



Product Details, Services
And
Technical Specifications

TABLE OF CONTENTS

INTRODUCTION.....	3
PRODUCTS.....	5
JILS-20C FWD.....	5
JILS-20 FWD.....	6
JILS-20HF FWD.....	7
JILS-20T FWD.....	8
JILS-20T FWD WITH GPR (GROUND PENETRATING RADAR).....	9
JTEST SOFTWARE.....	12
SERVICES.....	13
MAINTENANCE.....	13
TESTING.....	13
CALIBRATION.....	13
OTHER FEATURES AND SPECIFICATIONS.....	14
ADAPTIVE CONTROL ALGORITHM.....	14
DISTANCE MEASURING INSTRUMENT (DMI).....	14
VIDEO MONITORING SYSTEM.....	15
FIELD CALIBRATION EQUIPMENT.....	15
COMPUTER SYSTEM.....	15
GLOBAL POSITIONING SYSTEM (GPS) (OPTIONAL).....	16
LOADING PULSE.....	16
FORCE MEASUREMENT (AUTOMATIC LOAD SENSING).....	16
LOADING PLATE.....	17
POWER SYSTEM.....	17
LOADING ASSEMBLY.....	17
DISPLACEMENT MEASUREMENT.....	17
TEMPERATURE MEASUREMENT (PAVEMENT) (OPTIONAL).....	18
TEMPERATURE MEASUREMENT (AMBIENT).....	18
AUTOMATIC LOAD SENSING.....	19
DATA OUTPUT.....	19
DATA ACQUISITION.....	19
CUSTOM TESTING PROGRAMS.....	19
PRODUCTS IN USE.....	20
JILS VERSUS DYNATEST.....	21
THE COMPANY.....	23
HISTORY.....	23
EMPLOYEES.....	23
HOW TO CONTACT US.....	24
SALES INQUIRIES.....	24

INTRODUCTION

Today's network of roads, airport runways, and similar surfaces are critical to the operation and efficiency of our global economy. Building and maintaining this massive infrastructure can be a daunting task, and an expensive one at that. Optimizing the construction and ongoing maintenance costs requires the right mix of specialists with precise knowledge and information.

First introduced at the end of the 1960s, Falling Weight Deflectometers (FWDs) were built to perform non-destructive testing of pavement and other foundations. Instead of ripping up a section of pavement to determine the strength and condition of its elements, FWDs work by dropping a controlled amount of weight on to a given pavement structure. The falling weight causes the pavement to deflect, similar to the moving wheel load of a car or plane, and this deflection is measured and analyzed using a series of user positioned velocity sensors. Because of their accuracy, flexibility, and reliability, FWDs have become accepted as the device for the everyday measurement, assessment, and planning tasks associated with these types of structures.

Since 1969, JILS has produced dynamic custom-designed pavement and foundation loading and testing systems for state, county, and city departments, private agencies, medical and aerospace applications, and numerous other entities world-wide. All JILS systems are well supported and have earned a strong reputation for performance, accuracy and reliability. The Road Rater™ was built in 1970, followed by the Pavement Profiler in 1972, and then the JILS-FWD in 1987.

Today, JILS is producing the most cutting edge and state-of-the-art pavement analysis system yet, the JILS-20T FWD with Ground Penetrating Radar. This

more flexible and proven technology that will save you costs, enhance safety, and integrate more data for you is only available through JILS.

PRODUCTS

JILS produces five FWD systems, all of which can be *custom designed* to meet special requirements.

JILS-20C FWD



The JILS-20C FWD is mounted on a single axle trailer that may be towed by a van, a pickup truck, or a similar vehicle. Only one person is needed to operate the 20C, and using the connecting PC cable, the driver can fully operate the FWD from his or her seat in the vehicle. The data from the tests are displayed on the included mounted laptop computer and recorded for analysis using the JTEST Software.

