CHHATRAPATI SHIVAJI INTERNATIONAL AIRPORT

BAGGAGE HANDLING SYSTEM

INTERFACE SPECIFICATION

APPLICATION PROTOCOL: SAC2PLCGW

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1. REVISIONS

Version	Release	Date	Init.	Description
1	00	22-Jun-2010	HS C	Initial version. – Please take note the all IP address not yet defined.
1	01	23-Jun-2010	HSC	Modify the application code to make both primary and secondary have same code. The entire Primary PLC connection will connect to SAC server 1 and the all Secondary PLC will connect to SAC Server 1. For PLC-MES, it also same.

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2. PREFACE

2.1 DOCUMENT OBJECTIVE

The objective of this document is to specify the SAC-PLC standard application protocol used in PALS-BHS, a standard Baggage Handling System (BHS) product from Pteris Global Limited.

For the application protocol all telegrams are defined and the transport protocol for exchanging them is specified.

2.2 SCOPE

It is the scope of this document to state all necessary information needed in order to implement the Item Tracking application protocol for SAC-PLC interface.

2.3 AUDIENCE

This interface specification is intended as a technical document specifying the protocols. Also the document serves, as the technical basis when deciding which standard transport protocols should be used in a particular solution.

2.4 DOCUMENT ORGANISATION

2.5 DOCUMENT LIMITATIONS

The transport protocol is described in [IR-102-08-1.00 IS_TP_EIP&CIP].

2.6 DOCUMENT MAINTENANCE

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3. INTRODUCTION

This document describes the interface between SAC and Plant Control, usually referred to as PLC.

A general design guideline of the system is to minimize the number of re-identifications of a bag on its journey through the Baggage Handling System, as this is the only way to reduce transport times. Therefore the interfaces are mostly based on tracking the bag through the connections/interfaces of different system sections.

The general tracking is performed by using a Global Identifier (GID). All subsystems use this GID to keep tracking and when the item is transferred from one subsystem to another the GID is exchanged.

3.1 BAGGAGE FLOW

The picture shown in is the layer diagram of BHS outbound conveyor system in Chhatrapati Shivaji International Airport.   The red colour is the PLC tracking line.

From the HLC point of view, the baggage process flow in the BHS can be described in following 7 sections:

- Check-in and Transport Lines - From check-in counter to scanner and dimension check array;
- Level 1/2 HBS Lines - From scanner and dimension check array to vertical sorter (VS) located after Level 1/2 X-ray machine;
- Level 3/4 EDS Lines - From VS located after Level 1/2 vertical sorter to VS located after Level 3 EDS machine;
- Level 5 Inspection Lines - From VS located after Level 3 EDS machine to Level 5 screening area;
- Manual Encoding Line;
- Early Baggage Storage Line and Early Baggage Reloading Line;
- Sortation Tilt-Tray Sorter (not included in this document);

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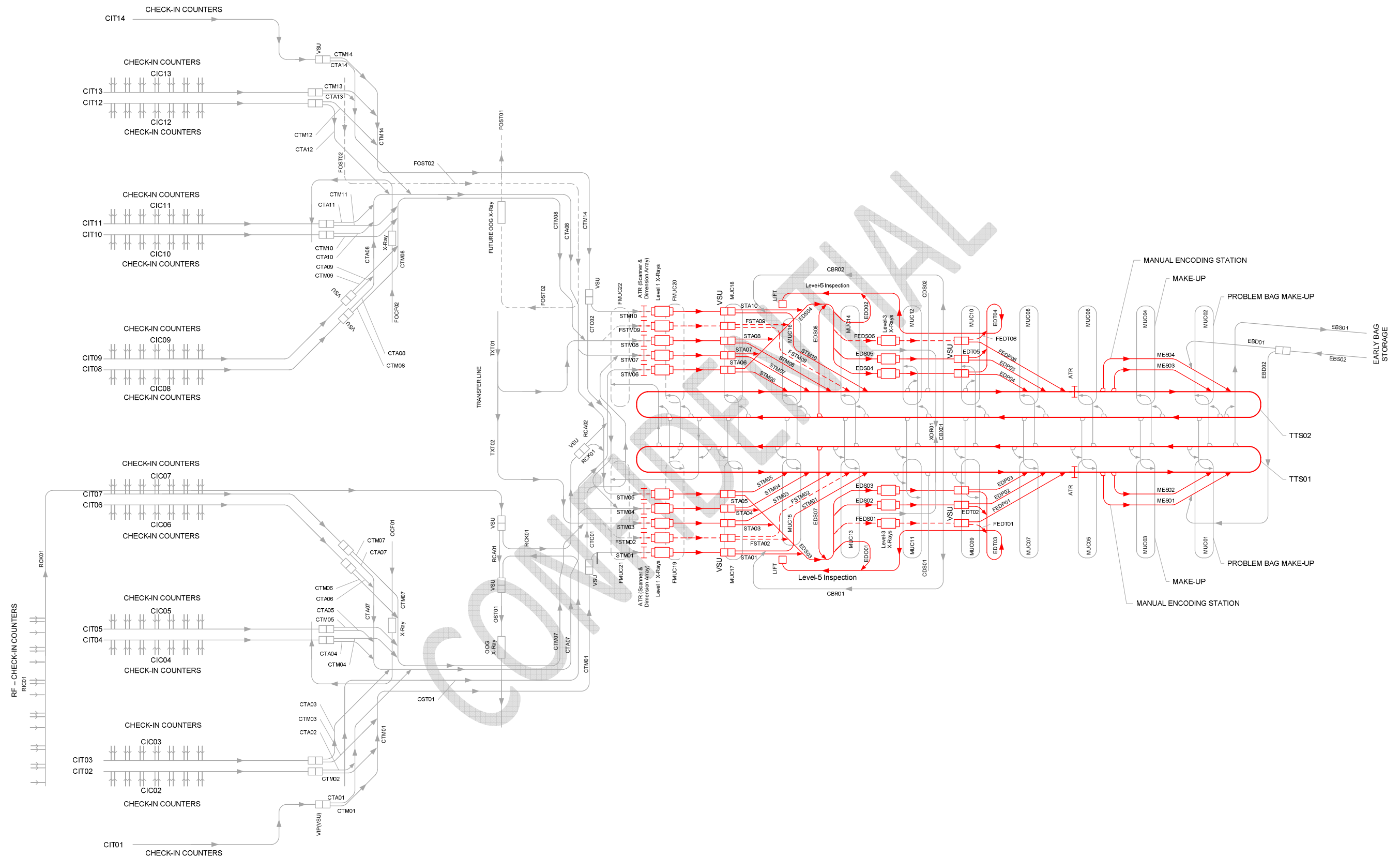
Figure 3-1: BHS Process Flow and Tracking (Red Colour) Diagram

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3.2   CHECK-IN AND TRANSPORT LINES

The normal size bag enters into BHS system from the check-in counter. The oversize baggage will be identified by check-in operator and instructed to oversize check-in line. Due to the oversize baggage is not sent to Tilt-tray Sorter for sortation, below control process flow descriptions are solely for normal size baggage.
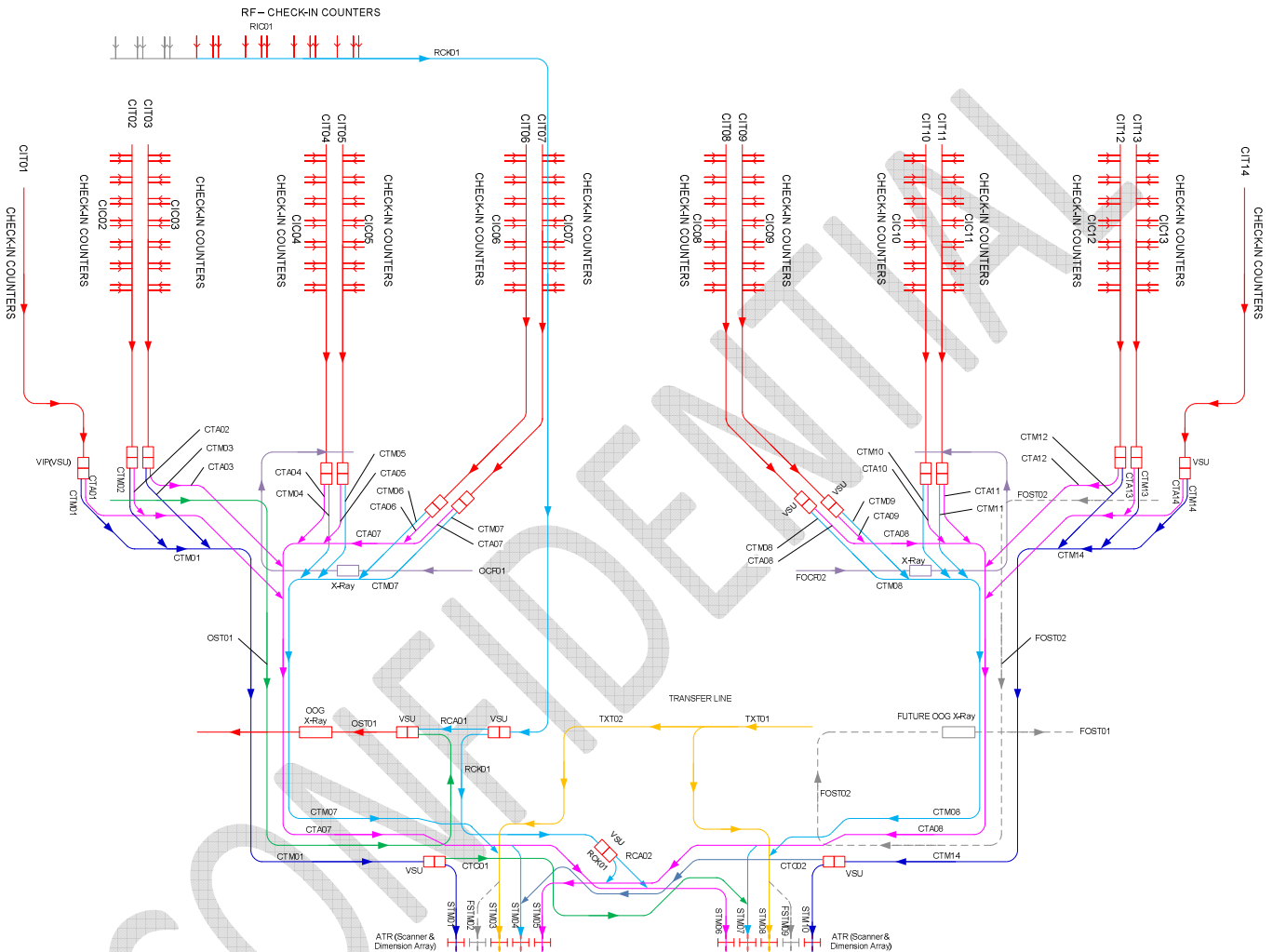
Figure 3-2: Check-in and Transport Lines

The normal size originating outbound bags are entered into check-in line from check-in counters located in the 8 check-in islands, which are consisted of 14 check-in rows (CIT01~14). Originating outbound bag will be transported from check-in area towards the scanner and dimension check arrays located on 8 screening transport mainlines (SMT01, STM03~08 and STM10). The transfer baggage will be loaded onto transfer lines (TXT01 and TXT02) and conveyed towards the scanner and dimension check array located on 2 screening transport mainlines (STM03 and STM08). The load balancing control is implemented at LLC PLC control level to distribute the bags come from 14 check-in line take-away conveyors and 2 transfer lines to 8 screening transport mainlines.

The baggage transportation control on check-in and transport lines indicated in **Figure 3-2** does not require HLC involvements. It is solely controlled by PLC in LLC level.

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3.3   LEVEL 1/2 HBS LINES

Before the bag passed through ATR, PLC will generate GID and send to HLC SAC by using GID Used (GID) telegram message as normal bag. This is the start of tracking point. Bag tag will be scanned and the dimension will be measured when the physical bag passes the ATR (scanner and dimension measurement array) that is located before Level 1/2 X-ray machines on each screening transport mainline. PLC will forward the scanned bag tag number and dimensional to HLC SAC system through Item Scanned (ISC) and Baggage Measurement Array Message (BMAM) telegrams. The tag number and dimension check result will be tracked by PLC during the bag's travelling along the conveyor.

Telegram Types:

BMAM – Baggage Measurement Array Message

FBTI – Fallback Tag Information Telegram

GID – GID Generated Telegram

ICR – Item Screened Telegram

ICCR – Item Customs Screened Telegram

IPR – Item Proceeded Telegram

ILT – Item Lost Tracking Telegram

IMSL – Item Minimum Security Level Telegram

IRD – Item Redirect Telegram

ISC – Item Scanned Telegram

ITI – Item Tracking Information Telegram

SSTL – Special Security Tag Level Telegram

SSTD – Special Security Tag Destination Telegram

TSYN – Time Synchronization Telegram
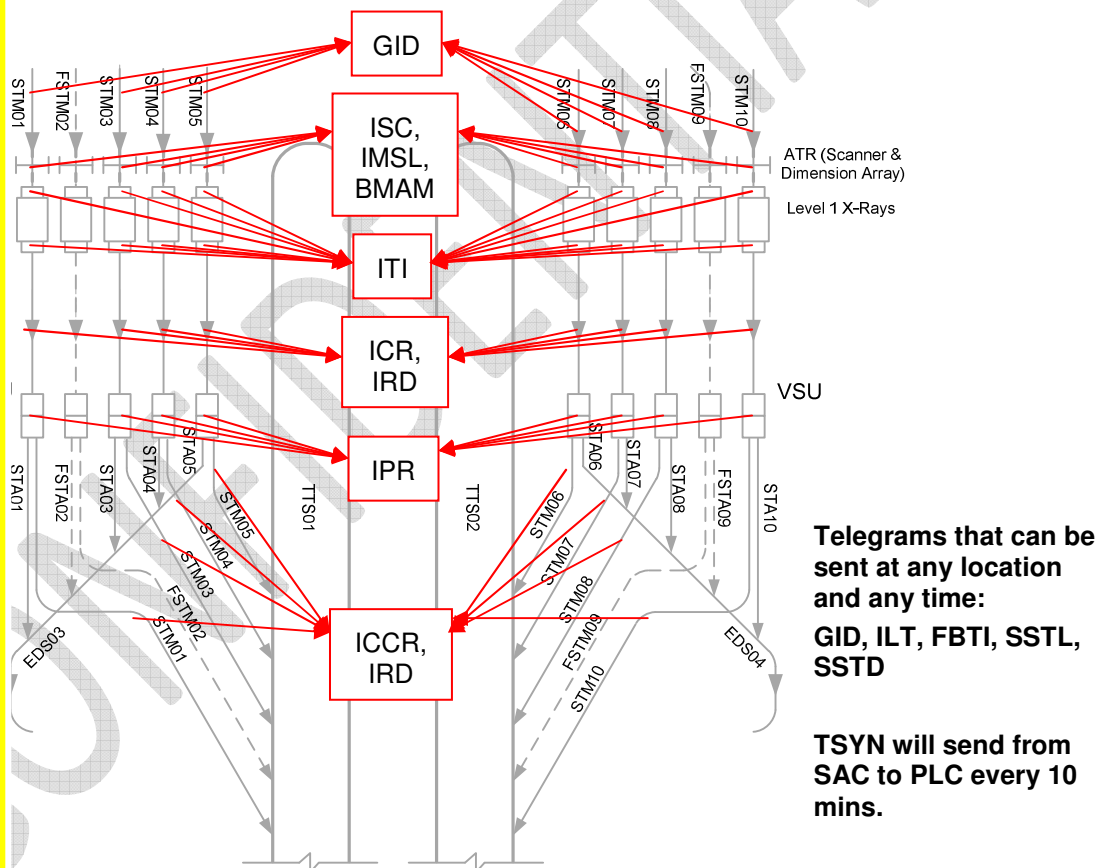
Figure 3-3: Level 1/2 HBS Lines

After receives the tag number, SAC will look up the minimum HBS screening level associated to the bag and return it to PLC through Item Minimum Security Level (IMSL) telegram. The minimum HBS screening level setting will then be tracked by PLC during the bag's travelling along the conveyor.

Before entry to and after exit the AT machine, PLC will send Item Tracking Information to SAC to use for reporting purpose.

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After the bag is screened by Level 1 X-ray machine, the screening result will be sent from X-ray machine to PLC, and then forwarded from PLC to SAC through Item Screened (ICR) telegram.

In HLC layer, the minimum screening level will be verified by SAC after it receives the Level 1 and Level 2 screening result from PLC. If the result is "Accepted" and the level of screening meets bag's minimum screening level requirement, then SAC will look up customs sort destination (Customs Chute line) and returned to PLC through Item Redirect (IRD) telegram. If the screening result is not "Accepted", e.g. the result is "Rejected", "Timeout", "No Picture", etc., or the result is "Accepted" but the screening level is below the minimum screening level requirement, then there is no bag sort destination is looked up by SAC and returned to PLC. The Item Redirect (IRD) telegram will not send to PLC.

The purpose of returning bag sort destination from SAC to PLC is for forwarding the sort destination from PLC to TTS controller (CMC) via PLC-CMC direct data interface during the physical bag transferring from conveyor to TTS induction. So that the intelligence induction control can be performed by TTS controller for those bags with sort destination attached to reducing bag recirculation on TTS due to tray discharge sequence. The intelligence induction control is not applied to bags that do not have sort destination, e.g. no-read by ATR, no sort destination returned from SAC, or lost tracking by PLC after ATR, etc.

At LLC layer, after receive bag's Level 1 and Level 2 screening result from AT machine, PLC will verify the screening result, bag's minimum screening level requirement, and bag's dimension check result tracked along with bag. If the result is "Accepted" and the level of screening meets bag's minimum screening level requirement, PLC will divert it to TTS via vertical sorter. If the screening result is not "Accepted", e.g. the result is "Rejected", "Timeout", "No Picture", etc., or the result is "Accepted", but the level of screening result is below the minimum screening level requirement, PLC will divert the bag to Level 3 EDS line (EDS03 and EDS04) via vertical sorter and PLC will send Item Proceeded (IPR) telegram to SAC.

For those bags whose tag is not read by ATR, SAC is not able to return bag's minimum screening level to PLC. In this scenario, at HLC layer, there is no bag sort destination is looked up and returned to. The Item Redirect (IRD) telegram will not send to PLC. At LLC layer, PLC will control the vertical sorter based on the Level 1 or 2 screening result without verify the minimum screening level. If bag's Level 1 screening result is "Accepted" or Level 1 screening result is not "Accepted" but its Level 2 result is "Accepted", PLC will divert the bag to TTS. The bag's minimum screening result will be verified when bag tag is detected by TTS ATR or Manual Encoding Station and tilted to Level 3 discharge if minimum screening level is not met. If both Level 1 and Level 2 screening result of no-read bag are not "Accepted", the PLC will divert the bag to Level 3 EDS line (EDS03 and EDS04) via vertical sorter and PCL will send Item Proceeded (IPR) telegram to SAC.

For those good read bags but lost track by PLC after ATR and before AT machine, after SAC receives bag's Level 1 or 2 screening result through ICR, PLC will divert them based on HBS screening result without verify the minimum screening level. If bag's Level 1 screening result is "Accepted" or Level 1 screening result is not "Accepted" but its Level 2 result is "Accepted", PLC will divert the bag to TTS. The bag's minimum screening result will be verified when bag tag is detected by TTS ATR or Manual Encoding Station and tilted to Level 3 discharge if minimum screening level is not met. If both Level 1 and Level 2 screening result of lost tracking bag are not "Accepted", the PLC will divert the bag to Level 3 EDS line (EDS03 and EDS04) via vertical sorter and PLC will send Item Proceeded (IPR) telegram to SAC. SAC will not return IRD telegram at this time as no destination can be looked up.

