



H. W. ULMER CO.

**PRODUCT LINE
CARD**

ELECTRON TUBES

**Special Purpose
High Reliability
Laboratory Accuracy**

WELDING EQUIPMENT

**Stored Energy Resistance
Butt - Seam
Electron Beam
Automated Welding Equipment**

VACUUM EQUIPMENT

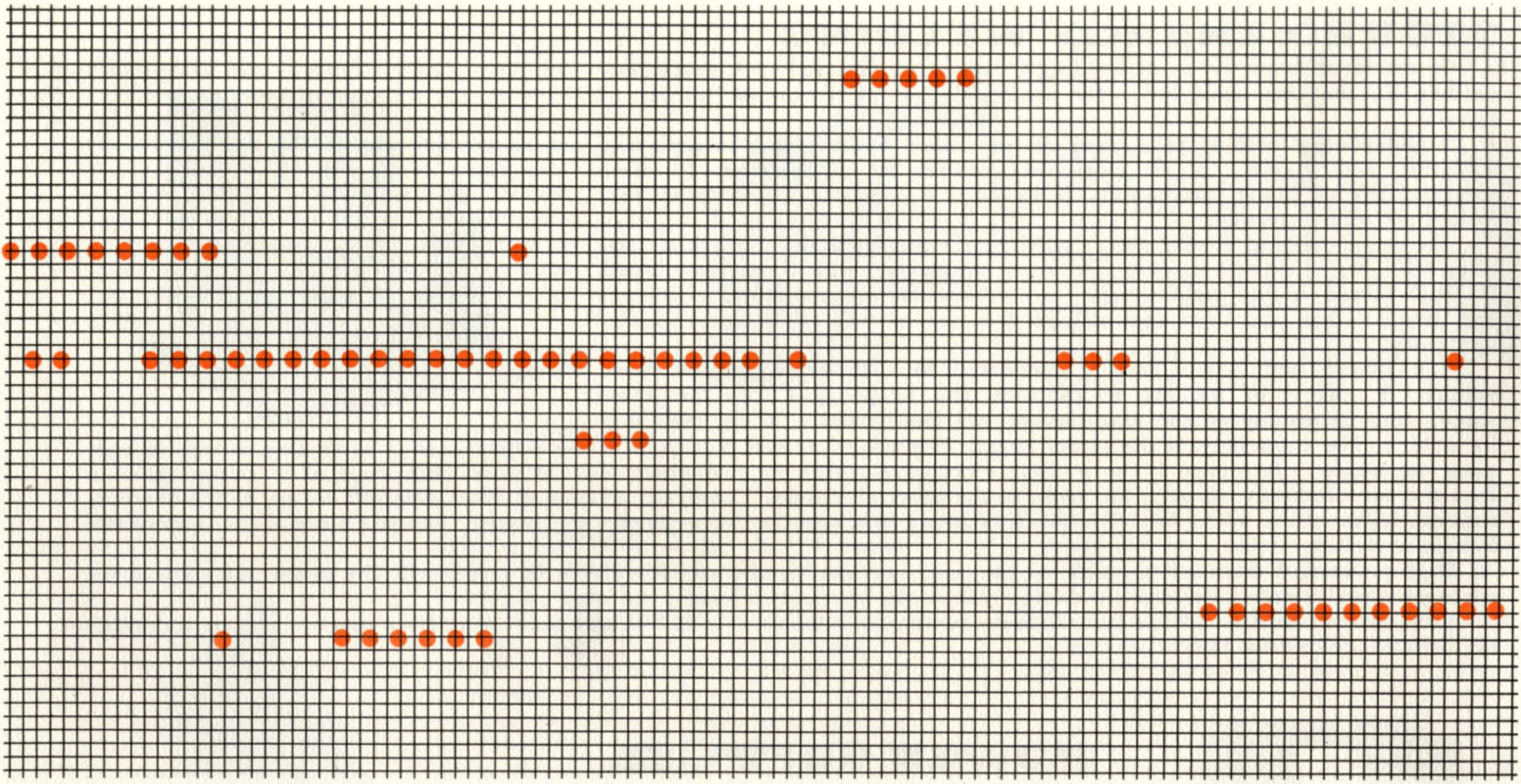
**Vacuum Systems
Vacuum Gauges
Vacuum Tubes**

MICRO WELDED MODULES

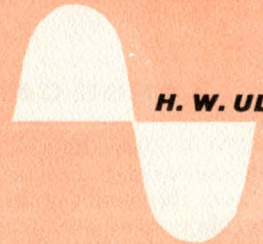
**High Reliability
High Density
High Production Capability**

RESEARCH and DEVELOPMENT

**Basic and Applied Research in High Vacuum,
Electron Beam and other Welding.
Electron Tube and Miniaturized Circuitry.**



STORED ENERGY WELDERS



H. W. ULMER CO.

STORED ENERGY WELDING

Of the three major types of welding (resistance, gas and arc), resistance welding is the one most generally applicable to the precision joining of metals.

Stored energy welding is a class of resistance welding that is replacing soldering and brazing for an increasing number of applications. It offers opportunities of higher production, reliability, economy and flexibility that should not be overlooked.

The advantages of stored energy welding are particularly suited to assembling the high density circuit packages which are now being developed. ULMER stored energy welders offer a combination of simplicity, efficiency and trouble-free operation that allows the use of only moderately skilled operators.

The power supply unit can be connected to a 110-130 volt 60 cycle supply. A variety of welding accessories can be plugged into the power supply unit depending on the size, nature and configuration of the metals to be welded. The capacitors in the power supply discharge into the primary of a transformer, and a secondary current of high peak magnitude is furnished to the welding electrodes, which are in contact with the work. This surge of DC current passes from the one electrode, through the work, to the other electrode. Localized melting of short duration occurs at the contacting interfaces of the work. Since the work is firmly held together between the electrodes, fusion occurs at the spot of the localized melting.

High production rates are possible as the time consumed in the actual welding is very small. The power unit capacitors recharge rapidly, and the equipment design allows the operator to handle the work quickly.

Call upon ULMER to advise you on cost-saving opportunities. ULMER has more than thirty years of resistance welding experience to draw upon.



POWER SUPPLIES

MODELS SE-10, SE-40, SE-80, SE-100

ULMER stored energy power supplies are bias thyatron controlled for exceptionally fast recharging. Reliable reproduction of the charge value is provided by the controlled time actuator relay.

PORTABLE MODELS PSE-40, PSE-80

ULMER portable models are powerstat controlled, two tube rectified units encased in a portable cabinet measuring only 8½" x 9" x 13".

SPECIFICATIONS

Model	Energy Storage in Watt Seconds	Approx. Discharge Time	Capacitor Bank in Microfarads	Storage Voltage	Secondary Voltage Crest Vol. (Approx.)	Secondary Current Amperes Max.	** Input Voltage
SE-10*	.1 to 10	.0008	200	0-340	14	2000	115
SE-40	.5 to 40	.002	500	0-400	15	8000	115
SE-80	.5 to 80	.004	1000	0-425	15	8000	115
SE-100	.5 to 100	.003	1200	0-425	17	12000	115
PSE-40	.5 to 40	.002	500	0-400	15	8000	115
PSE-80	.5 to 80	.004	1000	0-425	15	8000	115

Operating speed for all bench units is 1 weld per second at maximum charge; 2 per second at minimum charge.

Operating speed for PSE-40 is 1 weld per second at maximum charge; operating speed for PSE-80 is 1 weld every 2 seconds at maximum charge.

NOTE: Discharge time is dependent upon watt second setting, weld electrode pressure, and size and material being welded.

* Input Line voltage regulated with constant voltage transformer. ** Maximum demand less than 10 amperes.

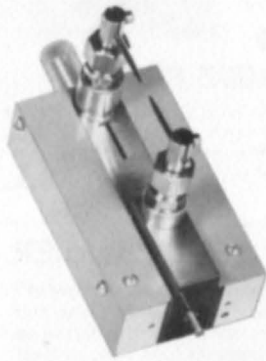
LARGE CAPACITY STORED ENERGY POWER SUPPLIES

MODEL SE-250 - The SE-250 unit is supplied in two cabinets with the weld transformer in a cabinet suitable for mounting near the weld pieces. The operating controls and the panel layout of one cabinet is identical to the SE-40, SE-80 and SE-100 except that the power output jacks deliver power to the primary of the weld transformer instead of coming from the secondary. The primary of the weld transformer package is plugged into the power jacks at the rear of the control cabinet when operating the unit. Storage capacity is 3200 mfd.

MODEL SE-500 - The SE-500 welder unit consists of two packages, one housing the control panel, the other housing the weld transformer and capacitors. Interconnecting cables are provided. Operation is identical to the lower powered SE series units, except that additional circuitry is provided to switch either lower power stored energy or higher powered stored energy into the weld transformer. Extra capacitor circuits are used to avoid heavy switching of capacitor circuitry. Full control ranges are provided with values of 1/2 to 50 watt seconds and 5 to 500 watt seconds of energy. Storage capacity of 600 microfarads is used on the low range and 6400 is used on the high range.

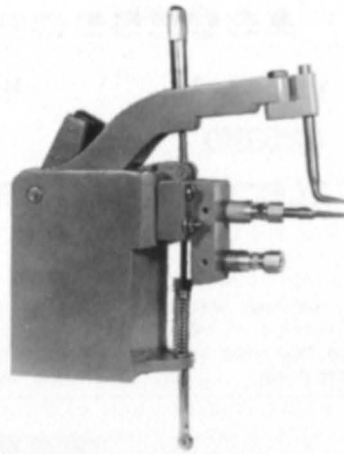
NOTE - Information on larger Stored Energy Power Supplies is presented in a separate brochure.

MODEL HWH-100 - The ULMER Model HWH-100 Bench Welder Head is of the vertical acting type. Its low inertia movable electrode assembly travels in linear ball bushings, providing precision alignment and friction-free, fast follow-up. Although small enough in size for the most delicate jobs, it has adequate strength and current carrying capacity to handle the output of a 250 watt second stored energy or an equivalent AC power supply.



HMW-102

MODEL HMW-102 - The ULMER Model HMW-102 Microtron Welding Head provides a very low inertia top welding electrode that can be placed precisely on the work every time. Accurately ground bearing raceways assure exact alignment of tips and maximum freedom of electrode travel. Electrical circuits are provided with high flexibility to avoid electrode currents in the precision bearings. Overtravel of the actuating mechanism switches the welding power supply to firing condition. The weld pressure knob allows for setting of weld pressure to a precisely reproducible value. Welding can occur only after set point pressure is applied. Bearing surfaces are designed to eliminate side slippage and duplication of welding is assured.



HWH-101

WELDING HEADS

MODEL HWH-101 - The ULMER Model HWH-101 is a precision rocker arm type welder head, used in production welding of electronic tube parts. The rocker arm hinge joint is low in friction, yet sufficiently rigid to provide excellent tip alignment. When used with the type tip shown in the photograph, the natural spring-back of the electrode material provides exceptionally fast follow-up.

MODEL HWH-250 - The ULMER Model HWH-250 is a precision vertical action medium duty Bench Welder head. Its low inertia electrode assembly moves in linear ball bushings, providing precision alignment and friction-free, fast follow-up. Although small in size it is so designed that a wide range of weld pressure can be used to weld from the most delicate assemblies to the medium sized production type jobs. Light weight machined aluminum construction provides high current capacity with the minimum of head heating on the heaviest of work for its rating. It will handle the output of a 500 watt second stored energy welder or its equivalent AC line type welder.

SPECIFICATIONS

Model	Throat Depth	Throat Spacing	Electrode Shank Diameter	Weld Firing	Pressure Range	Pressure Adjustment
HWH-100	2-1/2"	1-1/2"	1/4" lower 1/8" upper	By built in Micro-switch which closes when preset tip pressure is reached	1/4 to 10 lbs. standard. Higher ranges obtainable by pressure spring change	By marked knurled screw knob.
HWH-101	2-5/8" (with vertical upper tip)	2" and 3-1/2" (two arm positions)	5/16" is standard, 1/8" and 1/4" adaptors are available.	By built in Micro-switch which closes when preset tip pressure is reached	1/2 to 15 lbs.	By hexagon nut on top of Rocker arm
HMW-102	3" maximum 2" minimum	1-3/4"	1/8" standard	Automatic at preset pressure	Adjustable, maximum 10 lbs.	By marked knurled screw knob
HWH-250	3-1/2"	2-1/2"	Lower 5/16" Upper 5/16"	By built in Micro-switch which closes when preset tip pressure is reached	1/4 to 10 lbs. standard. Higher ranges obtainable by pressure spring change	By marked knurled screw knob

NOTE: Foot pedal actuation is standard; if air actuation desired instead of foot pedal specify Model HWH-100A, HWH-101A or HWH-250A.

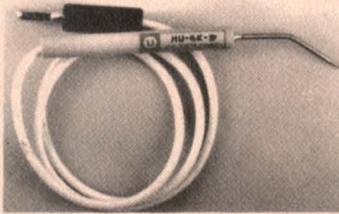
MODEL HBW - The ULMER Model HBW Butt Welder is a precision unit designed for bench mounting and hand actuation. The unit utilizes the proven design of the low inertia precision alignment linear ball bushing assembly used in the Model HWH-100 Bench Welder Head. Toggle clamps are provided for accurately locking the work to be welded in the copper welding jaws. Easy mounting allows for quick interchange of jaws so that many different types of material may be easily butt welded. Unit is provided with connecting cables and Cam-lock connectors to fit the B-002 receptacles which are standard on many welding power supplies.

BUTT WELDER

MODEL HBW SPECIFICATIONS -

Jaw (Open) Maximum Separation, 3/8" • Jaw (Closed) Minimum Separation, 1/32" • Jaw Length, 1-1/4" • Toggle Clamp Travel (Opening) 5/8" • Material Capacity, Round Wire: .005" to .100"; Flat Ribbon: 1/2" wide (depends on jaw design) • Power Rating, will handle the output of a 250 watt second stored energy or an equivalent AC line type power supply.

ACCESSORIES



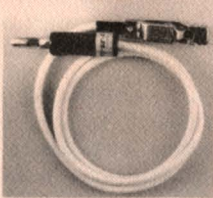
**HU-GE-8
GROUND
ELECTRODE**

A 1/8" diameter pointed Mallory #3 welding electrode 2-1/2" long bent at 45° in middle. Housing of bakelite tubing and cable is #12 extra-flexible test lead cable 3 feet long terminated in a 60 amp banana plug.



**HU-GE-16
GROUND
ELECTRODE**

A 5/16" diameter pointed Mallory #3 welding electrode 4-1/2" long bent at a 30° angle 2-1/2" from the tip. Housing of bakelite tubing and cable is #4 welding cable, 6 feet long terminating in a B-002 Camlok plug.



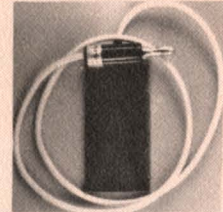
**HU-GE-C
GROUND
ELECTRODE CLIP**

A copper battery clip with a 3 foot long #12 extra-flexible test lead wire terminating in a 60 amp banana plug.



**HU-GE-D
GROUND
ELECTRODE DISC**

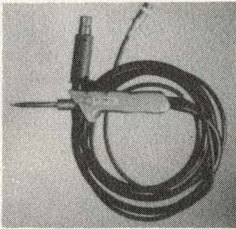
A copper disc 5/16" thick by 1-3/4" diameter with a 3 foot long #12 extra-flexible test lead cable terminating in a 60 amp banana plug.



**HU-GE-P
GROUND
ELECTRODE PLATE**

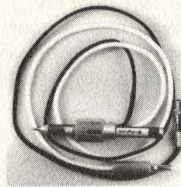
A copper plate 1/4" thick by 2" wide by 4" long with a 3 foot long #12 extra-flexible test lead cable terminating in a 60 amp banana plug.

HU-PW-16 PROBE WELDER



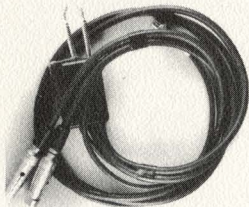
A probe welder with 5/16" diameter pointed Mallory #3 electrode. The handle houses microswitch which is finger actuated when weld action is desired. Weld circuit cable supplied is #6 cable, 6 feet long, terminating in a B-002 Camlok plug. Actuation switch cable is rubber covered, 6 feet long, terminating in an Amphenol plug.

HU-PW-8 PROBE WELDER



A 1/8" diameter pointed Mallory #3 welding electrode in an insulated housing complete with spring follow up pressure adjustment from 2 oz. to 8 oz. pressure. Actuating micro switch automatically actuates welder when selected pressure is applied. An actuator switch cable 3' long, terminating in a 60 amp banana plug is supplied. The cable is equipped with an amphenol plug and #12 extra flexible test lead cable.

HU-TW-8 TWEezer WELDER



A complete tweezer welding handpiece with spring-loaded follow up and microswitch weld actuation from closure over pressure. Cables supplied are 6 feet long. Actuator cable terminates in an Amphenol plug and the #6 weld cables in Camlok B-002 plugs.

HU-RWA ROLLER WELDER ATTACHMENT



A yoke with set screw housing a 1/4" wide by 1-1/2" diameter tapered wheel, pin supported, and removable for wheel dressing. Set screws allow attachment on PW-16.

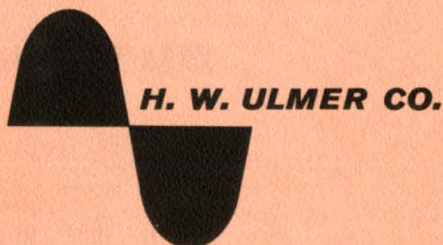
HU-A-60 ADAPTOR



An adaptor to accept 60 amp banana plugs and make connection in standard welding power supplies having Camlok receptacles.

HAA-90 AIR ACCESSORY UNIT

For use with air actuated welding heads. Solenoid operated air valve, pressure regulator with gauge, lubricator and filter are all combined in a single, small cabinet. Specify solenoid valve coil voltage desired - 110, 220 or 440.



