



(12) **United States Patent**
Wu

(10) **Patent No.:** **US 6,219,378 B1**
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(54) **DIGITAL SUBSCRIBER LINE MODEM
INITIALIZATION**

OTHER PUBLICATIONS

- (75) Inventor: **Song Wu**, Plano, TX (US)
- (73) Assignee: **Texas Instruments Incorporated**,
Dallas, TX (US)

(*) Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

"A Discrete Multitone Transceiver System for HDSL Applications," Chow, et al., *IEEE Journal on Selected Areas In Communications*, vol. 9, No. 6, Aug. 1991, pp. 895-908.

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Primary Examiner—Chi Pham

Assistant Examiner—Phuong Phu

(74) Attorney, Agent, or Firm—J. Dennis Moore; Wade James Brady, III; Frederick J. Telecky, Jr.

(21) Appl. No.: **08/995,256**

(22) Filed: **Dec. 19, 1997**

Related U.S. Application Data

- (60) Provisional application No. 60/059,182, filed on Sep. 17, 1997.
- (51) Int. Cl.⁷ **H03H 7/30; H03H 7/40;**
H03K 5/159
- (52) U.S. Cl. **375/231; 375/222; 370/484**
- (58) Field of Search **375/222, 231,**
375/260; 370/484, 210

(56) **References Cited**

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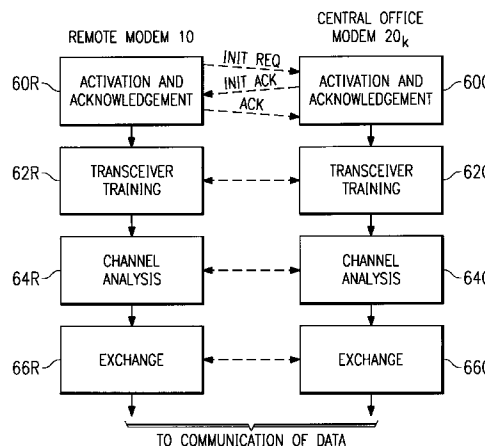
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(57) **ABSTRACT**

A method of initializing the operation of a remote modem (10) and central office modem (20_k) for asymmetric subscriber line modem communications over a twisted pair wire facility (TWP), using discrete multi-tone technology, is disclosed. The initialization process begins with the remote modem (10) issuing an initialization request, in response to which the central office modem (20_k) issues an acknowledgment. The remote modem (10) includes a low-cost analog filter (21) for separating upstream communication echoes from downstream data. This analog filter (21) increases the duration of impulse response over the channel, and thus requires time-domain equalization (TEQ) process (31) performed by the remote modem (10) to filter relatively long circular prefixes, so that intersymbol interference is eliminated. Transceiver training processes (62R, 62C) are carried out, through the generation of a pseudo-random sequence of frames by the central office modem (20_k), the receipt of which is used by the remote modem (10) to establish its TEQ coefficients and taps in an optimal manner.

