



# Problems and Solutions for Utilizing the Return on the GI SX Platform

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When the GI SX platform was design the industry had no concrete idea on how the return system would be utilized.

The assumption that was made with the SX, was that the return would operated the same as the forward with the feeder levels carried higher than the trunk.

The SX platform was therefore built with 10 dB of attenuation on the bridger return prior to its combining with the return from the trunk. Actual measurements of SX chassis confirm this 10 dB loss and in it could sometime be as much as 13 dB. (See Fig 1)

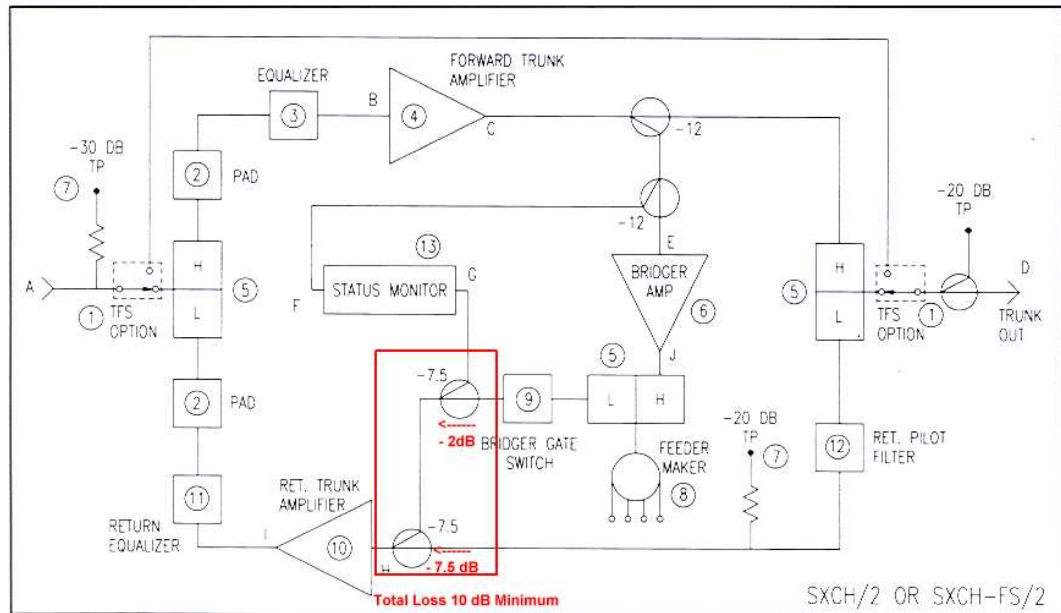


Figure 1

In today's HFC systems the inputs for the returns on both the trunk and feeder are both nominally 18 dB and when you subtract 10 dB from the bridger side prior to combining you end up with a situation where it is impossible to set the levels properly.

If you had a return amplifier with 22 dB of gain you would have, at best, a 30 dB output from your bridger signals and a 40 dB output from your trunk signals. Actual measurements show that this discrepancy can be as high as 13 dB.

There have been three solutions to this problem that we are aware of, they are:

1. Replace the hybrid in the return amplifier with a high gain 34 dB device and set your bridger levels properly and let the trunk run 10 dB higher.
  - a. **PROBLEM** This could potentially create unusually high distortions and significantly lower your BER. To solve this a special return module with 0 dB of gain was used in every 2<sup>nd</sup> or 3<sup>rd</sup> location to reduce the gain. Considerable skill and understanding is needed to implement this solution;
2. Add a low noise preamp in the location where the old Bridger Gate Switch was located, which had a built in preamp and increase the bridger levels prior to combining.
  - a. **PROBLEM** This adds another active device to the return path and could lead to decreased reliability; (See Fig 2). In the overall operation this solution seems to be the best for field implementation and understanding;

