

Chiropractic Alignment Tool Testing

using the DaqBook

Medical

Application Note #92

Application Summary

Chiropractors administer various types of physical therapy during a treatment program, including a procedure called controlled joint displacement. The small, hand-held instrument used in this treatment produces a regulated thrust or force several times per second, which is applied to the area of concern on a patient's body. The ideal rate is 12 strokes per second, a frequency that is within a range called low beta somatomotor rhythm. The energy output ripples through the patient's joints and surrounding fringe tissues. The therapy liberates secondary trigger points and muscular spasm sites, intended to align joints and relieve pain. The high-velocity, short-stroke thrusts and recoil motion activate the patient's muscle and tendon sensory receptors (proprioceptors) and agents of muscle contraction and relaxation (mechanoreceptors) without invoking the pain receptors (nociceptors).

A closely related instrument is one that chiropractors use for muscle and ligament problems and myofascial conditions (which concern the tissues separating muscle layers). In a similar fashion, this tool delivers percussive impulses deep into body tissues. It can apply a range of different frequencies for custom therapies. The energetic waves help increase circulation and lymphatic flow and decrease muscle spasms. In addition, the instrument is often used to warm up muscles and set proper tonus (relieve tension) in athletes before and after

events, and exercise muscles to minimize soreness. The pumping action it generates also releases joints. The multiple percussive waves loosen stuck areas without a need for heavy thrusting forces.

One company that manufactures hand-held versions of these instruments is Impac, Inc., Salem, Ore. It makes an instrument called "Arthrostim"™ for controlled joint therapy as first described above, and the "Vibracussor"™ for muscle stimulation. Phil Koetsch, Principal Electronics Engineer at Impac, has been developing these products for several years and routinely uses laboratory grade instruments for graphically displaying and observing the force impulses. He ensures that the pulses are of the proper magnitude and wave shape for producing optimal therapeutic results under all conditions of the application.

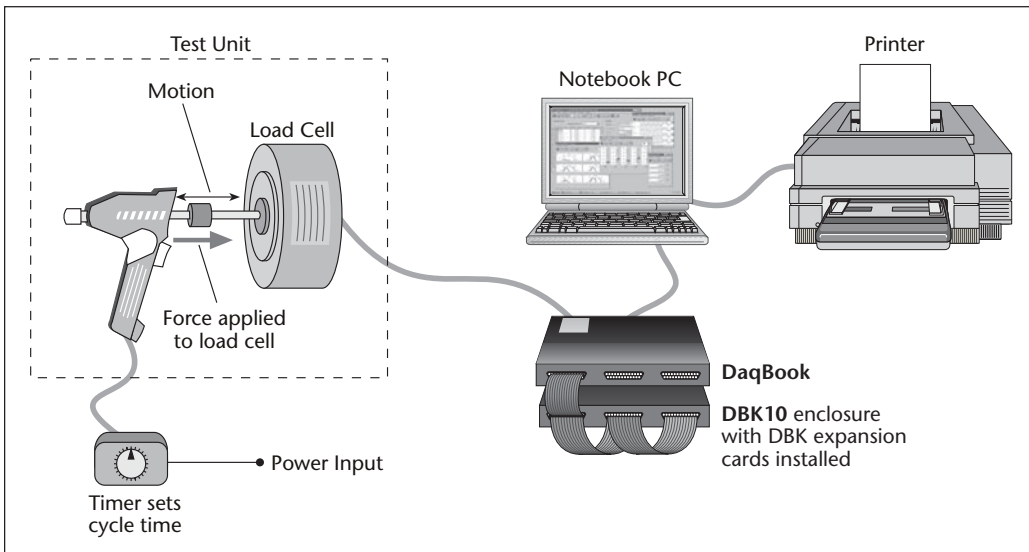
Potential Solution

Until recently, Koetsch had used a variety of oscilloscopes, including storage types, and other instruments to monitor and record these data, but they have had some limitations. For example, the storage 'scope's memory was unable to record the long series of waveforms that Koetsch needed in order to analyze the test results.

