the power cable provided to the rear panel. Press ON/OFF key on keyboard. Parameters are displayed on LCD as soon as the unit is started.
3. The units are carefully inspected before shipment. Instruments failing to operate as described above are indicative of damage in transit. Proceed as outlined in the Warranty Section.

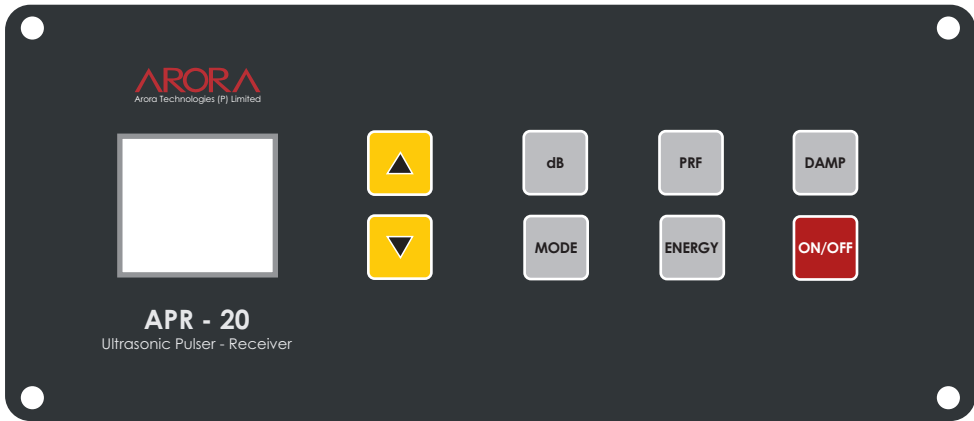
3. Instrument Controls & I/o Controls

This section of the manual, which is broken down into two sections: 3.1-Front Panel and 3.2-Rear Panel describes the functionality of the instrument's controls, input and output signals, and connectors.

3.1- Front Panel

- Power Key (ON/OFF)
- Pulser Voltage (ENERGY)
- Pulser Mode (MODE)
- Pulser Damping (DAMP)
- Pulse Repetition Frequency Control (PRF)

- Gain (dB)
- Slew Keys Up/Dn ▲/▼



3.1.1- Power Key (ON/OFF)

With the APR-20 connected to the mains supply using the power cable, the power switch energizes the internal power supplies. The LCD display should be on when the ON/OFF key is pressed. Same for the OFF condition, press key for few milliseconds instrument will get turned OFF.

3.1.2- Pulsar Voltage (ENERGY)

The Pulsar Voltage Switch provides two positions and is used to select the optimum pulse amplitude for a given transducer. The Model APR-20 selects a controlled pulse voltage to regulate energy level settings. 100V and 450V options are given which respectively show Lo and Hi. Please note the following recommendations:

- Use the minimum pulse voltage that gives good results.
- Reserve maximum pulse energy for transducers with centre frequencies below 5MHz.
- Reduce pulse energy for higher frequency transducers, which generally have less massive actuating elements and are more easily overloaded.
- Take special care of composite element transducers.

3.1.3- Pulsar Mode (MODE)

The Mode key selects between Pulse echo Mode(T+R) & Through transmission or dual element (T-R)

3.1.4- Pulsar Damping (DAMP)

Damping controls the transducer's ringing to improve signal clarity, allowing for before resolution and reduce echo interference. it can be switched between Lo/Hi depending on the application.

3.1.5- Pulse Repetition Frequency Control (PRF)

This control regulates the frequency at which excitation pulses are applied to the transducer through six crystal controlled calibrated settings from 500 to 1000Hz. When measurements are being made in relatively thin material (up to 1 inch or 25mm) or in thicker materials that have high ultrasonic attenuation. This provides a bright oscilloscope trace at fast sweep rates.

