



*Designed for **remote monitoring** of inaccessible structures or equipment*

RCM

EDM-RCM

ENGINEERING DATA MANAGEMENT
REMOTE CONDITION MONITORING

EDM Remote Condition Monitoring

Topics Covered | Remote Condition Monitoring

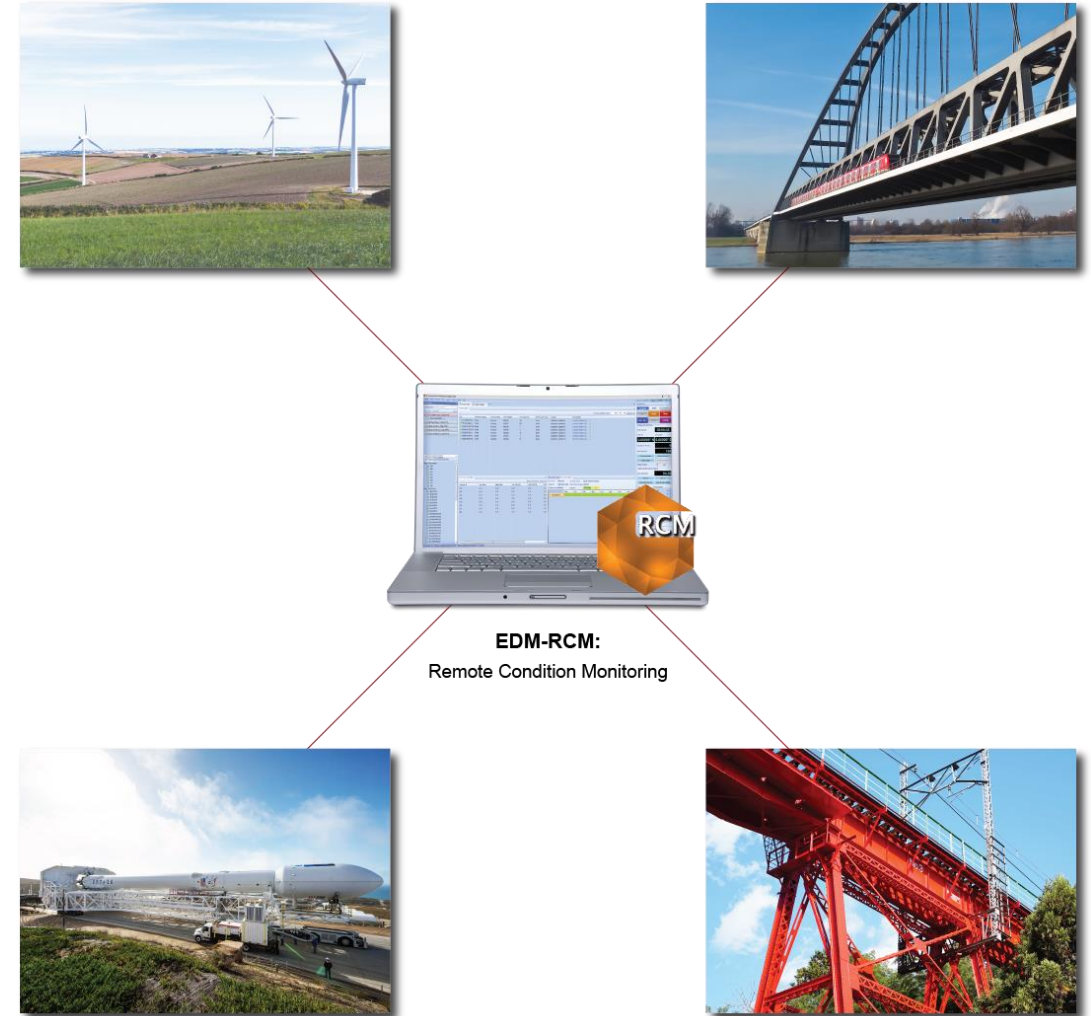


- ❑ What is RCM?
- ❑ How does RCM work?
- ❑ Software Requirements
- ❑ Hardware Requirements
- ❑ Deployed example
- ❑ Competitor Analysis