For those good read bags but lost track by PLC after AT machine and before vertical sorter, PLC will divert them to Level 3 HBS line directly and send Item Proceeded (IPR) telegram to SAC.

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For those bags whose Level 1 or 2 HBS screening result have not received at the time when bag reaches the predetermined diverting point of vertical sorter (VS) on Level 1/2 HBS lines, they will be classified by PLC as the HBS screening not cleared bag and diverted to Level 3/4 HBS line.

Once PLC received Customs Screening results, PLC will send Item Customs Screened telegram (ICCR) to SAC. SAC will verify the Customs Result and if the result is Clear or Accepted, SAC will look up bag's sort destination (departure make-up carousel or MES) and send to PLC. If the Customs results others than Clear or Accepted, SAC will get Customs Chute line destination and return to PLC through IRD telegram. Whenever PLC received IRD telegram, PLC will replace the previous destination with new destination.

The SAC will send the Fallback Tag Information telegram (FBTI), Special Security Tag Level telegram (SSTL), Special Security Tag Destination telegram (SSTD) to PLC at the beginning of the connection establish or at anytime upon the Departure Allocation Application make the created, changed and deleted on those settings.

Whenever bag is lost track by PLC, PLC will send Item Lost telegram (ILT) to SAC to report the bag GID#, location of lost.

Whenever a stray bag is detected by PLC, it will generate a new GID# to the stray bag. And then PLC will send GID Used telegram (GID) to SAC as stray bag.

SAC will send Time Synchronization (TSYN) telegram to PLC to synchronize the time of PLC which is directly sending from SAC2PLCGW.

3.4   LEVEL 3/4 HBS LINES

If bag is not cleared Level 1/2 screening, or cleared Level 1/2 screening but its minimum screening level requirement is higher than Level 2, then bag will be diverted from Level 1/2 HBS line to Level 3/4 HBS line.

As shown in **Figure 3-4** below, before bags reach the first plow diverter point, PLC will verify its dimension check result tracked along with the bag.

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Telegram Types:

GID – GID Generated Telegram

FBTI – Fallback Tag Information Telegram

ICR – Item Screened Telegram

IPR – Item Proceeded Telegram

ILT – Item Lost Tracking Telegram

IRD – Item Redirect Telegram

ITI – Item Tracking Information Telegram

SSTL – Special Security Tag Level Telegram

SSTD – Special Security Tag Destination Telegram

TSYN – Time Synchronization Telegram
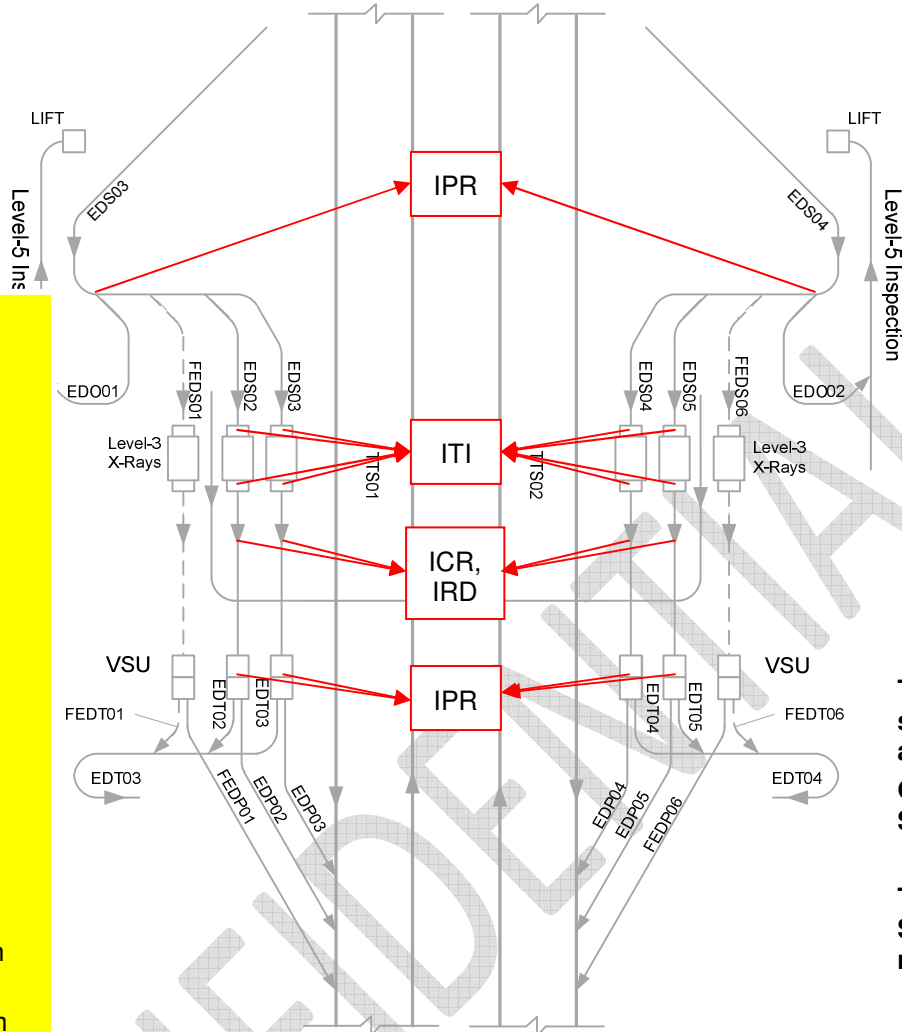
Telegrams that can be sent at any location and any time:

GID, ILT, FBTI, SSTL, SSTD

TSYN will send from SAC to PLC every 10 mins.

Figure 3-4: Level 3/4 HBS Lines

If bag failed the dimension check, it represents that it is Out-Of-Gauge (OOG) bag and cannot enter into Level 3 EDS machine. PLC will divert all OOG bags to Level 5 lines via EDO01 or EDO02 line for manual security check at Level 5 screening area. At same time, PLC will send Item Proceeded (IPR) telegram to SAC.

Before entry to and after exit the EDS (CT) machine, PLC will send Item Tracking Information to SAC to use for reporting purpose.

The normal gauge bags entered into Level 3 line will be diverted by PLC to Level 3 EDS machines for screening. If bag fails the Level 3 screening, the level 4 on screen resolution determination will be performed by HBS operators. After the bag is screened by Level 3 EDS machine, or by Level 4 manual determination, the screening result will be sent to PLC from EDS machine, and then forwarded to HLC SAC by PLC through ICR telegram.

Similar to the Level 1/2 HBS line process, In HLC layer, the minimum screening level will be verified by SAC after it receives the Level 3 and Level 4 screening result through ICR from PLC. If the result is "Accepted" and the level of screening result meets bag's minimum screening level requirement, then SAC will look up bag's sort destination (departure make-up carousel or MES) and returned to PLC through IRD telegram. If the screening result is not "Accepted", e.g. the result is "Rejected", "Timeout",

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"No Picture", etc., or the result is "Accepted" but the screening level is below the minimum screening level requirement, then there is no bag sort destination is looked up by SAC and returned to PLC. SAC will not send IRD telegram to PLC. After receives bag's sort destination from SAC, PLC will track it with the bag and later forward it to TTS controller for intelligence induction control purpose.

At LLC layer, after receive bag's Level 3 and Level 4 screening result from EDS machine, PLC will verify the screening result and bag's minimum screening level tracked along with the bag. If the result is "Accepted" and the level of screening meets bag's minimum screening level requirement, PLC will divert it to TTS via vertical sorter and produce IPR telegram to send to SAC. If the screening result is not "Accepted", e.g. the result is "Rejected", "Timeout", "No Picture", etc., or the result is "Accepted", but the level of screening is below the minimum screening level requirement, PLC will divert the bag to Level 5 HBS line (EDT03 and EDT04) via vertical sorter and PLC will send IPR telegram to SAC.

For those bags without IATA tag number attached in the tracking data, e.g. no-read by ATR or lost tracking by PLC before Level 3 EDS machine, at HLC layer, there is no sort destination will be returned from SAC to PLC. This mean no IRD telegram will be returned by SAC. At LLC layer, PLC will divert the bag based on the Level 3 or Level 4 screening result without verify the minimum screening level. If the Level 3 screening result is "Accepted" or Level 3 screening result is not "Accepted" but its Level 4 result is "Accepted", PLC will divert the bag to TTS. Otherwise, the bag will be diverted to Level 5 HBS line. All the diverting, PLC will produce IPR telegram and PLC will send this telegram to SAC.

For those bags lost track by PLC after EDS machine and before vertical sorter, PLC will divert them to Level 5 HBS line directly and send IPR telegram to SAC.

For those bags who's Level 3 or 4 screening result have not received at the time when bag reaches the predetermined diverting point of vertical sorter (VS) on EDS lines, they will be classified by PLC as the HBS screening not cleared bag and diverted to Level 5 HBS line directly and send IPR telegram to SAC.

The SAC will send the Fallback Tag Information telegram (FBTI), Special Security Tag Level telegram (SSTL), Special Security Tag Destination telegram (SSTD) to PLC at the beginning of the connection establish or at anytime upon the Departure Allocation Application make the created, changed and deleted on those settings.

Whenever bag is lost track by PLC, PLC will send Item Lost telegram (ILT) to SAC to report the bag GID#, location of lost.

Whenever a stray bag is detected by PLC, it will generate a new GID# to the stray bag. And then PLC will send GID Used telegram (GID) to SAC as stray bag.

SAC will send Time Synchronization (TSYN) telegram to PLC to synchronize the time of PLC which is directly sending from SAC2PLCGW.

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3.5 LEVEL 5 HBS LINES

If bag is not cleared Level 3/4 screening, or cleared Level 3/4 screening but its minimum screening level requirement is higher than Level 4, then bag will be diverted from Level 3/4 HBS line to Level 5 HBS line for next level screening.

As shown in **Figure 3-5** below, bags will be conveyed to Level 5 HBS area and then be searched manually by security agent by using ETD device with combination of review of HBS Level 2 image on the HBS workstation (provided by others) located at HBS Level 5 area, and/or review of HBS Level 4 imaged on the HBS workstation (provided by others) located at the same place.

Telegram Types:

GID – GID Generated Telegram

FBTI – Fallback Tag Information Telegram

IPR – Item Proceeded Telegram

ILT – Item Lost Tracking Telegram

SSTL – Special Security Tag Level Telegram

SSTD – Special Security Tag Destination Telegram

TSYN – Time Synchronization Telegram

Telegrams that can be sent at any location and any time:

GID, ILT, FBTI, SSTL, SSTD

TSYN will send from SAC to PLC every 10 mins.

Figure 3-5: Level 5 HBS Lines

If bag cleared the Level 5 security checking, security agent will manually transfer it from Level 5 inspection conveyor line to the reloading line (CBR01 or CBR02) for reloading it back to TTS. When the bag needs transfer to STM01 or STM10 at the junction point, PLC will generate new GID Used (GID) telegram and send to SAC. This is the start tracking point. If bag is not cleared Level 5 checking, then it will be directly transported to threat containment unit via left and then classified as out of BHS and PLC will send IPR to SAC.

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There is a BHS Baggage Identification System (BIS) workstation supplied by PGL at each Level 5 inspection area. BIS workstation provides the functionalities to security agent for them to identify information (Flight#, Passenger Name, L1~4 HBS Result, etc.) by entering the bag IATA tag number. And also for updating the Level 5 manual checking result into BHS database for reporting purpose.

The SAC will send the Fallback Tag Information telegram (FBTI), Special Security Tag Level telegram (SSTL), Special Security Tag Destination telegram (SSTD) to PLC at the beginning of the connection establish or at anytime upon the Departure Allocation Application make the created, changed and deleted on those settings.

Whenever bag is lost track by PLC, PLC will send Item Lost telegram (ILT) to SAC to report the bag GID#, location of lost.

Whenever a stray bag is detected by PLC, it will generate a new GID# to the stray bag. And then PLC will send GID Used telegram (GID) to SAC as stray bag.

SAC will send Time Synchronization (TSYN) telegram to PLC to synchronize the time of PLC which is directly sending from SAC2PLCGW.

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3.6   MANUAL ENCODING LINES

After bags are transferred to Tilt-Tray Sorter (TTS), it will be scanned by TTS 90 degree induction underneath ATR and 270 degree overhead ATR. The detected tag number will be forwarded to HLC SAC by TTS controller for looking up the sort destination. If bags are not read by either one of these 2 types of ATR, or bag is good read but its sort destination is not able to be identified by SAC, then TTS controller will redirect them to the MES line for manual handling.

Telegram Types:

GID – GID Generated Telegram

FBTI – Fallback Tag Information Telegram

IEC – Item Encoded Telegram

ILT – Item Lost Tracking Telegram

IPR – Item Proceeded Telegram

IRM – Item Removed

IRY – Item Ready Telegram

SSTL – Special Security Tag Level Telegram

SSTD – Special Security Tag Destination Telegram

TSYN – Time Synchronization Telegram
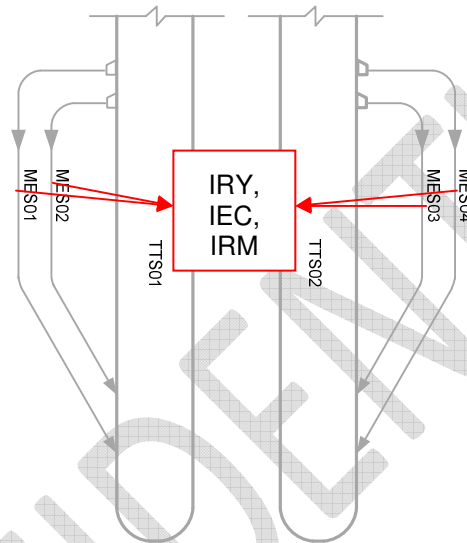
Telegrams that can be sent at any location and any time:

GID, ILT, FBTI, SSTL, SSTDs

TSYN will send from SAC to PLC every 10 mins.

Figure 3-6: MES Lines

There is one set MES workstation that equipped with touch screen computer, wired handhold barcode scanner and label printer supplied by PGL at each ME line. This MES workstation connects to PLC and SAC for MES operator to encode bag by bag tag number, flight number or make-up unit number. In the scenario of HLC (SAC) is not available, MES operator can still encode bag by fallback tag or make-up unit number.

When bag arrived at MES, PLC will send Item Ready (IRY) telegram to inform MES that the bag arrived. Once the operator encoded in MES, MES will send Item Encoded (IEC) telegram to PLC for inform PLC that the bag is ready to go.

At MES, operator also can remove bag. MES will send Item Removed (IRM) to PLC for inform PLC that the conveyor now is ready for next item or run once the bag removed from the photocell.

When bag is successfully encoded at MES workstation, its sort destination will be sent from MES computer to PLC. PLC will track the sort destination with the physical bag and handed over to TTS controller during the bag transfer from conveyor to TTS induction unit. And then TTS will sort the bag to the destination encoded at MES.

Similar with the TTS inductions connected to the screening transport mainlines, the TTS inductions connected to ME lines shall also has the intelligence induction for bags come from MES with sort destination attached to reducing recirculation due to tray discharge sequence. The intelligence

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induction control is not applied to bags that do not have sort destination, e.g. lost tracking by PLC after MES, etc.

The SAC will send the Fallback Tag Information telegram (FBTI), Special Security Tag Level telegram (SSTL), Special Security Tag Destination telegram (SSTD) to PLC at the beginning of the connection establish or at anytime upon the Departure Allocation Application make the created, changed and deleted on those settings.

Whenever bag is lost track by PLC, PLC will send Item Lost telegram (ILT) to SAC to report the bag GID#, location of lost.

Whenever a stray bag is detected by PLC, it will generate a new GID# to the stray bag. And then PLC will send GID Used telegram (GID) to SAC as stray bag.

SAC will send Time Synchronization (TSYN) telegram to PLC to synchronize the time of PLC which is directly sending from SAC2PLCGW.

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3.7 EARLY BAGGAGE STORAGE LINES

After bags are sent to Tilt-Tray Sorter (TTS), it will be scanned by TTS 90 degree induction underneath ATR and 270 degree overhead ATR. The detected tag number will be forwarded to HLC SAC by TTS controller for looking up the sort destination. If the bag is identified as early checked in before the flight allocation is opened, then SAC will return EBS as the sort destination to TTS controller for TTS to tilt bag to early baggage storage line.

Telegram Types:

GID – GID Generated Telegram

FBTI – Fallback Tag Information Telegram

SSTL – Special Security Tag Level Telegram

SSTD – Special Security Tag Destination Telegram

TSYN – Time Synchronization Telegram

Telegrams that can be sent at any location and any time:

GID, ILT, FBTI, SSTL, SSTD

TSYN will send from SAC to PLC every 10 mins.
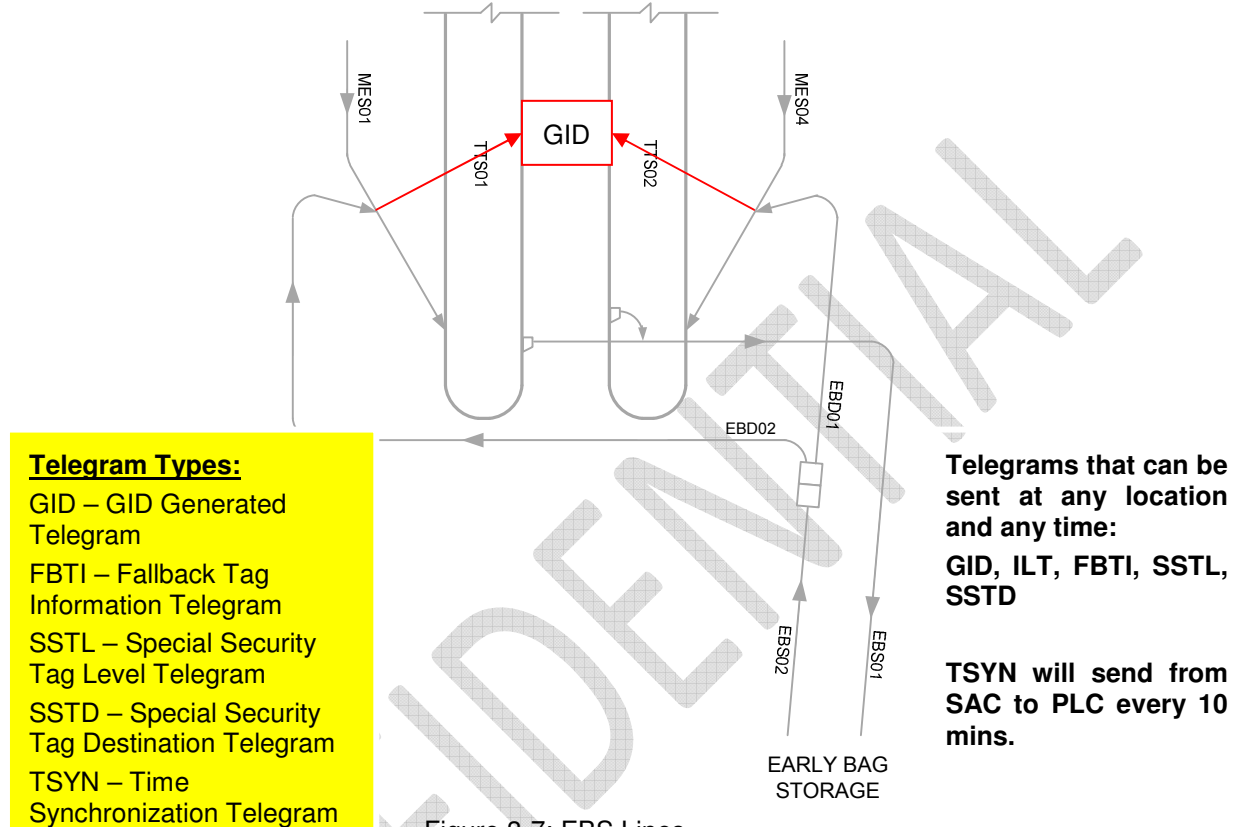
Figure 3-7: EBS Lines

There are total 4 set of workstations are supplied by PGL at the EBS area. Each EBS workstation equips with one wireless handhold barcode scanner. When early bag arrive the EBS line (EBS01), operator will scan the bag tag and storage rack compartment ID barcode to register the bag into EBS inventory.