H. W. ULMER CO.

STORED ENERGY WELDERS

PRICE LIST

EFFECTIVE JANUARY 1, 1963

WELDER POWER SUPPLIES

PRECISION SE-10	INTERNALLY BALLAST REGULATED WITH SOLA REGULATOR	\$ 430.00
SE-14	POWERSTAT CONTROLLED (NO METER) PANEL MOUNTING	225.00
PSE-40	POWERSTAT CONTROLLED, 500 MFD STORAGE - PORTABLE CABINET	310.00
PSE-80	POWERSTAT CONTROLLED, 1000 MFD STORAGE - PORTABLE CABINET	385.00
† SE-40	BIAS THYRATRON CONTROLLED, TIME DELAY, BLUE AND GOLD CAB., SET UP CONTROLS	410.00
† SE-80	BIAS THYRATRON CONTROLLED, TIME DELAY, BLUE AND GOLD CAB., SET UP CONTROLS	420.00
† SE-100	BIAS THYRATRON CONTROLLED, TIME DELAY, BLUE AND GOLD CAB., SET UP CONTROLS	430.00
† SE-250	BIAS THYRATRON CONTROLLED, TWO PACKAGES. WELD TRANSFORMER CABINET REMOTE FROM CONTROL CABINET	735.00
† SE-500	DUAL RANGE - 50 AND 500, TWO PACKAGES. TWO IDENTICAL CABINETS WITH CAPACITOR STORAGE BANK REMOTE. ALL CONTROLS AND WELD TRANSFORMER IN BENCH MOUNTED CABINET.	1150.00
SE-3000	2700 WATT SECOND HEAVY DUTY TWO UNIT WELDING SUPPLY, WITH AIR ACTUATION WELDING HEAD.	4500.00
* HWH-100	DIE SET, LINEAR BEARING HEAD, 250 WATT SECOND	150.00
HWH-101	ROCKER ARM, PRECISION HEAD, 250 WATT SECOND	135.00
* HWH-250	DIE SET, LINEAR BEARING HEAD, 500 WATT SECOND	175.00
* HMW-102	MINIATURE LOW INERTIA MODULE WELDER HEAD - 100 WATT SECOND	140.00
HDB-200	LOW INERTIA BEARINGLESS PRECISION AIR/MANUAL HEAD	300.00

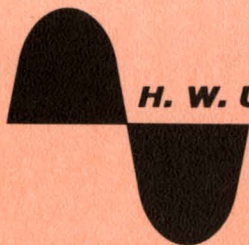
† NOTE: THESE MODELS CAN BE SUPPLIED WITH A SPECIAL HEAT CONTROL AND MICROMETER DIAL WITH 1 PART IN 1000 SETTING - ADD TO STANDARD PRICE 45.00 (ADD SUFFIX LETTER MD TO MODEL NUMBER)

† NOTE: VOLTAGE REGULATOR MODEL HU-REG-1 OR MODEL HU-REG-10 MAY BE PLUGGED INTO THESE UNITS WITHOUT EQUIPMENT MODIFICATION.

* NOTE: THESE MODELS AVAILABLE WITH AIR CYLINDER ACTUATORS. HEAD PRICE PLUS 75.00 (ADD LETTER A TO MODEL NUMBER TO INDICATE AIR ACTUATED)

WELDER ACCESSORIES

BW-11	HORIZONTAL BUTT WELDER, HAND ACTUATED, V JAWS, DIE SET, LINEAR BEARING, 250 WATT SECOND RATING - FOR USE WITH ANY SUPPLY LISTED ON OTHER SIDE	375.00
HS-2	WELDER TABLE, FORMICA TOP, TWO PILLAR CAST IRON BASE	100.00
HU-PW-8	PROBE WELDER, SMALL, 1/8", 3' LEADS - 60A PLUG	75.00
HU-GE-8	GROUND ELECTRODE, SMALL, 1/8", 3' LEADS - 60A PLUG	12.50
HU-GE-D	GROUND ELECTRODE DISC, 5/16" THICK, 1 3/4" DIAM., 3' LEADS - 60A PLUG	12.50
HU-GE-P	GROUND ELECTRODE PLATE, 1/4" THICK, 2" WIDE, 4" LONG, 3' LEADS - 60A PLUG	13.00
HU-GE-C	GROUND ELECTRODE CLIP, WITH COPPER CLIP - 60A PLUG	7.50
HU-A-60	ADAPTOR, 60 AMP JOHNSON PLUG TO CAMLOK - EACH	6.00
HU-A-WELD	ADAPTOR, WELDMATIC ACCESSORIES TO CAMLOK - EACH	6.00
HU-GE-16	GROUND ELECTRODE, 5/16" DIA., No. 4 CABLE, 6' LEADS - CAMLOK PLUG	15.00
HU-PW-16A	PROBE WELDER, SPOT, 5/16" DIA., No. 6 CABLE, 6' LEADS - CAMLOK PLUG	25.00
HU-RWA	ROLLER WELDER ATTACHMENT FOR PROBE WELDER, 1 1/2" WHEEL (FITS ON HU-PW-16A)	17.50
HU-TW-8	TWEEZER WELDER, WITH CAMLOK PLUGS	85.00
HAA-90	AIR ACCESSORY UNIT - FOR PRECISION FIRING AIR ACTUATOR EQUIPMENT	125.00
HU-REG-1	PLUG IN VOLTAGE REGULATOR FOR SE BIAS CONTROLLED POWER SUPPLY (1%)	40.00
HU-REG-10	PLUG IN VOLTAGE REGULATOR FOR SE BIAS CONTROLLED POWER SUPPLY (1/10%)	55.00



H. W. ULMER CO.

Division of Microtron Industries, Inc.

RESISTANCE WELDERS BY ULMER

GENERAL: Critical quality requirements in today's mechanical and electronic components have placed unprecedented demands upon the manufacturers of resistance welding equipment. Thirty-one years of continuous experience, supported by hundreds of man-years of engineering, enable the H.W. Ulmer Co. to meet this demand with welding equipment for all classes of customers—manufacturers of high reliability welded modules, electronic tubes, jewelry or any other product requiring precision metal-to-metal joining.

The broadening line of welders produced by Ulmer already has undergone thorough proving in the firm's own factory, both in research and production work on Ulmer's own products. Constant development of these lines, including welded modules and electronic tubes, has resulted in an ever expanding range of applications for these welding units.

The H.W. Ulmer Co. welders also are used in training personnel not versed in metal joining techniques through resistance welding.

The Ulmer line of welders covers a wide range, from precision low watt-second types, capable of welds in the fractional thousandth range, up to the large 2700 watt-second unit, capable of making projection ring welds on heavy steel sections.

RELIABILITY: H.W. Ulmer Co. welding equipment is made for work—steady, accurate, day-in-day-out production. Into its design have gone oversize components and sound electrical design for thorough reliability. Mechanically, it is designed for simplicity of manufacture and ease of servicing.

STABILITY: Components have been chosen to provide circuits which yield excellent weld to weld uniformity, so that in normal operation no special consideration need be given to produce welds of consistent quality. In most instances, normal line voltage variations will cause less deviation of weld heat than are caused by variations in shape, thickness, alloy composition, surface cleanliness, electrode surface condition and electrode size. But for even more critical control, Ulmer provides plug-in type electrical circuits which regulate the stored energy within very close limits. Two such models are available, one providing 1% control for 15% input variation, and the other maintaining 1/10% control for 15% input variation.

On some Ulmer welding units, a micrometer dial permits precise selection of the stored energy to an accuracy of one part in 1,000. This device eliminates the need for internal switching of any of the electrical circuits, which generally will cause variations in accuracy in some of the dual range power supplies now on the market. The micrometer system also enables an operator to set weld schedules to a precise number rather than having to set the heat rating to a certain watt-second value as read on an electrical meter.

METERING: Meters are available to permit the operator to monitor watt-second values on most Ulmer stored energy resistance welders. Most units are provided with a 3" meter reading directly in watt-seconds. However, larger or smaller edgewise or flat face meters may be installed as optional extras. Also available is a 7" precision-scaled meter with a knife-edge pointer and mirror back for reading to accuracies of ½% for engineers desiring to set weld schedules. While not normally installed on the equipment, meters of this type may be provided for all models in the Ulmer line. The added feature of plug-in jacks allow for either a temporary setup or permanent installation for production line use.

COMPONENTS: Components in the H.W. Ulmer Co. stored energy resistance welding units either have been selected for their proven reliability or have been specially manufactured to Ulmer's rigid specifications. The heart of these units lies in high-speed, accurate recharging of the storage bank, followed by uniform storage and accurate discharge of energy into a carefully designed weld transformer. Power supplies are provided with highly engineered charging transformers having optimum copper, core, insulation and impedance designs which allow the heavy-duty thyratrons to perform fast recycling of energy storage. The storage capacitors are especially fabricated to the design requirements of the H.W. Ulmer Co. At present these capacitors are not available on any machines other than those supplied by Ulmer.

Unique design affords multiple connections to the capacitor, thereby minimizing inherent inductance as well as the internal heat which is generated in ordinary capacitors, used by other manufacturers, wherein discharged energy passes through the capacitor foil and alters the stored energy value of the component. The uniform value of stored energy in the Ulmer welding unit is switched to the welding transformer through a heavy duty mercury-to-mercury pool contact. The weld-to-weld uniformity maintained by this sealed switching circuit cannot be duplicated with mechanical relays, which vary in contact resistance.

A specially designed welding transformer delivers the stored energy to the weld head or hand piece. Ulmer weld transformers embody optimum copper and inductance, and the cores have been selected to deliver optimum wave forms of energy to the secondary of the transformer over the wide range of voltage and discharge frequencies encountered. The maximum amount of energy is transferred to the weld pieces through a heavy duty secondary copper in the welding transformer.



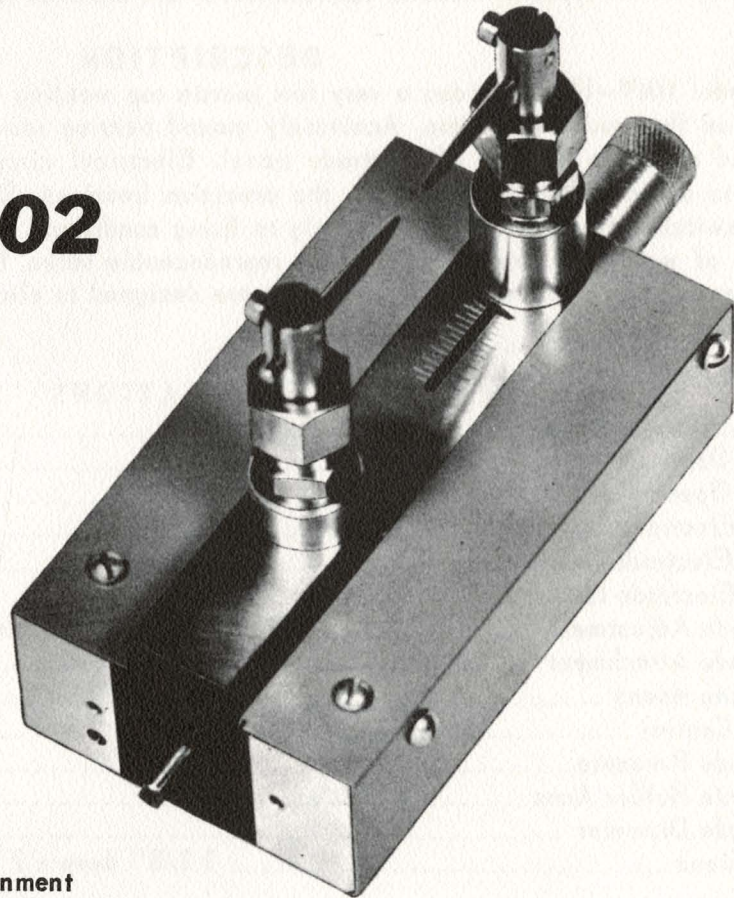
Division of Microtron Industries, Inc. • 3018 San Luis Rey Road • Oceanside, California

H. W. ULMER CO.

MICROTRON WELDING HEAD

for production of **MICRO**scopic elec**TRON**ic assemblies

Model HMW 102



- P**recision electrode alignment
- R**eproduceable welds every time
- E**xtremely low inertia and fast follow up
- M**aximum flexibility of electrode adjustment
- I**ndicator for weld pressure setting
- U**niform pressure on every weld
- M**icrotron Quality Product

HMW 102

The Standard of Quality for Welded Modules

Model HMW 102 Microtron Welding Head

GENERAL

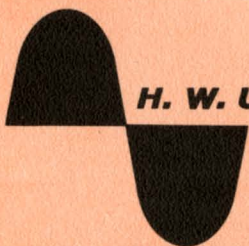
The Model HMW-102 Microtron Welding Head is available to meet the requirements of high volume manufacturing of high density electronic assemblies. The precision head is fabricated to engineering designs specifically for the production of premium quality welds as required for Space Age military and commercial equipment. Optimum size has been balanced with ease of operation to provide highest efficiency with minimum operator fatigue. A proven design assures maximum flexibility for all types of module, semiconductor and electron tube manufacturing operations.

DESCRIPTION

The Model HMW-102 provides a very low inertia top welding electrode that can be placed precisely on the work every time. Accurately ground bearing raceways assure exact alignment of tips and maximum freedom of electrode travel. Electrical circuits are provided with high flexibility to avoid electrode currents in the precision bearings. Overtravel of the actuating mechanism switches the welding power supply to firing condition. The weld pressure knob allows for setting of weld pressure to a precisely reproduceable value. Welding can only occur after set point pressure is applied. Bearing surfaces are designed to eliminate side slippage. Duplication of welding is assured.

SPECIFICATIONS

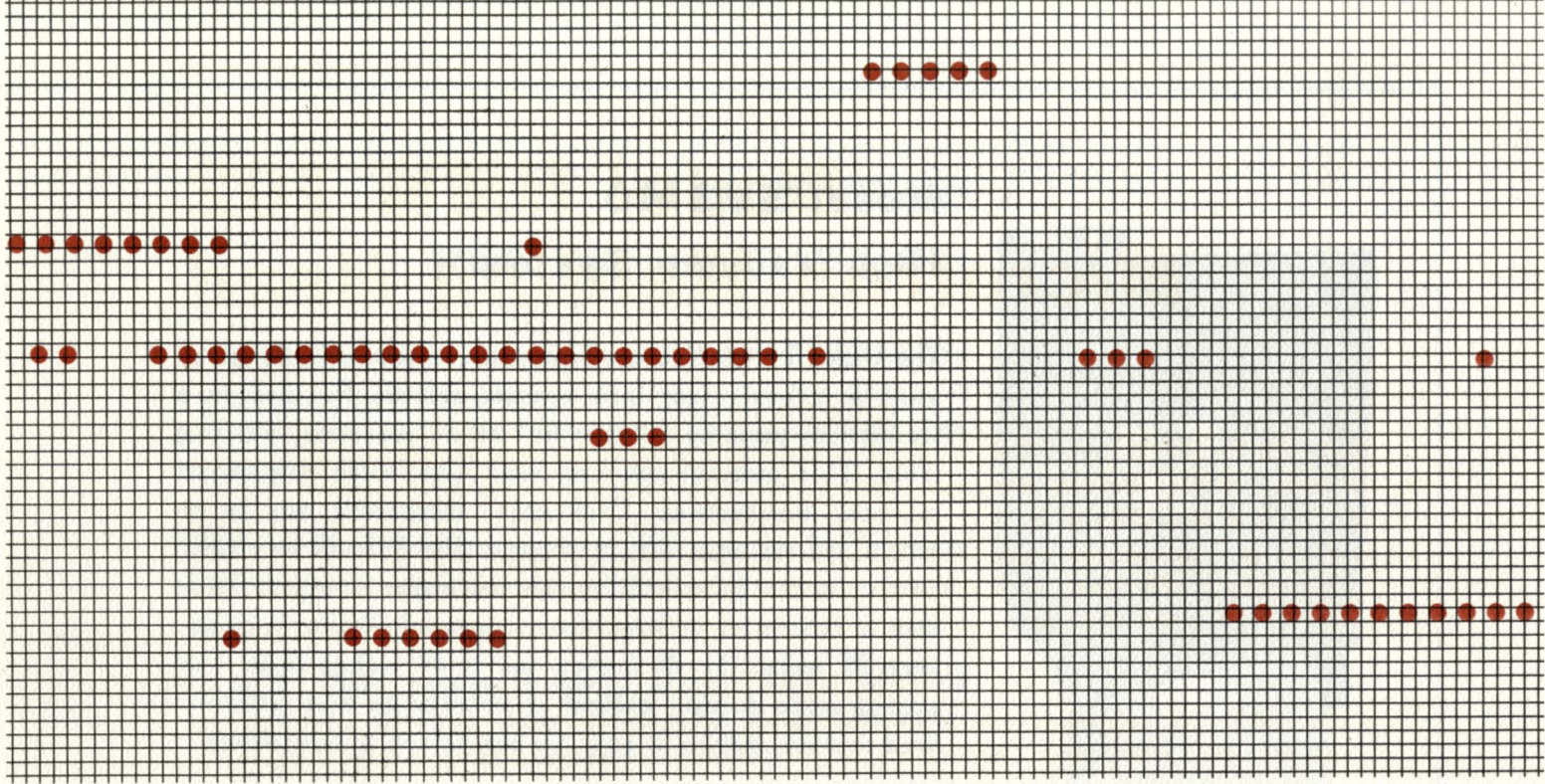
Maximum Power Rating	100 watt seconds
Throat Depth	3" maximum, 2" minimum
Throat Opening	1 3/4"
Upper Electrode Stroke	1/2"
Lower Electrode Holder Height	1 1/2"
Upper Electrode Holder Height	4"
Electrode Adjustment	Any - Upper and lower electrodes separated 2 1/2"
Electrode Attachment	Finger tightening split collar
Operating Means	Foot or air cylinder actuated
Firing Control	Automatic at preset pressure
Electrode Pressure	Adjustable - Maximum 10 lbs.
Electrode Holder Arms	45° or 90° - 3/8" diameter
Electrode Diameter	1/8" standard
Dimensions	1 3/8" deep x 2 9/16" width x 5 3/8" o.a. height
Weight	1 3/4 lbs.



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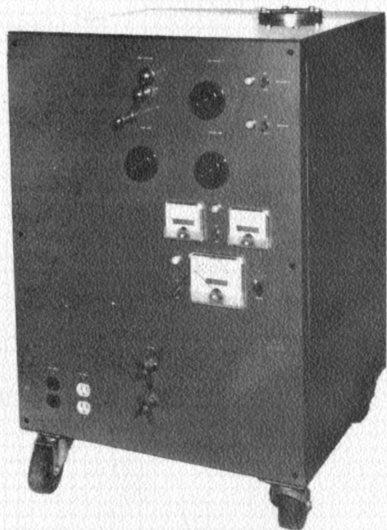
3018 San Luis Rey Road • Oceanside, California • telephone: 714-722-1511



HIGH VACUUM SYSTEMS



H. W. ULMER CO.



MODEL SVS-40

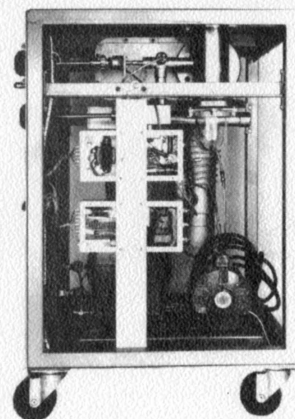
Model SVS-40 High Vacuum System

The ULMER High Vacuum System gives you everything you want in a basic four inch vacuum system. For use as a production pumping station or as a laboratory pumping table. This compact unit has been specifically engineered for easy maintenance. Each major component may be removed and replaced within minutes. The SVS-40 was built so that it can be moved through doorways, from production area to laboratory or from laboratory to laboratory. It measures 26 inches by 26 inches and is 40 inches high. The custom made durable cabinet is mounted on four rubber-tired casters, making it easy for one person to manipulate.

