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Serve Customers Beyond The Reach Of Traditional Drops

Grow your customer base by 10-30% with an ROI in months, rather than years

Every installer has had the feeling that no matter where they were, there were always at least a few more potential customers just beyond the reach of a traditional drop, or a new subdivision or housing cluster that would require an expensive system expansion.

A few years ago, the owner of a small cable system – we'll call him Dan - ran into the place where small town politics and small town business intersect. The mayor's brother had built a new house about 2000 feet past the end of the existing system. The mayor and his brother came by the cable office on a monthly basis asking when cable would be available.

During the mid-90s this writer worked on a device that would allow an operator to switch from coax to a long fiber line and drop that to a customer's home, where the fiber would be converted back to coax. At the time it looked too expensive to be practical, so the project was dropped.

But tech changes, and Dan's situation presented an opportunity to take a second look at the idea. Indeed, the advent of RFoG had brought the premise device down to acceptable levels and also the massive number of diodes used in the R-ONUs had brought the price of the laser diodes down to a level that would work. Thus RF2F (Radio Frequency to Fiber) was born. Dan bought the first installation, and informed the mayor's brother that the system was ready to hook him up.

"How much is high speed Internet," the mayor's brother asked.

"Cable TV and Internet would be $90 per month," Dan replied.

"How much for just Internet?" the mayor's brother countered.

Dan thought for a moment, then said, "High speed Internet is $90 per month, and the cable TV is included for free."

> You may be surprised by the number of prospects that are with 5,000 feet of your existing plant.

As you can see from the basic block diagram of an RF2F network in Figure 01, the RF signal enters, and is divided by a diplex filter into forward and reverse signals. The forward signal goes through a plug-in pad and a plug-in equalizer or cable simulator so that the forward signal can be adjusted flat. The forward signal is then fed into a pre-distortion circuit, after which it modulates a 1550 nm laser diode which sends light through a wavelength division multiplexer (WDM) and onto the drop fiber. The laser diode can be either a 2mW (3dBm) or a 5 mW (7dBm) device.

At the premise, a 1310, 1590, or 1610 nm return is generated and modulated with the return signal from the cable modem and fed back to the RF2F network where the return wavelength is split off by the WDM and is fed into a return receiver. The resultant RF signal is send back to the coaxial cable system through the diplex filter.

Figure 1

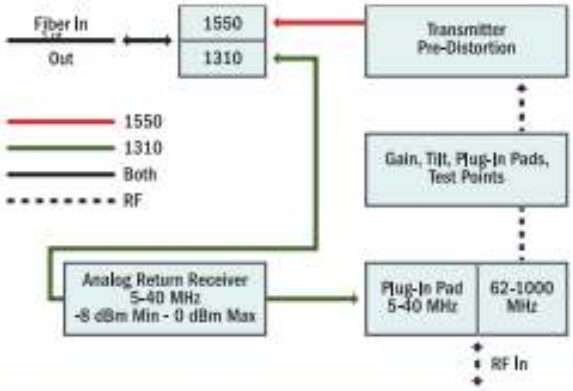


Figure 2

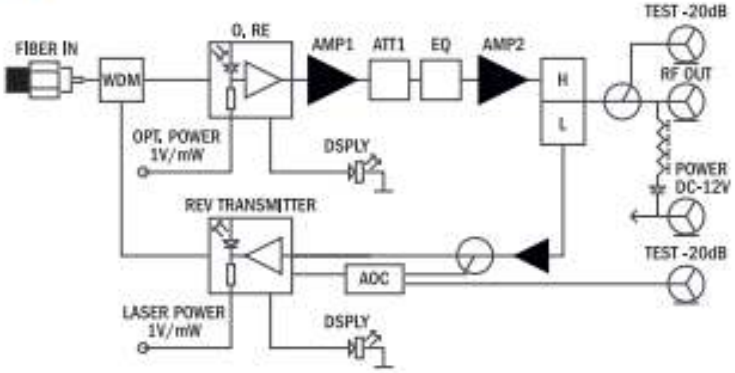


Figure 3

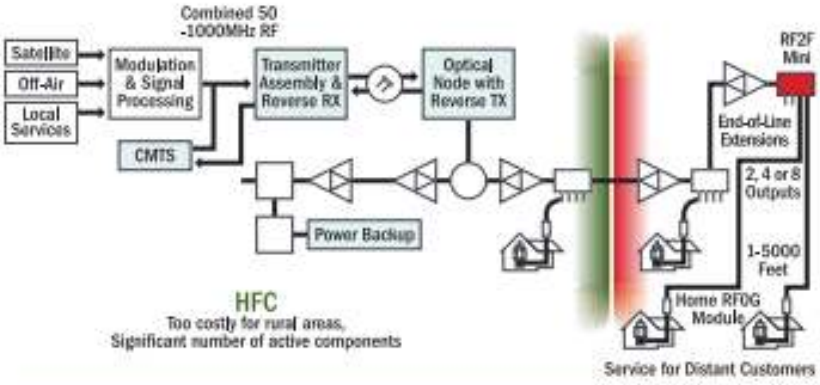
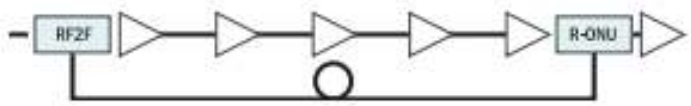