IOtech's Solution

After some investigation, Koetsch evaluated an IOtech **DaqBook**® and found that it suited his needs. He uses the **DaqBook** on the impact unit of both tools to optimize its magnetic force, pulse duration, and the heating effects of its solenoid over long-term use. The solenoid causes an armature to move, which in turn, imparts the force to the patients' body. The coil heats during the process, and because the device is hand held and operates on 120 or 240 Vac power, its temperature must remain low enough to be comfortable for the practitioner to hold and operate.

The device has an adjustable force and cycle range, and must be kept within a narrow, repeatable tolerance band. The forces are measured with a piezoelectric type of load cell. The load cell measures the magnitude, duration, repetition rate, and wave shape when the work piece moves. The impact device is designed to deliver a



*Impac, Inc. uses an IOtech **DaqBook** and a load cell to accurately measure and record the thrust forces generated by a Chiropractor's alignment tool. The instrument is used during physical therapy to treat joint displacement and stimulate muscle tissues.*

single pulse or a series of pulses. Only one voltage input channel of the **DaqBook** is needed to monitor and record the force signals from the load cell, but Koetsch plans to connect a second channel to record temperature and force pulses simultaneously.

Koetsch found the **DaqBook** easy to set up, learn its operation, and use daily. He appreciates its portable size, large storage capacity, compatibility with numerous software packages, and ability to print out a hard copy or display the data in real time as he collects it. Koetsch also purchased a **DBK10™**, a three-slot expander enclosure to accommodate any three IOtech analog or digital **DBK signal conditioning cards**. Another feature that he likes is the **DaqBook's** ability to handle many more channels than the three he currently has when they are needed in the future.

Conclusion

Impac, Inc., Salem, Ore., uses a **DaqBook** digital data acquisition system to help design and develop tools for chiropractors to work with during physical therapy. The **DaqBook** measures and collects solenoid temperature and force data, pulse duration, and cycle times from the impact tool which is intended to align joints, stimulate muscles and tendons, decrease muscle spasms, and help increase circulation and lymphatic flow. The data collected with the **DaqBook** is necessary to ensure that the tool is reliable, repeatable, and outputs a safe and regulated force pulse over an extended period of use.

DaqBook/2000 Series

The DaqBook/2000® series of portable data acquisition devices can synchronously measure analog inputs, frequency inputs, and digital inputs. The 16-bit/200-kHz DaqBooks come equipped with built-in signal I/O capability, which can be further expanded and enhanced with over 40 DBK series expansion and signal conditioning options.

The DaqBook/2000 series includes a built-in 10/100BaseT Ethernet interface capable of transferring acquired data back to the PC at the full 200 Kreading/s measurement rate of the DaqBook. Multiple DaqBooks can be attached to a single PC via an Ethernet hub or switch, and are capable of being synchronized and of transferring data continuously at full speed into the PC. Up to 10 DaqBooks can be transferring 200 Kreading/s back to a PC concurrently, with no loss in data.



Features

- Analog input, analog output, frequency input, timer output, and digital I/O; all in one compact and portable enclosure
- Built-in Ethernet connection provides continuous streaming to the PC with no data loss
- 16-bit, 200-kHz A/D converter
- Operates from -30° to +70°C
- Powerable from 10 to 30 VDC, or with included AC adapter
- Synchronous analog, digital, and frequency measurements
- Trigger modes include analog, digital, frequency, and software
- Virtually infinite pre-trigger buffer
- 4 channels of 16-bit, 100-kHz analog output (models /2001 and /2020)
- DaqBook/2020 offers convenient front panel connectors for thermocouple, voltage and frequency measurements all in one box
- DaqBooks attach to over 40 DBK signal conditioning options to assemble a low-cost system, customized to your particular application



DaqView™ graphical data acquisition and display software is included with all DaqBook systems

Signal Conditioning Options

- Signal conditioning and expansion options for thermocouples, strain gages, accelerometers, isolation, RTDs, etc. — over 40 DBK I/O expansion options are available

Software

- DaqView™ software included for effortless data logging
- Includes support for Visual Basic®, C/C++, ActiveX/COM, LabVIEW®, MATLAB®, and DASyLab®

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