A1 - Interfaces

Data Link to Level 2 & 3

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Note

This document is an extracted version of the general ARMCO Level 2 / Level 3 interface documentation (File 1, chapter C4) and shows the HSM related message exchange only.

1. General

1.1 Used Standard Software

The transmissions are exchanged via Ethernet/TCP-IP. VAI's internode communication tool CMV (Communication Manager VAX) is used for exchanging mailbox messages between processes running on different nodes.

1.2 Message Headers

Each message has a message header like defined in the CMV User's Manual, chapter **Application Header**.

The header's User Information field has the below shown format:

Byte	Description
0	Simulation flag, if 'Y' the message is not caused by real production, it is the receiver's decission to treat the message data or not
1 - 4	initiating aggregate ('EAF8', 'EAF9', 'AOD ', 'LMF ', 'CC1 ', 'RHF ' or 'HSM ')

All exchanged transactions will contain a **Level 3 Header** at the begin of the users data buffer of the following format:

Format	Description
A6	node name (logical node)
A2	level ("02" for level 2 systems)
A10	program name
A4	cost center (fixed string for each system)
DATE	send time
A3	message type (= message number)

1.3 Data Format Description

The following data format descriptions are used in the transmission definitions:

Axx	xx byte, ASCII character string
I2	2 byte, integer
I4	4 byte, integer
F4	4 byte, float
DATE	8 byte, binary VAX system time format.

1.4 Transmission Exchange Matrix

Sender \ Receiver	Level 3	EAF	AOD	LMF	CC1	RHF	HSM	MST
Level 3	**X**	Create Plan Delete Plan Synchronize Clock	Create Plan Delete Plan Synchronize Clock	Create Plan Delete Plan Synchronize Clock	Create Plan Delete Plan Synchronize Clock	Piece data Synchronize Clock	Roll Data Synchronize Clock	
EAF	EAF Status Update Delay Closed EAF Heat Report Ladle Skull Weight	**X**	EAF Heat Report	EAF Heat Report	EAF Status Update Delay Information Delay Closed EAF Heat Report Retreat Heat Charged Master Heat Map Request			Metallurgical Data
AOD	AOD Status Update Delay Closed AOD Heat Report	AOD Status Update	**X**	AOD Heat Report	AOD Status Update Delay Information Delay Closed AOD Heat Report Retreat Heat Data Request Master Heat Map Request			
LMF	LMF Status Update Delay Closed LMF Heat Report	LMF Status Update		**X**	LMF Status Update Delay Information Delay Closed LMF Heat Report Retreat Heat Data Request Master Heat Map Request Expected End			Metallurgical Data
CC1	CC1 Status Update Delay Closed Piece data CC1 Cast Report	Master Heat Map Expected End CC1 Status Update	Master Heat Map Retreat Heat Data	Master Heat Map Retreat Heat Data Expected End	**X**	Master Heat Map Cast Speed Piece data	Master Heat Map	Metallurgical Data
RHF	Delay Closed Piece data Reqest RHF Production Result				Delay Information Delay Closed Master Heat Map Request Number of Slabs in RHF	**X**	Piece Data Furnace Discharging Furnace Recharging Furnace Map Furnace Map on Request Slab Temperature	Metallurgical Data
HSM	Delay Closed HSM Production Result Roll Change				Delay Information Dealy Closed Master Heat Map Request	Delay Information Piece Data Request Furnace Map request RM Exit Temperature	**X**	
LAB	Heat Analysis	Heat Analysis	Heat Analysis	Heat Analysis	Heat Analysis			

2. Heat Status and Facility Status Transmissions

2.1 ID 116 - Master Heat Map Request

Message ID:	116
Sender:	EAF, AOD, LMF, RHF, HSM
Receiver:	CC1
Transmission Time:	any time
Description:	CC1 will answer with **Master Heat Map**
Structure:	

2.2 ID 117 - Master Heat Map

Message ID: 117
Sender: CC1
Receiver: EAF, AOD, LMF, RHF, HSM
Transmission Time: after change of one of the values on the *Steelmaking Facilities Overview* or on request (**Master Heat Map Request**)

Description:

at facility index	pool index
1 = at EAF8	1 = retreat
2 = at EAF9	2,3 = EAF to AOD
3 = at AOD	4,5 = EAF to LMF,
4 = at LMF	6,7 = AOD to LMF,
5 = pouring at CC1	8,9 = to CC1

Structure:

