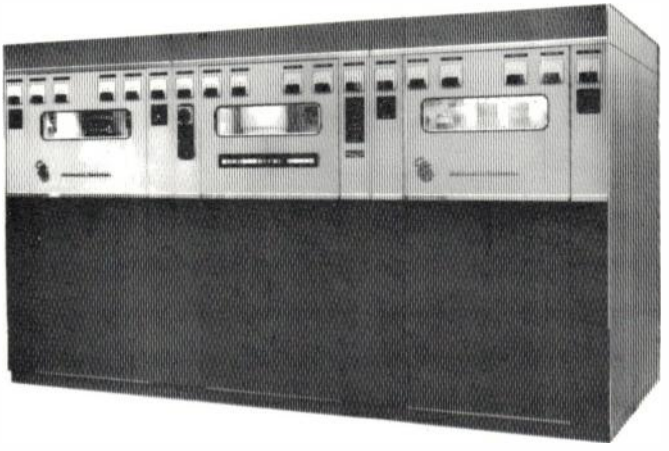
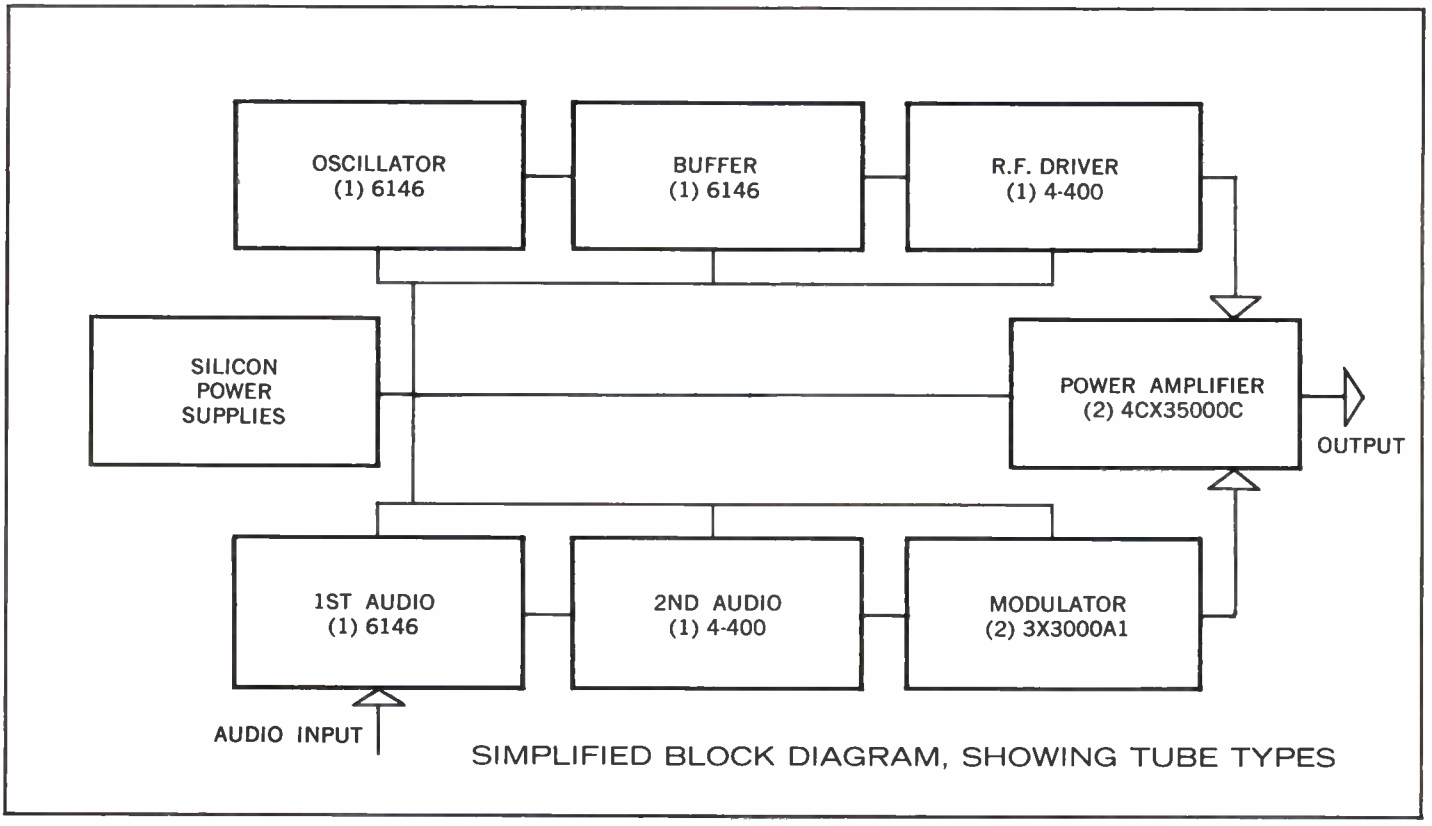