Dimensions

Weight 821kg (2,200 lbs)

Length 3,658mm (144")

Width 1,829mm (72 inches)

Height 1,727mm (68 inches)

Features

- Single Axle Trailer
- Hydraulic Brakes
- 2-cylinder 18-horsepower *gasoline engine* with 12 volt alternator permits high-speed and independent operation of the tow vehicle
- 4 drop automated sequence in 30 seconds
- Data capture from 1-35 drops at each location with up to 35 forces



JILS-20 FWD

The *fully customizable* JILS-20 FWD is mounted on a double axle trailer that may be towed by a van, a pickup truck, or a similar vehicle. Like the JILS-20C, only one person is needed for operation, and using the connecting PC cable, the driver can fully operate the FWD from his or her seat in the vehicle. The data from the tests are displayed on the included mounted laptop computer and recorded for analysis using the JTEST Software.

Dimensions

Weight 970kg (2,600 pounds)

Length 4,064mm (160 inches)

Width 1,829mm (72 inches)

Height 1,829mm (72 inches)



Features

- Double Axle Trailer
- Hydraulic Brakes
- 2-cylinder 18-horsepower *gasoline engine* with 12 volt alternator permits high-speed and independent operation of the tow vehicle
- 4 drop automated sequence in 30 seconds
- Data capture from 1-35 drops at each location with up to 35 forces

JILS-20HF FWD

When it comes to testing pavements such as airfields or thick highway pavements, a regular FWD may not be enough. This is why JILS introduced the JILS-20HF FWD, a high force FWD mounted on a two-axle trailer designed specifically for these types of situations where you need a greater load to obtain deflection measurements for determining structural information of these heavy-duty type pavements.

Dimensions

Weight 1,492kg
(4,000 pounds)
Length 4,064mm (160
inches)
Width 1,829mm (72 inches)
Height 1,829mm (72 inches)



Special Features

- Double Axle Trailer
- Hydraulic Brakes
- 2-cylinder 18-horsepower *gasoline engine* with 12 volt alternator permits high-speed and independent operation of the tow vehicle
- 4 drop automated sequence in 30 seconds
- Data capture from 1-35 drops at each location with up to 35 forces

JILS-20T FWD



The JILS-20T-FWD is a truck (Ford F350 XLT or equivalent) mounted FWD, which is operated from the driver seat in the vehicle. The data from the tests are displayed on a cab-mounted laptop computer and recorded for future analysis.

There are many advantages in using a truck mounted FWD system, especially where maneuverability in and out of and around traffic are serious considerations. In addition, the truck takes up less space than a trailer plus tow vehicle would require. There is no time spent hooking up the trailer. You can use the truck for purposes other than FWD work. And also, if considerable travel distances are involved between testing sites it is much safer traveling without the trailer.



JILS-20T FWD with GPR (Ground Penetrating Radar)

In order to provide the full picture of a road structure, it is essential to complement FWD information with existing asphalt thickness. Asphalt thickness can not be determined by the FWD system alone and is typically obtained by either assuming that either the thickness is constant or by sporadic coring. Assumptions are inaccurate, and not only is coring destructive to the pavement and dangerous because it requires traffic control and personnel, but a coring crew may also cost \$2,000 per day.



Recognizing an opportunity for a solution, JILS teamed up with Geophysical Survey



Systems (GSSI – <http://www.geophysical.com>) to

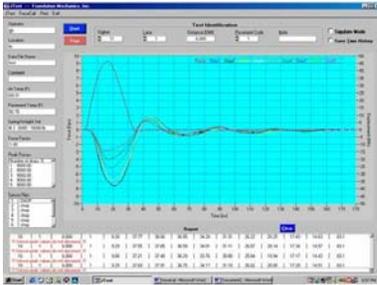
produce the most state of the art and cutting edge pavement analysis system yet. GSSI is the world leader in the development and manufacture of Ground Penetrating Radar Systems, systems used to non-destructively explore the subsurface of the ground. Using GSSI's FCC certified Roadscan™ GPR System, JILS changed road design for the better forever by integrating the GPR with the JILS truck-mounted FWD.

What are the benefits of this ground-breaking integration?

