MSF5000 MUXbus Signals

Transcribed and Enhanced by Robert W. Meister WA1MIK

This document provides definitions for each of the 64 MUXbus data bits. This data is normally displayed via the Diagnostic Metering Panel (DMP) or through the MUXbus display screen of the RSS.

The DMP is optional test equipment, which contains a speaker, an analog meter, and a MUXbus display. The data bits are presented in a matrix on the MUXbus display in a format similar to the table below.

The DMP allows the service technician to read or modify MUXbus data. It is connected to the station via the expansion connector (J800) on the SSCB. This connector is located on the top of the Control Tray. Disconnect the DMP from the station during normal station operation to minimize the effects of Radio Frequency Interference (RFI) into the station.

The cells in the table with a **red background** are **STATUS-ONLY** and cannot be modified with the DMP (or RSS on digital-capable stations). The signal names in **bold red** have a different name or are unassigned on analog (CLB) stations. See the individual descriptions following this map.

MUXbus Bit Map

ADDRESS	D3/B3	D2/B2	D1/B1	D0/B0
0	**DAT PTT**	SCAN	T ALM DS	S ALM DS
1	RPT PTT	LIN PTT	LOC PTT	INTCOM
2	TX PL DS	TX ACT	RX2 ACT	RX1 ACT
3	RX PL DS	R1 PL DT	**RX CD DT**	R1 UN SQ
4	R2 MUTE	R2 PL DT	**R2 CD DT**	R2 UN SQ
5	GD TN DT	AUX DET	RPT KD	RPT UN SQ
6	ACC DIS	EX DA DT	**TX CD DT**	**ENCRYPT**
7	**SP 3**	**SP 2**	**SP 1**	**BAUD**
8	TX RX C8	TX RX C4	TX RX C2	TX RX C1
9	AUX C8	AUX C4	AUX C2	AUX C1
10	**RX2 C8**	**RX2 C4**	**RX2 C2**	**RX2 C1**
11	**TX INHB**	**RX INHB**	**R2 AUX DT**	**DOS**
12	RW4 OVG	RW3 SYN	RW2 PA	RW1 BAT
13	RW8	RW7 FWD	RW6 REF	RW5 TSTAT
14	**FW 4**	**FW 3**	**FW 2**	**FW 1**
15	**MODE 8**	**MODE 4**	**MODE 2**	**MODE 1**

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The MUXbus is a time multiplexed address and data bus with 16 addresses, each containing four data bits. The SSCB (or SCB for analog stations) serves as the MUXbus master and drives the address and Data Strobe (DS*) lines. The address lines are periodically incremented, and the DS* is used to synchronize the read/write cycle.

Since the MUXbus is available to all control modules in the main and expansion trays, all modules may read and write data to the MUXbus. Using the MUXbus, wildcards and special application boards in the expansion tray may easily be used to create special functions that are not a standard offering with the station.

The External PTT Input and Spare Output signals (available on Station Connector J2 if a TTRC is present) can be programmed on digital-capable stations to deal with the MUXbus bits. The syntax is "MUXAnBx", where "n" is one of the address characters (0 thru 9 or A thru F) and "x" is a digit (0 thru 3).

Individual Bit Descriptions:

The following descriptions define each of the 64 MUXbus bits. Each definition includes the mnemonic, a spelled-out description, and the associated row/column address on the MUXbus. The analog (CLB) stations have alternate names and signal assignments for some bits, shown in bold red text in the map above. These will be shown as red text within square brackets below.

DAT PTT - Data Push-To-Talk (A0/D3) [SP XMT]
Indicates if a Data PTT request is active. When active, the request is arbitrated against all other active PTT requests. The PTT priorities may be changed via the field programmer or with option C672.

[Special Transmit: Indicates that the deviation and/or the rf PA power should be either boosted or cut, defined by information in the Station Control Module (SCM) code plug. The default condition in the SCM code plug, upon activation of this MUXbus bit, is deviation control. This bit will only have an effect during a PTT. The activation of this bit, by itself, will not key the station.]

SCAN - Scan Enable (A0/D2)
In stations equipped with scan option C42, this bit activates receiver scanning. When active, the station scrolls through programmed channels, stopping when receiver activity is detected.

