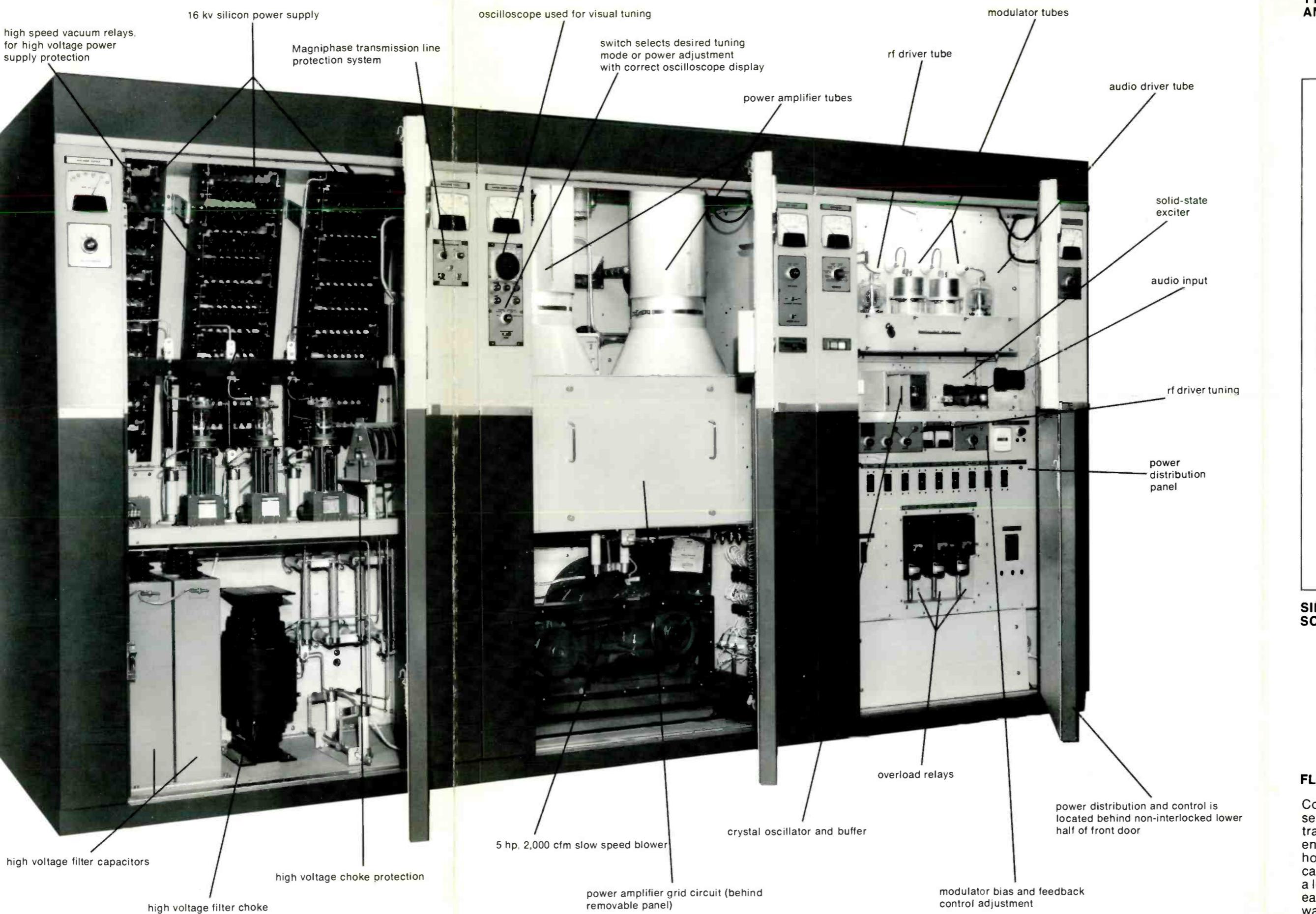


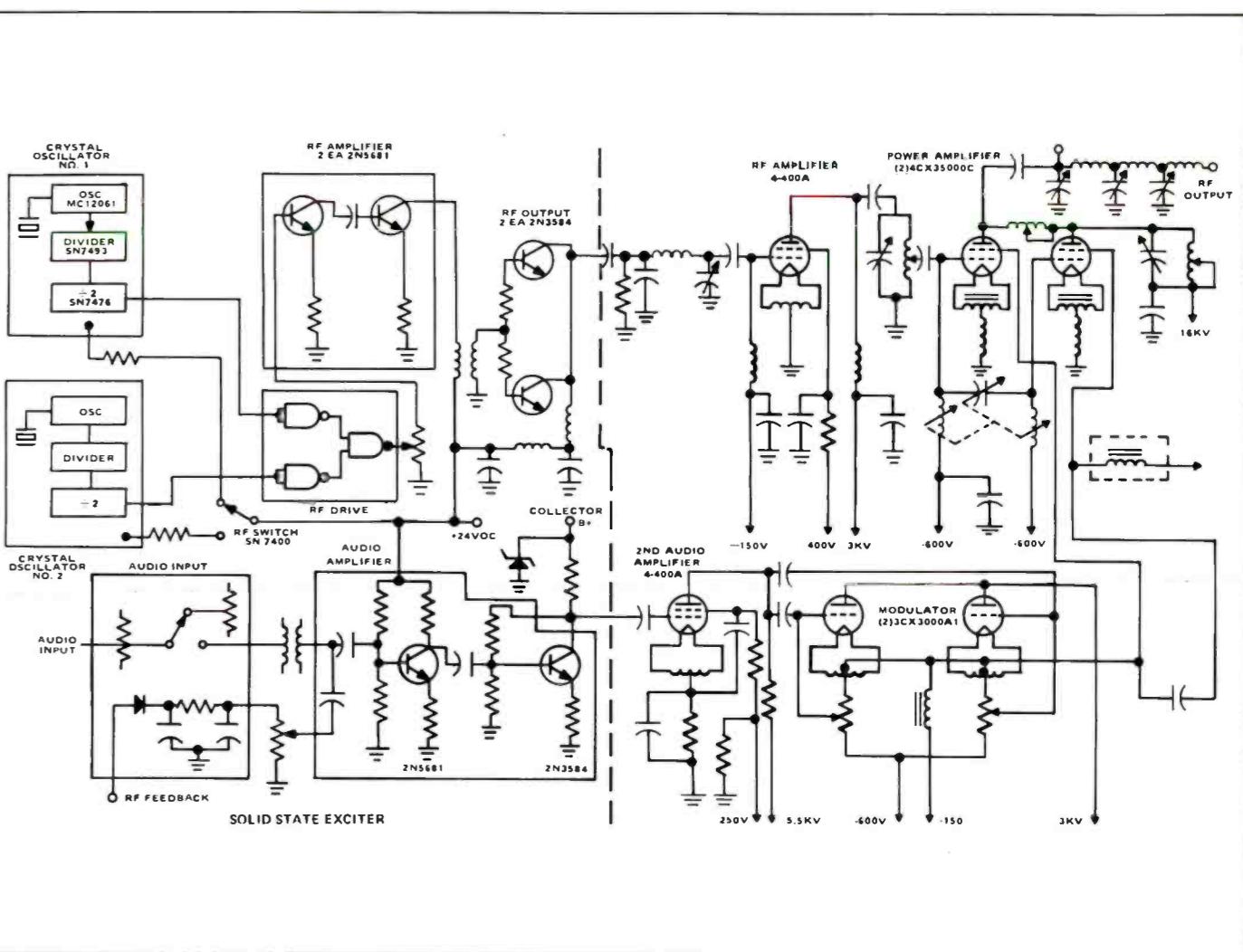
**CONTINENTAL ELECTRONICS
TYPE 317C-1 50,000 WATT
AM BROADCAST TRANSMITTER**

QUALITY TALKS

- **High Efficiency**
Better than 60% overall efficiency.
- **No Modulation Transformer**
Screen modulation combined with impedance variation modulation gives efficient operation without excessive high-voltage.
- **High Reliability**
Quality workmanship, conservative design.
- **Customer Acceptance**
More in use than any other single design.
- **Excellent Performance**
Exceeds all FCC and CCIR specifications.
- **Loud Sound**
125% positive peak handling capability of asymmetrical audio processing.
- **Long Tube Life**
More than 40,000 hours for 4CX35000C PA tubes, typical for 317C transmitter.
- **No X-Ray Radiation Hazards**
Better than minimum OSHA-AEC Regulations — no monitoring or labeling required.
