DEMATIC

DAI

Communication Standard

of the

EMU Emulation Interface

Authorised for release by	Role	Date

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CONTENTS

1 PURPOSE

The purpose of this document is to define a communication specification that can be used to interface between WCS and emulation tools. This communication channel is extra to the 'Normal' MHE connections that are made between the emulation and WCS.

This extra communication channel avoids having to modify existing MHE communication code, by avoiding adding 999 telegrams to the original protocols.

2 COMMUNICATIONS

Telegrams are sent between the emulation and WCS via TCP sockets.
Emulation always acts as the server and WCS is the client.
There is only a single connection between the two systems.

3 TELEGRAMS

3.1 Telegram Structure

A telegram is a single entity that can only contain a single Message. It consists of 4 Parts

- Start of Telegram
- Telegram Header
- Telegram Data
- End Of Telegram

A message is the telegram Data Field. All of the data within a telegram should be printable asci characters. Binary data is not supported in the data section.

The Start of Telegram is simply a STX character

The telegram header is always a fixed length

The Telegram Data (message) field can be any length with the proviso that the total telegram length is less than a system constant. The maximum length may change between projects.

The End of Telegram is simply an ETX character

Description	Length	Comment
Start of Telegram	1	STX
Telegram Header	14	This field uniquely identifies the telegram Type. Fixed length for every Telegram
Telegram Data	Variable	Telegram Data fields are comma separated.
End Of Telegram	1	ETX

3.2 Telegram Header.

The telegram header consists of three fields

Description	Length	Comment
Telegram Type	4	See table
Telegram Subtype	4	See table
CycleNumber(or timestamp)	6	for checking sequence in logs

The Telegram Type is a 4 character field. Current Values are defined in table under Telegram Type Values.

Each Telegram Type can have 1 or more subtypes defined.
The third field is a cycle number so that the history of the telegrams can be maintained.

3.3 Telegram Type Values

A single Telegram Type performs a specific action i.e. a FEED telegram instructs the emulation to add a TM on the emulation at a specific location. However, the emulation may require extra data so that it can create telegrams on the 'MHE' interfaces. This data may vary depending on the MHE interface.

To avoid trying to create a 'long' telegram that could cater for every eventuality, the idea of subtypes was used.

Telegram Type	Value	Sender	Comment
FEED	FEED	WCS	Used to add a TM to the emulation
REQUEST	RQST	Emulation	Used by emulation to request data from WCS
WIPE	WIPE	WCS	Remove TM from emulation
AUTOFEED	AUTO	WCS	Load a range of TMs at location
DATA	DATA	WCS	Data Requested by Emulation 02 telegram
LABEL	LABL	WCS	Label (extra) Data for a given TM
MODIFY	MDFY	WCS	Modify an existing Emulation TM
EMUCTRL	CTRL	WCS	Emulation Control

4 COMMON FIELDS

4.1 TM Types

A TM Type represents an object that can be created on the emulation model.

Value	Comment
TOTE	A Tote type object
CARTON	A carton type object
PALLET	A pallet type object
SHOPTOTE	A Shop Tote object
PALLETSTACK	A stack of pallets
TRAYCARRIER	A tray carrier object

4.2 Sub System Type

Each string represents a different messaging protocol.

String Value	Comment
BK10	BK10 Datcom sub system
BK25	BK25 Datcom sub system
MINILOAD	Miniload communications
MULTISHUTTLE	Multishuttle Datcom sub system

4.3 Exception Type

String Value	Comment
BIN_FULL	Used for a “BIN Full” exception
BIN_EMPTY	Used for a “BIN empty” exception
RETRIEVAL_BLOCKED	
PUTAWAY_BLOCKED	
COMPARTMENT_BLOCKED	
LOC_NOT_EXIST	
HEIGHT	
WEIGHT	
BLOCKADE	

4.4 Type 23 Strings

These strings will be project specific and are used by WCS to send a string to the emulation that is returned as a type 23 telegram. These will typically be created using ‘HOST’ data.

5 FEED TELEGRAM

5.1 Overview.

The Feed telegram is used by WMS to create TM's on the emulation. A separate subtype has been used for each TM type so that extra data that is specific to each data type can be sent. This eliminates redundant fields in a telegram format that tries to capture all possible dimensions.

5.2 Feed Telegram Subtypes

The following list of subtypes has been defined.