- Cost Savings – Coring costs are dramatically reduced. There is not need to hire a coring crew, and the dual functioning machine allows for simultaneous FWD and GPR data collection.
- Safety – Less time for personnel operating in dangerous traffic environments
- Data Integration – FWD and pavement thickness data are integrated into a single database using JILS' *JTEST Software*.
- Higher Data Density – Instead of obtaining asphalt thickness via coring once per mile, for example, a DOT can obtain real-time thickness at each of the same 2/10 of a mile testing points where the FWD data is commonly taken.
- Data Quality – Pavement thickness at each FWD location provides designers with the data they need to determine accurate design criteria.
- Flexibility – The FWD vehicle may be used for independent GPR surveys at highway speeds eliminating the need for traffic control.



JTEST SOFTWARE



 Operation and control of all JILS FWDs are performed by a proprietary Windows-based program called JTEST. This has allowed the JILS to use the latest in PCI technology which utilizes faster bus speeds and sampling rates to further enhance the performance of the JILS FWD.

The JILS system offers a unique procedure for the capture and graphic display of the time history plots for the loading force and each of the seven surface displacements. The display is presented on the computer screen within one second of the application of the load pulse. The display enables the operator to graphically review the data prior to moving to the next location. The data output format is *.dat, a raw data file format. The data can also be converted to formats like .fwd (f20) and pddx.



JILS offers laboratory calibrations of each of the velocity transducers over a displacement range from less than one mil to more than sixty mils. The calibrations may be performed at different load pulse durations, even for those with complex waveforms.

NOTE: There are several back calculation programs available that can be used to evaluate pavement and foundation structures from the data produced by the JILS FWD, but the DAPS™ program is strongly recommended.

SERVICES

Maintenance



We have a fully strained staff capable of fully servicing all JILS FWDs. Service contracts range from routine mechanical and electrical checkups to monthly performance monitoring of the system. And by providing you wireless laptop capability, we

can even include *web-based performance monitoring*.

Technical phone support is included **FREE** for the life of your FWD.

Testing



The JILS FWDs are available to rent or lease. Testing is offered to all customers that require and FWD and operator. And deflection analysis is available for overlay design and rehabilitation

purposes.

Calibration

JILS offers support for the SHRP calibrations that the Federal Highway Administration recommends getting on a yearly basis. In addition, monthly relative calibrations can be analyzed by our highly trained engineering staff.



OTHER FEATURES and SPECIFICATIONS

(Subject to Alteration)

Adaptive Control Algorithm

The JILS FWD utilizes advanced features for control. One such feature is to allow the operator to modify the required force levels via keyboard entry. The JILS force control system is the best in the industry and fully automated. This however creates a challenge when the structure under test changes either to a stiffer structure or a weaker structure. When this happens our advanced algorithm modifies the drop heights automatically to get the resulting load equal to the asking force. In fact the JILS FWD allows the operator to program multiple forces at one test location (Example, you can program a four drop sequence to have the same or varying loads.).

Distance Measuring Instrument (DMI)

We have integrated the Nu-Metrics Nitestar NS60 DMI (RS232 Protocol) in to our FWDs in order that recording of distances (feet, miles, km) during testing is automatically written to the data test file.



Accuracy: +/- 1ft/mile

Special Functions: Changing units, setting a pre-distance, and changing directions

Video Monitoring System



For vehicle positioning and joint testing, a color video monitoring system from Accele Vision (<http://www.accele.com>) is included in the base price. A flip down video monitor that saves space and color video camera are mounted for efficient tow vehicle positioning for test location load transfer testing and monitoring.



Field Calibration Equipment

Both the force and the velocity transducers can be calibrated in the field, using equipment and features provided with each JILS machine. JILS systems may also be calibrated at one of the SHRP Regional FWD Calibration Centers.

Computer System



Typically included with your purchase of any JILS FWD is a laptop with the JTEST Software pre-installed for you. The laptops are easily removable from the in-vehicle computer mounting.

Specifications

- 80 gigabyte hard drive
- CDROM Drive
- 512 megabytes of RAM
- 15" viewable screen
- Active matrix



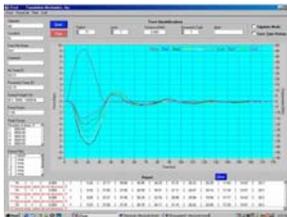
- 56K modem
- 10/100 Ethernet adapter
- Pentium4 2.0 GHz processor or greater
- 1.44" FD
- Wireless Capability (available upon request)

Global Positioning System (GPS) (Optional)

As an option, GPS data can be automatically collected during testing and recorded into the test data file. Both the Trimble (<http://www.trimble.com>) AGP132 sub-meter accurate GPS model and Trimble 3-meter accurate GPS model are available for integration.