Figure 4



The heart of an RFoG system is the home receiver. Sometimes called a network interface unit (NIU), network interface device (NID), a fiber interface device (FID), micro-node, or an RF optical network unit (R-ONU). Many of the current models will feature optical automatic gain control (AGC) receiver; all models will have a burst transmitter.

The burst transmitter is one of the features that makes RFoG and multiple receiver RF2F installations work. The return laser is only on when there is information to be transmitted. (See Figure 2.) The cable modem termination system (CMTS) will control and separate all of the modem traffic, allowing only one modem at a time to transmit. Conversely, only one return laser diode will be on at any time. This prevents optical beat interference (OBI), a major possible source of noise at the photodetector in passive optical networks (PON).

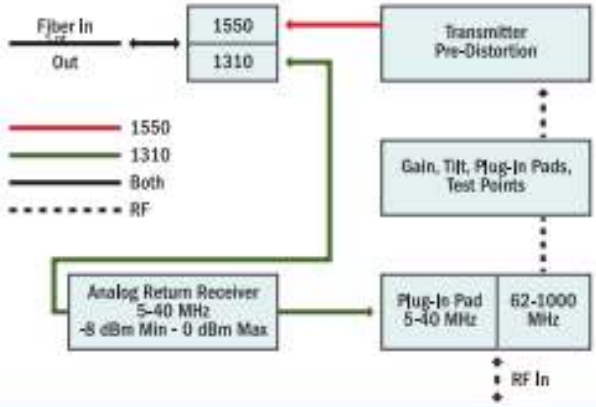
One of the differences between an RFoG installation and a RF2F installation is that in a RFoG installation, the light level at the R-ONU can be as low as **-5 dBmW**, which should result in can of about **48 dB**. The light input of an RF2F installation should be kept around **0 to -1 dBmW** in order to keep the RF2F link CN at about **51 dB**. This is because at the point in the system where the RF2F is installed the CN has already been degraded by the RF amplifier cascade. We want the RF2F link to be as high as possible in order to minimize the CN degradation contributed by the RF2F link.

Scale Inexpensively

The original RF2F network was designed and built to serve one customer. Because it had an output of **3 dB**, it was easy to add a 2-way splitter and serve two residences, thus dropping the cost per customer. The RF2F network can also be built with a **5 mW** diode, which will allow you to split it four ways, and lower the cost even more. (See Figure 3.)

RF2F networks can also replace long cascades of amplifiers to serve a remote cluster of residences, such as an apartment, mobile homes, or a new subdivision. Figure 4 demonstrates an installation where a cascade of six amplifiers was replaced with fiber, increasing reliability, decreasing power consumption, and improving service.

Figure 1



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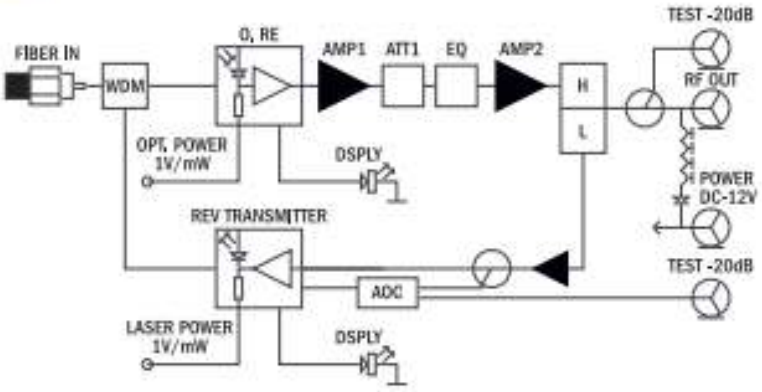