Sub Type	Value	Length	Comment
feed Tote	F001	Variable	Used to add a Tote on the emulation
feed Carton	F002	Variable	Used to add a Carton on the emulation
feed Pallet	F003	Variable	Used to add a Pallet on the emulation
feed Shop Tote	F004	Variable	Used to add a Tote on the emulation
feed empty Stack	F005	Variable	Used to add a pallet stack on emulation
feed Multiple	F006	Variable	Add multiple pallets at a single location as a single Feed. For example on a cross dock where there could be 3 quarter pallets moving as a group.
Feed Tray Carrier	F007	Variable	Used to add a subdivided tote on the emulation

5.3 Feed Tote (subtype F001)

Used by WMS to add an internal tote at a specified location. This type of tote is always contained within the warehouse. If there is only one type of internal tote in the warehouse, then the length, width and Height fields may be left blank. To create a no read, the Barcode field should be left blank.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create tote
Barcode	Variable	Fixed label on the Tote.
Length	Variable	Units mm
Width	Variable	Units mm
Height	Variable	Units mm
Weight	Variable	Units grams

Example Telegram:

<STX>FEEDF001000111,REJ1,0000034692,650,450,320,44000<ETX>

This telegram requests the emulation to add a new tote at location REJ1,
The tote will be created with:

Barcode	0000034692
Length	650mm
Width	450 mm
Height	320 mm
Weight	44Kg

<STX>FEEDF001000111,REJ1,0000034692,,,,24000<ETX>

This telegram requests the emulation to add a new tote at location REJ1,
The tote will be created with:

Barcode	0000034692
Length	standard dimension for internal tote

Width	standard dimension for internal tote
Height	standard dimension for internal tote
Weight	24Kg

5.4 Feed Carton (subtype F002)

Used by WMS to add a carton with the given dimensions at a specified location. The Label Data field may be left blank. It contains extra data that may be used when creating labels for despatch.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create carton
Carton Identifier	Variable	Fixed label on the carton. May link to a LABEL Telegram
Length	Variable	Units mm
Width	Variable	Units mm
Height	Variable	Units mm
Weight	Variable	Units gram
Label Data	Variable	Field that is project specific

Example Telegram:

<STX>FEEDF002000112,INP1,0000034693,610,450,420,27000,<ETX>

This telegram requests the emulation to add a carton at location INP1,
The carton will be created with:

Barcode	0000034693
Length	610mm
Width	450 mm
Height	420 mm
Weight	27Kg

5.5 Feed Pallet (subtype F003)

Used by WMS to create a Pallet at a specified location. The type 23 field contains a string that emulation can use to create a type 23 telegram for the PLC communications. This field will be project dependant.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create the pallet
Mission Id	Variable	Unique Identifier for the Pallet. Matches Label Telegram
Length	Variable	Pallet Length Units mm
Width	Variable	Pallet Width Units mm
Height	Variable	Pallet Height Units mm
Weight	Variable	Pallet Weight Units kg
Pallet Type	Variable	'EU' = euro 'HE' = Half 'QE' = quarter
Type 23 Data	Variable	A single string that contains the data that the emulation can use to create a BK25 type 23 telegram. If this field is empty and the location sends BK25 23 telegrams then a Label (06) telegram will be required. This string cannot contain non printable characters

Example Telegram:

<STX>FEEDF003000113,1AA1,01000025,1200,800,144,27,EU,1AA1TU_42244577801235690<ETX>

This telegram requests the emulation to add a pallet at location 1AA1,

The carton will be created with:

Barcode	01000025
Length	1200mm
Width	800 mm
Height	144 mm
Weight	27Kg
Type23	EU,1AA1TU_42244577801235690

<STX>FEEDF003000114,2AA1,01000026,,,1480,27,EU,2AA1TU_42144577801235690<ETX>

This telegram requests the emulation to add a pallet at location 1AA1,
The carton will be created with:

Barcode	01000026
Length	Standard Euro Length
Width	Standard Euro Width
Height	1480mm
Weight	27Kg
Type23	EU,2AA1TU_42244577801235690

5.6 Feed Shop Tote (subtype F004)

Used by WMS to add a Shop tote at a specified location.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create tote
Tote Barcode	Variable	Fixed label on the Tote.
Quantity	Variable	Quantity of Items on the load 0 = empty
Length	Variable	Units mm
Width	Variable	Units mm
Height	Variable	Units mm
Weight	Variable	Tote Weight Units gram

Example Telegram:

<STX>FEEDF004000111,,,600,400,353,44000<ETX>
This telegram requests the emulation to add a new tote at location REJ1,
The tote will be created with:

Barcode	0000034692
Length	600mm
Width	400 mm
Height	353 mm
Weight	44Kg

5.7 Feed Pallet Stack (subtype F005)

Used by WMS to add a Pallet Stack at a specified location.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create stack
Pallet Identifier	Variable	Unique Identifier for the Pallet.
Pallet stack Type	Variable	'E' = euro 'H' = Half 'Q' = quarter

Example Telegram:
To feed a stack of Euros at location STACK1:

<STX>FEEDF005000115,STACK1,01000125,E,<ETX>

To Feed a stack of Half Euros at location STACK2:
<STX>01F005000116,STACK2,01000126,H,<ETX>

5.8 Feed Multiple Pallets (subtype F006)

Used by WMS to add multiple pallets at a specified location that permits transportation of groups of pallets. The sum of the area of the pallet bases must not exceed the permitted pallet base area.

e.g. for a conveyor moving euro sized pallets :

1 single euro

1 or 2 half euro s

1 to 3 quarter euros

Each pallet may be linked to LABEL 06 telegrams if extra labels are required.