Loading Pulse



Load Pulse Shape: smooth $\frac{1}{2}$ sine waveform (produced by 4-part mass buffer)

Load Pulse Duration: 20-34 msec (milliseconds)

Meets ASTM Standards for Falling Weight Deflectometers.

Force Measurement (Automatic Load Sensing)

The JILS system uses a precision Strainsert (<http://www.strainsert.com>) fatigue rated strain gauge load cell force transducer to measure the loading force. Our system automatically adjusts to user required pavement loading via our adaptive control algorithm.



Accuracy: 1% +/- 0.07kN (15 pounds)
Range: 0 to 200 kN (45,000 pounds)
Material: Stainless steel

Loading Plate

12" diameter Rigid Steel Disk with 5/16" neoprene pad for uniform loading distribution

Power System

2 Cylinder, 18 horsepower gasoline engine directly drives the pump and the 12V alternator

Benefit: FWD can operate independent of a tow vehicle and has enough power to operate at high speeds.

Loading Assembly

4-part mass system
4 buffer spring combinations

Displacement Measurement

The JILS uses up to nine digital grade velocity transducers to measure the deflection response of the test surface. The sensors are positioned in a bar for automatic placement at user selected locations during testing. The bar will

permit placement of two sensors aft and one sensor to either side of the loading plate in addition to all sensors forward of the loading plate.

Accuracy: 2% +/- 1 micron (0.04 mils)

Range: 0 to 2032 microns (80 mils)

Each sensor is dynamically calibrated, and supplied with an individual data file. Nine sensors are included.

Temperature Measurement (Pavement) (Optional)

A non-contact infrared device by Omega (<http://www.omega.com>) is available as an option for measurement of the pavement surface temperature. This data is recorded automatically into the data file.

Accuracy: +/- 2% rdg

Range: -18 C to 400°C (0 to 750°F)



Temperature Measurement (Ambient)

A thermocouple device, also by Omega (<http://www.omega.com>), is used for measurement of the ambient air temperature. This data is recorded automatically into the data file.

Accuracy: +/- 2% rdg

Range: 0-750°F



Automatic Load Sensing

Computer automatically determines drop heights for varying loads up to 99 drops.

Data Output

Data is outputted into AASHTO recommended file format Pavement Data Declection Exchange (PDDX) format.

Data Acquisition

1.25 Msamples/second
Up to 32 Differential A/D channels
2 Analog Outputs, 8 Digital I/O
+/- 10V Input Range

Custom Testing Programs

JILS can provide customized JILS FWD testing programs to meet such specific as may be requested.

PRODUCTS IN USE

(Partial List)

Owner	JILS FWD	Road Rator	Other	Contact	Telephone
Arizona DOT	1			Dennis Rusher	(602) 390-4732
California DOT	4T			George Payntar	(916) 869-0611
Braun Intertec, China	1			Erland Lukanen	(612) 941-5600
Clackamas County, OR	1			Randy Harmon	(503) 655-9521
Clark County, WA	1	1		Bill Wills	(360) 699-2446
Colorado DOT	2T			Eric Prieve	(303) 757-9269
Braun Intertec		2			(612) 941-5600
Ground Engineering	2			Andrew Suedkamp	(303) 289-1989
Iowa DOT	1	2		Karman Kellogg	(515) 239-1158
Jefferson County, CO	1			John Suess	(303) 271-5284
Kentucky DOT		2		Tim Scully	(859) 257-4513
LeBelle-Marvin Engineers		2		Steve Martin	(714) 546-3468
City of Los Angeles	2T	1		Cu Luong	(213) 465-2242
Los Angeles County	2T	1		Raymond Frasier	(626) 458-1707
City of Loveland		1		Tom Gathmann	(970) 962-2514
Maine DOT	1	1		Steve Colson	(207) 941-4545
Roy D. McQueen		1	1*	Roy McQueen	(703) 709-2540
Montana DOT	2T	2		John Amestoy	(406) 444-7651
New Mexico DOT	1	1		Donald Garcia	(505) 827-9238
Orange County, CA	1	1		Dave Leiby	(714) 567-7847
Pacific Pavement Services	1	1		Dick McCluer	(360) 574-7072
Pierce County, WA		1		Eric Edwards	(206) 596-2957
San Bernadino County, CA		1		Laddie Sparks	(909) 387-2650
San Diego County, CA	1	2		Fred Best	(619) 694-2842
Snohomish County, WA		1		Jim Swearengin	(206) 388-3486
Spokane County, WA		1		Howard Hamby	(507) 324-3458
Thurston County, WA		1		Pat Carroll	(360) 754-4580
University of Kentucky	1	1		Clark Graves	(606) 257-4513
Whetcom County, WA		1		Dave Hower	(360) 767-6730
Taiwan	1			Raymond Chao	Request #
ERES Consultants (Florida DOT)	1T			Doug Steele	(217) 351-4883
Utah DOT	1T				
Golder Associates (Canada)	1HWD			Ludomir	905-723-2727

