

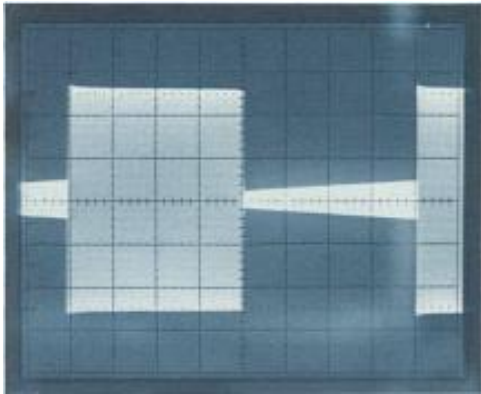
State of the Art AM



**Introducing the Power Rock 828D/E
from Rockwell-Collins**

The Power Rock™

SUPERIOR AUDIO PERFORMANCE DESIGNED
WITH STEREO IN MIND



This oscilloscope photograph, showing the output envelope under 20 Hertz square wave modulation, demonstrates the excellent dynamic response of the Power Rock as indicated by the near perfect square shape of the wave. Complete absence of any overshoot also shows the freedom-from-power-supply bounce, thanks to the Rockwell-Collins 12 phase supply.

These three photos, showing modulation, total harmonic distortion, and intermodulation distortion, demonstrate the typical performance of the Power Rock. Both harmonic and intermodulation distortion readings were taken at 95% modulation, harmonic distortion was taken at 1000Hz., while the intermodulation test follows the standard 4:1 SMPTE method.



Modulation



Harmonic

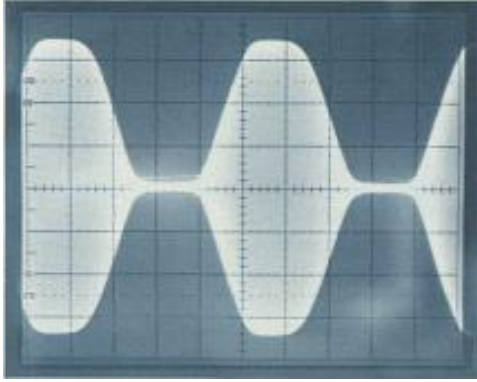


Intermodulation

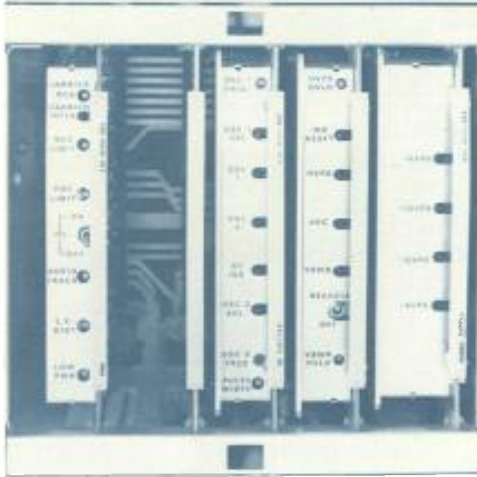
**With audio
performance to please
a most demanding
audience.**

**Rockwell-Collins
828 D/E-1**

Taking its roots from a 1968 United States patent (#3,413,570) issued to Collins Radio and Warren Bruene, the Rockwell-Collins Power Rock™ is the direct result of years of research, development, and refinement.

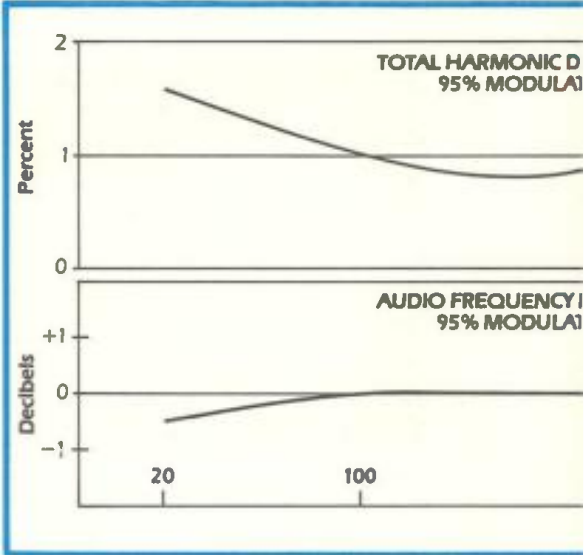


Modulation wave form showing effect of IPL



IPL settings on PWM card

The engineers at Collins set out to design an AM transmitter which would advance the state of the art in a number of areas, including audio performance, energy efficiency, reliability, simplicity, size, and cost. To meet these goals, the 5000 W 828E-1 and its companion 2500W 828D-1 incorporate a number of features, some novel, some time proven, which, when combined in the Power Rock, make the most advanced transmitters in their class.