- **Simplicity — No Complex Circuitry**
Ease of installation, operation and maintenance.
- **Small Size and Weight**
Economical to ship and install. Minimum facility requirements.
- **Magniphase**
Provides transmission line, antenna, and tuning equipment protection.
- **Ease of Operation**
Motor driven tuning and power adjust. Designed for unattended operation by remote control. Complete instrumentation and maximum personnel protection.

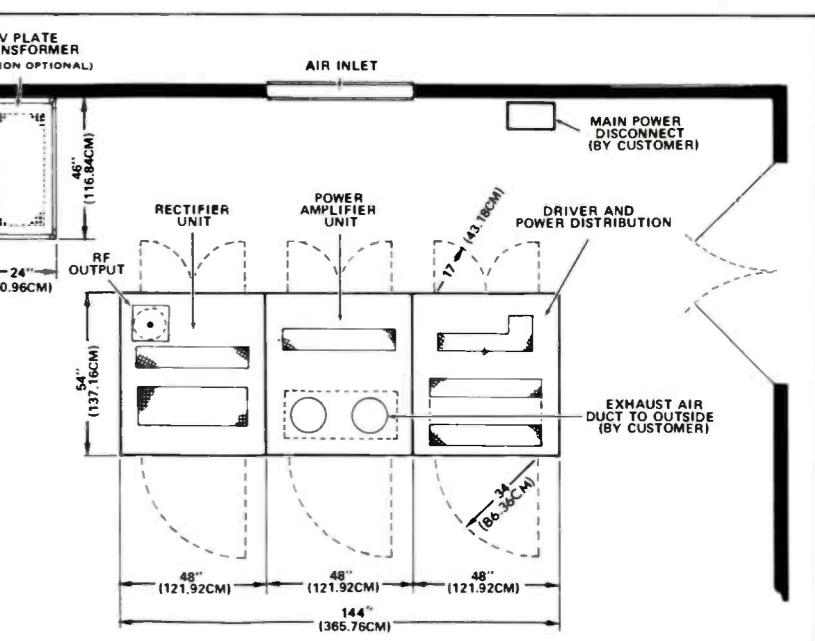


SIMPLIFIED SCHEMATIC



FLOOR PLAN

Continental's Type 317C-1 is all self-contained except for the plate transformer which is in a separate enclosure. A 5 hp, 2,000 cfm blower housed inside the transmitter cabinet provides cooling; and at a low noise level. Wide doors give easy access to all cabinets, with walk-in access to the driver and power distribution cabinet.