As the thickness of the test piece increases, the PRF should be decreased. When the PRF is excessive the baseline noise on the oscilloscope display will increase and appear to oscillate or vary with time. This is commonly referred to as "wrap around". It is sometimes easy to confuse true scattering noise resulting from grain structure, or other scattering sources with noise induced by repetition rate. Unlike noise induced by the material, wrap around noise usually appears to vary with time while the transducer is held in a fixed position and greatly reduces or disappears completely when the repetition rate is decreased.

3.1.6- Gain (dB)

This control, used in conjunction with the vertical sensitivity control of the oscilloscope, provides a wide range in the adjustment of display sensitivity. The control provides a total adjustment range of 110dB. The output of the amplifier is linear up to 2.5Vpk-pk.

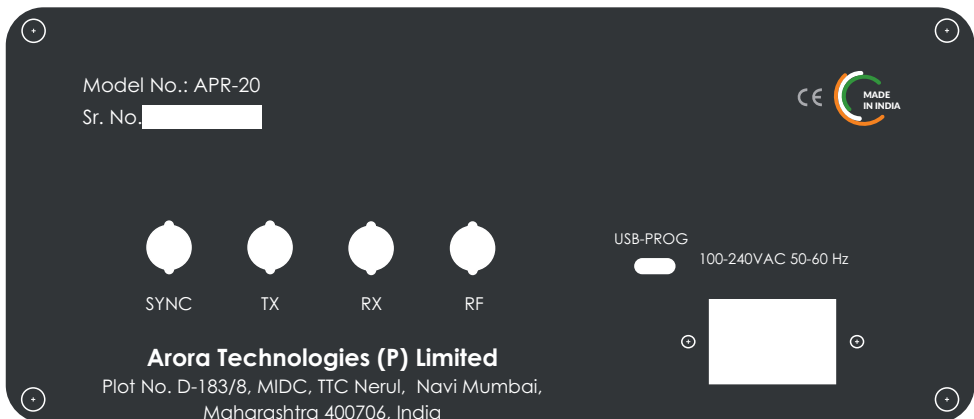
3.1.7- Slew Keys Up/Dn ▲/▼

This Control used to increase or decrease the parameters value which displays on LCD.

3.2 - Rear Panel

Rear Panel include the following connector:

- SYNC
- T/R Connector (TX)
- R Connector (RX)
- RF Out
- Type-c (only for manufacturer)
- Power supplying socket (100-240VAC 50-60 Hz)



3.2.1- SYNC

This connector provides a positive polarity sync pulse signal that can be used to trigger an oscilloscope or other signal monitoring/recording instrument.

3.2.2- T/R Connector (Tx)

The transducer is connected to Tx Connector for transmit/receive or pulse-echo operation. Both the pulser and receiver are connected to the Tx Connector when the MODE is in T+R. If the MODE is in T+R, then only the excitation pulse is available at the Tx Connector for the transmitting transducer and the receiver is disconnected. For through-transmission applications, a second transducer is connected to the Rx Connector for receiving ultrasonic signals. In the case of dual element transducers, the transmit side should be connected to the Tx Connector, the receiver side should be connected to the Rx Connector and the Mode set to T-R.

3.2.3- R Connector (Rx)

With the MODE T-R, the receiver is internally connected to the Rx connector. For through-transmission, or pitch-and-catch applications, the receiving transducer is, therefore, attached to the Rx Connector.

3.2.4- RF Out

The amplified RF signal is available at the RF OUT Connector. A 50-ohm coaxial cable should be connected from the RF OUT Connector to the required destination, i.e. vertical amplifier of the oscilloscope, or to the signal input of other data acquisition or signal conditioning equipment. The input impedance of the device connected to the cable should be 50 ohms. If a 50-ohm input is not provided on the user instrumentation, then a 50-ohm feed through terminator should be employed at the instrumentation input.

4. Specifications

This section of the manual, which is broken down into two sections: 3.1–Front Panel and 3.2–Rear Panel describes the functionality of the instrument's controls, input and output signals, and connectors.