5 * at facility
{

heat number	A7
plan number	A7
melt grade	A5
processing step	A12
ladle number	I4
net steel weight	F4
treatment start time	DATE
expected treatment end time	DATE
delay code	I4
delay text	A30
delay start time	DATE
expected delay end time	DATE

}
9 * pool
{

heat number	A7
plan number	A7
melt grade	A5
ladle number	I4
net steel weight	F4
last treatment end time	DATE

}
RHF delay code I4

RHFdelay text	A30
RHF delay start time	DATE
RHF expected delay end time	DATE
HSM delay code	I4
HSM delay text	A30
HSM delay start time	DATE
HSM expected delay end time	DATE
RHF number of slabs	I4

2.3 ID 118 - Delay Information

Message ID: 118
Sender: EAF, AOD, LMF, RHF, HSM
Receiver: CC1
Transmission Time: after delay entry
Description:
Structure:

delay code	I4
delay text	A100
comment	A200
delay start time	DATE
expected delay end time	DATE

2.4 ID 119 - Delay Closed

Message ID: 119
Sender: EAF, AOD, LMF, CC1, RHF, HSM
Receiver: CC1, Level 3
Transmission Time: after a delay has been closed
Description: heat number is blank in case of RHF or HSM is the sender
Structure:

delay code	I4
delay text	A100
delay comment	A200
heat number	A7
delay start time	DATE
delay end time	DATE
expected delay end time	DATE

2.5 ID 123 - Furnace Discharging

Message ID: 123
Sender: RHF
Receiver: HSM
Transmission Time: discharging of furnace
Description:
Structure:

Slab ID	A6
Total number of slabs in furnace (max 30)	I4
Calc. discharging temp. surface / top	F4
Calc. discharging temp. surface / bottom	F4
Calc. discharging temp. center	F4
Calc. discharging temp. average	F4
Calc. taper temp. average (offset)	F4
Reheating time (seconds)	I4

2.6 ID 124 - Furnace Recharging

Message ID: 123
Sender: RHF
Receiver: HSM
Transmission Time: recharging of furnace
Description:
Structure:

Slab ID	A6
Total number of slabs in furnace (max 30)	I4

2.7 ID 125, 140 - Furnace Map

Message ID: 125
140 (furnace map on request from HSM)
Sender: RHF
Receiver: HSM
Transmission Time: - startup of tracking at RHF
- manual correction of map on RHF
- map request received at RHF

Description:
Structure:

Total number of slabs in furnace (max 30)	I4
number of slabs * Slab ID	A6

REMARK:

Message ID for furnace map on request and for furnace map, initiated at RHF are different.

2.8 ID 126 - Furnace Map Request

Message ID: 126
Sender: HSM
Receiver: RHF
Transmission Time:
- startup of HSM tracking
- map mismatch detected
- manual request

Description:
Structure:
none

2.9 ID 127 - Slab Temperature

Message ID: 127
Sender: RHF
Receiver: HSM
Transmission Time: cyclically every 60 seconds
Description: for HSM operator to give information of actual temperature of next slab for discharging

Structure:

Slab ID	A6
Calc. discharging temp. surface / top	F4
Calc. discharging temp. surface / bottom	F4
Calc. discharging temp. center	F4
Calc. discharging temp. average	F4
Calc. taper temp. average (offset)	F4
Reheating time (seconds)	I4

2.10 ID 128 - Reject at Discharge

Message ID:	128
Sender:	HSM
Receiver:	RHF
Transmission Time:	slab reject dialog performed by operator
Description:	
Structure:	
Slab ID	A6

2.11 3.19. ID 154 - RM Exit Temperature

Message ID: 128
Sender: HSM
Receiver: RHF
Transmission Time: end of pass before last pass in RM
Description:
Structure:

Slab ID	A6
Time from furnace discharging to start of last pass at RM (seconds)	I4
Number of temperature samples (max 50)	I4
number of samples * temperature	F4

3. Actual Production Information

3.1 ID 142, 153 - Piece Data

Message ID: 142
153 (piece data on request)
Sender: CC1 (to Level 3 and RHF),
RHF (to HSM),
Level 3 (to RHF)
Receiver: RHF, HSM, Level 3
Transmission Time: after actual cutting sent by CC1 to RHF and Level 3
after slab charging sent by RHF to HSM
Level 3 sends after *Piece Data Request* to RHF
Description:
Structure:

slab ID	A6
slab number	A3
disposition code	A2
defect code 1	A4
average speed at mold	F4
heat number	A7
melt grade	A5
charging date and time (only RHF to HSM)	DATE
number of slabs in furnace (only RHF to HSM)	I4
slab weight	F4
scrap and sample weight	F4
crop weight	F4
slab head width	F4
slab tail width	F4
slab thickness	F4
slab length	F4
mill order number	A11
customer name	A20
inspection code	A4
test code	A4
50 * CHEMICAL ANALYSIS	
{	
element abreviation	A3

