ALESIS

M20 OWNER'S MANUAL REVISIONS FOR OPERATING SOFTWARE VERSION 2.10

REPLACES THESE SECTIONS IN OWNER'S MANUAL REVISION 1.05:

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M20 MAJOR FEATURE UPDATE: VERSION 2.0 (ADDENDUM 2.0)

M20 USER INTERFACE PROTOCOL

Copy the print of these new sections as double-sided pages for best integration into the existing manual format

ALESIS M20

PROFESSIONAL 20-BIT DIGITAL RECORDER

OWNER'S MANUAL

FIRST EDITION VERSION 1.06

APPLIES TO OPERATING SOFTWARE VERSION 1.11

INCLUDES SOFTWARE VERSION 2.10 ADDENDUM

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M20 HIDDEN FUNCTIONS

POWER-ON BUTTON COMBINATIONS

Holding the following button combinations when the M20 is powered-on will allow access to the following special functions:

- **Play and Record**
  Performs a user reset which initializes all parameters to their default values. The display will show "Initializing …"

MISCELLANEOUS BUTTON COMBINATIONS

Accessing hidden functions involves holding the **Peak Clear** button in combination with the following buttons:

- **Stop**
  Displays drum head hours.

- **Eject**
  When pressed on the master unit, only the master tape is ejected, i.e. the eject command is not sent to the slaves.

- **Record**
  This allows the user to record on a write-protected tape. It toggles between "OVERRIDE WRITE PROTECT" which allows recording regardless of the write-protect tab status, and "SENSE WRITE PROTECT" which only allows recording if the write-protect tab is intact. Note that this function can only be toggled if a tape is loaded. The override is reset to sense the write-protect tab whenever a tape is ejected.

- **Auto Return**
  Displays the number of continuous auto-loops.

Accessing other hidden functions involves holding the **Peak Mode** button in combination with the following buttons:

- **Stop**
  The transport enters deck standby mode. In this mode, the cassette remains loaded in the transport and the tape is completely withdrawn into the cassette.

- **Eject**
  This performs an auto-inject. When a cassette is partially inserted (as is the case when a cassette remains in the transport door after an eject command), the cassette will automatically load into the transport.

ADVANCED FUNCTIONS

Although not technically hidden functions, the following are additional advanced features that are not obvious:

- Holding Stop for at least 3 seconds will force the tape to unthread.

- Double-clicking the Fast Forward or Rewind button (pressing the button twice within 500 milliseconds) will cause the tape to wind at the fastest possible speed (approximately 85X play speed) with the capstan disengaged.

- Holding the Search button for at least 3 seconds will allow editing of the Search Master (see M20 manual section 8.4d).

- While in a locate name field, pressing the Up or Down button while holding Name will scroll through a list of 16 default names. To customize a name in this list, edit the name, then hold Name and press Record. The list of user-defined names will be retained through a power-cycle and will resort back to the default names with a user reset.

- Holding Sample Rate and pressing Up, Down, or 0 will allow Pull Up, Pull Down or No Pull Up/Down, respectively.

- Holding Edit while pressing Rollback will allow editing of the Rollback time. Refer to the CADI user manual for further details.

M20 MAJOR FEATURE UPDATE: VERSION 2

Version 2.00 Features

RS-422 (SONY 9-PIN) SLAVE OPERATION

The Online Source page in the Utility menu now has the "RS-422" parameter added to its choice of online control source settings. Two new utility pages have also been added to facilitate RS-422 slave track arming operations. When Online Source is set to RS-422, the M20 will recognize standard Sony 9-pin control commands. The M20 is optimized for BVU-950 emulation.

The way RS-422 Edit Preset commands record arm M20 tracks is determined by the RS-422 Track Arm and RS-422 Mapping settings. These Utility pages are defined as follows:

RS-422 TRACK ARM: ON/OFF

When on, the M20 will respond to RS-422 Edit Preset commands by record arming M20 tracks according to the mapping page setting. When off, local track arming from the M20 front panel is allowed i.e., Edit Preset commands are ignored. Local track arming is recommended when slave M20s (ID 2 and above) must be record enabled, or when ID 1 record arming that does not follow the assigned RS-422 mapping scheme is desirable.

RS-422 MAPPING: 1-2, ODDEVN, (LOCAL)

This parameter sets the mapping for 2-track (BVU-950) Edit Preset commands. When set to 1-2, an A1 or A2 track arm command will record arm M20 tracks 1 and 2 respectively. No mapping to other M20 tracks will occur. When OddEvn (Odd/Even) is selected, an A1 track arm command will record arm tracks 1, 3, 5, and 7 (the odd channels) and an A2 track arm command will record arm tracks 2, 4, 6, and 8 (the even channels). If an RS-422 controller can force an emulation type other than SONY BVU-950 (e.g. Sony DVR-10 or Fostex RD-8) for the purposes of using A1-A4 (4 track Edit Preset) or Da1-Da8 (8 track Edit Preset) arming with the M20, the map setting will be ignored. This, for example, will allow an A1 or A2 track arm command from a DVR-10 (a VTR with 4 audio tracks) to record arm track 1 or track 2 of the M20 without mapping, i.e. M20 tracks 3 and 4 can be record armed independently with an A3 or A4 Edit Preset command regardless of the map setting.

If RS-422 Track Arm is off, "**(Local)**" is indicated in place of the mapping selection and editing is not allowed. When Track map is turned back on, the previously selected RS-422 mapping selection is reverted to and editing is allowed.

ID 1 OFFLINE WITH THE CADI REMOTE

When the CADI remote is connected to multiple M20 recorders, the ID 1 master can now be taken offline. ID 1 maintains clock and serial control over all slaves (excluding 32-bit ABS time code). Using a CADI, when ID 1 is offline, its transport remains idle while the CADI transport controls operate the next online slave (known as the pseudo-master). Without a CADI connected, an offline ID 1 M20 transport will continue to operate normally and control online slaves.

CADI TAPE AND REFERENCE COUNTER INDICATIONS WHEN ID 1 IS OFFLINE

The CADI's display shows the pseudo-master's ABS and Tape TC values on the Tape and Reference Counters respectively. The CADI's Reference Counter will not show the pseudo-master's SMPTE In, Locate Point, Internal Generator, or SMPTE Offset values.