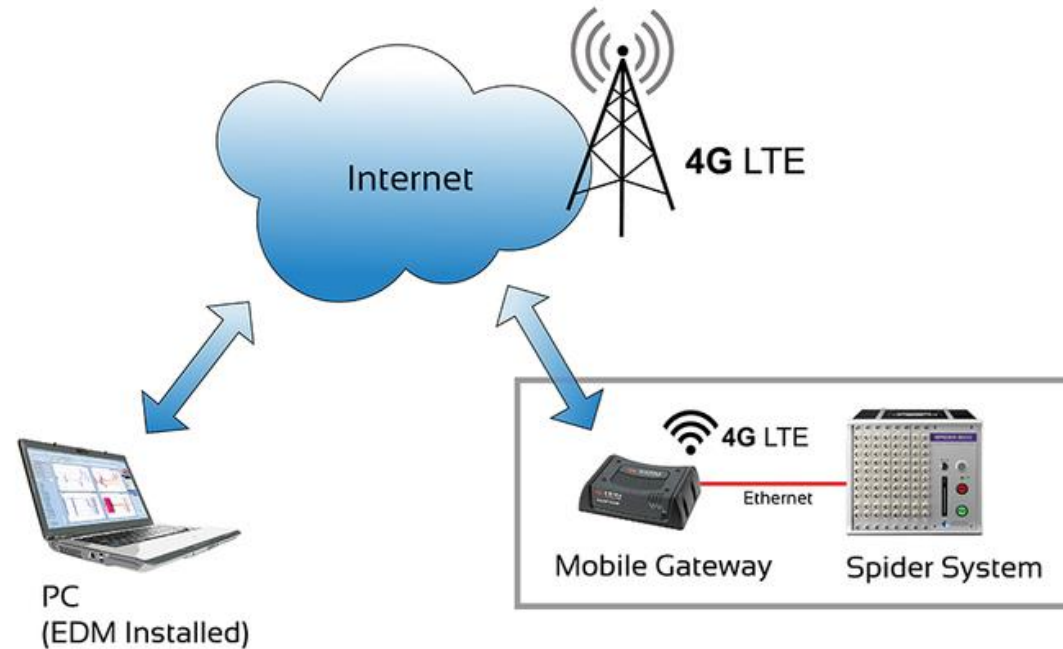
Remote Condition Monitoring | Overview

Remote Condition Monitoring | Overview

- ❑ Simultaneously monitor vibrations on multiple remote structures located across the world
- ❑ Includes all the powerful DSA functions
 - ❑ Dynamic data acquisition, real time signal analysis and time waveform recording
 - ❑ Scalability up to 512 channels with time synchronization
 - ❑ Alarm, Limit and trigger functionality with user customizable event actions
- ❑ Testing locations can be fixed (Railway bridges or Windmills) or Mobile (Sensitive equipment being transposed on the road)
- ❑ Works without a dedicated PC (Spider Black Box mode)



RCM | How does it work?



PC w/EDM RCM ↔ Internet ↔ Cell Network ↔ Router ↔ Spider System

RCM | Network Connection Types

☐ Local Area Network

- Monitor machines within a Local Area Network

☐ Public Static IP through Mobile Data Network

- Monitor vibrations on sensitive equipment transported on the road
- Monitor structures / machines remotely located with no access to internet