The unit contains a high-speed pumping combination of a 620 L/S diffusion pump and a 5 CFM mechanical pump. Vacuum measurements are made by two thermocouple vacuum gauges and a cold cathode gauge; these gauges cover the range of from 1MM Hg (1,000 microns) to 10^{-7} MM Hg.

SPECIFICATIONS:

- Inlet: 4" flange, 6 holes on 5/4" bolt circle
- Pumps: V.I.C. DW-4" diffusion pump; 620 L/S speed, 10^{-7} MM Hg ultimate Welch 1402 VE mechanical pump; 5 CFM speed
- Gauges: Ulmer Twin T-C Gauge Control with two Thermocouple Gauge Tubes
Ulmer Cold Cathode Gauge Control with Cold Cathode Gauge Tube
- Cold Trap: Optional four inch LN₂ cold trap may be installed above diffusion pump or optional LN₂ wall may be installed thru entry plate in pumping tee into attached chamber

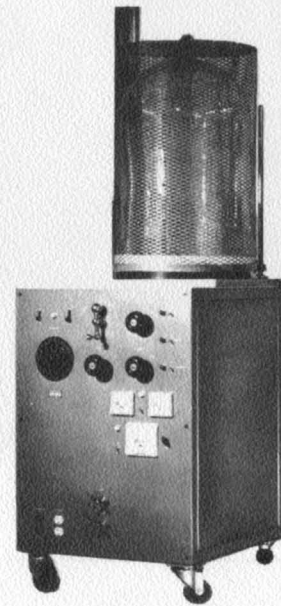


Model SVE-40 High Vacuum Evaporator

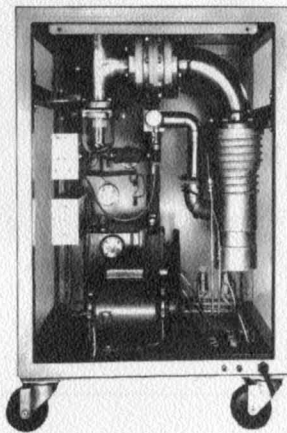
The ULMER High Vacuum Evaporator is a high quality production unit for all vacuum evaporation processes. It is also well suited for laboratory use because of its ease of maintenance and its utility of operation.

The basic pumping unit is only 26" wide by 26" deep by 40" high; it includes complete facilities for vacuum evaporation including:

- a. 4" high vacuum pumping system (using 620 L/S V.I.C. diffusion pump and 5 CFM Welch fore pump; 15 CFM fore pump specially available).
- b. 2.3 KVA evaporator power supply (variable: 0-5, 0-10, 0-20 volts).
- c. Either 12", 14", or 18" diameter bell jars of any standard height may be used with no base plate modification.
- d. A 4" diameter entry plate at the base of the pumping tee allows entry modifications (i.e. additional feed thrus for rotary motion, power transmission, and/or cooling water, etc.) to be made by user without the necessity of base plate alteration.



MODEL SVE-40



Choice of many system configurations enable the user to exactly define the system requirements and thus tailor the system to the job.

RF, Liquid and Gas feed thrus and any standard Pyrex piping available to adapt to your specifications. Vacuum Systems custom made for special purposes to your specifications.



Model 90-15 Ultra High Vacuum Pumping System

The ULMER Model 90-15 is a fully integrated titanium discharge, ultra high vacuum pump system for use as a production pumping station or as a laboratory pumping station requiring super clean pumping systems.

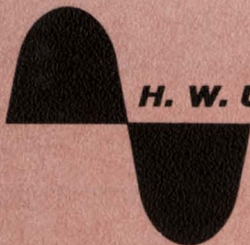
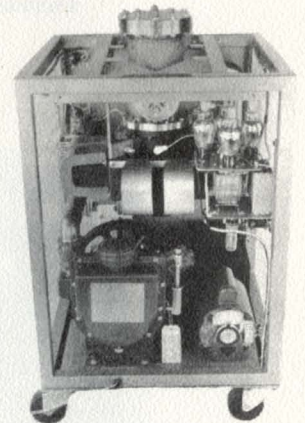
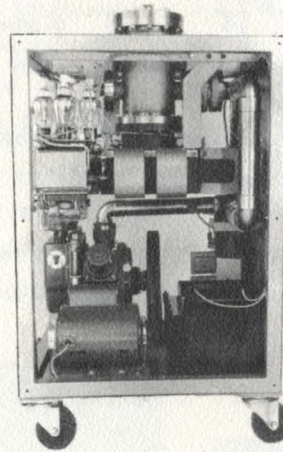
The Model 90-15 measures 26" x 26" x 40" high, it contains a 90 liter per second titanium discharge pump and a 15 CFM fore pump.

Vacuum measurements are made by a thermocouple gauge and an ionization gauge. These cover the range of from 1 MM Hg (1000 microns) to 10⁻⁹ MM Hg.

This compact system has been engineered for easy maintenance. The side and rear panels can be readily removed, exposing the entire system. The gauge controls are placed so that they may be easily removed or maintained without removal.

SPECIFICATIONS:

- Inlet: 6" flange, 12 holes
- Pumps: Ultek Model 290, 90 to 100 L/S 2x10⁻⁹ MM Hg ultimate
Welch 1397 mechanical 15 CFM speed
- Gauges: Ulmer CGT 74 Gauge Control with a G 34 Gauge Tube
Ulmer CGH 77 Gauge Control with a G79FS Gauge Tube
- Cold Trap: Optional LN₂ trap may be installed above the titanium discharge pump
- Molecular Sieve Trap available as optional equipment.



H. W. ULMER CO.

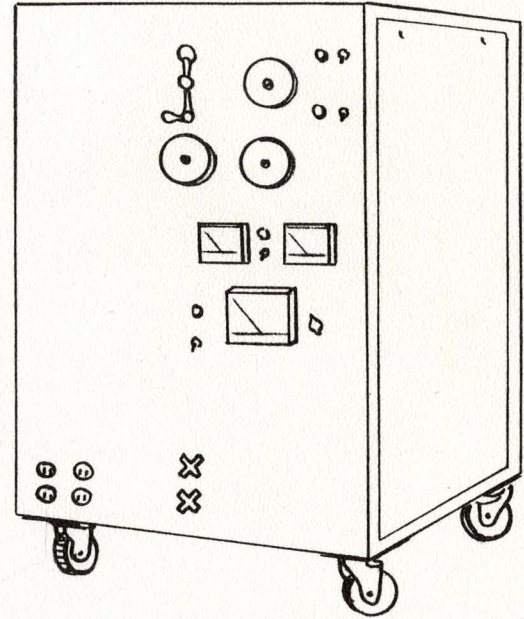
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HIGH VACUUM PUMPING SYSTEM

MODEL SVS-40

THE ULMER MODEL SVS-40 IS A FULLY INTEGRATED FOUR INCH HIGH VACUUM PUMPING SYSTEM FOR USE AS A PRODUCTION PUMPING STATION OR AS A LABORATORY PUMPING TABLE. ALTHOUGH A VERY COMPACT SYSTEM, MEASURING ONLY 26" X 26" X 40" HIGH, IT CONTAINS A HIGH SPEED PUMPING COMBINATION OF A 620 L/S DIFFUSION PUMP AND A 5 CFM FORE PUMP. VACUUM MEASUREMENTS ARE MADE BY TWO THERMOCOUPLE VACUUM GAUGES AND A COLD CATHODE GAUGE; THESE GAUGES COVER THE RANGE OF FROM 1 MM HG (1000 MICRONS) TO 10^{-7} MM HG.

THIS COMPACT SYSTEM HAS BEEN ENGINEERED FOR EASY MAINTENANCE. THE SIDE AND REAR PANELS CAN BE EASILY REMOVED, EXPOSING THE ENTIRE SYSTEM. EACH MAJOR COMPONENT IS INSTALLED IN SUCH A WAY THAT IT MAY BE REMOVED WITHIN A FEW MINUTES WITHOUT THE REMOVAL OF ANY OTHER COMPONENT BEING NECESSARY. THE GAUGE CONTROLS ARE PLACED SO THAT THEY MAY BE EASILY REMOVED OR MAY BE MAINTAINED WITHOUT THEIR REMOVAL.



SPECIFICATIONS:

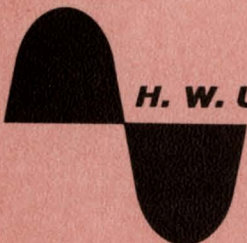
INLET: 4" FLANGE, 6 HOLES ON 5 1/4" BOLT CIRCLE

PUMPS: V.I.C. DW-4" DIFFUSION PUMP; 620 L/S SPEED, 10^{-7} MM HG ULTIMATE
WELCH 1402 VE MECHANICAL PUMP; 5 CFM SPEED

GAUGES: ULMER CGT-43 TWIN T-C GAUGE CONTROL WITH TWO G-33 GAUGE TUBES
ULMER CGC-45 COLD CATHODE GAUGE CONTROL WITH G-55 GAUGE TUBE

COLD TRAP: OPTIONAL FOUR INCH LN₂ COLD TRAP MAY BE INSTALLED ABOVE DIFFUSION
PUMP OR OPTIONAL LN₂ WALL MAY BE INSTALLED THRU ENTRY PLATE IN
PUMPING TEE INTO ATTACHED CHAMBER.

PRICE: MODEL SVS-40 HIGH VACUUM PUMPING STATION \$3200.00



H. W. ULMER CO.

Division of Microtron Industries, Inc.

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HIGH VACUUM EVAPORATOR

MODEL SVE-40

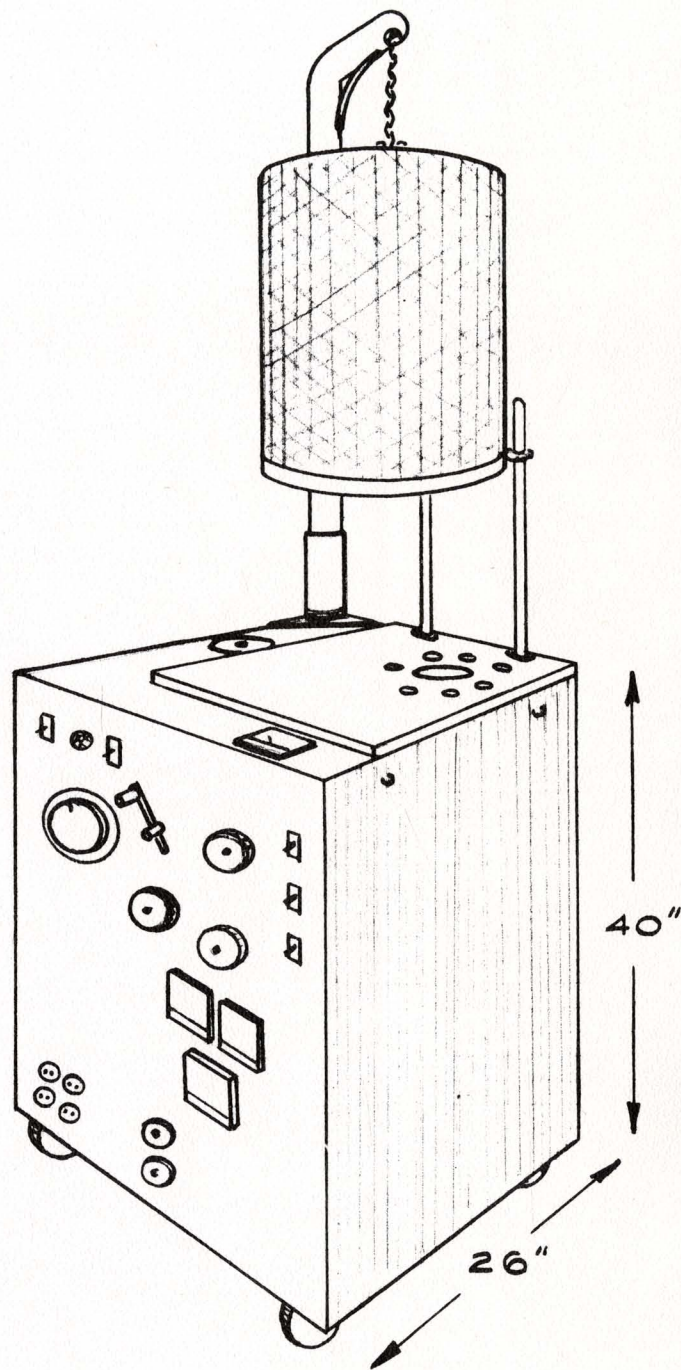
THE ULMER MODEL SVE-40 HIGH VACUUM EVAPORATOR IS A NEW COMPACT UNIT DESIGNED TO PROVIDE A HIGH QUALITY PRODUCTION TOOL FOR ALL VACUUM EVAPORATION PROCESSING. ITS UTILITY OF OPERATION AND EASE OF MAINTENANCE MAKE THE SVE-40 NOT ONLY IDEAL FOR THE PRODUCTION LINE, BUT ALSO VERY WELL SUITED TO THE LABORATORY.

THE BASIC PUMPING UNIT IS ONLY 26" WIDE BY 26" DEEP BY 40" HIGH; IT INCLUDES COMPLETE FACILITIES FOR VACUUM EVAPORATION INCLUDING:

- A) 4" HIGH VACUUM PUMPING SYSTEM (USING 620 L/S V.I.C. DIFFUSION PUMP AND 5 CFM WELCH FORE PUMP; 15 CFM FORE PUMP SPECIALLY AVAILABLE)
- B) 2.3 KVA EVAPORATOR POWER SUPPLY (VARIABLE: 0-5, 0-10, 0-20 VOLTS)
- C) EITHER AN 18" DIA. X 30 BELL JAR, OR A 14" DIA. BELL JAR, OR A 12" DIA. BELL JAR MAY BE USED WITHOUT ANY BASE PLATE MODIFICATION
- D) A 4" DIAMETER ENTRY PLATE AT THE BASE OF THE PUMPING TEE ALLOWS ENTRY MODIFICATIONS (I.E. ADDITIONAL FEED THRU'S FOR ROTARY MOTION, POWER TRANSMISSION, AND/OR COOLING WATER, ETC.) TO BE MADE BY USER WITHOUT THE NECESSITY OF BASE PLATE ALTERATION

CHOICE OF MANY SYSTEM CONFIGURATIONS ENABLE THE USER TO EXACTLY DEFINE THE SYSTEM REQUIREMENTS AND THUS TAILOR THE SYSTEM TO THE JOB.

REFER TO ULMER PRICE LIST FOR FULL SPECIFICATIONS AND PRICES ON THIS LOW COST, FLEXIBLE, COMPACT EVAPORATOR.

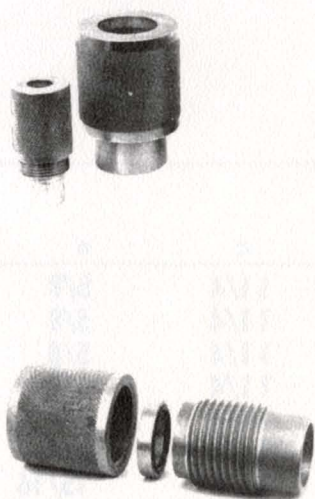


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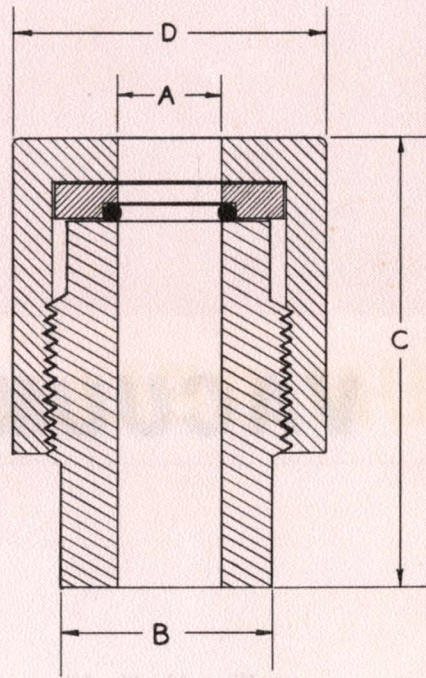
H. W. ULMER CO.

VACUUM COUPLINGS



The H. W. Ulmer Vacuum Couplings are hand tightening compression fittings suitable for interconnecting tubing, vacuum gauges or other plumbing parts on high vacuum systems. Optimum design has been achieved by allowing proper fits on the threaded section and clearance on the washer to nut seat. The "O" ring groove dimensions are designed to provide maximum sealing with minimum pressure and torque. The "O" ring seats in a square recess allowing freedom to provide maximum resilient pressure on the wall of the connecting tube. Restriction of the outside diameter of the "O" ring causes a constriction of the inside diameter when pressure is applied by tightening the torque nut.

These vacuum couplings may be either soft soldered, hard soldered, brazed or waxed to the vacuum system. The quick tightening coupling nut allows easy attachment of metal or glass tubes to a permanent manifold. Two couplings may be soldered together and substitute for a glass to glass seal for either experimental or permanent glass apparatus assemblies if glass workers are not readily available.



