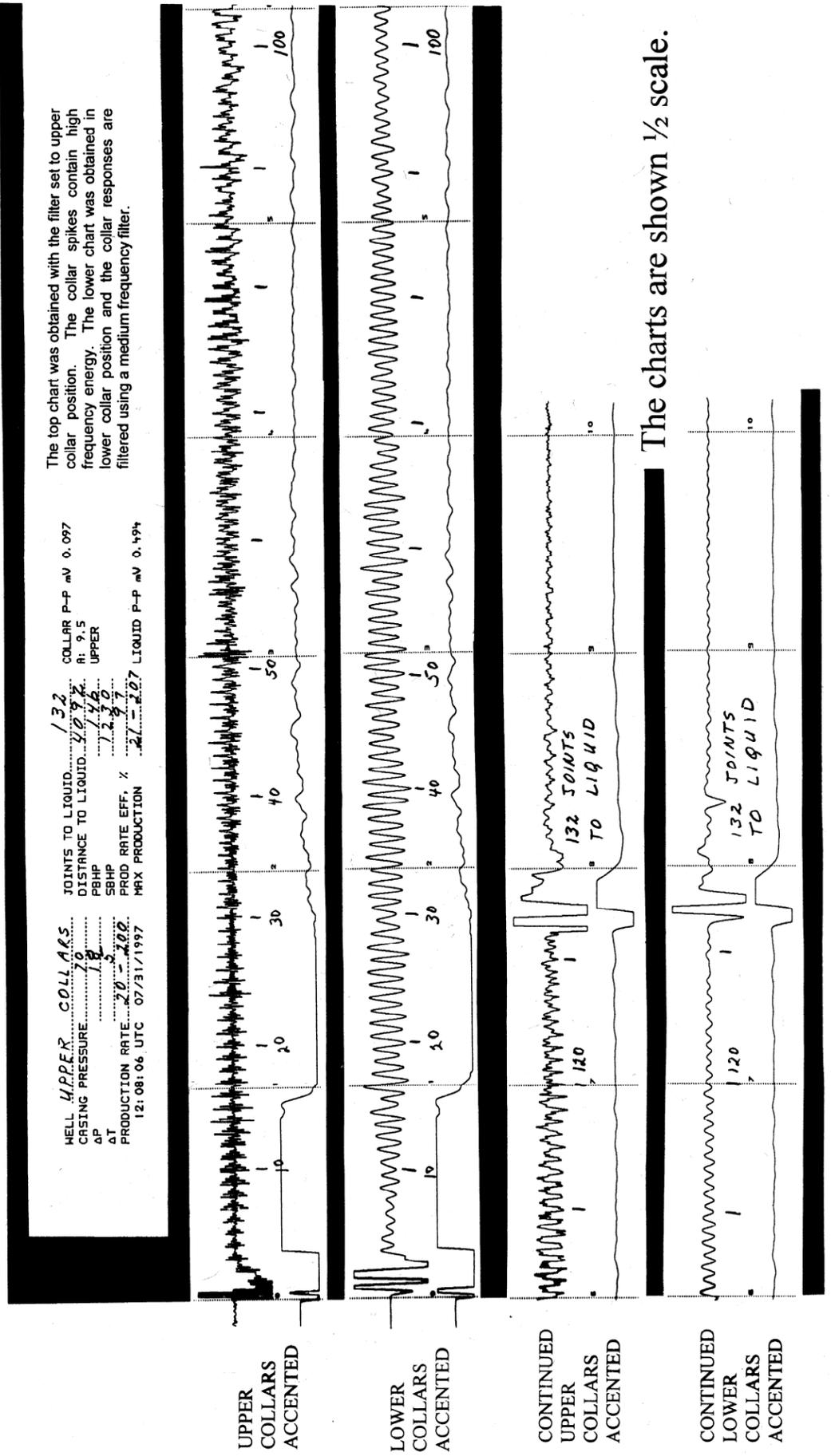


EXAMPLES OF UPPER AND LOWER COLLAR FILTERS



WELL UPPER COLLARS
 CASING PRESSURE..... 7.0
 ΔP..... 1.8
 PRODUCTION RATE..... 2.0
 12:08:06 UTC 07/31/1997

JOINTS TO LIQUID..... 132
 DISTANCE TO LIQUID..... 50.94
 PBHP..... 1.46
 SBHP..... 1.23
 PROD RATE EFF. %..... 27.27
 MAX PRODUCTION..... 2.7