☐ IP address / VPN through Internet

- Monitor structures or machines within a plant with internet access

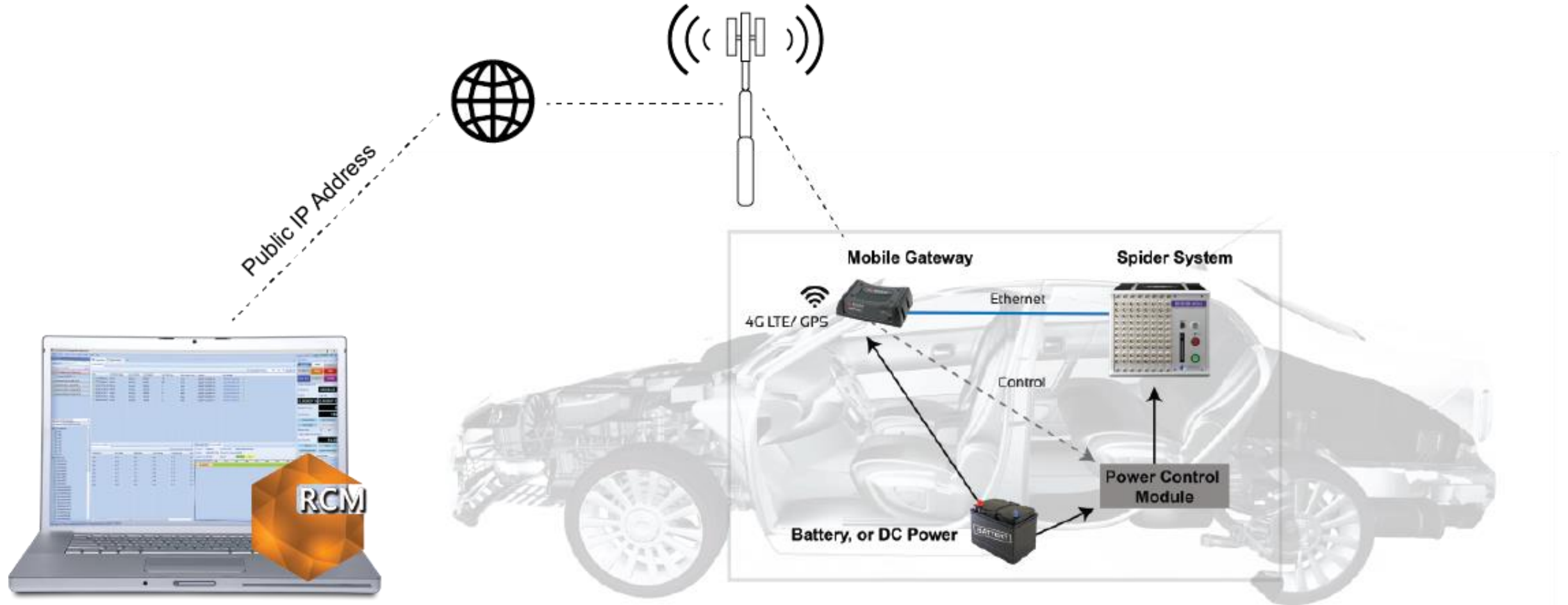
RCM | Local Area Network



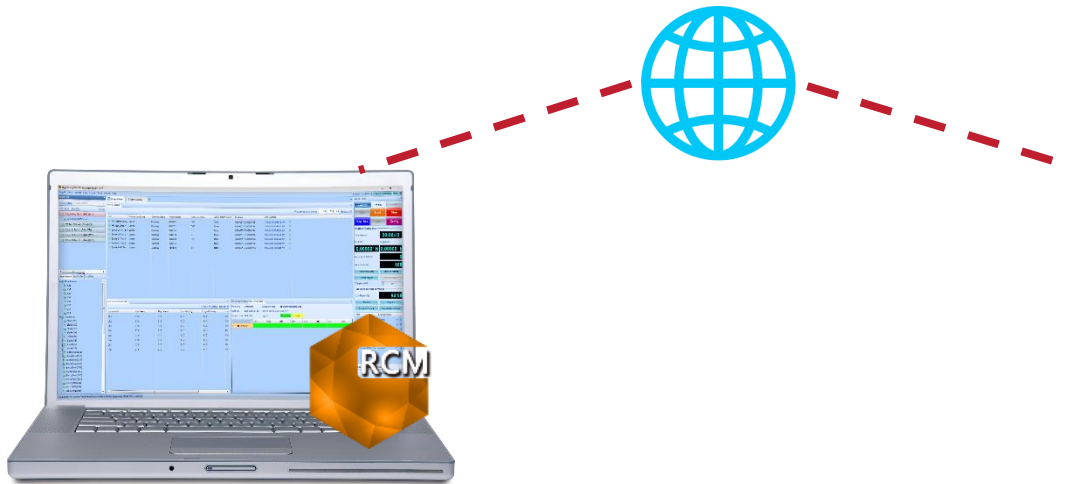
Local Area Network



RCM | Mobile Gateway



RCM | Internet



Remote Condition Monitoring | Hardware

RCM | Hardware



- WIFI gateway using cellular data
 - Sierra Wireless RV50
 - SIM card with cell plan
- Spider Analyzer
 - S20, S80X, S80Xi, S81, S81B, S80SG
- Power Source for module and router
- PC with internet connection
- Optional casing for environmental protection

RCM | Required Components

- ❑ Single front-end Spider 80X/80Xi/81/20 or high channel configuration of Spider 80X/Xi – All Spiders are capable of running in Black Box mode
- ❑ Network Connection
 - **LAN** – Existing LAN can be used to connect multiple Spiders that need to be simultaneously monitored
 - **Mobile Gateway** – Enables connectivity to the Spider system using Mobile Data Network with a Public Static IP address.
 - **Internet** – Existing Internet connectivity within a structure can also be used to configure multiple Spiders for simultaneous monitoring
- ❑ PC running EDM – RCM mode – Part of powerful EDM – DSA software capable of simultaneously connecting to updating the status from multiple Spiders

RCM | Configurations

RCM handles two typical types of configurations:

- ❑ Monitoring multiple independently running Spider front-ends
 - Supports up to 64 Independently running Spider front-ends
- ❑ Monitoring High Channel Count System
 - Supports one Spider system up to 512 channels



RCM | Storage Expansion

- ❑ Attach a Spider-NAS directly to the Spider-80X without the necessity for a Spider-HUB (Saves hardware and power)
- ❑ Extends the storage of Spider-80X from 4GB to 256GB
- ❑ Extended time-waveform recording while Spiders are deployed remotely
- ❑ Conveniently swap solid-state drives on the Spider-NAS when post-processing of data is needed or when storage is full



Remote Condition Monitoring | EDM Software

RCM | Key Features

- ❑ View Project Status (consolidated status of all Spiders)
- ❑ Configurable alarms and notification
- ❑ Consolidated “Alarm Status” view
- ❑ Ability to remotely download the data
- ❑ Live View of Data (If required and when connection permits)
- ❑ Long time recording

- Project based – Consists of a combination of tests, each running on an individual Spider system

Engineering Data Management Spider-RCM

Project Setup Control View Layout Tools Report Help

Recent tests: Active project: Multiple Systems

New Open Properties Delete

FFT_Battery Test9 [DSA (FFT)]

System (2590752)

FFT Test Office 4 [DSA (FFT)]

Spider 81 Test 1 [DSA (FFT)]

Spider 20 Test 110 [DSA (FFT)]

Spider 20 Test 211 [DSA (FFT)]

Live Signals Run Folders Data Files

Time Streams

Ch1

Ch2

Ch3

Ch4

Ch5

Ch6

Ch7

Ch8

Time Blocks

Block(Ch1)

Block(Ch2)

Block(Ch3)

Block(Ch4)