18 Claims, 5 Drawing Sheets



ARRIS EX. 1008

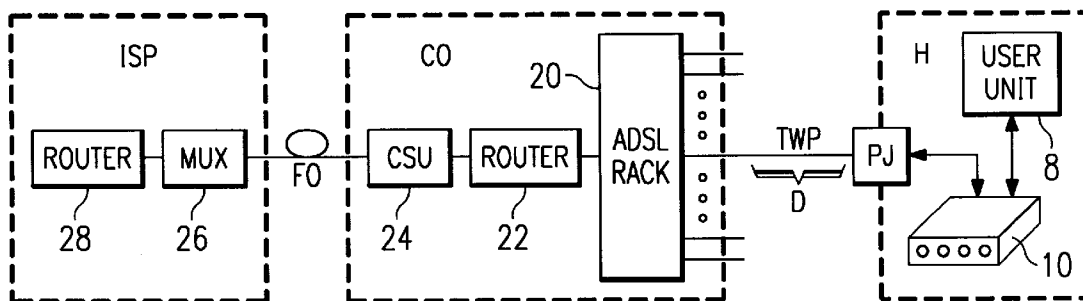


FIG. 1

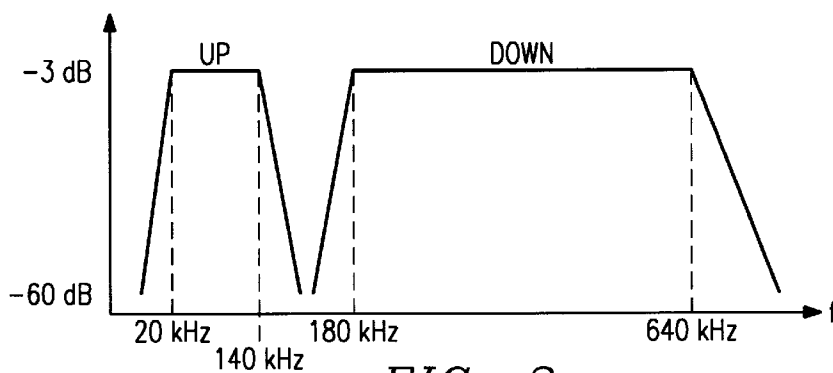