CATALOG NO.	PRICE EA.	SIZE	A	B	C	D	"O" RING
UC-06	5.00	1/16	.070	3/8	1 1/4	5/8	2-3
UC-09	5.00	3/32	.106	3/8	1 1/4	5/8	2-5
UC-12	5.00	1/8	.140	3/8	1 1/4	5/8	2-6
UC-18	5.00	3/16	.203	3/8	1 1/4	5/8	2-8
UC-25	5.00	1/4	.265	1/2	1 1/4	3/4	2-10
UC-31	5.50	5/16	.328	1/2	1 1/4	3/4	2-11
UC-38	5.50	3/8	.390	5/8	1 5/8	15/16	2-110
UC-50	6.00	1/2	.515	3/4	1 5/8	1 1/4	2-112
UC-62	6.50	5/8	.640	7/8	1 5/8	1 1/4	2-114
UC-75	6.50	3/4	.765	1 1/8	1 3/4	1 1/2	2-210
UC-87	7.00	7/8	.890	1 1/4	2	1 5/8	2-212
UC-100	8.00	1	1.015	1 3/8	2 1/4	1 3/4	2-214
UC-112	9.00	1 1/8	1.156	1 1/2	2 1/4	1 3/4	2-216
UC-137	14.00	1 3/8	1.406	1 3/4	2 1/2	2 1/4	2-220
UC-162	19.00	1 5/8	1.656	2	2 1/2	2 1/2	2-223

Neoprene "O" rings are standard - Viton can be supplied on special order

Note: Price discounts quoted separately for lots in excess of 10 each

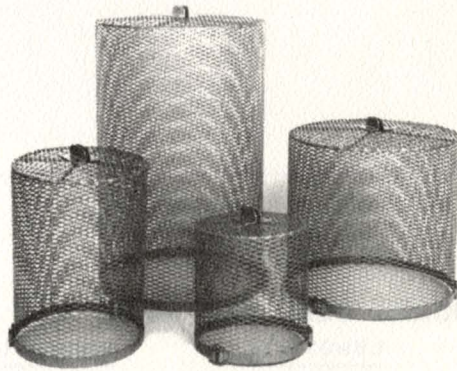


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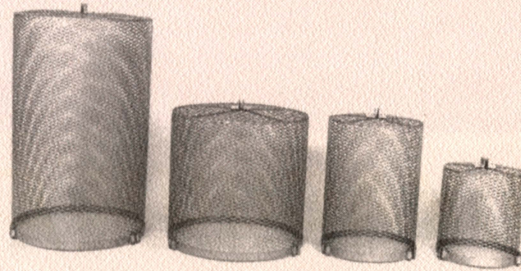
H. W. ULMER CO.

VACUUM BELL JAR GUARDS



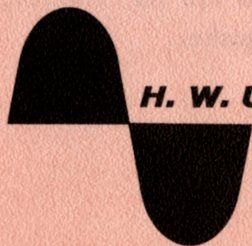
The H. W. Ulmer Company manufactures metal protecting guards for glass bell jars used for both operator protection and as a means of attaching a lifting cable. Guards are fabricated of perforated metal and assembly is completed by acetylene welding. All edges are smooth and guards are finished in grey hammertone. Hole size is such as to provide complete operator protection from any implosion or explosion.

Guards are available for all standard Corning Glass Co. pyrex jars. The inside diameter is 1" greater than the O.D. of the glass, allowing for two wraps of 1/4" x 2" asbestos cloth tape as a clamp cushion (not furnished). The inside height is the same as the height of the jar, allowing for 2" clearance to install the bell jar gasket.



STANDARD BELL JAR SIZES

O.D./IN.	LENGTH/IN.	MINIMUM I.D./IN.
10 1/4 ± 5/32	12 ± 1/8	9 1/4
10 1/4 ± 5/32	24 ± 1/8	9 1/4
10 1/4 ± 5/32	30 ± 3/16	9 1/4
12 1/2 ± 3/16	12 ± 1/8	11 1/2
12 1/2 ± 3/16	18 ± 1/8	11 1/2
12 1/2 ± 3/16	24 ± 1/8	11 1/2
12 1/2 ± 3/16	30 ± 3/16	11 1/2
15 3/8 ± 7/32	12 ± 1/8	14 1/4
15 3/8 ± 7/32	18 ± 1/8	14 1/4
15 3/8 ± 7/32	30 ± 3/16	14 1/4
18 ± 7/32	12 ± 1/8	16 7/8
18 ± 7/32	18 ± 1/8	16 7/8
18 ± 7/32	30 ± 3/16	16 7/8



H. W. ULMER CO.

HIGH VACUUM EQUIPMENT

JUNE 1, 1962

SVS-40	VACUUM SYSTEM. 4" BASIC VACUUM PUMPING SYSTEM WITH VALVES FOR ROUGHOUT AIR RELEASE, OR GAS FILL AND HIGH VACUUM HOLDING. HIGH SPEED, 5 CFM FORE PUMP 26" X 26" X 40" - PORTABLE.	\$3,200.00
SVE-40	VACUUM EVAPORATOR. SAME AS ABOVE EXCEPT SUPPLIED WITH 18" X 30" BELL JAR, GUARD, COUNTER BALANCED HOIST, BASEPLATE AND FEED THRU, CONTROLLED 2 KVA HIGH CURRENT HEATER SUPPLY AND GLOW DISCHARGE SUPPLY. MANY OPTIONAL ACCESSORIES AVAILABLE - STANDARD SYSTEM OVERALL 26" X 26" X 40" TABLE HEIGHT PLUS HOIST.	4,400.00
90-15	TITANIUM DISCHARGE VACUUM PUMPING SYSTEM. COMPLETE DRY VACUUM SYSTEM WITH 6" INLET FLANGE AND 90 LITER/SEC DISCHARGE PUMP - 26" X 26" X 40" OVERALL DIMENSIONS - PORTABLE - HIGH SPEED - WITH 15 CFM ROUGHOUT PUMP - WITH STANDARD ACCESSORIES	5,000.00

HIGH VACUUM ACCESSORIES

TYPE F-42 HIGH CURRENT FEED THRU - 300 AMP 250 V.	
STANDARD - BRASS CONSTRUCTION NEOPRENE "O" RING	25.00
COPPER CONSTRUCTION WITH VITON "O" RING	35.00
TYPE F-54 R.F. FEED THRU (WATER COOLED)	
STANDARD - BRASS CONSTRUCTION AND LUCITE INSULATOR	182.00
WITH TEFLON INSULATOR AND COPPER LINES	228.00

THIS ISSUE SUPERSEDES PRICE LIST DATED MAR. 1, 1962

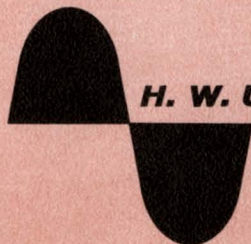
BELL JAR GUARDS

10 1/4" X 12"	\$40.00	15 3/8" X 12"	\$75.00
10 1/4" X 24"	50.00	15 3/8" X 18"	85.00
10 1/4" X 30"	60.00	15 3/8" X 30"	95.00
12 1/2" X 12"	60.00	18" X 12"	95.00
12 1/2" X 18"	65.00	18" X 18"	105.00
12 1/2" X 24"	70.00	18" X 30"	120.00
12 1/2" X 30"	75.00		

VACUUM COUPLINGS

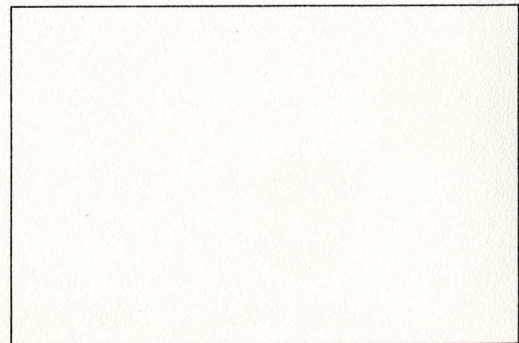
BRASS CONSTRUCTION WITH NEOPRENE "O" RINGS — VITON AVAILABLE ON SPECIAL ORDER. ALSO STAINLESS STEEL INSERT AVAILABLE ON SPECIAL ORDER, SUITABLE FOR HELIARC WELDING TO STAINLESS STEEL SYSTEMS.

UC - 06	\$ 5.00	UC - 62	\$ 6.50
UC - 09	5.00	UC - 75	6.50
UC - 12	5.00	UC - 87	7.00
UC - 18	5.00	UC - 100	8.00
UC - 25	5.00	UC - 112	9.00
UC - 31	5.50	UC - 137	14.00
UC - 38	5.50	UC - 162	19.00
UC - 50	6.00		



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HIGH CURRENT FEED THRU

TYPE F-42

THE ULMER TYPE F-42 FEED THRU IS A HIGH CURRENT FEED THRU FOR USE IN HIGH VACUUM APPLICATIONS SUCH AS VACUUM EVAPORATION, ENVIRONMENTAL TESTING, AND OTHER SITUATIONS WHERE IT IS NECESSARY TO PROVIDE A HIGH CURRENT ELECTRICAL PATH INTO A VACUUM CHAMBER. THE INSULATION IS PROVIDED BY TWO FIBER INSULATORS, BOTH ON THE ATMOSPHERE SIDE OF THE VACUUM SEAL. THE SEAL IS MAINTAINED BY ONE STANDARD O-RING. THE LARGE BODY SHIELDS THE INSULATION AND THE O-RING SO THAT DEPOSITS OF MATERIALS ARE KEPT AWAY FROM THESE PIECES.

SPECIFICATIONS:

RATED CURRENT: 300 AMPS

RATED VOLTAGE: 250 VOLTS

BREAK-DOWN VOLTAGE:

OVER 750 VOLTS D.C.

MATERIAL: COPPER STUDS, BRASS BODY AND NUTS, NEOPRENE O-RING (COPPER BODY, BRONZE NUTS AND VITON O-RING AVAILABLE ON SPECIAL ORDER).

MOUNTING HOLE: 3/4" DIAMETER

MOUNTING THICKNESS: 3/8" MIN.

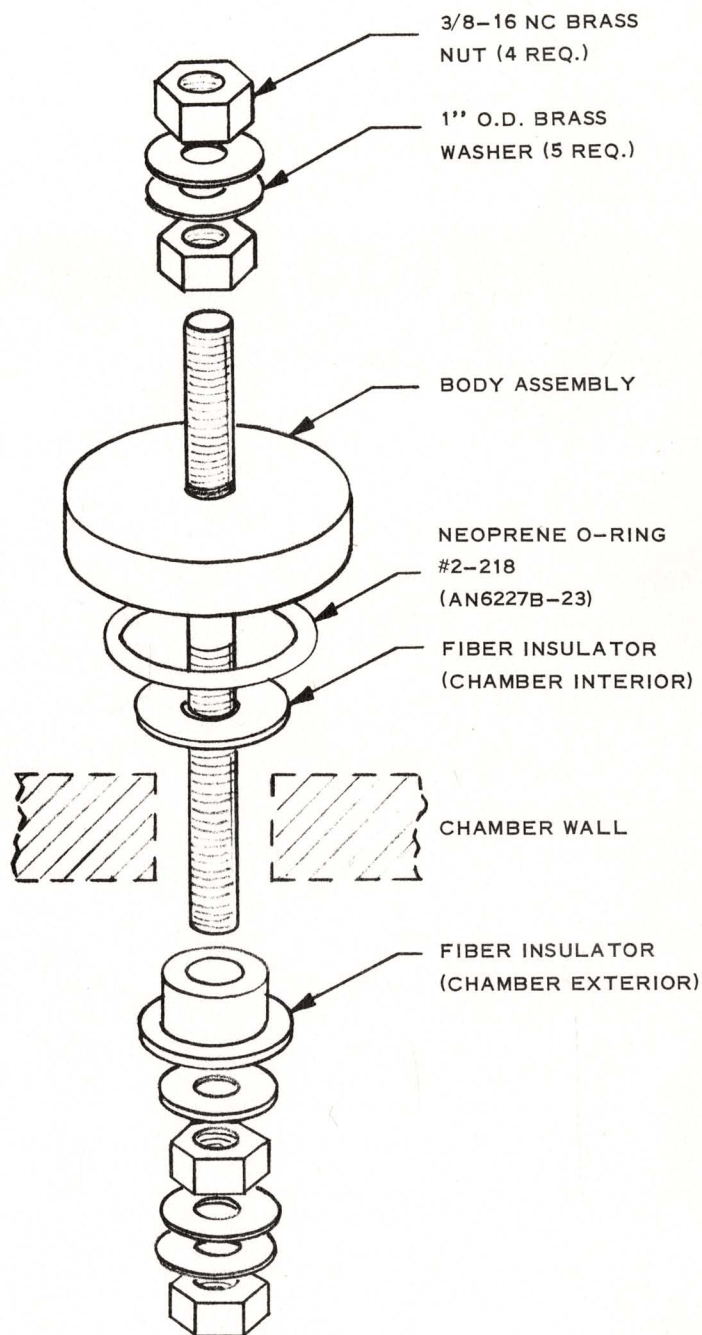
TO 1 1/4" MAX.

OVERALL LENGTH: 4"

BODY: 2" DIA. X 0.4" THICK

PRICE: \$25.00 STANDARD

(COPPER BODY, BRONZE NUTS, VITON O-RING: \$35.00)



H. W. ULMER CO.

Division of Microtron Industries, Inc.

R. F. FEED THRU

TYPE F-54

THE ULMER TYPE F-54 R.F. FEED THRU IS A HIGH VOLTAGE, HIGH FREQUENCY WATER COOLED FEED THRU. IT IS DESIGNED FOR USE IN PROVIDING AN ELECTRICAL PATH FOR BRINGING INDUCTION HEATING POWER INTO A HIGH VACUUM CHAMBER. ITS VERY LOW LOSS CHARACTERISTICS AND ITS HIGH BREAKDOWN VOLTAGE MAKE IT ALSO APPLICABLE TO MANY OTHER APPLICATIONS INVOLVING THE USE OF HIGH FREQUENCY POWER.

THE SIMPLICITY OF DESIGN INSURES A TROUBLE-FREE UNIT AND PROVIDES FOR EASE OF MAINTENANCE. THE TYPE F-54 FEED THRU IS EASILY INSTALLED IN A BASE PLATE OR OTHER VACUUM CHAMBER WALL.

SPECIFICATIONS:

INLET AND EXHAUST CONNECTIONS:

1/8" PIPE COUPLINGS OR
1/4" FLARE FITTINGS
(ADAPTER SUPPLIED)

RATED VOLTAGE: 10,000 V.D.C.

TESTED VOLTAGE: 17,000 V.D.C.

RATED FREQUENCY: THRU 800 K.C.

WATER LINE: 1/2" O.D. PIPE

MOUNTING HOLES: 2 1/2" DIAMETER

ADMITTANCE HOLE WITH 6 EACH
EQUALLY SPACED 5/16-16 NC TAPPED
HOLES ON 4 1/4" B.C.

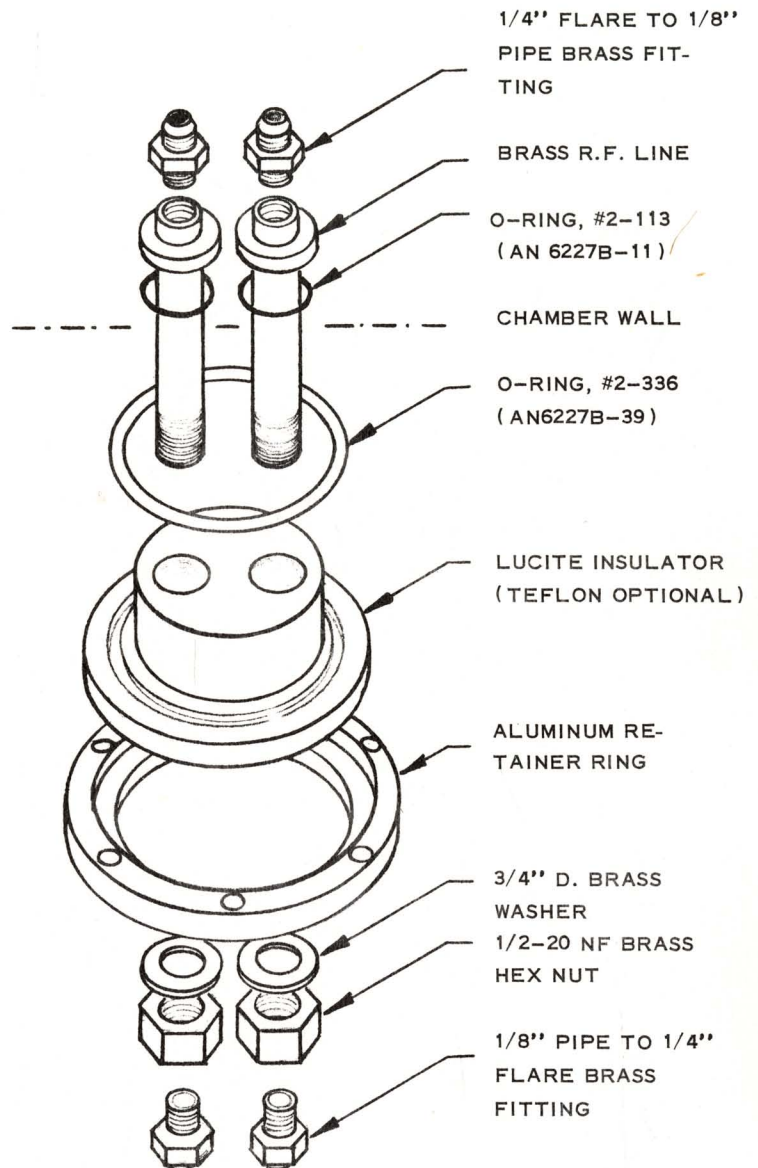
OVERALL LENGTH: 2 1/4"

