CHAR SYSTEM
OPERATION & TRAINING

Overview of Hardware and Software

LEARNING OBJECTIVES

- Introduction to CHAR System hardware and software.
  - Identify Instrumentation and function.
  - Accessories that are available.
  - Basic software structure.
  - How plant data is tracked.
- At the conclusion of this section, the students will be familiar with the basic nomenclature and application of the system, but are not yet expected to operate the CHAR System on their own.

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CHAR SYSTEM DESCRIPTION

The CHAR System is an automated system using the latest technology

- Automatic measurements using pre-programmed test sequences
- Systematically characterizes any electrical circuit
- Used to locate and resolve cable circuit problems

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CHAR SYSTEM FRONT PANEL

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BACK OF CHAR SYSTEM

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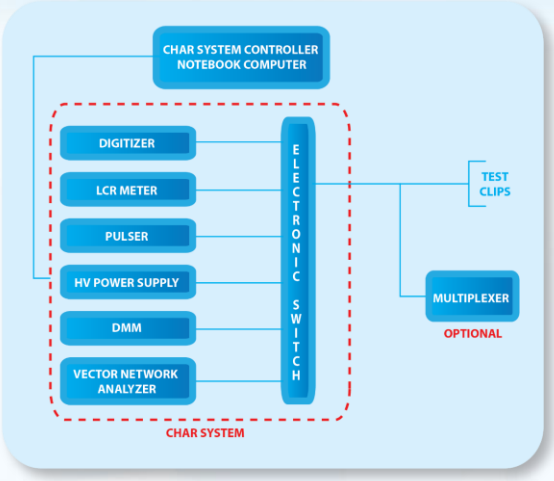
BLOCK DIAGRAM OF THE CHAR SYSTEM (WITH OPTIONAL VNA)



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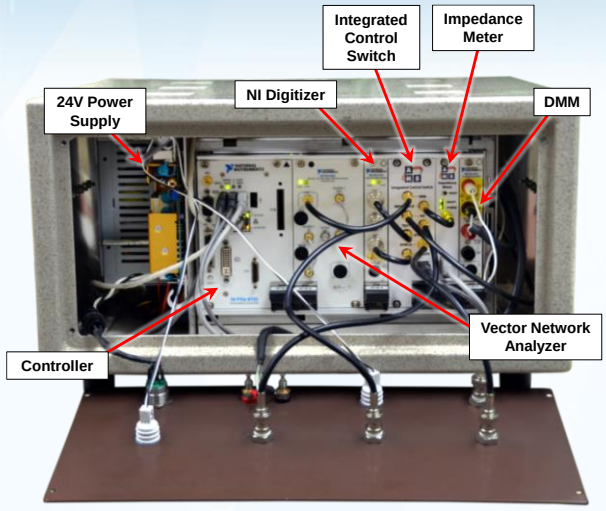
CHAR SYSTEM INTERNALS (FRONT)



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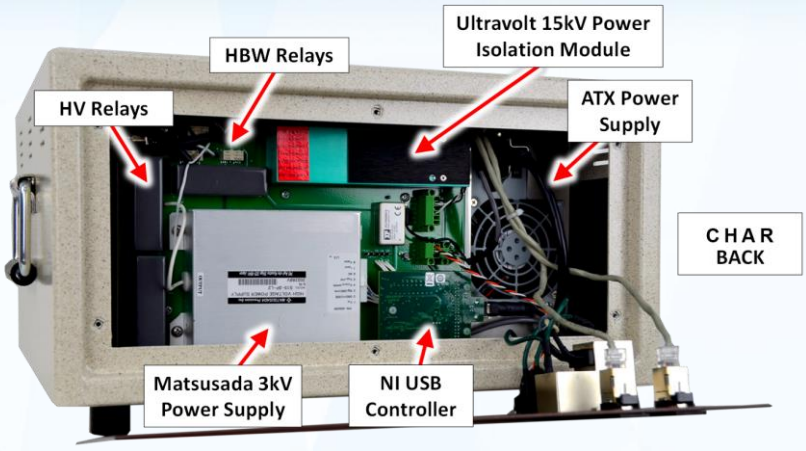
CHAR SYSTEM INTERNALS (BACK)