STORING LOCATE POINTS WHEN ID 1 IS OFFLINE

When updating locate points (e.g. pressing Set Locate on the CADI), ID 1 locate points are overwritten based on the pseudo-master's tape position. For example, pressing Copy Tape Location on the CADI will write ID 2's tape position into ID 1's currently selected locate address. The following scenarios suggest operation when ID 1 is offline:

<u>M20 master and two slaves (ID 1 → ID 2 → ID 3)</u>

ID 1 Offline
- With ID 1 offline, the system will function normally. Transport operations performed on ID 1 will control online slaves (32-bit ABS time code is transmitted). The only difference is that ID 1 will ignore any remote online source input.

<u>CADI with M20 master and two slaves (CADI → ID 1 → ID 2 → ID 3)</u>

ID 1 Offline
- The first online unit becomes the pseudo-master. The pseudo-master will operate like a master in regards to all transport functions, including Rollback, Replay, Loc Before Play, Mute Until Lock, etc.

- The CADI will reflect ID 1 parameters with the following exceptions: Tape Counter, Reference Counter – Tape TC only, and transport status. The CADI will reflect the pseudo-master status in these cases.

- All track enable selections and track groups along with All Input, All Safe, and All Clear functions initiated from the CADI will be ignored by ID 1. The "Machine Offline" message is temporarily displayed when a track selection is attempted (similar to what occurs when trying to record or input enable an offline ID 2 or greater unit).

- There is no independent use of the ID 1 front panel functions other than Eject and Online functions.

- Using Tape Offset mode.
  1. Tape Offset is enabled, ID 2's tape offset value is non-zero and user tries to take ID 1 offline:

     ID 1 offline is not allowed and "ID 2 Tape Offset Not Zero" is temporarily displayed.

  2. ID 1 is offline, ID 2's tape offset value is non-zero and the user tries to enable Tape Offset:

     Tape Offset enable is not allowed and "ID 2 Tape Offset Not Zero" is temporarily displayed.

- When ID 1 is put back online, all slaves will stop. CADI and slave memory is updated to be consistent with ID 1 parameters.

All Machines Offline
- If no machines are online, then the CADI will display "No Machines Online" when any action is attempted.

Special notes when operating a CADI with ID 1 offline

No SMPTE Chase
- SMPTE Chase remains a function of the ID 1 machine. ID 1's SMPTE Chase parameter settings are reflected on the CADI display even when ID 1 is offline. When ID 1 is offline, SMPTE Chase for the pseudo-master and remaining slaves is not permitted.

Internal Generator operation
- ID 1's internal generator parameter settings are reflected on the CADI display even when ID 1 is offline. The pseudo-master's internal generator will operate, but its output is subject to its own internal generator parameter settings (which may differ from the ID 1 settings). Therefore, in most situations, time code generation should remain a function of the ID 1 machine.

TAPE TC DETECTION IN FAST WIND MODES

Detecting discontinuous and noncontiguous Tape TC in fast wind modes has been implemented. The M20 will recognize TC Track time code discontinuities and time code gaps in fast wind modes, i.e., when chasing time code or during a locate, scan, search, fast forward, or rewind). In addition, when Rew/Fwd TC Out is on, time code accurate with the TC Track will be present at the M20's Time Code and MIDI Outputs in fast wind modes.

Please note that for speeds less than 1X (one times) play speed, the Tape TC is extrapolated from the last valid reading.

Note the following exceptions when using tapes previously formatted with v1.xx software:

- When a version 1.xx formatted tape has tc recorded to it using version 1.xx software, time code discontinuities and non-contiguities in fast wind will *not* be recognized. In this case, the M20 will extrapolate time code values when in wind modes (based on the last valid tape tc detected in Play or Record mode).

- When a version 1.xx formatted tape has tape tc recorded to it using version 2.xx software, time code discontinuities will be detected in wind modes. However, time code values will be extrapolated when a section of tape without time code (noncontiguous time code) is encountered while winding. Once Play or Record is pressed, the actual tape tc value (if present and different) will be detected and properly displayed.

TAPE TC IN THE TAPE COUNTER

When the Tape Counter selection is SMPTE, the display is now based upon the chase reference selection:

- When the chase reference is ABS Time, the display shows the ABS Time plus SMPTE Offset value, as before.

- When the chase reference is TapeTC, the display now shows the Tape TC plus SMPTE Offset value.

When Tape TC is selected as a chase reference and no Tape TC is detected on tape, the Tape Counter will indicate "no tAPE tc" when in SMPTE mode.

FIXED MODE TIME CODE GENERATION: "TC START REF: FIXED"

The internal generator's TC start reference parameter can now be set to "Fixed". When in Fixed mode, the start offset does not update to the last generated value when time code generation stops as is the case with User Set mode. Fixed mode will maintain the same start offset value after generation stops, i.e., the start offset value remains fixed, therefore, every time generation is restarted, time code output will always begin with the same start offset value.

DIGITAL SCRUB: "DIG SCAN: ON/OFF, *NN* dB"

A Digital Scan page has been added to the Utility pages. This allows the user to have control over digital audio output when in jog/shuttle mode. The output may be attenuated in 6 dB increments (0 dB to –42 dB).

Note the following when using Aux Track routing:

- Aux routing play back through the "AUX" selected channels is defeated when Digital Scan mode is enabled.

- Cue and review scanning will always output audio at –6 dB regardless of the DigScan status and the attenuation setting.

I/O CARD AS THE DIGITAL SOURCE

- The "D" indicators in the Meter Display are now always lit solid when the Digital Source is I/O Card and the Clock Source is from a source other than I/O Card (even when the selected clock source is not present).

- When the Digital Source is set for I/O Card, there are some limitations on the routing. Basically, the AES/EBU and analog input share the routing, i.e., they are one in the same. What this means is that when the Dig Source = I/O Card, only I/O Card routing (1/2 → 3/4, 5/6, 7/8, 1-4 → 5-8, or 1-8 → 1-8) is allowed. The analog input routing will not be editable and will follow (be the same as) the I/O Card routing. If control of analog input routing is desired, the digital source cannot be I/O Card. Also, note that if the user wants to mix the I/O Card and analog inputs, Input Routing mode <u>must</u> be set to 1-to-1.

SMPTE CHASE WITH THE STOP BUTTON

If currently chasing SMPTE, pressing the Stop button will now stop the tape ***and*** disable SMPTE Chase.

TAPE TC UPDATING WHEN IN INPUT MODE

When the TC Track is input enabled, the SMPTE Rate will not automatically change when transitioning from an area of tape with no tape TC into tape TC.

VARI-SPEED AND PULL-UP/DOWN

When the M20 is set for a pull-up/down, changing the pitch mode to VARI (by pressing Pitch Mode or by entering a non-zero vari-speed value) now disables the pull-up/down. Likewise, when the M20 is in vari-speed, enabling pull-up/down returns the M20 to FIXED pitch mode operation.