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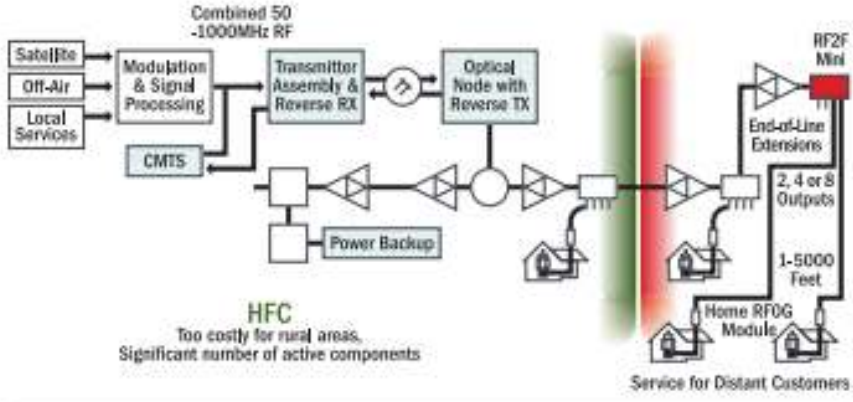

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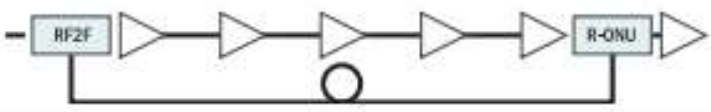

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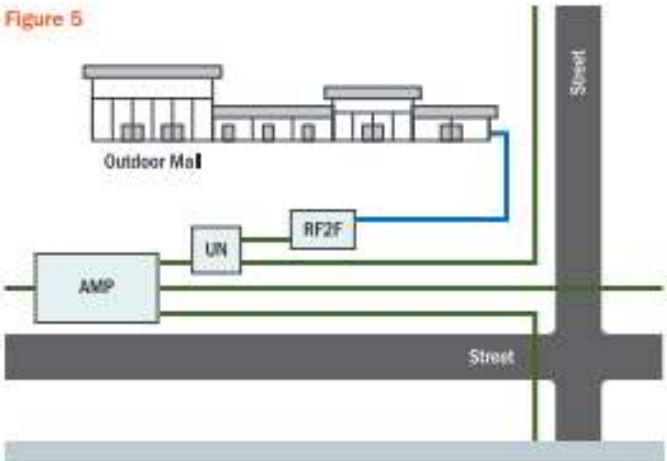

Sample RF2F Costing

1. COST, SINGLE

a. RF2F mini 1-way	$600
b. R-ONU 1 each	$135
c. Fiber 6 count 1000 ft	$240
d. Misc boxes connectors	$50
TOTAL PER CUSTOMER	$1025

2. COST, DUAL

a. RF2F mini 2-way	$690
b. R-ONU 2 each	$270
c. Fiber 6 count 1000 ft	$240
d. Misc boxes connectors	$100
TOTAL PER CUSTOMER	$650

3. COST, 4-WAY

a. RF2F mini 4-way	$995
b. R-ONU 4 each	$540
c. Fiber 6 count 1000 ft	$240
d. Misc boxes connectors	$200
TOTAL PER CUSTOMER	$494

4. COST, 8-WAY

a. RF2F mini 8-way	$1595
b. R-ONU 4 each	$1080
c. Fiber 6 count 1000 ft	$240
d. Misc boxes connectors	$400
TOTAL PER CUSTOMER	$414

5. INCOME

a. Installation income	$100
b. 1st month cable and Internet income	$86
c. Net after 1st month income	$50

6. ROI

a. 8-way Install	5.5 months
b. 4-way install	6 months
c. Dual Install	10 months
d. Single Install	17 months

If, in the future, you need to go to an all-fiber system, you already have fiber drops in place from the RF2F install.

5 Other Benefits Of RF2F Buildouts

- Potential 20% increase in subscribers
- Minimal or no engineering cost
- 1 day installation
- Pole attachments are classed as drops — in many cases no engineering fees
- Only connect presigned customers — time contracts are very possible; ROI almost 100% guaranteed

In many cases, a business customer's data network is separate from its cable TV network. Many times, a business will want to add a TV to a break room or conference room, but the existing data network configuration prevents it, regardless of whether or not there is dark fiber on the premise. Installers can place an RF2F network at a point in the RF plant, allowing the reception of CATV signals on the dark fiber. RF2F networks can also serve data to strip malls, small office parks and downtown areas that were never wired with coax. (See Figure 5.)

The Payoff

Another important aspect to consider: because you are running fiber drops, you are future-proofing your new customers. Let's say five years from now you realize that in order to compete, you need to rebuild to an all fiber system. All of your RF2F customers were given fiber during the RF2F install. When you build out the rest of your plant to fiber, all you have to do for these customers is slice them into the new system. Yes, you may have to change out the equipment on the side of the house, but if you happen to go RFoG you won't even have to do that.

Take an afternoon to drive the outskirts of your system, and maybe down a few roads toward the next town, or where natural barriers, like hillsides and waterways may have made the extension of traditional drops just expensive enough to be cost-prohibitive. You may be pleasantly surprised by the number of prospective customers that are with 5,000 feet of your existing plant.