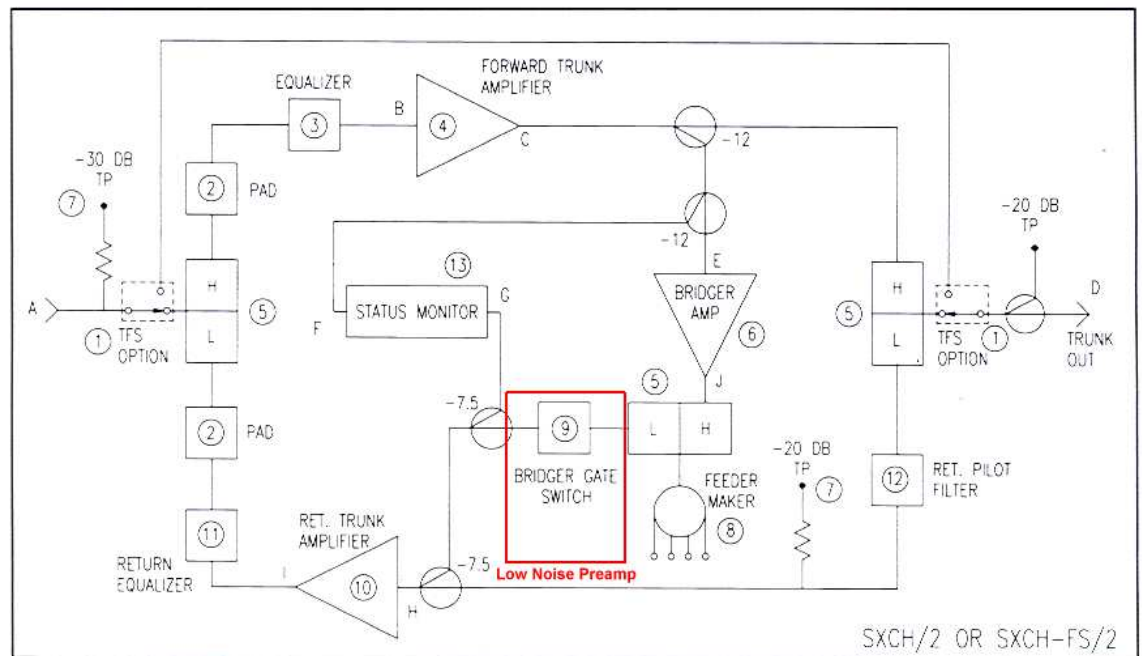


Figure 2

3. Add a plug in pad in the location where the Notch Filter Jumper is located and attenuate the trunk return signals to be equal to the bridger return. (See Fig. 3) Additionally the return amp needs to have a noise figure of 4 dB to ensure that with a 18 dB return input and under the worst case scenario the

input to the actual amplifier will be above the noise figure. It will also need a gain of 35 dB to ensure a 45dB output under the worst input conditions;

- a. **PROBLEM** System Technicians are not used to doing this and experience has shown that levels are consistently set incorrectly.

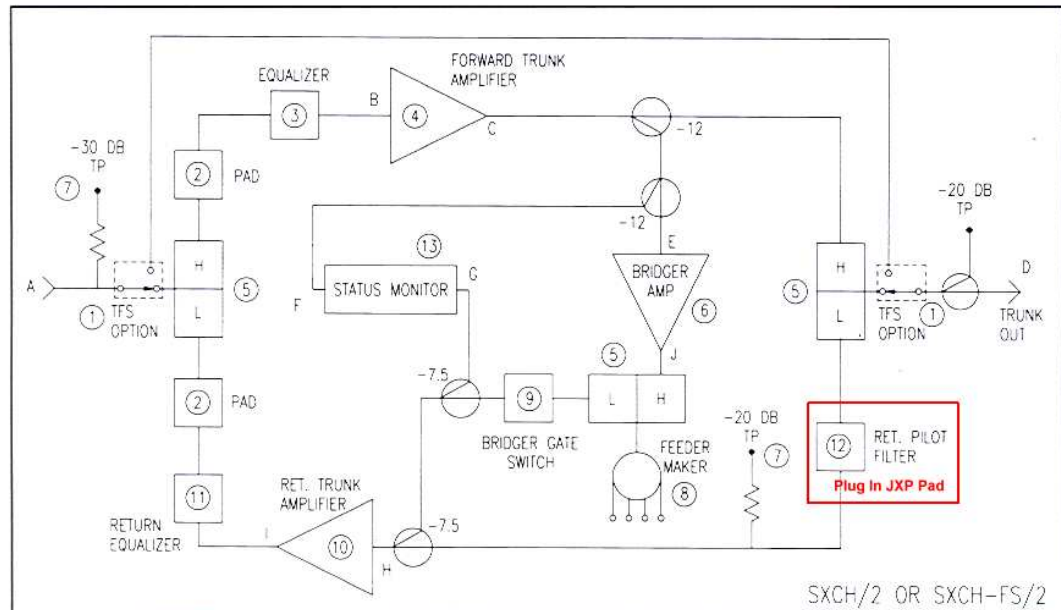


Figure 3

In practice all three methods have been used, however those who used the first method are constantly fighting level problem while those who used the second and third method can set the system levels properly.

4Cable TV recommended the use of the second method but has equipment to implement any of the above solutions.

### Notch or Return Pilot Filter:

Questions have been asked about the return Pilot filter, why and what it is for and why a jumper is needed.

In the early days of return transmission, pilot carrier generators, both CW and noise, were added at the end of the lines to provide carriers for the return AGCs to operate from. When different legs were combined the pilots from different legs would be additive or subtractive, dependant on the phase and therefore unreliable. To solve the problem the pilot from one leg had to be trapped out and the return Pilot filter was used. As the industry progressed narrow band noise generators were used which, because they were random noise, and therefore not additive and could be combined, without level change, the notch filter was no longer needed. In today's systems with the adaptive AGC consisting of the CMTS and the modem there is no longer any need for pilots.

Many technicians, when implementing return on the SX trunks fail to provide some type of jumper in the Notch filter location and then will not be able to pass any signal from the trunk output. A common field solution to the problem is a piece of lashing wire. This solves the problem at the time but can and does lead to intermittent problems and potential CPD in the future. 4Cable TV manufactures a simple plug-in Notch Filter Jumper to solve this problem.