MIDI THRU

"Soft" MIDI Thru (automatically echoing non-F0 commands) is now defeated in order to accommodate a MIDI closed loop more effectively.

NEW UTILITY PAGE ORDER

The Utility menu page order in version 2.00 has changed as follows:

Utility Pages	
1 Dig Out	14 Mute Until Lock
2 Online Source	15 Dynamic Punch
3 RS-422 Track Arm	16 Track Groups
4 RS-422 Mapping	17 RMD Error LEDs
5 Online Control	18 Dig Scan
6 One-Button Record	19 Save data to tape?
7 Input Monitor	20 Load data from tape?
8 Unthread Timeout	21 Tape Type
9 TC Output Level	22 ID status
10 Rew/Fwd TC Out	23 User Bits
11 XFade Time*	24 Error Rate
12 Search Enable	25 Front Panel
13 Loc(ate) Before Play	26 Main

CADI DISPLAY CHANGES

- Machine-specific Utility pages 21 (Tape Type), 23 (User Bits), 24 (Error Rate), 25 (Front Panel), and 26 (Main) now indicate "**See Local**" in the CADI display.

- When the master M20 (ID 1) parks at a locate point before other slaves have completed the locate, the CADI now continues to indicate a locate in progress by flashing the Locate or Locate 0 buttons. The stop is also lit solid to indicate the master is stopped.

- The CADI now displays the more general "**Select digital src trks**" message when routing digital input, since a system can have several M20s with various digital input sources.

Version 2.10 Features

CASSETTE AUTO-INJECT

The M20 now has an inject command. When a cassette is partially inserted (as is the case when a cassette remains in the transport door after an eject command), it is possible to remotely load the cassette into the transport by pressing the Peak Mode and Eject buttons simultaneously. Auto-Inject works from the M20's front panel or from the CADI.

DECK STANDBY MODE

A deck standby mode has been added as a user-optional transport load condition. Place the M20 in Deck Standby by pressing the Peak Mode and Stop buttons simultaneously. In this mode, the cassette remains loaded in the transport and the tape is completely withdrawn into the cassette. When the tape is withdrawn, the drum is turned off and drum hours do not accumulate. The counter display will indicate "DECK STANDBY" until it is refreshed by another operation; however, the transport will remain in standby. Pressing any transport control button (Rew, FFwd, Stop, Play, Rec, Loc, Loc 0,) will first rethread the tape, then perform the selected transport operation.

AUTO-PARK AFTER FORMATTING

When a tape format is completed by reaching the end of tape, the tape will autolocate to 00:00 ABS time and park, i.e., enter deck standby mode until another transport operation is performed.

DEFERRED EJECT

Deferred Eject has been added. Pressing Eject when a locate is in progress will defer the Eject action until the locate is complete. Pressing Eject twice before the locate is completed, will abort the locate and result in an immediate tape eject.

NEW RS-422 DEVICE ID

The M20's RS422 device ID is now a BVW-75 instead of a BVU-950. Many Sony 9-pin editor/controllers will identify the M20 as this standard Betacam SP videotape recorder. Changing the ID to the BVW-75 specifically improves performance with AVID's Media Composer Version 7.1.

IMPROVED SMPTE CLOCK SOURCE RECOGNITION

The algorithm for determining if a SMPTE clock is valid has been improved to increase transport and drum motor performance.

SAMPLE RATE CHANGE DURING PLAY/RECORD

Sample rate can no longer be changed when the tape is in Play or Record. This guarantees the output of MTC at the proper frequency for the selected sample rate.

The M20 User Interface Protocol (Version 2.10)

This section identifies and describes several user interface issues regarding parameter settings, their initialized defaults, and the master/slave M20 relationship. There is also a brief definition of every M20 parameter and option. The chart below specifies this protocol.

Parameter Setting Issues

Most parameter values are stored in battery-backed (i.e. non-volatile) RAM and retain their settings when power-cycled. The exceptions are Format, SMPTE Chase, Internal Gen and Auto Record enables, which always power on disabled. In addition, Search and Edit modes are not retained through a power-cycle. Parameters that are termed "dynamic" contain values that are independent of the battery-backed RAM and update actively.

The chart indicates all stored parameters and the values they default to when initialized by a power-on reset (i.e. power on holding Play and Record). The parameters that are stored to the data section of tape in the BRC-compatible format are indicated with an asterisk (*). The parameter options available are underneath the associated parameter and *italicized* for clarity. If a parameter or option is an "executable", it performs the indicated function when initiated.

Master → Slave Relationship Issues

When a user interface parameter is changed on a master, the resulting effect on a slave can be as follows:
- The master change is reflected on the slave. The master updates the slave status and/or value. The parameter may or may not be modifiable on the slave.
- The master change has no effect on the slave. The parameter may or may not be modifiable on the slave.
- The master change is partially reflected on the slave. This is the case when the parameter value should not or cannot change on the slave, but it is desired that the slave somehow reflect the master (or system) status.

Whether or not a parameter is editable depends upon the following:
- On a master machine   →   All parameters are editable regardless of online/offline status.
- On a slave machine   →   When offline, all parameters are editable.
                               When online, some parameters are not editable (see chart below).