Block(Ch5)

Block(Ch6)

Block(Ch7)

Block(Ch8)

Block(Peak(Ch1))

Block(Peak(Ch2))

Block(Peak(Ch3))

Block(Peak(Ch4))

Block(Peak(Ch5))

Block(Peak(Ch6))

Block(Peak(Ch7))

Block(Peak(Ch8))

Block(RMS(Ch1))

Block(RMS(Ch2))

Block(RMS(Ch3))

Project Status

Site	Connection Status	Running Status	Time Elapsed	New Data Files	Active Alarm Status	Location	Last Updated
FFT_Battery Test...	Online	Running	00:06:24	188	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:46 AM
FFT Test Office 4	Online	Running	00:02:51	346	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM
Spider 20 Test 110	Online	Running	00:02:56	5	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM
Spider 20 Test 211	Online	Running	00:06:18	2	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM
Spider 81 Test 1	Online	Running	00:02:02	10	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM
Spider 81 Test 2	Online	Running	00:06:12	1	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM
Spider 805G Test...	Online	Stopped	18:46:40	57	None	(0.000000° E, 0.000000° N)	1/18/2018 10:46:41 AM

Auto update every: 00:01:00 Update All

Alarm/Warning Status

Location ID	Low Alarm	High Alarm	Low Warning	High Warning	Lim
Ch1	0/0	0/0	0/0	0/0	0/0
Ch2	0/0	0/0	0/0	0/0	0/0
Ch3	0/0	0/0	0/0	0/0	0/0
Ch4	0/0	0/0	0/0	0/0	0/0
Ch5	0/0	0/0	0/0	0/0	0/0
Ch6	0/0	0/0	0/0	0/0	0/0
Ch7	0/0	0/0	0/0	0/0	0/0
Ch8	0/0	0/0	0/0	0/0	0/0

Reset All Active Reset All

Site Location Map Recording Status

File name: Unknown Storage media: Spider internal storage

Capacity: 1.00 GB/3.73 GB Time to full storage: 24:47:57

Elapsed time: 00:01:43 Legend: Recording Idle

CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
SN: 2590752							

Control Panel

Disconnect Online Upload

Run Hold Stop

Stop Rec. Save Config

Status of Active Test

Total elapsed: 00:06:43

Latitude: 0.00000° N Longitude: 0.00000° E

Number of Alarms: 0

New Data Files: 188

Download Data Reset All Alarms

Setup trigger Preview trigger

Trigger switch: OFF

Status of all Tests in Project

Data Used(MB): 94.58

Start All Stop All

Download from All Clear All Alarm Status

Site Running Status

FFT_Battery Test... Running

FFT Test Office 4 Running

Spider 81 Test 1 Running

Spider 20 Test 110 Running

Spider 20 Test 211 Running

Spider 81 Test 2 Running

Spider 805G Test... Stopped

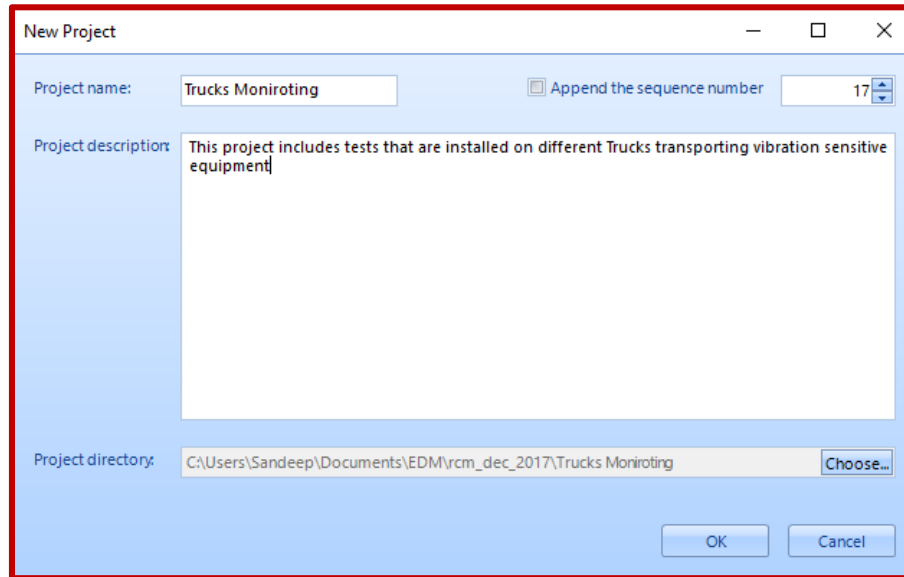
Input Output Alarm Status

Test running...