Continental Electronics

A SUBSIDIARY OF LTV ELECTROSYSTEMS, INC.

MAIL ADDRESS: BOX 17040 / DALLAS, TEXAS 75217 / 214-381-7161

THE SPECIALISTS IN SUPER POWER RADAR & RADIO TRANSMITTERS



SIMPLIFIED BLOCK DIAGRAM, SHOWING TUBE TYPES

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: ± 5 cycles

AF input impedance: 150/600 ohms

AF input level 100% mod.: ±10 dbm ± 2 db

AF response 50-7,500 cycles: ±1.0 db
30-10,000 cycles: ±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: ±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.

WNAC BOSTON, MASSACHUSETTS

MOBILE, ALABAMA WMOO

WKVM SAN JUAN, PUERTO RICO

PORTLAND, OREGON KWJJ

WCCO MINNEAPOLIS, MINNESOTA

TIJUANA, MEXICO XETRA

ARMED FORCES RADIO and TELEVISION SERVICE

DIPLOMATIC WIRELESS SERVICE of GREAT BRITIAN

RADIO RUMBOS CARACAS, VENEZUELA

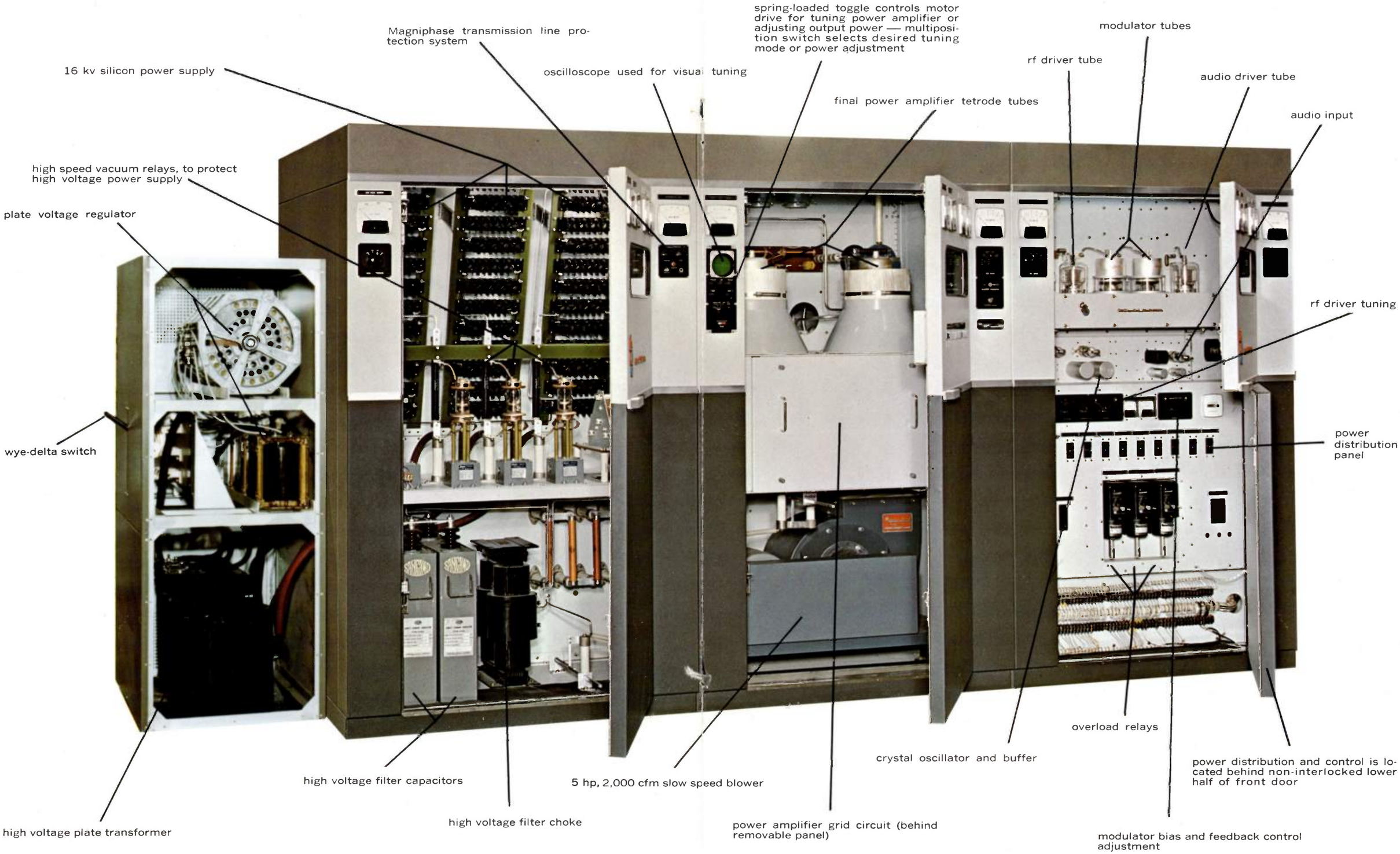