The EBS workstation will notify the EBS operator to reload bag back to TTS when the flight allocation of any early baggage is opened. Operator will transfer the desired bag from storage rack compartment onto the reloading line (EBS02) and scan the bag tag before release it to TTS. Then the EBS workstation will update the EBS inventory accordingly. Reloaded bags will be distributed to 2 early bag distribute lines (EBD01 and EBD02), and merged to ME lines (MES01 and MES04), PLC will generate new GID Used (GID) telegram and send to SAC (the start of tracking point), and then transferred to TTS induction from these two ME lines. The distribution from EBS02 line to EBD01 and EBD02 lines via vertical sort is solely controlled by conveyor PLC at LLC level.

In the HLC system, there is a configurable system parameter to control sending all EBS retrieval bags to Level 3 EDS machines for screening. If this setting is enabled, SAC will inform TTS to tilt such bags to Level 3 EDS line discharge. Otherwise, SAC will inform TTS to tilt bag to make-up carousel allocated to their flight.

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Due to the security reason, all manually reloaded bags from the EBS reloading line are not allowed to have the sort destination manually given by EBS operator. Such bags have to be scanned by TTS 90 degree induction underneath ATR and 270 degree overhead ATR and then the tag number will be forwarded to HLC SAC by TTS controller for looking up the sort destination automatically. By the time, the flight allocation of reloaded baggage has been opened and the reloaded baggage will be sorted to make-up carousel or Level 3 HBS line, instead of back to EBS.

The SAC will send the Fallback Tag Information telegram (FBTI), Special Security Tag Level telegram (SSTL), Special Security Tag Destination telegram (SSTD) to PLC at the beginning of the connection establish or at anytime upon the Departure Allocation Application make the created, changed and deleted on those settings.

Whenever bag is lost track by PLC, PLC will send Item Lost telegram (ILT) to SAC to report the bag GID#, location of lost.

Whenever a stray bag is detected by PLC, it will generate a new GID# to the stray bag. And then PLC will send GID Used telegram (GID) to SAC as stray bag.

SAC will send Time Synchronization (TSYN) telegram to PLC to synchronize the time of PLC which is directly sending from SAC2PLCGW.

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3.8 INTERNATIONAL ARRIVAL LINES

For the international arrival for Mumbai International Airport, the tracking starts a conveyor before the X-Ray machine. PLC will generate GID Used (GID) telegram and send to SAC.

Before entry to and after exit the X-Ray machine, PLC will send Item Tracking Information to SAC to use for reporting purpose.

Now the bag will continue track and waiting for the X-Ray results. When PLC received the X-Ray results, PLC will send these results to SAC by using Item Screened telegram (ICR). This bag will continue track until the bag passed the diverter. The Item Proceeded telegram (IPR) will send to SAC as to inform where the bags are diverted to. All the clear baggage will sort to make-up carousel and this clear baggage finished the tracking on this point. The entire Level 2 unclear bag will divert to security room for manual handling, the tracking finish at this point.

There are no tracking in the domestic arrival.
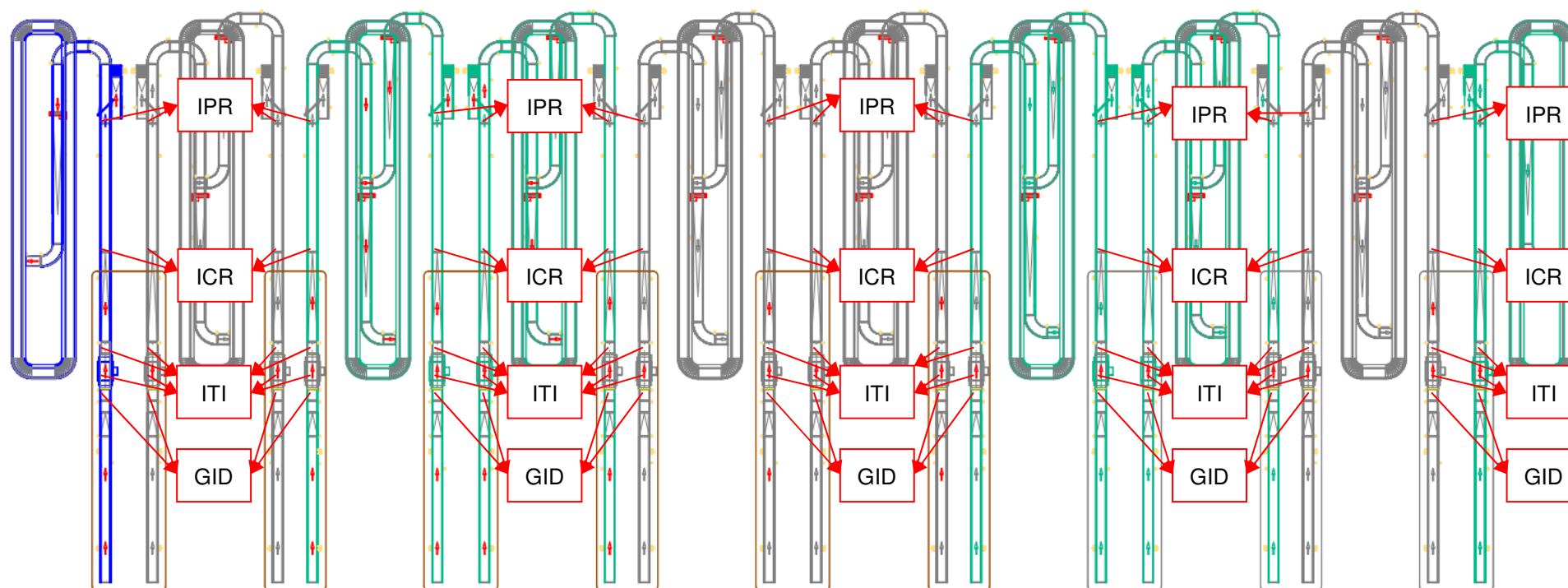
Telegram Types:
GID – GID Generated Telegram
ICR – Item Screened Telegram
ILT – Item Lost Tracking Telegram
IPR – Item Proceeded Telegram
TSYN – Time Synchronization Telegram

Telegrams that can be sent at any location and any time:
GID, ILT

TSYN will send from SAC to PLC every 10 mins.

Figure 3-8: International Arrival

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3.9 TRACKING USING GLOBAL ID (GID)

The idea behind Global ID's is to give each bag a global serial number which identifies a specific piece of baggage as long as it is being tracked by Plant Control.

The GID is a 10 characters number that is generated and provided to subsystems by the PLC. The subsystem that first detects an item is responsible for attaching a GID to the item. Hence the PLC will generate and then attaching to the specific piece of baggage. This Global ID is used to report events for, and submit information about.

At some point in time the bag is scanned, and then the Global ID and license plate are linked together. If the Plant Control loses tracking of the bag, then a new GID is assigned when Plant Control rediscovers the bag.

3.9.1 GID Format

The GID is consisted of 10 alphanumeric characters. It can be divided to 2 fields as below:
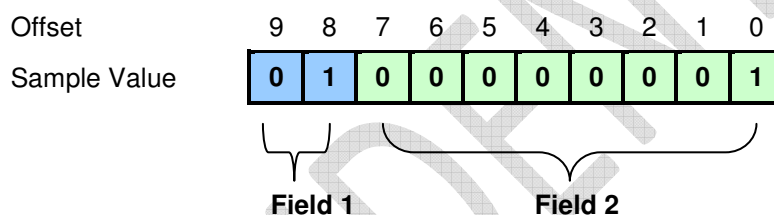
- **Field 1 –** Characters 8 to 9. It is the conveyor line number. Its value is from **"01"** to **"10"**.
- **Field 2 –** Character 0 to 7. It is the running number of bag. Its value is from **"00000001"** to **"99999999"**.

The new GID will be generated by PLC for those stray bags immediately when PLC detects it.

3.10 EMPTY LICENSE PLATE

In order to differential the bag with standard 10 digits IATA tag and the no IATA tag bag or no read bag, the ten digits string "**0000000000**" is defined as the "Empty License Plate" for those bags without IATA tag or no read bag.

Before any new item is scanned by ATR or hand hold scanner, it is always assigned with the Empty License Plate number.

The Empty License Plate will be used by some of application layer telegrams as defined in later section.

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3.11   DUMMY MULTIPLE LICENSE PLATE

As per Mumbai project BHS design, the multiple license plates (LP) can be detected by ATR. And up to two (2) license plates are allowed to be sent to SAC by PLC via Item Scanned telegram. These two LPs could be both valid, both invalid, and only one is valid LP.

Upon receives the Item Scanned telegram, SAC will send Item Minimum Security Level (IMSL) telegram to PLC. According IMSL telegram format design, only single LP will be included in the telegram body. Hence, if only one LP is valid, the valid LP and bag's destination will be included in the IMSL telegram. If both LPs are valid, and both invalid, the Dummy Multiple License Plate **"9999999999"** (10 digits of 9) will be included in the IMSL telegram.

3.12   RESPONSE TIME REQUIREMENT

It is essential that the SAC responses to a request for destinations as fast as possible – any delay in the response may result in an item to re-circulate on the sorter thus delaying the sortation of the item and thereby reducing the overall capacity of the sorter.

The theoretical maximum allowed response time depends on the sorter layout. For example, the distance from an overhead scanner and the first chute after the overhead scanner; the scanner type selected, and the speed of the sorter.

In the light of the above the maximum response time from the SAC may not exceed **500ms**.

3.13   MANUAL ENCODING PROCESS

The HMI Touch Panel is used as the manual encoding workstation (MES). It is equipped with a barcode handhold scanner. Touch panel is connected to the PLC and SAC directly. Hence, the bag license plate # will be captured by PLC after it is detected by handhold scanner.

The MES has the GUI to allow operator encode the bag by following 6 methods:
- **Encode by License Plate #** - Scanning the license plate # on the bag tag, or
- **Encode by Flight #** - Entering the flight# that can be seen on the bag tag, or
- **Encode by Destination** - Entering the make-up carousel #.
- **Encode by Problem Bag** - Press problem bag button in HMI panel.
- **Encode by Rush Bag** - Press rush bag button in HMI panel.
- **Encode by Bag Removed** - Press button Remove in HMI panel.

When bag arrive the manual encoding conveyor, it will be stopped and PLC will send IRY telegram to MES for the manual encoding process.

When operator manual encode the bag by using any one of above 5 methods except Encode by Bag Removed, MES will search the destination. Once MES have the destination, MES will display on screen and send IEC telegram to PLC to inform PLC that the bag ready to go.

MES also provide "Problem Bag" and "Bag Remove" function. When operator does not has enough information to manual encode a bag, he can sent the bag as Problem bag or remove the bag from the ME conveyor by press the "Problem bag" or "Remove" function button on the MES GUI, and then the bag will send to the assigned problem location from above method as Problem bag or physically

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remove the bag from the conveyor if by encoded as Bag Removed.   IRM telegram will send from MES to PLC once the operator pressed the "Remove" function button in MES GUI. PLC will allow next bag come or run the conveyer once the PLC detected photocell clear.

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4. TRANSPORT PROTOCOL: FRAME-ON-RFC1006

4.1 OVERVIEW

The transport layer protocol of the SAC-PLC communication is based on the interface described in the interface specification document [IR-102-04-1.01 IS_TP_FrameOnRFC1006]. This chapter is intended to list out the required project related parameters for Frame-On-RFC1006 protocol, which are described in above document.

As per the BHS design in Mumbai International Airport BHS, SAC needs communicate as following:

Departure – 12 PLCs with each have 2 Ethernet modules
        – 2 redundant PLC
        – Total gateway needed: 12 x 2 + 2 x 2 = 28

Arrival   – 6 PLCs with each have 2 Ethernet modules
        – Total gateway needed: 6 x 2 = 12

- PLC10 – PLC for STM01
  (IP: 172.16.0.99, 172.16.0.100)
- PLC11 – PLC for STM03
  (IP: 172.16.0.101, 172.16.0.102)
- PLC12 – PLC for STM06
  (IP: 172.16.0.107, 172.16.0.108)
- PLC13 – PLC for STM04
  (IP: 172.16.0.103, 172.16.0.104)
- PLC14 – PLC for STM08
  (IP: 172.16.0.83, 172.16.0.84)
- PLC15 – PLC for STM10
  (IP: 172.16.0.85, 172.16.0.86)
- PLC16– PLC for STM05
  (IP: 172.16.0.105, 172.16.0.106)
- PLC17 – PLC for STM07
  (IP: 172.16.0.109, 172.16.0.110)
- PLC19P – Primary PLC for EDP02, EDP03, EDO01, EDS02, EDS03, EDS07, EDT02, EDT03, Level 5 Inspection line
  (IP: 172.16.0.87)
- PLC19B – Backup PLC for EDP02, EDP03, EDO01, EDS02, EDS03, EDS07, EDT02, EDT03, Level 5 Inspection line
  (IP: 172.16.0.89)
- PLC20P – Primary PLC for EDP04, EDP05, EDO02, EDS04, EDS05, EDS08, EDT04, EDT05, Level 5 Inspection line
  (IP: 172.16.0.87)
- PLC20B – Backup PLC for EDP04, EDP05, EDO02, EDS04, EDS05, EDS08, EDT04, EDT05, Level 5 Inspection line
  (IP: 172.16.0.89)

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- PLC21 – PLC for MES01
  (IP: 172.16.0.85, 172.16.0.86)
- PLC22 – PLC for MES02
  (IP: 172.16.0.85, 172.16.0.86)
- PLC23 – PLC for MES03
  (IP: 172.16.0.85, 172.16.0.86)
- PLC24– PLC for MES04
  (IP: 172.16.0.85, 172.16.0.86)
- PLC31 – PLC for arrival CLF05, arrival make-up CLD03
  (IP: 172.16.0.85, 172.16.0.86)
- PLC32 – PLC for arrival CLF08, CLF09, arrival make-up CLD05
  (IP: 172.16.0.85, 172.16.0.86)
- PLC33 – PLC for arrival CLF10, CLF11, arrival make-up CLD06
  (IP: 172.16.0.85, 172.16.0.86)
- PLC34 – PLC for arrival CLF16, CLF17, arrival make-up CLD09
  (IP: 172.16.0.85, 172.16.0.86)
- PLC35 – PLC for arrival CLF18, CLF19, arrival make-up CLD10
  (IP: 172.16.0.85, 172.16.0.86)
- PLC36 – PLC for arrival CLF22, arrival make-up CLD12
  (IP: 172.16.0.85, 172.16.0.86)

4.2   PROJECT RELATED PROTOCOL PARAMETERS

4.2.1 RCF1006 Protocol Layer

Due to the SAC-COM server hardware is not implemented the RCF1006 protocol, the SAC-PLC Communication Gateway Application (SAC-PLC GW) has to be responsible for the RFC1006 connection establishment by means of sending the Connection Request message to PLC after the TCP layer connection is established, and then expect to receive the Connection Confirm message from PLC. If no Connection Confirm message is received within a time period (**ConnectionConfirmTimeout**, Default: 3000ms), the SAC server will close the TCP connection and report to the Application layer, and then wait for the Application layer to re-issue the connecting command.

Parameter name	Valid values	Description
ConnectionId	SAC Applications (HEX): • SAC-PLC01P GW Application: **0001** • SAC-PLC01B GW Application: **0002** • SAC-PLC02P GW Application: **0003** • SAC-PLC02B GW Application: **0004** • SAC-PLC03P GW Application: **0005** • SAC-PLC03P GW Application: **0006** • SAC-PLC04P GW Application: **0007** • SAC-PLC04B GW Application: **0008** • SAC-PLC05P GW Application: **0009** • SAC-PLC05B GW Application: **0010** • SAC-PLC06P GW Application: **0011** • SAC-PLC06B GW Application: **0012** • SAC-PLC07P GW Application: **0013** • SAC-PLC07B GW Application: **0014**	The connection id to send in the CR/CC messages in the 'SRC'-field.