If there are fewer than 3 pallets loaded, then the relevant fields should be zero length.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create the pallet
Pallet Identifier	Variable	Unique Identifier forPallet 1. Matches Label Telegram
Length	Variable	Pallet 1 Length Units mm
Width	Variable	Pallet 1 Width Units mm
Height	Variable	Pallet 1 Height Units mm
Weight	Variable	Pallet 1 Weight Units Kg
Type 23 Data	Variable	A single string that contains the data that the emulation can use To create a BK25 type 23 telegram. If this field is empty and the location sends BK25 23 telegrams then a Label (06) telegram will be required. This string cannot contain non printable characters
Pallet Identifier	Variable	Unique Identifier for Pallet 2. Matches Label Telegram
Length	Variable	Pallet 2 Length Units mm
Width	Variable	Pallet 2 Width Units mm
Height	Variable	Pallet 2 Height Units mm
Weight	Variable	Pallet 2 Weight Units Kg
Type 23 Data	Variable	A single string that contains the data that the emulation can use To create a BK25 type 23 telegram. If this field is empty and the location sends BK25 23 telegrams then a Label (06) telegram will be required. This string cannot contain non printable characters
Pallet Identifier	Variable	Unique Identifier for Pallet 3. Matches Label Telegram
Length	Variable	Pallet 3 Length Units mm
Width	Variable	Pallet 3 Width Units mm
Height	Variable	Pallet 3Height Units mm
Weight	Variable	Pallet 3 Weight Units Kg
Type 23 Data	Variable	A single string that contains the data that the emulation can use To create a BK25 type 23 telegram. If this field is empty and the location sends BK25 23 telegrams then a Label (06) telegram will be required. This string cannot contain non printable characters

Usage:

Example Telegrams:

Feeding 3 quarter pallets at one time.
<STX>FEEDF006000116,BK25LOC,,600,400,444,24,SSCCData1,600,400,464,24,SSCCData2,600,400,321,24,SSCCData3<ETX>

Feeding 2 pallets at one time.
<STX>FEEDF006000116,BK25LOC,,600,400,444,24,SSCCData1,600,400,464,24,SSCCData2,,,,,<ETX>

Feeding a single pallet at one time.
<STX>FEEDF006000116,BK25LOC,,600,400,444,24,SSCCData1,,,,,,,,,<ETX>

WMS/WCS will actually only send a single mission for the group. Therefore this group will be deleted by a delete pallet (W003) telegram.

5.9 Feed Tray Carrier (subtype F007)

Used by WMS to add a tray carrier at a specified location. Each tray has a unique barcode.

If a tray is not present then the appropriate tray Barcode field should be left blank

If there is only one type of tray carrier in the warehouse, then the length, width and Height fields may be left blank and the default values will be assumed. To create a no read, the Barcode field should be filled with the characters specified in the BK10 specification .

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create tray
Barcode	Variable	Fixed label on the Tray Carrier.
Length	Variable	Units mm
Width	Variable	Units mm
Height	Variable	Units mm
Weight	Variable	Units grams
Tray1 barcode	Variable	Fixed label on the Tray.
Tray2 barcode	Variable	Fixed label on the Tray.
Tray3 barcode	Variable	Fixed label on the Tray.
Tray4 barcode	Variable	Fixed label on the Tray.

Example Telegram:

<STX>FEEDF001000111,REJ1,0000034692,650,450,320,44000,,,,<ETX>

This telegram requests the emulation to add a new tray carrier at location REJ1, The carrier contains NO trays.

The carrier will be created with:

Barcode	0000034692
Length	650mm
Width	450 mm
Height	320 mm
Weight	44Kg

<STX>FEEDF001000111,REJ1,0000034692,,,,24000,0000123456,0000123457,,<ETX>

This telegram requests the emulation to add a new tray carrier at location REJ1; this carrier contains two trays
The tote will be created with:

Barcode	0000034692
Length	standard dimension for internal tote
Width	standard dimension for internal tote
Height	standard dimension for internal tote
Weight	24Kg

Tray1	0000123456
Tray2	0000123457
Tray3	not used
Tray4	not used

6 REQUEST TELEGRAM

6.1 Overview.

This telegram is sent from the emulation to WCS when it requires information. Data is normally returned by WCS using a type 05 DATA telegram with a subtype of the original 02 telegram. This telegram will probably be project specific.