**QUALITY DESIGN PUTS
CONTINENTAL FIRST**

Recognizing the limitations of performance and operation of heavy audio iron core components in AM transmitters, Continental's original 50 kW design eliminated these modulation components in 1946, and competitive transmitter designs did not achieve this until 15-20 years later.

Continuing to improve its product design, Continental was the first to supply silicon solid state rectifiers in the high voltage power supply of a 50 kW AM transmitter.

With availability of high power tetrode tubes, Continental was able to improve its original design concept and offer a 50 kW transmitter that achieved greater than 60% overall efficiency 8-10 years ahead of competitive designs.

Truly the 317C is a transmitter design ahead of its time, offering proven performance, reliability and simplicity that other designs are only beginning to approach.

QUALITY MODULATION

Screen modulation of modern tetrode tubes combined with impedance variation modulation achieves lowest distortion with highest efficiency.

High-level screen modulation requires only power to swing the screen voltage loaded only by the screen current. The power required by the modulator is very small, which adds to the overall efficiency of the transmitter and is adaptable for overall feedback, resulting in greater stability and further reduction of noise and distortion.

Continental Electronics holds patents for the "High Efficiency Screen Modulated Amplifier". U.S. 3,314,024; Canada 764,605; Great Britain 1,044,479; France 1,432,543.

**QUALITY SOUND
WITH SIMPLE CIRCUITRY**

The final, or modulated amplifier, consists of two type 4CX35000C ceramic tetrodes. One tube generates the "carrier" power. The other tube supplies the required additional energy during positive modulation "peaks". Both tubes have high control grid bias and saturation drive, typical of Class C operation. A nominal positive voltage is applied to the

screen of the carrier tube and a small negative voltage to the screen of the peak tube. Modulation is applied to the screens of both tubes. During the negative half cycle the "peak" tube remains cut off, and the output of the "carrier" tube follows linearly the audio signal applied to its screen. During the positive half cycle the screen of the "peak" tube swings in a positive direction so that its output increases according to the signal applied. At the 100% level both tubes are contributing equally to the power output. An impedance inverting network varies the load to the tubes during modulation to provide high efficiency without high voltage.

With the inherent design quality of this modulating technique, positive peaks above 100% are readily achieved with asymmetrical audio inputs. The separate carrier tube provides stable carrier level with heavy modulation for minimum carrier shift. The plate voltage swing does not increase with positive modulation. At 16 kvdc, the power amplifier achieves a plate efficiency of 80% or higher. Screen-grid modulation isolates the modulation source from the rf driving source. The driving power required for the two final amplifier tubes is only a few hundred watts.

Another factor contributing to high efficiency is the greatly reduced cooling requirement. Since there is very little heat to be removed, the 317C is cooled by a single 5 hp blower housed within the transmitter cabinets.



SPECIFICATIONS

Carrier Power:
Rated 50 kW
Capability 60 kW
Power Reduction 25 kW or 10 kW

Modulation:
High-level screen-grid/impedance modulation

Emission:
A3

Frequency Range:
Any single frequency 535-1620 kHz

Frequency stability:
 ± 5 Hz

Audio input:
150/600 ohms, +10 dbm, ± 2 db for 100% modulation

Audio response:
50-7500 Hz ± 1.0 db
30-10,000 Hz ± 1.5 db

Audio distortion:
50-10,000 Hz, less than 3% at 95% modulation

Carrier Shift:
2% or less at 100% modulation

Modulation capability:
100% continuous at any frequency 50-10,000 Hz
125% positive peak with asymmetrical input

Noise unweighted:
-60db at 100% modulation

Spurious & harmonic emissions:
-80db

Output impedance:
40 to 300 ohms as specified by customer

Power source:
460V, 3 phase, 50/60 Hz, other available by special order

Permissible combined voltage variation:
 $\pm 5\%$ voltage
 $\pm 2.5\%$ frequency

Power factor:
.9

Power consumption:
82 kW @ 0% modulation
92 kW @ 30% modulation
120 kW @ 100% modulation

Altitude:
7500 feet (2286 meters) higher by special order

Ambient temperature:
-4° to 122°F (-20° to 50°C)

Cooling:
transmitter is air cooled

Size:
transmitter is 144" wide, 54" deep, 78" high (365.76 CM wide, 137.16 CM deep, 198.1 CM high); plate transformer is 24" wide, 46" deep, 67" high (60.96 CM wide, 116.84 CM deep, 170.18 CM high)

Floor space:
62 sq. ft. (5.8 sq. meters)

Net weight:
transmitter (total, all cabinets) weighs 5,011 lbs. (2,273 kilos); plate transformer weighs 1,600 lbs. (727 kilos)

Export shipping:
gross weight 9,700 lbs. (4,400 kilos); 800 cubic feet (22.65 cubic meters)