INSULATOR: 3 3/4" DIA. X 1 1/4" THICK

RETAINER: 5" DIA. X 1/4" THICK

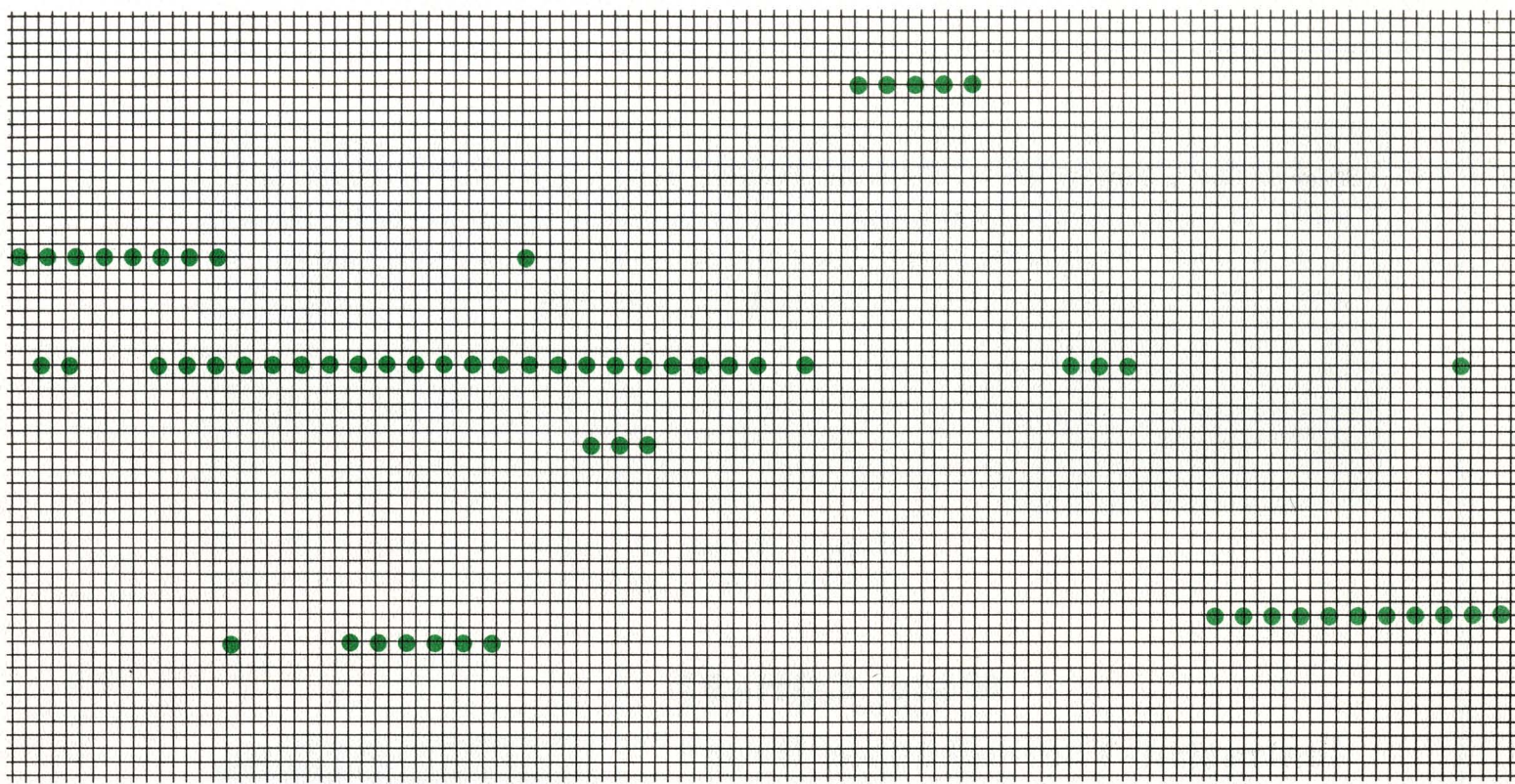
PRICE: \$182.00

(WITH TEFLON INSULATOR AND
COPPER LINES: \$228.00)

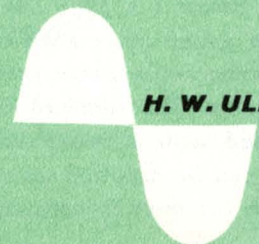


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VACUUM GAUGE CONTROLS



H. W. ULMER CO.

Vacuum Gauge Controls are specialized equipments where a high degree of vacuum technology is required in development and manufacturing. Harold Ulmer, the guiding genius of H. W. Ulmer Company, has been in this field, both in research and manufacturing, for over 30 years. You can be assured of reliability with Ulmer equipment.

Included in this group are thermocouple gauge controls, Philips or cold discharge gauge controls and ionization gauge controls to cover the entire range of vacuum from 1000_u to 10⁻¹² MM Hg.

Model CGH-27 Ionization-Thermocouple Gauge

The H. W. ULMER CGH-27 Ionization-Thermocouple Gauge covers the vacuum pressure range from 1000 microns to below 1×10^{-7} MM Hg. This instrument combines the Ulmer thermocouple gauge and the Ulmer ionization gauge in one broad range. It is a highly dependable piece of test equipment. The Ulmer ionization gauge affords the utmost in ease of operation. The circuit will adapt for many types of ion tubes and will automatically compensate for ion tube ageing. An automatic cut off feature protects the ion tube from pressure surges. The cut off relay is the plug in type . . . dust proof and easily replaceable. A contact out-gas button operates thru a special circuit to heat and outgas the grid by passing current thru it. This prevents the slow evolution of gas and subsequent false pressure readings. Simple front panel adjustments give you immediate accurate calibrations of the ionization gauge circuit.

The Ulmer CGH-27 permits accurate readings of the ionization gauge and the thermocouple gauge on an easily read meter. The ionization gauge covers the range from 1 micron to below 1×10^{-7} MM Hg, in four steps controlled by the ion gauge range knob on the front panel. The compensated thermocouple gauge covers the range from 1000 microns to 1 micron. The standard ionization thermocouple gauge is supplied with a two position selectable thermocouple gauge. It can be supplied for use with either fast response or medium response thermocouple gauge circuit.



FEATURES:

1. Electric requirements, 90 to 140 volts, 60/50 cycle AC, 60 watts power consumption.
2. Large accurate meter provides precise pressure readings.
3. Covers range from 1000 microns to below 10^{-7} MM Hg.
4. Automatically compensates for ion tube ageing.
5. Incorporates regulated thermocouple gauge.
6. Outgas circuit for elimination of false pressure readings.
7. Automatic cutoff relay protects ion tube from burnout.
8. Special custom made units available by request.

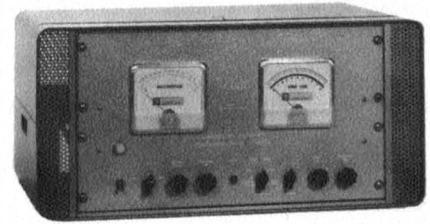
Model CGH-47 Ionization Gauge Control

The Ulmer CGH-47 is applicable to standards work or other work where high accuracy of vacuum measurement is required. The range is from 1 MM Hg. to 2×10^{-9} MM Hg.

The amplifier gain of the CGH-47 may be adjusted to allow the correct calibration of any ionization tube at that tube's normal operating temperature.

Protection controls include both a single-pole double-throw relay output and a controlled 110 volt AC outlet.

10 millivolt recorder connections for both the ionization gauge output and the thermocouple gauge output are provided.



SPECIFICATIONS:

Range: 1 MM Hg. (1000 microns) to 2×10^{-9} MM Hg.

Thermocouple vacuum gauges measure from 1 MM Hg. to 10^{-3} MM Hg.

Ionization vacuum gauge measures from 10^{-2} MM Hg. to 2×10^{-9} MM Hg.

Accuracy: When calibrated per specified procedure, accuracy is within:

$\pm 10\%$ of reading from 1 MM Hg. (1000 microns) to 0.1 MM Hg. (100 microns)

± 5 microns Hg. from 0.1 MM Hg. (100 microns) to 0.05 MM Hg. (50 microns)

± 2 microns Hg. from 0.05 MM Hg. (50 microns) to 0.005 MM Hg. (5 microns)

$\pm 5\%$ of range from 0.005 MM Hg. (5 microns) to 10^{-7} MM Hg.

$\pm 10\%$ of range below 10^{-7} MM Hg.

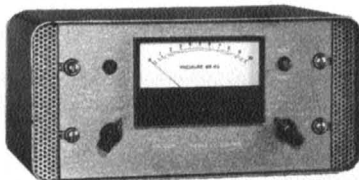
Tubes Required: One ionization gauge tube of any type (G-77, G-78, G-79 recommended)

Two thermocouple gauge tubes (specify either high current circuit W21 for 550 MA tubes such as G-31 or low current circuit W23 for 20 MA tubes such as G-33)

Size: $10\frac{1}{2}$ " high by 19" long, standard rack panel; cabinet size $11\frac{1}{2}$ " high x 24" wide x 15" deep

Cables: One five foot ionization gauge tube cable, two five foot thermocouple gauge tube cables

Model CGH-77 and CGH-87 Modular Gauge Control



The ULMER CGH-77 is supplied in two packages; one contains the power supply and heavy transformers, the other the meter and controls.

This control meters from 10^{-3} to 2×10^{-10} MM Hg. It has an easily read $4\frac{1}{2}$ " horizontal meter and operates on 115v AC, 50/60 cycle power.

Model CGH-87 is an extended range version capable of reading to 2×10^{-11} MM Hg.

Model CGT-13 Thermocouple Vacuum Gauge Control

The ULMER CGT-13 Thermocouple Vacuum Gauge Control is a light weight, battery operated, portable instrument for industrial usage. This outstandingly rugged control is supplied in a non-breakable fiber glass case with leather carrying strap.

This control, when used with a suitable gauge tube, will give continuous pressure readings over a range of from 1 micron Hg. to 1000 microns Hg. absolute pressure. It is also applicable to leak detection by virtue of its very fast response and its variation in readings caused by changes in gas compositions.

SPECIFICATIONS:

Range: 1 micron Hg. to 1000 microns Hg. (absolute); 10^{-3} MM Hg. to 1 MM Hg. (absolute)

Power: $1\frac{1}{2}$ volt battery (flashlight battery Neda No. 13)

Dimensions: Case - $7\frac{7}{8}$ " high x $5\frac{7}{8}$ " wide x $3\frac{1}{4}$ " deep

Panel - $7\frac{1}{2}$ " high x $5\frac{1}{2}$ " wide

Meter: 3" rect. 0-10 mv (3" ruggedized meter and 4" rect. meter optional)

Weight: Approximately four pounds

Gauge Cord Length: Nominally four feet long

Gauge Tube: Ulmer G-33 (or equivalent: Hughes 6343, CEC GTC 004, etc.)

The Model CGT-13 is especially suited to the monitoring or servicing of vacuum insulated liquid gas storage tanks and service lines.



Models CGT-21 and CGT-23 Thermocouple Vacuum Gauge Control

The Models CGT-21 and CGT-23 Thermocouple Vacuum Gauge Controls are industrial instruments with high reliability and laboratory accuracy. Operating from 115v AC, these units give pressure readings over a continuous range from 1 micron Hg. to 1000 microns Hg. absolute.

SPECIFICATIONS:

Range: 1 micron Hg. to 1000 microns Hg. (absolute); 10^{-3} MM Hg. to 1 MM Hg.

Power: 115v AC, 50/60 cycle

Dimensions: Cabinet Type - 10" long x 8" high x 8" deep (shown)

Panel Type - 19" standard rack panel x 7" high x 6" deep

Meter: 2 each 3" meters (4" meters optional; specify 4" standard meters or 4" mirror scale meters)

Weight: $7\frac{1}{2}$ pounds

Gauge Cord Length: Nominally 6' long

Gauge Tube: Model CGT-21 - G-31 (or NRC 501, Hughes 6416)

Model CGT-23 - G-33 (or Hughes 6343, CEC GTC 004)



Many other types of Vacuum Gauge Controls available - Also special purpose controls custom made to order



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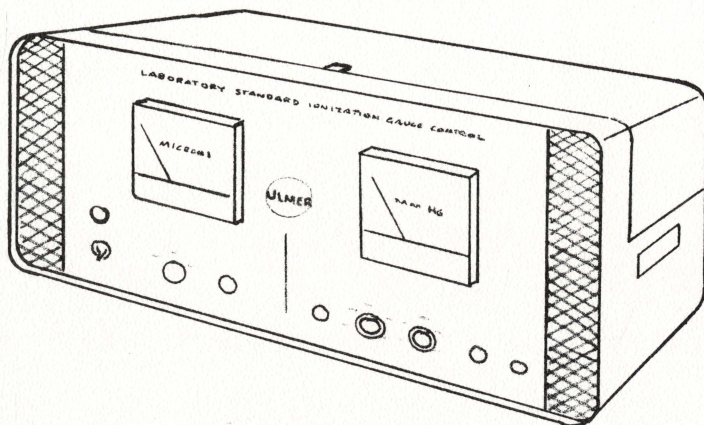
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LABORATORY STANDARD IONIZATION GAUGE CONTROL

MODEL CGH-47

THE ULMER MODEL CGH-47 CONTROL IS AN EXCEPTIONALLY ACCURATE VACUUM GAUGE CONTROL APPLICABLE TO STANDARDS WORK OR OTHER WORK WHERE HIGH ACCURACY OF VACUUM MEASUREMENTS IS DESIRED. THE CGH-47 IS FOR USE WITH ANY STANDARD TRIODE HOT FILAMENT IONIZATION GAUGE TUBE AND TWO THERMOCOUPLE GAUGE TUBES. THE RANGE IS FROM 1 MM HG TO 2×10^{-9} MM HG.

THE AMPLIFIER GAIN OF THE CGH-47 MAY BE ADJUSTED TO ALLOW THE CORRECT CALIBRATION OF ANY IONIZATION TUBE AT THAT TUBE'S NORMAL OPERATING TEMPERATURE. PROTECTION CONTROLS INCLUDE BOTH A SPDT RELAY OUTPUT AND A CONTROLLED 110 VOLT A.C. OUTLET. 10 MILLIVOLT RECORDER CONNECTIONS FOR BOTH THE IONIZATION GAUGE OUTPUT AND THE THERMOCOUPLE GAUGE OUTPUT ARE PROVIDED.



SPECIFICATIONS:

RANGE: 1 MM HG (1000 MICRONS) TO 2×10^{-9} MM HG

THERMOCOUPLE VACUUM GAUGES MEASURE FROM 1 MM HG TO 10^{-3} MM HG

IONIZATION VACUUM GAUGE MEASURES FROM 10^{-2} MM HG TO 2×10^{-9} MM HG

ACCURACY: WHEN CALIBRATED PER SPECIFIED PROCEDURE, ACCURACY IS WITHIN:

$\pm 10\%$ OF READING FROM 1 MM HG (1000 MICRONS) TO 0.1 MM HG (100 MICRONS)

± 5 MICRONS HG FROM 0.1 MM HG (100 MICRONS) TO 0.05 MM HG (50 MICRONS)

± 2 MICRONS HG FROM 0.05 MM HG (50 MICRONS) TO 0.005 MM HG (5 MICRONS)

$\pm 5\%$ OF RANGE FROM 0.005 MM HG (5 MICRONS) TO 10^{-7} MM HG

$\pm 10\%$ OF RANGE BELOW 10^{-7} MM HG

TUBES REQUIRED: ONE IONIZATION GAUGE TUBE OF ANY TYPE (G-77, G-78, G-79 RECOMMENDED)

TWO THERMOCOUPLE GAUGE TUBES (SPECIFY EITHER HIGH CURRENT CIRCUIT

W21 FOR 550 MA TUBES SUCH AS G-31 OR LOW CURRENT CIRCUIT W23 FOR

20 MA TUBES SUCH AS G-33)

SIZE: 10 1/2" HIGH BY 19" LONG, STANDARD RACK PANEL; CABINET SIZE 11 1/2" HIGH X 24" WIDE X 15" DEEP

CABLES: ONE FIVE FOOT IONIZATION GAUGE TUBE CABLE, TWO FIVE FOOT THERMOCOUPLE GAUGE TUBE CABLES

PRICES:

TYPE CGH-47W21 CONTROL WITH CABLES BUT LESS TUBES \$615.00

TYPE CGH-47W23 CONTROL WITH CABLES BUT LESS TUBES 615.00



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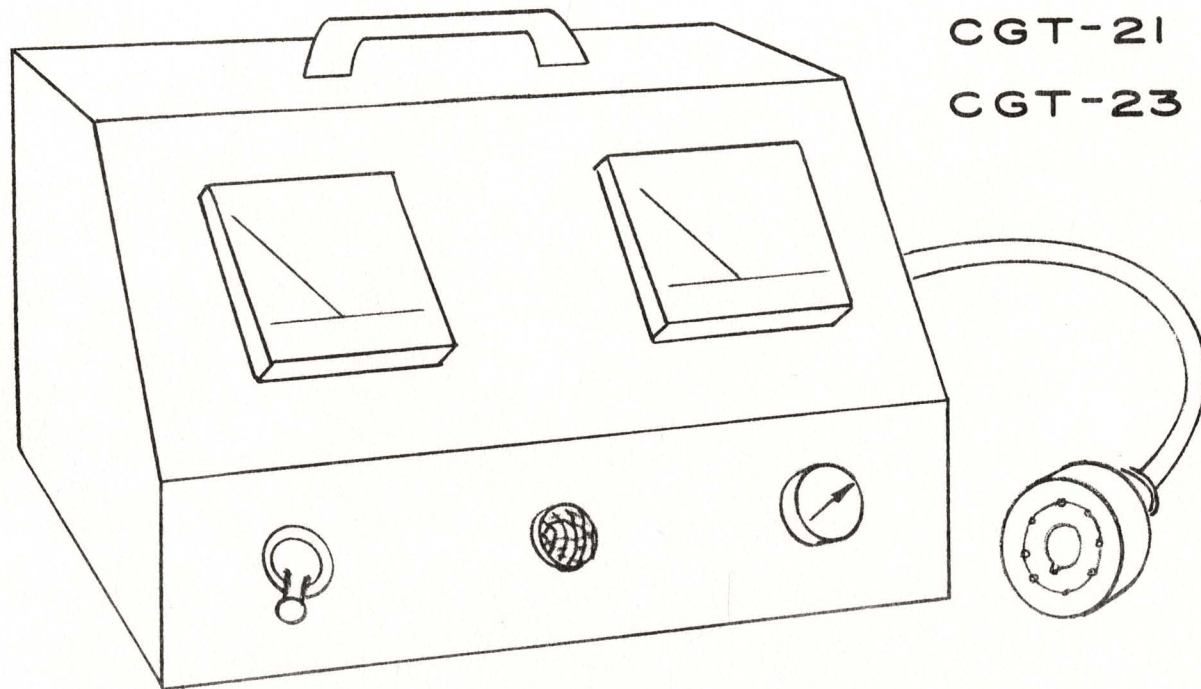
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THERMOCOUPLE VACUUM GAUGE CONTROL

MODELS

CGT-21

CGT-23



THE MODELS CGT-21 AND CGT-23 THERMOCOUPLE VACUUM GAUGE CONTROLS ARE INDUSTRIAL INSTRUMENTS WITH HIGH RELIABILITY AND LABORATORY ACCURACY. OPERATING FROM 115 V.A.C., THESE UNITS GIVE PRESSURE READINGS OVER A CONTINUOUS RANGE FROM 1 MICRON HG TO 1000 MICRONS HG ABSOLUTE.

SPECIFICATIONS:

RANGE: 1 MICRON HG TO 1000 MICRONS HG (ABSOLUTE); 10^{-3} MM HG TO 1 MM HG.