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
				Meter Display Block	
Digital Source	Y	N	Y	Selects which digital source is to be used as digital input.	
ADAT Optical	--	--	--	ADAT optical input is the digital source.	Default.
Track Copy	--	--	--	Internal tracks are the digital source.	Allows an internal digital track bounce.
I/O Card	--	--	--	Optional I/O card input is the digital source.	Selectable only when card is present.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Input Select	Y	N	Y	Enters/exits Input Select mode. Uses the Input Enable buttons to select analog or digital input for channel pairs. An "A" or "D" indicator in the meter display shows the input selection.	Defaults as all tracks analog input. Input selection is by adjacent channel pairs (1/2, 3/4, 5/6, 7/8). The "D" indicator will flash when no digital input clock is detected. The "A" is displayed only when in Input Select mode.
Input Routing	Y	N	Y	Enters/exits Input Routing mode. Uses the Input Enable buttons to select digital source tracks routing or analog input tracks routing (depending on the Input Select status).	Defaults as Digital: one-to-one/Analog: one-to-one. Digital source track selection is dependent on the currently selected digital source (ADAT Optical, Track Copy, or I/O Card).
Aux Routing	Y	N	Y	Enters/exits Aux Routing mode. Uses the Input Enable buttons to select which tracks will be routed to the analog aux track. AUTO routing sends record enabled tracks to the Aux track.	Defaults as no auxiliary track routing.
Peak Mode	Y	Y	Y	Selects the peak hold status for the VU meters.	
No Peak Hold	--	--	--	No peaks are sustained.	
Momentary Peak Hold	--	--	--	Peak sustain is temporary.	Default. The duration is determined by the VU Peak Hold parameter in the Display menu.
Continuous Peak Hold	--	--	--	Peak sustain is infinite.	
Peak Clear	--	N	Y	Clears momentarily or continuously held peaks.	Executable.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Track Enable Block					
Record Enables	Y	N	Y	Record enabling/disabling for channels 1-8, Aux, and TC. These buttons flash when record-ready and light solid when recording.	Defaults to no tracks enabled. Record-ready tracks are automatically placed in input monitor.
Dynamic Punch-In/Out	--	--	--	When Record mode is pending (see Record), pressing a record enable toggles between recording and playback.	Punches performed with Record enables are not automatically stored into location points 98 and 99.
Input Enables	Y	N	Y	Input monitoring for channels 1-8, Aux, and TC. When disabled, monitoring is from tape.	Defaults to tape monitor. Input enables are used for audio routing and track delay parameters as well.
All Safe*	Y	N	Y	Prevents all tracks (including Aux and TC) from being record enabled, thereby preventing any recording.	Defaults to Off.
All Input*	Y	Y	Y	Places all tracks (excluding TC) into input monitor.	Defaults to Off.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Counter Display Block					
Tape Counter Mode*	Y	Y	Y	Determines how tape location is expressed on the Tape Counter.	
ABS TIME	--	--	--	Shows the current tape location referenced to normal ADAT absolute (ABS) time code.	Default.
RELATIVE	--	--	--	Shows the current tape location referenced to the relative zero location (determined by the Locate 00 value).	
SMPTE	--	--	--	Shows the current tape location referenced to SMPTE (i.e. ABS Time or Tape TC + SMPTE Offset).	When the chase reference is set to Tape TC, TC Track time code is displayed in the tape counter.
Clock Source*	Y	N	N	Selects the sample clock source.	A slave's clock source is automatically set to ADAT Clock and cannot be changed. The clock source indicator will flash when no clock is detected at the selected input.
INTernal	--	--	--	Sample clock is synchronized to the internal crystal.	Default.
VIDEO	--	--	--	Sample clock is derived from NTSC/PAL black burst or composite video input.	
ADAT	--	--	--	Sample clock is synchronized to the ADAT 9-pin Sync Input.	
WORD	--	--	--	Sample clock is synchronized to the Word Clock Input.	
SMPTE	--	--	--	Sample clock is derived from SMPTE/EBU Input.	
OPTICAL	--	--	--	Sample clock is synchronized to the ADAT Optical Input.	
I/O CARD	--	--	--	Sample clock is synchronized to the I/O Card Input.	Optional expansion card must be installed.
Sample Rate	Y	Y	N	Toggles the nominal sample rate between 48kHz and 44.1kHz. Also used to select the respective 0.1% pull-up and pull-down rates. A pull-down is available with a 29.97 fps SMPTE rate only. A pull-up is available with a 30 fps SMPTE rate only.	To select a 0.1% pull-up or pull-down, press the Up or Down buttons while holding the Sample Rate button. Press the 0/Space button while holding the Sample Rate button to return to a nominal 48/44.1kHz sample rate. The counter displays will adjust their ABS/SMPTE time to reflect the selected sample rate as a reference to real time.
48kHz	--	--	--	Professional standard.	Default. Pull-up/down rates are 48.048kHz & 47.952kHz .
44.1kHz	--	--	--	Compact Disc mastering standard.	Pull-up/down rates are 44.144kHz & 44.056kHz .

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
SMPTE Rate*	Y	Y	Y	Selects the various SMPTE/EBU frame rates for input and output.	
30	--	--	--	30Hz/30 frames. Music production standard.	Default. Counting is equivalent to realtime.
30 DROP FRAME	--	--	--	30Hz/Drop Frame. Non-standard.	Counting is 0.1% fast relative to realtime.
24	--	--	--	24Hz/24 frames. Film standard.	Counting is equivalent to realtime.
25	--	--	--	25Hz/25 frames. PAL standard.	Counting is equivalent to realtime.
29.97	--	--	--	29.97Hz/30 frames. NTSC Film transfer standard.	Counting is 0.1% slow relative to realtime.
29.97 DROP FRAME	--	--	--	29.97Hz/Drop Frame. NTSC standard.	Counting is equivalent to realtime.
Time Code Source	Y	N	Y	Selects the time code source for the TC Track or the time code output.	
INTERNAL	--	--	--	TC is referenced to ABS time or the TC Track and dependent on INTernal GEN parameter settings.	Default.
EXTERNAL	--	--	--	TC is referenced to the external source available at the time code input.	
Chase Reference	Y	N	N	Selects the synchronization reference for locking to incoming TC.	If the clock source is Video, ADAT, Word Clock, or Optical, the incoming time code must be synchronous (gen-locked/resolved) to the incoming external clock reference.
ABS TIME	--	--	--	The absolute time is used as a reference for locking to incoming SMPTE/EBU.	Default. ABS Time is always synchronous to the selected sample rate.
TAPE TC	--	--	--	The time code track is used as a reference for locking to incoming SMPTE/EBU.	User must insure that the TC Track is synchronous to the selected sample rate and any incoming external clock reference.
Pitch Mode*	Y	Y	N	Toggles between a fixed (nominal) pitch and variable pitch control.	
FIXED	--	--	--	The pitch is set to the standard 000.	Default.
VARI	--	--	--	The pitch is determined by the Vari-Speed value.	