FIG. 2

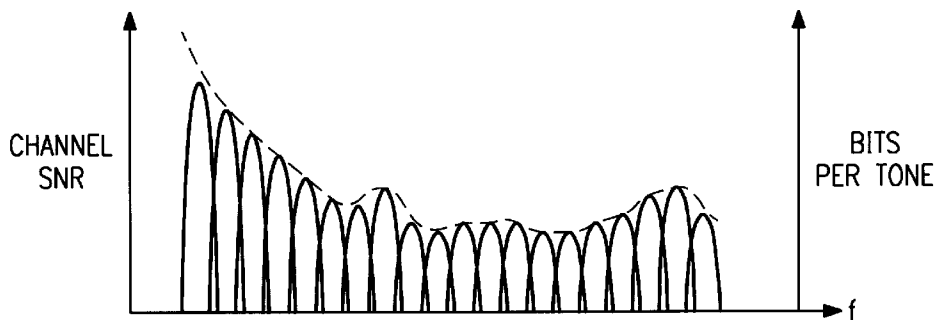


FIG. 3

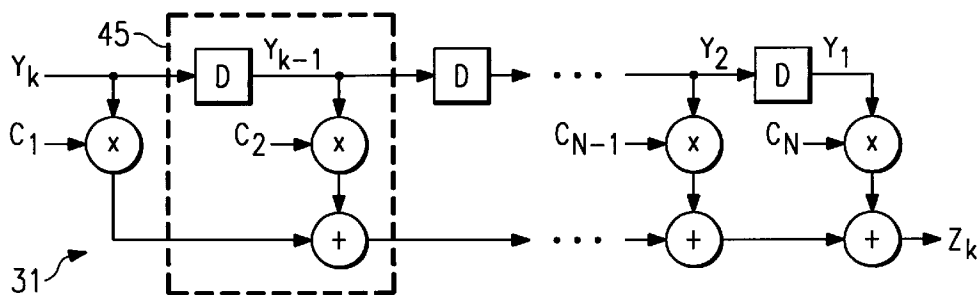


FIG. 5