POWER: 115 V.A.C. 50-60 CYCLE

DIMENSIONS: CABINET TYPE - 10" L X 8" H X 8" D (SHOWN ABOVE)

PANEL TYPE - 19" STD. RACK PANEL X 7" H X 6" D

METER: 2 EACH 3" RECT. METERS (4" METERS OPTIONAL; SPECIFY 4" STD. METERS OR 4" MIRROR SCALE METERS)

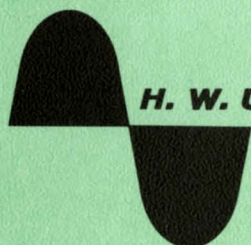
WEIGHT: APPROXIMATELY 10 POUNDS

GAUGE CORD LENGTH: NOMINALLY 6' LONG

GAUGE TUBE: MODEL CGT-21 - G-31 (OR NRC 501, HUGHES 6416)

MODEL CGT-23 - G-33 (OR HUGHES 6343, CEC GTC 004)

PRICE: REFER TO ULMER PRICE LIST



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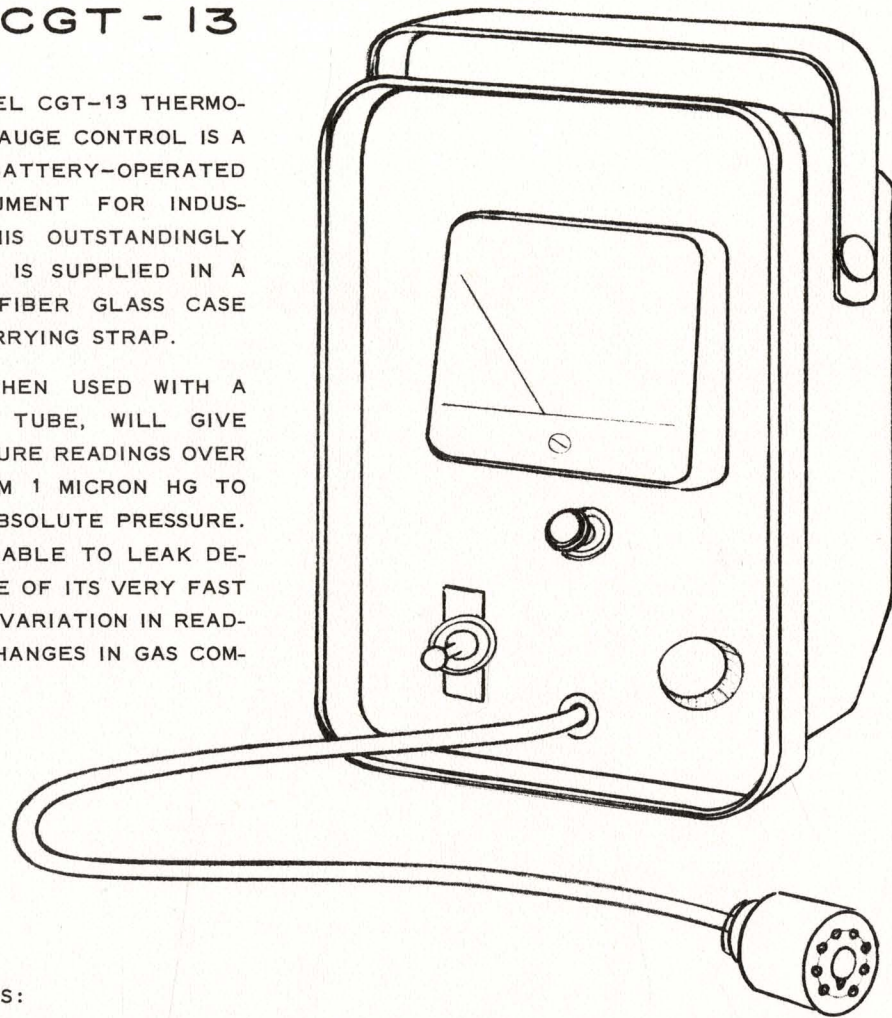
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THERMOCOUPLE VACUUM GAUGE CONTROL

MODEL CGT - 13

THE ULMER MODEL CGT-13 THERMOCOUPLE VACUUM GAUGE CONTROL IS A LIGHT WEIGHT BATTERY-OPERATED PORTABLE INSTRUMENT FOR INDUSTRIAL USAGE. THIS OUTSTANDINGLY RUGGED CONTROL IS SUPPLIED IN A NON-BREAKABLE FIBER GLASS CASE WITH LEATHER CARRYING STRAP.

THIS CONTROL, WHEN USED WITH A SUITABLE GAUGE TUBE, WILL GIVE CONTINUOUS PRESSURE READINGS OVER A RANGE OF FROM 1 MICRON HG TO 1000 MICRONS HG ABSOLUTE PRESSURE. IT IS ALSO APPLICABLE TO LEAK DETECTION BY VIRTUE OF ITS VERY FAST RESPONSE AND ITS VARIATION IN READINGS CAUSED BY CHANGES IN GAS COMPOSITIONS.



SPECIFICATIONS:

RANGE: 1 MICRON HG TO 1000 MICRON HG (ABSOLUTE); 10^{-3} MM HG TO 1 MM HG (ABSOLUTE)

POWER: 1 1/2 VOLT BATTERY (FLASHLIGHT BATTERY NEDA #13)

DIMENSIONS: CASE - 7 7/8" HIGH X 5 7/8" WIDE X 3 1/4" DEEP

PANEL - 7 1/2" HIGH X 5 1/2" WIDE

METER: 3" RECT. 0-10 MV (3" RUGGEDIZED METER AND 4" RECT. METER OPTIONAL)

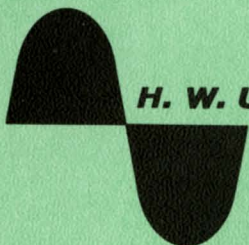
WEIGHT: APPROXIMATELY FOUR POUNDS

GAUGE CORD LENGTH: NOMINALLY FOUR FEET LONG

GAUGE TUBE: ULMER G-33 (OR EQUIVALENT: HUGHES 6343, CEC GTC 004, ETC.)

PRICE: REFER TO ULMER PRICE LIST

NOTE: THE MODEL CGT-13 IS ESPECIALLY SUITED TO THE MONITORING OR SERVICING OF VACUUM INSULATED LIQUID GAS STORAGE TANKS AND SERVICE LINES



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VACUUM GAUGE CONTROLS

THERMOCOUPLE VACUUM GAUGE CONTROLS

CGT-01	MINIATURE CONTROL, SINGLE METER, BAL- LAST TUBE STABILIZED. FOR TYPE G-31, 6416, OR NRC 501 THERMOCOUPLE TUBE.	75.00	CGT-24M	SAME AS ABOVE EXCEPT FOR CONTACT METER.	185.00
CGT-02	MINIATURE CONTROL, SINGLE METER, A.C. BALANCED HEATER. FOR TYPE G-32, OR DV-2 THERMOCOUPLE TUBE.	75.00	CGT-24X2	SAME AS CGT-24 EXCEPT OPTIONAL SELEC- TION OF EITHER OF TWO TUBES. DUAL CURRENT SET CONTROLS FOR INSTANT CORRECT PRESSURE READING.	135.00
CGT-03	MINIATURE CONTROL, SINGLE METER, BAL- LAST TUBE STABILIZED. FOR TYPE G-33, 6343, TG-77 OR GTC-004 THERMOCOUPLE TUBE.	75.00	CGT-24X3	SAME AS ABOVE EXCEPT FOR THREE TUBES.	150.00
CGT-033	MINIATURE CONTROL, SINGLE METER, WITH VR TUBE REGULATION AND LINE ISOLATION. FOR TYPE G-33, 6343, TG-77 OR GTC-004 THERMOCOUPLE TUBE.	85.00	CGT-71	SINGLE RECTANGULAR METER MODULAR CONTROL FOR TWO TUBES, SUPPLIED WITH- OUT CABINET, FOR 1/2 RACK MOUNTING (9 1/2" WIDE X 5 1/4" HIGH). FOR THERMOCOUPLE GAUGE TUBES TYPE G-31, 6416 AND NRC 501.	95.00
CGT-13	BATTERY POWERED PORTABLE, RUGGED- IZED, TO CHECK VACUUM INSULATION ON LIQUID GAS TANKS. FOR TYPE G-33, 6343, TG-77 OR GTC-004 THERMOCOUPLE TUBE.	85.00	CGT-71M	SINGLE METER MODULAR CONTROL, AS ABOVE, EXCEPT WITH CONTACT METER.	165.00
CGT-21	DUAL METER CONTROL TO READ BOTH HEATER CURRENT AND PRESSURE SIMUL- TANEOUSLY. FOR TYPE G-31, 6416 OR NRC 501 THERMOCOUPLE TUBE.	115.00	CGT-72	SINGLE RECTANGULAR METER MODULAR CONTROL FOR TWO TUBES, SUPPLIED WITH- OUT CABINET, FOR 1/2 RACK MOUNTING (9 1/2" WIDE X 5 1/4" HIGH). FOR THERMOCOUPLE GAUGE TUBES TYPE G-32 OR DV-2 THERMO- COUPLE TUBES.	95.00
CGT-21M	SAME AS ABOVE WITH CONTACT METER.	185.00	CGT-72M	SINGLE METER MODULAR CONTROL, AS ABOVE, EXCEPT WITH CONTACT METER.	165.00
CGT-21X2	SAME AS CGT-21 EXCEPT FOR OPTIONAL SELECTION OF EITHER OF TWO TUBES. DUAL CURRENT SET CONTROLS FOR INSTANT CORRECT PRESSURE READING.	135.00	CGT-73	SINGLE RECTANGULAR METER MODULAR CONTROL FOR TWO TUBES, SUPPLIED WITH- OUT CABINET, FOR 1/2 RACK MOUNTING (9 1/2" WIDE X 5 1/4" HIGH). FOR THERMOCOUPLE GAUGE TUBES TYPE G-33, 6343, TG-77 OR GTC-004	95.00
CGT-21X3	SAME AS ABOVE EXCEPT FOR THREE TUBES.	150.00	CGT-73M	SINGLE METER MODULAR CONTROL, AS ABOVE, EXCEPT WITH CONTACT METER.	165.00
CGT-22	DUAL METER CONTROL TO READ BOTH HEATER CURRENT AND PRESSURE SIMUL- TANEOUSLY. FOR TYPE G-32 OR DV-2 DUAL DIRECTLY HEATED, A.C. BALANCED HEATER THERMOCOUPLE GAUGE TUBE.	115.00	CGT-74	SINGLE RECTANGULAR METER MODULAR CONTROL FOR TWO TUBES, SUPPLIED WITH- OUT CABINET, FOR 1/2 RACK MOUNTING (9 1/2" WIDE X 5 1/4" HIGH). FOR THERMOCOUPLE GAUGE TUBES TYPE G-34, 7822, OR HV-2000.	95.00
CGT-22M	SAME AS ABOVE WITH CONTACT METER.	185.00	CGT-74M	SINGLE METER MODULAR CONTROL, AS ABOVE, EXCEPT WITH CONTACT METER.	165.00
CGT-22X2	SAME AS CGT-22 EXCEPT FOR OPTIONAL SELECTION OF EITHER OF TWO TUBES. DUAL CURRENT SET CONTROLS FOR INSTANT CORRECT PRESSURE READING.	135.00	CAB-70	CABINET FOR CGT-71 THROUGH CGT-88.	20.00
CGT-22X3	SAME AS ABOVE EXCEPT FOR THREE TUBES.	150.00	CST-20	FIVE CIRCUIT MULTI-SWITCH FOR SELEC- TION OF ANY ONE OF FIVE GAUGE TUBES (NO ADJUSTMENT) (SPECIFY TUBE BASING OR TUBE TYPE).	35.00
CGT-23	DUAL METER CONTROL TO READ BOTH HEATER CURRENT AND PRESSURE SIMUL- TANEOUSLY. FOR TYPE G-33, 6343, TG-77 OR GTC-004 THERMOCOUPLE TUBES.	115.00	CST-31	AS ABOVE BUT WITH SHUNT CURRENT SET RESISTORS AND SHAFT LOCKS. FOR G-31, 6416 OR NRC 501 THERMOCOUPLE GAUGE TUBES.	75.00
CGT-23M	SAME AS ABOVE EXCEPT FOR CONTACT METER.	185.00	CST-32	SAME AS ABOVE EXCEPT FOR G-32, OR DV-2 THERMOCOUPLE TUBES.	75.00
CGT-23X2	SAME AS CGT-23 EXCEPT FOR OPTIONAL SELECTION OF EITHER OF TWO TUBES. DUAL CURRENT SET CONTROLS FOR INSTANT CORRECT PRESSURE READING.	135.00	CST-33	SAME AS ABOVE EXCEPT FOR G-33, 6343, TG-77 OR GTC-004 THERMOCOUPLE GAUGE TUBES.	75.00
CGT-23X3	SAME AS ABOVE EXCEPT FOR THREE TUBES.	150.00	CST-34	SAME AS ABOVE EXCEPT FOR G-34, 7822 OR HV-2000 THERMOCOUPLE GAUGE TUBES.	75.00
CGT-24	DUAL METER CONTROL TO READ BOTH HEATER CURRENT AND PRESSURE SIMUL- TANEOUSLY. FOR TYPE G-34, 7822 AND HV-2000 THERMOCOUPLE GAUGE TUBES.	115.00	CCT-30XX	CABLES FOR CGT -31, 32, 33 OR 34, (SPECIFY TUBE TYPE AND LENGTH) (BASE COST EACH) 3.00 (PRICE PER FOOT ADDED) 25¢ ft.	

THIS ISSUE SUPERSEDES PRICE LIST DATED JUNE 1, 1962

COLD CATHODE DISCHARGE GAUGE CONTROLS

CGC-05	CONTINUOUS RANGE, SINGLE METER, NON-SWITCHING, 350 TO .03 MICRON NON-RECTIFIED A.C. SUPPLY.	150.00
CGC-25	DUAL RANGE, D.C. SUPPLY, 25 TO .1 AND .1 TO .01 MICRONS, WITH 4" METER.	175.00
CGC-25X2	SAME AS ABOVE FOR TWO GAUGE TUBES.	200.00
CGC-25M	SAME AS CGC-25 EXCEPT SUPPLIED WITH CONTACT METER.	245.00
CGC-45	TRIPLE RANGE, D.C. SUPPLY, 25 MICRONS TO .0001 MICRON WITH 4" METER.	195.00
CGC-45X2	SAME AS ABOVE FOR TWO TUBES.	220.00
CGC-45M	SAME AS CGC-45 EXCEPT SUPPLIED WITH CONTACT METER.	265.00
CGC-65	FOUR RANGE, 500 MICRON TO 10 ⁻⁷ MM GAUGE CONTROL WITH 4" METER.	255.00
CGC-65X2	SAME AS ABOVE FOR TWO GAUGE TUBES.	280.00
CGC-65M	SAME AS CGC-65 EXCEPT SUPPLIED WITH CONTACT METER.	325.00
CGC-75	DUAL RANGE MODULAR CONTROL WITH RECTANGULAR TYPE METER (9½" WIDE X 5½" HIGH), ½ RACK MOUNTING.	185.00
CGC-75M	SAME AS CGC-75 EXCEPT SUPPLIED WITH CONTACT METER.	255.00

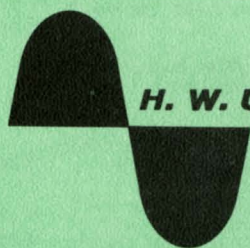
HOT FILAMENT IONIZATION GAUGE CONTROLS

CGH-06	POWER SUPPLY WITH DIRECT METER READOUT, GRID AND COLLECTOR CURRENT METERS SUPPLIED. SUITABLE WITH READOUT ON EXTERNAL RESISTOR AND ELECTROMETER FOR VERY HIGH VACUUM READINGS.	195.00
CGH-27	ION GAUGE CONTROL, 10 ⁻³ TO 2 X 10 ⁻⁸ (1 X 10 ⁻⁷ IS 10% OF DIAL).	325.00
CGH-27W11	SAME AS CGH-27 WITH CIRCUIT FOR ONE G-31 OR 6416 THERMOCOUPLE GAUGE TUBE	375.00
CGH-27W21	SAME AS CGH-27 WITH CIRCUIT FOR TWO G-31 OR 6416 THERMOCOUPLE GAUGE TUBES.	395.00
CGH-27W12	SAME AS CGH-27 WITH CIRCUIT FOR ONE G-32 OR DV-2 THERMOCOUPLE GAUGE TUBE.	375.00
CGH-27W22	SAME AS CGH-27 WITH CIRCUIT FOR TWO G-32 OR DV-2 THERMOCOUPLE GAUGE TUBES.	395.00
CGH-27W13	SAME AS CGH-27 WITH CIRCUIT FOR ONE G-33 OR 6343 THERMOCOUPLE GAUGE TUBE.	375.00
CGH-27W23	SAME AS CGH-27 WITH CIRCUIT FOR TWO G-33 OR 6343 THERMOCOUPLE GAUGE TUBES.	395.00
CGH-27W14	SAME AS CGH-27 WITH CIRCUIT FOR ONE G-34 OR 7822 THERMOCOUPLE GAUGE TUBE.	375.00
CGH-27W24	SAME AS CGH-27 WITH CIRCUIT FOR TWO G-34 OR 7822 THERMOCOUPLE GAUGE TUBES.	395.00

CGH-47	LABORATORY STANDARD IONIZATION GAUGE CONTROL WITH DUAL THERMOCOUPLE CONTROL INCLUDED, TWO 4" METERS INCORPORATED FOR SIMULTANEOUS READINGS. CONTAINS REGULATED 150 VOLT GRID AND REGULATED 30 VOLT COLLECTOR SUPPLY PLUS EITHER DIRECT GRID OUTGAS OR D.C. BOMBARD OUTGAS FOR EITHER GRID OR COLLECTOR HEATING.	615.00
CGH-77	TWO PACKAGE UNIT MODULAR GAUGE CONTROL 10 ⁻⁴ TO 2 X 10 ⁻¹⁰ MM HG. CONTROL UNIT FOR ½ RACK MOUNTING (9½" WIDE X 5½" HIGH). POWER SUPPLIED FROM A SEPARATE PACKAGE AND CONNECTED WITH A CABLE TO CONTROL. ION GAUGE OVER-PRESSURE BURNOUT PROTECTION.	400.00
CGH-87	ION GAUGE CONTROL 10 ⁻⁴ TO 2 X 10 ⁻¹¹ . TWO PACKAGE UNIT WITH MODULAR CONSTRUCTION SIMILAR TO CGH-77 EXCEPT HAS AN EXTRA ELECTROMETER STAGE. EQUIPPED WITH REGULATED CIRCUITS, OVER-PRESSURE BURNOUT PROTECTION AND FOR DIRECT CONDUCTIVITY GRID OUTGAS.	525.00
CGH-78	SAME AS CGH-77 EXCEPT EQUIPPED WITH D.C. BOMBARD GRID OUTGAS.	400.00
CGH-88	SAME AS CGH-87 EXCEPT EQUIPPED WITH D.C. BOMBARD GRID OUTGAS	525.00

NOTE: MODELS CGH-77, 87, 78 AND 88 ARE CONSTRUCTED IN TWO UNITS WITH INTERCONNECTING CABLE. THE POWER SUPPLY MAY BE MOUNTED SEPARATELY FROM THE CONTROL WHEN INCORPORATING THE UNITS IN EQUIPMENT, OR THE POWER SUPPLY AND CONTROL MAY BE MOUNTED IN A 19" RACK CABINET FOR LABORATORY USE. AN ALTERNATE MOUNTING IS THE INSTALLATION OF THE CONTROL PANEL OF THE CGH-77, 87, 78 OR 88 IN CONJUNCTION WITH A CGT-71, 72, 73, 74 OR CGC-75 IN A SINGLE SYSTEM, OR IN A SINGLE RACK CABINET, USING A RACK JOINER TO MOUNT IN FULL 19" RACK PANEL MOUNT.