6.2 Telegram Subtypes

The following list of sub-types has been defined.

Sub Type	Value	Sender	Comment
Request ULID's	R001	Emulation	Request valid ULID's
Request Pallet	R002	Emulation	Request pallet data. This telegram should be sent on a fixed period if SSI is not connected. WCS will respond with a data telegram if a pallet is available
Request Barcode	R003	Emulation	If emulation only knows a Mission ID for a tm it will request the Barcode when needed.
Request Delete	R004	Emulation	Request Delete from WCS

6.3 Request ULID list (subtype R001)

Tm's may need to be created at certain points on the emulation. An example of this could be totes coming out of a tote de-stacker. The Emulation should not create its own barcodes as there is a possibility of the creation of duplicate labels. Instead, whenever the emulation model runs low on ULID's, it will send a request for a list of ULID's. WCS will respond with a DATA (Subtype D001) telegram.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create TM
Tm Type	Variable	See 4.1
Quantity	Variable	Count of TmIds required

Example Telegram:

<STX> <ETX>

This telegram requests WCS to supply a list of 50 Unit Load Id's (barcodes) that are suitable for identifying TM's of type TOTE at location 14CE01.

6.4 Request FEED (subtype R002)

At certain locations the emulation model will need to request FEED data from WCS.
These locations are different from normal WCS FEED positions as they are not always available to WCS.
When one of these locations becomes available and empty, then emulation can request that a TM is placed on the location.
If WCS does not have an available TM, then it will not send a FEED telegram.
If there is a suitable TM then it sends a FEED that is suitable for the location. (e.g. a tote on BK10).
It is expected that the emulation will periodically send the Request FEED telegram while the location is available.

Description	Length	Comment

Location	Variable	Conveyor location where FEED is required
Sub System Type	Variable	See 4.14.1

Example Telegram:

<STX>RQSTR002000001,1AA1,BK25<ETX>

6.5 Request Barcode (subtype R003)

There are points within the emulation where TM's move from one MHE system (e.g. multishuttle) to a different MHE system (e.g. BK10 conveyor) and the emulation needs to switch between using Mission ID's and real barcodes. This telegram is sent by the emulation.

The type of Data telegram that is returned is dependent on the TM Type.

Description	Length	Comment
MissionID	Variable	Mission ID for tote. Emulation requests the appropriate barcode for the tote with this Mission ID.
TM Type	Variable	See 4.1

Example Telegram:

<STX>RQSTR003000001,0100000011,TRAYCARRIER<ETX>

6.6 Request Delete (subtype R004)

There are points in the emulation where WCS should control the deletion of TM's from the model, e.g. if a TM arrives at a manual station and WCS needs to control the deletion at this point. Before deletion the emulation will request a deletion message from WCS, when an operator is available to remove the tote then WCS will send a delete message and the emulation will remove the TM from the model.

Description	Length	Comment
Barcode	Variable	Barcode of TM at location
Location	Variable	Conveyor location where emulation requests from
Tm Type	Variable	See 4.1

Example Telegram:

<STX>RQSTR004000001,0100000011,PP01,TOTE<ETX>

6.7 Request Release (subtype R005)

There are points in the emulation where WCS should control the release of TM's from a location in the model, e.g. if a TM arrives at a manual station and WCS needs to control when an operator completes an operation and pushes the carton manually back to a take away conveyor. The emulation will send a request and when the manual operation is complete WCS will send a RELEASE message to move the TM onto the takeaway conveyor.

Description	Length	Comment
Barcode	Variable	Barcode of TM at location
Location	Variable	Conveyor location where emulation requests from
Tm Type	Variable	See 4.1

Example Telegram:

<STX>RQSTR005000001,0100000011,PS01,CARTON<ETX>

7 DELETE (WIPE) TELEGRAM

7.1 Overview.

This telegram is sent by WCS when a TM needs removing from the emulation. An example of this is at a pick station where a stock tote arrives at the pick station. If it is picked to empty and the totes are manually removed, then the tote will need removing from the emulation.

If it is part-picked then WCS will send a mission to move it using the standard Datcom BK10 protocol.

7.2 Telegram SubTypes.

The following list of sub-types is defined.

Sub Type	Value	Sender	Comment
Delete Tote	W001	WCS	Wipe Tote
Delete Carton	W002	WCS	Wipe Carton
Delete Pallet	W003	WCS	Wipe Pallet
Delete Shop Tote	W004	WCS	Delete Shop Tote
Delete Tray Carrier	W005	WCS	Delete Tray Carrier

There is no need for delete telegrams

7.3 Delete Tote (subtype W001)

This telegram is sent by WCS when it requires the emulation to remove a tote from the model. If the location field is not set, then the emulation can delete the tote at the most suitable location.