SwitchMod System™—Far more than just a pulse modulation circuit advancement, the Rockwell-Collins SwitchMod System combines the DC coupled series switching modulator with the stability of the proven 12 phase power supply and the built-in Instantaneous Peak Limiter and automatic modulation controller circuits to achieve dramatically improved AM audio performance, especially in the areas of low frequency response, intermodulation distortion and overall modulation density or loudness. The end result is a louder, cleaner sound and improved reliability and efficiency.

IPL front panel adjustments set both positive and negative limits of modulation. Working in conjunction with the automatic modulation control, the maximum level of modulation is maintained at all power levels and with power line voltage variations of as much as 10%. Below the limiting levels, audio performance is virtually

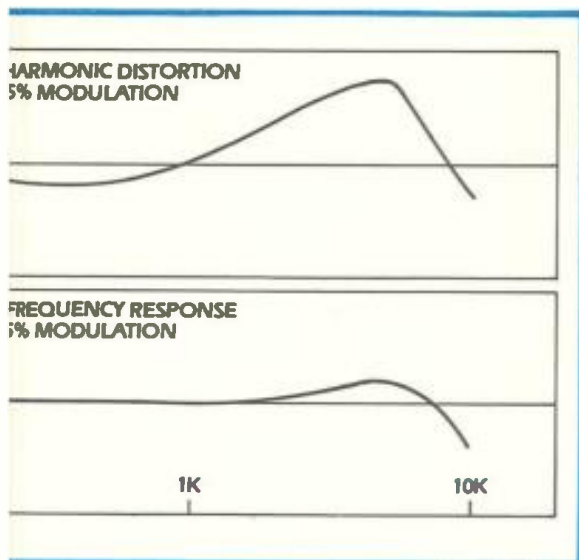
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The Power Rock™

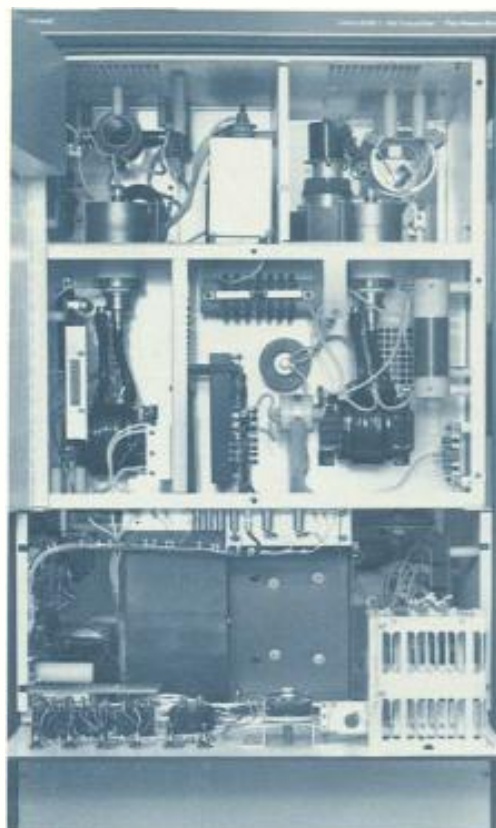
SUPERIOR AUDIO PERFORMANCE



unaffected, while overmodulation due to power line variations or audio peaks is effectively prevented.

High Efficiency P.A. — Using the high efficiency third harmonic injection technique of the proven Tyler-type PA, the Power Rock achieves final efficiency approaching 90%. This, combined with the high efficiency SwitchMod System, results in an overall efficiency in excess of 55%, a vast improvement over the 42-45% in conventional transmitters. This means a lower power bill in addition to lower cooling and air conditioning requirements to operate the Power Rock.