COLLAR P-P mV 0.097
 R: 9.5
 UPPER

LIQUID P-P mV 0.494

WELL LOWER COLLARS
 CASING PRESSURE..... 7.0
 ΔP..... 1.8
 PRODUCTION RATE..... 2.0
 12:12:21 UTC 07/31/1997

JOINTS TO LIQUID..... 132
 DISTANCE TO LIQUID..... 50.94
 PBHP..... 1.46
 SBHP..... 1.23
 PROD RATE EFF. %..... 27.27
 MAX PRODUCTION..... 2.7

COLLAR P-P mV 0.184
 R: 8.8
 LOWER

LIQUID P-P mV 0.621

GENERATE PULSE..... 11.6 VOLTS

ECHOMETER LIQUID LEVEL INSTRUMENT MODEL M

- ✓ DUAL CHANNEL RECORDER
- ✓ AUTOMATIC GAIN SETTING AND CONTROL
- ✓ ONE SECOND TIMER WITH DATE STAMP
- ✓ PERFORMANCE AND RELIABILITY
- ✓ INCLUDES SOFTWARE FOR CALCULATING BOTTOMHOLE PRESSURES AND WELL ANALYSIS ON EXTERNAL COMPUTER



WORLD'S MOST POPULAR LIQUID LEVEL INSTRUMENT

Phone (940) 767-4334
 Fax (940) 723-7507
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 www.echometer.com

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 Wichita Falls, Texas 76302
 U.S.A.

Patent Nos.
 4,408,676
 4,637,463
 6,014,609

MODEL M PRINCIPLE OF OPERATION

The Echometer is used to determine the distance to the liquid level in the casing annulus of a well. A pressure pulse is generated from a gas-gun/microphone attachment that is connected to the surface casing annulus valve. The pressure pulse travels down the casing annulus gas and is reflected by collars, the liquid level and other obstructions. A microphone in the wellhead attachment converts the pressure pulses into electrical signals that are amplified, filtered and recorded on a strip of paper. The record shows the number of tubing collars from the surface to the liquid level and hence the liquid level depth can be determined.

“THE ECHOMETER MODEL M LIQUID LEVEL INSTRUMENT”

The Echometer instrument consists of an analog/digital amplifier-recorder and a gun-microphone wellhead. The amplifier-recorder features dual-channel recording. One channel is used to optimize the reflections from the liquid level, liners, tubing anchors and other large downhole anomalies. The second channel is used to optimize the response from the tubing collars.

A microprocessor controls the instrument. When the gain controls are set to the AUTO position, the microprocessor automatically sets both amplifier gains to the proper recording level. This simplifies operation of the equipment. The recording level of the reflected acoustic signal is optimized by the microprocessor so that the reflected signal can be easily interpreted by the operator. The operator can select the amplifier gains if desired.

OTHER MODEL M FEATURES

GENERAL DESIGN AND CONSTRUCTION - The quality and design of the Echometer is as important as the features listed. The latest in technology including a microprocessor, clock, timer and printhead are utilized for outstanding performance and reliability. The Echometer is constructed so that stray noise is reduced by shielding, shock mounting or filtering in order to record the desired information. The reliable Echometer is appreciated in remote applications where simple, rugged equipment is desired. A built-in self-test permits the operator to test the electronic circuit and the microphone cable. The microphone can be tested by a test bulb.

INTERPRETATION OF RECORDS - Interpretation of the charts is simplified. The Echometer features a recording system which responds in one direction for the liquid level kick, liners or any other obstruction. The recorder responds in the opposite direction for casing annulus enlargements such as open holes, enlarged sections, split casing, perforations, etc. This feature helps to prevent misinterpretation of the strip chart since upper perforations and “shot” holes can easily be separated from a liquid level kick. The dual-channel recording of the accented liquid level and accented collars allows improved interpretation of the reflected acoustic signal.

FILTER OPERATION - The reflected signals are filtered by the amplifier to remove undesirable noises and accent desired signals. The filter has the capability of removing undesirable noises so that the upper collars can be shown as sharp “kicks” or the deep collars can be recorded for maximum accuracy in a deep well. A distinct liquid level can be recorded even in a deep, low pressure, slim hole well on the channel which is designed to maximize the response from large downhole anomalies.

