

TPC-FEE FERO DB Structure & Access

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1 Structure

The structure of the FERO database in the DCS system of the ALICE-TPC follows the structure of the Hardware. The following hardware components will need a configuration:

- ALTRO
- FEC (Board Controller)
- RCU

The amount of ≈ 5 million configurable parameters of one TPC configuration rejected an atomic representation of each parameter, thus all parameters of an ALTRO chip (also FEC and RCU) are collected in one database entry. The components are linked together via the corresponding relation tables. In the following sections the tables will be sketched, a full SQL-create query (in oracle format) is in the Appendix (See section 3 on page 4). This Document is written for the table revision 6 (See section 1.5 on page 3). This revision includes the changes done to adapt to the new Firmware of the RCU (RCU Firmware V2).

The reuse of the configuration parameters in one of the parameter tables can be achieved by the multiple use of this configuration id in the appropriate link tables. This has to be done by the client which creates the configuration in the database (Insert the configuration). One complete configuration needs ≈ 30 MByte of space in the database. It is expected that the TPC will need 20 to 100 different configurations. As the state of the electronics is stored in the database the configurations will change over time due to disfunctional or changed Hardware or changing hardware behaviour, but obsolete configurations can be backuped. The configurations of the TPC should never be deleted, since the FERO-db is the only source for informations of the state of the Detector.

1.1 ALTRO

The table consists of 150 columns. There are 8 ALTROs per FEC.

id	unique id of one ALTRO configuration
Position	Position of the ALTRO on the FEC (0...7)
ON_ALTRO	Switch to define the state of the chip (0,1)
ON_CHANNEL[0...15]	Switch to define the state of the channel (0,1)
[K/L/VFPED]_CHANNEL[0...15]	Channel configuration parameters
ZSTHR/.../DPCF2	Global configuration parameters

1.2 FEC

The table consists of 15 columns. There are 18, 20 or 25 (depending on the Position of the RCU in the Sector) FECs per RCU

id	unique id of one FEC configuration
BranchPosition	Branch-Position of the FEC (0,1)
Position	Position of the FEC in the branch
ON_FEC	Switch to define the state of the card (0,1)
BC.T.TH/.../CSR3	Configuration parameters

1.3 RCU

The table consists of 24 columns. There are 6 RCUs per Sector.

id	unique id of one RCU configuration
Equipmentid	Equipment id of the corresponding readout partition
Position	Position of the RCU in the SECTOR (0...5)
ON_RCU	Switch to define the state of the card (0,1)
ALTROIF_NSAM_EV/...	Configuration Parameters
.../TRGCONF_TRG_MODE	
PLACEHOLDER_01/...	Placeholder for configuration parameters
.../PLACEHOLDER_02	

The three placeholders will possible be defined and used in future.

1.4 SECTOR

The table consists of 3 colums, the sector has no configuration, it is only needed for the position determination. There are 36 Sectors per TPC.

id	unique id of the SECTOR
Position	Position of the SECTOR on the TPC (0..17)
SidePosition	Side of TPC with the SECTOR (0,1)

1.5 TPC

The table consists (currently) of 6 columns. The TPC has no configuration; this table holds the meta information in the configuration. Later some additions will be implemented here, as global Firmwares of the FPGAs or the detector and the readout list.

id	unique id of the TPC configuration
Created	Time of the creation of this configuraion
Used	Time since when the configuration has the first use
Updated	Time when the configuration was last updated
Revision	Revision of the TPC tables
Comment	Comment to describe the configuration

The TPC table revision is supposed to ensure that the client is build for the correct table version.

In total one TPC configuration needs ≈ 30 MByte and consists of

34848	ALTRO entries,
4356	FEC entries,
216	RCU entries,
36	Sector entries,
1	TPC entry,
34848	ALTRO and FEC relation entries,
4356	FEC and RCU relation entries,
216	RCU and Sector relation entries and
36	Sector and TPC relation entries.

1.6 ALTRO_FEC & FEC_RCU & RCU_SECTOR & SECTOR_TPC

These tables consist of the relation between the tables holding the data.