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- SAC-PLC08P GW Application: **0015**
- SAC-PLC08P GW Application: **0016**
- SAC-PLC09 GW Application: **0017**
- SAC-PLC10 GW Application: **0018**
- SAC-PLC11 GW Application: **0019**
- SAC-PLC12 GW Application: **0020**
- SAC-PLC13P GW Application: **0021**
- SAC-PLC13B GW Application: **0022**
- SAC-PLC14P GW Application: **0023**
- SAC-PLC14B GW Application: **0024**
- SAC-PLC15P GW Application: **0025**
- SAC-PLC15B GW Application: **0026**
- SAC-PLC16P GW Application: **0027**
- SAC-PLC16B GW Application: **0028**
- SAC-PLC17P GW Application: **0029**
- SAC-PLC17B GW Application: **0030**
- SAC-PLC18P GW Application: **0031**
- SAC-PLC18B GW Application: **0032**
- SAC-PLC19P GW Application: **0033**
- SAC-PLC19B GW Application: **0034**
- SAC-PLC20P GW Application: **0035**
- SAC-PLC20B GW Application: **0036**
- SAC-PLC21P GW Application: **0037**
- SAC-PLC21B GW Application: **0038**
- SAC-PLC22P GW Application: **0039**
- SAC-PLC22B GW Application: **0040**

PLCs (HEX):
- PLC-01P: **0011**
- PLC-01B: **0012**
- PLC-02P: **0013**
- PLC-02B: **0014**
- PLC-03P: **0015**
- PLC-03B: **0016**
- PLC-04P: **0017**
- PLC-04B: **0018**
- PLC-05P: **0019**
- PLC-05B: **0020**
- PLC-06P: **0021**
- PLC-06B: **0022**
- PLC-07P: **0023**
- PLC-07B: **0024**
- PLC-08P: **0025**
- PLC-08B: **0026**
- PLC-09: **0027**
- PLC-10: **0028**
- PLC-11: **0029**
- PLC-12: **0030**
- PLC-13P: **0031**
- PLC-13B: **0032**
- PLC-14P: **0033**
- PLC-14B: **0034**
- PLC-15P: **0035**
- PLC-15B: **0036**
- PLC-16P: **0037**
- PLC-16B: **0038**
- PLC-17P: **0039**
- PLC-17B: **0040**
- PLC-18P: **0041**

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	• PLC-18B: **0042** • PLC-19P: **0043** • PLC-19B: **0044** • PLC-20P: **0045** • PLC-20B: **0046** • PLC-21P: **0047** • PLC-21B: **0048** • PLC-22P: **0049** • PLC-22B: **0050**	
SendConnectRequest	SAC Applications (Boolean): • SAC-PLC01P GW Application: **Y** • SAC-PLC01B GW Application: **Y** • SAC-PLC02P GW Application: **Y** • SAC-PLC02B GW Application: **Y** • SAC-PLC03P GW Application: **Y** • SAC-PLC03B GW Application: **Y** • SAC-PLC04P GW Application: **Y** • SAC-PLC04BGW Application: **Y** • SAC-PLC05P GW Application: **Y** • SAC-PLC05B GW Application: **Y** • SAC-PLC06P GW Application: **Y** • SAC-PLC06B GW Application: **Y** • SAC-PLC07P GW Application: **Y** • SAC-PLC07B GW Application: **Y** • SAC-PLC08P GW Application: **Y** • SAC-PLC08B GW Application: **Y** • SAC-PLC09 GW Application: **Y** • SAC-PLC10 GW Application: **Y** • SAC-PLC11 GW Application: **Y** • SAC-PLC12 GW Application: **Y** • SAC-PLC13P GW Application: **Y** • SAC-PLC13B GW Application: **Y** • SAC-PLC14P GW Application: **Y** • SAC-PLC14BGW Application: **Y** • SAC-PLC15P GW Application: **Y** • SAC-PLC15B GW Application: **Y** • SAC-PLC16P GW Application: **Y** • SAC-PLC16B GW Application: **Y** • SAC-PLC17P GW Application: **Y** • SAC-PLC17B GW Application: **Y** • SAC-PLC18P GW Application: **Y** • SAC-PLC18B GW Application: **Y** • SAC-PLC19P GW Application: **Y** • SAC-PLC19B GW Application: **Y** • SAC-PLC20P GW Application: **Y** • SAC-PLC20B GW Application: **Y** • SAC-PLC21P GW Application: **Y** • SAC-PLC21B GW Application: **Y** • SAC-PLC22P GW Application: **Y** • SAC-PLC22B GW Application: **Y** PLCs (Boolean): • PLC-01P: **N** • PLC-01B: **N** • PLC-02P: **N** • PLC-02B: **N** • PLC-03P: **N** • PLC-03B: **N** • PLC-04P: **N** • PLC-04B: **N**	The 'SendConnectRequest' parameter is set to determine which of the peers should send the Connect Request message.

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	• PLC-05P: **N** • PLC-05B: **N** • PLC-06P: **N** • PLC-06B: **N** • PLC-07P: **N** • PLC-07B: **N** • PLC-08P: **N** • PLC-08B: **N** • PLC-09: **N** • PLC-10: **N** • PLC-11: **N** • PLC-12: **N** • PLC-13P: **N** • PLC-13B: **N** • PLC-14P: **N** • PLC-14B: **N** • PLC-15P: **N** • PLC-15B: **N** • PLC-16P: **N** • PLC-16B: **N** • PLC-17P: **N** • PLC-17B: **N** • PLC-18P: **N** • PLC-18B: **N** • PLC-19P: **N** • PLC-19B: **N** • PLC-20P: **N** • PLC-20B: **N** • PLC-21P: **N** • PLC-21B: **N** • PLC-22P: **N** • PLC-22B: **N**	
LocalTSAP	SAC Applications (String): • SAC-PLC01P GW Application: **SACPLC10** • SAC-PLC01B GW Application: **SACPLC10** • SAC-PLC02P GW Application: **SACPLC11** • SAC-PLC02B GW Application: **SACPLC11** • SAC-PLC03P GW Application: **SACPLC12** • SAC-PLC03B GW Application: **SACPLC12** • SAC-PLC04P GW Application: **SACPLC13** • SAC-PLC04B GW Application: **SACPLC13** • SAC-PLC05P GW Application: **SACPLC14** • SAC-PLC05B GW Application: **SACPLC14** • SAC-PLC06P GW Application: **SACPLC15** • SAC-PLC06B GW Application: **SACPLC15** • SAC-PLC07P GW Application: **SACPLC16** • SAC-PLC07B GW Application: **SACPLC16** • SAC-PLC08P GW Application: **SACPLC17** • SAC-PLC08B GW Application: **SACPLC17** • SAC-PLC09 GW Application: **SACPLC19** • SAC-PLC10 GW Application: **SACPLC19** • SAC-PLC11 GW Application: **SACPLC20** • SAC-PLC12 GW Application: **SACPLC20** • SAC-PLC13P GW Application: **MESPLC21** • SAC-PLC13B GW Application: **MESPLC21** • SAC-PLC14P GW Application: **MESPLC22** • SAC-PLC14B GW Application: **MESPLC22** • SAC-PLC15P GW Application: **MESPLC23** • SAC-PLC15B GW Application: **MESPLC23** • SAC-PLC16P GW Application: **MESPLC24**	The TSAP string to send as local ('Calling') TSAP when sending the CR message. If the 'SendConnectRequest' parameter is set to false, the 'Called' TSAP received in the CR message is used as 'Calling' TSAP in the CC message.

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	• SAC-PLC16B GW Application: **MESPLC24** • SAC-PLC17P GW Application: **SACPLC31** • SAC-PLC17B GW Application: **SACPLC31** • SAC-PLC18P GW Application: **SACPLC32** • SAC-PLC18B GW Application: **SACPLC32** • SAC-PLC19P GW Application: **SACPLC33** • SAC-PLC19B GW Application: **SACPLC33** • SAC-PLC20P GW Application: **SACPLC34** • SAC-PLC20B GW Application: **SACPLC34** • SAC-PLC21P GW Application: **SACPLC35** • SAC-PLC21B GW Application: **SACPLC35** • SAC-PLC22P GW Application: **SACPLC36** • SAC-PLC22B GW Application: **SACPLC36** PLCs (String): • PLC-10P: **PLC10** • PLC-10B: **PLC10** • PLC-11P: **PLC11** • PLC-11B: **PLC11** • PLC-12P: **PLC12** • PLC-12B: **PLC12** • PLC-13P: **PLC13** • PLC-13B: **PLC13** • PLC-14P: **PLC14** • PLC-14B: **PLC14** • PLC-15P: **PLC15** • PLC-15B: **PLC15** • PLC-16P: **PLC16** • PLC-16B: **PLC16** • PLC-17P: **PLC17** • PLC-17B: **PLC17** • PLC-19P: **PLC19** • PLC-19B: **PLC19** • PLC-20P: **PLC20** • PLC-20P: **PLC20** • PLC-21P: **PLC21** • PLC-21B: **PLC21** • PLC-22P: **PLC22** • PLC-22B: **PLC22** • PLC-23P: **PLC23** • PLC-23B: **PLC23** • PLC-24P: **PLC24** • PLC-24B: **PLC24** • PLC-31P: **PLC31** • PLC-31B: **PLC31** • PLC-32P: **PLC32** • PLC-32B: **PLC32** • PLC-33P: **PLC33** • PLC-33B: **PLC33** • PLC-34P: **PLC34** • PLC-34B: **PLC34** • PLC-35P: **PLC35** • PLC-35B: **PLC35** • PLC-36P: **PLC36** • PLC-36B: **PLC36**	
RemoteTSAP	Values (String): Its value refers to LocalTSAP according to the remote host.	The TSAP string to send as the remote ('Called') TSAP when sending the CR message.

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		If the 'SendConnectRequest' parameter is set to false, the 'Calling' TSAP received in the CR message is used as 'Called' TSAP in the CC message.
MaxTPDUSize	Values (HEX): • SAC: **0a** (the MaxBytes=1024)	Specifies the maximum number of bytes to send in a single RFC1006 message before splitting the message. The maximum number of bytes is calculated as: maxBytes = 2^MaxTPDUSize e.g. MaxTPDUSize = 11 means maxBytes = 2048
ConnectionConfirmTimeout	3000	The timeout period in milliseconds. If the connection is not confirmed within this period the TCP connection must be closed and re-established.

4.2.2 TCP/IP Protocol Layer

IP is the protocol that provides the packet delivery service for TCP (and others). The combination of TCP using IP is often referred to as TCP/IP.

The port number for the RFC 1006 protocol stack is fixed by standard to **102** as defined in [IANA-Port-Numbers].

The PLC acts as the TCP connection server to listens for the TCP client (the SAC server) connection request on the TCP port 102. Hence, the SAC server is responsible for establishing the TCP connection to the PLCs.

Host	Role	IP Address	Port	Remark
SAC01	TCP Client	172.16.0.33/24	0	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
SAC02	TCP Client	172.16.0.33/24	0	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-10P	TCP Server	172.16.0.99/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-10B	TCP Server	172.16.0.100/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-11P	TCP Server	172.16.0.101/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-11B	TCP Server	172.16.0.102/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-12P	TCP Server	172.16.0.103/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-12B	TCP Server	172.16.0.104/24	102	IP refers to document :

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				[BHS-503-07-1.01 DDS_IPAddress]
PLC-13P	TCP Server	172.16.0.105/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-13B	TCP Server	172.16.0.106/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-14P	TCP Server	172.16.0.107/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-14B	TCP Server	172.16.0.108/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-15P	TCP Server	172.16.0.109/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-15B	TCP Server	172.16.0.110/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-16P	TCP Server	172.16.0.83/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-16B	TCP Server	172.16.0.84/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-17P	TCP Server	172.16.0.85/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-17B	TCP Server	172.16.0.86/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-19P	TCP Server	172.16.0.87/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-19B	TCP Server	172.16.0.88/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-20P	TCP Server	172.16.0.89/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-20B	TCP Server	172.16.0.90/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-21P	TCP Server	172.16.0.99/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-21B	TCP Server	172.16.0.100/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-22P	TCP Server	172.16.0.101/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-22B	TCP Server	172.16.0.102/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-23P	TCP Server	172.16.0.103/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-23B	TCP Server	172.16.0.104/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-24P	TCP Server	172.16.0.105/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-24B	TCP Server	172.16.0.106/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-31P	TCP Server	172.16.0.107/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-31B	TCP Server	172.16.0.108/24	102	IP refers to document :

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				[BHS-503-07-1.01 DDS_IPAddress]
PLC-32P	TCP Server	172.16.0.109/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-32B	TCP Server	172.16.0.110/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-33P	TCP Server	172.16.0.83/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-33B	TCP Server	172.16.0.84/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-34P	TCP Server	172.16.0.85/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-34B	TCP Server	172.16.0.86/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-35P	TCP Server	172.16.0.87/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-35B	TCP Server	172.16.0.88/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-36P	TCP Server	172.16.0.89/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]
PLC-36B	TCP Server	172.16.0.90/24	102	IP refers to document : [BHS-503-07-1.01 DDS_IPAddress]

Please note that the entire primary PLC will connect to the SAC01 and all the Secondary PLC will connect to SAC02.

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5. APPLICATION PROTOCOL: ITEM TRACKING

The application protocol describes the actual telegram information flow between SAC and PLC.

5.1 APPLICATION LAYER CONNECTION

5.1.1 Overview

As illustrated in the Figure 5-1, there are 3 different protocol layers are required to establish the connections between SAC and PLC. They are TCP connection in transport protocol layer, RFC1006 connection in transport protocol layer, and the application protocol layer connection. These connections are established one by one follow the sequence of from the bottom layer to the top layer. The application layer telegram can be sent only when the application layer connection was established.
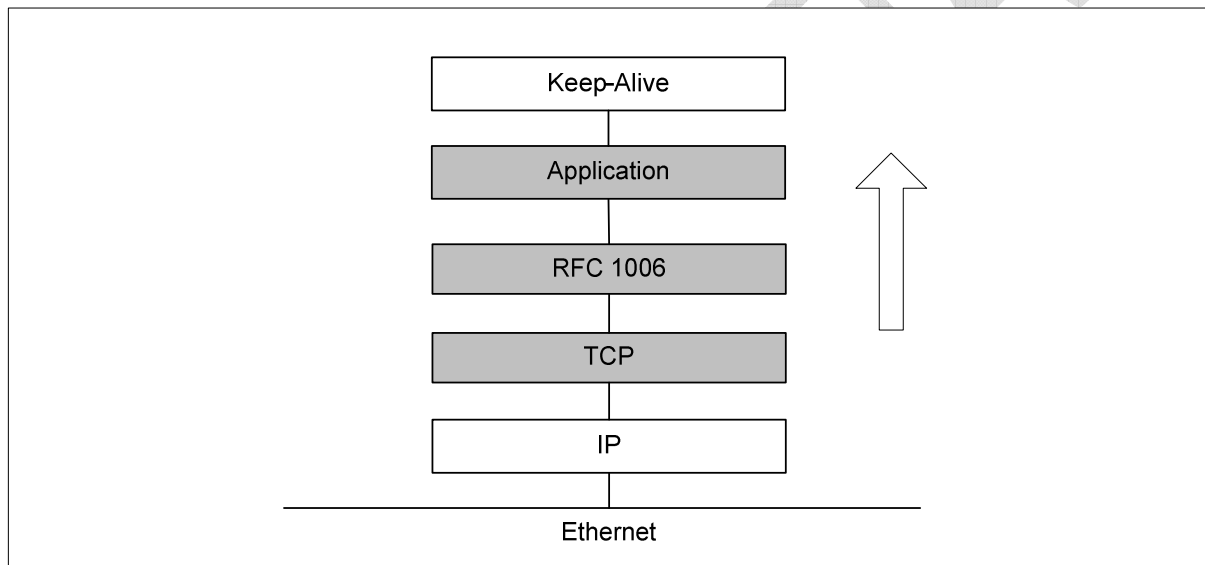
Figure 5-1: Connection layers

The connections of layers in the grayed boxes need to be handled by active/client side (SAC).

As the TCP client, the SAC is required to initialize the connections actively by means of sending the connection request to PLC.

5.1.2 Application Layer Connection Establishment

Below Figure 5-2 illustrate the sequence of application layer connection establishment.

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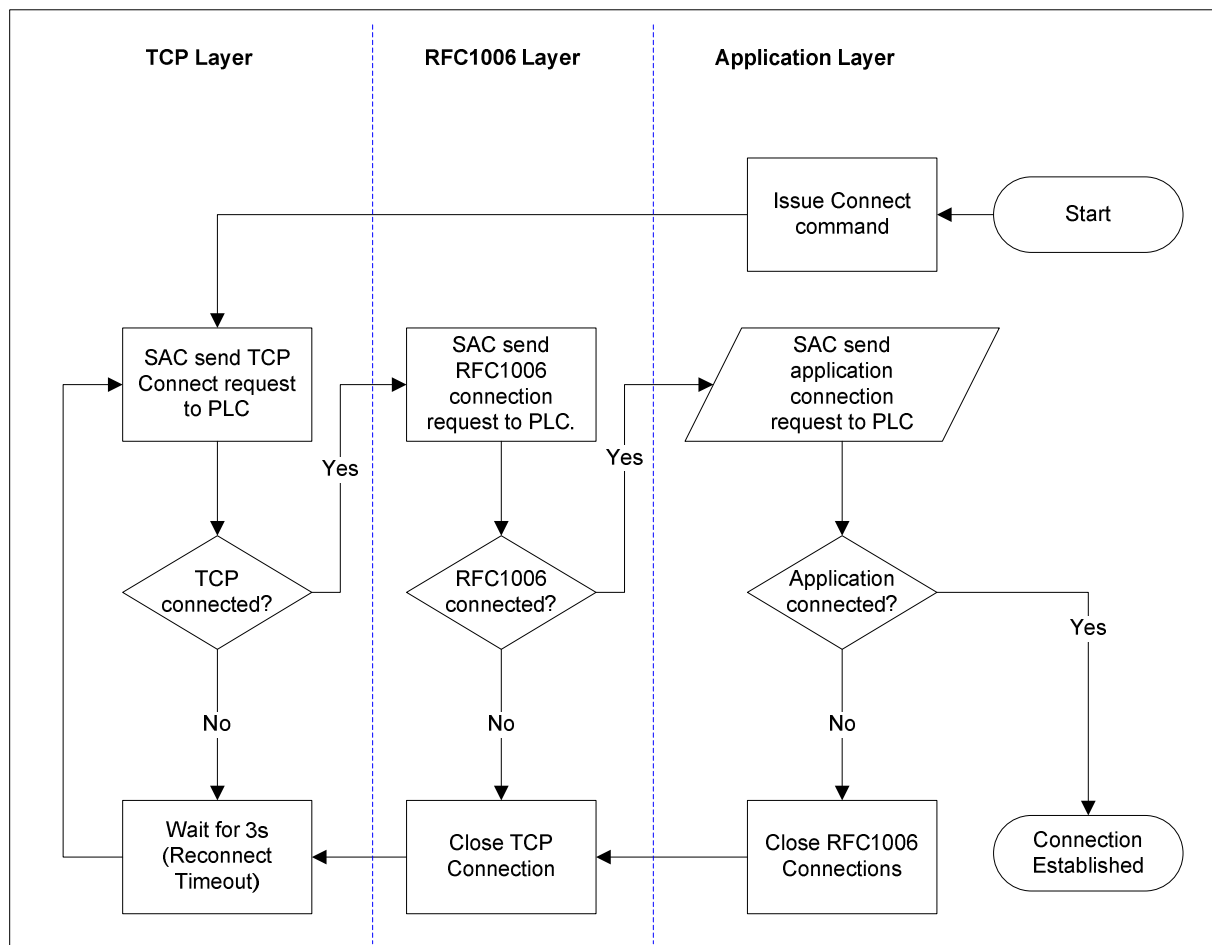
Figure 5-2: Application layer connection establishment sequence.

The detail of the TCP protocol connection establishment refers to [RFC-793-TCP].

The detail of the RFC1006 protocol connection establishment refers to [IR-102-04-1.00 IS_TP_FrameOnRFC1006] and [IR-102-05-1.00 IS_TP_RFC1006].

The detail of application protocol connection establishment will be described in detail at later section of this document.

5.2 RESPONSE TIME REQUIREMENT

It is essential that the SAC responses to a request for destinations as fast as possible – any delay in the response may result in an item to re-circulate on the sorter thus delaying the sortation of the item and thereby reducing the overall capacity of the sorter.

The theoretical maximum allowed response time depends on the sorter layout. For example, the distance from an overhead scanner and the first chute after the overhead scanner; the scanner type selected, and the speed of the sorter.

In the light of the above the maximum response time from the SAC may not exceed **500ms**.

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5.3   TELEGRAM DATA VALIDITY

All Item Tracking protocol telegrams must adhere to the format specified. Telegrams that do not adhere to this format must be ignored by the receiving part.

5.3.1 Valid Data Ranges

The byte format of the telegrams can only contain characters in the range [20 – 7E] Hex from the standard US ASCII character set.

A telegram will always consist of an even number of bytes. If the number of bytes in a telegram adds up to an odd number of bytes, the padding rule will be applied to it.

The data types shown in the following table is used in the telegram definitions to limit the contents of a specific field:

Field type	Syntax	Range	Padding rule	Not available rule
Alphanumeric	At least one character	[20 – 7E] Hex in the US ASCII character set.	Left justified, space filled	Filled with spaces (hex 0x20) if not available
Numeric	At least one digit	[30 – 39] Hex in the US ASCII character set.	Right justified, zero filled	Filled with "0" (hex 0x30) if not available
Timestamp	YYYYMMDDHHMMSSmmm	[30 – 39] Hex in the US ASCII character set.	Not applicable	Filled with spaces (hex 0x20) if not available

All fields in telegrams are of fixed length according to the specified length given as number of characters. Values must therefore be padded (either preceding or succeeding the data) according to the field length and the above specified padding rule. Thus there is no separation between each field; the telegram is one long string of ASCII characters.