Record to Front-End internal storage

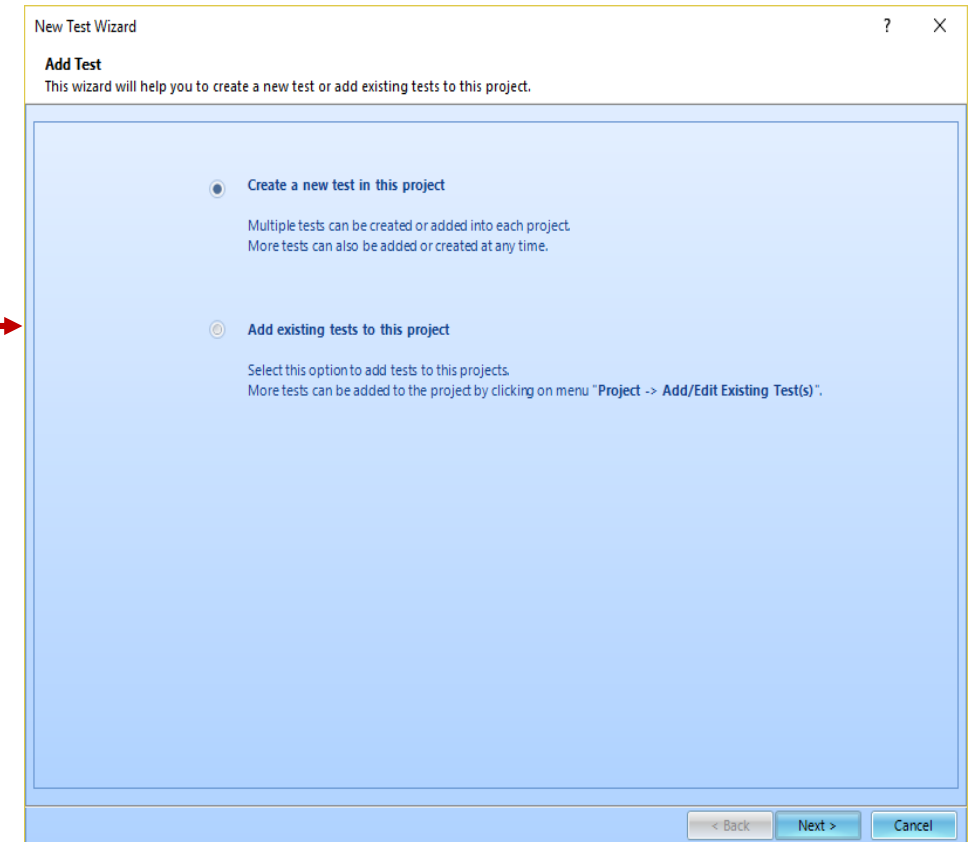
Test name: FFT_Battery Test9; Sampling rate (fs) = 500 Hz; Frequency range (fa) = 225 Hz

RCM Interface | Project Hierarchy for DSA Tests



The 'New Project' dialog box is shown with a red border. It contains the following fields and options:

- Project name:** Trucks Moniroting
- Append the sequence number:** ☒ (with a spinner box set to 17)
- Project description:** This project includes tests that are installed on different Trucks transporting vibration sensitive equipment
- Project directory:** C:\Users\Sandeep\Documents\EDM\rcm_dec_2017\Trucks Moniroting (with a 'Choose...' button)
- Buttons:** OK, Cancel



The 'New Test Wizard' dialog box is shown. It contains the following information:

- Title:** Add Test
- Text:** This wizard will help you to create a new test or add existing tests to this project.
- Options:**
 - ☒ **Create a new test in this project**
Multiple tests can be created or added into each project.
More tests can also be added or created at any time.
 - ☐ **Add existing tests to this project**
Select this option to add tests to this projects.
More tests can be added to the project by clicking on menu "Project -> Add/Edit Existing Test(s)".
- Buttons:** < Back, Next >, Cancel

- ❑ Projects group many tests together by user categories
- ❑ One test in many projects
- ❑ Add existing or create a new test
- ❑ Each Spider system runs respective test