[ALTRO&FEC&RCU&SECTOR]_id	unique id of the configuration table
[FEC&RCU&SECTOR&TPC]_id	unique id of the configuration table

2 Access

The configuration of the TPC is subdivided in 216 blocks (one block per RCU, respectively DCS Board) as the Detector Control System (DCS) of the TPC has 216 devices on the detector for monitoring and configuration. There are 2 queries per RCU. The input of the queries is the requested configuration id (ConfigID) and the Target. The ConfigID is in the TPC Table (See section 1.5 on page 3). The Target carries the position information, thus side, sector & readout partition (RCU). The task of the first query is to retrieve the rcuID for the requested ConfigID and Target. The second query retrieves the RCU, FEC and ALTRO configuration using the rcuID from the first query. The parameters are encapsulated in the [].

```
SELECT * FROM tpc, sector_tpc, sector, rcu_sector, rcu
WHERE rcu."id"=rcu_sector."RCU_ID"
AND sector."id"=rcu_sector."SECTOR_ID"
AND sector."id"=sector_tpc."SECTOR_ID"
AND tpc."id"=sector_tpc."TPC_ID"
AND tpc."id"= [ConfigID]
AND sector.SidePosition = [Target.Side]
AND sector.Position = [Target.Sector]
AND rcu.Position = [Target.ReadoutPartition]

SELECT * FROM fec, fec_rcu, altro, altro_fec, rcu
WHERE altro.id = altro_fec.altro_id
AND fec.id=altro_fec.fec_id
AND fec.id = fec_rcu.fec_id
AND rcu.id = fec_rcu.rcu_id
AND rcu.id = [rcuID]
ORDER BY fec.BranchPosition, fec.Position, altro.Position
```

The time to compile, send and execute the configuration is expected on the order of a few seconds. The time to get the data and configure the detector is around 20s. By the use of bind variables for the geometry variables instead of literals the execution plans for these two statements can be reused.

3 Appendix

Here we give the CREATE statements for the described tables.

3.1 ALTRO

```
CREATE TABLE "ALTRO" (
  "id" Number(11) Primary Key ,
  "Position" Number(1) default NULL ,
```

```

"ON_ALTRO" Number(1) default NULL ,
"ON_CHANNEL00" Number(1) default NULL ,
"ON_CHANNEL01" Number(1) default NULL ,
"ON_CHANNEL02" Number(1) default NULL ,
"ON_CHANNEL03" Number(1) default NULL ,
"ON_CHANNEL04" Number(1) default NULL ,
"ON_CHANNEL05" Number(1) default NULL ,
"ON_CHANNEL06" Number(1) default NULL ,
"ON_CHANNEL07" Number(1) default NULL ,
"ON_CHANNEL08" Number(1) default NULL ,
"ON_CHANNEL09" Number(1) default NULL ,
"ON_CHANNEL10" Number(1) default NULL ,
"ON_CHANNEL11" Number(1) default NULL ,
"ON_CHANNEL12" Number(1) default NULL ,
"ON_CHANNEL13" Number(1) default NULL ,
"ON_CHANNEL14" Number(1) default NULL ,
"ON_CHANNEL15" Number(1) default NULL ,
"K1_CHANNEL00" Number(5) default NULL ,
"K1_CHANNEL01" Number(5) default NULL ,
"K1_CHANNEL02" Number(5) default NULL ,
"K1_CHANNEL03" Number(5) default NULL ,
"K1_CHANNEL04" Number(5) default NULL ,
"K1_CHANNEL05" Number(5) default NULL ,
"K1_CHANNEL06" Number(5) default NULL ,
"K1_CHANNEL07" Number(5) default NULL ,
"K1_CHANNEL08" Number(5) default NULL ,
"K1_CHANNEL09" Number(5) default NULL ,
"K1_CHANNEL10" Number(5) default NULL ,
"K1_CHANNEL11" Number(5) default NULL ,
"K1_CHANNEL12" Number(5) default NULL ,
"K1_CHANNEL13" Number(5) default NULL ,
"K1_CHANNEL14" Number(5) default NULL ,
"K1_CHANNEL15" Number(5) default NULL ,
"K2_CHANNEL00" Number(5) default NULL ,
"K2_CHANNEL01" Number(5) default NULL ,
"K2_CHANNEL02" Number(5) default NULL ,
"K2_CHANNEL03" Number(5) default NULL ,
"K2_CHANNEL04" Number(5) default NULL ,
"K2_CHANNEL05" Number(5) default NULL ,
"K2_CHANNEL06" Number(5) default NULL ,
"K2_CHANNEL07" Number(5) default NULL ,
"K2_CHANNEL08" Number(5) default NULL ,
"K2_CHANNEL09" Number(5) default NULL ,
"K2_CHANNEL10" Number(5) default NULL ,
"K2_CHANNEL11" Number(5) default NULL ,
"K2_CHANNEL12" Number(5) default NULL ,
"K2_CHANNEL13" Number(5) default NULL ,
"K2_CHANNEL14" Number(5) default NULL ,
"K2_CHANNEL15" Number(5) default NULL ,