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Locate Select	Y	N	Y	Selects and displays the current locate number. Use the numeric keypad or up/down arrows to select a new locate number.	Default is Locate 00.
Locate Addresses 00-99*	Y	N	Y	Use the cursor, numeric keypad, and up/down arrows to edit the locate address.	Default value is 00:00:00:00.00.00 for all locate addresses.
Locate Names*	Y	N	Y	Press Enter/Name then use the cursor, numeric keypad, and up/down arrows to edit the locate point names in the Locate Select page. Press Enter/Name again to exit and store the edited name.	Default name is "Locate*XX*" (where *XX* = current locate number) for locates 00-97. Names are reserved for Locates 98 and 99 ("Punch In" and "PunchOut").
Reference Counter Mode	Y	N	Y	Selects the reference counter display mode.	
LOCATE PT	--	--	--	The reference counter displays the address of the selected locate number specified in the LOCATE PT block.	Default.
TAPE TC	--	--	--	The reference counter displays time code recorded to the TC Track.	
INT GEN	--	--	--	The reference counter displays time code from the internal generator.	
OFFSET	--	--	--	The reference counter displays the SMPTE/EBU chase offset value.	
SMPTE IN	--	--	--	The reference counter displays incoming SMPTE/EBU.	
Edit/Enable Block						
Edit	N	N	Y	Toggles in and out of Edit mode.	Defaults to off after a power-cycle.
Format Enable	N	N	Y	Toggles between format enabled (format ready) and disabled.	Defaults to off after a power-cycle. Button flashes when no format is detected on a tape.
1 Format Type	Y	Y	Y	Selects the tape format type.	
20-bit	--	--	--	Formats tape for 20-bit linear (Type II) recording.	Default.
16-bit	--	--	--	Formats tape for 16-bit linear (Type I) recording.	ADAT(XT) compatible.
2 Format Safe	Y	N	Y	When turned on, format mode selection is prohibited.	Defaults to off.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
SMPTE Chase Enable*	N	N	N	Toggles between chase mode on and off. When enabled, the M20 will chase to external TC input.	Defaults to off after a power-cycle.
1 SMPTE Offset Value*	Y	N	Y	Adjustable range is ±24:00:00:00.00.00. This value is added to the selected time code chase reference (ABS Time or Tape TC) when synchronizing to incoming TC.	Defaults to +00:00:00:00.00.00.
2 Chs Mode*	Y	N	Y	Selects the chase mode preference.	
Frame-Lock	--	--	--	Uses the incoming TC location reference to establish and maintain a lock.	Default. The M20 will re-locate and re-sync when incoming TC does not match the current tape location.
Lock/Release	--	--	--	Uses the incoming TC location reference to establish a lock, then ignores time code data and releases to the selected external clock source to maintain the lock.	
3 Flywheel	Y	N	Y	Selects the maximum number of out-of-range (or missing) frames allowed before re-chasing to incoming TC. Adjustable from 000 to 150 frames of flywheel.	Defaults to 010 frames.
4 Park Ahead	Y	N	Y	Selects the amount of time the tape will park ahead of the last valid TC input. Adjustable from 00:00 to 59:29 (ss:ff).	Defaults to 00:15 frames.
INTernal GEN Enable*	N	N	Y	Toggles the internal generator function on and off. When enabled, the M20 will generate TC based on the INT GEN parameters, TC Track Input status, TC Source, SMPTE Chase, and Chase Reference setup.	Defaults to off after a power-cycle. To turn on INT GEN, TC Source must be set to INTERNAL. To output TC from the internal generator, the TC track must be input enabled.
1 Gen Mode	Y	N	Y	Determines the generator mode.	
Play/Rec	--	--	--	Internal generator will run when playing or recording.	Default.
Free Run	--	--	--	Internal generator will start when INT GEN and TC Track Input are enabled.	

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
INTernal GEN (Continued)					
2 TC Start Reference	Y	N	Y	Determines the TC starting reference for the internal generator.	
ABS Time	--	--	--	The start address for INT GEN TC output is based on the current ABS address plus the start offset.	Default.
TC Track	--	--	--	The start address for INT GEN TC output is based on the TC track.	If no TC track reference is printed onto the tape, no TC will output.
User Set	--	--	--	The start address for INT GEN TC output is based on the time that is set on the next INT GEN page (i.e. the start offset value). When time code generation stops, the start offset is automatically updated to the last generated value.	TC output is synchronous (resolved) to ABS time, but the start address is arbitrary as defined by the user.
Fixed	--	--	--	The start address for INT GEN TC output is based on the time that is set on the next INT GEN page (i.e. the start offset value). The start offset does not auto-update when generation stops. This value remains fixed.	TC output is synchronous (resolved) to ABS time, but the start address is arbitrary as defined by the user.
3 ABS/Start Offset Value	Y	N	Y	This address is used to set the start offset for ABS referenced INT GEN TC output, or set a new start time when the start reference is User Set. Adjustable range is 00:00:00:00 to +24:00:00:00.	Default value is 00:00:00:00. This parameter is only available when TC Start Ref is set to either ABS Time or User Set.
4 User Bits	Y	N	Y	Eight characters of hexadecimal values 0 through F can be entered in as user bits.	Default is 00:00:00:00. This is page 3 (no ABS/Start offset page) if the INT GEN start reference is TC Track.
Tape Offset Enable*	Y	N	Y	Toggles the tape offset time on and off. When enabled, the M20 will use the selected offset value to offset the tape's ABS location (positive or negative) relative to normal ABS time.	Default is off.
1 Offset Mode*	Y	N	Y	Determines the tape (machine) offset mode used.	
Time Code	--	--	--	The tape offset is set referenced to ABS time code.	Default.
Locate	--	--	--	The tape offset is set referenced to two locate points.	The resulting TC difference between the selected locate points determines the TC offset value used.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Tape Offset Enable* (continued)					
*Tape Offset value**	Y	N	Y	Displays the offset for editing as referenced to ABS time code. Adjustable range is ±24:00:00:00.00.00.	Default value is 00:00:00:00.00.00.
*Tape Offset Loc Pt1**	Y	N	Y	Displays the offset for editing as referenced to a locate point. Locates 00 - 99 available.	Default is Locate 00.
*Tape Offset Loc Pt2**	Y	N	Y	Displays the offset for editing as referenced to a locate point. Locates 00 - 99 available.	Default is Locate 00.
Track Delay Enable*	Y	N	Y	Toggles the track delay on and off. When enabled, any track that has a non-zero delay value will play back with the defined amount of delay relative to ABS time.	Default is off. Playback only.
*Trk x Delay or Group Delay**	Y	N	Y	Displays the track delay value for the selected track(s). Adjustable from 0000 - 8160 samples of delay (000.0 - 170.0 ms @ 48kHz or 000.0 - 185.0 ms @ 44.1kHz).	Default is 000.0 milliseconds. The delay time displayed is accurate only when playing back at normal pitch (48kHz or 44.1kHz). Can use the Input enables to select tracks.
Pre-Roll Enable*	Y	Y	N	Toggles the pre-roll function on and off. When enabled, performing a locate will move the tape to the specified locate address plus the pre-roll amount.	Default is off.
*Pre-Roll Time**	Y	N	Y	Adjustable from 00 - 25 seconds.	Default is 5 seconds.
Post-Roll Enable*	Y	Y	N	Toggles the post-roll function on and off. When enabled, an Auto Return or Auto Record operation will add the post-roll amount to the end point or punch-out address.	Default is off. When used with Auto Record, the punch-out still occurs at the exact location specified by the auto punch-out address, but will continue playing for the indicated post-roll amount then stop (if Auto Return is disabled).
*Post-Roll Time**	Y	N	Y	Adjustable from 00 - 25 seconds.	Default is 5 seconds.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Auto Record Enable*	N	Y	N	Toggles the automatic record function on and off. When enabled, Auto Record mode automatically performs the punch-in and punch-out when Record and Play are pressed.	Defaults to off after a power cycle. Button flashes when enabled and punch-in/out times are invalid.
*1 In Point**	Y	Y	Y	Defines the auto punch-in locate point and address. Locate points 00 - 99 are valid points.	Default Auto Punch-In point is Locate 98. The master updates slaves prior to performing an Auto Record.
*2 Out Point**	Y	Y	Y	Defines the auto punch-out locate point and address. Locate points 00 - 99 are valid points. Disable the auto punch-out point by pressing both Up and Down buttons.	Default Auto Punch-Out point is Locate 99.
Auto Return Enable*	Y	Y	N	Toggles the automatic return function on and off. The tape will automatically rewind to a user defined start locate point after reaching a user defined end point.	Default is off. A slave will reflect the enable status of the master, even if the slave's Start and End points are invalid.
*1 Start Point**	Y	N	Y	Displays and defines the "return to" locate point number and name. Locate points 00 - 99 are valid points.	Default is Locate 01.
*2 End Point**	Y	N	Y	Displays and defines the "return from" locate point number and name. Locate points 00 - 99 are valid points.	Default is Locate 02.
Setup/Enable Block					
Auto Input Enable*	Y	Y	Y	Toggles the automatic input monitor function on and off. When enabled, all record-ready tracks are monitored from tape when playing, and monitored from input when recording, fast winding, locating, or stopped.	Default is off.
Auto Play Enable*	Y	Y	N	Toggles the automatic play-after-locate function on and off. When enabled, Play mode will be entered automatically after a locate has completed.	Default is off.
Display	N	N	Y	Pressing the Display button will access the display pages.	Default is page 1 on a power cycle.
1 VU Meter Scale	Y	Y	Y	Selects the dB scale used for the VU meter.	
Normal	--	--	--	The VU meter ranges from -72 through 0 dB.	Default.
FinedB	--	--	--	The VU meter ranges from -2.0 through 2.0 dB.	