T ALM DS - Total Alarm Disable (A0/D1)
Unconditionally mutes all alarm tones generated in response to active reverse wildcards bits on addresses 12 and 13. See also S ALM DS.

S ALM DS - Selective Alarm Disable (A0/D0)
Mutes repetitive alarm tones generated in response to active reverse wildcard bits on addresses 12 and 13. For example, when reverse wildcard bit is active, a corresponding alarm tones are sent once; they are not repeated every ten seconds.

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There are two modes of operation when using the Selective Alarm Disable feature. Mode A is to set this bit on the MUXbus and continue driving it active. In this mode, the SSCB will generate alarm tones only once; however, it will generate the tones whenever the state of the reverse wildcard bits changes. The user will hear one full set of alarm tones whenever the alarm status changes (unless the change is to all alarms cleared).

Mode B is to set the MUXbus bit for at least 20 msec, and then stop driving it active. The SSCB then latches the bit active, even though the original driver has released the bit. When the state of the reverse wildcard bits change, the SSCB stops holding the S ALM DS bit active. This has the effect of stopping alarm tone generation completely until the alarm status changes, then normal alarm tone generation is resumed; alarm tones are generated every ten seconds. The SSCB also stops holding this bit active when the T ALM DS bit is activated.

RPT PTT - Repeater Push-To-Talk (A1/D3)
Indicates that a Repeater PTT or Trunking PTT is active. If this is the highest priority active PTT, then the audio gating will be set for in-cabinet repeat. If the repeater PTT time-out timer (TOT) times out, the RPT PTT bit will stay active until the request goes away; however, the active PTT type will change to the next active lowest priority, if any. PTT priories are set on a per mode basis by the Field Programmer or with option C672.

If repeater knock down (RPT KD) goes active while RPT PTT is active, PL reverse burst or DPL turn off code (RB/TOC) will be encoded if appropriate, and the transmitter will un-key. RPT PTT is active during repeater dropout delay and is inactive when RB/TOC is encoded.

The SSCB activates RPT PTT if qualified repeater audio activity exists on Receiver 1. Qualified repeater audio activity can be set for each mode by the Field Programmer or with option C673. Qualified repeater audio activity is determined by any combination of MUXbus bits RX PL DS, R1 DT, RPT USQ, and AUX DET.

The RPT PTT bit is a STATUS-ONLY bit. This means that the bit is used for indication purposes only. Activating this bit via the DMP or wildcard module will not cause the station to key or gate repeater audio. Only the SSCB may determine that the repeater squelch qualifiers have been met and allow the station to repeat.

LIN PTT - Line Push-To-Talk (A1/D2)
Keys the transmitter, modulating with TX Audio if no higher priority PTT is active. PTT priorities are set on a per mode basis by the Field Programmer or with option C672. LIN PTT is inactive when RB/TOC is encoded, unless the RB/TOC is caused by the Line PTT timing out. This bit is usually written to the MUXbus by the TTRC module in response to a console request to key the station.

LOC PTT - Local Push-To-Talk (A1/D1)
Keys the transmitter, modulating with local audio if no higher priority PTT is active. PTT priorities are set on a per mode basis by the Field Programmer or with option C672. LOC PTT is inactive

when RB/TOC is encoded, unless the RB/TOC is caused by the Local PTT timing out. This bit is usually written to by the SSCB, in response to a PTT switch actuation on a local microphone plugged into the station control module front panel Control connector J812.

INTCOM - Intercom (A1/D0)
Allows LOC PTT without keying the station, which enables a service technician at the station to communicate with the console site via the wire-lines. This bit is usually written to the MUXbus by the TTRC module, in response to the front panel Intercom switch.

TX PL DS - Transmit PL/DPL Disable (A2/D3)
Disables PL, DPL, or Trunking Data from being added onto the transmitted signal. The Transmit PL Strip wire-line option (C63) utilizes this bit. If PL or DPL is being encoded when TX PL DS goes active, then RB/TOC will be generated before muting PL or DPL. This bit will also be set active by the front panel Xmit switch on the station control module.