percent element concentration	F4
}	
HSM special instructions (from plan)	A80
aim discharge temperature	F4
aim RM exit temperature	F4
RM rolling recipe number	I4
defect code 2	A4
hot mill aim gauge	F4
hot mill gauge lower tolerance	F4
hot mill gauge upper tolerance	F4
aim strip width	F4
acceptable minimum strip width	F4
acceptable maximum strip width	F4
aim temperature after F6	F4
acceptable minimum temperature after F6	F4
acceptable maximum temperature after F6	F4
aim coiling temperature	F4
acceptable minimum coiling temperature	F4
acceptable maximum coiling temperature	F4
defect code 3	A4
xfer bar thickness	F4
armco grade	I4
alternate gauge	F4
alloy number	A5
spare	A31

3.2 ID 143 - Piece Data Request

Message ID:	143
Sender:	RHF (to Level 3), HSM (to RHF)
Receiver:	Level 3, RHF
Transmission Time:	HSM: Slab in furnace detected, but no slab data RHF: at cold charging
Description:	
Structure:	
slab ID	A6

3.3 ID 148 - HSM Production Result

Message ID: 148
Sender: HSM
Receiver: Level 3
Transmission Time: material confirmed or deleted manually
weigher/bander queue full (automatic delete)

Description:
Structure:

SLAB_ID	A6
DROPOUT_TIME	DATE
HEAT_NUMBER	A7
MELT_GRADE	A5
CUSTOMER_NAME	A20
SLAB_LENGTH	F4
SLAB_WEIGHT	F4
ORDER_NUMBER	A11
HM_AIM_GAUGE	F4
AIM_STRIP_WIDTH	F4
HM_ACTUAL_GAUGE	F4
HM_ACTUAL_WIDTH	F4
DISPOSITION_CODE	A2
DEFECT_CODE	A4
HM_REMARKS	A80
WEIGHER_BANDER	A5
ROLLER	A6
TOTAL_STRIP_LENGTH	F4
TOTAL_ROUGHER_PASSES	I4
COIL_WEIGHT	F4

- ***Time stamps:***

RM_START_FIRST_PASS	DATE
RM_END_LAST_PASS	DATE
FM_START_F1	DATE
FM_END_F6	DATE
DC_END_COILING	DATE

3.4 Roll Management

3.4.1 ID 151 - Roll Data to Level 2

Message ID: 151
Sender: Level 3
Receiver: HSM
Transmission Time: roll data on level 3 available
Description:
Structure:

ROLL_ID	A7
ROLL_DIAMETER	F4
ROLL_CROWN	F4
ROLL_TAPER	F4
ECCENTRICITY_GRINDER	F4
ROLL_HARDNESS_CENTER	F4
ROLL_ROUGHNESS_CENTER	F4
YOUNGS_MODULUS	F4
POISSONS_RATIO	F4
TOP_OR_BOTTOM_IND	I4 0 = bottom 1 = top
WORK_OR_BACKUP_IND	I4 0 = work roll 1 = backup roll type 2 = backup roll type
MILL_IND	I4 0 = RM 1 = FM

3.4.2 ID 152 - Roll Change to Level 3

Message ID: 152
Sender: HSM
Receiver: Level 3
Transmission Time: roll change
Description:
Structure:

ROLL_ID_OUT	A7
TONS_ON_ROLL	F4
FOOTAGE_ON_ROLL	F4
TOTAL_COILS_ROLLED	I4
ROLL_CHANGE_REASON	A2
UNIT_CODE	A4
TOP_OR_BOTTOM_IND	I4 0 = bottom 1 = top
WORK_OR_BACKUP_IND	I4 0 = work roll 1 = backup roll type 2 = backup roll type
ROLL_STAND	A1 (1 - 6 or "R")
ROLL_ID_IN	A7

3.5 ID 199 - Metallurgical Data

Message ID:	199
Sender:	EAF, LMF, CC1, HSM
Receiver:	MST
Transmission Time:	same as HSM production result
Description:	
Structure:	
file name	A80

4. Revision and Document Distribution List

REVISION LIST

Date	Version	Author	Description
95-Dec-19	V2.0	F.Dvo	revision
96-Feb-28	as built	F.Dvo	as built

DISTRIBUTION LIST

Version	Receiver
as built	ARMCO