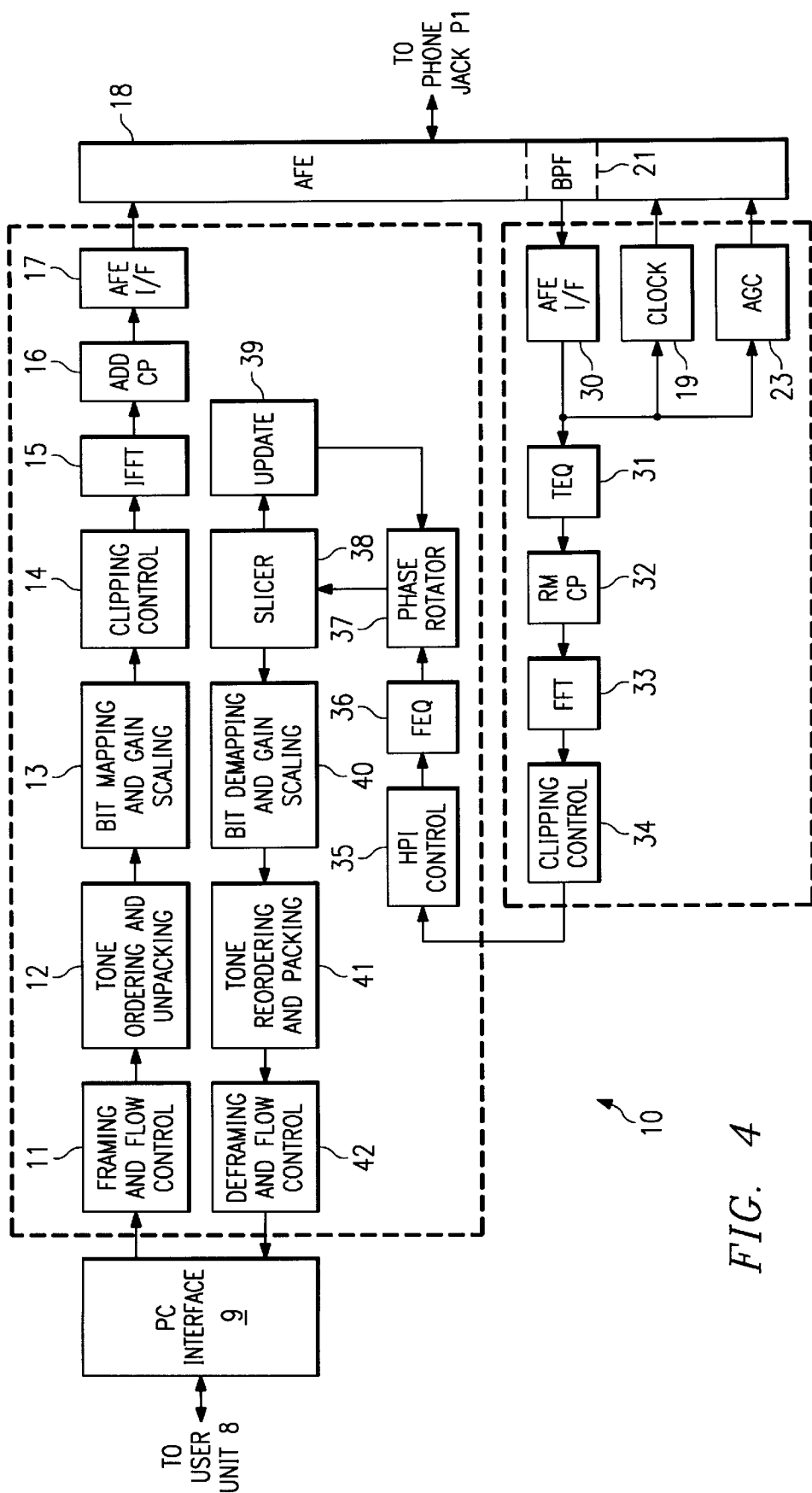


FIG. 4

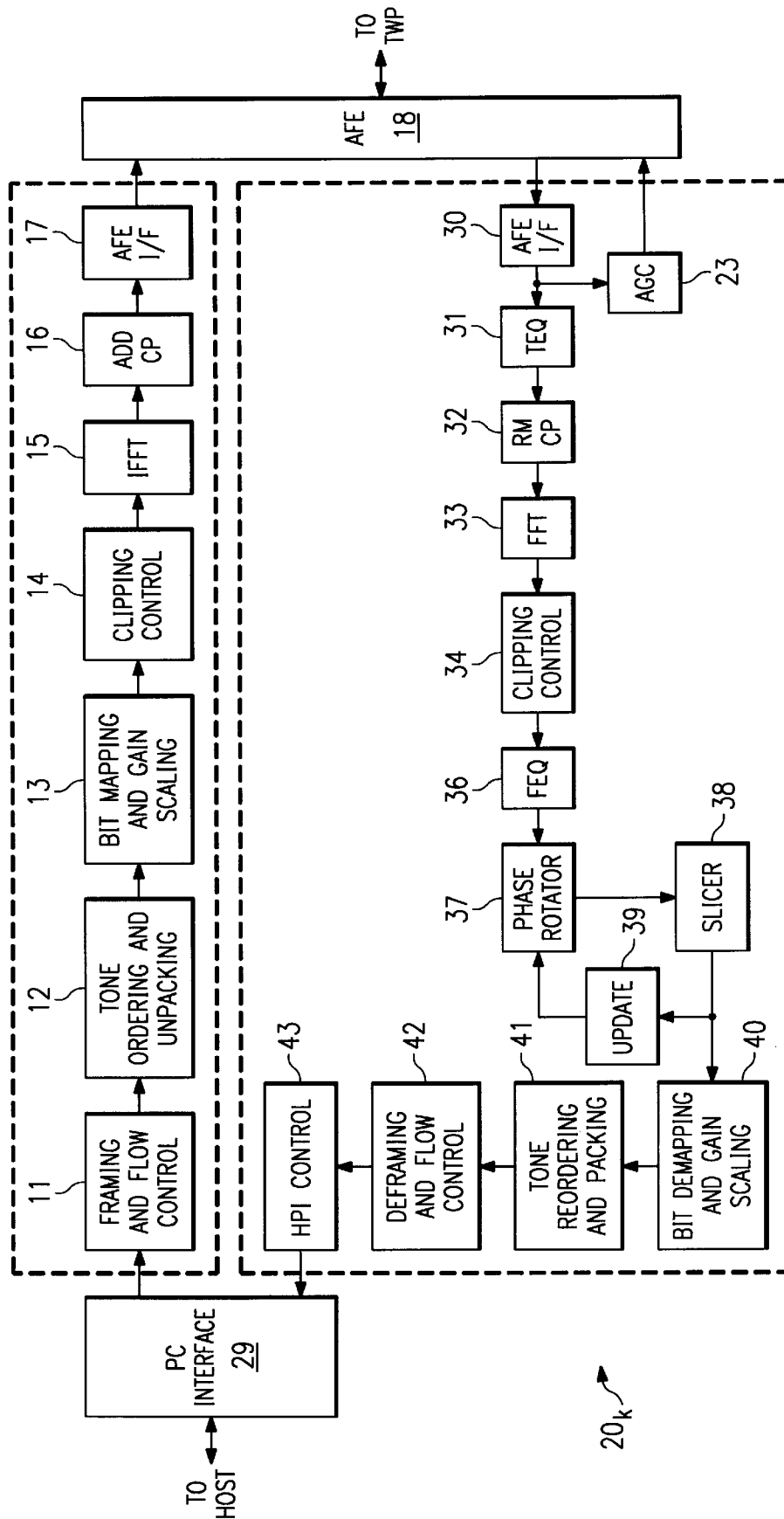


FIG. 6

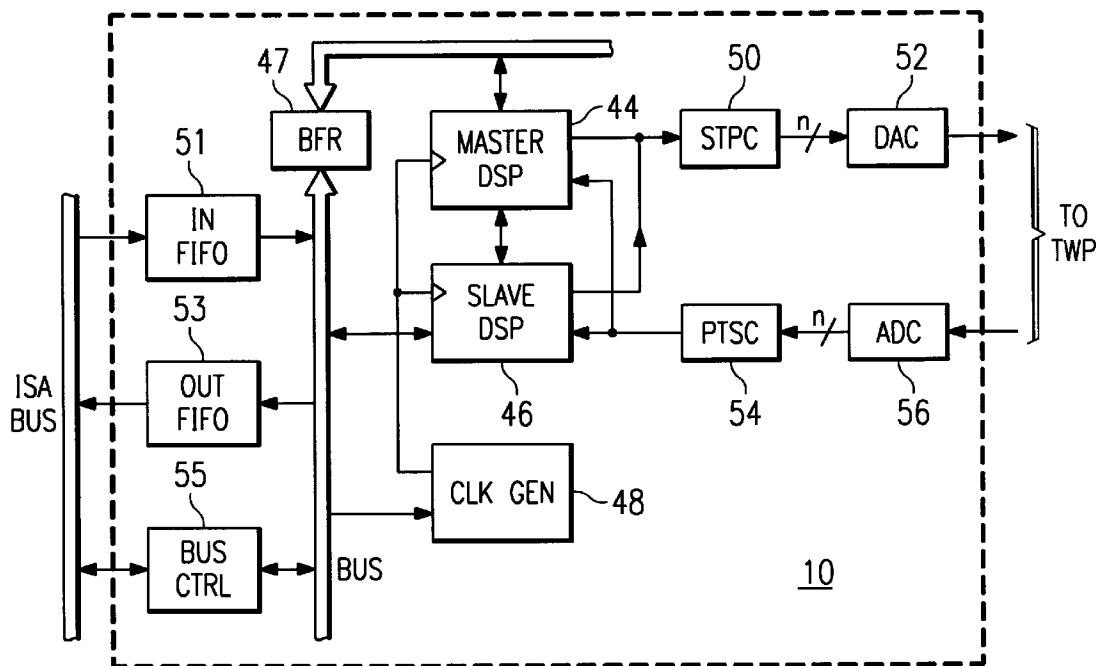