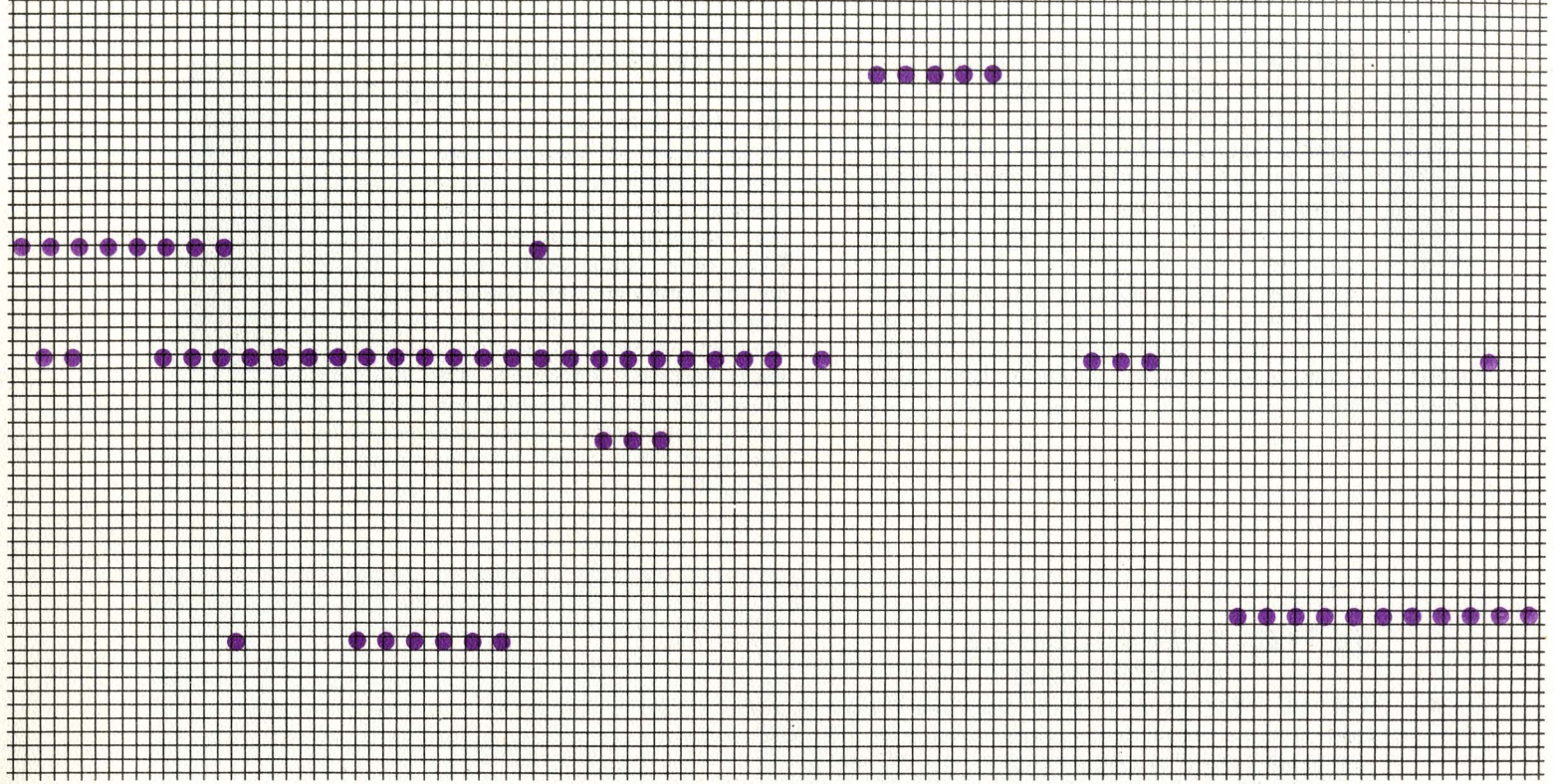
NOTE: ALL GAUGE CONTROLS ARE SUPPLIED WITHOUT GAUGE TUBES UNLESS SPECIFIED. ALL METERS USED ARE 3" RECTANGULAR CLEAR PLASTIC UNLESS SPECIFIED, EXCEPT MODELS CGT-71, 72, 73, 74, CGC-75, CGH-77, 87, 78 AND 88. 4" PLASTIC METERS ARE APPROXIMATELY \$7.50 PER METER ADDITIONAL. 4" 1% MIRROR SCALE METERS ARE APPROXIMATELY \$25.00 PER METER ADDITIONAL. THIS DOES NOT APPLY TO CONTROLS REFERENCED ABOVE. CONTACT METERS CAN BE SUPPLIED ON MOST CONTROLS FOR APPROXIMATELY \$70.00 EACH METER. WHERE METERS ARE SPECIFIED ABOVE AS CONTACT METER SUPPLIED, ONLY THE PRESSURE INDICATING METER IS CONTACT AND IN EACH CASE, THE METER IS SETTABLE FOR CONTROL AT ANY POINT ON ITS SCALE. 3 AMPERE SPDT CONTACTS ARE BROUGHT OUT FOR CONTROL PURPOSES.



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VACUUM GAUGE TUBES



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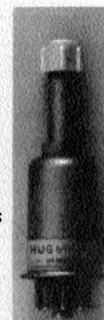


HU 6343-THERMOCOUPLE GAUGE TUBE

The HU 6343 vacuum gauge tube is a small, rugged vacuum gauge tube operating on the principle of change in the thermal conductivity of a gas by variation in density. The tube is of all metal construction and is designed for reliable operation under commercial service. A particular feature of the HU 6343 is the incorporation of very small heaters and thermocouples so that response time is maintained below .1 of a second.

HU 6416-THERMOCOUPLE GAUGE TUBE

The HU 6416 is a metal thermocouple gauge tube of medium size wherein a larger sized heater and thermocouple wire are employed allowing its use on systems not requiring extremely fast response. This tube finds application in systems having contaminating vapors. This tube may be removed from the system and cleaned internally by vigorous shaking with solvents enclosed. The tube will then respond to its original calibration curve if the elements are undamaged by the contamination. This tube is interchangeable with the NRC 501.



HU 7822-THERMOCOUPLE GAUGE TUBE

The HU 7822 is a medium response thermocouple tube and is much more rugged than the HU 6343 yet much faster in response than the HU 6416 (or the NRC 501). The HU 7822 is physically the same size as the HU 6343 but has electrical connections the same as the HU 6416. Heater current is approximately 80 milliamps. This tube is interchangeable with the Hughes HV2000.

HU 6535-GLASS THERMOCOUPLE GAUGE TUBE

The HU 6535 vacuum gauge tube is an all glass tube with an internal structure similar to that used in HU 6343 tube. The construction of the HU 6535 allows its use either by direct sealing of the pyrex connecting tube to an all glass vacuum system or coupling either to a glass or metal system by means of a port couple.

HU 6536-GLASS THERMOCOUPLE GAUGE TUBE

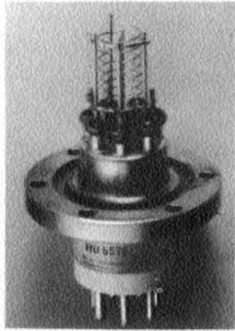
The HU 6536 vacuum gauge tube is an all glass tube with an internal structure identical to that used in the HU 6416 tube. The construction of the HU 6536 allows its use either by direct sealing of the pyrex connecting tube to an all glass vacuum system or coupling to either a glass or metal system by means of a port couple.



HU G32-THERMOCOUPLE GAUGE TUBE

The HU G32 is a dual element, directly heated thermocouple gauge tube. This tube is of all metal construction and is made in the minimum size, providing for rugged usage in commercial service and relatively fast response. While the calibration curve is different from that of the type HU 6343, it finds application where less expensive gauge tubes are required. It will not operate interchangeably with the HU 6343, but requires a specially designed gauge control operating on the A.C. balance principle.

HU 6578-IONIZATION GAUGE TUBE



The HU 6578 is a flanged ionization gauge tube designed especially for use on metal vacuum systems. Applications are on equipment which stays under vacuum for extended periods, such as cyclotrons, linear accelerators, space chambers or other large vessels. Extremely accurate pressure readings are possible since there is no connecting

tubulation and the gauge elements are directly exposed to the vacuum environment. Three filaments are provided to maintain operation of the system whether or not a single filament burns out due to excess life, or due to the release of some corrosive gas within the vacuum system, while the tube is in operation. Connections are provided to outgas the grid structure by passing current through the grid element. The collector element is a single rod having a minimum cross-sectional area, allowing most accurate readings of the gauge and a minimum release of absorbed gas due to ion bombardment.

HU 7169-IONIZATION GAUGE TUBE

The HU 7169 is an ionization gauge tube of the hot filament type suitable for measuring pressure from 10^{-3} to 10^{-10} region. It is provided with three filaments capable of being used either separately or collectively, allowing for either extra long life or higher gauge sensitivity when using higher electron currents to the grid. The HU 7169 has a sensitivity of 60 microamperes per micron when using 5 milliamperes grid current or 100 microamperes per micron when using $8 \frac{1}{3}$ ma grid current. This tube has a heavy grid mounted like a filament and the gauge tube may be outgassed by passing current directly through the grid wire either as a separate outgassing operation, or while the tube is reading vacuum system pressure.



HU 507-HOT FILAMENT IONIZATION GAUGE TUBE

The HU 507 is a triode type single "Vee" filament standard structure triode ion gauge of the hot tungsten filament type. This tube employs a grid with two leads allowing for direct connections to a power source to provide both direct outgassing of the grid, and indirect outgassing of the metal cylinder collector and the bulb by radiation. Sensitivity is 100 ua/u at 5 ma grid current. The tube is interchangeable with the NRC 507.



HU VG1A and HU VG1B IONIZATION GAUGE TUBES

The HU VG1A is a triode type ion gauge tube of the hot filament type made of pyrex glass and incorporating a platinated collector fused directly to the outer glass envelope. While the accuracy of this gauge tube is not as good as the other types, it does have the advantage of being able to be fused directly to an all glass vacuum system and baked out during a system evacuation. It may be sealed directly to pyrex glass systems or connected to either glass or metal vacuum systems by means of a port couple.



HU 7170-IONIZATION GAUGE TUBE

The HU 7170 is an ionization gauge tube of the hot filament type suitable for measuring pressure from the 10^{-3} to the 10^{-10} region. It is provided with three filaments capable of being used either separately or collectively, allowing for either extra long life or higher gauge sensitivity when using higher electron currents to the grid. The HU 7170 has a sensitivity of 50 microamperes per micron when using 5 milliamperes grid current, or 100 microamperes per micron when using 10 milliamperes grid current. This tube has a fine wire molybdenum grid heavily gold plated to minimize contamination due to chemical action. Outgassing is accomplished by DC bombardment of the grid by passing electron current to it from a 200 to 400 volt source.



HU 5966-HOT FILAMENT IONIZATION GAUGE TUBE

The HU 5966 is an ionization gauge tube of the hot filament type suitable for measuring pressure from the 10^{-3} to the 10^{-10} region. It is provided with two filaments capable of being used either separately or collectively, allowing for either extra long life or higher gauge sensitivity when using higher electron currents to the grid. The HU 5966 is a glass tube with pigtail leads to the filament and grid. It is provided with a tungsten side terminal for the collector and an end tubulation for connection to the vacuum system. This tube is interchangeable electrically with the Westinghouse WL5966.

HU 6794—HOT FILAMENT IONIZATION GAUGE TUBE

The HU 6794 is a hot filament ionization gauge tube similar internally to the HU 5966. Differences are the end tubulation and the dish type 7 pin stem for filament and grid terminals. The collector terminates in a tungsten pin in the center of this dish stem. The HU 6794 is interchangeable with the Westinghouse WL 6794.

HU 010—HOT FILAMENT IONIZATION GAUGE TUBE

The HU 010 is an ionization gauge tube of the hot filament type suitable for measuring pressure from the 10^{-3} to the 10^{-11} region. It is provided with a cylindrical grid having end cages and a collector element with a side lead near the tubulation end of the gauge. The grid is identical to the HU 6794, and the mechanical structure is similar, with the dish stem and two filaments. The tube is interchangeable with the CVC type CIC-010, 011, 012 and 013.

HU G81—HOT FILAMENT IONIZATION GAUGE TUBE

The HU G81 (Nottingham) hot filament ionization gauge tube is a unit designed for measurement of the lowest pressures, such as the 10^{-10} to 10^{-12} region. It is provided with a platinum film shield on the inside of the glass gauge tube envelope together with an electrical connection to this shield so as to drain off accumulated electrical charges. Cages are provided on the grid ends to remove the possibility of any except the desired ions being measured to be within the measurement area. This gauge is interchangeable with the "Nottingham" gauge. (NRC type 551).

HU G42—PIRANI VACUUM GAUGE TUBE



The HU G42 is a metal enclosed Pirani vacuum gauge tube working on the principle of change in thermal conductivity of the residual gas due to changes in gas density. The metal shell of this Pirani tube satisfactorily shields the internal element from external radiations and the sensitivity, or accuracy, is relatively unaffected by changes in ambient temperature.

HU 6440, HU 6441—PIRANI GAUGE TUBES

The HU 6440 and HU 6441 are metal enclosed Pirani vacuum gauge tubes working on the principle of change in thermal conductivity of the residual gas due to changes in gas density. These two tube types are identical in internal construction and operation and vary only in their means of connection to a vacuum system. The HU 6440 is provided with a $1/8$ " pipe thread connection whereas the HU 6441 uses a nonthreaded $1/2$ " tubulation suitable for connection to the vacuum system by means of a port couple. The metal shell of these Pirani tubes satisfactorily shields the internal element from external radiations and the sensitivity, or accuracy, is relatively unaffected by changes in ambient temperature.



HU PG25—PHILIPS GAUGE TUBE

The HU PG25 (Philips) gauge tube is a cold discharge type provided with an internal, specially designed, loop element inserted in a flatsided metal container. This gauge tube is of a demountable design so that it may be dismantled for cleaning should it be operated for extended periods of time in contaminating atmospheres. It is provided with removable magnets and pole pieces so that cleaning is simplified and magnetic metals may be removed should they accidentally enter the tubulation. A special feature of this gauge tube is its internal gap which insures against false readings of the gauge tube and, at all times, passing highest currents at highest pressures.



H. W. ULMER CO.

VACUUM GAUGE TUBES

EFFECTIVE MAY 1, 1962

<u>TYPE</u>	<u>FORMER ULMER NO.</u>		<u>PRICE</u>
THERMOCOUPLE VACUUM GAUGE TUBES			
HU 6416	G-31	(INTERCHANGEABLE WITH NRC 501)	\$ 10.00
HU 6536	G-31-G	(INTERCHANGEABLE ELECTRICALLY WITH HU 6416)	13.00
HU G-32	G-32	(INTERCHANGEABLE WITH HASTINGS DV-2)	10.00
HU 6343	G-33	(INTERCHANGEABLE WITH TG-77 AND GTC-004)	12.50
HU 6535	G-33-G	(INTERCHANGEABLE ELECTRICALLY WITH HU-6343)	14.00
HU 7822	G-34	(INTERCHANGEABLE WITH HV-2000)	10.00
PIRANI VACUUM GAUGE TUBES			
HU G42			18.00
HU 6440	G-44P	(1/8" I.P.S. TUBULATION)	20.00
HU 6441	G-44T	(1/2" O.D. SMOOTH TUBULATION)	20.00
COLD CATHODE DISCHARGE GAUGE TUBES			
HU PG25	G-55	ULTIMATE PRESSURE RANGE 1 X 10 ⁻⁶ MM	55.00
HU PG35		ULTIMATE PRESSURE RANGE 5 X 10 ⁻⁸ MM	65.00
HU PG45		ULTIMATE PRESSURE RANGE 2 X 10 ⁻¹¹ MM	90.00
NOTE : ALL TUBES STANDARD WITH 1/2" TUBULATIONS. OTHER SIZES OR MATING FLANGES AVAILABLE ON SPECIAL ORDER.			
HOT FILAMENT IONIZATION GAUGE TUBES			
HU VG-1A	G-76A	(1/2" EXHAUST TUBULATION)	21.75
HU VG-1B	G-76B	(3/4" EXHAUST TUBULATION)	22.75
HU 507	G-77	(INTERCHANGEABLE WITH NRC 507)	21.75
HU 7170	G-78	(INTERCHANGEABLE WITH HUGHES/VTP 7170)	29.50
HU 7169	G-79	(INTERCHANGEABLE WITH HUGHES/VTP 7169)	28.00
HU 6578	G-79F	(INTERCHANGEABLE WITH HUGHES/VTP 6578)	50.00
HU 5966	G-80	(INTERCHANGEABLE WITH WL5966 EXCEPT HAS END TUBULATION AND SIDE SEALED COLLECTOR LEAD)	32.50
HU 6794	G-80A	(INTERCHANGEABLE WITH WL 6794)	30.00
HU 551	G-81	(INTERCHANGEABLE WITH NOTTINGHAM NRC 551)	50.00
HU 010	G-82	(INTERCHANGEABLE WITH CVC TYPE GIC-011)	32.50
HU G-71-2		(INTERCHANGEABLE WITH HiVac EQUIP No. G71-2)	20.00
HU 75/34		(INTERCHANGEABLE WITH VEECO RG75 AND VIC N 34 EXCEPT ONLY SUPPLIED WITH DOUBLE TUNGSTEN FILAMENT)	
		-N 3/4" NONEX TUBULATION	30.00
		-P 3/4" PYREX TUBULATION	32.00
		-K 3/4" KOVAR TUBULATION	34.00

NOTE : ALL GAUGE TUBES EXCEPT VG-1A AND B AND 6578 HAVE NONEX TUBULATION STANDARD AND ARE AVAILABLE WITH 3/4" PYREX (SUFFIX LETTER -P) AT \$1.50 EACH EXTRA, OR 3/4" KOVAR (SUFFIX LETTER -K) AT \$3.00 EACH EXTRA. VG-1A AND B ARE PYREX STANDARD AND CAN BE SUPPLIED WITH NONEX (SUFFIX LETTER -N) AT \$1.50 EACH EXTRA OR KOVAR (SUFFIX LETTER -K) AT \$3.00 EACH EXTRA.