Notes: 1) A "*" indicates a custom made dynamic loading system.
 2) A "T" indicates a truck-mounted FWD.

JILS VERSUS DYNATEST

In 2004, a company called Applied Research Associates, Inc. (ARA), ERES



Consultants Division, performed a comparison study between the JILS 20T-FWD and the Dynatest 8002 FWD. ARA has provided FWD services to private and public clients since the early 1990s, and at the time of the test owned two

Dynatest Model 8081 Heavy Weight Deflectometers (HWD) and three Dynatest Model 8002 FWDs.

While ARA had been satisfied with the data quality, service, and operation of their fleet of Dynatests, when it came time to acquire additional equipment, they desired to give equal consideration to all manufacturers. They made a precursory screening of all FWD manufacturers currently made, or that will be eventually made, in the United States. The manufacturers considered included Dynatest, JILS, Carl Bro, and KUAB.

Through their research, ARA quickly caught interest in an FWD mounted in a vehicle versus the trailer-mounted FWD with a dedicated tow vehicle. Carl Bro was eliminated because they lacked a strong North American presence. KUAB was eliminated because their choice of vehicle platforms seemed to be bulky and potentially high on maintenance.



Therefore, ARA narrowed the choices down to Dynatest and JILS. ARA conducted side-by-side testing on three different pavement structures for a comparison of load pulses, deflection basins, and back calculated sub grade moduli. In addition, equipment characteristics of both machines were analyzed based on the following criteria:

- Quality of load and deflection data, including past calibration history
- Maneuverability and ease of operation, including field program and data output file format
- Added features (e.g. temperature sensors, distance measuring instrument (DMI), and video camera system)
- Maintenance history and customer satisfaction with support and service
- Number of units and references for units with similar characteristics in operation in North America



Based on the results of this study, **ARA put the JILS 20-T FWD in to service.**

Details of this analysis are available at <http://www.jils.com>.

THE COMPANY

History

In 1969, Foundation Mechanics, Inc. was incorporated in the state of California as a subsidiary of Wyle Laboratories. Wyle Laboratories had been a leader in testing and in the design of testing systems for the aerospace and nuclear industry for nearly fifty years. Foundation Mechanics, Inc. (FMI) is now privately held and operates from its world headquarters near the Los Angeles airport in El Segundo, California. FMI has been designing and building dynamic pavement testing systems since its inception. The Road Rater™ was built in 1970, followed by the Pavement Profiler in 1972, and then the JILS-FWD in 1987.

Today, FMI, now known and marketed as JILS, produces dynamic custom-designed pavement and foundation loading and testing systems for state, county, and city departments, private agencies, medical and aerospace applications, and numerous other entities world-wide. All JILS systems are well supported and have earned a strong reputation for performance, accuracy and reliability.

Employees

Name	Position	Email Address
Gary Sanati	President, CEO	gsanati@jilsfwd.com
Wendan Ni	Lead Software Specialist	
Dr. Min Chen	Lead Control System Specialist	
Adrian Elizondo	Production Manager	aelizondo@jilsfwd.com

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