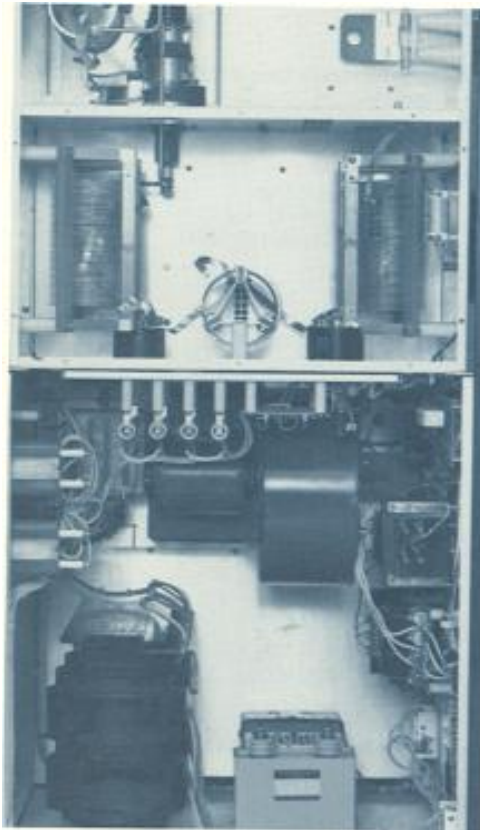
12-Phase Power Supply — Used by Collins since the early 1950's, the 12 phase power supply employs a combination Delta-Wye connected power transformer and two three-phase full wave rectifiers to develop high voltage DC with a 720



Power Rock-front view

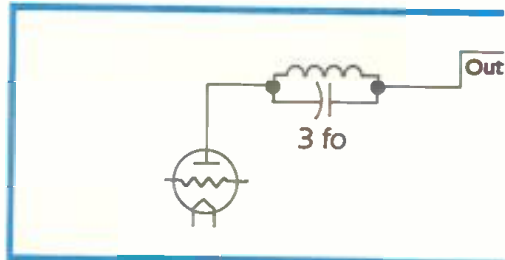
Hertz ripple frequency. This ripple is easily filtered without inductors, eliminating the power supply resonances formerly associated with AM transmitters. Power supply sag and bounce are also eliminated. The result, again, is improved audio performance with better low frequency response and higher average modulation capability.

The absence of filter inductors and large capacitors, as well as the modulation transformer, also help make possible the reduction in size of the Power Rock and eliminates several expensive, failure-prone components.

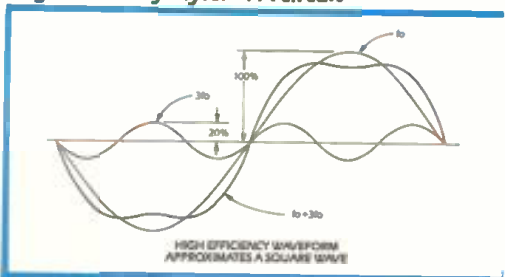


Power Rock™ -rear view

Q-Taper Network™ — The Rockwell-Collins Q-Taper output network, a proven performer in the 820D-1 and 820D-2 transmitters, provides flatter response across the audio pass band and very steep skirts above and below the pass band. Unlike conventional "Pi" networks, the skirts of the Q-Taper network are nearly symmetrical with second harmonic suppression at 80 dB below carrier. The 3 dB bandwidth is approximately 10% of the operating frequency or 1000KHz. average. The 4 node network, whose overall Q is the product of the Q's of each node, achieves low circulating currents by the use of low nodal Q's, on