If no data is available for the field the 'Not available rule' given for the field type must be used to fill the field in question.

The Timestamp field is composed of a 4 digit year, a 2 digit month (1 = January), a 2 digit day, 2 digit hours (24 hour format), 2 digit minutes, 2 digit seconds and a 3 digit milliseconds.

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5.4   TELEGRAM FORMAT

All Item Tracking protocol telegrams consist of 2 portions: Telegram Header and Telegram Data.

Telegram Portions	Portion Length (# of char)	Description
Telegram Header	12	Telegram header
Telegram Data	Vary according to type of telegrams	Application data. The length varies according to the telegram type.

The format of Telegram Header is illustrated as below.

Field	Byte No	Format	Length (char)	Description
Telegram Header	0-3	Alphanumeric	4	Telegram Type. • Example value: "**0001**".
	4-7	Numeric	4	Telegram Length. • Decimal, presented in ASCII format. • Example value: "**1234**".
	8-11	Numeric	4	Telegram Sequence number. • Used by PLC internal control only. • Decimal, presented in ASCII format. • Example value: "**0123**".

The telegram data format of individual type of telegrams will be defined by the sections below.

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5.5 TELEGRAM DEFINITIONS

5.5.1 Overview

It is the responsibility of the PLC to identify baggage by assigning a Global ID, route the baggage through the HBS levels, and submit screening and scanning information. When scanning information is submitted the SAC will respond with a sorting destination.

When baggage has been sorted or failure to be sorted to its destination, it is the responsibility of the PLC to submit discharge information for the baggage.

The following table shows the telegrams defined for the Item Tracking protocol.

Telegram Type	Alias Name	Telegram Name	Adopted in this Project	Source	Destination	Acknowledge Required
0001	CRQ	Application Layer Connection Request	Mandatory	SAC/MES	PLC	N
0002	CCF	Application Layer Connection Confirm	Mandatory	PLC	SAC/MES	N
0003	GID	GID Generated	Mandatory	PLC	SAC	Y
0004	ICR	Item Screened	Mandatory	PLC	SAC	Y
0005	ISC	Item Scanned	Mandatory	PLC	SAC	Y
0006	IRD	Item Redirected	Mandatory	SAC	PLC	Y
0007	ISE	Item Sortation Event	Optional	PLC	SAC	Y
0008	IPR	Item Proceeded	Mandatory	PLC	SAC	Y
0009	ILT	Item Lost	Mandatory	PLC	SAC	Y
0010	ITI	Item Tracking Information	Mandatory	PLC	SAC	Y
0011	CSR	Chute Status Request	Optional	SAC	PLC	N
0012	CST	Chute Status Reply	Optional	PLC	SAC	N
0013	IDR	Item Destination Request	Optional	PLC	SAC	N
0014	LRQ	Baggage License Plate Request	Optional	SAC	PLC	N
0015	LRP	Baggage License Plate Reply	Optional	SAC	PLC	N
0016	MER	Item Manual Encoding Request	Optional	PLC	SAC	Y
0017	AFAI	Airport Code and Function Allocation Information	Optional	SAC	PLC	Y
0018	BMAM	Baggage Measurement Array Message	Mandatory	PLC	SAC	Y
0019	CRAI	Carrier Allocation Information	Optional	SAC	PLC	Y
0020	FBTI	Fallback Tag Information	Mandatory	SAC	PLC	Y
0021	FPTI	Four Digits Pier Tag Information	Mandatory	SAC	PLC	Y
0022	TPTI	Two Digits Pier Tag Information	Optional	SAC	PLC	Y
0023	PV1K	PVP 1000 Information	Optional	PLC	SAC	N
0024	BSDI	Bag Status Display Information	Optional	PLC	SAC	N
0025	SSTL	Special Security Tag Level	Mandatory	SAC	PLC	Y
0026	IMSL	Item Minimum Security Level	Mandatory	SAC	PLC	Y

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0027	MCML	Make-up Carousel and Chute Mapping List	Mandatory	SAC	PLC	Y
0028	ICCR	Item Customs Screened	Mandatory	PLC	SAC	Y
0029	SSTD	Special Security Tag Destination	Mandatory	SAC	PLC	Y
0090	SOL	Sign-Of-Live (or keep alive) Message	Mandatory	SAC/PLC/ MES/PLC	PLC/SAC/P LC/MES	N
0091	TSYN	Time Synchronization	Mandatory	SAC	PLC	N
0099	ACK	Acknowledge	Mandatory	SAC/PLC/ MES/PLC	PLC/SAC/P LC/MES	N
0201	IRY	Item Ready	Mandatory	PLC	MES	Y
0202	IEC	Item Encoded	Mandatory	MES	PLC	Y
0203	IRM	Item Removed	Mandatory	MES	PLC	Y

As stated above, some telegrams are "Mandatory", which means they have to be implemented in this BHS project. Those telegrams with "Optional" are not required by this project.

As stated above some application telegrams must be acknowledged. Both sides can only send one acknowledgement required telegram before the acknowledgement of previous telegram is received. During the waiting for the acknowledgement, the incoming telegram from the opposed can still be received. This does not entitle the receiver to send another telegram that requires acknowledge. However, the protocol allow the application can still send the telegram that does not require acknowledge while waiting for an acknowledge telegram.

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5.5.2 Application Layer Connection Request (0001)

Direction: SAC => PLC, MES =>PLC

Requirement: Mandatory

Alias Name: CRQ

Acknowledgement: Un-required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0001	Telegram Type.
	4-7	Numeric	4	0020	Telegram Length.
	8-11	Numeric	4	0001	Telegram Sequence Number.
Data Fields	12-19	Alphanumeric	8	(SACPLC10)	Client Application Code.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0001 –   Telegram type, Application layer connection request telegram.

0020 –   Telegram length, 20 bytes.

0001 –   Sequence number, generated by SAC. The value "0001" will be always assigned to this field as it is the first telegram to be exchanged between SAC, PLC and MES interface. Hence, the sequence number will be reset to 0001 whenever the application layer connection was broken and re-established again.

(SACPLC10) – Client Application Code. Succeeding pad with space character (Hex: 0x20).

To inform the PLC which application is trying to make the connection to it. PLC is able to control which application can make the application layer connection. Please note that the entire primary PLC will connect to the SAC01 and all the Secondary PLC will connect to SAC02. For MES-PLC, it also same but one MES will have two connection with each connect to Primary and Secondary PLC. So at same time only one application code will accept in PLC no matter in primary or secondary.

There are following 20 valid application codes are defined for SAC-PLC, MES-PLC communication gateway application in the Mumbai BHS project. They are:

"**SACPLC10**" –   SAC to PLC-10P Communication Gateway Application Code;

"**SACPLC10**" –   SAC to PLC-10B Communication Gateway Application Code;

"**SACPLC11**" –   SAC to PLC-11P Communication Gateway Application Code;

"**SACPLC11**" –   SAC to PLC-11B Communication Gateway Application Code;

"**SACPLC12**" –   SAC to PLC-12P Communication Gateway Application Code;

"**SACPLC12**" –   SAC to PLC-12B Communication Gateway Application Code;

"**SACPLC13**" –   SAC to PLC-13P Communication Gateway Application Code;

"**SACPLC13**" –   SAC to PLC-13B Communication Gateway Application Code;

"**SACPLC14**" –   SAC to PLC-14P Communication Gateway Application Code;

"**SACPLC14**" –   SAC to PLC-14B Communication Gateway Application Code;

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"**SACPLC15**" – SAC to PLC-15P Communication Gateway Application Code;
"**SACPLC15**" – SAC to PLC-15B Communication Gateway Application Code;
"**SACPLC16**" – SAC to PLC-16P Communication Gateway Application Code;
"**SACPLC16**" – SAC to PLC-16B Communication Gateway Application Code;
"**SACPLC17**" – SAC to PLC-17P Communication Gateway Application Code;
"**SACPLC17**" – SAC to PLC-17B Communication Gateway Application Code;
"**SACPLC19**" – SAC to PLC-19P Communication Gateway Application Code;
"**SACPLC19**" – SAC to PLC-19B Communication Gateway Application Code;
"**SACPLC20**" – SAC to PLC-20P Communication Gateway Application Code;
"**SACPLC20**" – SAC to PLC-20B Communication Gateway Application Code;
"**MESPLC21**" – MES to PLC-21P Communication Gateway Application Code;
"**MESPLC21**" – MES to PLC-21B Communication Gateway Application Code;
"**MESPLC22**" – MES to PLC-22P Communication Gateway Application Code;
"**MESPLC22**" – MES to PLC-22B Communication Gateway Application Code;
"**MESPLC23**" – MES to PLC-23P Communication Gateway Application Code;
"**MESPLC23**" – MES to PLC-23B Communication Gateway Application Code;
"**MESPLC24**" – MES to PLC-24P Communication Gateway Application Code;
"**MESPLC24**" – MES to PLC-24B Communication Gateway Application Code;
"**SACPLC31**" – SAC to PLC-31P Communication Gateway Application Code;
"**SACPLC31**" – SAC to PLC-31B Communication Gateway Application Code;
"**SACPLC32**" – SAC to PLC-32P Communication Gateway Application Code;
"**SACPLC32**" – SAC to PLC-32B Communication Gateway Application Code;
"**SACPLC33**" – SAC to PLC-33P Communication Gateway Application Code;
"**SACPLC33**" – SAC to PLC-33B Communication Gateway Application Code;
"**SACPLC34**" – SAC to PLC-34P Communication Gateway Application Code;
"**SACPLC34**" – SAC to PLC-34B Communication Gateway Application Code;
"**SACPLC35**" – SAC to PLC-35P Communication Gateway Application Code;
"**SACPLC35**" – SAC to PLC-35B Communication Gateway Application Code;
"**SACPLC36**" – SAC to PLC-36P Communication Gateway Application Code;
"**SACPLC36**" – SAC to PLC-36B Communication Gateway Application Code;

Telegram Sample:
"000100200001SACPLC10"

Description:
Application layer connection request.

After the transport layer (TCP and RFC1006) connections have been established, SAC server will sends the Application Layer Connection Request telegram to PLC. This is the application layer connection handshake message used to establish the connection between the SAC application and PLC application.

The Connection Request telegram is the first application telegram need to be sent from SAC to PLC, and it is expects to receive the Connection Confirm telegram (Telegram Type: 0002) from the PLC. SAC will send or receive other application telegrams only when "0002" telegram has been received. PLC will send or receive other application telegrams only when "0001" telegram has been received and "0002" telegram has been sent out.

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Redundant SAC Server Design:

If redundant SAC servers are used, there will be two instances of each SAC2PLC communication gateway (SAC2PLC GW) application will be running at any time. One instance is running in the primary SAC server hardware, and another one is running in the secondary SAC server hardware. The identical Client Application Code will be set for these 2 instances.

At any time, only one application layer connection is allowed for any Client Application Code. Hence, there will be only one of two instances of each PLC-GW application can successfully establish the connection to the PLC and exchange the application layer telegrams with PLC.

Once receives the "0001" telegram, PLC will check whether the application layer connection of the specified Client Application Code has already been established. If it has, PLC just ignores this "0001" telegram. If it hasn't, the "0002" telegram will be generated and send to SAC to confirm the connection request.

The Connection Request telegram must be sent at least once after the transport protocol layer connection was established.

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5.5.3 Application Layer Connection Confirm (0002)

Direction: PLC => SAC, PLC => MES

Requirement: Mandatory

Alias Name: CCF

Acknowledgement: Un-required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0002	Telegram Type.
	4-7	Numeric	4	0020	Telegram Length.
	8-11	Numeric	4	0001	Telegram Sequence Number.
Data Fields	12-19	Alphanumeric	8	(SACPLC10)	Client Application Code.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0002 –	Telegram type, Application layer connections confirm telegram.
0020 –	Telegram length, 20 bytes.
0001 –	Sequence number. The value "0001" of the received Connection Request telegram sequence number field will be echoed back to SAC by PLC.
(SACPLC10) –	Client Application Code. Succeeding pad with space character (Hex: 0x20).
	PLC will echo back the same code in the "0001" telegram to SAC if the connection is accepted.

Telegram Sample:
"000200200001SACPLC10"

Description:
Application layer connection request confirmation.

Once receives the Application Layer Connection Request (0001) telegram, PLC must reply the Application Layer Connection Confirm (0002) telegram to SAC immediately.

If the "0002" telegram is not received within one time period (**Connection Confirmation Timeout, Default: 3000ms**) after the "0001" telegram has been sent to PLC, SAC will resend "0001" telegram to PLC. This process will be kept retried for preset number of times (**Connection Request Retry Times, Default: 1**) before stop.

If the SAC still does not receive the "0002" telegram after the number of times retry, it will then issue the close command to transport layer to close the RFC1006 and TCP connection to the PLC. After all layer connections have been closed, SAC will quite for a time period (**Reconnect Timeout, Default:**

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10000ms) and then reinitialize the connections from the transport protocol layer to application protocol layer. The above application layer connection handshake will be repeated after the transport layer connections have been established again.

The Connection Confirm telegram must be sent by PLC for every received Connection Request telegram.

Parameters:

Parameter name	Default Values	Description
Connection Confirmation Timeout	3000	Millisecond.
Connection Request Retry Times	1	
Reconnect Timeout **(Same parameter as Keep-Alive protocol layer. 0: Application Protocol Layer: Keep-Alive)**	10000	Millisecond.

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5.5.4 GID Used (0003)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: GID

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0003	Telegram Type.
	4-7	Numeric	4	0054	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(STM01-40)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-53	Alphanumeric	2	(NB)	Type of Bag

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0003 –	Telegram type, GID Used telegram.
0054 –	Telegram length, 54 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
	The name of the Subsystem in which the GID was generated. The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-40) –	Location Identifier. Succeeding pad with space character (Hex: 0x20).
	The location name of the conveyor on which the GID was generated. The valid range of subsystem identifier value refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.
Appendix 2: Conveyor Location Identifier List**.**	
(0123456789) –	Global Identifier of Bag.
(NB) –	Type of Bag. There are 2 possible values:
	"**NB**" – Normal Bag
	"**SB**" – Stray Bag

Telegram Sample:

"000300541234 STM01-40   STM01-40   0123456789NB"

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Description:

The PLC generates the Global Identifier (GID) for the item at the following time:

• A conveyor before ATR at STM01, STM03, STM04, STM05, STM06, STM07, STM08, SYM10

• A conveyor before the merge point between CBR01 and STM01 or CBR02 and STM10

• A conveyor before the merge point between EBD02 and MES01 or EBD01 and MES04

• Whenever the stray item was detected

When a GID has been generated and attached to an item, the PLC will inform SAC by sending a "GID Used" (0003) telegram.

The "GID Used" telegram must be sent at least one time for each item that was inducted into BHS.

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5.5.5   Item Screened (0004)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: ICR

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0004	Telegram Type.
	4-7	Numeric	4	0074	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(STM01-080-XRL1)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number
	62-71	Alphanumeric	10	(X-RAY1)	X-ray Location Identifier.
	72	Numeric	1	(1)	Level of HBS Screening.
	73	Alphanumeric	1	(A)	Screening Result.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0004 –	Telegram type, Item Screened telegram.
0074 –	Telegram length, 74 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
	The name of the Subsystem in which the item was scanned. The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-080-XRL1) –	Location Identifier. Succeeding pad with space character (Hex: 0x20).
	The location name of the conveyor on which the item was scanned. The valid range of subsystem identifier value refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.
Appendix 2: Conveyor Location Identifier List**.**	
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA License Plate Number.
(X-RAY1) –	X-ray Location Identifier. Succeeding pad with space character (Hex: 0x20).
	The location name of the X-ray in which the item was screened. There are 3 possible values of this field:

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"**X-RAY01**" – X-ray machine on the STM01-080-XRL1;
"**X-RAY02**" – X-ray machine on the FSTM02-110-XL1;
"**X-RAY03**" – X-ray machine on the STM03-080-XRL1;
"**X-RAY04**" – X-ray machine on the STM04-110-XL1;
"**X-RAY05**" – X-ray machine on the STM05-090-XRL1;
"**X-RAY06**" – X-ray machine on the STM06-080-XRL1;
"**X-RAY07**" – X-ray machine on the STM07-110;
"**X-RAY08**" – X-ray machine on the STM08-080-XRL1;
"**X-RAY09**" – X-ray machine on the FSTM09-110;
"**X-RAY10**" – X-ray machine on the STM10-070-XL1;
"**X-RAY11**" – X-ray machine on the FEDS01-110;
"**X-RAY12**" – X-ray machine on the EDS02-100-XL3;
"**X-RAY13**" – X-ray machine on the EDS03-160-XL3;
"**X-RAY14**" – X-ray machine on the EDS04-160-XL3;
"**X-RAY15**" – X-ray machine on the EDS05-100;
"**X-RAY16**" – X-ray machine on the FEDS06-110;

(1) –   Level of HBS Screening. There are 4 possible values of this field:
"**1**" – HBS level 1
"**2**" – HBS level 2
"**3**" – HBS level 3
"**4**" – HBS level 4

(A) –   Screening Result. There are 9 possible values of this field:
"**A**" – Item is accepted / cleared.
"**R**" – Item is rejected / suspected.
"**W**" – Item screening result is pending (Will be treated as rejected in SAC)
"**T**" – Item screening result is timeout (Will be treated as rejected in SAC)
"**E**" – Item screening result is error (Will be treated as rejected in SAC)
"**U**" – Item screening result is unknown (Will be treated as rejected in SAC)
"**P**" – Item screening no picture (Will be treated as rejected in SAC)
"**S**" – Item screening is unanalysed (Will be treated as rejected in SAC)
"**F**" – Item screening is Force Reject (Will be treated as rejected in SAC)

Telegram Sample:
"000400741234 STM01   STM01-080-XRL1   01234567890123450234X-RAY1   1A"

Description:
Whenever the PLC receives a Level 1, 2, 3, or 4 x-ray screening result from Hold Baggage Screening (HBS), it will forward the result to SAC by sending Item Screened (0004) telegram.

Any screening result other than "A" is regarded as rejected (un-cleared) bag.

The Item Screened telegram can be sent any number of times, usually for different screening levels.

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5.5.6 Item Scanned (0005)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: ISC

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0005	Telegram Type.
	4-7	Numeric	4	0097	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Current Location Subsystem Identifier.
	22-41	Alphanumeric	20	(STM01-041)	Current Location Identifier
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number 1.
	62-71	Numeric	10	(0000000000)	Bag IATA Number 2.
	72-81	Numeric	10	(0000000000)	Bag IATA Number 3.
	82-86	Alphanumeric	5	(ATR01)	Scanner ID.
	87-94	Alphanumeric	8	(00000003)	Scanner Head.
	95-96	Alphanumeric	2	(01)	Scanning Status.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0005 –	Telegram type, Item Scanned telegram.
0097 –	Telegram length, 97 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Current Location Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
	The name of the Subsystem in which the item scanned telegram was sent. The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-041) –	Current Location Identifier. Succeeding pad with space character (Hex: 0x20).
	The current location in which the item scanned telegram was sent. The valid range of subsystem identifier value refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.