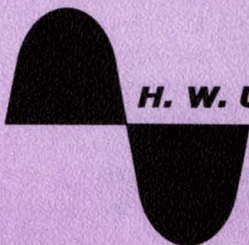
THIS PRICE LIST SUPERSEDES ALL PREVIOUS ISSUES.

QUANTITY DISCOUNTS

1 - 9	NET
10 - 24	LESS 10%
25 - 99	LESS 15%

NOTE: PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. FIRM QUOTATIONS WILL BE MADE WHEN REQUESTED ON SPECIFIC QUANTITIES AND WILL REMAIN FIRM FOR QUOTATION PERIOD.

REPAIR SERVICE IS AVAILABLE ON MOST GAUGE TYPES. REPAIRS ARE MADE BASED ON EXAMINATION AT FACTORY AND PRICES ARE QUOTED AFTER EXAMINATION ON SINGLE OR LOT BASIS.



H. W. ULMER CO.

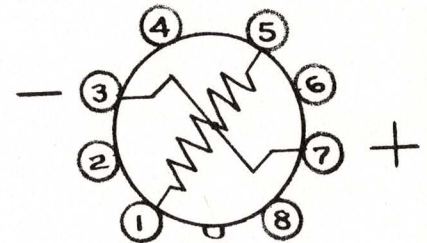
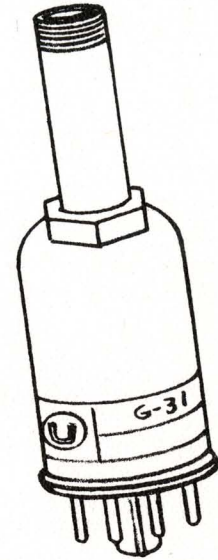
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THERMOCOUPLE VACUUM GAUGE TUBE

TYPE HU-6416

THE ULMER TYPE HU-6416 THERMOCOUPLE VACUUM GAUGE TUBE IS A HEAVY DUTY GAUGE TUBE FOR MEASURING PRESSURES IN THE RANGE OF FROM 1000 MICRONS (1 MM HG) TO 1 MICRON (10^{-3} MM HG). THE SENSING ELEMENT OF THE HU-6416 IS A RUGGED THERMOCOUPLE-HEATER COMBINATION ENCASED IN A STRONG, WELDED, METAL SHELL. THE OUTPUT OF THE TUBE IS PROVIDED BY THE THERMOCOUPLE WHICH SENSES THE TEMPERATURE RESULTING FROM THE HEATING CURRENT AND THE COOLING EFFECT OF THE RESIDUAL GAS IN THE TUBE.

THE HU-6416 IS BUILT FOR INDUSTRIAL USAGE. THE NEW IMPROVED METAL BASE INCREASES THE RUGGEDNESS OF WHAT PREVIOUSLY HAD BEEN CONSIDERED THE LEAST STRONG PORTION OF THIS TYPE TUBE. EACH GAUGE TUBE IS PRECISELY AND INDIVIDUALLY CALIBRATED AND THE CORRECT CURRENT IS MARKED ON THE TUBE LABEL. THE TUBE IS UNHARMED BY OPERATION AT ATMOSPHERIC PRESSURE.



SPECIFICATIONS:

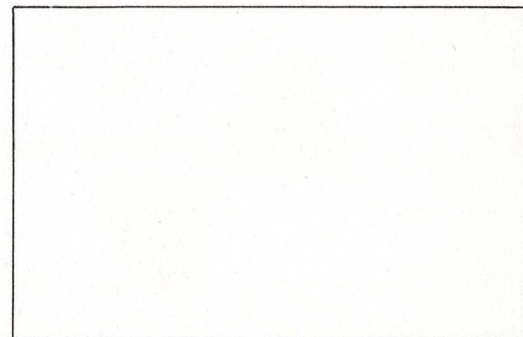
OVERALL LENGTH	3 3/4"
OVERALL DIAMETER	1.1"
TUBULATION	0.4 DIA. TUBE WITH 1/8 IPS MALE THREAD
HEATER CURRENT, NOMINAL	0.550 AMPERES
HEATER CURRENT, MAXIMUM	1.0 AMPERES
HEATER RESISTANCE, NOMINAL	0.2 OHMS
HEATER TO THERMOCOUPLE RESISTANCE	ZERO
THERMOCOUPLE OUTPUT @ 55 OHM LOAD	
HARD VACUUM	10 MV D.C.
ATMOSPHERIC PRESSURE	APPROXIMATELY 1.05 MV
RESPONSE TIME	LESS THAN 20 SEC.
BASE	JETEC B6-23 (FITS AMPHENOL 78-PF8-11 OR EQUAL)
BASING	JETEC 8 FS
PRICE	\$10.00 EACH; QTY. DISCOUNTS: 10 TO 24, LESS 10%; 25 TO 99, LESS 15%



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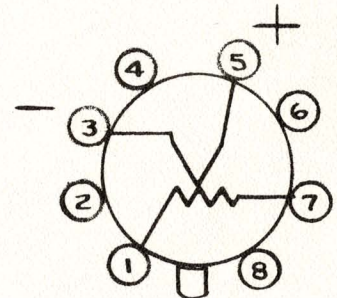
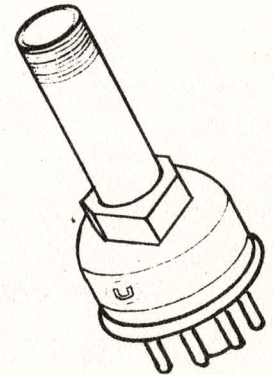


THERMOCOUPLE VACUUM GAUGE TUBE

TYPE HU-6343

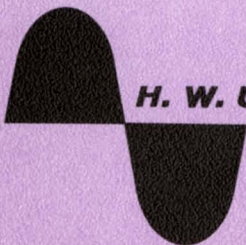
THE ULMER TYPE HU-6343 THERMOCOUPLE VACUUM GAUGE TUBE IS A FAST RESPONSE GAUGE TUBE FOR MEASURING PRESSURES IN THE RANGE OF FROM 1000 MICRONS (1 MM HG) TO 0.1 MICRON (10^{-4} MM HG) ABSOLUTE. THE SENSING ELEMENT OF THE HU-6343 IS A COMBINATION HEATER AND THERMOCOUPLE. THE PRECISION THERMOCOUPLE PROVIDES AN OUTPUT VOLTAGE DETERMINED BY THE HEAT CONDUCTIVITY OF THE RESIDUAL GAS IN THE EVACUATED TUBE WHEN HEATING CURRENT IS APPLIED THRU THE HEATER.

THE HU-6343 IS OF METAL CONSTRUCTION WITH AN IMPROVED METAL BASE. EXCELLENT SENSITIVITY AND VERY FAST RESPONSE ARE INHERENT CHARACTERISTICS OF THE DESIGN OF THE HU-6343. THE TUBE IS UNHARMED BY OPERATION AT ATMOSPHERIC PRESSURE.



SPECIFICATIONS:

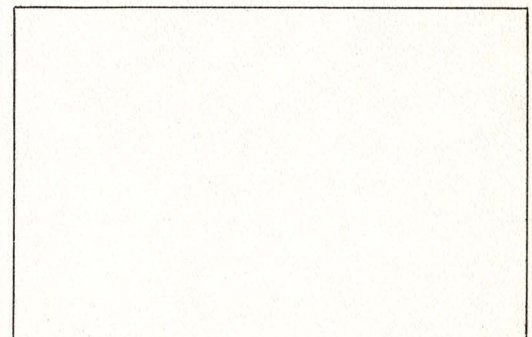
OVERALL LENGTH	2 1/2"
OVERALL DIAMETER	1.1"
TUBULATION	0.4" DIA. TUBE WITH 1/8 I.P.S. MALE THREAD
HEATER CURRENT, NOMINAL	APPROXIMATELY 20 MA.
HEATER CURRENT, MAXIMUM	100 MA.
HEATER RESISTANCE, NOMINAL (COLD)	APPROXIMATELY 8.5 OHMS
HEATER RESISTANCE, NOMINAL (HOT)	APPROXIMATELY 18 OHMS
HEATER TO THERMOCOUPLE RESISTANCE	LESS THAN 100 OHMS
THERMOCOUPLE OUTPUT @ 55 OHM LOAD (METER INTERNAL RESISTANCE)	
HARD VACUUM	10 MILLIVOLTS D.C.
ATMOSPHERIC PRESSURE (AIR)	APPROXIMATELY 0.15 MILLIVOLT D.C.
THERMOCOUPLE RESISTANCE (COLD)	APPROXIMATELY 8.5 OHMS
RESPONSE TIME	LESS THAN 1 SECOND
BASE	JETEC B6-23 (FITS AMPHENOL 78-PF8-11 OR EQUAL)
BASING	JETEC 8FR
PRICE:	\$12.50 EACH; QTY. DISCOUNTS: 10 TO 24, LESS 10%; 25 TO 99, LESS 15%

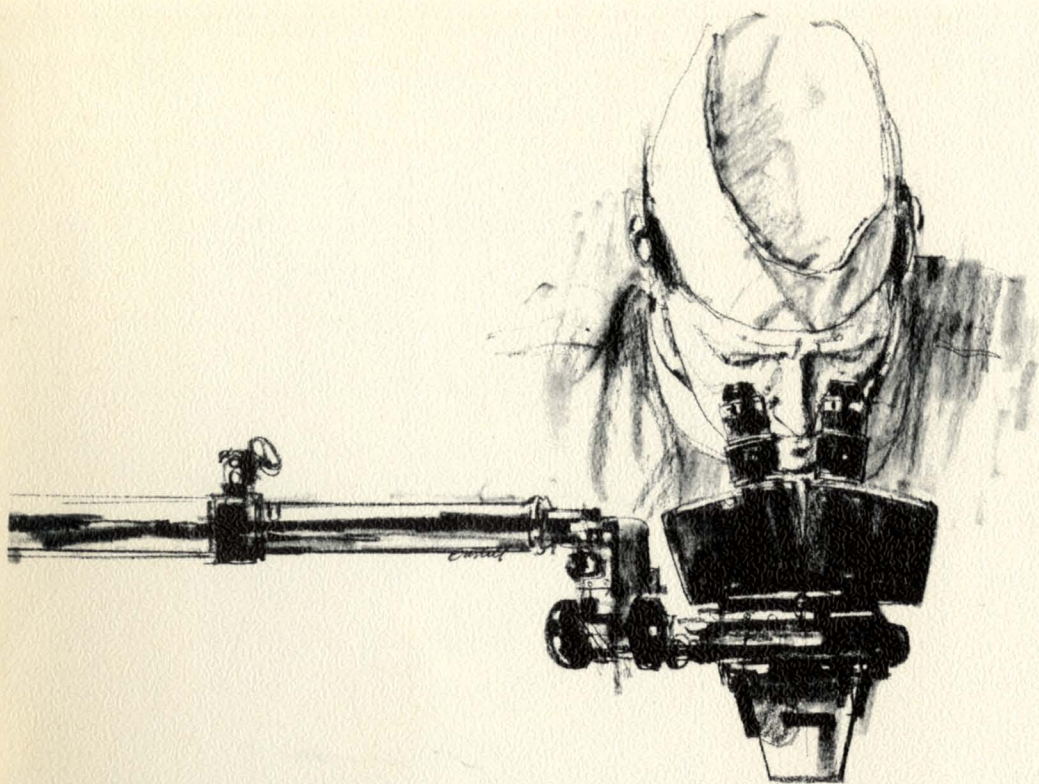


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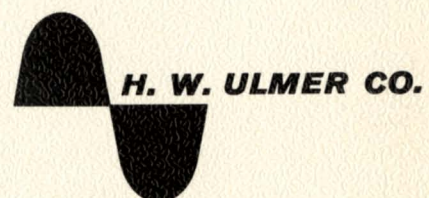
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micro
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modules

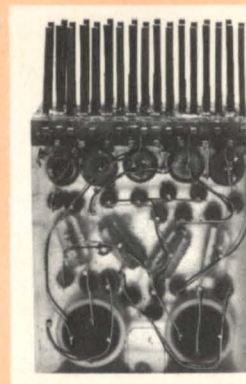
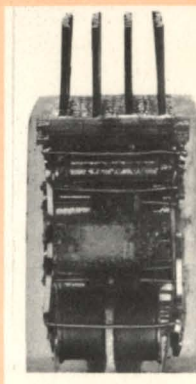
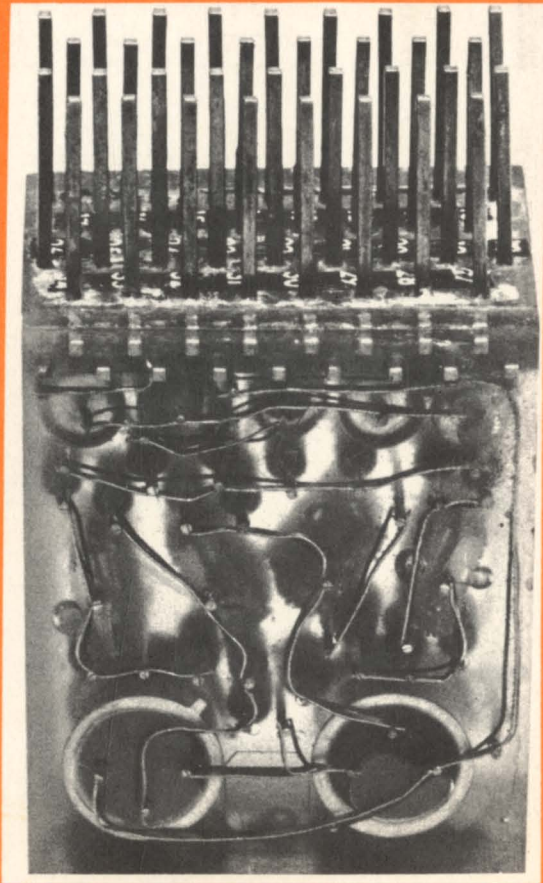


What are you looking for to satisfy your today's circuitry requirement?

HIGH RELIABILITY?

¶ Harold Ulmer, President of H. W. Ulmer Co. has spent 35 years building a reputation for reliability. His background in Electron tubes, in which field he was a pioneer, has allowed him to devise procedures which assure things being done right the first time; because once a tube is sealed in a glass vacuum tight capsule, it is impossible to correct construction errors.

¶ The H. W. Ulmer Co. has brought together an organization and designed a facility based on the belief that *higher reliability* components were not only badly needed but saleable. "Reliability is our watchword."





HIGH DENSITY:

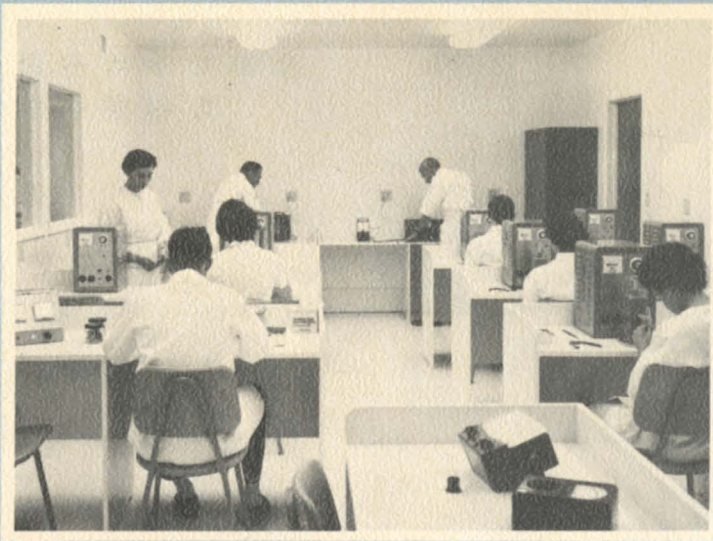
¶ Size and weight in today's technology have assumed monstrous proportions. Ulmer circuitry engineers are wizards in "cord wood" packaging to attain the highest density possible. This is only part of the story, however, since placing component parts in such close proximity causes attendant problems of environmental operational limits, etc. Our packaging engineers must be thoroughly grounded in the capabilities of every component part used.

¶ The Ulmer Co. offers you services of packaging engineers continually checked out and updated on the properties of component parts because the Ulmer Co. maintains an R and D facility and test Lab. making constant environmental, reliability and Mil type tests on all components as well as completed assemblies.

RUGGEDNESS?

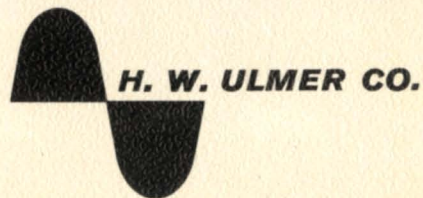
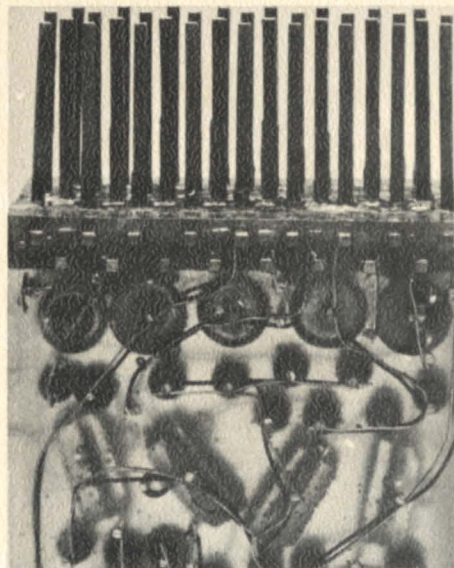
¶ This is not entirely covered in high reliability—Ulmer modules give you high reliability under *all* conditions. This is because once the high density package is properly put together an encapsulation engineer takes over and sees that your module is potted in exactly the right compounds under exactly the right conditions to insure long maintenance, free life under all subjected environments.





¶ The Ulmer Co. has the capability to give you what you want *when you want it*. We have set up a facility designed to give you volume production with individually checked reliability. You'll be amazed at the Ulmer Co.'s ability to help you solve your requirement problems. What are they?

1. Get in touch with the H. W. Ulmer Co.
2. Come see the Ulmer people and facilities (you will quickly convince yourself of our capabilities).
3. Give us a chance to help you with your problem.



H. W. ULMER CO.

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