SELF-CONTAINED RECHARGEABLE BATTERY OR EXTERNAL 12VDC OPERATION - The amplifier-recorder operates from its own 12V rechargeable lead-cell battery. Also, the amplifier-recorder will operate from a 12V automobile cigar lighter outlet. When operating from the cigar lighter outlet, the lead-cell battery is charged automatically. This battery system is reliable and convenient. It is well suited for hot and cold weather operation.

CONVENIENCE FEATURES

TIME MARKS - The microprocessor continuously monitors the signal from the microphone and determines the instant of "firing." A timing mark is placed on the chart at the instant of "firing." Each second thereafter, another timing mark is placed onto the strip chart. These timing marks are numbered so that the elapsed time after pulse generation can easily be determined. In addition, an internal clock is used to place a date and time stamp on each record. This aids in record keeping of the precise time that an acoustic test is performed. A header is placed onto the strip chart when the power switch is turned on. The header contains general information, the instrument serial number and an electronic system test. Analysis forms are printed onto the strip chart so that the operator can input the distance to the liquid level, casing pressure, casing pressure buildup rate, SBHP and the well test. “AWP” software is supplied and used with an external computer to calculate bottomhole pressures and the maximum production rate of the well which are entered into these analysis forms. Please refer to the example.

GAS GUNS

Several gas guns are available for use with the Model M acoustic instrument. A manual fire compact gas gun, remote fire gas gun, 5000 PSI gas gun and a 15,000 PSI gas gun are available. Please refer to the gas gun wellhead brochure for details of these excellent gas guns. Visit www.echometer.com for additional information. Gas guns are preferred to blank guns that discharge burning particles of black powder which could result in a fire hazard and injury to people. Black powder blanks are difficult to ship and import into some countries.

CSA/KEMA/ATEX CERTIFICATION

The Model M and two of our gas guns can be modified for intrinsically safe service with the sensor located in hazardous areas. Please request a special quote if certification is desired. See www.echometer.com
CSA CERTIFICATE 1705541
CLASS 2258 03; CLASS 2258 83
CLASS I; DIVISION 1; DIVISION 2;
GROUPS A, B, C, AND D
KEMA CERTIFICATE: KEMA 05ATEX1246
II 1 G EEx ia IIC T4 (gas guns)
II (1) G [EExia] IIC (Model M, Model E)

SCHOOLS

Echometer Company holds schools regularly in the United States and Canada on the use and operation of liquid level instruments and the efficient production of wells. Customers may attend without a fee. Special and overseas seminars are available for a reasonable fee. Visit www.echometer.com for additional information.

MODEL M SPECIFICATIONS

TYPE: The Echometer Model M is a portable, self-contained instrument operating from a rechargeable self-contained battery or external 12VDC power supply. The amplifier-recorder is housed in a compact, plastic case. Standard equipment consists of the Model M amplifier-recorder, compact gas gun, carrying case, a 5’ microphone to amplifier cable, 110 (or 220, please specify) VAC automatic battery charger, 12 VDC automobile cigar lighter power cord, 11 point dividers, 10 rolls of paper, a 200 PSI gauge with quick connector for measuring casing pressure, set of o-rings and miscellaneous parts, and a comprehensive operating manual. A 2 1/2 lb CO₂ cylinder is supplied in the USA, and a 5 lb. cylinder is supplied overseas unless the customer requests the other option. A hose and filler connector are supplied for the CO₂ cylinders. If a different wellhead, special equipment, longer cables, or changes are desired, please specify.

WEIGHT:

Amplifier-Recorder Case.....	12 pounds	5Kg
Wellhead Attachment.....	8 pounds	4Kg
Well Accessory Box with wellhead attachment and supplies.....	25 pounds	11Kg

SIZE:

Amplifier-Recorder Case.....	5”x9”x12”	12cm x 20cm x 30cm
Well Accessory Box, Complete.....	8”x10”x12”	20cm x 25cm x 30cm

WELLHEAD: See the gas gun wellhead brochure for pressure ratings and options.

SHIPPING DATA: Complete Echometer, wellhead unit, with supplies including crating.

Dimension.....	15 x 15 x 18”	38 x 38 x 46cm
Displacement.....	4 Ft. ³	0.2 Meters ³
Weight, Gross.....	50 pounds	23 Kg