Appendix 2: Conveyor Location Identifier List.

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(0123456789) –	Global Identifier of Bag.
(0123450234) –	Barcode number of the 1st IATA tag or license plate of the bag.
	If bag only has one tag, the barcode number will always be assigned to this field.
(0000000000) –	Barcode number of the 2nd IATA tag or license plate of the bag.
	If bag only has one tag, the empty license plate number "**0000000000**" will be assigned to this 2nd barcode field. This field will be handled by SAC only when the Scanning Status field value is "02".
(0000000000) –	Barcode number of the 3rd IATA tag or license plate of the bag.
	If bag only has one or two tag(s), the empty license plate number "**0000000000**" will be assigned to this 3rd barcode field. This field will be handled by SAC only when the Scanning Status field value is "02".
(ATR01) –	Scanner ID.
	The location name of the scanner on which the item was scanned. This scanner ID will be used for the item recirculation counting purpose. There are 12 possible values:
	"**ATR01**" – ATR 1 on the STM01-041.
	"**ATR02**" – ATR 2 on the FSTM02-071.
	"**ATR03**" – ATR 3 on the STM03-041.
	"**ATR04**" – ATR 4 on the STM04-071.
	"**ATR05**" – ATR 5 on the STM05-051.
	"**ATR06**" – ATR 6 on the STM06-041.
	"**ATR07**" – ATR 7 on the STM07-071.
	"**ATR08**" – ATR 8 on the STM08-041.
	"**ATR09**" – ATR 9 on the FSTM09-071.
	"**ATR10**" – ATR 10 on the STM10-031.
(00000003) –	Scanner Head.

Position	1	2	3	4	5	6	7	8
Scanner Head	0	0	0	0	0	0	0	3
Bit	0000	0000	0000	0000	0000	0000	0000	0011
Scanner Head No.	32,31...	......	......	......	......	......	......	... 3,2,1

Values	Bits
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

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A	1010
B	1011
C	1100
D	1101
E	1110
F	1111

Each position contains 4 bits which represented 4 scanner heads. The first scanner head is represented by bit 4 of position 8. The last scanner head (32th) is represented by bit 1 of position 1. All the position values must use the values as showed above from 0 to F (second table). The Scan Head of each position can refer to second table in the bits to know which position(s) are read ok or not.

E.g.:

1. The values of 00000003 which represent in bit as 0000 0000 0000 0000 0000 0000 0000 0011 mean label are read by head 1 and 2.

2. The values of 00000030 which represent in bit as 0000 0000 0000 0000 0000 0000 0011 0000 mean label are read by head 5 and 6.

(00) –   Scanning Status. There are 5 possible values:

"**00**" – Read ok. Single tag.

"**01**" – No read.

"**02**" – Read ok. Multiple tags.

"**03**" – Index error.

"**04**" – No answer.

"**05**" – Scanner Failure.

Telegram Sample:

"000500971234STM01   STM01-041
01234567890123450234000000000000000000000ATR01010000000300"

Description:

"Item Scanned" (0005, ISC) telegram will be sent from PLC to SAC upon bag license plate number is detected by ATR.

The ISC telegram can contain up to three barcodes. Upon receives the ISC telegram, SAC will check the LP(s) in the ISC telegram:

• If the value of "Scanning Status" field in ISC telegram is "**00**" (Read ok with single tag), this single LP (IATA Number 1 in the ISC telegram) will be used to lookup the security level according to security screening level set for IMSL telegram;

• If the value of "Scanning Status" field in ISC telegram is "**02**" (Read ok with multiple tags), then the LP validity checking will be performed for three LPs.

   o If the BSM of three LPs has been received from BSI (three LPs are valid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "1" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;

   o If only one BSM of three barcodes has been received from BSI (only one LP is valid), the valid LP will be assigned to "IATA Number" field, and the minimum security level, which is queried according to this valid LP, will be assigned to security level fields in IMSL telegram and returned to PLC;

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- o If no BSM of three barcodes have been received from BSI (three LPs are invalid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "0" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;

- o If more than two the BSM of three barcodes have been received from BSI (only one LP is invalid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "0" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;

If the value of "Scanning Status" field in ISC telegram is "**01**" (No Read), "**03**" (Index Error), "**04**" (No Answer), or "**05**" (Scanner Failure), SAC will send IMSL telegram with LPs as Empty LP (0000000000) to PLC with minimum security level 1;

The Item Scanned telegram can be sent at any time and any number of times by PLC.

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5.5.7 Item Redirect (0006)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: IRD

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0006	Telegram Type.
	4-7	Numeric	4	0124	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(MUF01)	Sortation Destination 1 Subsystem Identifier.
	22-41	Alphanumeric	20	(MUF01-040)	Sortation Destination 1 Location Identifier.
	42-51	Alphanumeric	10	(MUF02)	Sortation Destination 2 Subsystem Identifier.
	52-71	Alphanumeric	20	(MUF02-010)	Sortation Destination 2 Location Identifier.
	72-81	Alphanumeric	10	( )	Sortation Destination 3 Subsystem Identifier.
	82-101	Alphanumeric	20	( )	Sortation Destination 3 Location Identifier.
	102-111	Numeric	10	(0123456789)	Global Identifier of Bag.
	112-121	Numeric	10	(0123450234)	IATA Number (bag tag).
	122-123	Numeric	2	(01)	Sortation Reason.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0006 –	Telegram type, Item Redirect telegram.
0124–	Telegram length, 124 bytes.
(1234) –	Sequence number, generated by SAC. The value varies according the sequence of telegram is created.
(MUF01) –	Sortation Destination 1 Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
	The name of the Subsystem which the sortation destination belongs to. The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(MUF01-040) –	Sortation Destination 1 Location Identifier. Succeeding pad with space character (Hex: 0x20).

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	The location name of the sortation destination where the item will be sorted to.
	In Winnipeg, the sortation destination is the Racetrack number, instead of discharge chute number. PLC will decide which chute of this racetrack the bag needs to be discharged to.
	The valid range of Sortation Destination Location Identifier refers to **Error! Reference source not found.**.
(MUF02) –	Sortation Destination 2 Subsystem Identifier.
(MUF02-010) –	Sortation Destination 2 Location Identifier.
( ) –	Sortation Destination 3 Subsystem Identifier. There are maximum 3 destinations can be supported by this Item Redirect telegram. Sample data (10 digits of Hex20) here is empty subsystem identifier.
( ) –	Sortation Destination 3 Location Identifier. Sample data (20 digits of Hex20) here is empty Location identifier.
(0123456789) –	Global Identifier of Bag.
(0123450234) –	IATA number or license plate number of bag.
	It could be valid LP, Empty LP (**0000000000**), or Dummy Multiple LP (**9999999999**).
(01) –	Sortation Reason. There are following possible values:

"**00**" – Sorted by Stray Bag

"**01**" – Sorted by Flight Allocation

"**02**" – Sorted by No-Read

"**03**" – Sorted by L1&2 HBS reject

"**04**" – Sorted by L3 HBS reject

"**05**" – Sorted by High Risk Flight

"**06**" – Sorted by High Risk Flight Unclear L3 HBS

"**07**" – Sorted by No BSM

"**08**" – Sorted by Multiple BSM

"**09**" – Sorted by Multiple License Plates

"**10**" – Sorted by Unknown Flight

"**11**" – Sorted by Flight No-Allocation

"**12**" – Sorted by Maximum Recirculation Reached

"**13**" – Sorted by Early Function Allocation

"**14**" – Sorted by Rush Function Allocation

"**15**" – Sorted by Too Late Function Allocation

"**16**" – Sorted by Destination Unavailable

"**17**" – Sorted by Airline Allocation

"**18**" – Sorted by Fallback Tag

"**19**" – Sorted by Problem Bag

"**20**" – Sorted by Too Early Function Allocation

"**21**" – Sorted by Flight Exception Function Allocation

"**22**" – Sorted by Bag Exception Function Allocation

Telegram Sample:

"000601241234 MUF01   MUF01-040   MUF02   MUF02-010
012345678901234502340 1"

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Description:

The Item Redirect (0006) telegram will be created by SAC and sent to PLC upon Item Screened telegram (0004) is received.

The IATA number will be checked and it will use to look up for the destination(s). If the IATA number is the Dummy Multiple LP (**9999999999**), SAC will return Sortation Reason "09" Sorted by Multiple License Plate.

If the IATA number is not Dummy Multiple LP, SAC will look up the make-up destination allocated in Departure Allocation application. If SAC detected that the make-up carousel contains more than one chute which can go to this make-up, SAC will based on the weight of each chute to look for the shortest path. The shortest path will use for returned destination to PLC.

There are maximum three (3) destinations of one item can be returned to PLC via this Item Redirect telegram. In other words, one Flight can be allocated to maximum up to 3 destinations (The destination includes racetracks, ME lines). The empty destination (10 digits of Hex value 20 for Subsystem Identifier, 10 digits of Hex value 20 for Location Identifier) will be used for the field value if item only has one or two destinations.

Upon receives the Item Redirect telegram with more than one destination, PLC will take first destination pass to TTS PLC.

SAC is required to lookup the sortation destination for the bag according to the certain sortation rules. And return it to PLC by Item Redirect (0006) telegram.

SAC will send the reason why the item is redirected to the given destination to PLC via "Sortation Reason" field, so that MES can provide more detail information of the item to the HMI Touch Panel for display on its GUI screen automatically when the item reaches the MES.

The Item Redirect telegram can be sent any number of times for each bag and at any given time. It is usually being sent when an allocation changes.

There are 25 available Sortation destinations chutes could be returned from SAC to PLC for Sortation control for each tilt tray sorter. They are:

TTS01:

- **MUF01-060** – Chute to Make-up carousel MUC01
- **MUF02-010** – Chute to Make-up carousel MUC02
- **MUF03-060** – Chute to Make-up carousel MUC03
- **MUF04-010** – Chute to Make-up carousel MUC04
- **MUF05-060** – Chute to Make-up carousel MUC05
- **MUF06-010** – Chute to Make-up carousel MUC06
- **MUF07-060** – Chute to Make-up carousel MUC07
- **MUF08-010** – Chute to Make-up carousel MUC08
- **MUF09-060** – Chute to Make-up carousel MUC09
- **MUF09-070** – Chute to Make-up carousel MUC09
- **MUF10-010** – Chute to Make-up carousel MUC10
- **MUF11-060** – Chute to Make-up carousel MUC11
- **MUF11-070** – Chute to Make-up carousel MUC11

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- **MUF12-010** – Chute to Make-up carousel MUC12
- **MUF13-060** – Chute to Make-up carousel MUC13
- **MUF14-010** – Chute to Make-up carousel MUC14
- **MUF15-060** – Chute to Make-up carousel MUC15
- **MUF16-010** – Chute to Make-up carousel MUC16
- **MUF17-060** – Chute to Make-up carousel MUC17
- **MUF18-010** – Chute to Make-up carousel MUC18
- **EBS01-010** – Chute EBS line
- **EDS07-010** – Chute to Level 3 line
- **CDS01-010** – Chute to Custom line
- **MES01-010** – Chute to Manual Encoding Station 01
- **MES02-010** – Chute to Manual Encoding Station 02

TTS02:
- **MUF01-010** – Chute to Make-up carousel MUC01
- **MUF02-060** – Chute to Make-up carousel MUC02
- **MUF03-010** – Chute to Make-up carousel MUC03
- **MUF04-060** – Chute to Make-up carousel MUC04
- **MUF05-010** – Chute to Make-up carousel MUC05
- **MUF06-060** – Chute to Make-up carousel MUC06
- **MUF07-010** – Chute to Make-up carousel MUC07
- **MUF08-060** – Chute to Make-up carousel MUC08
- **MUF09-010** – Chute to Make-up carousel MUC09
- **MUF10-060** – Chute to Make-up carousel MUC10
- **MUF10-070** – Chute to Make-up carousel MUC10
- **MUF11-010** – Chute to Make-up carousel MUC11
- **MUF12-060** – Chute to Make-up carousel MUC12
- **MUF12-070** – Chute to Make-up carousel MUC12
- **MUF13-010** – Chute to Make-up carousel MUC13
- **MUF14-060** – Chute to Make-up carousel MUC14
- **MUF15-010** – Chute to Make-up carousel MUC15
- **MUF16-060** – Chute to Make-up carousel MUC16
- **MUF17-010** – Chute to Make-up carousel MUC17
- **MUF18-060** – Chute to Make-up carousel MUC18
- **EBS01-070** – Chute EBS line
- **EDS08-010** – Chute to Level 3 line
- **CDS02-010** – Chute to Custom line
- **MES03-010** – Chute to Manual Encoding Station 03
- **MES04-010** – Chute to Manual Encoding Station 04

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5.5.9 Item Proceeded (0008)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: IPR

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0008	Telegram Type.
	4-7	Numeric	4	0084	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Identifier of Subsystem in which the item was proceeded.
	22-41	Alphanumeric	20	(STM01-131)	Identifier of Location on which the item was proceeded.
	42-61	Alphanumeric	20	(STM01-132)	Identifier of destination location where the item was proceeded to.
	62-71	Numeric	10	(0123456789)	Global Identifier of Bag.
	72-81	Numeric	10	(0123450234)	Bag IATA Number.
	82-83	Numeric	2	(00)	Type of Proceeding

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0008 –	Telegram type, Item Proceeded telegram.
0084 –	Telegram length, 84 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created. The same sequence number will be returned by SAC application through Acknowledge telegram.
(STM01) –	Identifier of Subsystem in which the item was proceeded. Succeeding pad with space character (Hex: 0x20).
	The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-131) –	Identifier of Location on which the item was proceeded. Succeeding pad with space character (Hex: 0x20).
	If the item was sorted by Vertical Sorter Unit (VSU), this field will be VSU name.
	If the item was pushed by Pusher, this field will be Pusher name.
	If the item was removed from the MES, this field will be the MES conveyor name.

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If the item was sent to problem bag line which is located at the end of transport conveyor line, this field will be the conveyor name on which the IPR telegram is sent.

The valid range of Location Identifier refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.

Appendix 2: Conveyor Location Identifier List**.**

(STM01-132   ) –   Location identifier of the proceeding destination where the item was proceeded to. Succeeding pad with space character (Hex: 0x20).

If the item was sorted to the conveyor, this field will be conveyor name.

If the item was sorted to the racetrack, this field will be racetrack name.

If the item was sorted to the ME line, this field will be the name of the ME line.

If the item was removed from the MES, this field will be empty (10 digits of space character: 0x20).

If the bag was sent to problem bag line, this field will be the name of problem bag line.

The valid range of Discharge Location Identifier refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.

Appendix 2: Conveyor Location Identifier List**.**

(0123456789) –   Global Identifier of Bag.

(0123450234) –   IATA tag number or license plate number of bag.

(00) –   Type of proceeding.

Valid value range:

00 -   Successfully Proceeded

01 -   Proceeded to Clear Line (Accepted Baggage)

02 -   Proceeded to Alarmed Line (Alarmed Baggage)

03 -   Proceeded by Clear Bag to Alarmed line

04 -   Proceeded by Alarmed Bag to Clear line

05 -   Proceeded as OOG Bag

06 -   Proceeded to Alarmed Line by Lost Track

Telegram Sample:

"000800841234 STM01   STM01-131   STM01-132   012345678901234 5023400"

Description:

Item Proceeded telegram will be created and sent to SAC by PLC on following location and proceeded location: (please note that the vertical sorter lower is cleared line, and top is un-cleared line.)

Location	Proceeded Location
STM01-131	STM01-132 (Lower) STM01-133 (Top)
STM03-131	STM03-132 (Lower) STM03-133 (Top)
STM04-161	STM04-162 (Lower) STM04-163 (Top)
STM05-141	STM05-142 (Lower)

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	STM05-143 (Top)
STM06-131	STM06-132 (Lower)
	STM06-133 (Top)
STM07-161	STM07-162 (Lower)
	STM07-163 (Top)
STM08-131	STM08-132 (Lower)
	STM08-133 (Top)
STM10-121	STM10-122 (Lower)
	STM10-123 (Top)
EDS03-060	EDO01-010-030
EDS04-060	EDO02-010-030
EDT03-270	EDT03-280 (L5 Rejected line)
EDT04-270	EDT04-280 (L5 Rejected line)
EDS02-151	EDS02-152 (Lower)
	EDS02-153 (Top)
EDS03-211	EDS03-212 (Lower)
	EDS03-213 (Top)
EDS04-211	EDS04-212 (Lower)
	EDS04-213 (Top)
EDS05-151	EDS05-152 (Lower)
	EDS05-153 (Top)

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5.5.10 Item Lost Tracking (0009)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: ILT

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0009	Telegram Type.
	4-7	Numeric	4	0062	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Identifier of Subsystem in which the item was lost.
	22-41	Alphanumeric	20	(STM01-060)	Identifier of Location on which the item was lost.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0009 –	Telegram type, Item Lost telegram.
0062 –	Telegram length, 62 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Identifier of Subsystem in which the item was lost. Succeeding pad with space character (Hex: 0x20).
	The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-060) –	Identifier of Location on which the item was lost. Succeeding pad with space character (Hex: 0x20).
	The valid range of Location Identifier refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.
	Appendix 2: Conveyor Location Identifier List**.**
(0123456789) –	Global Identifier of Bag.
(0123450234) –	IATA tag number or license plate number of bag.
	The Empty License Plate number "**0000000000**" will be assigned to this field if the item was lost before scanned.

Telegram Sample:

"000900621234 STM01   STM01-060   01234567890123450234"

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Description:

Whenever the PLC loses tracking of an item, the Item Lost telegram is sent to the SAC.
After this telegram has been sent the GID of this item is considered lost, and will not be used any more.

Lost tracked after ATR and before AT machine, the bag will sortation is based on the HBS Result. For the bag lost tracked after the AT machine will directly go to alarmed line to proceed to EDS machine.

For the bag lost tracked after EDS machine will redirect to alarmed line by PLC to Level 5.

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5.5.11 Item Tracking Information (0010)

Direction: PLC => SAC

Requirement: Optional

Alias Name: ITI

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0010	Telegram Type.
	4-7	Numeric	4	0080	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Identifier of Subsystem in which the item was reported.
	22-41	Alphanumeric	20	(STM01-070)	Identifier of Location on which the item was reported.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number
	62-79	Alphanumeric	18	(20101231-230559078)	Timestamp of tracking event.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0010 –	Telegram type, Item Tracking Information telegram.
0080 –	Telegram length, 80 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Identifier of Subsystem in which the item was reported. Succeeding pad with space character (Hex: 0x20).
	The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-070) –	Identifier of Location on which the item was reported. Succeeding pad with space character (Hex: 0x20).
	The valid range of Location Identifier refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.
	Appendix 2: Conveyor Location Identifier List.
(0123456789) –	Global Identifier of Bag.
(0123450234) –	IATA tag number or license plate number of bag.
	The Empty License Plate number "**0000000000**" will be assigned to this field if the item was lost before scanned.
(20100831-230559078) –	Timestamp of tracking event.
	The format of timestamp is "**YYYYMMDD-hhmmssxxx**":

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YYYY - Year
MM   - Month
DD   - Day
-     - Separator
hh   - Hour (24 hours)
mm   - Minutes
ss   - Second
xxx   - Millisecond

Telegram Sample:

"001000801234 STM01   STM01-070   012345678901234502342 0101231-230559078"

Description:

The "Item Tracking Information" (ITI) telegram is defined to allow the PLC to submit tracking information for each item.