```

"K3_CHANNEL00" Number(5) default NULL ,
 "K3_CHANNEL01" Number(5) default NULL ,
 "K3_CHANNEL02" Number(5) default NULL ,
 "K3_CHANNEL03" Number(5) default NULL ,
 "K3_CHANNEL04" Number(5) default NULL ,
 "K3_CHANNEL05" Number(5) default NULL ,
 "K3_CHANNEL06" Number(5) default NULL ,
 "K3_CHANNEL07" Number(5) default NULL ,
 "K3_CHANNEL08" Number(5) default NULL ,
 "K3_CHANNEL09" Number(5) default NULL ,
 "K3_CHANNEL10" Number(5) default NULL ,
 "K3_CHANNEL11" Number(5) default NULL ,
 "K3_CHANNEL12" Number(5) default NULL ,
 "K3_CHANNEL13" Number(5) default NULL ,
 "K3_CHANNEL14" Number(5) default NULL ,
 "K3_CHANNEL15" Number(5) default NULL ,
 "L1_CHANNEL00" Number(5) default NULL ,
 "L1_CHANNEL01" Number(5) default NULL ,
 "L1_CHANNEL02" Number(5) default NULL ,
 "L1_CHANNEL03" Number(5) default NULL ,
 "L1_CHANNEL04" Number(5) default NULL ,
 "L1_CHANNEL05" Number(5) default NULL ,
 "L1_CHANNEL06" Number(5) default NULL ,
 "L1_CHANNEL07" Number(5) default NULL ,
 "L1_CHANNEL08" Number(5) default NULL ,
 "L1_CHANNEL09" Number(5) default NULL ,
 "L1_CHANNEL10" Number(5) default NULL ,
 "L1_CHANNEL11" Number(5) default NULL ,
 "L1_CHANNEL12" Number(5) default NULL ,
 "L1_CHANNEL13" Number(5) default NULL ,
 "L1_CHANNEL14" Number(5) default NULL ,
 "L1_CHANNEL15" Number(5) default NULL ,
 "L2_CHANNEL00" Number(5) default NULL ,
 "L2_CHANNEL01" Number(5) default NULL ,
 "L2_CHANNEL02" Number(5) default NULL ,
 "L2_CHANNEL03" Number(5) default NULL ,
 "L2_CHANNEL04" Number(5) default NULL ,
 "L2_CHANNEL05" Number(5) default NULL ,
 "L2_CHANNEL06" Number(5) default NULL ,
 "L2_CHANNEL07" Number(5) default NULL ,
 "L2_CHANNEL08" Number(5) default NULL ,
 "L2_CHANNEL09" Number(5) default NULL ,
 "L2_CHANNEL10" Number(5) default NULL ,
 "L2_CHANNEL11" Number(5) default NULL ,
 "L2_CHANNEL12" Number(5) default NULL ,
 "L2_CHANNEL13" Number(5) default NULL ,
 "L2_CHANNEL14" Number(5) default NULL ,
 "L2_CHANNEL15" Number(5) default NULL ,
 "L3_CHANNEL00" Number(5) default NULL ,

