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SOURCE¹: VoCAL Technologies Ltd.

TITLE: G.hs: Loading Coil Detection

ABSTRACT

xDSL modems are designed to operate between a Central Office and a customer premises. As such they use existing telephone network wiring between the Central Office and the subscriber. There are several modems in this class which function in generally similar manner. All of these modems transmit their signals usually above the voice band. As such, they are dependent on adequate frequency response above voice band.

The telephone lines which are already in place generally have not been tested for adequate response in the intended frequencies of operation. In particular, prior to ISDN deployment, use of loading coils on long telephone lines has been common. Their intended purpose was to equalize the voice band frequency dependent signal propagation. Their effect on xDSL modems however is drastic. Because xDSL modems can not be expected to operate on loaded lines, here we propose a technique to identify their presence.

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1. Introduction:

xDSL modems are designed to operate between a Central Office and a customer premises. As such they use existing telephone network wiring between the Central Office and the subscriber. There are several modems in this class which function in generally similar manner. All of these modems transmit their signals usually above the voice band. As such, they are dependent on adequate frequency response above voice band.

The telephone lines which are already in place generally have not been tested for adequate response in the intended frequencies of operation. In particular, prior to ISDN deployment, use of loading coils on long telephone lines has been common. Their intended purpose was to equalize the voice band frequency dependent signal propagation. Their effect on xDSL modems however is drastic. Because xDSL modems can not be expected to operate on loaded lines, here we propose a technique to identify their presence.

2. Load Coil Detection:

There have been several suggested methods of detecting loading coils. All of which rely on certain frequencies not being passed. We suggest of an enhancement to this detection by using specific frequencies within G.hs that will and will not be passed through the loading coils. G.hs should use frequencies low enough so as to reliably pass through the loading coils. This is desired so that basic communications between the two modems can be established. By using an additional higher frequency, both modems can detect the presence of loading coils. The frequencies of the carriers used by G.hs, would certainly need to be known by both modems. The frequency of the high frequency detection signals sent in each direction may not need to be exactly specified. However the respective levels of all of these signals should be specified in at least relative levels for the modem at each end. The recipient modem would measure the signal levels of each frequency and be able to identify when a loading coil is present by detecting significant attenuation. One familiar with the art can easily model the telephone line and loading coil to predict the amount of frequency dependent attenuation that can be expected.

The benefit of using two frequencies in each direction over other proposed methods is to establish that basic system communications between two xDSL modems is possible. If only a single frequency was used in each direction, one would have to sacrifice either determination of basic system communications or detection of loading coils. Knowledge of basic system communications aids a telephone company installer in determining that the modems at both ends are connected and to concentrate on the identification of wiring problems such as loading coils.

As a further refinement, we propose that G.hs support additional messages to request and respond with the signal level measurements at the frequencies of interest. A general approach would be to specify the frequency to be measured. Known tone detector algorithms, such as Goertzel tone detector, can be used in a programmable fashion using a coefficient for the center frequency and number of iterations for evaluation controlling the sharpness of the tone detector. G.hs should provide for a message requesting the remote modem to perform a power measurement at a particular frequency or set of frequencies and report the measurement information in a reply G.hs message.

As the telephone operating company would likely be responsible for the installation, these provisions should be required in order to provide the information an installer may need. For this reason it is desirable to have the remote modem perform the measurement on request and report the information to the central office modem where the information can be accessed by the installer or other administrator.

3. Summary:

1. This paper should be present in the G.hs agenda.
2. We proposed that the G.hs include this algorithm to detect the presence of loaded coils.