This telegram will remove all ‘Tote’ type TM’s e.g. shop totes.

If the tote was created using FEED subtype F007 – i.e. the tote contained trays – then the trays will also be deleted.

Description	Length	Comment
Tote Barcode	Variable	Fixed label on the Tote.
Location	Variable	Conveyor location where emulation should delete TM

Example Telegram:

To remove tote 350001010 from the emulation when it is at REJ1 send :

<STX>WIPEW001000001,350001010,REJ1<ETX>

To remove tote 350001010 from the emulation send :

<STX>WIPEW001000001,350001010,<ETX>

7.4 Delete Carton (subtype W002)

This telegram is sent by WCS when it requires the emulation to remove a Carton from the model. If the location field is not set, then the emulation can delete the carton at the most suitable location.

Description	Length	Comment
Tote Barcode	Variable	Fixed label on the Tote.

Location	Variable	Conveyor location where emulation should delete TM

Example Telegram:

<STX>WIPEW002000011,2513456789,REJ2<ETX>

7.5 Delete Pallet (subtype W003)

This telegram is sent by WCS when it requires the emulation to remove a pallet from the model. If the location field is not set, then the emulation can delete the pallet at the most suitable location.

The telegram may also be used to delete other pallet based TM's if required.

Description	Length	Comment
Pallet Identifier	Variable	Unique Identifier for the Pallet.
Location	Variable	Conveyor location where emulation should delete TM

Example Telegram:

To delete a pallet when it arrives at C01NH1:

<STX>WIPEW003000011,01000002,C01NH1<ETX>

To delete a pallet:

<STX>WIPEW003000011,01000002,<ETX>

7.6 Delete Shop Tote (subtype W004)

This telegram is sent by WCS when it requires the emulation to remove a shop tote from the model. If the location field is not set, then the emulation can delete the TM at the most suitable location.

Description	Length	Comment
Tote Barcode	Variable	Fixed label on the Shop Tote.
Location	Variable	Conveyor location where emulation should delete TM

Example Telegram:

To remove tote 350001010 from the emulation when it is at REJ1 send :

<STX>WIPEW004000001,350001010,REJ1<ETX>

To remove tote 350001010 from the emulation send :

<STX>WIPEW004000001,350001010,<ETX>

7.7 Delete Tray Carrier (subtype W005)

This telegram is sent by WCS when it requires the emulation to remove a tray carrier from the model. If the location field is not set, then the emulation can delete it at the most suitable location.

Use the modify message to delete (remove) a tray from the tray carrier..

Description	Length	Comment
Tray Identifier	Variable	Unique Identifier for the Tray.
Location	Variable	Conveyor location where emulation should delete TM

Example Telegram:

To delete a tray carrier when it arrives at C01NH1:

<STX>WIPEW005000011,01000002,C01NH1<ETX>

To delete a tray carrier:

<STX>WIPEW005000011,01000002, <ETX>

To delete a tray from a tray carrier:

<STX>MDFYM005000111, 01000002,,,,,,,0000123457,,<ETX>

8 AUTOFEED TELEGRAM

8.1 Overview.

This message can be used to tell the emulation to feed a list of TM's in at a location. The telegram Could be used for example to feed empty totes onto a conveyor.

8.2 Auto-feed Subtypes

There are no automatic load subtypes defined. Telegram will be used to feed a list of TM's at a given location on a set period or from a file.

Subtype	Value	Sender	Comment
Auto-feed Totes	A001	WCS	All the totes have the same dimensions

8.3 Auto-feed Totes (subtype A001)

Used by WMS to add internal totes at a specified location.

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create totes
Feed Rate	Variable	Rate(emulation time) at which to feed totes (units seconds)
Length	Variable	Units mm
Width	Variable	Units mm
Height	Variable	Units mm
Weight	Variable	Units grams
Tote label list	Variable	Pipe '|' separated list of barcodes

Example Telegram:

<STX>AUTOA001000111,INP1,60,650,450,320,44000,0000034692|0000034693|0000034694<ETX>

This telegram requests the emulation to add three totes at location INP1, with a period of 60 seconds (emulation time).
The tote will be created with:

Barcode	0000034692, 0000034693, 0000034694,
Length	650mm
Width	450 mm
Height	320 mm
Weight	44Kg

<STX>01F001000111,REJ1,30,0000034692,,,,24000<ETX>

This telegram requests the emulation to add a new tote at location REJ1,
The tote will be created with:

Barcode	0000034692
Length	standard dimension for internal tote
Width	standard dimension for internal tote
Height	standard dimension for internal tote
Weight	24Kg

9 DATA TELEGRAM

WCS sends this telegram in response to a type 02 (Request Data) from the emulation.