RCM | Project Status

Shows real-time status of all Spiders associated with the Project

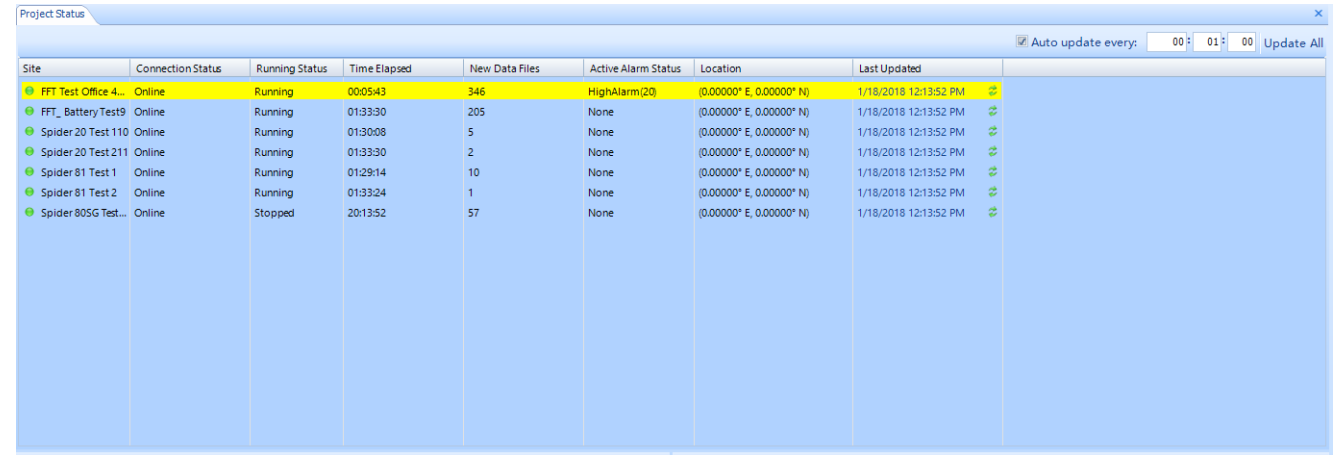


The screenshot shows a software window titled "Project Status" with a close button (X) in the top right corner. Below the title bar is a control area with a checked checkbox labeled "Auto update every:" followed by a time selector set to "00 : 01 : 00" and a button labeled "Update All". The main area contains a table with the following columns: Site, Connection Status, Running Status, Time Elapsed, New Data Files, Active Alarm Status, Location, and Last Updated. The table lists six data points, with the first row highlighted in yellow.

Site	Connection Status	Running Status	Time Elapsed	New Data Files	Active Alarm Status	Location	Last Updated
● FFT Test Office 4...	Online	Running	00:05:43	346	HighAlarm(20)	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● FFT_ Battery Test9	Online	Running	01:33:30	205	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● Spider 20 Test 110	Online	Running	01:30:08	5	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● Spider 20 Test 211	Online	Running	01:33:30	2	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● Spider 81 Test 1	Online	Running	01:29:14	10	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● Spider 81 Test 2	Online	Running	01:33:24	1	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
● Spider 80SG Test...	Online	Stopped	20:13:52	57	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM

RCM | Alarm Status

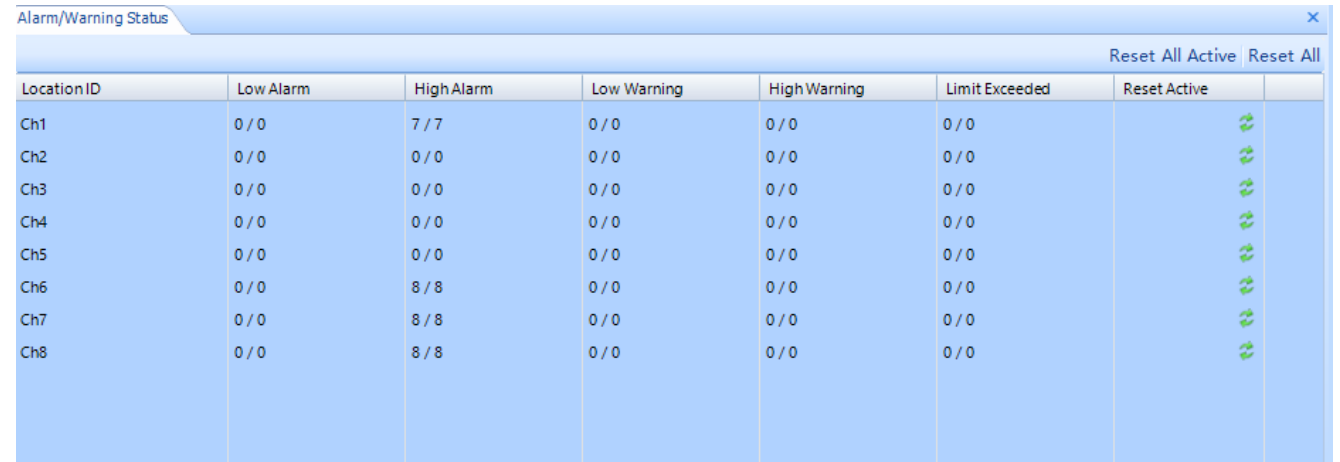
- ❑ Define Alarms on Time or Frequency data
- ❑ Multiple alarms on each channel
- ❑ Custom actions for each alarm including recording raw time data, saving processed time / frequency data, email notifications, and more
- ❑ View channel specific, alarm specific status for each of the connected Spider front-end



Project Status

Auto update every: 00 : 01 : 00 Update All

Site	Connection Status	Running Status	Time Elapsed	New Data Files	Active Alarm Status	Location	Last Updated
FFT Test Office 4...	Online	Running	00:05:43	346	HighAlarm(20)	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
FFT, Battery Test19	Online	Running	01:33:30	205	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
Spider 20 Test 110	Online	Running	01:30:08	5	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
Spider 20 Test 211	Online	Running	01:33:30	2	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
Spider 81 Test 1	Online	Running	01:29:14	10	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
Spider 81 Test 2	Online	Running	01:33:24	1	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM
Spider 80SG Test...	Online	Stopped	20:13:52	57	None	(0.00000° E, 0.00000° N)	1/18/2018 12:13:52 PM