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Display (continued)					
2 Fine Headroom	Y	Y	Y	Sets the amount of headroom for the Fine dB VU meter mode. The user specifies what value the 0 dB marking represents. Adjustable from 2 to 22 dB.	Default is 15dB.
3 VU Decay	Y	Y	Y	Sets the decay (segment sustain) time for the VU meter. Adjustable from 00 (no decay) to 99 (500ms decay).	Default value is 10 (50ms per segment). Each step is 5ms.
4 VU Peak Hold	Y	Y	Y	Sets the peak hold time for the VU meter. Adjustable from 00 to 99 (24.75 seconds of hold time).	Default value is 8 (2 seconds of hold time). Each step is 250ms.
Vari-Speed	N	N	Y	Pressing the Vari-Speed button will access the vari-speed page.	Display only on slaves.
VARI *	Y	Y	N	Sets the vari-speed value in cents and displays the percent equivalent. Adjustable from -300 to +100 @ 48kHz Fs and from -200 to +200 @ 44.1kHz Fs.	Default is 000 cents / +0.00%. Pitch changes are reflected on all slave machines.
MIDI	N	N	Y	Pressing the MIDI button will access the MIDI pages.	Default is page 1 on a power cycle.
1 MIDI Device*	Y	N	Y	Selects the MIDI input and output device ID number. The value range is from 000 (00 hex) to 126 (7E hex), and All (127 decimal, 7F hex).	Default ID is 000.
2 MMC Output	Y	N	Y	Sets MMC (MIDI Machine Control) output from the MIDI out port On or Off.	Default is Off.
3 MTC Follow SMPTE	Y	N	Y	Determines if MTC (MIDI Time Code) will generate simultaneously when SMPTE is output.	Default is Off.
4 Send Sysex Dump?	--	N	Y	Press Yes to perform a system exclusive dump.	Executable. A sysex dump can be performed from a slave.
5 Receive Sysex Dump?	--	N	Y	Press Yes to enter a sysex receive-ready state.	Executable. A sysex receive can be performed from a slave.
6 Send Software?	--	N	Y	Will execute an operating system software send via the MIDI output jack. Use Yes, No, and Enter buttons to navigate this page.	Executable.
7 Load Software?	--	N	Y	Will prepare the M20 to receive new operating system software. Use Yes, No, and Enter buttons to navigate this page.	Executable. **CAUTION:** Placing an M20 in this software receive-ready state will erase the current operating system software.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Utility				Pressing the Utility button will access the Utility pages.	Default is page 1 on a power cycle.
1 DIGital Out	Y	Y	Y	Sets the digital audio output format for playback, or configures the optical I/O for digital audio throughput.	If a 16-bit (Type I) tape is inserted, selecting "20-bit" or "16-bit dithered" will only add or dither 4 zero value LSBs.
20-bit	--	--	--	All 20 bits of audio data are available at the optical and I/O Card output.	Default.
16 dithered	--	--	--	The digital audio optical output from a 20-bit tape or digital input source is dithered down (utilizing the last 4 LSBs of the 20-bit word) to a 16-bit format.	Type I compatible output.
16-bit	--	--	--	The digital audio optical output from a 20-bit tape or digital input source is truncated down (the last 4 LSBs of the 20-bit word are removed without manipulation) to a 16-bit format.	Type I compatible output.
Dig Thru	--	--	--	The digital audio input from an optical or I/O Card source is throughput to the optical or I/O Card output. The digital audio word length is unchanged.	"Dig Thru" is necessary when performing a digital copy from an ID 1 (master) M20 to an ID 3 slave for example. ID 2 must be in Dig Thru mode to transfer digital audio to ID 3.
2 Online Source	Y	N	Y	Determines the control (command) source when online is enabled.	A software load and sysex receive will occur regardless of the Online Source and Online settings.
ADAT	--	--	--	The M20 will receive control commands from its Sync In port when online.	Default.
MIDI	--	--	--	The M20 will receive control commands (MMC/SYSEX) from its MIDI In port when online.	
RS-422	--	--	--	The M20 will receive control commands from its RS-422 port when online.	The M20 is configured to emulate a Sony BVW-75 Betacam SP videotape recorder.
3 RS-422 Track Arm	Y	Y	N	Determines if the ID 1 M20 will receive record arm commands via the RS-422 port. Can be On or Off.	Default is On. If off, ID 1 local (M20 front panel) record arming is allowed.
4 RS-422 Mapping	Y	Y	N	Determines what ID 1 M20 tracks are record enabled when an RS-422 record arm command is received.	If an A1-A4 or Da1-Da8 machine protocol is used from an RS-422 controller for track arming, the RS-422 map setting is ignored.
1-2	--	--	--	An A1 or A2 record arm command will arm M20 tracks 1 and 2 respectively.	Default.
OddEvn	--	--	--	Odd/Even. An A1 record arm command will arm M20 tracks 1,3,5, and 7. An A2 record arm command will arm M20 tracks 2,4,6, and 8.	