RADIO BARQUISIMETO VENEZUELA

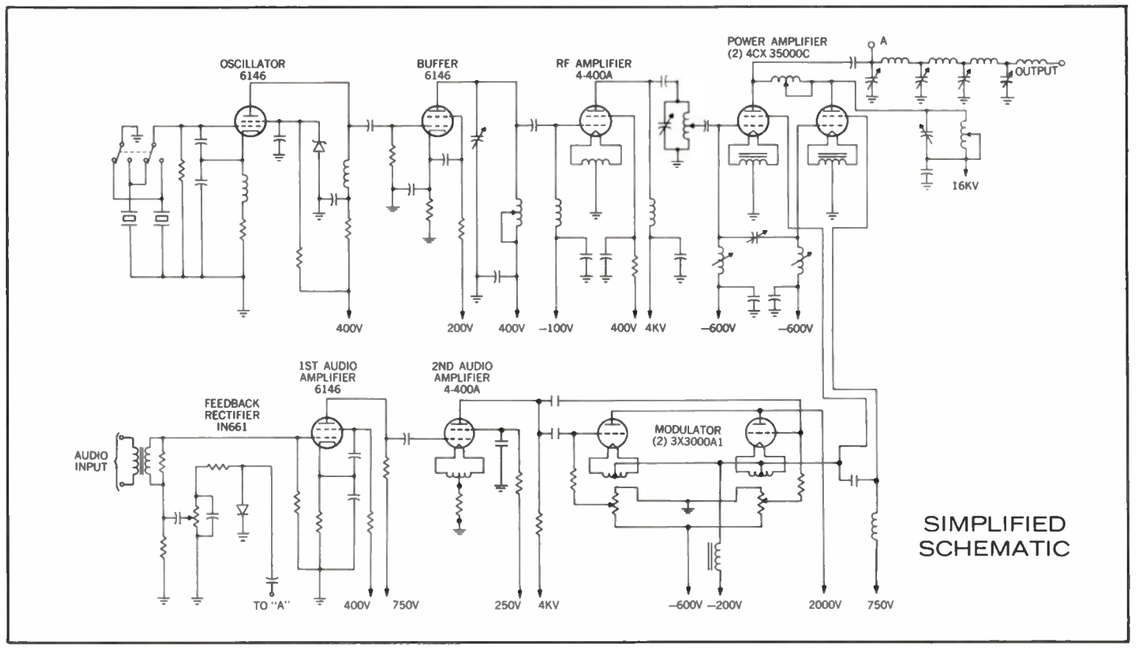
RADIO ENGLAND

RADIO CAROLINE ENGLAND

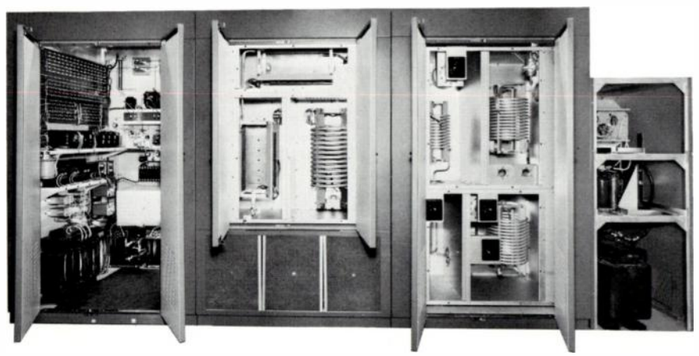
BURMA BROADCASTING SERVICE

THESE CUSTOMERS HAVE ADVANCED TO A NEW LEVEL OF 50 KW BROADCASTING BY PURCHASING 15 *Continental Electronics* TYPE 317C TRANSMITTERS.
HAVE **YOU** CONSIDERED IT YET?


Magniphase transmission line protection system
spring-loaded toggle controls motor drive for tuning power amplifier or adjusting output power — multiposition switch selects desired tuning mode or power adjustment
modulator tubes
16 kv silicon power supply
oscilloscope used for visual tuning
rf driver tube
audio driver tube
final power amplifier tetrode tubes
audio input
high speed vacuum relays, to protect high voltage power supply
plate voltage regulator
rf driver tuning