Among these tracking points, PLC is required to send ITI telegram on entering and exit point of the X-Ray machine.

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5.5.13 Baggage Measurement Array Message (0018)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: BMAM

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0018	Telegram Type.
	4-7	Numeric	4	0044	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Numeric	10	(0123456789)	Global Identifier of Bag.
	22-31	Alphanumeric	10	(0123450234)	Bag IATA Number.
	32-41	Alphanumeric	10	(STM01-041)	BMA Location
	42-43	Alphanumeric	2	(00)	BMA Type

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0018 –	Telegram type, Baggage Measurement Array Message telegram.
0044 –	Telegram length, 44 bytes.
(1234) –	Sequence number.
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA license plate number or X-Ray Bag ID. If this is not in used the **Empty License Plate number "0000000000"** will be assigned to this field.
(STM01-041) -	BMA Location. This will the subsystem of the BMA allocated. Succeeding pad with space character (Hex: 0x20).
(00) –	BMA Type. The types as following:
	00 – Out Of Gauge
	01 – Normal Size Baggage

Telegram Sample:
"0018003412340123456789012345 0234 STM01-041 00"

Description:

When the Baggage pass through the BMA, PLC will send this telegram to SAC to inform the baggage whether is out of gauge or is a normal size baggage.

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5.5.14 Fallback Tag Information (0020)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: FBTI

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0020	Telegram Type.
	4-7	Numeric	4	(0134)	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-13	Numeric	2	(10)	Number of Fallback in this telegram
	14-15	Numeric	2	(00)	Last 2 digits fallback number
	16-25	Alphanumeric	10	(MUC01)	Destination
	26-27	Numeric	2	(01)	Last 2 digits fallback number
	28-37	Alphanumeric	10	(MUC02)	Destination
	38-39	Numeric	2	(02)	Last 2 digits fallback number
	40-49	Alphanumeric	10	(MUC03)	Destination
	50-51	Numeric	2	(03)	Last 2 digits fallback number
	52-61	Alphanumeric	10	(MUC04)	Destination
	62-63	Numeric	2	(04)	Last 2 digits fallback number
	64-73	Alphanumeric	10	(MUC05)	Destination
	74-75	Numeric	2	(05)	Last 2 digits fallback number
	76-85	Alphanumeric	10	(MUC06)	Destination
	86-87	Numeric	2	(06)	Last 2 digits fallback number
	88-97	Alphanumeric	10	(MUC07)	Destination
	98-99	Numeric	2	(07)	Last 2 digits fallback number
	100-109	Alphanumeric	10	(MUC08)	Destination
	110-111	Numeric	2	(08)	Last 2 digits fallback number
	112-121	Alphanumeric	10	(MUC09)	Destination
	122-123	Numeric	2	(09)	Last 2 digits fallback number
	124-133	Alphanumeric	10	(MUC10)	Destination

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

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0020 –		Telegram type, Fallback Tag Information telegram.
(0134) –		Telegram length, from 26 bytes and up to 134 bytes.
(1234) –		Sequence number.
(10) –		Number of Fallback in this telegram from 01 to 10, as the maximum fallback can send by this telegram.

The following 2 data fields can repeat up to 10 times as it allow sending 10 fallback per telegram.

(00) –		Last 2 digits of IATA standard fallback tag.
(MUC01) –		Sorting Device (Make-up Carousel) Number. 10-digit alphanumeric value. Succeeding pad with space character (Hex: 0x20).

Telegram Sample:

1 Fallback
"0020002612340100 MUC01   "

2 Fallbacks
"0020003812340200 MUC01   01 MUC02   "

3 Fallbacks
"0020005012340300 MUC01   01 MUC02   02 MUC03   "

4 Fallbacks
"0020006212340400 MUC01   01 MUC02   02 MUC03   03 MUC04   "

5 Fallbacks
0020007412340500 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   "

6 Fallbacks
"0020008612340600 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   05 MUC06
"

7 Fallbacks
"0020009812340700 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   05 MUC06
06 MUC07   "

8 Fallbacks
"0020011012340800 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   05 MUC06
06 MUC07   07 MUC08   "

9 Fallbacks
0020012212340900 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   05 MUC06
06 MUC07   07 MUC08   08 MUC09   "

10 Fallbacks
"0020013412341000 MUC01   01 MUC02   02 MUC03   03 MUC04   04 MUC05   05 MUC06
06 MUC07   07 MUC08   08 MUC09   09 MUC10   "

Description:

Due to the sortation need to done in PLC when HLC down, FBTI telegram was defined to send all the fallbacks allocation to PLC. This telegram can send ten fallback allocations to PLC. If the there are 100 fallbacks in the allocation, then it will send 10 times to PLC with each times with 10 fallbacks.

But if Departure application just updated a fallback destination, SAC will send just 1 fallback data to PLC which only sends one times.

This telegram will send upon connection established by sending the entire fallbacks allocation list to PLC. Any updated from Departure Allocation will send to PLC of that particular changed fallback.

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The Sort Device is the make-up carousel name not the chute name. Thus, PLC must use the MCML telegram for the mapping list for each make-up carousel with the associated chute. PLC will map and passed this chute name to the TTS not the make-up carousel name when HLC down. PLC will make own decision to choose which chute if the related make-up carousel has more than one chute destination.

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5.5.15 Four Digits Pier Tag Information (0021)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: FPTI

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0021	Telegram Type.
	4-7	Numeric	4	(0154)	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-13	Numeric	2	(10)	Number of 4 digits Fallback Tag in this telegram
	14-17	Numeric	4	(0000)	4 digits Fallback number
	18-27	Alphanumeric	10	(MUC01)	Destination
	28-31	Numeric	4	(0001)	4 digits Fallback number
	32-41	Alphanumeric	10	(MUC01)	Destination
	42-45	Numeric	4	(0002)	4 digits Fallback number
	46-55	Alphanumeric	10	(MUC01)	Destination
	56-59	Numeric	4	(0003)	4 digits Fallback number
	60-69	Alphanumeric	10	(MUC01)	Destination
	70-73	Numeric	4	(0004)	4 digits Fallback number
	74-83	Alphanumeric	10	(MUC01)	Destination
	84-87	Numeric	4	(0005)	4 digits Fallback number
	88-97	Alphanumeric	10	(MUC01)	Destination
	98-101	Numeric	4	(0006)	4 digits Fallback number
	102-111	Alphanumeric	10	(MUC01)	Destination
	112-115	Numeric	4	(0007)	4 digits Fallback number
	116-125	Alphanumeric	10	(MUC01)	Destination
	126-129	Numeric	4	(0008)	4 digits Fallback number
	130-139	Alphanumeric	10	(MUC01)	Destination
	140-143	Numeric	4	(0009)	4 digits Fallback number
	144-153	Alphanumeric	10	(MUC01)	Destination

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0021 –		Telegram type, Four Digits Fallback Tag Information telegram.
(0154) –		Telegram length, from 28 bytes and up to 154 bytes.
(1234) –		Sequence number.
(10) –		Number of 4 digits Fallback Tag in this telegram from 01 to 10, as the maximum 4 digits Fallback can send by this telegram.

The following 2 data fields can repeat up to 10 times as it allow sending ten of 4 digits Fallback per telegram.

(0000) –		4 digits of Fallback tag, from 0000 to 0099.
(MU1) –		Sorting Device (Make-up Carousel) Number. 10-digit alphanumeric value. Succeeding pad with space character (Hex: 0x20).

Telegram Sample:

1 4 Digits Fallback
"002100281234010000MUC01   "

2 4 Digits Fallbacks
"002100421234020000 MUC01   0001 MUC01   "

3 4 Digits Fallbacks
"002100561234030000MUC01   0001MUC01   0002MUC01   "

4 4 Digits Fallbacks
"002100701234040000MUC01   0001MUC01   0002MUC01   0003MUC01   "

5 4 Digits Fallbacks
002100841234050000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01   "

6 4 Digits Fallbacks
"002100981234060000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01 0005MUC01   "

7 4 Digits Fallbacks
"002101121234070000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01 0005MUC01   0006MUC01   "

8 4 Digits Fallbacks
"002101261234080000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01 0005MUC01   06MUC01   0007MUC01   "

9 4 Digits Fallbacks
002101401234090000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01 0005MUC01   0006MUC01   0007MUC01   0008MUC01   "

10 4 Digits Fallbacks
"002101541234100000MUC01   0001MUC01   0002MUC01   0003MUC01   0004MUC01 0005MUC01   0006MUC01   0007MUC01   0008MUC01   0009 MUC01   "

Description:

Due to the sortation need to done in PLC when HLC down, FPTI telegram was defined to send all the 4 digits fallback tag allocation to PLC. This telegram can send ten 4 digits fallback tag allocations to PLC. If the there are 100 four digits fallback tag in the allocation, then it will send 10 times to PLC with each times with 10 4 digits fallback tag.

But if Carrier application just updated a 4 digits fallback tag destination, SAC will send just 1 fallback tag data to PLC which only send one times.

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This telegram will send upon connection established by sending all the carriers allocation list to PLC. Any updated from Departure Allocation will send to PLC of that particular changed 4 digits fallback tag.

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5.5.16 Special Security Tag Level (0025)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: SSTL

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0025	Telegram Type.
	4-7	Numeric	4	(0044)	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-13	Numeric	2	(10)	Number of pair for Special Security tag mapping in this telegram
	14-15	Numeric	2	(01)	First 2 digits number
	16	Alphanumeric	1	(3)	Security Level
	17-18	Numeric	2	(02)	First 2 digits number
	19	Alphanumeric	1	(3)	Security Level
	20-21	Numeric	2	(03)	First 2 digits number
	22	Alphanumeric	1	(3)	Security Level
	23-24	Numeric	2	(04)	First 2 digits number
	25	Alphanumeric	1	(3)	Security Level
	26-27	Numeric	2	(05)	First 2 digits number
	28	Alphanumeric	1	(3)	Security Level
	29-30	Numeric	2	(06)	First 2 digits number
	31	Alphanumeric	1	(3)	Security Level
	32-33	Numeric	2	(07)	First 2 digits number
	34	Alphanumeric	1	(3)	Security Level
	35-36	Numeric	2	(08)	First 2 digits number
	37	Alphanumeric	1	(3)	Security Level
	38-39	Numeric	2	(09)	First 2 digits number
	40	Alphanumeric	1	(3)	Security Level
	41-42	Numeric	2	(10)	First 2 digits number
	43	Alphanumeric	1	(3)	Security Level

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0025 –	Telegram type, Special Security Tag Information telegram.
(0044) –	Telegram length, from 26 bytes and up to 44 bytes.
(1234) –	Sequence number.
(10) –	Number of in this telegram from 01 to 10, as the maximum fallback can send by this telegram.

The following 2 data fields can repeat up to 10 times as it allow sending 10 mappings per telegram.

(01) –	First 2 digits number of security tag, from 01 to 99.
(3) –	Security Level of the mapping for first 2 digits tag number.

Telegram Sample:

1 Mapping
"00250017123401013"

2 Mappings
"00250020123402013023"

3 Mappings
"00250023123402013023033"

4 Mappings
"00250026123402013023033043"

5 Mappings
"00250029123402013023033043053"

6 Mappings
"00250032123402013023033043053063"

7 Mappings
"00250035123402013023033043053063073"

8 Mappings
"00250038123402013023033043053063073083"

9 Mappings
"00250041123402013023033043053063073083093"

10 Mappings
"00250044123402013023033043053063073083093103"

Description:

Due to the sortation need to done in PLC when HLC down, SSTL telegram was defined to send all the security tag level mappings to PLC. This telegram can send ten security level mappings to PLC. If the there are 100 security level mappings, then it will send 10 times to PLC with each times with 10 security level mappings.

But if Departure application just updated a security level, SAC will send just 1 security level mapping data to PLC which only sends one time.

This telegram will send upon connection established by sending the entire security level mappings list to PLC. Any updated from Departure Allocation will send to PLC of that particular changed security level mapping.

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5.5.17 Item Minimum Security Level (0026)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: IMSL

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0026	Telegram Type.
	4-7	Numeric	4	0033	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Numeric	10	(0123456789)	Global Identifier of Bag.
	22-31	Numeric	10	(0123450234)	IATA Number (bag tag).
	32	Numeric	1	(1)	Minimum Security Level

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0026 –	Telegram type, Item Minimum Security Level telegram.
0033 –	Telegram length, 33 bytes.
(1234) –	Sequence number.
(0123456789) –	Global Identifier of Bag.
(0123450234) –	IATA number or license plate number of bag. It could be valid LP, Empty LP (**0000000000**), or Dummy Multiple LP (**9999999999**).
(1) –	Minimum Security Level

Telegram Sample:
 "00260033123401234567890123450234 1 "

Description:

The Item Minimum Security Level (0026) telegram will be created by SAC and sent to PLC upon Item Scanned telegram (0005 - ISC) is received.

The ISC telegram can contain up to three barcodes. Upon receives the ISC telegram, SAC will check the LP(s) in the ISC telegram:

- If the value of "Scanning Status" field in ISC telegram is "**00**" (Read ok with single tag), this single LP (IATA Number 1 in the ISC telegram) will be used to lookup the security level according to security screening level set for IMSL telegram;

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- If the value of "Scanning Status" field in ISC telegram is "**02**" (Read ok with multiple tags), then the LP validity checking will be performed for three LPs.
  - o If the BSM of three LPs has been received from BSI (three LPs are valid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "0" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;
  - o If only one BSM of three barcodes has been received from BSI (only one LP is valid), the valid LP will be assigned to "IATA Number" field, and the minimum security level, which is queried according to this valid LP, will be assigned to security level fields in IMSL telegram and returned to PLC;
  - o If no BSM of three barcodes have been received from BSI (three LPs are invalid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "0" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;
  - o If more than two the BSM of three barcodes have been received from BSI (only one LP is invalid), the Dummy Multiple LP (**9999999999**) will be assigned to field "IATA Number" and "1" on the field "Minimum Security Level" of the IMSL telegram and send to PLC;

If the value of "Scanning Status" field in ISC telegram is "**01**" (No Read), "**03**" (Index Error), "**04**" (No Answer), or "**05**" (Scanner Failure), SAC will send IMSL telegram with LPs as Empty LP (0000000000) to PLC with minimum security level 1;

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5.5.18 Make-up Carousel and Chute Mapping List (0027)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: MCML

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0027	Telegram Type.
	4-7	Numeric	4	(0214)	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-13	Alphanumeric	2	(10)	Number of mapping in this telegram.
	14-23	Alphanumeric	10	(MUC01)	Make-up Carousel Name.
	24-33	Alphanumeric	10	(MUF01-060)	Chute Name.
	34-43	Alphanumeric	10	(MUC02)	Make-up Carousel Name.
	44-53	Alphanumeric	10	(MUF02-010)	Chute Name.
	54-63	Alphanumeric	10	(MUC03)	Make-up Carousel Name.
	64-73	Alphanumeric	10	(MUF03-060)	Chute Name.
	74-83	Alphanumeric	10	(MUC04)	Make-up Carousel Name.
	84-93	Alphanumeric	10	(MUF04-010)	Chute Name.
	94-103	Alphanumeric	10	(MUC05)	Make-up Carousel Name.
	104-113	Alphanumeric	10	(MUF05-060)	Chute Name.
	114-123	Alphanumeric	10	(MUC06)	Make-up Carousel Name.
	124-133	Alphanumeric	10	(MUF06-010)	Chute Name.
	134-143	Alphanumeric	10	(MUC07)	Make-up Carousel Name.
	144-153	Alphanumeric	10	(MUF07-060)	Chute Name.
	154-163	Alphanumeric	10	(MUC08)	Make-up Carousel Name.
	164-173	Alphanumeric	10	(MUF08-010)	Chute Name.
	174-183	Alphanumeric	10	(MUC09)	Make-up Carousel Name.
	184-193	Alphanumeric	10	(MUF09-060)	Chute Name.
	194-203	Alphanumeric	10	(MUC09)	Make-up Carousel Name.
	204-213	Alphanumeric	10	(MUF09-070)	Chute Name.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

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0027 –	Telegram type, Make-up Carousel and Chute Mapping List telegram.
(0032) –	Telegram length, from 32 bytes to 212 bytes.
(1234) –	Sequence number.
(10) –	Number of make-up in this telegram from 01 to 10, as the maximum make-up mapping can send by this telegram.

The following 2 data fields can repeat up to 10 times as it allow sending 10 make-ups mapping per telegram.

(MUC01) –	Make-up Carousel name. 10-digit alphanumeric value.
	Succeeding pad with space character (Hex: 0x20).
(MUF01-060) –	Sorting Device (Make-up Carousel) Number. 10-digit alphanumeric value.
	Succeeding pad with space character (Hex: 0x20).

Telegram Sample:

1 Make-up

"00270034123401 MUC01   MUF01-060 "

2 Make-ups

"00270054123401 MUC01   MUF01-060 MUC02   MUF02-010 "

3 Make-ups

"00270074123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 "

4 Make-ups

"00270094123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 "

5 Make-ups

"00270114123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 "

6 Make-ups

"00270134123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 MUC06   MUF06-010 "

7 Make-ups

"00270154123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 MUC06   MUF06-010 MUC07   MUF07-060 "

8 Make-ups

"00270174123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 MUC06   MUF06-010 MUC07   MUF07-060 MUC08   MUF08-010 "

9 Make-ups

"00270194123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 MUC06   MUF06-010 MUC07   MUF07-060 MUC08   MUF08-010 MUC09   MUF09-060 "

10 Make-ups

"00270214123401 MUC01   MUF01-060 MUC02   MUF02-010 MUC03   MUF03-060 MUC04   MUF04-010 MUC05   MUF05-060 MUC06   MUF06-010 MUC07   MUF07-060 MUC08   MUF08-010 MUC09   MUF09-060 MUC09   MUF09-070 "

Description:

Due to the LLC mode, the PLC need use the fallback mapping to get the destination and mapped the make-up carousel name to chute name, the MCML telegram was defined to send all make-up carousel name mapping of chute name to PLC. This telegram can send up to ten make-up carousel mapping

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to PLC. If the there are 100 make-up carousel mapping in the database, then it will send 10 times to PLC with each times with 10 make-up carousel mapping.

This telegram only will send upon connection established by sending the entire make-up carousel mapping list to PLC.

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5.5.19 Item Customs Screened (0028)

Direction: PLC => SAC

Requirement: Mandatory

Alias Name: ICCR

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0028	Telegram Type.
	4-7	Numeric	4	0063	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(STM01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(STM01-180)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number
	62	Alphanumeric	1	(A)	Screening Result.

Note: The value that is inside the brackets is data sample of field. The value without brackets is the actual field data of the telegram.

