



# TECHNICAL BULLETIN

T-023

## PROBLEMS OF TELEVISION SET OPERATION ON GENERATING PLANTS



AUGUST 1964

DIVISION OF STUDEBAKER CORPORATION

MINNEAPOLIS, MINNESOTA 55414

IN CANADA: ONAN GENERATORS CANADA LTD., P.O. BOX 559, GUELPH, ONTARIO

Printed in U.S.A.

## PROBLEMS OF TELEVISION SET OPERATION ON GENERATING PLANTS

When operating a television receiver from generating plant power instead of commercial power, defects in reception may become more noticeable. The differences between commercial power and generating plant power tend to emphasize weaknesses in television receiver operation and design. This bulletin describes the most commonly occurring reception difficulties and methods used to remedy them.

### RECEPTION DIFFICULTIES

Defective television reception, observed when operating on a generating plant, normally falls into 3 categories; radio frequency interference, generating plant deviation from the frequency standard (asynchronous operation), pulses or notches in the voltage wave form --

- Radio frequency interference appears in the picture either as short white or black horizontal lines (snow) in mild cases, or as horizontal tearing of the picture (disruption of horizontal synchronization) in severe cases.
- A frequency difference between the generator output and the receiver's picture scan frequency, determined by the television transmitter (asynchronous operation) can create moving disturbances in the picture. These usually appear as cyclic variations in picture height, or as vertical waves, wiggles or dark and light bands moving vertically through the picture. The picture scan frequency is precisely controlled to match the commercial power lines 60 cps frequency.
- AC wave form defects (pulses or notches) usually show up as roll over of the picture (disruption of the vertical synchronization).

### RADIO FREQUENCY INTERFERENCE

Electronic equipment, shop tools, and passing automobiles are sources of radio frequency interference. The generating plant is a potential source of interference, but ONAN plants include suppression equipment to reduce interference to an acceptable level when the receiver is operating in an area where the television signal is adequate.

If radio frequency interference is suspected, a radio serviceman can determine the cause. Various types of filters used in the line voltage connection or in the antenna system will usually cure this problem. To check receiver operation with a generating plant power source, move the receiver to a different power source and compare operation. If the plant is producing interference, thoroughly inspect all suppression equipment, especially ignition, for defective operation. For additional information about radio frequency interference, see ONAN Service Bulletin Misc. 7.

## ASYNCHRONOUS OPERATION

Since the governor on ONAN generating plants regulates frequency to 5% between no load and full load, there can be a frequency difference of 2 cps between the generator output frequency and the receiver's vertical scan frequency which is determined by the transmitter. An ideal television receiver, of course, would not be affected by this frequency difference because the receiver power supply would eliminate the difference, but no receiver is ideal. Power supply filters leave some ripple in their output voltage wave form, and the power transformer and tube filaments introduce stray magnetic fields. The resulting ripple and stray fields affect the picture. Defects in the picture of a receiver operated on a synchronous power source are stationary, and normally unnoticeable; on an asynchronous power source, the defects move through the picture so the viewer notices them.

Probably the best way to discover if picture defects are caused by the generating plant is to vary the plant operating frequency slightly. An under frequency power source will cause disturbances that move downward through the picture; an over frequency source, causes disturbances that move upward. If when you disturb the generating plant throttle and change its output frequency you change the direction of motion of picture disturbances, or even their speed through the picture, the frequency difference is causing the disturbance.

While it's easy to attribute picture defects to the generating plant, it's more difficult to do something for the reception, because both the basic design and condition of the receiver greatly influence the degree of picture disturbances. A well designed receiver, in good condition, will produce a picture acceptable to almost anyone.

If a receiver exhibits a defective picture on the commercial power line, don't expect it to operate properly on an asynchronous power source. In addition, operation on an asynchronous power source may exaggerate the defects of a receiver in poor condition. This means that the set could exhibit an adequate picture on commercial power but not when operated on the generator power source. The most common sources of trouble in the receiver will probably be tubes with leaky heater-cathode insulation and defective components in the main power supply.

Some television receiver designs, especially sets built in the last few years, have a reduced tolerance to operation on an asynchronous power source. In an effort to reduce television prices, some models have been designed exclusively for operation on the commercial synchronous power source and are susceptible to the effects of asynchronous operation. Since it is impractical to change the television set circuitry to improve operation with a generating plant, the only choice is to change to another model. The best method of determining whether or not a particular model can tolerate asynchronous operation is to compare 2 or more sets of the model in question. If the defect is caused by poor design, none of the sets will exhibit an acceptable picture; if one or more sets of the same model exhibit adequate pictures, a defective component is affecting the sets with poor pictures.

## INPUT WAVEFORM DISTORTION

A television receiver power input waveform that contains sharp notches, pulses, or other defects, can disrupt the television set vertical synchronization because the power supply doesn't remove all ripple. Equipment using magnetic amplifiers often produces such a wave notch, for example, some battery chargers. When operated from a commercial power line, the line absorbs the notch by acting substantially as an infinite bus. A generating plant produces only a few watts when compared to the power company's millions and so could reflect a pulse produced by another piece of equipment into the television receiver. In addition, ONAN generators with static exciter (Magneciter), which includes a magnetic amplifier voltage regulator, have a notch in the generating plant output wave form. If the television set power supply doesn't eliminate the notch, it can disrupt the vertical scanning.

The solution, as with the asynchronous operation, is to use a brand or model of television set not susceptible to these effects. Whether a specific model is susceptible may be determined by experimenting with 1 or more sets operated by the generator.

## CONCLUSION

If television set reception is poor only on a generator power source, compare that set with others of the same model. If this test indicates that the model of television set in question isn't suitable for operation on an asynchronous power source, the only choice is to use another type of television receiver. A generating plant that appears to be disrupting reception should, of course, be inspected to assure that it is operating properly within its frequency limits and that the suppression equipment is working properly.

If, however, only 1 television set exhibits poor reception when compared with others of the same model, the trouble can probably be traced to a component defect in the set. Repair work should be done using the asynchronous power source in order to determine the difficulty. The television set could exhibit defective operation on the generator power, but be perfectly acceptable when removed to a test bench and operated with commercial synchronous power.

Any television receiver operated from a generator power source, should receive more rigorous maintenance than its equal operated from commercial synchronous power. Because the asynchronous power source can exaggerate component defects in the set, it becomes more important to maintain the receiver in perfect working condition. Small defects that wouldn't be noticed in normal synchronous operation, could seriously impair the picture when operated on asynchronous power.