Continental Electronics 

CONTINENTAL ELECTRONICS MFG. CO. BOX 17040 DALLAS, TEXAS 75217 (214) 381-7161

Printed In USA 1M37



THE NEW STANDARD OF PERFORMANCE
FOR 50,000 WATT AM BROADCASTERS



CONTINENTAL'S TYPE 317C 50,000 WATT AM BROADCAST TRANSMITTER
WITH THE NEW, HIGH-EFFICIENCY SCREEN MODULATED POWER AMPLIFIER*

FEATURES

HIGHEST OVERALL EFFICIENCY of any 50 kw transmitter in operation today

LOWEST POWER CONSUMPTION OF any 50 kw transmitter in operation today

A NEW, HIGH EFFICIENCY MODULATED AMPLIFIER* eliminates neutralization; rf driving power is very low

HI-FIDELITY SCREEN MODULATION* of the amplifier eliminates the need for a high power modulator and a large modulation transformer and reactor

OVERALL FEEDBACK minimizes residual noise, distortion; improves response

AIR COOLED THROUGHOUT, blower is mounted in transmitter cabinet

VARIABLE VACUUM CERAMIC CAPACITORS used in high power rf networks

SILICON DIODES used in all power supplies

MINIMUM NUMBER OF TUBES REQUIRED only

four tube types, total of nine tubes for transmitter

INDIVIDUAL INSTRUMENTATION for all important electron tube functions, rectifier output voltages, primary power voltage, elapsed operating time

AUTOMATIC PERSONNEL PROTECTION SYSTEM interrupts and grounds all dangerous voltage conductors when any access door is opened

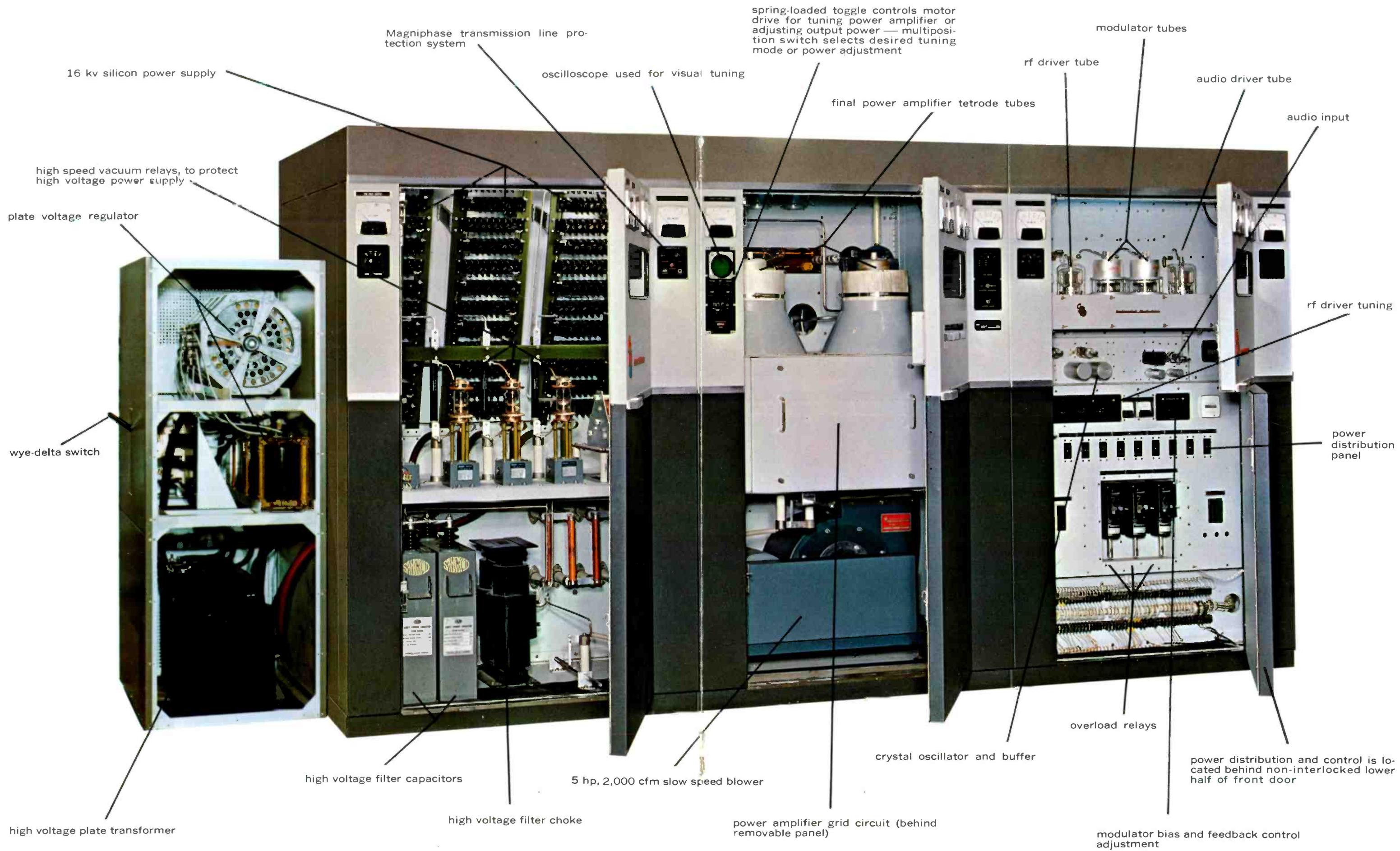
MAXIMUM SHIELDING is provided by steel and aluminum cabinets