"L3_CHANNEL01" Number(5) default NULL ,
 "L3_CHANNEL02" Number(5) default NULL ,
 "L3_CHANNEL03" Number(5) default NULL ,
 "L3_CHANNEL04" Number(5) default NULL ,
 "L3_CHANNEL05" Number(5) default NULL ,
 "L3_CHANNEL06" Number(5) default NULL ,
 "L3_CHANNEL07" Number(5) default NULL ,
 "L3_CHANNEL08" Number(5) default NULL ,
 "L3_CHANNEL09" Number(5) default NULL ,
 "L3_CHANNEL10" Number(5) default NULL ,
 "L3_CHANNEL11" Number(5) default NULL ,
 "L3_CHANNEL12" Number(5) default NULL ,
 "L3_CHANNEL13" Number(5) default NULL ,
 "L3_CHANNEL14" Number(5) default NULL ,
 "L3_CHANNEL15" Number(5) default NULL ,
 "VFPED_CHANNEL00" Number(5) default NULL ,
 "VFPED_CHANNEL01" Number(5) default NULL ,
 "VFPED_CHANNEL02" Number(5) default NULL ,
 "VFPED_CHANNEL03" Number(5) default NULL ,
 "VFPED_CHANNEL04" Number(5) default NULL ,
 "VFPED_CHANNEL05" Number(5) default NULL ,
 "VFPED_CHANNEL06" Number(5) default NULL ,
 "VFPED_CHANNEL07" Number(5) default NULL ,
 "VFPED_CHANNEL08" Number(5) default NULL ,
 "VFPED_CHANNEL09" Number(5) default NULL ,
 "VFPED_CHANNEL10" Number(5) default NULL ,
 "VFPED_CHANNEL11" Number(5) default NULL ,
 "VFPED_CHANNEL12" Number(5) default NULL ,
 "VFPED_CHANNEL13" Number(5) default NULL ,
 "VFPED_CHANNEL14" Number(5) default NULL ,
 "VFPED_CHANNEL15" Number(5) default NULL ,
 "ZSTHR_OFFSET" Number(4) default NULL ,
 "ZSTHR_ZS_THR" Number(4) default NULL ,
 "BCTHR_THR_HI" Number(4) default NULL ,
 "BCTHR_THR_LOW" Number(4) default NULL ,
 "TRCFG_ACQ_START" Number(4) default NULL ,
 "TRCFG_ACQ_END" Number(4) default NULL ,
 "DPCFG_BC1_MODE" Number(2) default NULL ,
 "DPCFG_BC1_POL" Number(1) default NULL ,
 "DPCFG_BC2_PRE" Number(1) default NULL ,
 "DPCFG_BC2_POST" Number(2) default NULL ,
 "DPCFG_BC2_EN" Number(1) default NULL ,
 "DPCFG_ZS_GF" Number(1) default NULL ,
 "DPCFG_ZS_POST" Number(1) default NULL ,
 "DPCFG_ZS_PRE" Number(1) default NULL ,
 "DPCFG_ZS_EN" Number(1) default NULL ,
 "DPCF2_PTRG" Number(1) default NULL ,
 "DPCF2_BUF" Number(1) default NULL ,
 "DPCF2_FLT_EN" Number(1) default NULL ,

"DPCF2_PWSV" Number(1) default NULL)

3.2 FEC

```
CREATE TABLE "FEC" (  
  "id" Number(11) Primary Key ,  
  "BranchPosition" Number(1) default NULL ,  
  "Position" Number(2) default NULL ,  
  "ON_FEC" Number(1) default NULL ,  
  "BC_T_TH" Number(5) default NULL ,  
  "BC_AV_TH" Number(5) default NULL ,  
  "BC_AC_TH" Number(5) default NULL ,  
  "BC_DV_TH" Number(5) default NULL ,  
  "BC_DC_TH" Number(5) default NULL ,  
  "TSMWORD" Number(3) default NULL ,  
  "USRATIO" Number(5) default NULL ,  
  "CSR0" Number(4) default NULL ,  
  "CSR1" Number(4) default NULL ,  
  "CSR2" Number(5) default NULL ,  
  "CSR3" Number(5) default NULL)
```