wye-delta switch
power distribution panel
overload relays
high voltage filter capacitors
crystal oscillator and buffer
power distribution and control is located behind non-interlocked lower half of front door
5 hp, 2,000 cfm slow speed blower
high voltage filter choke
power amplifier grid circuit (behind removable panel)
high voltage plate transformer
modulator bias and feedback control adjustment

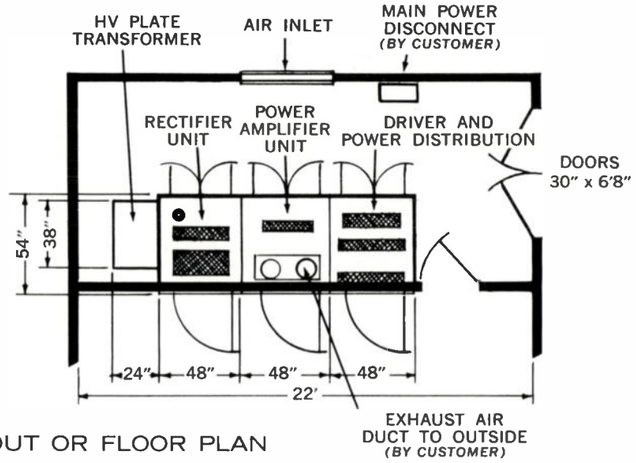


SIMPLIFIED SCHEMATIC



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.



LAYOUT OR FLOOR PLAN

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 circut. 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 distrotion.

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

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

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