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CHARACTERIZATION TESTS

1. Voltage – AC/DC coupled voltage waveform acquired using the digital oscilloscope.
2. DC Resistance - Measurement of the DC resistance value using the DMM.
3. Impedance - Measurement of the Inductance (L), Capacitance (C), and AC Resistance of the circuit at 100 Hz, 1kHz, and 10 kHz using the LCR meter.
4. TDR Signature – Records circuit reflection from pulse input. Provides distance to impedance changes in cable and end device.
5. FDR Signature – Detects and locates impedance and permittivity changes in cable insulation from a sweep of sine waves.
6. Insulation Resistance (IR) - Measurement of the insulation resistance at a pre-selected DC voltage level.

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NUMEROUS ADVANTAGES TO USING CHAR SYSTEM

- **Tests can be preplanned with automatic set up of test equipment**
- **Data is stored in digital format for archiving and retrieval**
- **Standard reports are available for trending/analysis**
- **Test will automatically compare current results to prior data**
- **AMS can compare the site data with data taken at other sites on similar systems**
- **Plant personnel can focus on performing testing rather than fighting with test equipment**

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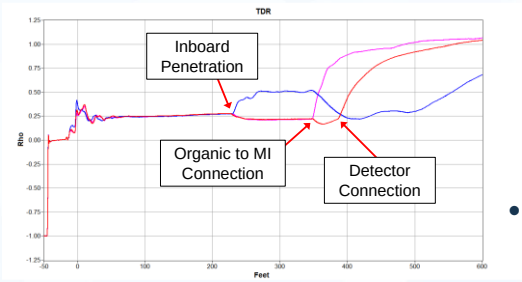
THE TDR TEST LOCATES CABLE, CONNECTOR, AND END DEVICE DISTANCE TO FAULT



- **TDR Pulser**
  - Square wave pulse
  - 2V amplitude (4V peak-to-peak)
  - 650 pS rise time (into 50Ω)
  - Rho (ρ) resolution - 488.4μρ
- **Dynamic TDR**
  - Continuous pulsing
  - Automatically capture and store impedance anomalies

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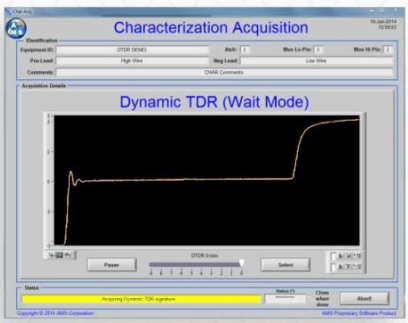
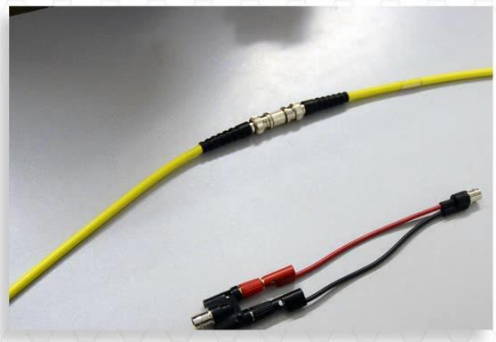
LOCATE INTERMITTENT FAULTS IN REAL TIME WITH DYNAMIC TDR (DTDR)





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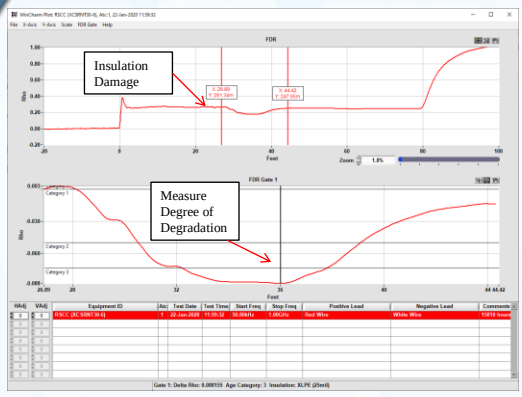
THE FDR TEST LOCATES CABLE INSULATION AGING AND PROVIDES DISTANCE TO FAULT