Alarm/Warning Status

Reset All Active Reset All

Location ID	Low Alarm	High Alarm	Low Warning	High Warning	Limit Exceeded	Reset Active
Ch1	0 / 0	7 / 7	0 / 0	0 / 0	0 / 0	
Ch2	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	
Ch3	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	
Ch4	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	
Ch5	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	
Ch6	0 / 0	8 / 8	0 / 0	0 / 0	0 / 0	
Ch7	0 / 0	8 / 8	0 / 0	0 / 0	0 / 0	
Ch8	0 / 0	8 / 8	0 / 0	0 / 0	0 / 0	

RCM | Control Panel

Low Alarm (Active / Total) **0/0**

High Alarm (Active / Total) **31/31**

Low Warning (Active / Total) **0/0**

High Warning (Active / Total) **0/0**

Limit Exceeded (Active / Total) **0/0**

Input Output Alarm Status

Number of Alarms: **31**

New Data Files: **346**

Trigger switch: ☐ OFF

Status of all Tests in Project

Data Used(MB): **694.39**

Site	Running Status	
FFT Test Office 4...	Running	<input checked="" type="radio"/> ↓
FFT_ Battery Test9	Running	<input type="radio"/> ↓
Spider 81 Test 1	Running	<input type="radio"/> ↓
Spider 20 Test 110	Running	<input type="radio"/> ↓
Spider 20 Test 211	Running	<input type="radio"/> ↓
Spider 81 Test 2	Running	<input type="radio"/> ↓
Spider 80SG Test...	Stopped	<input type="radio"/> ↓

RCM | Batch Operations

Number of Alarms: **31**

New Data Files: **346**

[Download Data](#) [Reset All Alarms](#)

[Setup trigger](#) [Preview trigger](#)

Trigger switch: ☐ OFF

Status of all Tests in Project

Data Used(MB): **694.39**

[Start All](#) [Stop All](#)

[Download from All](#) [Clear All Alarm Status](#)

Site	Running Status	
● FFT Test Office 4...	Running	● ↓
● FFT_ Battery Test9	Running	● ↓
● Spider 81 Test 1	Running	● ↓
● Spider 20 Test 110	Running	● ↓
● Spider 20 Test 211	Running	● ↓
● Spider 81 Test 2	Running	● ↓
● Spider 80SG Test...	Stopped	● ↓

Number of Alarms: **31**

New Data Files: **346**

[Download Data](#) [Reset All Alarms](#)

[Setup trigger](#) [Preview trigger](#)

Trigger switch: ☐ OFF

Status of all Tests in Project

Data Used(MB): **694.39**

[Start All](#) [Stop All](#)

[Download from All](#) [Clear All Alarm Status](#)

Site	Running Status	
● FFT Test Office 4...	Running	● ↓
● FFT_ Battery Test9	Running	● ↓
● Spider 81 Test 1	Running	● ↓
● Spider 20 Test 110	Running	● ↓
● Spider 20 Test 211	Running	● ↓
● Spider 81 Test 2	Running	● ↓
● Spider 80SG Test...	Stopped	● ↓