The telegram contains data specific to the subtype.

9.1 Overview.

9.2 Data telegram Subtypes.

The following list of sub-types has been defined.

Subtype	Value	Sender	Comment
ULID List	D001	WCS	
Barcode	D002	WCS	Returns a single Barcode associated with a mission Id
Barcode List	D003	WCS	Returns a list of barcodes associated with a mission Id

9.3 Unit Load ID List (subtype D001)

Description	Length	Comment
Location	Variable	Conveyor location where emulation should create tote
List of ULID's	Variable	Comma separated ULID's

Usage:

Whenever the emulation model request ULID's, the WCS will send a list of valid ULID's.

Emulation model to DAI WMS:

1. The emulation model requests a valid range of 100 ULID's for the location 'bk10loc' and Tm type 'Tote' by sending the telegram:
   <STX>RQSTR001000001,bk10loc,Tote,100<ETX>
2. WMS sends a list of 100 valid ULID's to the emulation model. Telegram:

<STX>DATAD001000001,bk10loc,2000032978,2000032985,...,2000033968<ETX>

9.4 Barcode Data (subtype D002)

Description	Length	Comment
Mission ID	Variable	As sent in the request telegram
Barcode	Variable	Appropriate barcode for the TM Type
TM Type	Variable	TM type e.g. TOTE, CARTON

If emulation only knows the Mission ID then a request for Barcode will be sent.

1. The emulation model request Barcode for the tote with mission ID 0100000014
   <STX>RQSTR003000001,0100000014,TOTE<ETX>
2. WMS response with Barcode 0000003667:

<STX>DATAD002000030,0100000014,0000003667,CARTON<ETX>

9.5 Barcode Data (subtype D003)

Description	Length	Comment
Mission ID	Variable	As sent in the request telegram
Carrier Barcode	Variable	Barcode for the carrier
TM Type	Variable	TM Type e.g. TOTE, CARTON
Insert Barcode 1	Variable	Barcode for the insert; empty if no insert
Insert Barcode 2	Variable	Barcode for the insert; empty if no insert
Insert Barcode 3	Variable	Barcode for the insert; empty if no insert
Insert Barcode 4	Variable	Barcode for the insert; empty if no insert

If emulation only knows the Mission ID then a request for Barcode will be sent.

1. The emulation model request Barcode for a carrier with mission ID 0100000014
   <STX>02R003000001,0100000014, TRAYCARRIER <ETX>
2. WMS response with Barcode 81003667 with inserts 41000225 and 41000226:

<STX>05D002000030,0100000014,81003667,41000225,41000226,,<ETX>

Without barcodes as follows

<STX>05D002000030,0100000014,81003667,,,,<ETX>

10 LABEL DATA TELEGRAM

10.1 Overview.

This telegram is sent by WCS to the emulation. It contains data that would have been scanned as the TM passes contour checks etc. It could be used to create a type 23 message for the BK25 subsystem.

10.2 Label Subtypes

Sub Type	Value	Sender	Comment
BK25 Type23	L001	WCS	Telegram containing type 23 telegram body
BK10 Type23	L002	WCS	Telegram containing type 23 telegram body

Subtypes can be defines for each type of label data required. It is assumed that this message will be targeted per project.

10.3 BK25 Type23 Data (Sub-type L001)

Description	Length	Comment
Pallet Identifier	Variable	Unique Identifier for a pallet.
Type 23 Data	Variable	A single string that contains the data that the emulation can use To create a BK25 type23 telegram.

Example Telegram:

<STX>LABLL001000011,01000001,<project specific data><ETX>

10.4 BK10 Type23 Data (Sub-type L002)

Description	Length	Comment
Tray Identifier	Variable	Unique Identifier for the tray.
Type 23 Data	Variable	A single string that contains the data that the emulation can use To create a BK10 type23 telegram.

Example Telegram:

<STX>LABLL002000011,01000001,<project specific data><ETX>

11 MODIFY DATA TELEGRAM TYPE 07

11.1 Overview.

This telegram is sent by WCS to the emulation to change settings for an existing TM.

The following list of subtypes has been defined:

Subtype	Value	Sender	Comment
Modify Tote	M001	WCS	Modify an existing emulation Tote TM
Modify Carton	M002	WCS	Modify an existing emulation Carton TM
Modify Pallet	M003	WCS	Modify an existing emulation Pallet TM
Modify Tray Carrier	M005	WCS	Modify an existing emulation tray Carrier

11.2 Modify Tote (subtype M001)

Used by WMS to modify TM data on the emulation. It is unlikely that the dimension of the tote would change; but the weight could.