FIG. 7

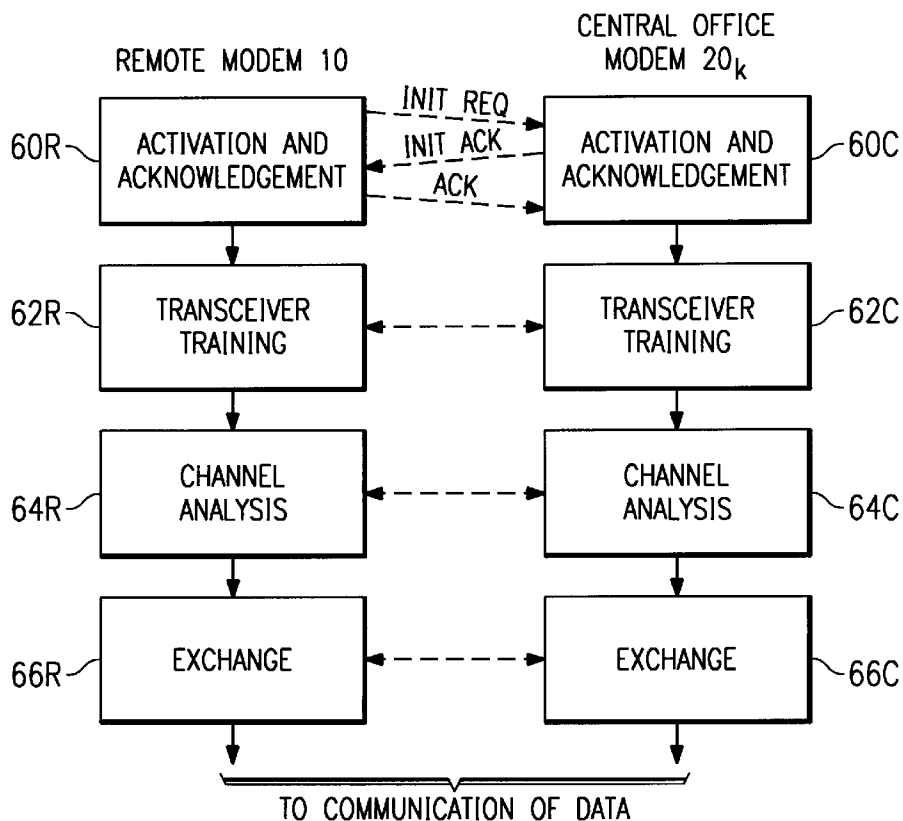


FIG. 8

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