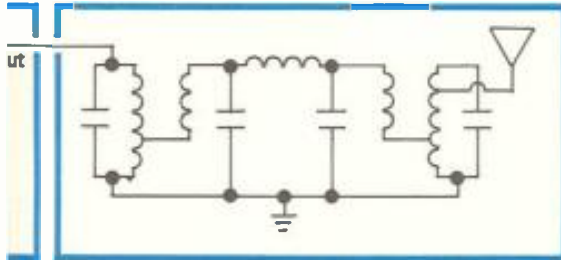
High Efficiency "Tyler" PA circuit



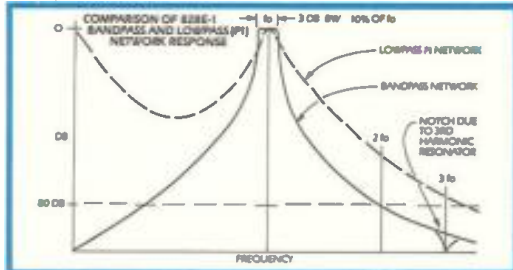
the order of 4-6. Overall system Q, being the product of these, is approximately 250. These lower circulating currents enable the use of smaller components without sacrifice in either performance or conservative component rating. The Q-Taper network also has improved phase linearity over conventional networks, an important consideration for AM stereo.

Grounded Anode — By operating the anode of the final amplifier at DC ground, peak RF voltages are reduced to about half the peak value with respect to the chassis in conventional configuration, thus less possibility of arcing or corona. In addition, since the plate of the final is at DC ground, required metering of this stage can be done directly at ground reference, both local and remote. Finally, because the plate is at ground, there is no need to use a blocking capacitor or feed choke.

This approach is made practical by the use of fiber optics to couple to the audio driver. DC coupling in the audio chain is thereby maintained throughout, for vastly improved audio performance.



Q-Taper™ network circuit



Front Panel



Fiber Optics assembly



Rear panel connections for Signal Access Card.



PWM card

Maintenance — Maintenance is an important consideration in any transmitter so the engineers at Rockwell-Collins have designed the Power Rock with service in mind. Modular circuit boards with an extender card and LED status indicators on major circuits and relays help simplify maintenance. The Power Rock uses the same tube type in both the final and the switch tube; spare tube stockage is minimized. And the Power Rock uses no tube sockets, eliminating yet another failure-prone component. Yet, despite its size, the smallest 5 Kilowatt transmitter in the industry, accessibility is excellent.

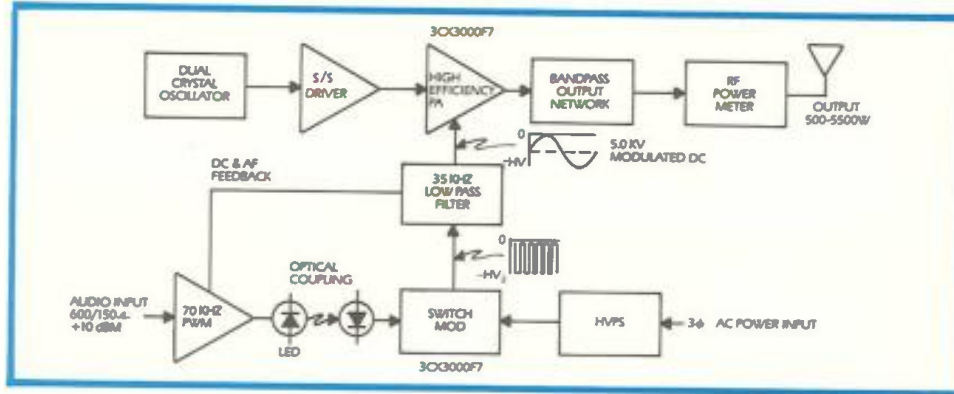
AM Stereo — The Signal Access Card, built into every Power Rock, provides rear panel access to both audio signal and RF drive, for use either in parallel operation of two Power Rocks or for possible later use in AM stereo. These terminals will make possible the connection of an external stereo generator to the RF drive line and to the audio chain, should this be required by future AM stereo systems.

The Power Rock needs no screen supply due to the selection of triodes in both the final and switch tubes. Built-in forward and reflected power metering is standard, making possible quick checks of transmitter performance and checks for

changes in antenna systems. Provision is made for the addition of an optional RF line current meter, and high/low power switching is standard. Audio feedback is taken from modulated DC rather than from the output envelope, reducing the sensitivity of the Power Rock™ to load conditions, while providing automatic power output control. And, though not recommended for repeated practice, when required, the Power Rock will come up to full power from a cold start in a matter of seconds at the push of a single button.

The Power Rock — for louder, cleaner and better sound, higher efficiency, increased reliability, lower operating costs, smaller size, and easier maintenance . . . for the ultimate in the AM art.

WE INVITE COMPARISON.