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Utility (continued)					
5 Online Control	Y	N	Y	Determines if local (front panel/LRC) control is allowed when online is enabled.	
Local/Rem	--	--	--	When online, control is allowed via the front panel/LRC and the user defined remote (online) source.	Default.
Remote	--	--	--	When online, control is allowed via a remote source only.	
6 One-Button Record	Y	N	Y	When in One-Button Record mode, Recording is initiated by pressing the Record button by itself. Play does not have to be held. Can be On and Off.	Default is Off. Pressing the Record button from Stop will also initiate recording. The M20 will automatically enter Play mode, establish a lock, then enter Record mode.
7 Input Monitor	Y	Y	Y	Determines the analog input signal path.	
ADC/DAC	--	--	--	Analog input is routed through the converters.	Default.
Direct	--	--	--	Analog input is routed directly to the analog output.	
8 Unthread Timeout	Y	Y	Y	Sets the time a transport must remain idle before the tape automatically disengages from the drum. Adjustable from 01 to 20 mins.	Default is 4 minutes.
9 TC Output Level	Y	N	Y	Sets the SMPTE/EBU time code output level. Adjustable from 0.1 to 3.0 volts in .1 volt increments.	Default is 1.0 volts.
10 Rew/Fwd TC Out	Y	N	Y	When generating SMPTE/MTC, this function determines if TC will output in fast wind modes. Can be On or Off. When on, time code will output in rewind, fast fwd, cue, review, jog, and shuttle (i.e. whenever tape is moving).	Default is Off.
11 XFade Time*	Y	Y	Y	Sets the crossfade time for Record↔Play (Punch-In/Out) transitions. Adjustable from 005.4 ms to 1.365 secs.	Default is 10.0 milliseconds. Note that a completed punch-out occurs only when the crossfade is finished.
12 Search Enable	Y	N	Y	Selects how Search mode (Jog/Shuttle) is enabled.	A slave will ignore its setting and follow a master when controlled by a master.
Normal	--	--	--	Search mode is entered when the Search button is pressed or the Jog/Shuttle wheel is moved.	Default.
Button	--	--	--	Search mode is entered only when the Search button is pressed.	

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Utility (continued)					
13 Loc(ate) Before Play	Y	Y	N	The M20 master will not enter Play mode until slaves are located to the master's tape location. Can be On or Off.	Default is On. This parameter is functional when slaves are online and have tapes inserted.
14 Mute Until Lock	Y	Y	N	M20 master and slaves will keep their DACs muted until all decks have established a sync-lock. Can be On or Off.	Default is On. This parameter is functional when M20 slaves are online and have tapes inserted.
15 Dynamic Punch	Y	Y	Y	Determines if a punch-in/out can be performed with the Record Enable buttons. Can be On or Off.	Default is On.
16 Track Groups	Y	Y	N	Determines if the CADI Remote's track enable groups can be recalled. Can be On or Off.	Default is On.
17 RMD Error LEDs	Y	Y	Y	Determines if interpolation and system errors are indicated on the RMD. Can be On or Off.	Default is On.
18 Dig Scan	Y	Y	Y	Offers digital audio output in Jog/Shuttle mode. The scan output can be attenuated up to –42dB.	Default for digital scan is Off. The default attenuation is 0dB. When Dig Scan is on, aux track routing playback is muted through the "aux" source channels.
19 Save data to tape?	--	N	Y	Press Yes to perform a TOC save to the data section.	Executable.
20 Load data from tape?	--	N	Y	Press Yes to perform a TOC load from the data section.	Executable.
21 Tape Type	N	N	N	Displays the tape type when a formatted tape is inserted. Detects ST60/120/180 tapes and their PAL equivalents.	Display only. Once the end-of-tape is reached, the M20 will store the actual tape-length value until the tape is ejected.
22 ID status	N	--	--	Displays the ADAT device ID number. Up to 15 slaves (ID 02 to ID 16) can be identified by a master (ID 01).	Display only. The master is always ID 01. A master will also indicate the number of slaves detected.
23 User Bits	Dynamic	--	--	Displays the user bits from a tape's TC track, incoming SMPTE/EBU, or from the internal generator.	Display only.
24 Error Rate	Dynamic	--	--	Displays the number of sync block errors per 14 drum revolutions (280ms). Range is from 0000 to 6720 errors.	Display only. There are 30 sync blocks per sector, 8 sectors per track, and 2 tracks per revolution.
25 Front Panel	Y	--	--	Displays the current software versions for the front panel processors.	Display only.
26 Main	Y	--	--	Displays the current software versions for the main processor.	Display only.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Online	Y	N	Y	Used to online and offline the M20. When enabled, the M20 will respond to control from the user selected "Online Source" as defined by Utility page 2.	Defaults to on. The M20 will always monitor and pass through ADAT Sync port commands regardless of the Online status and the selected Online Source.
Transport Block					
Locate 0	N	Y	N	When pressed, the button LED will light solid and the tape will move (rewind or fast forward) to the 00:00:00:00:00 display position (ABS or Relative zero time code).	See Locate button comments below. When the tape counter displays SMPTE time, the tape will locate to the SMPTE Offset location that is equivalent to ABS zero time code.
Locate	N	Y	N	When pressed, the button LED will light solid, and the Rewind or Fast Forward LED will flash to indicate the direction of the locate which is determined by the currently selected Locate number.	A Locate can be aborted by pressing Stop, Rew, FFwd, Search, or by pressing Play twice (aborting the deferred play with the second press).
Deferred Play	N	Y	N	Pressing Play before a locate completes will setup a deferred play condition. Play mode is entered after the locate has completed.	A deferred play can be aborted by pressing Stop, Rew, FFwd, or Search.
Deferred Record	N	Y	N	Pressing Play and Record before a locate completes will setup a deferred record condition. Record mode is entered after the locate has completed.	A deferred record can be aborted by pressing Play, Stop, Rew, FFwd, or Search.
Set Locate	N	N	Y	When pressed, the current tape location is stored into locate number memory addresses 01 through 97. The address is stored to the next locate number (i.e. current locate number + 1).	Set Locate will not auto-increment to Locate numbers 98 and 99 (Punch-In/Out points) from Locate 97. User must manually select Locate 98 or 99 in order to update these locate addresses with the Set Locate button.
Copy Tape Location	N	N	Y	When pressed, the current tape location is stored into locate number memory addresses 00 through 99. The address value is stored to the currently selected locate number.	Copy Tape Location is also used to capture the current tape location for the SMPTE Chase Offset value, the internal generator's ABS or User Set TC Start Reference, and the Tape Offset time code value.
Rewind	N	Y	N	When pressed, the button LED will light solid and the tape will rewind at 16x play speed for 3 min. ABS time, then transition to 85x play speed.	A rewind is always performed with the tape engaged.