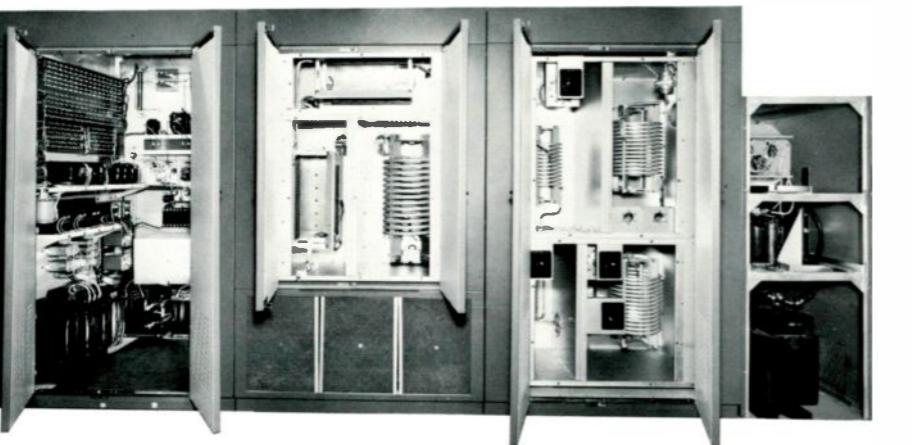
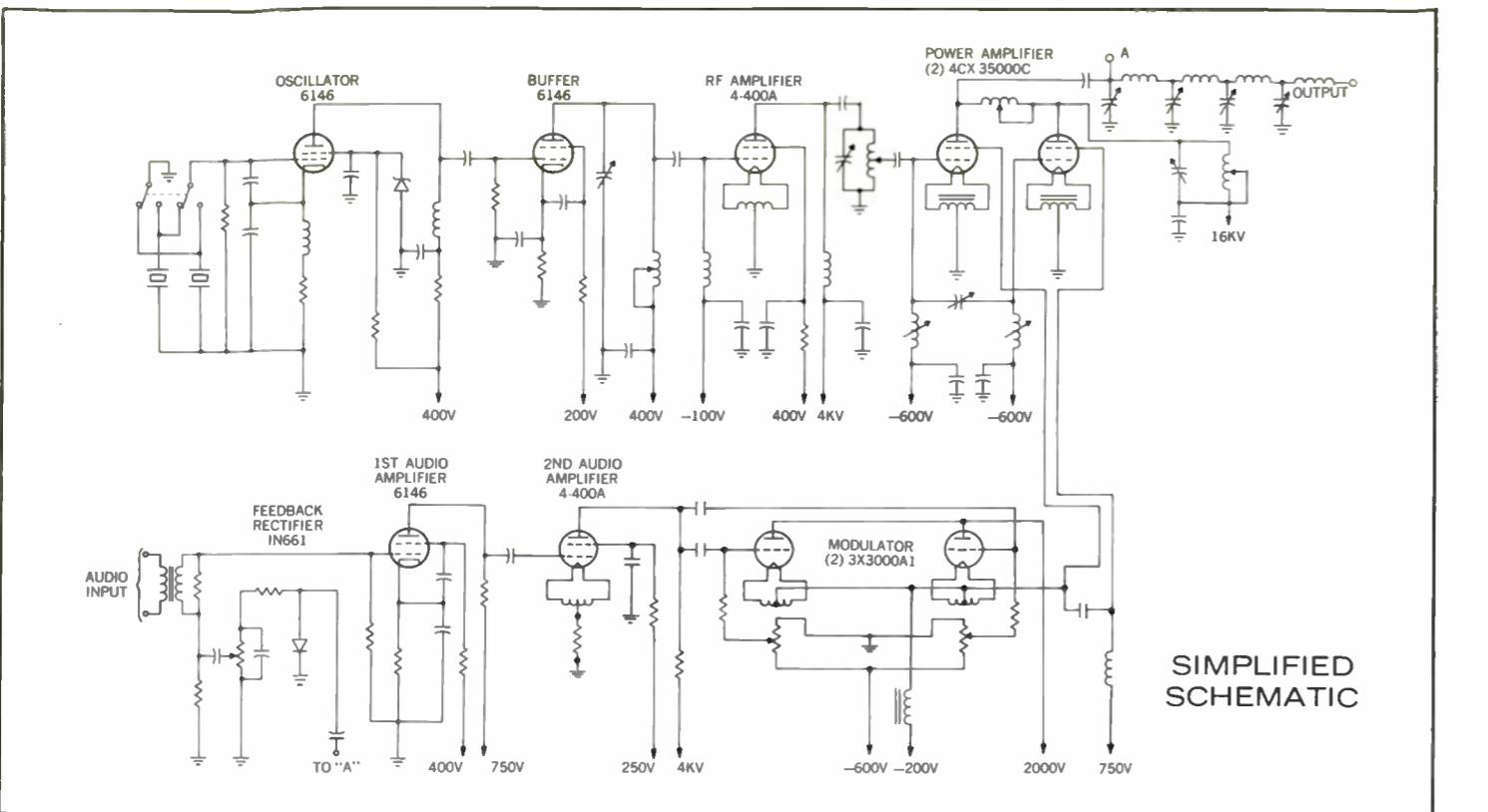
COMPACT DESIGN requires only 62 sq ft of floor space; wide front and rear doors give easy access to all transmitter components

TRANSMITTER IS SELF-CONTAINED, only external unit is plate transformer

BUILT-IN MAGNIPHASE line protection system protects antenna from damage caused by lightning or arc-overs.