Description	Length	Comment
Tote Barcode	Variable	Fixed label on the Tote.
New Quantity	Variable	Quantity of Items on the load 0 = empty Tote
New Length	Variable	Tote Length Units mm Keep original if blank
New Width	Variable	Tote Width Units mm Keep original if blank
New Height	Variable	Tote Height Units mm Keep original if blank
New Weight	Variable	Tote Weight Units gram Keep original if blank

Example Usage:

Where a tote is returned to storage after picking, and the tote is weighed by a weighing machine that is part of the emulation.

Example Telegram:

<STX> MDFYM001000141,3500012345,1,0650,0450,0320,0130<ETX>

11.3 Modify Carton (subtype M002)

Used by WMS to modify TM data on the emulation. It is unlikely that the dimension of the tote would change; but the weight could.

Description	Length	Comment
Carton Identifier	Variable	label on the Carton.
New Carton Identifier	Variable	New label on the carton. Keep original if blank
New Length	Variable	Tote Length. Units mm. Keep original if blank
New Width	Variable	Tote Width. Units mm. Keep original if blank
New Height	Variable	Tote Height. Units mm. Keep original if blank
New Weight	Variable	Tote Weight. Units gram Keep original if blank

Example Telegram:

This telegram will change the weight of the existing carton.

<STX>MDFYM002000011,3209345678,,,,6789<ETX>

This telegram requests that the carton label identifier is changed.
<STX>MDFYM002000011,3209345678, 1209345678,,,,<ETX>

11.4 Modify Pallet (subtype M003)

Used by WMS to modify Pallet data on the emulation.

Description	Length	Comment
Pallet Identifier	Variable	Fixed label on the Tote.
New Quantity	Variable	Quantity of Items on the load 0 = empty Pallet
New Length	Variable	Pallet Length Units mm. Keep original if blank
New Width	Variable	Pallet Width Units mm. Keep original if blank
New Height	Variable	Pallet Height Units mm. Keep original if blank
New Weight	Variable	Pallet Weight. Units Kg , Keep original if blank

Example Telegram:

This telegram will change the height and weight of an existing pallet.

<STX>MDFYM003000011,01004001,,,,1674,789<ETX>

11.5 Modify Shop Tote (subtype M004)

Used by WMS to modify TM data on the emulation. It is unlikely that the dimension of the tote would change; but the weight could.

Description	Length	Comment
Tote Barcode	Variable	Fixed label on the Tote.
New Quantity	Variable	Quantity of Items on the load 0 = empty Tote
New Length	Variable	Tote Length Units mm Keep original if blank
New Width	Variable	Tote Width Units mm Keep original if blank
New Height	Variable	Tote Height Units mm Keep original if blank
New Weight	Variable	Tote Weight Units gram Keep original if blank

Example Usage:

Where a tote is returned to storage after picking, and the tote is weighed by a weighing machine that is part of the emulation.

Example Telegram:

<STX> MDFYM004000141,3500012345,1,0650,0450,0320,0130<ETX>

11.6 Modify Tray Carrier (subtype M005)

Used by WMS to modify TM data on the emulation. It is unlikely that the dimension of the tote would change; but the weight could.

To add a tray to the existing tote on the emulation, add the tray label data to the telegram.

To remove a tray from an existing tote on the emulation; leave the appropriate tray label field blank.

Description	Length	Comment
Barcode	Variable	Fixed label on the Tray Carrier.
New Length	Variable	Tote Length Units mm Keep original if blank
New Width	Variable	Tote Width Units mm Keep original if blank
New Height	Variable	Tote Height Units mm Keep original if blank
New Weight	Variable	Tote Weight Units gram Keep original if blank
New Tray1 Barcode	Variable	Tray Label Data: Blank = not present
New Tray2 Barcode	Variable	Tray Label Data: Blank = not present
New Tray3 Barcode	Variable	Tray Label Data: Blank = not present
New Tray4 Barcode	Variable	Tray Label Data: Blank = not present

Example Usage:

A carrier was created on emulation with two trays.

<STX>FEEDF001000111,REJ1,0000034692,2,,,24000,0000123456,0000123457,,<ETX>

This telegram requests the emulation to add a new carrier at location REJ1; it contains two trays The tray carrier will be created with:

Barcode	0000034692
Length	standard dimension for internal tote
Width	standard dimension for internal tote
Height	standard dimension for internal tote
Weight	24Kg
Tray1	0000123456
Tray2	0000123457
Tray3	not used
Tray4	not used

Example Telegram:

To remove tray 1.

<STX>MDFYM005000112,0000034692,,,,,,,0000123457,,<ETX>

To remove tray 2.

<STX>MDFYM005000112,0000034692,,,,,,0000123456,,,<ETX>

To remove both tray2.