- **FDR Sweep of Sinusoid Waves**
  - User Controlled Frequency Spans
    - (50 kHz to 1 GHz) Default
    - 20,000 Data Points
  - Output Power (+15 dBm or 1.25 V RMS)
  - Power Step Resolution 0.01 dB (into 50Ω)
  - Resolution 1 Hz
  - Receiver Dynamic Range 90 dB to 110 dB

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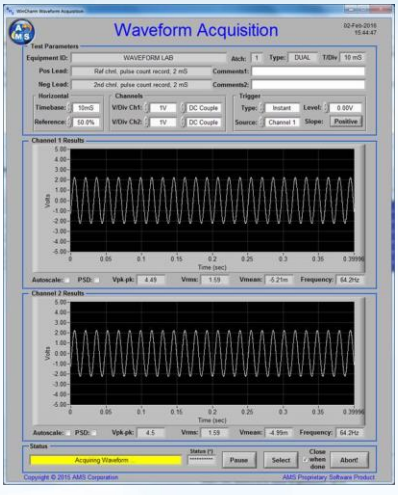
DIGITAL OSCILLOSCOPE



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CALIBRATION OF CHAR SYSTEM

- Setup Characterization System
- Start WINCHARM Version 6 software
- Select Calibration Tab
- Calibrate instrumentation (follow prompts)
- Verify calibration passed or accept new baseline calibration record

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REVIEW

- In this section we:
  - Explored what is inside the CHAR System
  - Explained what each component does, and how component data interfaces to system control
  - Demonstrated how to calibrate the CHAR System prior to testing

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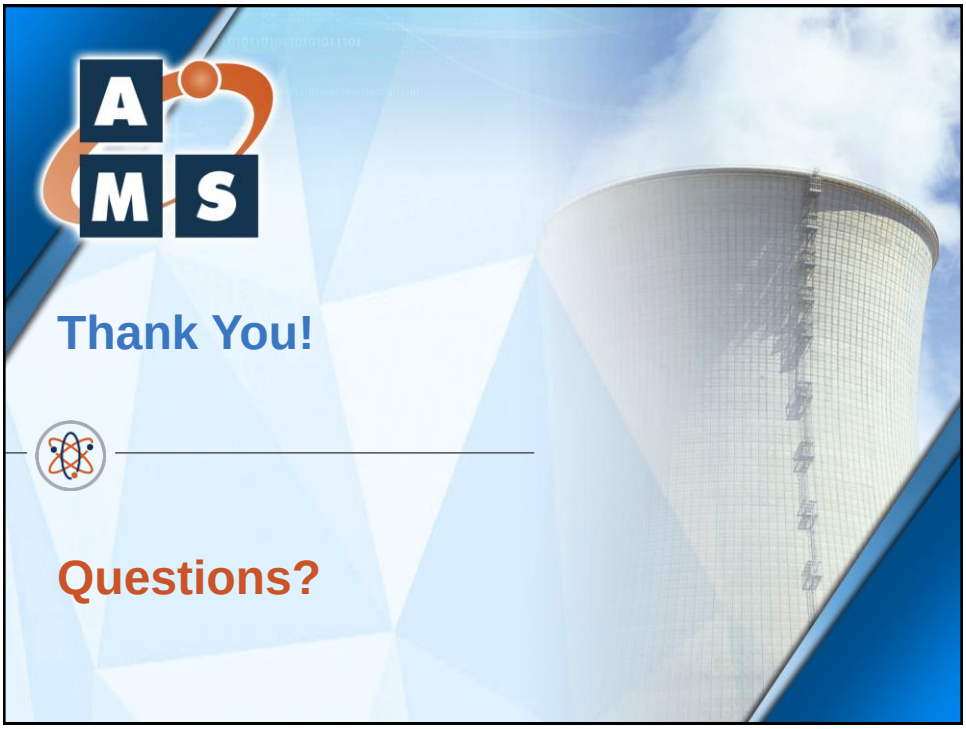
Thank You!
Questions?