TX ACT - Transmitter Activity (A2/D2)
Indicates that the transmitter is actually on. This bit is a reflection of the front panel PA ON LED.

The TX ACT bit is a STATUS-ONLY bit. This means that the bit is used for indication purposes only. Activating this bit via the DMP or wildcard module will not cause the station to key or activate the transmitter. Only the SSCB may key the station, in response to its inputs.

RX2 ACT - Receiver 2 Activity (A2/D1)
Indicates that the second receiver audio has met the qualifiers set for it on the current mode. The second receiver option is not yet supported, so this bit has no effect when active.

RX1 ACT - Receiver 1 Activity (A2/D0)
Indicates that the primary receiver has met the qualifiers set for it on the current mode. Qualified receiver audio activity can be set for each mode by the Field Programmer or with option C674. Qualified receiver audio activity is determined by any combination of MUXbus bits RX PL DS, R1 UN SQ, R1 PL DT, and AUX DET. The SSCB responds to an active RX1 ACT by opening the RX 1 audio gate. This gates RX1 audio to both the line audio and select audio (local speaker) lines. RX1 audio is also gated to the SSCB repeater audio gate. An RX1 ACT must occur before a RPT PTT will be issued to open the repeater audio gate.

RX PL DS - Receiver PL/DPL Disable (A3/D3)
Indicates that the station has reverted to carrier squelch only receiver operation. The monitor and receivers Squelch on/off wire-line functions utilize RX PL DS. Also, the station control module front panel PL Dis switch activates RX PL DS. This bit is usually set by the TTRC in response to a monitor command from a console.

R1 PL DT - Receiver 1 PL/DPL Detect (A3/D2)
Active when Private Line (PL), Digital Private Line (DPL), or Connect Tone (CT) coded squelch is being detected on Receiver 1.

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RX CD DT - Receiver 1 Code Detect (A3/D1) [R1 SQ LV]
Indicates a Receiver Code Detect due to a receipt of Secure (12 Kbit) data on Receiver 1.

[Receiver 1 Squelch Level: This bit changes the carrier squelch threshold of the SCM. When active, the primary receiver is operating with "loose" squelch.]

R1 UN SQ - Receiver 1 Un-squelch (A3/D0)
Active when the Receiver 1 audio carrier squelch circuit on the SSCB detects on-channel RF activity. R1 UN SQ is used for audio gating (refer to RX1 ACT), not for repeater keying (refer to RPT PTT).

R2 MUTE - Receiver 2 Mute (A4/D3)
Causes the second receiver audio to be muted or attenuated. The second receiver option is not yet supported, so this bit has no effect when active.

R2 PL DT - Receiver 2 PL/DPL Detect (A4/D2)
Active when PL, DPL, or CT coded squelch is being detected on Receiver 2. The second receiver option is not yet supported, so this bit has no effect when active.

R2 CD DT - Receiver 2 Code Detect (A4/D1) [R2 SQ LV]
Indicates a Receiver Code Detect due to receipt of Secure (12 Kbit) data on Receiver 2. The second receiver option is not yet supported, so this bit has no effect when active.

[Receiver 2 Squelch Level: This bit changes the carrier squelch threshold of the SCM. When active, the secondary receiver is operating with "loose" squelch.]

R2 UN SQ - Receiver 2 Un-squelch (A4/D0)
Active when the Receiver 2 audio carrier squelch circuit detects on-channel RF activity. R2 UN SQ is used for audio gating (refer to RX2 ACT). The second receiver option is not yet supported, so this bit has no effect when active.

GD TN DT - Guard Tone Detect (A5/D3)
Indicates that High Level Guard Tone is being detected from the Tx Audio signal. This bit is also active during the function tone detect window. The TX Audio signal is muted while GD TN DT is active, in order to prevent remote control tones from being transmitted over the air.

AUX DET - Auxiliary Detect (A5/D2)
Indicates that an optional decoder is detecting on Receiver 1. AUX DET can be used to activate RX1 ACT, RX2 ACT, and RPT PTT in a manner similar to the R1 PL DT and R1 UN SQ qualifiers. Used by the Repeater Activation/Hold-In RSS fields as the "A" qualifier.