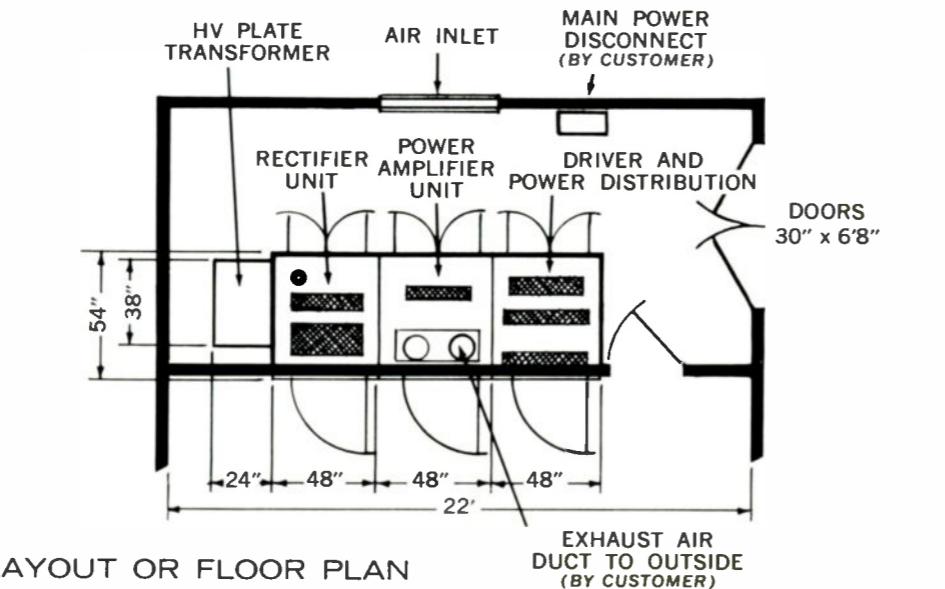
*Pat. applied for





Continental's Type 317C is completely self-contained with the exception of the plate transformer which is in a separate self-contained enclosure. A 5 hp, 2,000 cfm blower housed inside the transmitter cabinet provides cooling and at a low noise level.

The entire transmitter is 144" wide, 78" high, 54" deep and requires 54 sq. ft. of floor space. The external plate transformer is 24" wide, 61" high, 38" deep and requires 8 sq. ft. of floor space. Wide doors provide easy access to all cabinets, with walk-in access to the driver and power distribution cabinet.



Broadcasters have always sought ways to improve station performance while achieving the maximum operating economies possible. The development of automatic programming, logging and authenticating equipment, and transmitter remote control systems, has lessened the strain on the operating budgets of many stations.

In keeping with this trend, Continental has developed a transmitter that reduces your present operating costs by achieving a power efficiency greater than any other transmitter known to be in existence today, and provides the high degree of reliability essential for unattended operation.

BACKGROUND

Highest efficiency in a power amplifier is obtained by the use of Class C operation of the tubes. To produce an amplitude modulated signal, this requires that the modulation process be applied in this final amplifier stage, called "high level" modulation. There are various systems for producing final stage modulation, among which are:

1. Outphasing or "phase to amplitude" modulation described by H. Chireix in 1935.
2. Plate voltage modulation using a high power Class B or AB audio amplifier.
3. Screen grid modulation of tetrode tubes in the final power amplifier

1) The outphasing system utilizes two radio frequency channels driven by the same frequency generating source, with a phase difference between channels which is varied with the audio signal. The output power of the final amplifiers of the two channels is combined in the load circuit and amplitude modulation results as the two continuous wave signals subtract or add according to their phase difference. The system requires stable maintenance of the relative phase throughout all amplification stages of the two channels and predistortion of the audio signal to compensate for the fact that the phase to amplitude conversion follows a sine wave rather than a straight line curve. The power tubes work into a reactive load at all but one single point in the audio excursion. The negative modulation peaks can only reach zero by having the two channels deliver exactly equal amplitudes in exactly opposite phase to the load circuit. Because of this, auxiliary grid bias modulation has been used to somewhat relieve this critical requirement. After its introduction, several European stations used the system. All or most of these have abandoned it in favor of plate voltage modulation.

2) The plate voltage modulation system is well known and widely used. It requires an audio modulator capable of delivering an audio output power equal to one-half of the dc input power to the Class C final amplifier. The efficiency of this modulator is usually about 60% at maximum output (100% modulation) and lower at modulation percentages below this. The modulator power input must be added in determining the overall efficiency of the transmitter.

3) Screen grid modulation of a single tetrode tube operated in a Class C condition results in an efficiency on 100% modulation peaks in excess of 80%. However, at carrier level the voltage swing must reduce to one-half and an efficiency of only about 41% is usually realized.