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Fast Forward	N	Y	N	When pressed, the button LED will light solid and the tape will fast forward at 16x play speed for 3 min. ABS time, then transition to 85x play speed.	A fast forward is always performed with the tape engaged.
Stop	N	Y	N	When pressed, the button LED will light solid and any tape motion will terminate. If a timeout drum disengage has occurred, Stop will flash. Pressing Stop again will load the tape around the drum.	Default mode is a drum/capstan engaged Stop mode when a tape is inserted. Pressing Stop will abort recording and formatting.
Play	N	Y	N	When pressed, the button LED will light solid and the tape will move forward and lock at 1x play speed.	
Cue	N	Y	N	Pressing Play and Fast Forward simultaneously will light the Play button LED solid and flash the Fast Forward button LED while the tape is "scanned" forward at 3x play speed. Attenuated (-6 dB) digital audio is heard as play speed sound bites.	A cue can be aborted by pressing Play, Stop, Rew, FFwd, or Search.
Review	N	Y	N	Pressing Play and Rewind simultaneously will light the Play button LED solid and flash the Rew button LED while the tape is "scanned" in reverse at 3x play speed. Attenuated digital audio is heard as play speed sound bites.	A review can be aborted by pressing Play, Stop, Rew, FFwd, or Search.
Record	N	Y	Y	When pressed with the Play button, the Record button LED will flash, then light solid when the tape establishes a lock, and enter Record mode. From Play mode, recording will begin when Record is pressed.	See One-Button Record under the Utility pages for the alternative method of entering Record mode.
Record Pending Mode	--	Y	N	Allows a punch-in/out to be performed with the Record enable buttons. When no tracks are record-ready, the Record button will flash when Play and Record are pressed together (indicating no recording is taking place).	Auto Punch-In/Out location points 98 and 99 are automatically updated when entering and exiting Record Pending mode.
Override Write Protect	N	N	Y	Allows a tape that has its write-protect tab removed to be recorded on. Press and Hold Peak Clear, then press Record to override the cassette's physical write protection.	Default is "Sense Write Protect". When the tape is ejected the override will automatically return to the default (not allowing Record mode on a write protected tape).

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Rehearse*	Y	Y	Y	Toggles record rehearse mode on and off. When enabled, pressing Record/Play enters Rehearse mode for record-ready tracks. This emulates recording without writing to tape. The Record button flashes when rehearsing.	Defaults to off. Useful when used in conjunction with Auto Input mode to switch to input monitoring when rehearsing (punching in/out with Rec/Play or Auto Record).
Jog/Shuttle Wheel	Y	Y	N	Used to select between Jog and Shuttle modes when pushed. Perform a jog or shuttle operation by turning the wheel clockwise for forward motion or counter-clockwise for reverse motion.	Jog vs. Shuttle mode is determined by the physical position of the wheel. A slaves Jog or Shuttle LED will flash if its physical position does not match the physical position of the master. The wheel is ignored when in Record, Record Pending, Auto Rec Pending, Rehearse, and Format modes.
Direction Arrows	Dynamic	--	--	Indicates the direction tape is moving when jogging or shuttling. Shuttle direction is always indicated when the wheel is not in the center position. Jog direction is indicated only when the wheel is in motion.	Defaults to no indication until wheel movement (and the center position in Shuttle mode) is detected.
Jog Mode	Dynamic	--	--	The tape is scrubbed with a velocity proportional to the speed in which the wheel is turned. The speed range is 1/8x to 1x play speed.	When the wheel is turned at a proportional velocity range near the 1x speed, the wheel velocity is averaged and playback will be at 1x play speed.
Shuttle Mode	Dynamic	--	--	The tape is moved at controlled speeds in forward and reverse directions. The speeds available are 1/4x, 1/2x, 3/4x, 1x, 1.5x, 2x, 3x, 6x, 15x, and 16x play speed.	Center position must be sensed before there is tape motion.

The M20 User Interface Protocol (Continued):

User Parameter	Retained in Memory	Master Control	Slave Edit	Description	Comments
Search	N	Y	N	Toggles the transport control between the Jog/Shuttle wheel and the transport buttons. When enabled, the Search button LED will light, and the state of the wheel will determine what mode (Jog or Shuttle) and direction (Reverse or Forward) is applied to the transport.	Defaults to disabled for transport button control. The Search button is ignored when in Record, Record Pending, Auto Rec Pending, Rehearse, and Format modes.
Search Master	N	N	N	Selects the M20 (master or slaves) in a system that will provide the park point location for all online machines after a Jog/Shuttle operation. To edit this parameter, press and hold the Search button on the master M20 for 2 seconds. Continue to hold the Search button and use the up/down arrows or alpha-numeric keypad to select the search master machine (1 to 8, or None). If "None" is selected, all M20s will park independently after a search (i.e. no search master).	Defaults to machine 1 as the search master. Available on the ID1 (master) M20 only. Use this feature to more accurately find and mark location points when scrubbing the Aux track of a slave machine.
Eject	N	Y	Y	Removes the tape from the transport. Following pro VCR convention, the Eject button LED is on when the transport is empty and off when a tape is loaded.	Pressing Eject from the ID 01 master will eject the tapes in all onlined slaves. Eject is ignored when recording or formatting.
Master Eject Only	--	N	--	Removes the tape from the ID1 (master) transport only, even though online slaves may have tapes inserted. Hold Peak Clear and press Eject to perform a master eject.	
Alpha-Numeric Keypad Block					
Alpha-Numeric Keypad	N	N	Y	Used for entering parameter values, time code and locate address values, editing locate names, moving the cursor between fields, and incrementing/ decrementing values.	