<STX>MDFYM005000112,0000034692,,,,,,,,,<ETX>

12 RELEASE TELEGRAM

12.1 Overview.

This telegram is sent by WCS when a TM need to be released from its current position but there are no standard conveyor messages to do this. An example of this is at a pick station where a stock tote arrives at a station, is manually scanned, picked from, then manually pushed back to a takeaway conveyor.

12.2 Telegram SubTypes.

The following list of sub-types is defined.

Sub Type	Value	Sender	Comment
Release TM	S001	WCS	Release TM

12.3 Release TM (subtype S001)

Release TM from current position onto take away conveyor

Description	Length	Comment
Barcode	Variable	Barcode of TM at location
Location	Variable	Conveyor location where emulation requests from
Tm Type	Variable	See 4.1

Example Telegram:

<STX>RELES001000001,0100000011,PP01,CARTON<ETX>

13 EMULATION CONTROL

13.1 Overview.

This telegram is sent by WCS to the emulation to change operating conditions.

The following list of subtypes have been defined

Subtype	Value	*Sender*	Comment
Set Emulation Speed	E001	*WCS*	Set the emulation Speed
Pause/un-pause	E002	*WCS*	Pause / restart the emulation (communications stay live)
Set Connection Mode	E003	*WCS*	Set the Connection to LISTENING/DISCONNECTED/
Set Exception Mode	E004	*WCS*	Setup a mode where an exception will occur
Set Location Fault	E005	*WCS*	Request a change in the fault status of a piece of equipment.
Pause TM at LOC	E006	*WCS*	Pause emulation when TM arrives at specified Location

13.2 Set Emulation Speed (subtype E001)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
New Speed	Variable	Values are 1,5,10,20

Example Telegram:

Set the emulation speed to 1.

<STX>CTRLE001000001,1<ETX>

13.3 Pause/un-pause emulation (sub-type E002)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
Pause Flag	variable	0 = Pause, any other value = run

Example Telegram:

To pause the emulation

<STX>CTRLE002000001,0<ETX>

To un-pause the emulation
<STX>CTRLE002000002,1<ETX>

13.4 Set Connection State (subtype E003)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
Link	Variable	ALL, or a TSAP or a link number
State	Variable	LISTEN, DISCONNECT

Example Telegram:

To disconnect every socket:

<STX>CTRLE003000001,ALL,DISCONNECT<ETX>

To test matflow restart when the PLC drops connection
<STX>CTRLE003000002,41,DISCONNECT<ETX>
<STX>CTRLE003000003,41,LISTEN<ETX>

13.5 Setup Crane Exception (subtype E004)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
Subsystem	Variable	See 4.2
Aisle or location	Variable	1 to Max Aisle or actual Level3 location
Exception Type	Variable	See 4.3

Example Telegrams:

To set up a highbay bin full exception next time a pallet is stored in aisle 1
<STX>CTRLE004000001,BK25,1,BIN_FULL<ETX>

To set up a miniload bin empty exception next time a tote is retrieved in aisle 2
<STX>CTRLE004000002,MINILOAD,2,BIN_EMPTY<ETX>

To set up a multishuttle bin full exception next time a tote is stored in any aisle.
<STX>CTRLE004000003,MULTISHUTTLE,ALL,BIN_FULL<ETX>

13.6 Set Location Fault (subtype E005)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
Subsystem	Variable	See 4.2
Location identifier	Variable	Format depends on the subsystem type
State	Variable	FAULT, CLEAR

Example Telegram:

To test BK25 routing, where there are alternative routes.

<STX>CTRLE005000001,BK25,1AA,FAULT<ETX>

13.7 Conditional Pause(subtype E006)

Used by WMS to change a setting on the emulation.

Description	Length	Comment
Barcode	Variable	Fixed label on the Tote.
Subsystem	Variable	See 4.2
Location	Variable	Level3 location

Example Telegrams:

Pause emulation when Pallet with missionID 0100000001 arrives at C01AB4

<STX>CTRLE005000001,0100000001,BK25,1,C01AB4<ETX>

14 EMULATION MODEL UPDATE

14.1 Overview.

This telegram is sent by the emulation to WCS to update on a model status change

The following list of subtypes have been defined

Subtype	Value	*Sender*	Comment
Reset	L001	*Emulation*	All or part of the emulation model has been reset

14.2 Reset(subtype L001)

Used by the emulation to inform WCS that a reset has occurred and data tidy might be required.

Description	Length	Comment
Sub System	Variable	Area of model that has been reset

Example Telegrams:

The whole model has been reset:

<STX>MODEL001000001,ALL<ETX>

Multishuttle Aisle 1 (MS01) has been reset:

<STX>MODEL001000002,MS01<ETX>

Document History

Between versions of this document, changes are normally highlighted using Word's change tracking.