RPT KD - Repeater Knock Down (A5/D1)
Disallows a repeater PTT when active. Inhibits in cabinet repeat, but allows receive audio to be gated to the local speaker and wire-line.

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RPT UNSQ - Repeater Un-squelch (A5/D0) [RPT USQ]
Indicates when the Receiver 1 carrier circuit, located on the SSCB, detects activity. Used as a prerequisite to keying the station, if the station is a repeater, and to gating audio to the transmitter and/or wire-line.

[Repeater Un-squelch: A status-only bit, active when the repeater squelch circuit on the SCM detects activity. This bit is used to key the repeater, not to gate audio (see RPT PTT).]

ACC DIS - Access Disable (A6/D3)
Indicates that the station is in the Access Disable mode. See the operation section for a description of the Acc Dis function.

EX DA DT - External Data Detect (A6/D2)
When active, the SSCB mutes Tx, Local, RX1 (Repeater), and MRTI audio from the transmitter unless specially enabled for the current mode. These audio paths may be enabled or disabled via the Field Programmer or with option C678. The Tx Data Audio path is always routed to the transmitter, even when this bit is active.

TX CD DT - Transmit Code Detect (A6/D1) [DVP SEL]
Indicates that a Wire-line Code Detect is active due to receipt of Secure (12 Kbit) data on the transmit wire-line.

[Digital Voice Protection Select: When active, sets either the primary DVP code 1 or the secondary DVP sub-code from the DVP control module.]

ENCRYPT - Digital Voice Encryption (A6/D0) [DVP C/C]
When active, enables the encryption function of the optional Encrypt/Decrypt Secure module (voice is transmitted coded). When inactive, disables the encryption function (voice is transmitted clear). The decrypting function is unaffected by this bit (decryption is always active when the proper key is loaded).

[Digital Voice Protection Coded/Clear: When active, enables the encryption and decryption of the DVP control module, therefore voice is transmitted "coded". When inactive, disables the encryption and decryption functions, therefore voice is transmitted "clear".]

SP3, SP2, SP1 - Special Purpose 3-1 (A7/D3 thru A7/D1) [UNASSIGNED]
These bits are reserved for future applications, or special customer needs.

[Reserved for future use.]

BAUD - IPCB Baud Rate (A7/D0) [UNASSIGNED]
Indicates that the IPCB serial baud rate is not the default speed (1200 baud). When active, the alternate speed is 300 baud.

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[Reserved for future use.]

TX RX C8, C4, C2, C1 - Transmitter/Receiver 1 Channel (A8/D3 thru A8/D0)
These four bits are used to control the channel of the transmitter and receiver 1. The SSCB module code plug defines the channel parameters. These bits represent the channel number in binary format, so channels 0 through 15 may be represented with these bits. For channels higher than 15, the Auxiliary Channel bits are used (AUX C8 - AUX C1). You must activate external channel selection in RSS to utilize these bits.

These MUXbus bits actually represent the requested operating channel; the actual operating channel is always indicated by the front panel Status display. A discrepancy may arise between the two indicators if an undefined channel is requested; in this case, the SSCB utilizes channel number 1.

AUX C8, C4, C2, C1 - Auxiliary Channel (A9/D3 thru A9/D0)
These four bits are overflow bits, which may be used for indicating channel, mode, or Receiver 2 channel, depending on the application.

RX2 C8, C4, C2, C1 - Second Receiver Channel (A10/D3 thru A10/D0) [UNASSIGNED]
These four bits are used to control the channel of receiver 2. The SSCB module code plug defines the channel parameters. These bits represent the channel number in binary format, so channels 0 through 15 may be represented with these bits. For channels higher than 15, the Auxiliary Channel bits are used (AUX C8 - AUX C1). In MCS stations, these bits are used to indicate the four least significant bits of the active MCS user number. The second receiver option is not yet supported, so this bit has no effect when active.

[Reserved for future use.]

TX INHB - Transmit Inhibit (A11/D3) [UNASSIGNED]
Indicates that the transmitter is inhibited. When active, no station transmitter activity is allowed. All PTT requests will be ignored.