4.1 - Pulser

Pulser Type	Negative Spike Pulse
Pulse Amplitude	100V/450V (Lo/Hi selectable)
Pulser Energy	Selectable in 2 steps
Damping	50 Ω & 1,000 Ω (Lo/Hi)

4.2 - Receiver

Operating Mode	(T+R) & (T-R)
PRF	500HZ to 1000HZ with 100Hz steps
Bandwidth	0.5 to 20MHZ
Gain	0 to 110dB with 1dB step
Output Impedance	50 Ω
Output Voltage	2.5V peak -peak

4.3 - Unit Specifications

Power	Power cable
Dimensions	240 W x 125 H x 230L (mm)
Weight	With Power cable 2.32 Kg (5.14 lbs) W/O Power cable 2.08 Kg (4.56 lbs)
Operating Temperature	-45°C to 85°C

5. Operations

5.1- Oscilloscope Requirement

A wide variety of oscilloscopes may be used with the Model APR -20 Pulser/Receiver with good results. The final choice may be dictated by availability, cost, portability, anticipated applications, etc. In order to derive the full capabilities of the APR -20, an oscilloscope with a 100MHz analog bandwidth and delayed sweep function is most favorable.

For digital oscilloscopes, a minimum of 5 times sampling rate is suggested (i.e. a 20MHz application would require a minimum 100MHz sampler rate). To observe the excitation pulse (Main Bang) directly on the oscilloscope, a high voltage probe such as Tektronix or equivalent should be used. There are many oscilloscopes available that provide good performance.

5.2- Initial Set-up

After completing the unpacking procedure, connect the APR-20 to an oscilloscope and transducer as shown in Figure mentioned below. Connect Oscilloscope CH2 to SYNC connector of APR-20 which is given on the back side of the instrument. Adjust the parameters as listed below:

Oscilloscope

- Vertical Sensitivity: 0.2V/Div
- Horizontal Sweep Rate: 1uS/Div
- Connect RF out to channel 1
- Trigger Oscilloscope on Channel2 where SYNC signal is connected

Pulser/Receiver

- Mode: T+R
- PRF : 500
- Energy : depending on probe & application
- Damp : Lo
- Gain : as per requirement



When the initial set-up is complete, couple a transducer to a smooth steel or aluminum block about 25mm thick. Use lightweight oil, glycerin or other suitable couplant to couple sound from the transducer to the sample. The first backwall echo should appear after the Main Bang or excitation pulse. After the first echo, a number of multiple echoes will be noticed.

Warranty

Damage in transit: The instrument should be examined immediately upon receipt for evidence of external or concealed damage. The carrier making the delivery should be notified immediately of any such damage, since the carrier is normally liable for damage in shipment. Packing materials, waybills, and other such documentation should be preserved in order to establish claims. After such notification to the carrier, notify Arora Technologies of the circumstances so that we may assist in damage claims and in providing replacement equipment when necessary.

Warranty: The APR-20 is guaranteed by Arora Technologies to be free from defects in materials and workmanship for a period of twelve months from the date of shipment, provided that the equipment has been used in a proper manner as described in this instruction manual. Repairs or replacement, at Arora Technologies discretion, will be made without charge at its plant during this warranty period. Shipping expenses to Arora Technologies are to be paid by the customer; shipping expenses to return the repaired equipment will be paid by Arora Technologies.

Arora Technologies reserves the right to modify its products without incurring the responsibility for modifying previously manufactured products.

Arora Technologies does not assume any liability for the results of installations, as these circumstances are not in our control.

Any attempt to repair, modify, or adjust the instrument other than as described in this manual will void the warranty and a charge will be made if repairs are required after such attempts.

Cautions

- Do not touch the pulser output connector during operation.
- Use 50 Ω coaxial cables unless otherwise specified.
- This equipment must be connected to a properly grounded AC outlet.
- Switch off the equipment from the mains supply when not in use.
- Do not operate the pulser without a properly connected transducer or dummy load.

Thank you for your business!

WE trust, we have catered as per your expectations...

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