0028 –	Telegram type, Item Screened telegram.
0063 –	Telegram length, 63 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(STM01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
	The name of the Subsystem in which the item was scanned. The valid range of subsystem identifier value refers to **Appendix 1: Conveyor Subsystem Identifier List.**
(STM01-180) –	Location Identifier. Succeeding pad with space character (Hex: 0x20).
	The location name of the conveyor on which the item was scanned. The valid range of subsystem identifier value refers to **Refer to conveyor layout design drawing** for the actual name of conveyors.
	Appendix 2: Conveyor Location Identifier List
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA License Plate Number.
(A) –	Screening Result. There are 9 possible values of this field:
	"**A**" – Item is accepted / cleared.
	"**R**" – Item is rejected / suspected.
	"**W**" – Item customs screening result is pending (Will be treated as customs rejected in SAC)

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"**T**" – Item customs screening result is timeout (Will be treated as customs rejected in SAC)

"**E**" – Item customs screening result is error (Will be treated as customs rejected in SAC)

"**U**" – Item customs screening result is unknown (Will be treated as customs rejected in SAC)

"**P**" – Item customs screening no picture (Will be treated as customs rejected in SAC)

"**S**" – Item customs screening is unanalysed (Will be treated as customs rejected in SAC)

"**F**" – Item customs screening is Force Reject (Will be treated as customs rejected in SAC)

Telegram Sample:

"002800631234 STM01   STM01-180   01234567890123450234A"

Description:

Whenever the PLC receives a customs screening result, it will forward the result to SAC by sending Item Customs Screened (0028) telegram. SAC will verify the Customs Result and if the result is "A", SAC will look up bag's sort destination (departure make-up carousel or MES) and send to PLC. If the Customs results others than "A", SAC will get Customs Chute line destination and return to PLC through IRD telegram. Whenever PLC received IRD telegram, PLC will replace the previous destination with new destination.

Any customs result other than "A" is regarded as customs rejected (un-cleared) bag.

The Item Customs Screened telegram can be sent any number of times.

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5.5.20 Special Security Tag Destination (0029)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: SSTD

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0029	Telegram Type.
	4-7	Numeric	4	(0134)	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-13	Numeric	2	(10)	Number of pair for Special Security tag mapping in this telegram
	14-15	Numeric	2	(00)	Last 2 digits number
	16-25	Alphanumeric	10	(MUC02)	Destination
	26-27	Numeric	2	(01)	Last 2 digits number
	28-37	Alphanumeric	10	(MUC02)	Destination
	38-39	Numeric	2	(02)	Last 2 digits number
	40-49	Alphanumeric	10	(MUC02)	Destination
	50-51	Numeric	2	(03)	Last 2 digits number
	52-61	Alphanumeric	10	(MUC02)	Destination
	62-63	Numeric	2	(04)	Last 2 digits number
	64-73	Alphanumeric	10	(MUC02)	Destination
	74-75	Numeric	2	(05)	Last 2 digits number
	76-85	Alphanumeric	10	(MUC02)	Destination
	86-87	Numeric	2	(06)	Last 2 digits number
	88-97	Alphanumeric	10	(MUC02)	Destination
	98-99	Numeric	2	(07)	Last 2 digits number
	100-109	Alphanumeric	10	(MUC02)	Destination
	110-111	Numeric	2	(08)	Last 2 digits number
	112-121	Alphanumeric	10	(MUC02)	Destination
	122-123	Numeric	2	(09)	Last 2 digits number
	124-133	Alphanumeric	10	(MUC02)	Destination

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Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0029 –	Telegram type, Special Security Tag Information telegram.
(0134) –	Telegram length, from 26 bytes and up to 134 bytes.
(1234) –	Sequence number.
(10) –	Number of in this telegram from 01 to 10, as the maximum fallback can send by this telegram.

The following 2 data fields can repeat up to 10 times as it allow sending 10 mappings per telegram.

(00) –	Last 2 digits number of security tag, from 00 to 99.
(MUC01) –	Sorting Device (Make-up Carousel) Number. 10-digit alphanumeric value. Succeeding pad with space character (Hex: 0x20).

Telegram Sample:

1 Mapping
"0029002612340100MUC02   "

2 Mappings
"0029003812340200MUC02   01MUC02   "

3 Mappings
"0029005012340300MUC02   01MUC02   02MUC02   "

4 Mappings
"0029006212340400MUC02   01MUC02   02MUC02   03MUC02   "

5 Mappings
"0029007412340500MUC02   01MUC02   02MUC02   03MUC02   04MUC02   "

6 Mappings
"0029008612340600MUC02   01MUC02   02MUC02   03MUC02   04MUC02   05MUC02   "

7 Mappings
"0029009812340700MUC02   01MUC02   02MUC02   03MUC02   04MUC02   05MUC02 06MUC02   "

8 Mappings
"0029011012340800MUC02   01MUC02   02MUC02   03MUC02   04MUC02   05MUC02 06MUC02   07MUC02   "

9 Mappings
"0029012212340900MUC02   01MUC02   02MUC02   03MUC02   04MUC02   05MUC02 06MUC02   07MUC02   08MUC02   "

10 Mappings
"0029013412341000MUC02   01MUC02   02MUC02   03MUC02   04MUC02   05MUC02 06MUC02   07MUC02   08MUC02   09MUC02   "

Description:

Due to the sortation need to done in PLC when HLC down, SSTD telegram was defined to send all the security destination mappings to PLC. This telegram can send ten security destination mappings to PLC. If the there are 100 security destination mapping in the allocation, then it will send 10 times to PLC with each times with 10 security destination mappings.

But if Departure application just updated a security destination mapping, SAC will send just 1 security destination mapping data to PLC which only sends one times.

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This telegram will send upon connection established by sending the entire security destinations allocation list to PLC. Any updated from Departure Allocation will send to PLC of that particular changed security destination.

The Sort Device is the make-up carousel name not the chute name. Thus, PLC must use the MCML telegram for the mapping list for each make-up carousel with the associated chute. PLC will map and passed this chute name to the TTS not the make-up carousel name when HLC down. PLC will make own decision to choose which chute if the related make-up carousel has more than one chute destination.

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5.5.21 Acknowledge (0099)

Direction: PLC <=> SAC, PLC <=> MES

Requirement: Mandatory

Alias Name: ACK

Acknowledgement: Un-required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0099	Telegram Type.
	4-7	Numeric	4	0012	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0099 –   Telegram type, Acknowledge telegram.

0012 –   Telegram length, 28 bytes.

(1234) –   Sequence number.

The value is the echo back value of the sequence number field in the received acknowledgement required telegram, for example: Item Proceeded telegram.

Telegram Sample:
"009900121234"

Description:

Due to the critical to the SAC sortation control of some telegrams, for example the Item Proceeded telegram, the telegram sender must make sure the telegram is successfully received by receiver. Hence such items are designed to be the acknowledgement required telegram. After the telegram is sent, the sender must wait for the Acknowledge Telegram (0099), which contains the same sequence number as the original telegram. If no Acknowledge Telegram is returned from receiver within a certain time period (Acknowledgement Timeout, Default: 3000ms), the original telegram will be resent by sender. This process will be kept retried for preset number of times (Telegram Resend Times, Default: 3 times) before stop.

If the sender still does not receive the Acknowledge Telegram after the number of times retry, it will then stop all telegram sending, include the acknowledge un-required telegram and Keep-Alive telegram. If the sender is PLC, it then will wait for SAC to actively close the connections when the keep-alive receiving timeout. The SAC will re-establish the connection to PLC after certain time. If the sender is SAC, it then will close the connections immediately. After certain time (Connection Reinitialize Timeout, Default: 30000ms), the SAC will re-establish the connection to PLC.

After the application layer connection has been re-established, the sender will resend the original telegram to receiver. And the above procedure will be repeated until the sender receives the desired Acknowledge Telegram.

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Parameters:

Parameter name	Default Values	Description
Acknowledgement Timeout	3000	Millisecond.
Telegram Resend Times	3	Times.
Connection Reinitialize Timeout	30000	Millisecond. Refer to section **5.5.3 Application Layer Connection Confirm (0002).**

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5.5.22 Time Synchronization (0091)

Direction: SAC => PLC

Requirement: Mandatory

Alias Name: TSYN

Acknowledgement: Un-required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0091	Telegram Type.
	4-7	Numeric	4	0030	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-29	Alphanumeric	18	(20090415-121959088)	Timestamp

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0091 –	Telegram type, Acknowledge telegram.
0030 –	Telegram length, 30 bytes.
(1234) –	Sequence number.
(20090415-121959088) –	Timestamp of tracking event.

The format of timestamp is "**YYYYMMDD-HHmmssxxx**":

YYYY - Year
MM   - Month
DD   - Day
-       - Separator
HH   - Hour (24 hours)
mm   - Minutes
ss   - Second
xxx   - Millisecond

Telegram Sample:

"009100301234200904115-121959088"

Description:

Due to the ITI telegrams need to use time stamp in the PLC site, this telegram will send to PLC to Synchronisation with the PLC(s). This telegram will send once the connection established and will resend with the preset number of times (Telegram time Sync Interval, Default: 600000 msec).

Parameters:

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If the parameters of threadInterval and timeSyncInterval values is smaller than their default values as showed as below table, their default values will be used. The default values of threadInterval and timeSyncInterval will be used when threadInterval is bigger than timeSyncInterval.

Parameter name	Default Values	Description
threadInterval	1000	Millisecond.
timeSyncInterval	600000	Millisecond.
dateTimeFormat	yyyyMMdd-HHmmssfff	String.

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5.5.23 Item Ready (0201)

Direction: PLC => MES

Requirement: Mandatory

Alias Name: IRY

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0201	Telegram Type.
	4-7	Numeric	4	0062	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(MES01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(MES01-010)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0201 –	Telegram type, Item Screened telegram.
0062 –	Telegram length, 62 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(MES01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
(MES01-010) –	Location Identifier. Succeeding pad with space character (Hex: 0x20).
	Possible Locations:
	MES01-010, MES02-010, MES03-010, MES04-010
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA license plate number.
	This field will be filled with the actual IATA# if the IATA# known by PLC. Otherwise the **Empty License Plate number "0000000000"** will be assigned to this field.

Telegram Sample:

"020100621234MES01   MES01-010   01234567890123450234"

Description:

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Whenever the bag arrived at MES conveyor, PLC will send IRY telegram to MES to inform the arrived of the bag in MES conveyor in order for MES application ready to use.

Once MES received this telegram, MES will use the GID and IATA number to search the required information.

Upon the connection between MES and PLC established, PLC needs to check whether have any bag in the MES conveyor by checking on the photocell for the conveyor. If the photocell of MES conveyor blocked, PLC will need to send IRY telegram to MES. Otherwise, no action need to be done for the PLC.

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5.5.24 Item Encoded (0202)

Direction: MES => PLC

Requirement: Mandatory

Alias Name: IEC

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0202	Telegram Type.
	4-7	Numeric	4	0082	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(MES01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(MES01-010)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number
	62-81	Alphanumeric	20	(MUF01-060)	Bag Destination (Chute) Number.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0202 –	Telegram type, Item Encoded telegram.
0082 –	Telegram length, 82 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(MES01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
(MES01-010) –	Location Identifier. Succeeding pad with space character (Hex: 0x20).
	Possible Locations:
	MES01-010, MES02-010, MES03-010, MES04-010
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA license plate number.
	This field will be filled with the actual IATA# if the bag was manually encoded by operator scan the bag tag use handhold barcode scanner or key in the IATA tag number or given by PLC from IRY telegram. Otherwise the **Empty License Plate number "0000000000"** will be assigned to this field.
(MUF01-060) –	Bag Destination (Chute) Number. 20-digit alphanumeric value. Succeeding pad with space character (Hex: 0x20).

Telegram Sample:

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"020200821234MES01   MES01-010   01234567890123450234MUF01-060   "

Description:

Whenever the bag encoded is ready to go, MES will send IEC telegram to PLC.

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5.5.25 Item Removed (0203)

Direction: MES => PLC

Requirement: Mandatory

Alias Name: IRM

Acknowledgement: Required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0203	Telegram Type.
	4-7	Numeric	4	0062	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.
Data Fields	12-21	Alphanumeric	10	(MES01)	Subsystem Identifier.
	22-41	Alphanumeric	20	(MES01-010)	Location Identifier.
	42-51	Numeric	10	(0123456789)	Global Identifier of Bag.
	52-61	Numeric	10	(0123450234)	Bag IATA Number

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0203 –	Telegram type, Item Screened telegram.
0062 –	Telegram length, 62 bytes.
(1234) –	Sequence number, generated by PLC. The value varies according the sequence of telegram is created.
(MES01) –	Subsystem Identifier. Succeeding pad with space character (Hex: 0x20).
(MES01-010) –	Location Identifier. Succeeding pad with space character (Hex: 0x20). Possible Locations: MES01-010, MES02-010, MES03-010, MES04-010
(0123456789) –	Global Identifier of Bag.
(0123450234) –	Bag IATA License Plate Number. This field will be filled with the actual IATA# if given by PLC through IRY telegram or key in or scanned by operator the IATA#. Otherwise the **Empty License Plate number "0000000000"** will be assigned to this field.

Telegram Sample:

"020300621234MES01   MES01-010   0123456789 0123450234"

Description:

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Whenever ever the operator decided to remove bag from MES, MES will send IRM telegram to PLC once the operator pressed the function button for remove bag from the MES GUI.

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6. APPLICATION PROTOCOL LAYER: KEEP-ALIVE

6.1 OVERVIEW

To ensure the application protocol layer connection validity both participating hosts must enforce a minimum level of traffic on the connection. This is done by means of a keep-alive telegram. Whenever a host has detected a quiet period (**Send Interval: 10seconds**) where it has not send anything for a configurable amount of time, it must send a keep-alive telegram to the other host. This ensures that no host is totally quiet for more than this configurable "keep-alive timeout".

Whenever a host finds it communication opponent quiet for more than this timeout, plus a margin, it must terminate the communication and disconnect. After an optionally pause (**Reconnect Timeout: 10seconds**) it must agree to reestablish the connection. Such connection related processes will only be issued by the application protocol layer.

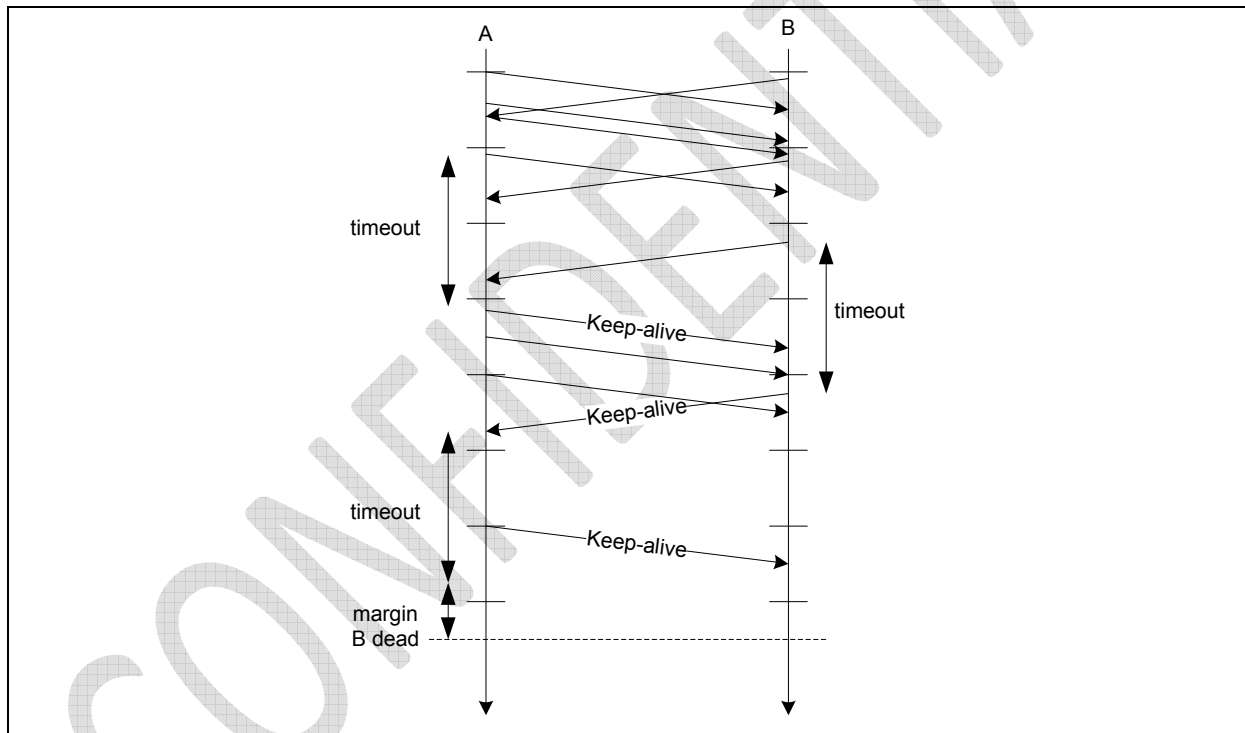The keep-alive protocol is illustrated in Figure 6-1 below.

Figure 6-1: Ensuring connection validity by means of life sign telegrams. The unnamed directed lines indicate normal telegrams of random type, whereas the lines marked "keep-alive indicates telegrams of exactly that type.

As can be seen from the figure, peer A and peer B have a busy period, at the top of the figure, where they exchange telegrams regularly. At some point the communication ceases. At the bottom of the figure peer B fails to send either keep-alive or any other telegram resulting in A concluding the communication and deeming B dead.

The keep-alive telegram will be sent only when the bottom application layer connection has been established. And it will be stopped sending when application layer connected is interrupted.

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6.2   PROTOCOL PARAMETERS

The table below lists the configurable parameters for the keep-alive protocol. These parameters must be decided and specified in the appropriate project documentation.

Parameter name	Values	Description
Receive_Timeout	25000	The timeout period in milliseconds. If keep-alive or other telegram is received within this period the connection must be closed and re-established.
Send_Interval	10000	The interval in milliseconds with which the keep-alive telegram are sent.
Reconnect_Timeout	20000	The timeout period in milliseconds. After the connection has been closed for this time period, the re-open connection will be performed.

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6.3   KEEP-ALIVE TELEGRAM DEFINITION

The keep-alive telegram has the same format as other application layer telegrams. It can be justified as the one of application layer telegrams.

The keep-alive telegram is an acknowledgement un-required telegram.

Telegram Type	Telegram Name	Source	Destination	Acknowledge Required
0090	Keep-Alive Telegram	MES/PLC	PLC/MES	N

6.3.1 Keep-Alive Telegram (0090)

Direction: MES <=> PLC

Requirement: Mandatory

Alias Name: SOL

Acknowledgement: Un-required

Format:

Field	Byte No	Format	Length (char)	Value	Description
Header Fields	0-3	Alphanumeric	4	0090	Telegram Type.
	4-7	Numeric	4	0012	Telegram Length.
	8-11	Numeric	4	(1234)	Telegram Sequence Number.

Note: The value that is inside the brackets is the data sample of field. The value without brackets is the actual field data of the telegram.

0090 –   Telegram type, Application layer connection request telegram.

0012 –   Telegram length, 22 bytes.

(1234) –   Sequence number, generated by telegram sender. The value varies according the sequence of telegram is created.

Telegram Sample:

"009000121234"

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7. REFERENCES

Abbreviation	Reference
[IR-102-08-1.00 IS_TP_EIP&CIP]	Interface Specification, Transport Protocol: EIP&CIP. Document Number: IR-102-08, Release 1.00

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8.   APPENDIX

8.1   APPENDIX 1: CONVEYOR SUBSYSTEM IDENTIFIER LIST

Refer to conveyor layout design drawing for the actual name of conveyors.

8.2   APPENDIX 2: CONVEYOR LOCATION IDENTIFIER LIST

Only those conveyors with the tracking control can be the location and its name will be used by control system. Those conveyors that are located before the tracking started point and after the tracking stopped point will not be justified as the valid location.

Refer to conveyor layout design drawing for the actual name of conveyors.

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