3.3 RCU

```
CREATE TABLE "RCU" (  
  "id" Number(11) Primary Key ,  
  "Equipmentid" Number(11) NOT NULL ,  
  "Position" Number(2) default NULL ,  
  "ON_RCU" Number(1) default NULL ,  
  "ALTROIF_NSAM_EV" NUMBER(10) default NULL ,  
  "ALTROIF_CLK_RATIO" NUMBER(4) default NULL ,  
  "ALTROIF_CSTB_DELAY" NUMBER(2) default NULL ,  
  "RDOMOD_SPARSE_RDO" NUMBER(1) default NULL ,  
  "RDOMOD_MEB_MODE" NUMBER(1) default NULL ,  
  "RDOMOD_DISABLE_RDYRX" NUMBER(1) default NULL ,  
  "TTC_CONTROL_CDH_VERSION" NUMBER(4) default NULL ,  
  "TTC_L1_LATENCY" NUMBER(12) default NULL ,  
  "TTC_L1_LATENCY_WINDOW" NUMBER(4) default NULL ,  
  "TTC_L1_MSG_LATENCY_MIN" NUMBER(12) default NULL ,  
  "TTC_L1_MSG_LATENCY_MAX" NUMBER(12) default NULL ,  
  "TTC_L2_LATENCY_MIN" NUMBER(12) default NULL ,  
  "TTC_L2_LATENCY_MAX" NUMBER(12) default NULL ,  
  "TTC_ROI_CONFIG1" NUMBER(18) default NULL ,  
  "TTC_ROI_CONFIG2" NUMBER(18) default NULL ,  
  "TTC_ROI_LATENCY_MIN" NUMBER(12) default NULL ,  
  "TTC_ROI_LATENCY_MAX" NUMBER(12) default NULL ,  
  "RDOMOD_SKIP_EMPTY" NUMBER(5) default NULL ,  
  "PLACEHOLDER_01" NUMBER(5) default NULL ,  
  "PLACEHOLDER_02" NUMBER(5) default NULL)
```


3.4 SECTOR

```
CREATE TABLE "SECTOR" (  
  "id" Number(11) Primary Key ,  
  "Position" Number(2) default NULL ,  
  "SidePosition" Number(1) default NULL)
```

3.5 TPC

```
CREATE TABLE "TPC" (  
  "id" Number(11) Primary Key ,  
  "Created" timestamp default to_timestamp('0001-01-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS') ,  
  "Used" timestamp default to_timestamp('0001-01-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS') ,  
  "Updated" timestamp default to_timestamp('9999-01-01 00:00:00', 'YYYY-MM-DD HH24:MI:SS') ,  
  "Revision" Number(5) default NULL ,  
  "Comment" VARCHAR(2000 CHAR))
```

3.6 ALTRO_FEC

```
CREATE TABLE "ALTRO_FEC" (  
  "ALTRO_ID" Number(11) default NULL ,  
  "FEC_ID" Number(11) default NULL ,  
  CONSTRAINT "afid" FOREIGN KEY ("ALTRO_ID") REFERENCES "ALTRO" ("id") ,  
  CONSTRAINT "faid" FOREIGN KEY ("FEC_ID") REFERENCES "FEC" ("id"))
```

3.7 FEC_RCU

```
CREATE TABLE "FEC_RCU" (  
  "FEC_ID" Number(11) default NULL ,  
  "RCU_ID" Number(11) default NULL ,  
  CONSTRAINT "frid" FOREIGN KEY ("FEC_ID") REFERENCES "FEC" ("id") ,  
  CONSTRAINT "rfid" FOREIGN KEY ("RCU_ID") REFERENCES "RCU" ("id"))
```

3.8 RCU_SECTOR

```
CREATE TABLE "RCU_SECTOR" (  
  "RCU_ID" Number(11) default NULL ,  
  "SECTOR_ID" Number(11) default NULL ,  
  CONSTRAINT "rsid" FOREIGN KEY ("RCU_ID") REFERENCES "RCU" ("id") ,  
  CONSTRAINT "srid" FOREIGN KEY ("SECTOR_ID") REFERENCES "SECTOR" ("id"))
```

3.9 SECTOR_TPC

```
CREATE TABLE "SECTOR_TPC" (  
  "SECTOR_ID" Number(11) default NULL ,  
  "TPC_ID" Number(11) default NULL ,  
  CONSTRAINT "stid" FOREIGN KEY ("SECTOR_ID") REFERENCES "SECTOR" ("id") ,  
  CONSTRAINT "tsid" FOREIGN KEY ("TPC_ID") REFERENCES "TPC" ("id"))
```