CONTINENTAL'S HIGH-EFFICIENCY SCREEN MODULATED POWER AMPLIFIER*

With the advent of high power tetrodes, Continental Electronics has introduced an ingenious new system which combines screen modulation with impedance variation modulation in a circuit similar to that used in previous Continental transmitters of the high efficiency linear amplifier type. In this new circuit the amplifier is no longer linear but operated in Class C with the usual Class C high efficiency. The high level modulation requires only sufficient power to swing the screen voltage and is loaded only by the screen current so the power consumed by the modulator is only a small fraction of that required for plate modulation. Overall efficiency is therefore greater than for any other system. Other advantages result. The tetrode modulation is essentially a low distortion system. Measurements as low as 1% are experienced with no negative feedback applied. The system is adaptable to the use of overall feedback for greater stability, and further reduction of noise and distortion.

DESCRIPTION

The final, or modulated amplifier, consists of two type 4CX35000C ceramic tetrodes. An impedance inverting (90 degree) network connects the plates of these two tubes together. One tube alone generates the carrier power. The other tube supplies the required additional energy during positive modulation peaks. Both tubes have high control grid bias and saturation drive, typical of Class C operation. Radio frequency drive is applied first to the grid of the "peak" tube and then through a 90 degree phase advancing network to the grid of the "carrier" tube. This network compensates for the 90 degree phase delay of the interplate network so that the signals from the "carrier" and "peak" tubes are in phase at the load. A nominal positive bias is applied to the screen of the carrier tube and a small negative bias to the screen of the peak tube. Modulation voltage is applied to the screens of both tubes. During the negative half cycle, the "peak" tube remains cut off and the output of the "carrier" tube follows linearly the audio signal applied to its screen. During the positive half cycle the screen of the peak tube swings in a positive direction so that its output increases linearly until it is delivering twice carrier power at the positive peak. The

power delivered to the load by the peak causes the impedance presented to the interplate network to increase in value until it is double its normal value at the positive peak of modulation. The impedance inverting characteristic of the network causes the load impedance at the "carrier" tube plate to decrease until it is one-half of its normal value at the positive peak. The impedance change produces "impedance modulation" of the "carrier" tube so that it also delivers twice carrier power and the total output is four times carrier power.

Plate voltage swing does not increase with positive modulation; thus, a higher dc plate voltage than normally used for plate modulated transmitters can be used. At 16 kvdc, the Type 317C achieves a plate efficiency of 80% or higher.

Screen grid modulation isolates the modulation source from the rf driving source, thereby eliminating the need to swamp the grid drive to maintain linearity. The driving power required for the two final amplifier tubes is a small fraction of the power required to drive the triodes formerly used. The new amplifier can be driven with a few hundred watts; a 4-400A tetrode drives the 317C.

Another factor contributing to high efficiency is the greatly reduced cooling requirement. Since there is very little heat to be removed, the 317C can be cooled by a 5 hp motor housed within the transmitter cabinets.