Remote Condition Monitoring | Deployed

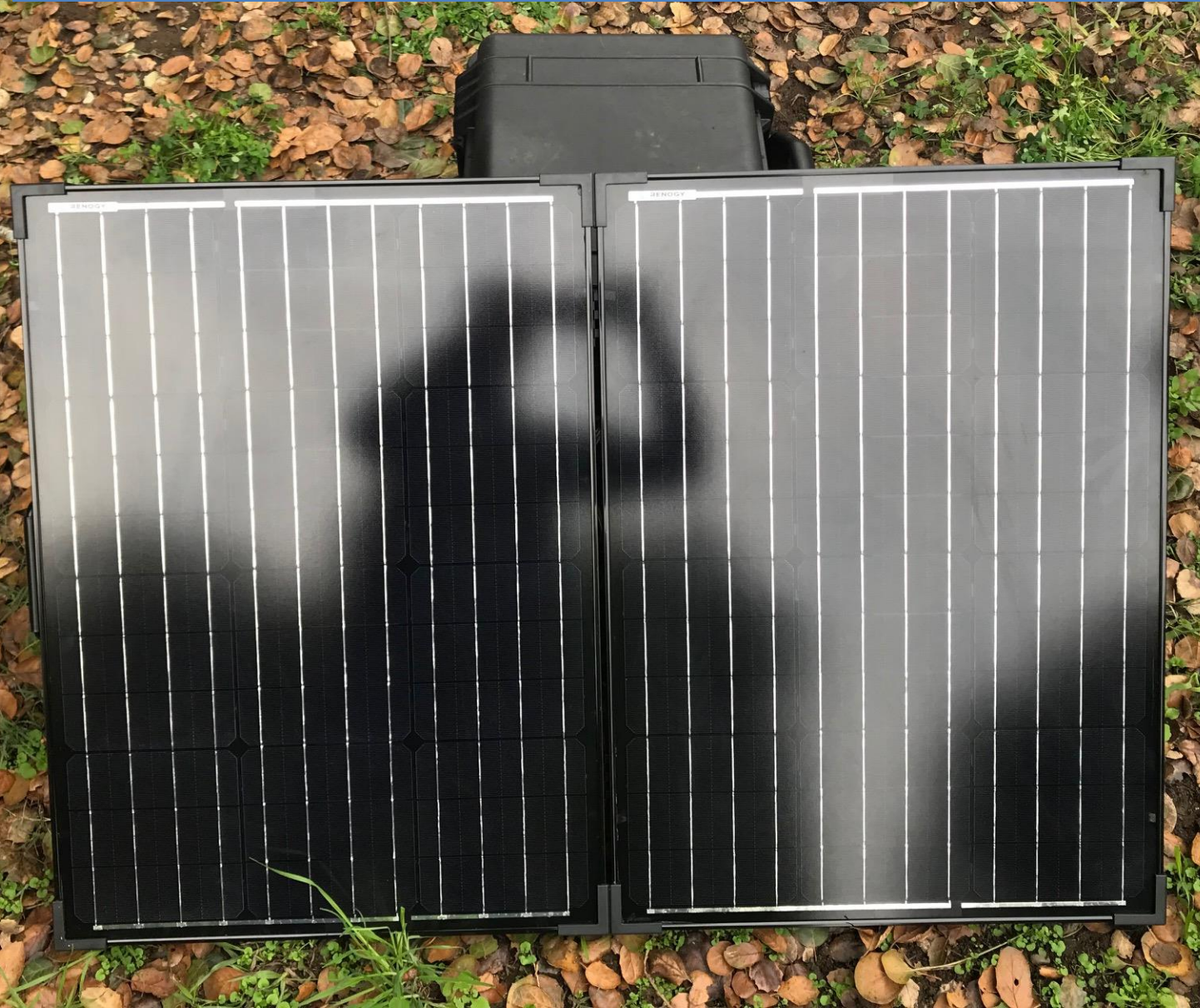
RCM | Deployed Application

Monitoring
ground vibrations
caused by each
rotating Windmill
in a Windmill farm



Solar Panel to power the System and charge the battery

Spider, Gateway and a Battery housed in Weatherproof Cases



Deployed Application | Spider

- ❑ Spider-80X-P08
- ❑ Time waveform recording



Deployed Application | Battery

- ❑ 35 Ah battery
- ❑ Genasun regulator



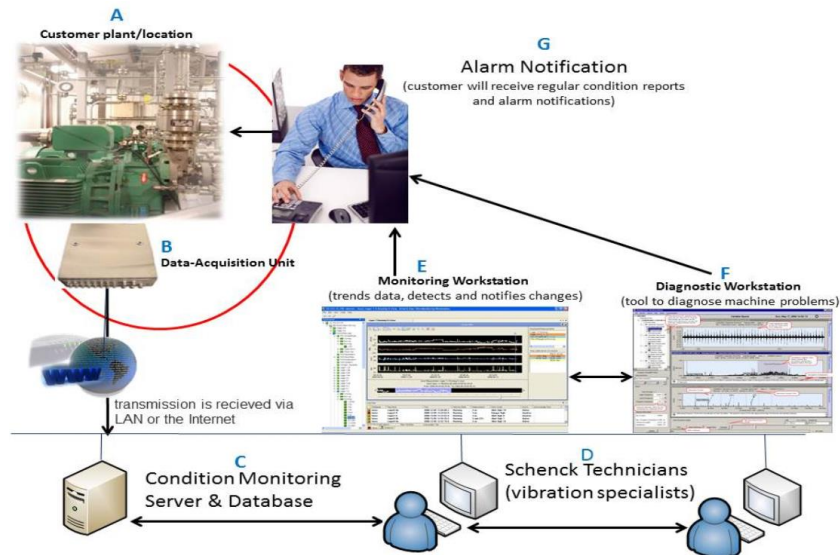
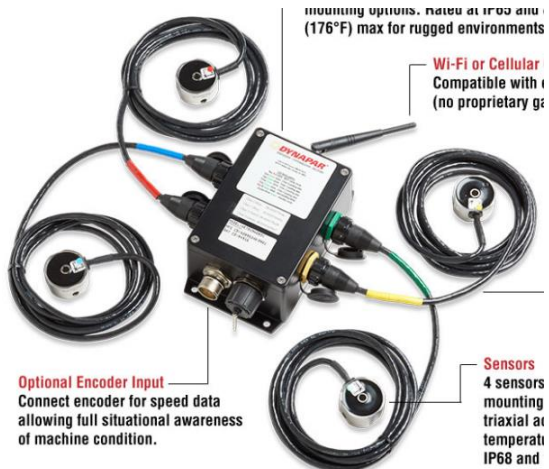
Deployed Application | Modem

- ❑ Sierra Wireless RV50
- ❑ 2 antennas
- ❑ Connected via ethernet to Spider to Spider



Remote Condition Monitoring | Sales and Marketing

Remote Monitoring | Competitive Analysis



- Dynapar
- Schneck
- Emerson
- Pruftechnik

Thank You

Crystal Instruments is dedicated to the innovation of testing equipment and solutions. Founded in 1996, Crystal Instruments is a leading manufacturer of equipment for condition monitoring, dynamic signal analysis, and vibration test control. Crystal Instruments is headquartered in Santa Clara, California, and is an ISO 9001 certified company.

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