Collins has set new standards for AM excellence. We invite comparison.

1. High efficiency SwitchMod™ pulse modulation technique.
2. High efficiency Tyler-type final.
3. Overall efficiency exceeding 55% at carrier.
4. Harmonic distortion less than 2.0% from 20 to 10000Hz.
5. Low intermodulation distortion per standard 4:1 SMPTE.
6. Feedback taken from modulated DC, not from RF envelope for reduced sensitivity to load conditions.
7. Bandpass "O-Taper"™ output network for flatter response across the audio pass-band and improved adjacent signal rejection.
8. Freedom-from-power-supply bounce and sag due to the dependable Rockwell-Collins 12 Phase supply.
9. Lower RF peak voltages as a result of operations of the PA anode at DC ground.
10. Local and remote metering directly at ground reference.
11. No plate blocking capacitor or feed choke required.
12. Automatic modulation control keeps average level of modulation constant at all power levels and with a $\pm 10\%$ line voltage variation, standard.
13. Built-in Instantaneous Peak Limiter, standard.
14. $+125\%$ modulation capability, standard.
15. Built-in Forward/Reflected Power meter, standard.
16. Low power setting continuously adjustable over entire power range of the transmitter, standard.
17. Built-in trouble-shooting aids, standard.
18. Modular construction with extender card for easier maintenance.
19. No tube sockets for higher reliability.
20. Using only one tube type for lower spares stockage costs.
21. Use of triodes eliminates need for screen grid supply.
22. Overload recycle interrupts pulse train to remove high voltage in microseconds. After third overload, high voltage power supply is shut down, standard.
23. Signal Access Card for direct connection to RF and audio drive.
24. Improved phase linearity in "O-Taper" network for AM stereo.
25. Fully contained in a single bay cabinet, 33" x 34-1/2" x 69" (7.9 sq. ft.).
26. Backed by the Rockwell-Collins two year limited parts warranty.
27. Supported by the Collins Broadcast Field Service Engineering team providing 24-hour emergency technical assistance 365 days a year.
28. Further supported by emergency parts service available 24 hours, year-round.
29. Competitive pricing... see your Collins Broadcast team for full details.

SPECIFICATIONS

828E-1(828D-1)

ELECTRICAL

Frequency Range
540-1600 KHz

RF Output Power
500-5500 w.
(250-2750 W)

Output Impedance
50 Ohm nominal (others
available on special order)

Output Fitting
1-5/8" EIA male flange
standard
7/8" EIA flange or stud
output also available.

Harmonic and Spurious
Complies with FCC and
CCIR regulations.

Carrier Amplitude Reg.
2% max. adjustable to 0

Frequency Stability
± 5 Hz. over ambient
temp. range (below)

Power Requirements
200-250 VAC 3 ϕ 3 or 4
wire, wye or closed delta,
50/60 Hz
385-435 VAC available
on special order

Power Consumption
13.0 KVA @ 95% PF for
5000 Watts, 95%
sine wave modulation

Overall Efficiency
Better than 57% at 5000
Watts, 95% sine wave
modulation.

Frequency Response
± 1 dB, 20-10000 Hz. @
95% modulation, 5000
Watts output

Total Harmonic Distortion
less than 2% 20-10000
Hz. @ 95% mod, 5000
Watts output

Noise
better than -60dB
reference 400 Hz., for
100% modulation @ 5000
Watts output

Audio Input
+ 10 dBm ± 2 db
600/150 ohms for 100%
modulation

Modulation Capability
-100%, + 125% standard

GENERAL

Size
88 cm. (34-3/4") W. x 85
cm. (33-3/8") D. x 176 cm.
(69") H. 0.75 sq. meters
(7.9 sq. ft.) floor space

Weight
476 Kg (1050 lbs)

Tubes
3CX3000F7 (2)

Air Flow Requirement
500 CFM

Humidity
95%, max

Ambient Temp. Range
To 0°C to + 50°C. (meets
FCC requirements to
-20°C)

Altitude
2280. M (7,500 ft.) above
mean sea level

For further information, contact your local
Collins Broadcast sales representative, or call
Broadcast Products Marketing 214-996-5424



Rockwell International

Collins Transmission Systems Division
Broadcast Products