COMPARISON

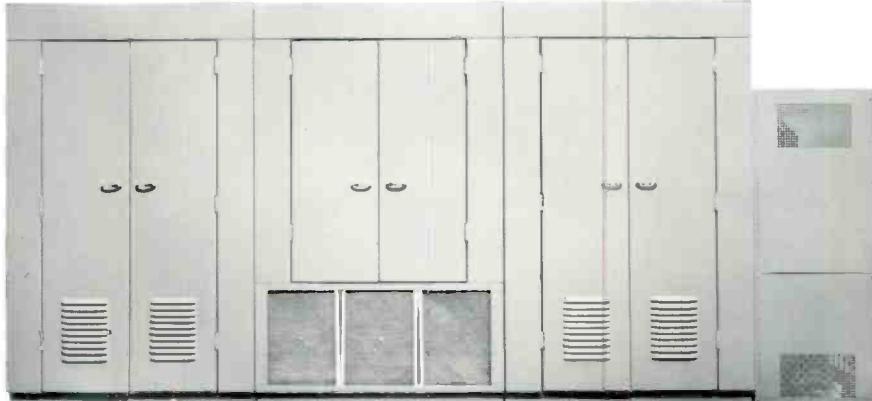
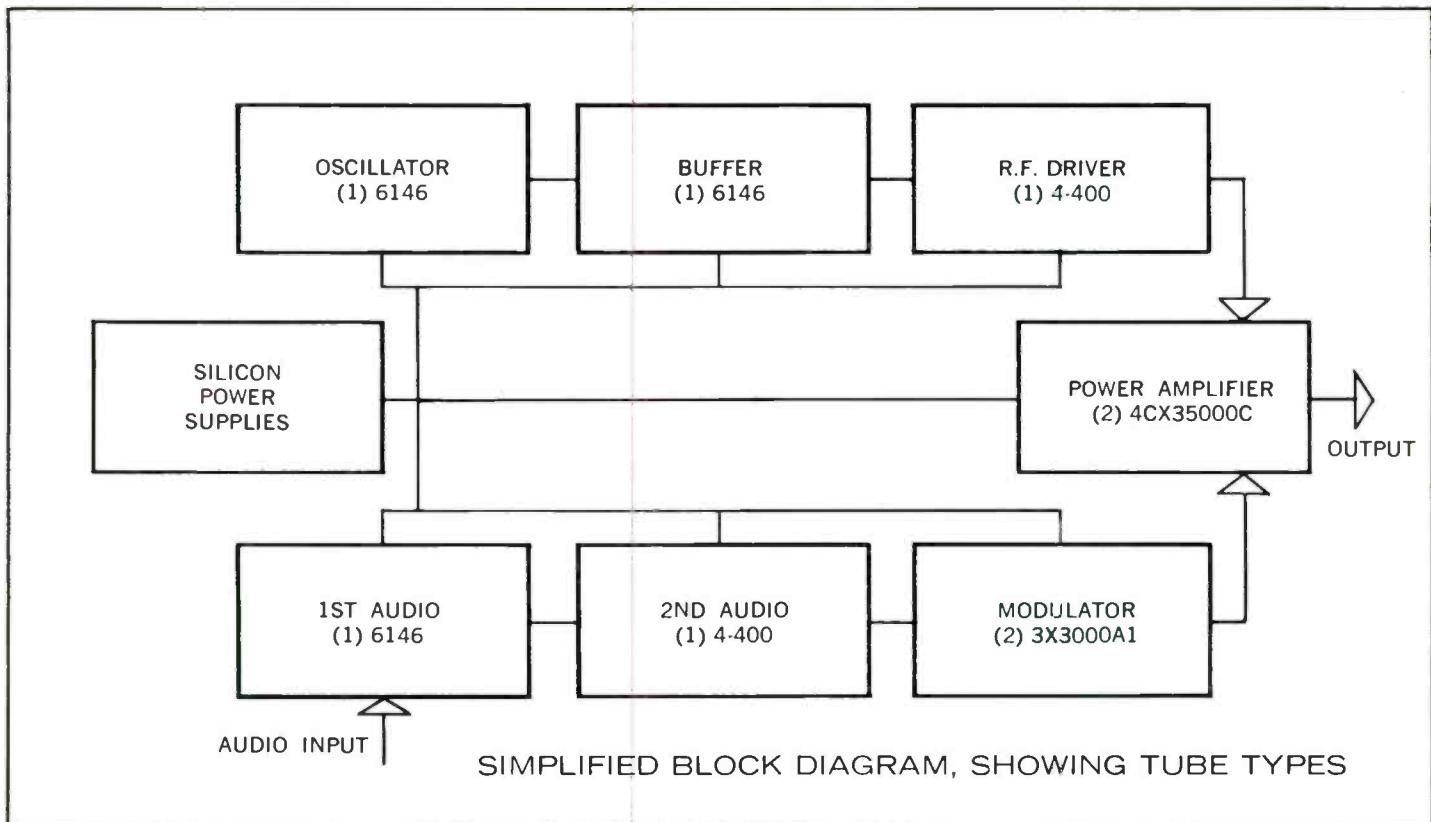
A comparison of the power requirements of the various American 50 kw transmitters manufactured today illustrates the outstanding performance of Continental's high-efficiency screen modulated amplifier. Figures shown are the averages of those figures as stated by each manufacturer (see figure 1).

Although our Type 317C shows a lower power requirement at all levels of modulation, and hence lower operating costs, the low power consumption at 100% modulation will take on even more significance as a station's average modulation climbs toward 100% because of high limiting and speech clipping.

Designed, developed and manufactured by the specialists in super power radio and radar transmitters and systems, Continental's Type 317C is another forward step in the evolution of better broadcasting equipment. It joins the parade of other developments such as silicon rectifiers, ceramic capacitors and other components which have made compact, more reliable and more efficient radio stations a reality for broadcasters everywhere.

*Pat. applied for

figure 1	Continental Type 317C	Phase-Amplitude	Plate Modulated
0% modulation	82 kw	94 kw	93 kw
average (30%) modulation	92 kw	110 kw	108 kw
100% modulation	120 kw	140 kw	140 kw



SPECIFICATIONS

Power output capability: 53 kw
Modulation: Screen Grid modulation of final stage
Emission: A3
Freq. range: any single freq., 535-1620 kcs
Freq. stability: \pm 5 cycles
AF input impedance: 150/600 ohms
AF input level 100% mod.: \pm 10 dbm \pm 2 db

AF response 50-7,500 cycles: \pm 1.0 db
 30-10,000 cycles: \pm 1.5 db
AF distortion, 50-7,500 cycles: Less than 3.0% RMS with 95% modulation
Carrier shift: less than 3%, 100% mod.
Modulation capability: 100% continuous at any frequency 50 to 10,000 cycles
Noise unweighted (below 100% mod.): 60 db
Spurious emission: 80 db down, or better
Output impedance: 50 ohms unbalanced, or other as specified
Power source: 460 v, 3 phase 50/60 cycles
Permissible combined voltage variation and regulation: \pm 5%
Power factor: 0.9 or better
Power consumption: 82 kw @ 0% mod.
 92 kw @ 30% mod.
 120 kw @ 100% mod.
Altitude: 7,500 ft.
Ambient temperature: -20° to 50° C
Size: 144" W, 78" H, 54" Deep
Floor space: 54 sq. ft. (plus 8 sq. ft. for external transformer)
Total weight all units: (approx.) 6,600 lbs.



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TELEX ADDRESS: 73-398