[Reserved for future use.]

RX INHB - Receiver 1 Inhibit (A11/D2) [UNASSIGNED]
Indicates that the receiver audio is inhibited from reaching the wire-line. When active, no audio (including status tone) is gated to Line 2 or Line 4.

[Reserved for future use.]

R2 AUX DT - Second Receiver Auxiliary Detect (A11/D1) [UNASSIGNED]
Indicates that an optional decoder is detecting on Receiver 2. In MCS stations, this bit is used to indicate the most significant bit of the active MCS user number. The second receiver option is not yet supported, so this bit has no effect when active. Used by the Repeater Activation/Hold-In RSS fields as the "A" qualifier.

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[Reserved for future use.]

DOS - Data Operated Squelch (A11/D0) [UNASSIGNED]
In MCS stations, this bit is used to indicate the second most significant bit of the active MCS user number. In data stations, this bit indicates a "data detect" has been achieved. The repeat audio pathway is muted to prevent repeating data while this bit is active.

[Reserved for future use.]

RW4 OVG - Reverse Wildcard 4 - Battery Over-voltage (A12/D3)
Indicates that the battery over-voltage internal station alarm is active. When active, the SSCB generates four alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW3 SYN - Reverse Wildcard 3 - Synthesizer Unlock (A12/D2)
Indicates that the transmitter or receiver synthesizer is out of lock. When active, the SSCB generates three alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW2 PA - Reverse Wildcard 2 - PA Fail (A12/D1)
This bit is the RF power amplifier failure alarm parameter, activated by the SSCB. RW2 PA is active when the RF power amplifier has failed. A successful key-up or a SSCB reset is required to clear the alarm. The alarm may be active when the transmitter is de-keyed, due to a prior failure. PA Fail means that one or both of the SSCB PA status lines (PA On or PA Full Power) is inactive 30-45 msec after the start of a key-up, or for 30-45 msec continuously during key-up, thereafter. When active, the SSCB generates two alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW1 BAT - Reverse Wildcard 1 - Battery Revert (A12/D0)
Indicates that the AC main power to the station has been lost and that the station is operating on battery power. When active, the SSCB generates one alarm beep, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW8 - Reverse Wildcard 8 - Redundant Station (A13/D3) [RWC 8]
Indicates that a problem exists with the redundant station system. When active, the SSCB generates eight alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW7 FWD - Reverse Wildcard 7 (A13/D2) [RWC 7]
Indicates that a reverse wildcard 7 is active. This bit is set by a low forward power condition. When active, the SSCB generates seven alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW6 REF - Reverse Wildcard 6 (A13/D1) [RWC 6]

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Indicates that a reverse wildcard 6 is active. This bit is set by a high reflected power condition. When active the SSCB generates six alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

RW5 TSAT - Reverse Wildcard 5 (A13/D0) [RWC 5]
Indicates that a reverse wildcard 5 is active. This bit is set as an indication of a TSTAT failure. This failure is prompted by high reflected power, low forward power, or receiver synthesizer being out of lock. When active, the SSCB generates five alarm beeps, which can be routed to the local speaker, the wire-line, and/or over the air depending on how the station is programmed.

FW4, FW3, FW2, and FW1 - Forward Wildcard 4 thru 1 (A14/D3 thru A14/D0) [FWC 4 thru 1]
Indicates that a forward wildcard is active. These bits are usually driven by the TTRC module in response to a TRC command from a console. Used in conjunction with a wildcard in the expansion tray, these bits can be used to activate or signal equipment external to the station.

MODE 8, 4, 2, 1 - Station Mode (A15/D3 thru A15/D0) [FWC 8 thru 5]
These four bits are used to control the mode of the station. The SSCB module code plug defines the mode parameters. These bits represent the mode number in binary format, so modes 0 through 15 may be represented with these bits. For modes higher than 15, the Auxiliary Channels bits are used (AUX C8 - AUX C1).

These MUXbus bits actually represent the requested operating mode; the actual operating mode is always indicated by the front panel Status display. A discrepancy may arise between the two indicators of an undefined mode is requested; in this case, the SSCB utilizes mode number 1.